



National Information Technology
Authority Uganda

Feasibility Study for Integration of
National Databases

Final Report

August 2015



EY

Building a better
working world

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1 Document Control

1.1 Report version control

Version No	Name	Revision Description	Organization	Date
1.1	First Draft report	First draft report	EY	17/04/2015
1.2	Second draft report	Draft including addressed comments from the NITA PIT	EY	08/05/2015.
1.3	Third Draft report	Included detailed functional and technical requirements	EY	25/05/2015
1.4	Fourth Draft report	Defining aggregated e-services from the specific e-services	EY	08/06/2015
1.5	Final Draft report	Report with addressed comments from EXCO	EY	27/07/2015
1.6	Final Report	Report with Workshop comments and Final World Bank comments addressed	EY	31/08/2015

1.2 Approved by

The following section describes who has approved this document:

	Name	Position	Date	Signature
1.				
2.				
3.				
4.				
5.				
6.				

1.3 Definition of key terms, acronyms and abbreviations

Throughout this document, unless otherwise stated the report shall use abbreviations and acronyms for specific works. The abbreviations in the first column of the table below have the meanings stated opposite them in the second column.

Abbreviation	Description
AG	Administrator General System
API	Application Programming Interface
BOU	Bank Of Uganda
CCAS	Court Case Administration System
DPP	Directorate of Public Prosecution
e-Government	Electronic Government
ERA	Electricity Regulatory Authority
e-Service	Electronic Service
eTax	Electronic Tax
ESB	Enterprise Service Bus
EY	Ernst & Young
GSB	Government Service Bus
G2B	Government to Business
G2C	Government to Citizen
G2G	Government to Government
GIS	Geographic Information System
GoU	Government of Uganda
Gov.	Government
HURIS	Human Rights Integrated Information System
ICT	Information Communication Technology
IFMS	Integrated Financial Management System
i-Gov.	Integrated Government
i-Government	Integrated Government
Infocomm	Infocomm Development Authority of Singapore
IRC	Industrial Resource Centre
IT	Information Technology
JLOS	Justice Law and Order Sector
LDC	Law Development Centre
LIS	Land Information System
LOGICS	Local Government Information and Communication System
MDA	Ministries Departments and Agencies

MGLSD	Ministry of Gender Labour and Social Development
MoFPED	Ministry of Finance, Planning and Economic Development
MoIA	Ministry of Internal Affairs
MoLHUD	Ministry of Lands, Housing and Urban Development
MoPS	Ministry of Public Services
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NDA	National Drug Authority
NITA-U	National Information Technology Authority Uganda
NIN	National Identification Number
NWSC	National Water and Sewage Corporation
OVCNIS	Orphans and Vulnerable Children Management Information System
TIN	Tax Identification Number
UAC	Uganda Aids Commission
UBOS	Uganda Bureau of Statistics
UHI	Uganda Heart Institute
UIA	Uganda Investment Authority
UIRI	Uganda Industrial Research Institute
UNEB	Uganda National Examinations Board
UPF	Uganda Police Force
URSB	Uganda Registration Services Bureau

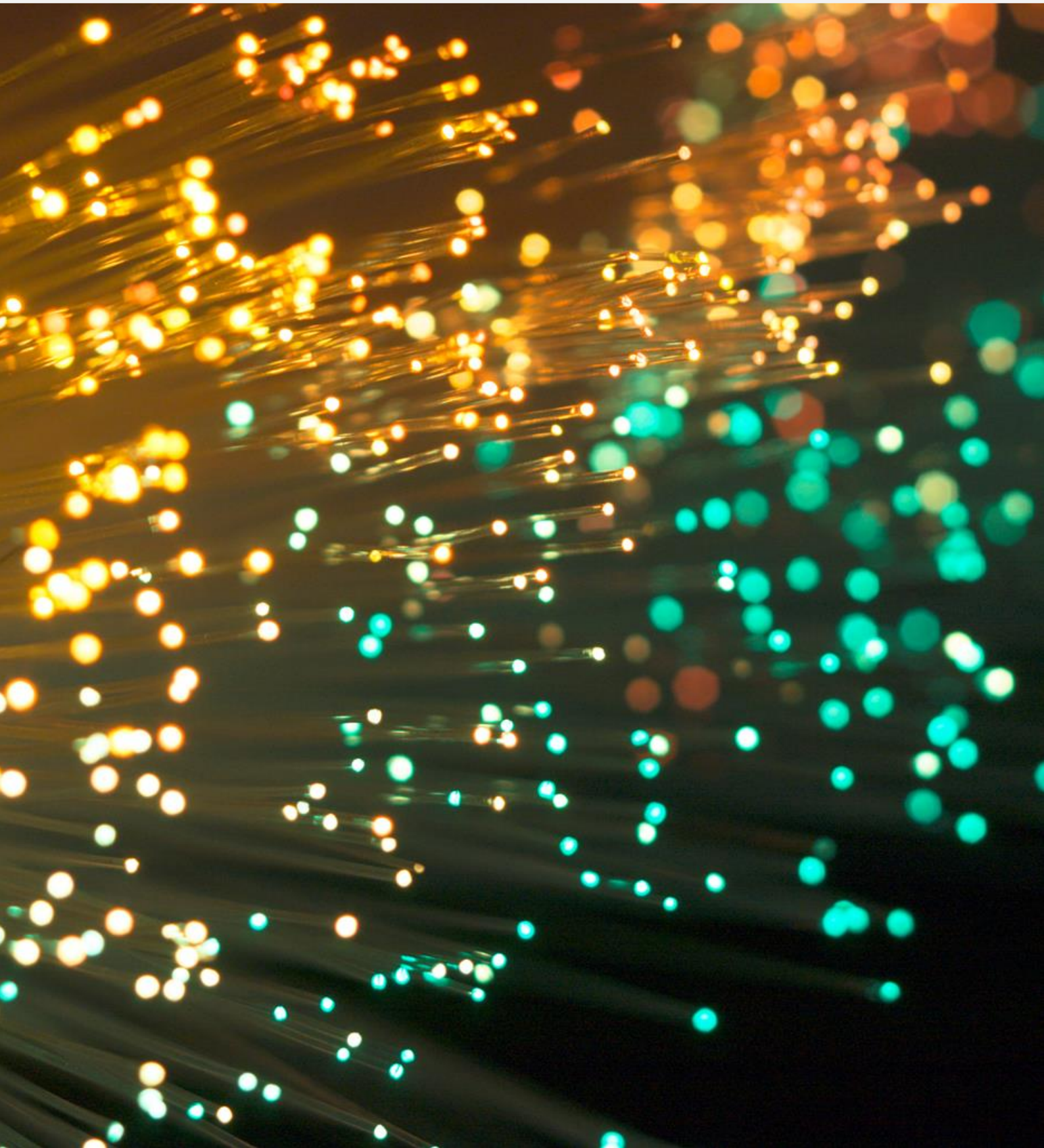
1.4 Definition of Terms

Throughout this whole document, the meaning of terms is as defined in the table below;

	Term	Definition
1.	e-Service	These are services that are provided to citizens, businesses and Government over the internet.
2.	Aggregate e-service	<ul style="list-style-type: none"> ▶ This e-service is composed of more than one unique e-service. These services have a related purpose. ▶ This e-service can have multiple service providers ▶ Citizen centric services ▶ The e- service will be deployed over the portal as a one stop shop.
3.	ESB	An Enterprise Service Bus (ESB) is a software architecture model used for designing and implementing communication between mutually interacting software applications in a service-oriented architecture (SOA)
4.	GSB	The Government of Uganda ESB will be referred to as the Government Service Bus (GSB)

5.	SOA	Service-Oriented Architecture (SOA) is an architectural style that supports service-orientation. Service-orientation is a way of thinking in terms of services and service-based development and the outcomes of services.
6.	Public bodies	Public bodies represent all Government ministries, agencies and departments;
7.	Private Bodies	Private bodies are privately owned institutions.
8.	Steering committee	An advisory board that oversees the activities of the integration and also makes strategic decisions.
9.	Administrative team	Technical group of experts
10.	Web service	A Web service is a method of communication between two electronic devices over a network. Web services describes a standardized way of integrating web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone. Web services allow organizations to communicate data without intimate knowledge of each other's IT systems behind the firewall. Web services do not provide the user with a GUI. Web services instead share business logic, data and processes through a programmatic interface across a network.
11.	Off the-Self applications	These are applications developed using standardized format and not for specialized or individual needs. It is also known as pre-packaged or pre-written software.
12.	Custom Built applications	These are applications customised using the specifications provided to the vendors by the MDA to serve specific needs. They can be configured to serve the needs of the purchasing MDA.
13.	Developed in-house	These refer to applications that are developed for an MDA to serve a particular need. They are developed internally by the MDA technical team.
14.	Alphanumeric (alphameric)	A combination of alphabetic and numeric characters, and is used to describe text constructed from this collection.
15.	Numerical data	Data that is expressed with digits as opposed to letters or words.
16.	String	A sequence of symbols or digits or characters in computer programming. For example words and sentences
17.	Character	A unit of information that roughly corresponds to a symbol, such as in an alphabet or syllabary in the written form of a natural language. Examples of characters include letters, numerical digits, common punctuation marks (such as "." or "-"), and whitespace.

2 Executive Summary



2.1 Introduction

The Government of the Republic of Uganda acting through NITA-U identified the need to integrate national databases and systems to provide standard e-Government Services Integration Framework for the development of G2G, G2B and G2C services. There are approximately 130 MDAs (Ministries, Departments and Agencies) each operating under a specific mandate to provide services to citizens and Government using different standalone systems. This justifies the need to integrate national systems and databases.

EY was contracted by National Information Technology Authority to carry out the feasibility study for integration of the national databases.

2.2 Project Objectives

Specifically, the objectives of the project were to develop a comprehensive feasibility study that will include:

- i. Needs analysis and justification for integrated database solution,
- ii. Technical design of the proposed solution including required functionality and technical specifications,
- iii. Overview of the best practices (2 case studies),
- iv. Based on the assessment of the existing databases and information already available, to prioritize at least 15 Government services that can be delivered as e-services, including identification of a minimum of 3 quick wins that can be developed by leveraging mobile technologies within 12 months timeframe,
- v. To develop time-bound descriptions of the top 3 priority mobile enabled e-services that would include description, implementation arrangements, timetable and cost estimates,
- vi. Time-bound implementation plan and strategy for databases integration and for launching e-services,
- vii. Detailed costing estimates for integration of databases and launching first e-services.

2.3 Scope of Services

EY undertook the following tasks:

1. Task 1: Preparation of an Inception Report and Overview of Best Practices

In line with Task 1, EY undertook the following:

- i. Following the initial kick-off meeting, EY in the Inception report, described the agreed procedures and processes for carrying out the Feasibility Study for Integration of databases as well as a fine-tuned approach to tasks, staffing, level of effort and agreed project schedule.

- ii. Reviewed successful models and best practices of integrating national databases at national level and documented 2 case studies (List of countries was agreed on during kick off meeting. Countries looked at included Estonia, Moldova, Singapore and the Republic of South Korea. Each case study highlighted high level;
 - a. Approach used/Implementation peculiarities
 - b. Technology options used
 - c. Technical designs used
 - d. Implementation costs
 - e. Business/commercial model used
 - f. Challenges faced
 - g. Change management approaches used
 - h. Lessons applicable to the Government of Uganda
- iii. Produced and agreed on an annotated outline of the main sections of the Feasibility Study and a timeline for its delivery.

2. Task 2: Preparation of a Feasibility Study Report

As part of task 2, EY prepared a comprehensive Feasibility Study report that summarized the findings of sub-tasks listed below:

- 2.1. Assessment of the current state and needs analysis
 - i. A detailed analysis of the current status of MDA systems and databases and needs analysis. Particular attention was given to the 37 databases listed in Annex I. EY was expected to advise the Government on which existing databases that were worth integrating;
 - ii. The review of the technology platforms and existing APIs for the existing national systems. Where APIs did not exist, EY proposed new API requirements;
 - iii. The review of existing national databases and their interfaces and proposed re-usable integration interface;
 - iv. Identified MDAs that already had necessary infrastructure and technology for quick integration. The review of the current information security controls and compliance to the controls for the operation of the Integrated Databases solution;
 - v. Conducted a cost benefit analysis for the integration of national systems & databases and development of the national databank.
- 2.2. Identification of priority e-services that can be launched leveraging information already available in existing databases:
 - i. EY identified Government services being offered by various MDAs that could be offered to citizens (G2C), Government employees (G2G) and business community (G2B) through mobile and web portal platforms;

- ii. EY liaised with stakeholders in order to identify innovative solutions being developed and how they could be scaled by the Government and offered as e-services;
- iii. Based on the research undertaken, we conducted a prioritization exercise with the view to identify at least 15 e-services that could be launched by leveraging existing databases (these were divided into shared e-services, sectorial e-services and “quick wins”);
- iv. We have proposed a list of 3 quick wins e-services to be implemented in the near term (less than 12 months);
- v. We have developed detailed description of each of three “quick win” e-services including implementation arrangements, timetable and rough cost estimates;
- vi. We facilitated discussions with other agencies led by NITA-U in respect to confirming the top 3 e-services. We have also provided a more detailed description for each prioritized 3 e-services.
- vii. We identified cross cutting, horizontal e-services that can be shared across Government MDAs (G2G).

2.3. Review legal and regulatory environment

- i. Undertook a detailed review of legal and regulatory mandates related to generation, modification, publishing and ownership of data by the different MDAs for the existing national systems and databases;
- ii. Proposed new laws and regulations or amendments to allow for the smooth operation of the integration of national databases solution and online Government services

2.4. Develop Technical Solution Proposal

EY has developed Technical and Functional proposal detailing each of the following:

- i. Detailed functional and technical specifications for the solution for integrating the national databases. This details out all the required software and licenses;
- ii. Detailed description of MDA system data and functionality/services that can be shared across MDAs, to Citizens and to Business community based on the existing national systems and databases;
- iii. Detailed proposal for the enterprise integration technologies that can be used for the solution;
- iv. Detailed solution on how centralized reporting based on data from various Government agencies will be implemented as part of the Integrated databases solution;
- v. All MDA system functionality and sharable data that can be exposed as re-usable services (abstracting system functionality);
- vi. All e-Government services from all MDAs to be exposed through integrated platform to consumers using access channels like web, mobile and MDA systems.
- vii. Proposed data exchange standards for integrated database solution;

- viii. Detailed proposal for information security solution that will enable secure systems integration and sharing of data in the integration of national databases, in terms of confidentiality, integrity and availability;
- ix. Solution proposal and clear solution design/architecture of the Integrated Databases solution;
- x. Detailed solution proposal of how integrated databases solution can work as a reporting platform;
- xi. Detailed standards that will be required to be in place for the smooth integration of national databases and operation of the National databank;
- xii. Designed operational processes that will enable integration of national systems and databases across MDAs;
- xiii. Hardware and infrastructure requirements for implementation

2.5. Cost estimates

- i. Developed detailed cost estimates for both national integration database solution and the launching of the initial e-services.

3. Task 3. Preparation of an Implementation Plan for Integrating Government Systems

In execution of Task 3, EY developed an implementation plan detailing each of the following:

- i. A detailed implementation plan and step by step approach from the existing stand-alone national systems and databases to the delivery of selected G2G, G2B and G2C services via integrated databases solution.
- ii. Detailed implementation plan for high-priority e-services (in terms of high value services to Citizens, Government and Business, implementation complexities, benefit from realization, implementation cost and quick impact on the communities) to be implemented first.
- iii. Detail out critical success factors for smooth integration of national systems and databases, operation of the National databank and launching of the e-services

4. Task 4: Workshops, Preparation of Workshop Reports and Related Presentations

- i. The EY team worked closely with the Government counterparts in organizing and delivering two workshops in Uganda. The EY team organized and facilitated the workshop while NITA met the costs associated with the workshop. Stakeholders invited are indicated in Annex II of the ToR.
 - ▶ Workshop #1 shall be a Mid-term presentation of draft Feasibility Study. During this first workshop the consultants will be expected to share initial recommendations coming out of Feasibility.
 - ▶ Workshop #2 shall involve presentation of final recommendations to the Government of Uganda. Final recommendations will incorporate stakeholders' comments provided during

first workshop and feedback provided by NITA-U team throughout this consulting assignment.

- ii. Submit final report(s) clearly addressing all required items in accordance with this scope of work and incorporating stakeholder comments obtained from the workshops.

2.4 Approach and methodology

The study was carried out using the Ernst & Young; Identify, Diagnose, Design, Delivery, Sustain (IDDDS) methodology. Our approach started with confirmation of the terms of reference and project expectations where we held a meeting with the project stakeholders. A project inception report was developed and presented to the stakeholders. Based on the methodology and approach accepted in the inception report, our team developed a detailed work plan of the activities that were to be carried out and a cost effective way of achieving the terms of reference and methodology. The project commenced with a current state assessment which was conducted through desk research (benchmarking against other countries), on boarding sessions and interviewing of the MDA representatives. The interviews were based on a data collection tool that aimed at getting a deeper understanding of the current situation of IT infrastructure, legal and regulatory environment, current and desired e-services for the GoU and its stakeholders.

Based on the current state assessment, a future state was developed including the proposed improvements to the legal environment, the technical and functional specifications for the integration bus, the information security framework, implementation plan and the cost estimates.

2.5 Summary of current state results

Based on the information reviewed and the interviews conducted with the identified MDA representatives, we have formed a view on the current state of the MDA IT environments and the legal environment. The key findings identified included the following:

Legal Environment

- ▶ Limited awareness of the current cyber laws and ICT regulations
- ▶ Poor IT governance within the MDAs in regards to policies and procedures governing the environment and usage of IT.
- ▶ Non-compliance to ICT regulations for example the National Information Security Framework.
- ▶ Generic governance model; the regulations do not provide a clear structure for the governance for the integration

National Systems and interfaces

- ▶ Some of the National systems/databases that were selected as part of the project terms of reference had either been replaced or phased out.
- ▶ Some MDAs are aware of the other MDAs they would need to be integrated with, but not aware or sure of the specific National systems within that MDA that they would need to connect to.

Infrastructure and Security

- ▶ Many of the MDAs interviewed did not have knowledge of the National information security policy and were not in compliance with it.
- ▶ 6 % of the MDAs did not have any antivirus protection installed on their networks.
- ▶ 13% of the MDAS did not have any firewall protection.
- ▶ 91% of the MDAs do not have load balancers or any clustering for their National Systems
- ▶ The current National Web portal is not interactive and does not provide any e-services.

E-services

- ▶ 63% of the MDAs do not provide web based e-services and 78% do not provide mobile based e-services.
- ▶ There is very limited integration between the current national systems, though 94% of the MDAs expressed the desire to share information and integrate in future.
- ▶ Some MDAs were identified by other MDAs to be service providers and yet they do not have any systems currently in place to support these services.

2.6 Summary of recommendations

Legal Environment

- ▶ Appointment of an independent governance structure for the integration with representation from the e-service providers as well as an administrative team
- ▶ Implementation of IT policies and procedures to govern aspects of the IT environment. These include; change management, monitoring, incident management, backup management, data classification, business continuity and access policies
- ▶ Proposed legislation/guidelines;
 - identity management in electronic transactions
 - Regulations that govern the management of e-services i.e. implementation, upgrade and removal of systems or e-services from the bus in the current legislation
 - Information management
 - Service Level Agreements between e-service providers and consumers
- ▶ Passing of the Data Protection and Privacy bill before the implementation of the integration infrastructure
- ▶ Drafting and passing of the cybersecurity laws.

Infrastructure and Security

- ▶ Enforcement of the National Information Security Policy by NITA-U.
- ▶ Implementation of an information security framework for integration that any MDA wishing to integrate must adhere to. This will set standards like the antivirus protection, access control and firewalls standards
- ▶ Implementation of a GSB that has load balancers to enhance the availability and scalability of server applications
- ▶ The GSB should have the ability to log all activities and store the logs.

E-services

- ▶ Implementations of the quick win e-services within the next 12 months i.e. E-verification, E-passport and E-land.
- ▶ Implementation of the top priority e-services within the next 3 years.
- ▶ Implementation of the Government enterprise service bus to enable data sharing and consolidation.

3 Current State Assessment



3.1 Current State Assessment Exercise

The main purpose of the current state assessment exercise was for Ernst & Young to acquire a clear understanding of the current IT environments at the identified MDAs. Our focus was on understanding the applications, databases, message application formats and interfaces that make up the National Databases as well as the legal environment in which they operate. Ernst & Young team visited different MDAs to administer the data collection tool.

The current state assessment points out relevant key findings of the current state within the MDAs regarding the National databases infrastructure, the legal environment and its implications to the integration process. It also points out the opportunities identified as a result of the review as well as challenges that may hinder the integration of these databases.

3.1.1 Current state Approach

The current state exercise included desk review of secondary data as well as collection of primary data. The secondary data review included a review of countries that have implemented ESBs, how they implemented them, which e-services they have implemented and the challenges they have faced. This was carried out as a way of understanding what Uganda can learn from these implementations and which challenges Uganda can avoid. See **section 3.2** for the detailed results

Primary data was collected from the list of priority databases that were provided to EY. See **section 3.3** for the detailed process and results.

3.2 Case study Review

We conducted a review of the best practices based on the countries that were suggested by NITA-U. This review was performed based on secondary data sources with special focus on the approach used/implementation peculiarities, technical designs used, implementation costs, business/commercial model used, challenges faced as well as lessons learnt applicable to the Government of Uganda. The outcomes of this review are further outline below.

3.2.1 Approach used / Implementation peculiarities

Country	Approach used / Implementation peculiarities
Estonia	<p>e-Government in Estonia got started by developing a functional architecture that includes:</p> <ul style="list-style-type: none"> ▶ Secure data transport backbone X-Road ▶ Distributed information systems functionality ▶ Different hardware and software components like portals elements of public key infrastructure (PKI), Governmental databases and information systems. <p>This was the very basis of hundreds of services that have been created today in Estonia.</p> <p>The architecture of e-Government was developed in the framework of the X-Road project. X-Road project, launched in 2001 was preliminarily initiated for interconnecting Estonian Governmental databases to the common data resource accessible over the Internet. After the successful start of sending database queries and answers over the Internet, the X-Road environment was expanded to send all kinds of XML-format electronic documents securely over the Internet. At the same time the X-Road started to become a skeleton of all the e-Government services.</p>
Moldova	<p>There were two components to the project.</p> <p>The first component was e-leadership capacity and enabling environment: this component provided support to the e-Government center that had been recently established to drive Government-wide e-transformation agenda. Support was also provided for e-leadership training and civil servants capacity building; strategic communications and partnerships; development of policy, technical, legal and regulatory frameworks; and project management;</p> <p>The second component was shared infrastructure and e-services development: this component provided funding for: (a) establishing and implementing the M-Cloud (Government Cloud Computing Infrastructure);</p>

Country	Approach used / Implementation peculiarities
	<p>and (b) developing a selected number of e-Government services and shared applications to be delivered through multiple channels, including Government portals and mobile phones.</p> <p>Based on the current state assessment this option might not work for Uganda since only 9% of the MDAs are cloud based. The first component will be considered in the Uganda Implementation.</p>
Singapore	<p>Thei-Government Council was set up which provided the policy and strategic direction on all e-Government programmes. This was assisted by the iGov steering Committee.</p> <p>For e-Government management and implementation, both the centralized and decentralized approaches were used.</p> <ul style="list-style-type: none"> ▶ The central infocomm technology infrastructure, services and policies within the public sector. ▶ The Infocomm Development Authority of Singapore (IDA) is the Chief Technology Officer and Chief Information Officer to the Government of Singapore. As the CTO and CIO to the Government, IDA: <ul style="list-style-type: none"> ○ Provides technical advice and recommendations ○ Defines and recommends infocomm technology policies, standards and procedures ○ Performs service-wide infocomm technology master planning ○ Advises on and manages the central infocomm technology infrastructure ○ Manages central infocomm technology projects ▶ Permanent Secretaries of Ministries, Heads of Organs of State and Chief Executive Officers of Statutory Boards are responsible for agency-specific infocomm technology infrastructure and services within their own organisations. Assisted by their CIOs, they: <ul style="list-style-type: none"> ○ Articulate the organisation’s vision in the exploitation of infocomm technology ○ Align infocomm technology policies, standards, projects, systems and infrastructure with those of the central authority, to meet business needs and priorities ○ Provide leadership in the planning and prioritisation of IT initiatives, in alignment with the iGov2010 Master plan ○ Ensure appropriate management attention, manpower and monetary resources are given to implement infocomm technology

Country	Approach used / Implementation peculiarities
	<p>initiatives</p> <p>Regular channels of communication, initiated by IDA's Government Chief Information Office, keep CIOs posted on the latest developments in e-Government, and allow them to provide their feedback on Government-wide initiatives, share their experiences and collaborate with each other</p>
<p>Republic of South Korea</p>	<p>Korea used and is still using the e-Government best Practices. The approach for implementation was implemented with focus on the following components in a serial order as listed below:</p> <ul style="list-style-type: none"> ▶ Government Integrated Data center <p>Separately managed information systems consolidated by establishing NCIA (National computing & Information Agency). The Information systems of Government agencies integrated and managed together.</p> <ul style="list-style-type: none"> ▶ Government Information Sharing <p>To minimize required documents and office visits by expanding Government information sharing to the entire public sector and financial institutions.</p> <ul style="list-style-type: none"> ▶ On-Nara Business Process System <p>Integrated online management of public process. This improved policy accountability: all decisions and opinions recorded in document cards and History of all edited documents</p> <ul style="list-style-type: none"> ▶ e-Procurement: KONEPS <p>Bidding procedures are now processed in one - stop process. This enhanced efficiency: information on all public biddings, one time registration for bidding for all agencies and bidding documents submitted online and saves \$8.1 Billion worth of transaction costs annually.</p> <ul style="list-style-type: none"> ▶ Online Civil Services: Minwon 24 <p>Number of documents and visits to civil offices has decreased through online civil services; this includes civil information inquiry, petition and application, document inquiry and issuance, etc.</p> <ul style="list-style-type: none"> ▶ Information Network Village: INVIL <p>IT infrastructures have been established and IT education provided to rural areas. 363 e-villages established, creating IT friendly environment in rural regions.</p>
<p>USA</p>	<p>Adopted the US Federal Enterprise Architecture (FEA) which formed a unified Framework for e-Government and templates for all federal Government Enterprise Architectures</p> <p>Initially each federal Government institution had its own federal institution database. An enterprise application interface was built to extract and</p>

Country	Approach used / Implementation peculiarities
	provide information from the various institutions' data repositories.

3.2.2 Technical designs used

Integration with focus on delivery of e-services dictates that service oriented architecture is used. Common technical designs are the Enterprise architecture and the X-Road.

X-Road Design

The X-Road core was developed (2001) and deployed by Estonia in 2002. Later it was adopted by the The European Union (hereafter EU) to come up with X-Road EU environment which was specifically developed for EU countries. Since then it has been adopted by many countries including Moldova (2011), Palestine, Namibia (2014), Azerbaijan, and Serbia.

The X-Road uses an Enterprise Service Bus (interoperability backbone) to facilitate the exchange of information and data and ensure connectedness between Government institutions. It is designed to use on a simple, easy-to-install architecture and few components needed to connect a data system to X-Road. The services are made available using an integrated service portal.

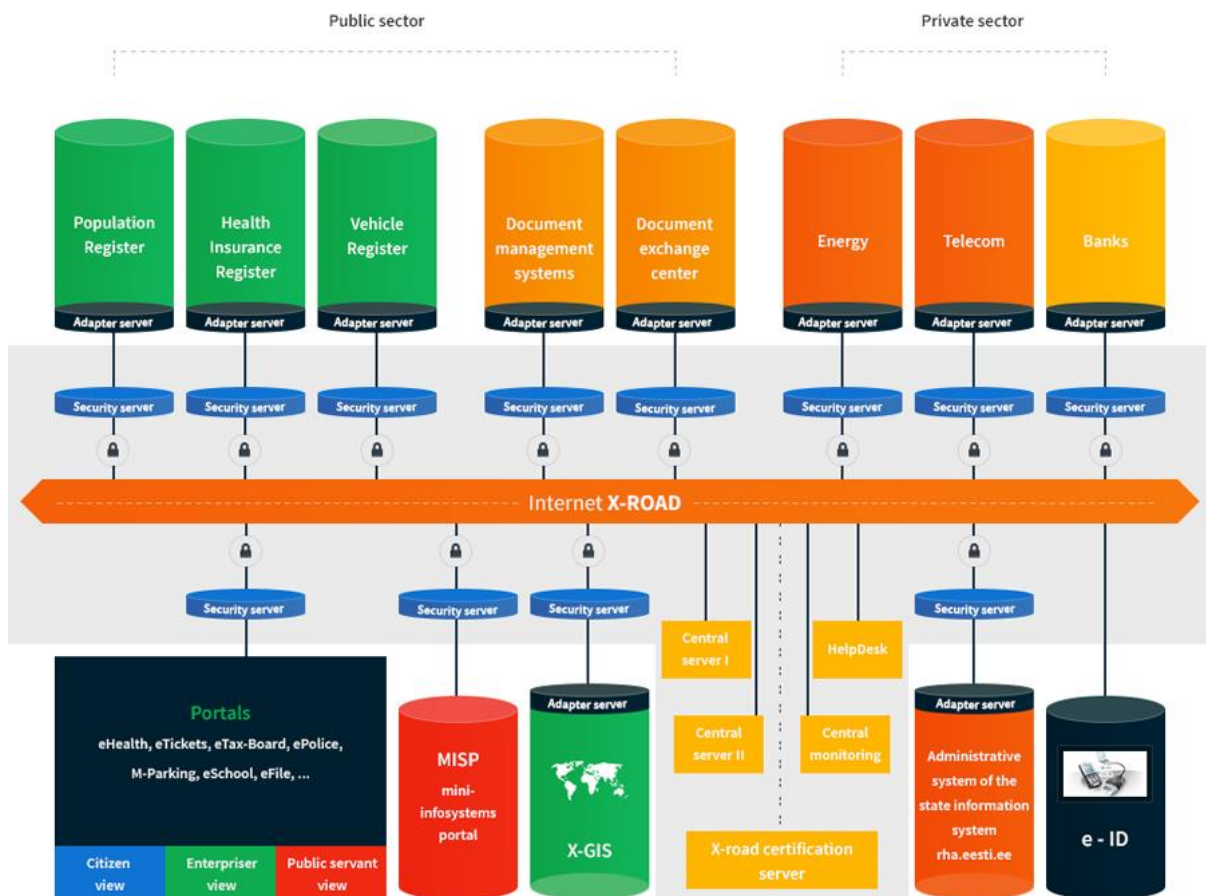


Figure 1: X-Road Data model Technical Design

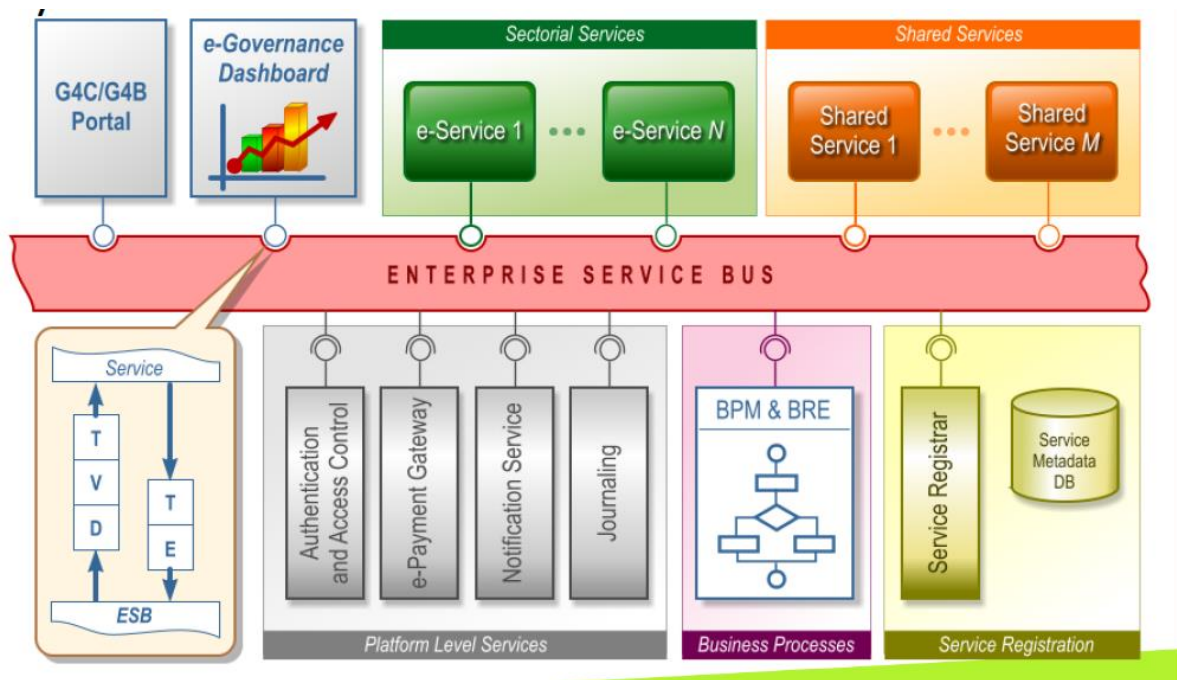


Figure 2: X-Road Service model Technical Design

Using the X-Road design, different Information systems running different platforms are able to communicate with each other simultaneously without any hindrances caused by their individual's characteristics and features. The X-Road is a good solution for data exchange in the instances where there is no agreed inter-organization technical solution or in areas that are still looking for an effective solution for organizing data exchange".

From a security perspective, the X-Road presents a platform that is open, secure and simple which enables different information systems to exchange data safely and according to standards of the public Internet.

In the X-Road environment, encrypted data can be directly transferred through secure servers from one information system to another. Data can also be transferred to one system from multiple systems simultaneously.

According to the EU, an X-Road central server can be used to issue certificates to secure servers and provides a list of trusted certificates to systems connected to the X-Road. Additionally, the central server accepts log hashes from secure servers so that if needed, a chain of service usage can be constructed later. In line with this, the service provider's log, the service user's log and the central server's hash are compared. This technique allows for checking the integrity of secure servers' logs, as it is impossible to change a log without it being detectable later. Users of the service (and groups) can be described in the central server, so that service providers could open services to users or groups as well.

X-Road gives service providers and data owners free hands to design and implement new services while relying on the existing secure infrastructure.

Figure 3: Multilateral Solution Representation

Unlike the bilateral solution which use a centralized system based on a classical service bus which creates a single point of failure and not found use in public administration, the X-Road is based on distributed architecture, individual data transactions do not rely on a central server, presenting no single point of failure. In addition it presents a multilateral solution thereby guaranteeing confidentiality, data security and the evidential value of data exchange.

Enterprise Architecture Design

The basis and conceptualization of this Enterprise architecture design is more from a business automation stand-point. Enterprise Architecture aims at establishing a balance between its three key areas of priority.

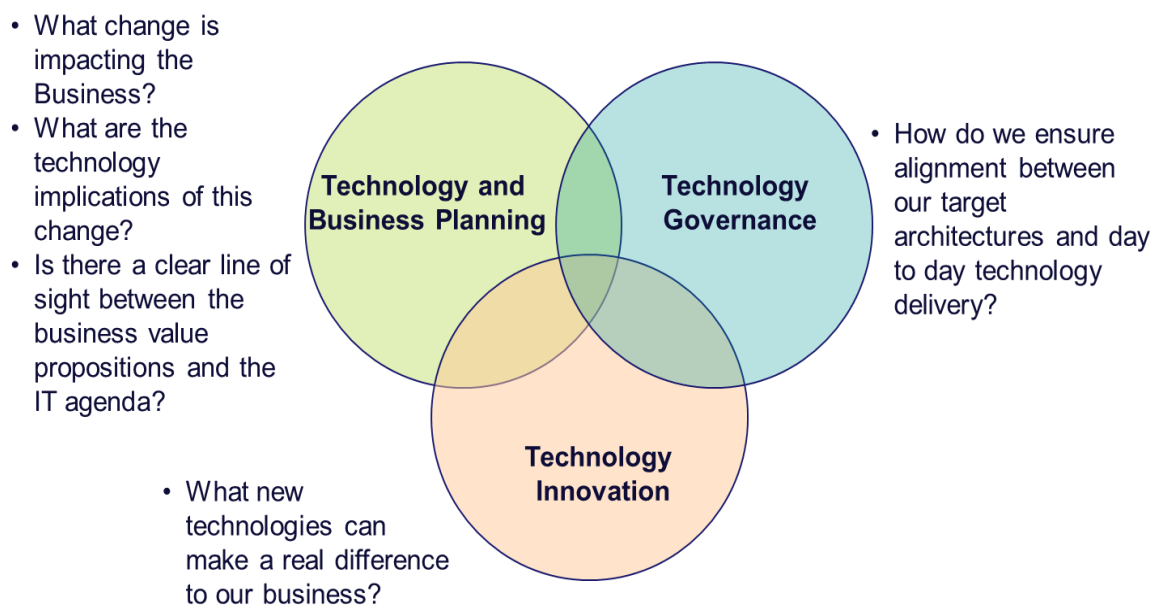


Figure 4: Key priority Areas for Enterprise Architecture

The Government is seen as an “Enterprise” or “organisation” while the different MDAs may be seen as functional areas/department within the “Enterprise”. The Enterprise architecture serve as the blueprint for detailed business and technology architectures without which, it becomes difficult for the organisations to execute on their strategies effectively.

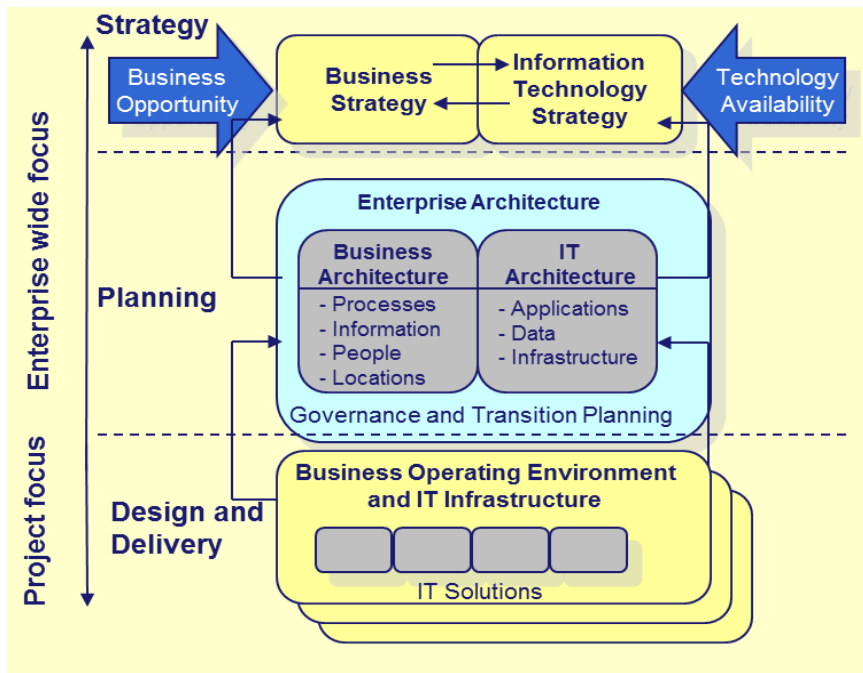


Figure 5: Enterprise Architecture Design

The figure below shows the Conceptual/Process Model of Enterprise architecture. It demonstrates the bridge between the functional view of the Business Reference Model and system/technology models that follow.

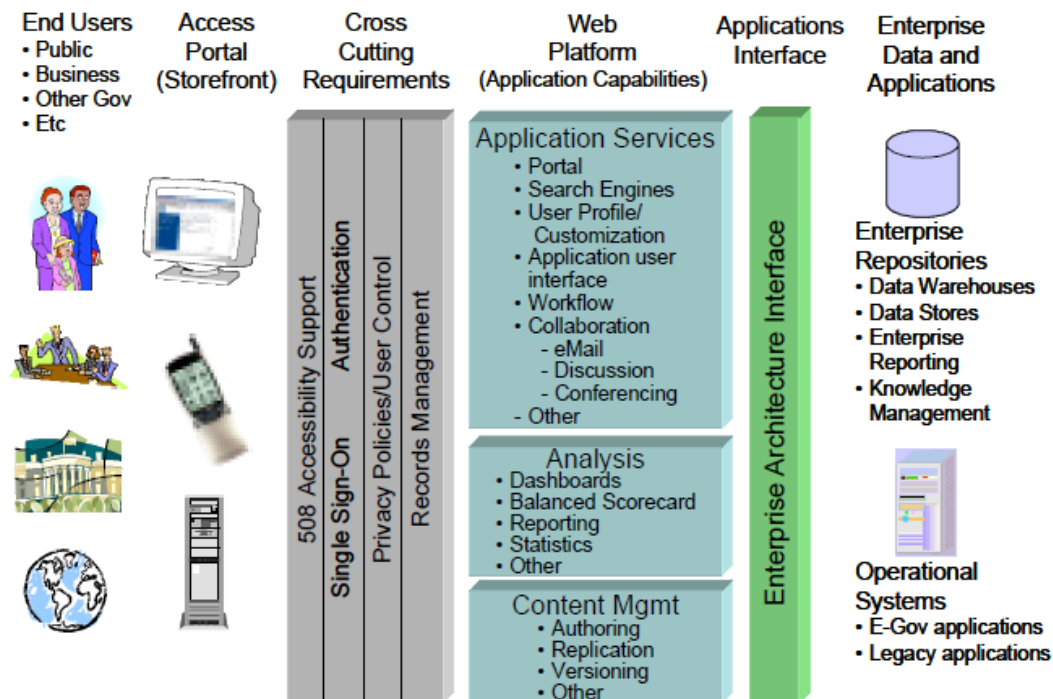


Figure 6: Conceptual Model of an Enterprise architecture

Extent of Adoption of Technical designs.

County	2014 e-Government Development Index(UN)	Technical Design	High-level description
Moldova	66	X-Road solution(started in 2011 - ongoing)	The Enterprise Service Bus was first built to facilitate the exchange of information and data and to ensure connectedness between Government institutions. Thereafter a Private Cloud Platform (MCloud) design was used by the Government of Moldova. This was a Cloud based Service Oriented Architecture.
Estonia	15	X-Road solution(started 2001 - ongoing)	Developed in 2001 and deployment started in 2002. The functional architecture includes: Secure data transport backbone X-Road; Distributed information systems functionality; Different hardware and software components like portals elements of Public Key Infrastructure (PKI), Governmental databases and information systems; and an integrated service portal.
USA	7	Enterprise Architecture(segmented)(Started in 1970s - ongoing)	Adopted the US Federal Enterprise Architecture (FEA) as a unified Framework for e-Government and templates for all federal Government Enterprise Architectures.
Singapore	3	Enterprise Architecture(Early 1980s - ongoing)	Thei-Government Council which is assisted by the iGov steering Committee was setup. Both the centralized and decentralized approaches were used for e-Government management and implementation.
South Korea	1	Enterprise Architecture(1987 - ongoing)	Adopted an enterprise architecture by setting up an integrated data centre, then implemented Government information sharing on which other systems have been developed.(including On-Nara Business process system, e-Procurement(, online civil services, customs clearance, etc.)

3.2.3 Implementation costs

County	Period	Project component/Phase	Approximate cost
Moldova	(2001 - 2003)	E-leadership capacity and enabling environment	\$8 million
		Shared infrastructure and e-services development	\$15 million
		Sub-total	\$23 Million
Estonia	2001	Development of framework and core technology of X-Road	\$0.58 Million
	2002 - 2003	Deployment	\$1.71Million
		Sub-total	\$ 1.28 Million
USA	2009 - to-date	Updating Open Government Initiative	\$7.1 Billion

3.2.4 Business/Commercial model used

Country	Business/Commercial model
Estonia	<p>Public Private Partnership business model. Participants</p> <ul style="list-style-type: none"> ▶ Public sector participants <ul style="list-style-type: none"> • Estonian MTC DSIS • Data protection inspection • Estonian Informatics Centre ▶ Private sector participants <ul style="list-style-type: none"> • Softshark Ltd. • Cybernetica Ltd. • IT Meedia Ltd. • Cell Network Ltd. • Andmevara Ltd. • Realsüsteemid Ltd • AA Arendus Ltd. • Commercial banks etc
Moldova	Moldova received a Grant, worth \$20Million, from World Bank to facilitate the Project.
Republic of South Korea	The Government of the Republic of Korea funded the E-Government

USA	Government Funding
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3.2.5 Challenges faced by the case studies

Country	Challenge(s)
Estonia	<p>Lack of good DB developers or IT Companies with large practices at the beginning of the project.</p> <p>The Government of Uganda should ensure that implementer of the integrated solution has vast experience in implementing similar solutions to avoid such pit holes.</p>
Moldova	<p>Low public interest: Citizens of Moldova did not strongly demand disclosure of Government data, in contrast with most other countries where Government data was released under strong public pressure. The Government has held events to generate interest and awareness top create public interest in data sharing, this is conducted in addition to training sessions on data journalism and application development using open data</p> <p>There will be a lot of sensitization about the benefits of using the integrated solution by the Government of Uganda as a way of ensuring that the public picks up interest. Ugandans have also demonstrated that they can easily adapt to the use of e-services.</p>
Singapore	<p>The Singapore Government faces four key issues in e-service delivery:</p> <ol style="list-style-type: none"> 1. Rising customer expectations on Government e-services - Customers' expectations are constantly evolving in the infocomm landscape where technologies are moving at an ever-increasing pace. When the integration solution is implemented the government should strive to expand the number of e-services in order to increase on the provisions of the citizens. 2. Online medium becoming the medium of choice among an infocomm-savvy population - Although a small segment of population resists the use of online services, there are growing numbers of citizens who prefer the online medium to the traditional medium. The challenge is in meeting the diversity of needs. <p>Uganda should setup internet kiosks in the rural areas to help bring on board people from all walks of life including the rural dwellers.</p>
Republic of South Korea	<ol style="list-style-type: none"> 1. Software framework became a basic tool for e-Government. 2. Some barriers were identified in e-Government system:

Country	Challenge(s)
	<ul style="list-style-type: none"> ▶ Only framework provider can modify or extend application on the framework ▶ Redundant development of same functionalities ▶ Framework is expensive asset that only big vendors can afford to possess it: <ul style="list-style-type: none"> ○ Major three IT Vendors dominate e-Government development ○ Unfair competition environment to SMEs <p>3. Increasing “Cyber Threats” such as hacking, DDoS, and Stuxnet. The Korean Government by 2011 had suffered a GPS interruption, which threatened the digital privacy.</p> <p>4. There was a digital divide for the disadvantaged</p> <p>5. Internet Addiction</p> <p>6. Cyber Ethics.</p> <ul style="list-style-type: none"> ▶ Harmful information such as malicious reply, spam and defamation are on a rise ▶ Incorrect information is made from speculation and rumours, the disseminated through the internet and cell phones causing harm to people. <p>As part of the security design, special care will be put to ensure that the security controls put in place are sufficient to counter cyber-attacks and crime. A lot of effort will also be put into the sensitization of the citizens about their personal security</p>
USA	<ul style="list-style-type: none"> ▶ Americans are not involved in the political process and e-government due to lack of access to technology, lack of technical skills, or due to some financial constraint. This is extremely problematic due to the necessity of e-government to have input from all voters and citizens, not just specific groups, for it to be fully effective. This may not affect Uganda as it is not part of the open government initiative. ▶ Another major issue having to do with citizen involvement stems from problems with the actual technology used for e-governance and the potential that it will not always function as it is supposed to. A good example of this was the problems with the healthcare.gov website that was established to help citizens with healthcare information and enrolment. Since the technology initially did not consistently work, this limited the initial effectiveness of the program and ultimately made it more difficult instead of more efficient. Uganda should

Country	Challenge(s)
	implement a robust solution that will support expansion at in future.

3.2.6 Phased implementation approach was used

All the countries under study (Estonia, Moldova, Republic of South Korea, Singapore and USA) used a phased approach to implementation. The first phases focused on developing the integration architecture and thereafter deployment of e-services.

3.2.7 E-services implemented

We reviewed the e-services that were implemented by Moldova, South Korea and Estonia since these countries successfully implemented e-services. Specifically, we looked at the e-services implemented and their impact on the Government, businesses and citizens. The e-services implemented and their impact on Moldova, Estonia and South Korea are discussed below.

1) Moldova

#	Name of the service	Description
1	E-record	<p>A record refers to a document that certifies whether an individual or a person has been convicted or if any criminal measures have been taken against them. The citizens can submit applications for the record online.</p> <p>The only time citizens need to be present at the counter is to pick up the document, on the date indicated in the receipt from the Department of Information and Operational Records of the Minister of Internal Affairs or at police stations.</p> <p>Accessing public e-Services increased transparency of the governance by reducing corruption and ending the bureaucracy of the system.</p>
2	Normative e-documents in construction	<p>This service simplified the access to construction documents for citizens, public officers, industry experts or economic agents. They now have access to a more reliable and complete source of information, as the database is being updated in real time. It simplified the interaction between authorities and citizens, offering its users modern working conditions and less bureaucracy.</p>
3	e-Visa	<p>It is the electronic service allowing applicants to request and receive visas for Moldova on-line. This project makes an important contribution for the tourism sector and the business environment of the country.</p>
4	Mobile Signature	<p>It is an innovative service, which allows accessing electronic</p>

#	Name of the service	Description
		<p>services with a mobile phone. "Mobile signature" works as an ID in the virtual world, which allows users to authenticate themselves in the cyberspace in order to prove their identity with the cell phone. With "Mobile Signature" citizens can sign papers from far apart, reports, declarations to institutions or online requests through the mobile phone. In the same way, they can access public and private e-services in an easy and convenient way. Citizens will no longer depend on the tight schedule of institutions, and they will be able to access e-services from anywhere and at any time.</p>
5	Open Data Platform	<p>It is the "Free access to public Government data" initiative; it provides among others functionalities, placing Governmental data in a standard online format. The program aims at increasing the transparency of institutions and to enable citizens take informed decisions.</p> <p>With the use of the "public Government data" journalists' daily work changed the way they observe and monitor changes in society and how the Government faces diverse challenges.</p> <p>Citizens and civil society can also monitor the running of Government.</p>
6	Unique Public Services Portal;	<p>It is a platform that offers brief, correct, accessible and complete information on the public services available in the Republic of Moldova. On this platform, one can find information regarding both electronic services, as well as traditional services.</p> <p>The platform has the description of the services, the set of documents required for services, the schedule of the services, the costs and the implementation duration. Users can also find contact details for more information and the forms that have to be completed by the citizens in electronic format, including completion's guidance.</p>
7	M-pay	<p>It is governmental service for electronic payments; it is an informational tool by which various services can be paid online. It supports e-Government where citizens use it to pay for the e-services they consume.</p> <p>Mpay enables payment services through multiple payment methods such as credit cards, payment terminals, e-banking and cash payments.</p>
8	e-Traffic	<p>It is mobile application allowing users to receive notices on the</p>

#	Name of the service	Description
		breaches committed in the traffic. The application informs the users on the following aspects related to the breach: the number of the internal file drafted by the police, the Article of the Contravention Code the breach is subject of, details on the breach, place of the breach, penalty points, and the minimal and maximal applicable fine.
9	Electronic Fiscal Record	It is a method of concluding and sending fiscal documents online. Using this service, the tax-payer no longer needs to go to the Fiscal State Agency to deposit fiscal reports. It is also no longer necessary to print forms, resulting in fewer resources spent on printing fiscal reports.
10	e-Invoice	The service represents a software solution designed for the economic agents from Moldova in terms of bills and invoices' development and electronic circulation. The electronic invoice has the same legal value and is as safe as the traditional one on paper. In addition, the system provides data accuracy and reduces the risk of invoices' counterfeiting.
11	Particip	The right of citizens to initiate bills or organize referendums, to be consulted on various draft decisions represent key elements of a "participatory democracy", a form of Government created to fill certain gaps of the "representative democracy".
12	e-Reporting	The public service of online electronic reporting has been elaborated with the support of the USAID/BIZTAR Project and is addressing economic agents, who have the possibility to present annual and quarterly reports through the unique portal
13	e-Public Procurement	The procurement process is conducted electronically, on-line, 24 hours a day, 7 days a week. It promotes transparency. Public auction volume has increased greatly in the last years and the volume of contracted goods/works/services also registered a significant increase.
14	e-Licensing	Service provides a full range of specialized functions to optimize submission and review of license applications from the Licensing Chamber. The following services can be accessed: filing an application for license issue, reissue or extension of the license.

2) Estonia

	Name of the service	Description
1	Archive notice - property rights	This form allows citizens to submit a query to the National Archives regarding property rights of buildings and owning a property. It also provides functionalities about owning shares of industrial enterprises, ships and securities. The citizens can search for property rights and owners without having to visit the National Archives department after paying for the service as required by the law; this is saves time of physically queuing to submit requests.
2	Registering a new-born	The registration of newly born is carried out online; there is no birth certificate on paper. All Information is in databases. This reduces the cost of moving to the Government agencies to record births; it has led to increased willingness in the registration of births by the citizens.
3	e-School	This is the data exchange hub between schools and homes. Students, parents and teachers are able to communicate. The purpose of e-School is to engage parents more actively in the study process, make information on subjects more available to children as well as to parents and to facilitate the work of teachers and the school management. For example, via e-School one can follow the marks given to students, their absence from classes, the content of lessons, and homework and assessments given to students by teachers at the end of the study period.
4	E-health Prescriptions	The service enables a person to see prescribed medicines and prescriptions' validity. Medical device prescriptions are available as well and detailed information is shown after clicking on the prescription number.
5	e-registration (Company)	An entrepreneur may create a company in Estonia through a completely bureaucracy-free process directly at his personal computer. The e-business portal's record for the set-up and registration of a company is 18 minutes. Creating a company via the internet requires only an Estonian ID card, but the system also recognises ID cards from Belgium, Portugal, Lithuania, and Finland, and work is currently underway to enable increasing numbers of other nations' citizens to electronically register businesses in Estonia
6	E-health; applying for	This service is for the person who needs a special care service, a

	special care service	<p>rehabilitation plan must be prepared explaining the need for special care service.</p> <p>Application for special care service can be submitted by a person himself/herself or his/her representative. After the submission of application, the most appropriate service provider shall be selected for the person in need of assistance in cooperation with the Social Insurance Board, a person in question and service provider.</p>
7	E-health Supplementary benefit for pharmaceuticals	An insured person who has spent more than 300 euros in a calendar year on medicinal products (medicine product distributed at a discount) stated in the list of the Estonian Health Insurance Fund can apply for an additional benefit for medical products. This service allows for verifying e.g. the total cost of prescriptions, the source amount for the benefit, the amount to be compensated and the amount already compensated.
8	Health Insurance and family physician	This service allows persons to see the state of own insurance, the insurance region and the data of own family physician.
9	Traffic Queries about personal vehicles	Service enables a citizen to check the data and validity of registration certificate of vehicles registered on his/her name at Estonian Motor Vehicle Registration Centre.
10	Query about driving licence	The service enables a citizen to check driving licence data and validity of right to drive thereof registered on his/her name at Estonian Motor Vehicle Registration Centre.
11	Traffic insurance history	The Traffic Insurance Registry lists every traffic insurance contract issued in Estonia and every registered case of damage in an insured event. Insurers can use this information to calculate the traffic insurance premium rate.
12	Professional certificate and taxi driver's professional certificate for a citizen	The service enables a citizen to check the date and validity of his/her professional certificate or taxi driver's professional certificate issued by Estonian Motor Vehicle Registration Centre.
13	Housing Master plan application (various parishes and towns)	Master plan proposition can be filed by anyone via an application to the parish administration. Without a valid master plan it is not possible to apply for a construction permit.
14	Cancellation of organized waste collection	A landowner may cancel the organized waste collection if the plot is uninhabited or unused. In the application for cancellation of organized waste collection one must mark the desired period of cancellation. In accordance with the Law on Waste Management,

		persons who own a waste processing permit or a complex environmental permit are not obliged to join the waste collection service
15	Entering the State privatized land mortgage management system	In the Ministry of Housing client view, it is possible to pay for the mortgage loans, land rentals and building rights for the contracts which are held by the state; <ul style="list-style-type: none"> ▶ View and download documentation related to contracts and processing; ▶ Send messages to the official who is responsible for the service and read answers.
16	Ordering an electronic voter card	Ordering an electronic voter card only takes a few seconds. One enters the Portal to order an electronic voter card. The electronic voter card is an alternative to the ordinary voter card that is sent on paper by mail. The electronic voter card is sent to the e-mail address of the voter and it contains information as to where, how and when they can vote.
17	Company search	The service enables a person to search for companies by name part or query about the data of particular company using registry code. Output comprises company's simple data: name, registry code, registry status and address.
18	e-tax declaration	Estonian citizens can declare their income taxes electronically over the internet. Estonia's e-Tax Board offers a pre-completed form which makes it easy and fast to submit tax return. The system identifies persons with the help of an ID card or mobile ID. A citizen only logs on to the e-tax system, checks the information that is automatically assembled, makes additions or changes (if necessary) and approves the declaration. The service has become so popular among Estonian residents in 2013. Over 95% of income tax declarations were presented through the e-tax system.
19	Transport permit information system	Transport permit information system enables entrepreneurs and officials to see data regarding transport permits issued by the Estonian Road Administration, local authorities and private road owners.
20	Road works description	Descriptions of road works that are describing requirements for building and constructing roads. This helps in accountability of the citizens funds
22	Defective tax forms and	The query returns a list of defective tax forms and tax forms not

	tax forms not submitted to the Tax and Customs Board	submitted to the Tax and Customs Board. Included are the tax forms regarding value-added tax, income tax, social tax, the mandatory funded pension and the unemployment insurance payment. A tax form is listed as not submitted if it has not reached the Tax and Customs Board database in 3 days after the submission deadline.
23	Entering the Admissions Information System (SAIS)	The Admissions Information System for vocational and higher education institutions - SAIS helps organise the entire admission process, including: processing of admission applications, making rated lists, sending and receiving notices between the future student and the higher education institution, accepting or rejecting the admission and much more.

3) South Korea

	Name of the service	Description
1	Government for Citizens (G4C) System	Government records of resident registration, real estate, vehicle registration, private businesses, and personal tax are very crucial to individual citizens. The Government for Citizens (G4C) System integrates these Government records into an information sharing system and combines various Internet-based Government services offered by different Government agencies into a Single Window E-Government.
2	Government e-Procurement System (GePS)	Through the establishment of a single window Government procurement system, the entire procurement process (registration of contractor bid on public project, signing of contract agreement, receiving of payment for services) can all take place via the Internet. The procurement process is open to the public and simplifies Government procurement through an Internet-based solution.
3	Home Tax Service(HTS)	The Home Tax Service (HTS) allows taxpayers to process their tax affairs from their home or office in real-time without visiting the tax office to file tax return forms, receive tax notices, request tax-related certificates or receive tax consultation with a Government employee.
4	Social Insurance Information Sharing System (SIIS)	The Social Insurance Information Sharing System (SIIS) is a project for interconnecting the 4 major social insurances information systems (health insurance, pension insurance, unemployment insurance and industrial accident compensation

		insurance) of each public corporation and agency. This helps in the co-ordination while delivering services to the citizens.
5	Local Government Information Network System Project	The Local Government Information Network System Project is a comprehensive Government administration information system that allows the sharing of Government records of resident registration, vehicle registration, and family register among 232 local Governments that issue these certified papers to citizens.
6	National Education Information System	The National Education Information System (NEIS) is a Government-wide initiative to interconnect more than 10,000 elementary and secondary schools, 16 provincial offices of education and their sub agencies, and the Ministry of Education & Human Resources Development into one network. Students, parents, and school administrators will have access to education-related information that will be shared across the nation.
7	Personnel Policy Support System (PPSS)	A standardized personnel management system has been developed for the processes of hiring, promoting, compensating, training, and providing social welfare benefits to civil servants. The Personnel Policy Support System (PPSS) will be expanded as a Government-wide project and make personnel management transparent, fair, and effective.
8	e-Bill and e-Payment Service	E-Window and Electronic Bill Presentment & Payment (EBPP) allows the Government to collect Government service fees and fines from citizens through an e-Bill, e-Payment, or e-Receipt. When citizens apply for e-Bill service at financial institutions, an e-Bill is automatically sent to citizens when they use Government services. After that, the citizen checks the amount of the Government service fee stated in the e-Bill, he or she can pay the e-Bill through Internet banking services (online invoice).
9	e-Approval and e-Document Exchange	For the improvement of Government administration processes and the creation of a Government-wide knowledge management database, the e-Approval and e-Document Exchange system has been created. After completing a document to be delivered to another Government agency by using the Government-issued e-Document System (www.mogaha.go.kr), one selects the recipient of the document among the list of Government agencies appearing in the Government directory system. After the selection is made, the document can be sent.

10	e-Signature and e-Seal System	This system protects personal information through the use of secure methods for Government-wide sharing of information and will build trust in the e-Administration system. The establishment and expansion of the e-Authentication System will be the key factor for expanding e-Government services, eProcurement, e-Commerce and e-Document exchange
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3.2.8 Lessons Applicable to the Government of Uganda

a) E-services

Moldova

- i. We noted that in Moldova implemented e-services similar to the ones requested in Uganda. For example E-invoice which is currently implemented as e-tax in Uganda by the Uganda Revenue Authority. E-invoice reduced the risks related to counterfeiting of invoices. E-tax will provide the same benefit to Uganda.
- ii. E-visa which allows applicants to apply for visas online has boosted the tourism sector in the Moldova. This is one of the e-services that were requested and when implemented, Uganda could get similar benefits.
- iii. e-Public Procurement, e-Licensing, and e-Reporting were part of the e-services requested by the MDA's in Uganda to be considered for implementation, the citizens and businesses in Moldova are already reaping benefits of implementing these e-services. The Government of Uganda and citizens could get similar benefits after the implementation of these e-services.
- iv. We noted that MDAs did not show need for some of the e-services that were implemented in Moldova, these included e-traffic, Mpay, Open Data Platform, Unique Public Services Portal and Mobile Signature. This could be as a result of Moldavia being more advanced in technology, governance and infrastructure. However, in future these could be used as references to providing citizens with more e-services and support of the e-services already implemented.
- v. We also noted that some of the e-services implemented in Moldova such as e- Particip could not be implemented because Uganda has not adopted open government which is the main component of this e-service.

Estonia:

- i. We noted that in Estonia e-services similar to the ones requested in Uganda had been implemented. For example;
 - ▶ Submission of tax forms to the Tax and Customs Board which is currently implemented as e-tax in Uganda by the Uganda Revenue Authority. Submission of tax forms to the Tax and Customs Board helps collect accurate information and enables citizens to pay taxes and businesses file returns. E-tax will provide the same benefit to Uganda.

- ▶ Registering new-borns, e-registration (Company), Entering the Admissions Information System (SAIS), State privatized land mortgage management system, Query about driving licence, and taxi driver's professional certificate for a citizen, Traffic Queries about personal vehicles and Company search were among the e-services suggested by the MDAs for implementation, Uganda could by implementation of these e- service get the same benefits being realised in Estonia.
- ii. We noted that although some services implemented in Estonia were not requested in Uganda, they could be used in future as references to providing citizens with more e-services and support the e-services already implemented, these e-services included, e-School, E-health Applying for special care service, E-health Prescriptions, Health Insurance and family physician, E-health Supplementary benefit for pharmaceuticals, Traffic insurance history, Housing Master plan application (for various parishes and towns), Cancellation of organized waste collection, Ordering an electronic voter card, Company search, e-tax declaration, Transport permit information system and Road works description

South Korea

- i. We noted that in South Korea e-services similar to the ones requested in Uganda had been implemented. For example;
- ▶ Home Tax Service implemented in South Korea is similar to the e-tax (domestic tax) currently implemented by the Uganda Revenue Authority, It enables citizens to register and pay taxes without going to the tax office physically. E-Bill and e-Payment Service implemented in South Korea could also be implemented by the utility service providers in Uganda to help prevent queues in paying for utilities.
 - ▶ E-verification which is to be implemented in Uganda is currently implemented as Government for Citizens (G4C) System the South Korea, the Government for Citizens (G4C) System has more functionality like the view of real estates, vehicle registration and private businesses in a single window, this could be achieved at later stages during implementation.
 - ▶ Personnel Policy Support System (PPSS), e-Bill and e-Payment, Local Government Information Network System Project, Government and e-Procurement System (GePS) are among the services requested by the MDAs, Uganda could get benefits similar to those realized in South Korea.
 - ▶ E-Signature and e-Seal System, e-Approval and e-Document Exchange system, National Education Information System and Social Insurance Information Sharing System (SIIS) e-

services were not requested for, but could act as a reference for implementation or help support and strengthen the already existing e-services.

b) Funding Models

We reviewed the funding models that were used to implement e-services in Moldova, South Korea and Estonia since these countries successfully implemented e-services. The Government of Uganda may choose the suitable funding model for the implementation of the e-services. We recommend that the government of Uganda applies for a Grant from development partners as was the case was with Moldova.

Government	Funding Model	Funder
Estonia	Public Private Partnerships	Government and Private Sector
South Korea	Self-Funding	Government of South Korea
Moldova	Grant	World Bank

c) Method of Implementation

We reviewed the implementation methods used in Estonia, Moldova and the Republic of South Korea; we found out that they all used a phased approach. The first phases focused on developing the integration architecture and thereafter deployment.

We suggest that Uganda also takes a phased approach in the implementation of the e-services as it has been a success in the reviewed countries.

d) Security Measures

Moldova

After the extensive process of e-Transformation, the Government of Republic of Moldova paid attention to the importance of cyber security, establishing procedures, adopting standards and taking concrete measures for cyber protection.

Thus, in order to meet the informational security needs and prevent cybercrime at governmental level, within the State Enterprise "The Centre for Special Telecommunications" Centre for Cyber Security - CERT - was created <http://cert.gov.md>. CERT's mission is to assist public authorities in implementing proactive and reactive measures in order to limit the risks of IT security incidents and offering assistance in responding to incidents. The Centre also examines incidents occurred in Moldovan networks, including those reported by citizens and institutions from the Republic of Moldova and from abroad. The tasks of the Centre include raising awareness on cyber security in

the public sector and building strategic relations to improve the cyber security of the national critical infrastructures.

Estonia

A hybrid security method was taken up where by X-Road core deals only with inter-organizational access control, whereas one organization grants access right to use some service to other organization as whole. It is the responsibility of the other organization to ensure that only right people can use this service, by using whatever technical means it sees appropriate. The obligation of the other organization to enforce rightful usage of the service is enforced by service provisioning contract between the organizations.

This two level access control mechanisms that isolates the details of the authentication and access control mechanisms used internally by the organizations was biggest success factor of the X-Road because the impact to the existing systems was minimized.

CERT-EE (Computer Emergency Response Team Estonia) handles security incidents taking place in the .ee domain. The department helps in case Estonian websites or services fall under cyber-attack or if Estonian computers distribute malware. CERT-EE also has the possibility to reverse engineer the malware.

Estonia's achievements in cyber security has also benefited from a strong IT partnership between the public and private sector. This unique spirit of cooperation gave birth to the Cyber Defence League- a volunteer organization operating under the Estonian Ministry of Defence. Tasked with assisting the nation during a cyber-attack, the Cyber Defence League is comprised of IT security experts, programmers, lawyers and management specialists from the nation's top IT companies, banks, ISPs and defence forces. The Estonian Police and Border Guard also have their own Cyber Crimes Unit, to investigate and prosecute online criminal activity.

Uganda already has the National CERT- UG (<http://www.ug-cert.ug/>) which can be supported and empowered to protect, detect, report and resolve cyber security related issues. The police and other law enforcement agencies should be involved in order to have the offenders arrested and prosecuted.

e) Challenges to the Integration of National Databases in Uganda

1) Unstable power supply.

Uganda suffers from irregular power supply in comparison to the countries reviewed in the case studies.. Some areas of the country suffer frequent power outages while others have not yet been connected. This can be attributed to the fact these areas are not connected to the national grid. As a result, the use of technology is hindered.

In addition, some MDAs do not have back up to the main power supply yet they are proposed e-service providers. This is bound to affect the 99.9% availability of services. This was not a challenge in the other countries; these countries utilize alternative sources of power including wind, nuclear and solar energy.

This challenge can be countered in the short run by using Uninterrupted Power Supply (UPS), Power Generators and investing in alternative power sources for example solar energy. In the long run, to ensure high availability of their services, MDAs will need to implement disaster recovery sites.

2) Illiteracy is high in Uganda

Computer illiteracy levels in Uganda are very high in comparison to Estonia, Moldova and South Korea. This will translate into a small portion of the population, concentrated in urban areas, accessing and utilizing the e-services. To combat computer illiteracy, NITA-U is in the process of setting business information centres in rural areas. The same centres can be used to sensitize the citizens on e-services, how to access and use them.

3) Language barrier in Uganda

While English is the official language in Uganda, not very many are able to read or write it. This would prove a challenge to citizens when using e-services. In the countries where integration was implemented, content was localised to cater for all citizens for example Korean is the main language in South Korea, Romanian and Russian in Moldova and Uralic language in Estonia. For the case of Uganda, localising content in the e-services into the major local languages will go a long way in ensuring the inclusion of all citizens in the integration.

4) Legal harmonisation of MDA roles

There is need for legal harmonisation among the different MDAs on the roles to be played in the integration to prevent interference in the delivery of their mandates. In the countries where the integration was implemented Service level agreements were signed by the different agencies on the use of the integration solution. Service Level Agreement's that clearly define the roles of the different MDAs will be signed to ensure there is clear communication on each one's mandates and expected service quality.

5) Lack of infrastructure and systems by the MDAs

A good number of the MDAs that have been proposed as service providers lack the infrastructure and/ systems to deliver e-services. The case studies review revealed that the countries that implemented integration solutions invested in the development of systems for each of the service providers. In Uganda some of the MDAs with no systems are currently engaged in the procurement

to acquire systems. NITA will also help in the development and as well as provide a central data store for frequently requested data.

6) Non-compliance with IT Governance

Currently, some of the MDAs proposed to be e-service providers do not have IT governance frameworks. In the case studies, governance frameworks were developed, implemented and utilized prior to the implementation of the integration. In Uganda NITA-U, has developed a detailed national information security framework for both public and private institutions that use protected computer resources. It covers minimum IT governance standards which can be adopted by MDAs that don't have. NITA U must ensure to perform compliance checks to confirm that all MDAs adhere to these standards.

7) Internet affordability

Access to the internet is not yet affordable to most citizens. In addition to the challenge above, there is low penetration of the internet which will make the use of e-services especially in the rural areas low. This means that these citizens will not be able to reap the benefits of the integration. In the other countries where the integration was implemented there was high connectivity throughout the country unlike Uganda. This challenge is being addressed through the implementation of the National Backbone Infrastructure to connect the different parts of the country. District business information centres are also being implemented and can be used to provide free internet access to the citizens in those areas for easy access to e-services.

8) MDA Acceptance

The MDA's acceptance of the solution due to lack of funds to develop systems and possibilities of retrenchment will prove to be a challenge to the integration. In the other countries business process re-engineering was carried out to makes sure the different roles of the agencies were clearly laid out to avoid redundancies. Business process reviews will need to be carried out before the implementation of the e-services and stakeholder workshops will also provide an avenue to involve them in the implementation process.

3.3 Data collection process

A total of 44 MDAs and two telecoms were selected as part of the feasibility study. This included MDAs that were on an initial list of 37 MDAs that was confirmed with NITA, then an additional 7 MDAs and 2 telecoms based on specific request from NITA. By the time of report writing, EY had received responses from 32 of the MDA's and the two telecoms (MTN and Airtel). This represents 74% of the targeted respondent institutions.

The graph below shows the completion status as at the time of report submission.

Completion status

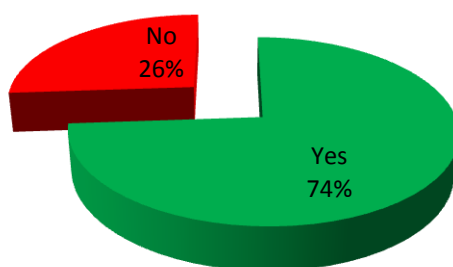


Figure 7: Study Completion Status

As part of the data collection process, EY developed a data collection tool that was used to get information about the identified National Databases from the MDAs. This tool was in an excel format and was administered by the EY team. The data collection tool had three main areas of focus. These were;

#	Focus Area in the tool	Rationale for the review
1	National Systems and interfaces	As part of this focus area, we collected information about the application and the database that supports the National System. We also collected data related to the interfaces that exist between the National systems
2	Data for e-services	As part of this, we collected data about the current e-services in the MDA, and the desired e-services from the MDA.
3	Infrastructure and Security	As part of this focus area, we collected information about the security controls at the different MDAs. This included the IT governance information, the information security documents, and the infrastructure security including firewalls and antivirus.

Table 1: Focus areas of the data collection tool

See Appendix 6.2 for the detailed data collection tool.

The development of the data collection tool was followed with a formal communication that was then sent out to each MDA. Formal letters of communication were prepared by NITA-U and delivered by EY to the respective MDAs. These were introducing the project to the head of the MDAs and requesting for a resource from the MDA to represent the MDA on the project.

EY then conducted on boarding sessions with the selected MDA representatives to introduce them to the project. The main objective of these sessions was to ensure that the MDAs understood the project objectives, project data collection tool and EY expectation of the MDAs. We then set up meetings with the MDA representatives to administer the data collection tool.

A pilot survey was then conducted with two MDAs as a way of testing the tool and timelines to complete the population of the responses. Based on the survey, the tool was refined and any identified gaps were closed. EY then sent the final data collection tool as well as the information requests to the different MDAs.

The tools were administered by the EY team at each individual MDA. EY then followed up with the MDA respondents to get information that was missing in the tool as a result of the respondent not knowing the response at the time of the tool administering.

The data collection tool from each MDA was reviewed by the EY team to ensure that there were no errors, inconsistencies and missing information. Each individual tool was then consolidated into a single spreadsheet representing all of the MDAs that responded. The analysis phase was based on the consolidated tool.

The consolidated data from the MDAs was analysed by the EY team. Results from this analysis will be as stated in **sections 3.3 to 3.9** of this report

3.3.1 Challenges faced during the data collection process

1. Unresponsive MDAs. This was faced during the process of collecting data. We noted that some of the MDAs did not complete the questionnaire and some did not provide information on some sections of the questionnaire.
2. Rescheduling of appointments which led to not meeting the set data collection project timelines. Some of the selected representatives from the MDAs were involved with their organisational activities which caused the rescheduling of the set project timetable. Some MDA representatives did not have sufficient information to complete the data collection tool. We noted that many of the respondents did not have the technical competence to complete the tool. For example questions to do with the APIs and encryption standards were mostly not responded to.

3. Changes in system ownership and location. This affected the planning since EY had to re-engage the new owner of the system.
4. Identification of new MDAs to take part in the study who were not part of the initial agreed upon list. This affected the planning in terms of the timelines, resources required and completion rate.

3.4 Current Business Applications

The 32 MDAs had a total of 47 National Systems in place currently. One of the components we sought to understand was the business applications that make up the National systems. These applications are used to interface with the various databases and information about them is critical to understand to establish if these applications will be able to share information or if interfacing them will be possible.

A National System (database) was defined as one that provides services to Government, businesses and citizens. The data collection tool collected information about the application(s), the database, the interfaces and the security controls that support the national system within each MDA. The questions that were asked in relation to the application are as listed below;

- ▶ What is the name of National System
- ▶ Main business activity supported by National System
- ▶ Nature of System/Application
- ▶ For Cloud-based Applications, provide Name of Cloud Service provider
- ▶ Software Application Type, Version and environment
- ▶ Application Server Operating System
- ▶ Application Server Type (Hardware)
- ▶ Application Server Processor Type
- ▶ Application Server Hard disk Type
- ▶ Application Licensing Type
- ▶ Duration of Current License (if Applicable)
- ▶ Number of Users(licensed number of Users)
- ▶ Application Mode of development and the Application Vender (Developer/contractor of the system)
- ▶ Date of System Inception Date (Start date) and Date of Completion of Implementation of System
- ▶ Approximate Transaction Volumes processed in a day
- ▶ For Financial management related systems, provide approximate money value for total daily transactions.

3.4.1 Current Business Application Observations

Based on the responses from the MDAs, we noted that;

3.4.1.1 Seven MDAs still do not have any systems and IT departments.

During analysis, we noted that seven MDAs did not have a National System or database. This was attributed to the prohibitive cost of the implementing system and on-going system implementation.

This means that in order for these MDAs to provide services through automated systems in the future, they will have to first implement automated systems that meet the minimum requirements (technical, security and governance) that would have been agreed upon in the integration framework as a result of this study. In order for these MDAs to receive services from other MDAs (service providers) as a result of integration, their information requirements would have to be consolidated in a database which they can access through a portal.

3.4.1.2 Most of the National Systems are Network Based.

76% of the MDA systems are network based (36 of the 47 National systems). 13% (6 of the 47 National systems) of the systems are standalone and only 11% (5 of the 47 National systems) institutions are currently cloud based systems. Seven of the MDAs did not have any systems. The integration solution implementer will need to have the ability to connect to all these types of systems.

See below the figure showing Nature of the National Systems

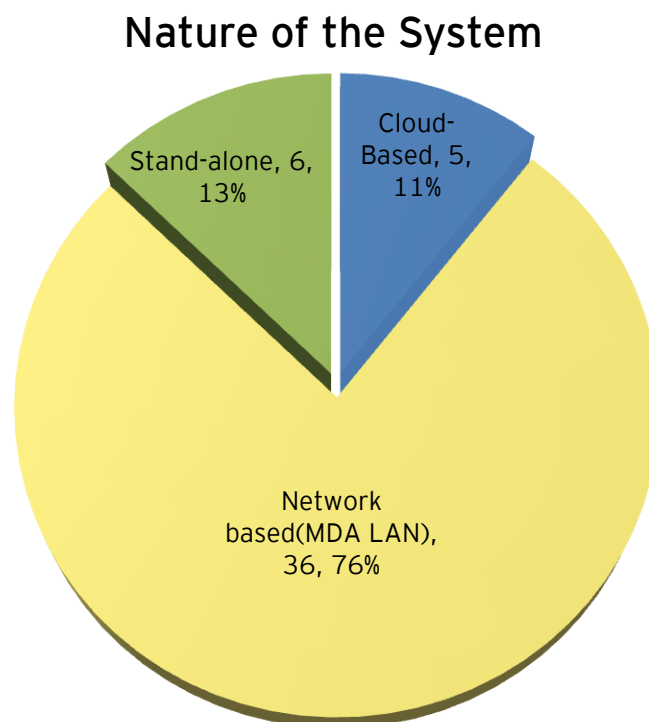


Figure 8: Nature of the system

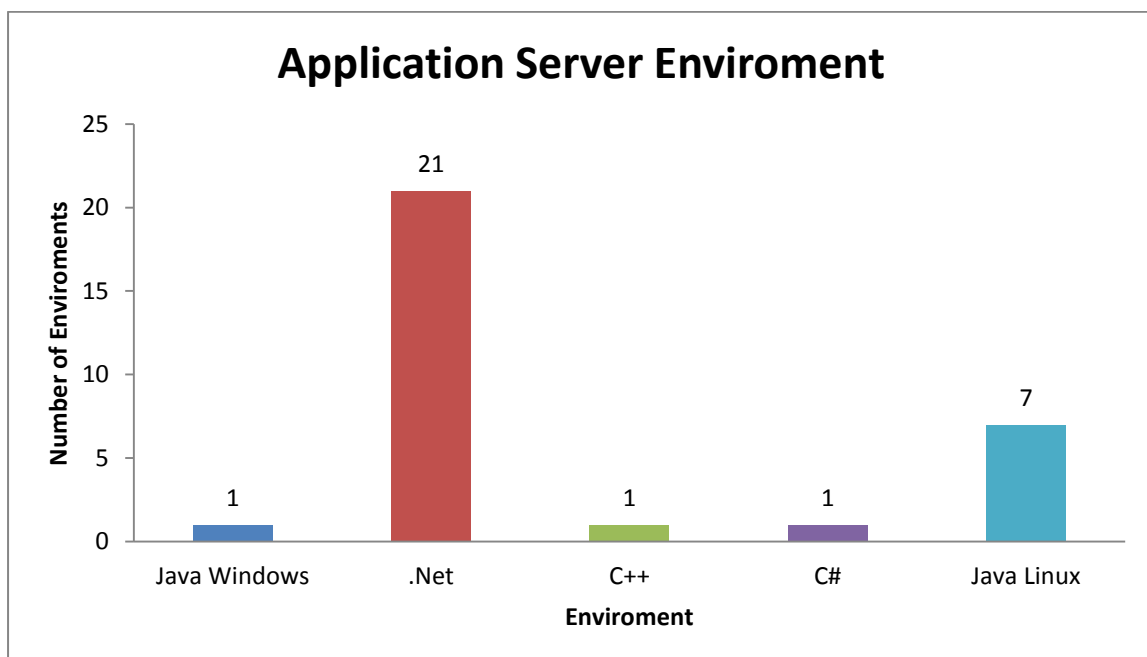
3.4.1.3 The MDAs that are cloud based are all on a public cloud

Most MDAs that were interviewed that used cloud based National systems are on public clouds. The drawback of this is data security and privacy is not guaranteed. MDAs do not know where the data is stored, if or how it is backed up and whether unauthorized users can get to it. See that table below;

	MDA	Cloud type	Provider
1.	Uganda Registration Services Bureau	Private Cloud	Webmaster Nairobi
2.	Database and Search Engine- Uganda Human Rights Commission	Public Cloud	Hostalite
3.	Human Rights Integrated Information System- UHRC	Public Cloud	Not Provided
4.	Microsoft Dynamics- UHRC	Public Cloud	Not Provided
5.	Public Procurement and Disposal of Public Assets Authority (PPDA)	Public Cloud	Omnitech
6.	Uganda Aids Commission	Public Cloud	Laboremus

3.4.1.4 .Net is the most application server environment

21 of the MDAs systems in the study use Microsoft .Net as the application server environment. 7 use java on Linux and the other percentages are shared among C# and C ++ .This means that for integration to be smooth, the integration layer should be compatible with all these technologies especially with Microsoft and Linux environments.



3.4.1.5 Microsoft is the most commonly used operating system

21 of the MDAs systems in the study use Microsoft as the application server operating system. 17 use Linux and while only 2 use HP-UX.

This means that for integration to be smooth, the integration layer should be compatible with all these technologies especially with Microsoft and Linux operating systems.

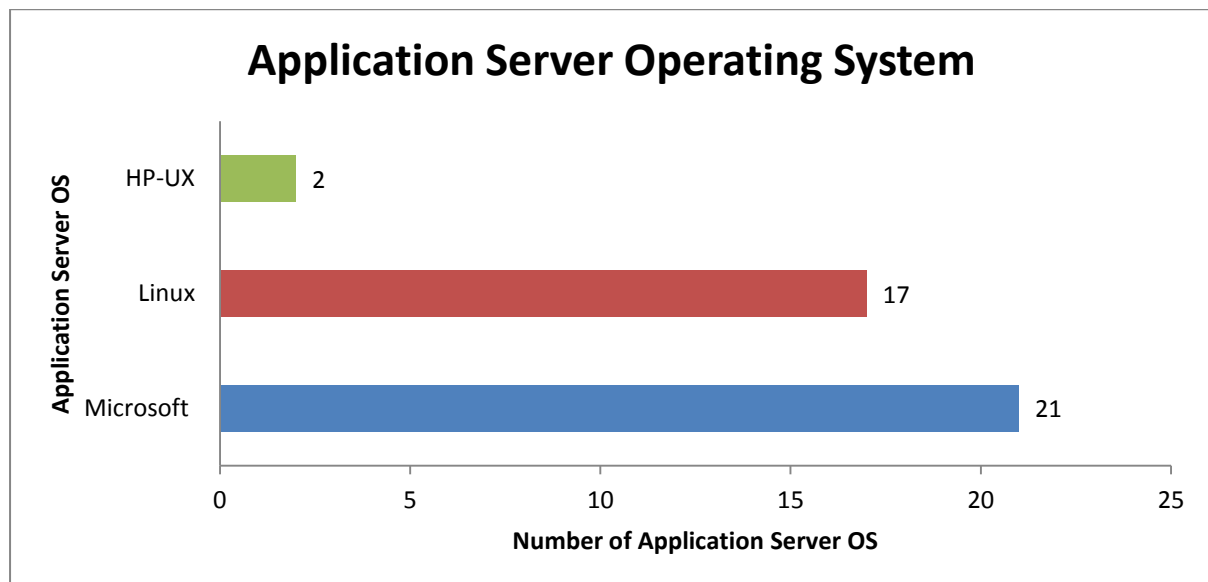


Figure 9: Application operating system

3.4.1.6 The NBI is the most used data service provider

The most commonly used service provider is NBI with 28% of the MDAs using that service provider. NBI has 9 of the 32 MDAs using it currently. These included Uganda Registration Services Bureau, Ministry of Public Service, Ministry of Water, Ministry of Justice and constitutional affairs, Courts of Judicature, Ministry of Local Government, Uganda Human Rights Commission, Ministry of Gender Labour and Social Development and the Ministry of East African Community Affairs

This will simplify the integration process since most of the MDAs are already connected to the backbone that will be used as the main communication channel. This however also shows that some MDAs are operating against the e-Government regulations for 2014 mandate that all MDAs should be connected to the NBI. As part of integration, all agreed upon frameworks, policies and contracts will have to be strictly followed otherwise there will be many integration challenges.

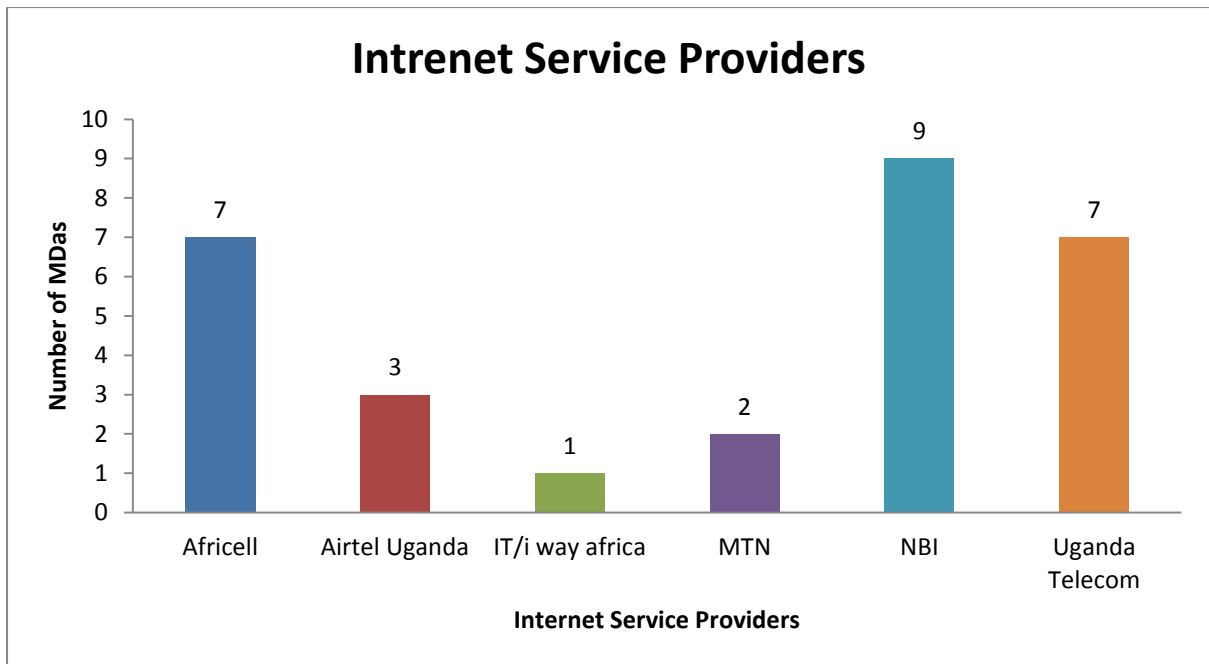


Figure 10: Service providers

3.4.1.7 Most of the applications are custom built.

We noted that 57% of the applications within the MDAs are custom built and another 24% are in house developed by the MDAs. This means that the integration implementer must have the ability to provide a solution that will be able to seamlessly connect the different applications for the purpose of information sharing or data consolidation.

See below the graphical representation of the application mode of development

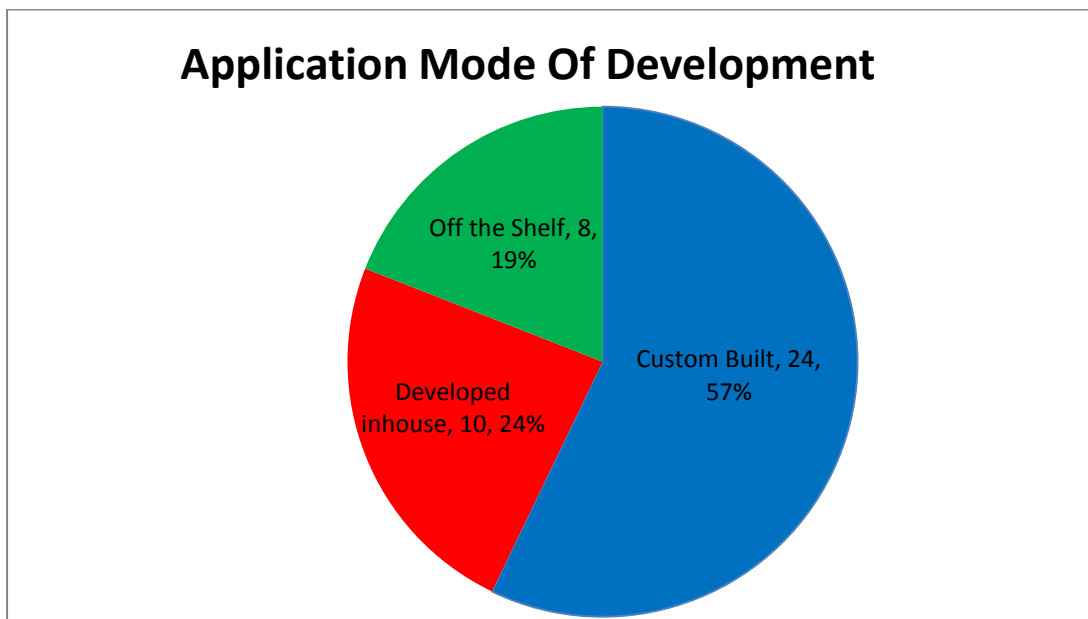


Figure 11: Application Mode of development

3.4.1.8 Most of the MDAs do not have any kind of licensing regime.

Most of the National Systems have open licensing regime. This might be attributed to the fact that they are mostly custom built or in-house developed.

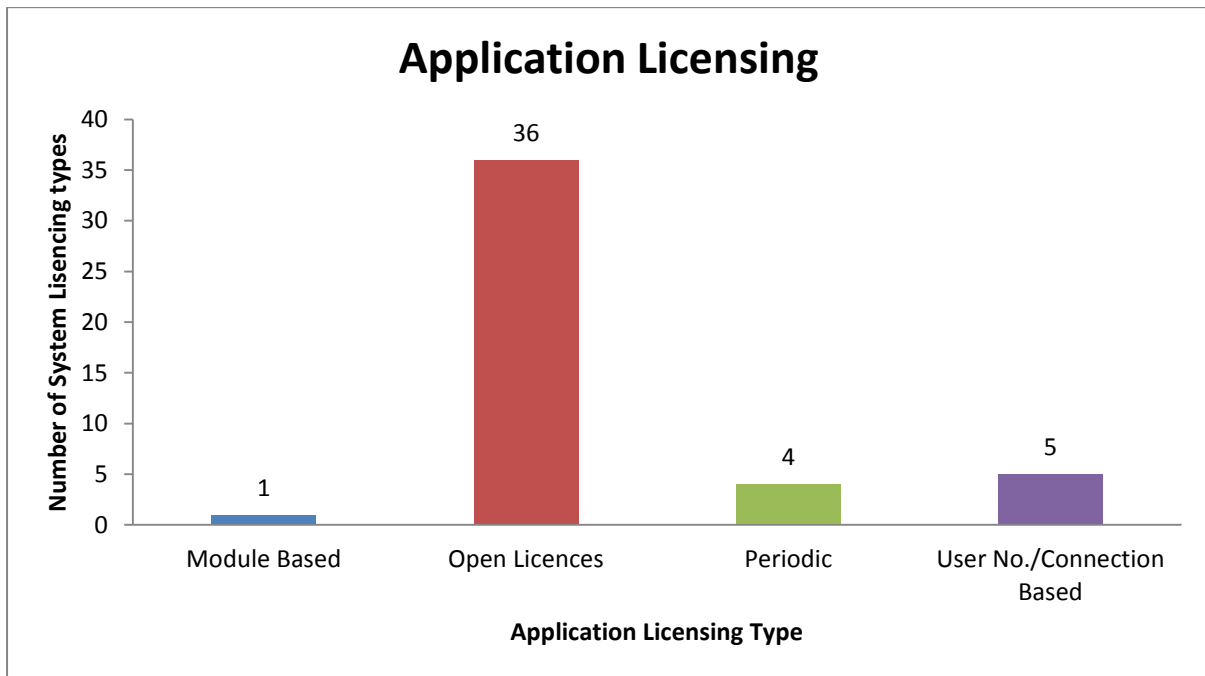
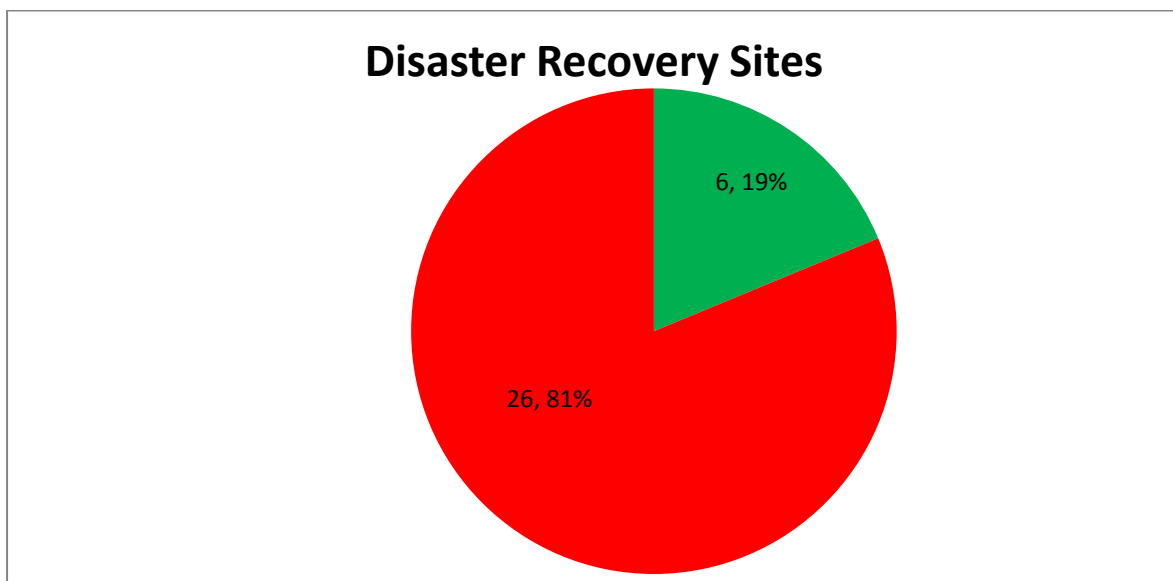


Figure 12: Application Licensing

3.4.1.9 MDA's with Disaster Recovery Sites

19% of the MDAs have Disaster Recovery Sites while 81% of the MDAs do not have Disaster recovery sites. The MDAs that have the sites are National Water and Sewerage Corporation, Kampala Capital City Authority, Judiciary, Ministry of Finance, Ministry of Public Service and Uganda Revenue Authority.



3.4.1.10 HP is the most common hardware used by the MDAs.

We noted that most MDAs systems were using HP hardware to run their servers. The integrated solution provider will have to deploy a solution that is compatible to various types of hardware.

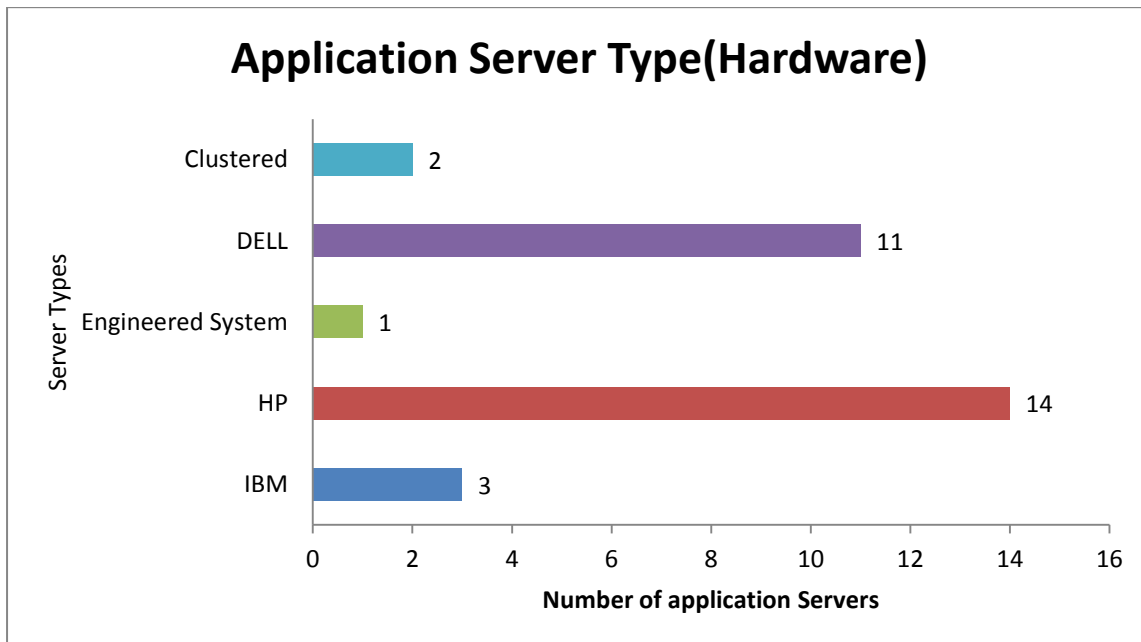


Figure 13: Server Hardware

3.4.1.11 Out dated National Systems Information.

Some of the National systems/databases that were selected as part of the project terms of reference had either been replaced or phased out. For example LDC, ERA, CADER, UIRI and NAADS were identified to have systems but this was not the case on ground. We also noted that systems like the ground rent management system and the property rates management system have been phased out in KCCA and replaced by e-citie. See section 6.1 to see the detailed status of each system.

3.5 Database Management information system

As part of the database analysis, EY sought to understand the types of databases that support the applications and hold the data that will be consolidated or shared. We also wanted to understand the information exchange standards used by the different National databases. The questions that were asked in relation to the databases and the information exchange standards are as listed below;

- ▶ DB platform
- ▶ DB version
- ▶ Operating System
- ▶ Database Server OS Version
- ▶ Application Programming Interface (API)
- ▶ Data centre Location
- ▶ Does the MDA use SSL certificates between the OS and the Database?
- ▶ If the MDA uses SSL, provide the approximate cost in Uganda Shillings
- ▶ Application message format
- ▶ Encryption used
- ▶ Message Protocol used

3.5.1 Database Management Information System Observations;

Based on the responses from the MDAs, we noted that;

3.5.1.1 MDAs have many different database platforms that they use.

The most common database platform across the MDAs systems is MySQL database, being used by 16 MDA systems. Many different platforms are used across the MDAs and therefore the integration partner should be able to seamlessly integrate data from these databases.

See the graph below for illustration;

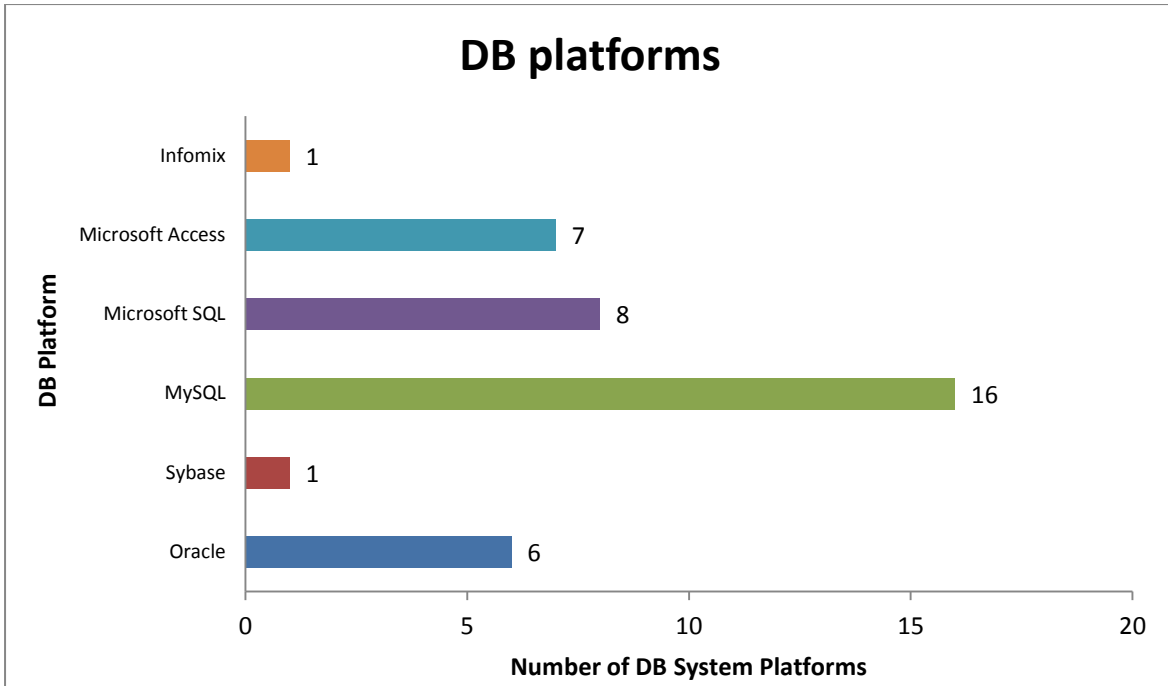


Figure 14: Database Platform

3.5.1.2 Encryption is not enabled. 83% of the National systems do not have any encryption enabled.

This leaves the information within these systems vulnerable to unauthorised access both during transmission and storage. In order for successful integration to happen, the security framework will have to classify data and information in terms of levels of confidentiality so that the confidential data has encryption enabled. The integration layer will have to have strong security controls implemented to counter this risk.

3.6 Business Application interfaces

As part of the data collection process, we collected information regarding which MDAs have National Systems that are interfaced internally if they have more than one system and which MDAs have interfaces with other MDAs which are external to them. Our observations are as summarised below;

3.6.1 Internal integration

Out of a total of 32 respondents, only 4 (13%) of these have their internal systems interfaced. 6 (19%) of these have no systems at all.

MDA's with Internal Interfaces

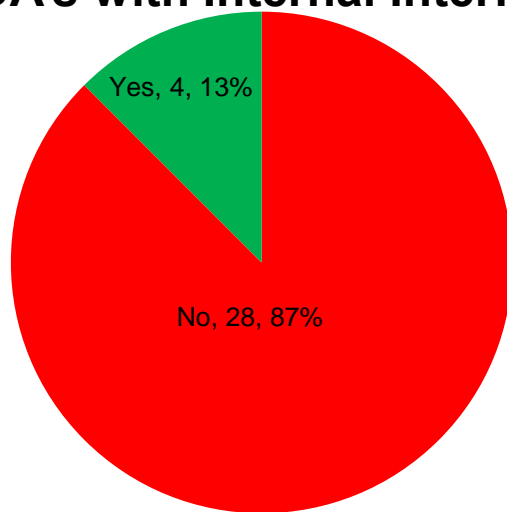
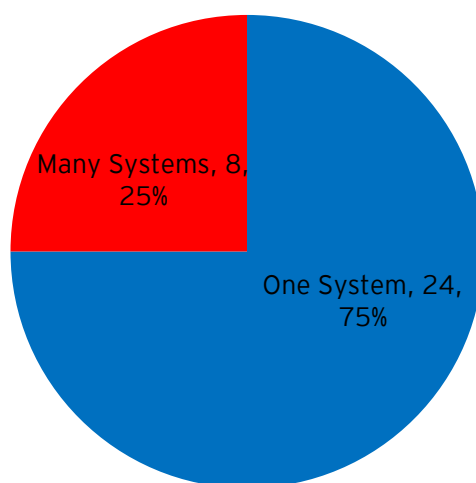


Figure 15: MDAs with internal interfaces

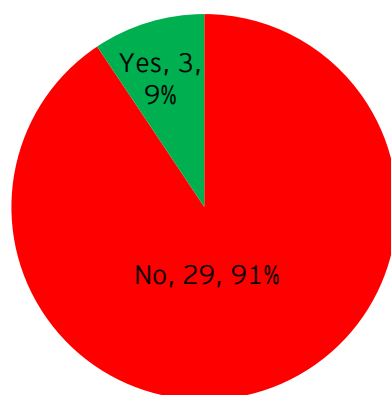
24 (75%) have only one system and therefore it cannot be interfaced and 8 (25%) have multiple systems that are not integrated. In terms of integration,

Number of National Systems in an MDA



91 % of the MDAs do not have system load balancers, clustering or scheduling algorithms. In terms of integration, this means that heavy loads (requests) to the systems will be overwhelmed which could crash them. This means that frequently requested information will have to be consolidated off the system to reduce the load.

Load Balancers



3.6.2 External Integration

During our analysis, we noted that 94% of the interviewed MDAs are currently not interfaced with any other MDAs. This is in environment where MDAs are sharing more and more information physically. This means that there is a large opportunity for integration and information sharing.

See below the table of the currently interfaced systems

MDA	Internal MDA systems	Other MDA/System	Inputs/Outputs for Interface
Uganda Revenue Authority	eTAX system	Ministry of Finance -Integrated Financial Management System (IFMS)	Revenue data
Kampala Capital City Authority	eCitie	Ministry of Finance - Integrated Financial Management System (IFMS)	City operator payment data /receipts
Ministry of Finance	IFMS	Ministry of Public Service -IPPS	Payroll
Uganda Investment Authority	Act system	Uganda Revenue Authority	Revenue data
Uganda National Bureau of Standards	Imports Inspection and Clearance Information Management System	Uganda Revenue Authority	Revenue data

Table 2: Currently interfaced systems

3.7 MDAs that requested Integration

As part of the data collection process, each MDA listed the other MDAs it requires information (e-services) from in order to make it more efficient.

We observed that some MDAs were requesting to connect to other MDAs but were not able to mention the specific Systems in the other MDAs to connect to and which specific data elements they would get from those MDAs.

See below the table showing the desired future integration from the MDAs

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Uganda Revenue Authority	E-Tax/Asycuda	BOU	Account details
Ministry of Local Government (MoLG)	LOGIC	HMS	Health information
Ministry of Local Government (MoLG)	LOGIC	EMIS	school statistics
Ministry of Local Government (MoLG)	LOGIC	CIS	households and their incomes
Ministry of Water & Environment	Water Information system	UBOS	Population Statistics, Demarcation of Administrative units
Kampala Capital City Authority	eCitie	eTax	Tax payers Data
National Planning Authority (NPA)	Geographic Information System	Community Information System	Planning Information
Judiciary	Database of prisoners	Case File Management System	Case numbers and sentences
Judiciary	CCAS	Uganda Police Force(UPF)	Details of the Suspects e.g. Suspect sex, Name, age, Address

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Judiciary	CCAS	Directorate of Public Prosecution(DPP)	Details of the Suspects e.g. Suspect sex, Name, age, Address
Judiciary	CCAS	Uganda Prisons service(UPS)	Details of the accused/Prisoner e.g. Conviction date, Sentence
Judiciary	CCAS	Ministry of Internal Affairs(GAL)	DNA test results
Judiciary	CCAS	JLOS Secretariat	Reports
Uganda Investment Authority (UIA)	ACT System	BOU	Actual investments
Uganda Investment Authority (UIA)	ACT System	URSB	Registration
Uganda Investment Authority (UIA)	ACT System	Ministry of Lands	For Land Registration Information
Uganda AIDS Commission (UAC)	National HW Database	Ministry of Gender OVC system	Orphans and Vulnerable Children Information
Uganda AIDS Commission (UAC)	National HW Database	DHIMS 2	HIV AIDS information
Uganda AIDS Commission (UAC)	National HW Database	EHIMS	HIV AIDS information
Uganda AIDS Commission (UAC)	National HW Database	Education	Behaviour change in schools
Public Procurement and Disposal of Public Assets Authority (PPDA)	National Register of Providers	URSB	Registration Numbers
Public Procurement and Disposal of Public Assets	National Register of Providers	eTax	Tax Payer's Identification Number

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Authority (PPDA)			
Public Procurement and Disposal of Public Assets Authority (PPDA)	National Register of Providers	eCitie (KCCA)	Trading Licence
Ministry of Justice and Constitutional Affairs (MOJCA)	AG_System	National ID	Deceased, Next of keen, beneficially Bio data
Ministry of Justice and Constitutional Affairs (MOJCA)	AG_System	Land Information System	Land Title/ ownership information
Uganda Police Force	Express Penalty System	MoFPED	Information Sharing: Picking Information from Express Penalty System: how much was paid to Uganda Police as per the Express Penalty
Uganda Police Force	Crime records System	Judiciary	Information sharing about the Crime records
Uganda Police Force	Crime records System	DPP	Information sharing about the Crime records
Uganda Police Force	No specific System	URA	Vehicle details, how much the defaulted vehicle should pay
Uganda Police Force	No specific System	MoW: Face Technology Information:	Data Input about validity driving licences of Citizens
Uganda Police Force	No specific System	MoIA	Citizens identity
Uganda Heart Institute	UHI patient DB access system	Min. of Health	To give information to them

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Uganda Heart Institute	UHI patient DB access system	Cancer Institute	To give information to them
The Law Development Centre (LDC)	No specific System	Court case administration system (CCAS)	Reports about cases for Students Study
The Law Development Centre (LDC)	No specific System	Identification of students	Information and details about LDC Students
Ministry of Lands, Housing and Urban Development (MoLHUD)	Land Information System(LIS)	eTax system	Tin Number
Ministry of Lands, Housing and Urban Development (MoLHUD)	Land Information System(LIS)	NSIS	National ID Number
Uganda Tourism Board	QAMS	URSB	Registered companies
Uganda Industrial Research Institute (UIRI)	IRC	URSB	Registered companies
Uganda Industrial Research Institute (UIRI)	IRC	UNBS	Certified products
Uganda Industrial Research Institute (UIRI)	IRC	UIA	Available investors and experts
Uganda Industrial Research Institute (UIRI)	IRC	UBOS	Statistics on industries, produce etc.

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Uganda Industrial Research Institute (UIRI)	IRC	MoPS	experts in the industries
Uganda Human Rights Commission(UHRC)	HURIS	Internal Affairs	Bio data
Uganda Human Rights Commission(UHRC)	HURIS	Court Cases	Cases in Courts of Law/Completed cases
Uganda Human Rights Commission(UHRC)	HURIS	Police	Police Prisoner Records
Electricity Regulatory Authority (ERA),	RMIS	URSB	Registration information
Directorate of Public Prosecution(DPP)	Procamis (iJustice)	JLOs institutions	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	Police	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	UIA	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	Ministry of Internal Affair	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	URSB	Not Provided

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Ministry of Gender, Labour and Social Development	MGLSD	Foreign Affairs	Not Provided
National Agricultural Advisory Services (NAADS)	Farmers Database	MoFPED, NARO and Ministry of Agriculture	Not provided
Uganda AIDS Commission (UAC)	National HW Database	Ministry of Health;	Not Provided
Uganda National Examinations Board(UNEB),	Examination Processing	Ministry of Education and Sports	Not Provided
Uganda National Examinations Board(UNEB),	Examination Processing	Recruitment Agencies	Not Provided
Uganda National Examinations Board(UNEB),	Examination Processing	Media houses (For publishing results)	Not Provided
Uganda National Examinations Board(UNEB),	Examination Processing	MOIA (Directorate of Immigrations) and Security agencies	Not Provided
Uganda National Examinations Board(UNEB),	Examination Processing	National Curriculum Development Centre	Not Provided
Directorate of Public Prosecution(DPP)	Procamis (iJustice)	JLOs institutions	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	Police	Not Provided
Ministry of Gender, Labour and Social	MGLSD	UIA	Not Provided

MDA Name	MDA systems	Other MDA/System	Data Inputs from other MDA system
Development			
Ministry of Gender, Labour and Social Development	MGLSD	Ministry of Internal Affair	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	URSB	Not Provided
Ministry of Gender, Labour and Social Development	MGLSD	Foreign Affairs	Not Provided

Table 3: Desired Future integration

It is based on these desired integrations that the e-services (G2 G, G2C, and G2B) were developed.

3.8 MDA e-Services

E-services are those services provided by Government to Government, businesses and citizen through the use of technology. As part of our review of the e-services, we got details on the currently existing e-services and the desired e-services by the MDAs in future. Specifically each MDA was asked about;

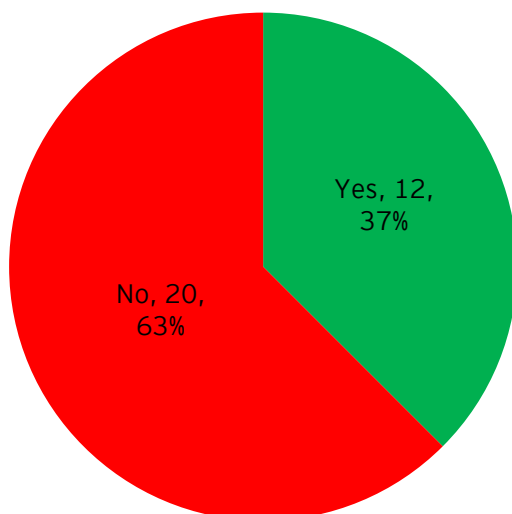
- ▶ Whether they provide any a web e-service or mobile based e-service
- ▶ The e-services it provides
- ▶ The name of the national system that provides the service
- ▶ The consumer group that receives the service
- ▶ The priority of each e-service to the MDA
- ▶ The data records that make up the e-service

3.8.1 E-services observations

During the data analysis phase of the responses provided in line with e-services, EY noted that following;

1. 37% of MDAs have web services available. This represents 12 out of the 32 MDAs that responded to the question of whether they have provided any web services.
2. 19% of MDAs have Mobile services available while the 81% do not have any. This represents 6 out of the 32 MDAs that responded to the question of whether they have provided any mobile services that they offer to Government, businesses or citizens.
3. 63% of the MDAs interviewed did not have any e-services currently available.
4. Only 6% MDAs did not show future integration desire.
5. For cases where e-services were available, majority of respondents did not know the exact data records required for the e-service.

Provide Web Services



Provide Mobile e-services

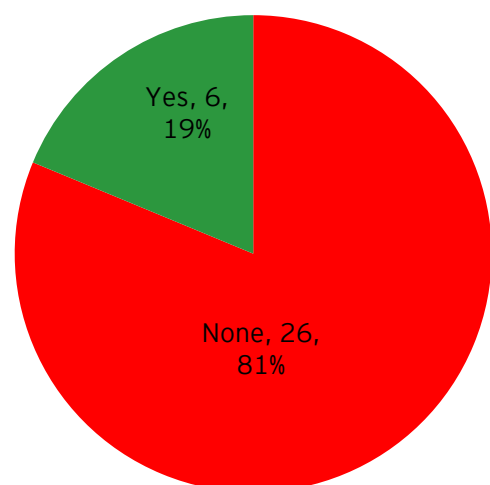


Figure 16: E-services status in MDAs

The above statistics mean that the Government will have to put in a lot of resources to develop these e-services that currently do not exist but are required by citizens and MDAs. Government will also have to put a lot of effort into training of the MDA representatives who are expected to help ensure the services continue to run as part of sustainability.

3.8.2 Existing e-services

The services below already exist and are being provided by Government to citizens, businesses and other Government agencies. See below the table showing these e-services

No	Name of the existing e- service	Provider
1.	Registration for a Tax Identification Number (TIN) and Payment of Taxes	Uganda Revenue Authority
2.	Motor Vehicle Transfer and checking of Payment Status for the vehicle transfer.	Uganda Revenue Authority
3.	Verification of tax payments	Uganda Revenue Authority
4.	Registration for Domestic Taxes	Uganda Revenue Authority
5.	Tracking of imports - International trade	Uganda Revenue Authority
6.	Payment Request for civil servants	Ministry Of Public Service
7.	Payment Of Service Providers	Ministry Of Finance
8.	Verification Of Law Advocates	Courts Of Judicature
9.	Registration of Loans	Banks
10.	E - candidate Registration	Ministry Of Education And Sports
11.	Registration for NSSF membership, accessing of financial Statements(E - statement)	National Social Security Fund
12.	Registration of Business and Individuals by Kampala Capital City Authority	Kampala City Council Authority
13.	Tax Assessment for business	Kampala City Council Authority
14.	Access to Scheduled Court Case Details	Courts Of Judicature
15.	Access to Passed Judgements	Courts Of Judicature
16.	Verification Of registered Court Bailiffs	Courts Of Judicature
17.	e-tender	Public Procurement and Disposal of Public Assets Authority
18.	Monitor Government compliance with international regional and local human rights recommendations	Uganda Human Rights Commission
19.	Complaint Management	Uganda Human Rights Commission
20.	View customers' accounts statements, bills and account balances	National Water and Sewage Corporation

Table 4: Existing e-services in Uganda

3.9 Infrastructure and Security Controls

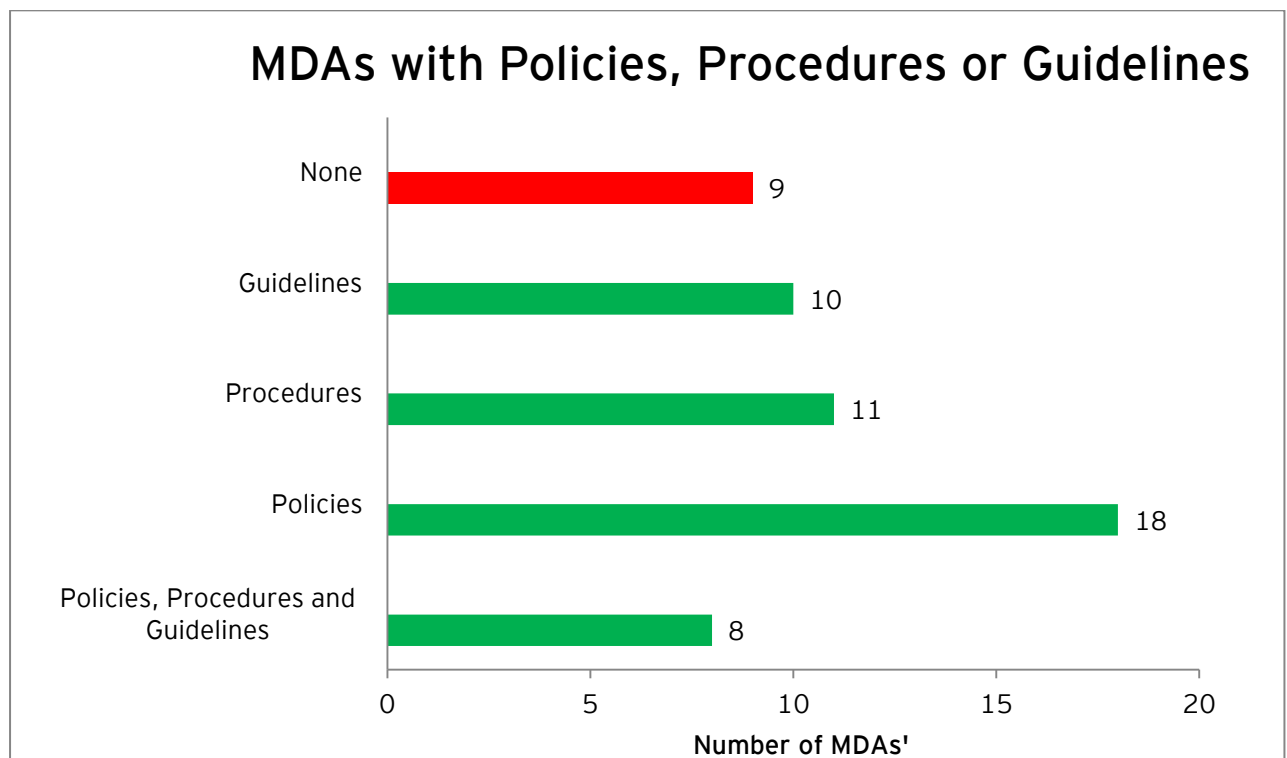
As part of governance, the study wanted to understand if MDAs at a minimum had IT governance documents (policies, procedures, guidelines and blueprints). We also wanted to understand the extent to which these MDAs had gone in terms of implementing security policies and if these were in line with the National Information Security Policy.

3.9.1 IT governance Observations

During our analysis, of the responses, we noted the following;

- ▶ 8 institutions had more than one IT governance document i.e. they had Policies, Procedures and Guidelines
- ▶ 18 MDA's had Policies
- ▶ 11 MDA's had Procedures
- ▶ 10 MDA's had Guidelines
- ▶ 9 of the MDA's did not have Policies, Procedures or Guidelines

Bar graph representing the findings;



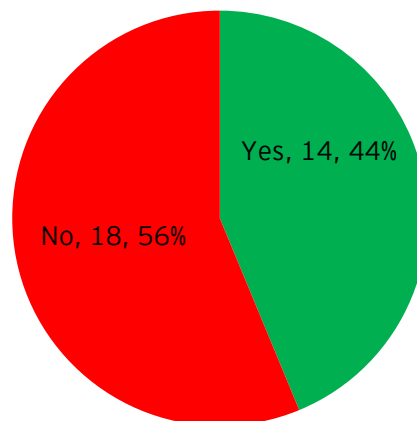
This will be a key challenge to integration since different MDAs are at different stages in governance and appreciation of technology.

3.9.2 Information security Observations;

In terms of the information security policy, EY noted that 56% of the MDAs did not have these in place. This means that as part of integration, a clear information security policy will have to be developed and all those MDAs that are to integrate will have to strictly follow this policy. This framework will also have to be incorporated within the integration layer to ensure that some of the controls are automatically enforced.

See below the graphical representation of the responses;

Information Security Policy



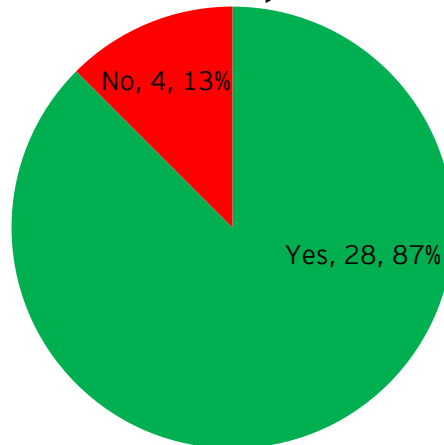
3.9.3 Infrastructure security

As part of the infrastructure review, EY sought to understand what controls the MDAs had implemented on their networks at a basic minimum level. Specifically, the MDAs were requested to respond to questions regarding their firewalls and antivirus protection.

With regard to firewall protection, we noted that

- ▶ The most commonly used firewalls are the Network-Level / Packet Filter
- ▶ 87% MDAs have firewalls installed while 13% of the MDAs did not have any firewalls configured

Firewall in place



See below the table showing the level grouping of firewalls at the MDAs

Firewall level	No. of MDAs	
	Yes	No
Network-Level / Packet Filter	21	11
Circuit Level	5	27
Application Level	8	23
State-full Multi-Level	6	26

Table 5: Firewalls at MDAs

As part of the information security standards that will be set, MDAs that are connecting to the integration layer will have to have at least one firewall to ensure that the information is accessed by only the authorised entities. The integration layer will also have to have both internal and external firewalls.

With regard to the antivirus protection, EY made the following observations;

- ▶ Currently the antivirus program used by the MDAs is mostly network level antivirus.
- ▶ 6% did not have any antivirus protection on their network. This was attributed to not having any systems in place or not having a network in place. This was even though they have people who use computers to do their work within the MDAs. This presents a risk to other MDAs that may wish to share information or consolidate information with non-secure MDAs.

- ▶ The most commonly used antivirus protection by the MDAs is Kaspersky with 20 out of the 32 interviewed MDAs using it. See the graph below representing the MDA responses on the name of the antivirus used.

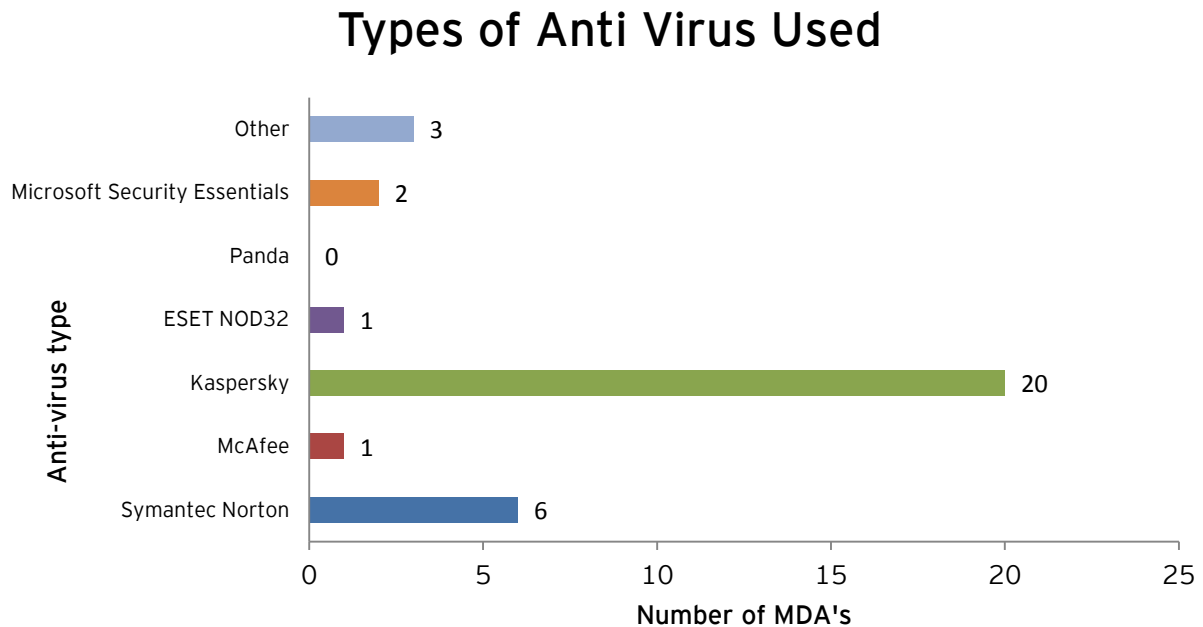


Figure 17: Antivirus protection used at MDAs

3.9.4 Interface documented controls and Embedded controls

Interface documented controls are the technical specification documents that describe the interfaces currently in place. Since 88% do not have any interfaces in place, they also do not have interface documents in place. For the 12% of the MDAs that have interfaces, 25% of them do not have interface control documents.

This means that as part of the integration, these controls will have to be designed and strictly followed by all MDAs.

3.9.5 Embedded Controls

The embedded controls that EY was interested in as part of the study were

- i. On screen feedback to highlight completion status
- ii. Identification and/or hard-coding of source and target files
- iii. Security over source and target files
- iv. Use of control tables to control destination addresses
- v. Transaction reports showing number of successful validated records or errors
- vi. Access control to run, monitor interfaces

- vii. Controls to prevent interference
- viii. Restart mechanisms in case of transfer failure
- ix. Control counts of numbers of records transported

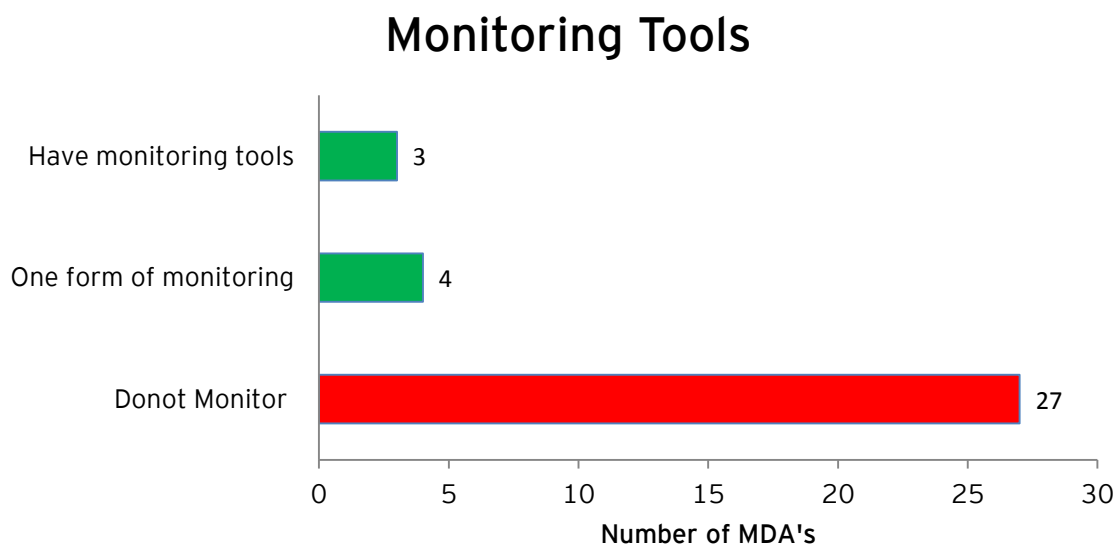
3.9.6 Monitoring techniques and tools

EY as part of the study was interested in the types of monitoring techniques that are used at the different MDAs. MDAs were required to respond on how they monitor, that is, if they monitor performance of Interfaces, if they have automated monitoring (using specialised IT tools which may be licensed or open source), manual monitoring (including physical verification of records transferred into a destination system) or if they use both methods (combining both automated and manual methods)

Based on the analysis of the responses, we noted that

- ▶ None of the MDAs use all the monitoring techniques
- ▶ 27 out the 32 of the MDA's interviewed do not monitor at all
- ▶ 4 of the MDAs interviewed have at least one form of monitoring.
- ▶ Only 3 of the MDAs of the interviewed have monitoring tools.

See the graph below;



This means that strict monitoring will have to be effected at the integration layer or by the integration Bus.

3.9.7 Disaster Recovery Planning

In terms of disaster recovery, we noted that 84% (27 out of the 32 MDAs) of the organisations did not have a formal disaster recovery plan. Only 16 % (5 out of the 32 MDAs) have formal disaster recover practices in use which have been approved by management.

See the figure below representing the percentage of MDAs that have disaster recovery plans

Disaster Recovery Planning

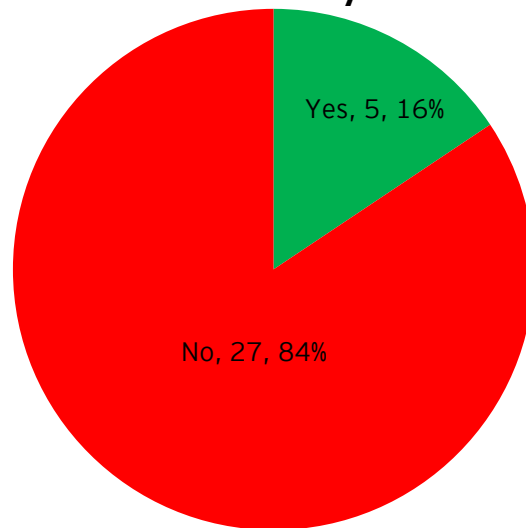


Figure 18: Disaster Recovery Planning at MDAs

This will mean that during integration, a disaster recovery framework will have to be developed which all the connecting MDAs will follow. This will ensure continuity in case of a disaster as well as prevention of information loose.

3.10 Legal and Regulatory Landscape analysis

For purposes of this review, the laws were studied for provisions on generation, modification, publishing and ownership of data. Where there are other laws that have legislated on these areas, they too were considered where applicable.

3.10.1 Data Protection

Data protection laws primarily focus on the use and abuse of personal data that directly or indirectly impact an individual. The use of the internet and electronic communications with the ability to process large quantities of data, gives rise to significant concerns over how that data will actually be used, by whom and for what purposes. The electronic environment has increased the scale of the data collected and as a result of the ability to store large volumes of records in a fully searchable manner.

In 2014, NITA-U circulated a draft data protection and privacy bill for comments. The bill was developed¹ to protect the privacy of an individual and personal data by regulating the collection and processing of personal information. It also highlights the obligations of data controllers/collectors and processors; and provides regulations for the use and disclosure of personal information. While the bill has not yet been passed by the Parliament of Uganda, there are several of the benefits that can be realised when the bill is eventually passed, and these include;

- ▶ Lawful use of data for the purpose for which it was requested
- ▶ Ensuring that data is used according to citizens' data protection rights
- ▶ Secure storage of personal data
- ▶ Guaranteeing that personal data is kept for no longer than necessary.

Below are the areas in this bill that are relevant to the integration of national databases;

3.10.1.1 Ownership and Consent

The bill proposes clauses on the possession and responsibility of personal data. Data subject is an individual from whom personal data has been collected; controller identifies a person who determines the purposes for and manner in which personal data is processed and a data processor is a person who processes the data on behalf of the data controller. A data subject can object to the collection or processing of their data and at that point the collector/processor shall stop. A data subject may request a controller to confirm whether or not the controller holds the data or give a description of the data held by the controller as well as other third parties that have access to this information.

Clause 4 of the Data Protection and Privacy bill states that:

¹ Data Protection and Privacy Bill (Draft)

- 1) Personal data may be collected and processed where;
 - a. The collection and processing is authorised or required by law; or
 - b. Where it is necessary
 - i. For the proper performance of a public duty by a public body
 - ii. For national security
 - iii. For the prevention, detection, investigation, prosecution or punishment of an offence or breach of law²

Similarly the e-Government regulations protect a person/entity against disclosure of information in the delivery of e-services without the consent of the data owner.³

3.10.1.2 Quality of data

The bill caters for the quality of data, a crucial aspect for ensuring that personal data collected serves the purpose for which it was collected which is the responsibility of the entity that collects the personal data. Data quality issues such as completeness, accuracy and up to date data need to be addressed in order to deliver well established services and where information is generated by systems (Government or private institutions), the owner of the information or data generated by the system will be liable or responsible for the accuracy should this information be shared with other system(s) and more so if the information will be relied upon for processing related or other information in other databases.

3.10.1.3 Data processing

Data collected can require further processing which can either be performed by the data controller/owner or a third party. Where a third party is contracted to carry out further processing, the bill required that the data processor treat the personal data as confidential and it goes ahead to state that a data processor shall not disclose the data unless required by law or in the course of the discharge of duty⁴. This is particularly important for purposes of controlling and monitoring usage or information by data owners and compliance by data processors within the boundaries of data sharing through database integration.

3.10.1.4 Storage and retention

According to the bill, a person who collects personal data shall not retain it for a period longer than is necessary to achieve the purpose for which it was collected unless it is; authorized by law, required for a lawful purpose related to the function for which it was collected, required by a

² CI 4 Data Protection and Privacy Bill (Draft)

³ National Information Technology Authority Uganda-E-Government Regulations, 2014

⁴ CI 17 Data Protection and Privacy Bill (Draft)

contract between the parties to the contract, data subject consents to the retention⁵. Where personal data is transferred from one system then processed and stored in another, the bill proposes that this data be treated as confidential and shall not be disclosed unless required by law⁶. The bill however does not mention the period in which data can be retained. Different types of data will require different retention periods depending on the purpose for which this data would have been collected; some may require longer retention periods than others. There is a need for a policy that governs retention and clearly defines how the length of the retention period. It must also cater for the length for which an MDA can retain data it has acquired from another MDA to deliver its obligations. Citizens must also be made aware of how their personal data will be used, stored and retained as well as protection against unauthorised use of data.

Uganda's Electronic Transactions Act No 8 of 2011 states that:

- (1) Where a law requires that a document, record or information be retained, the requirement is fulfilled by retaining the document, record or information in electronic form if;
 - (a) The information contained in the electronic record remain accessible and can be used for the subsequent reference;
 - (b) The electronic record is retained in the format in which it was originally generates, sent or receives or in a format which can be demonstrated to accurately represent the information originally generated, sent or received;
 - (c) The information which is retained enables the identification of the origin and destination of an electronic record and the date and time it was sent or received; and
 - (d) The consent of the department or ministry of the Government, or the statutory corporation, which had supervision over the requirement for retaining the record, had been obtained⁷.

3.10.2 Access to Information

The Constitution of the Republic of Uganda provides for the right to information in Article 41. The Ugandan Parliament has further entrenched this right by passing the Access to information Act 2005 which applies to all information and records of Government ministries, departments, local Governments, statutory corporations and bodies, commissions and other Government organs and agencies, unless specifically exempted by this Act. It does not apply to cabinet records and records of committees of the cabinet; records of court proceedings before the conclusion of the case. This right to access information is subject to the Act but is not affected by any reason the person gives for requesting access or by the information officer's belief as to what the person's reasons are for requesting the access⁸. A citizen has a right of access to information and records in the possession

⁵ CI 14 Data Protection and Privacy Bill (Draft)

⁶ CI 17 Data Protection and Privacy Bill (Draft)

⁷ S 9 Electronic Transactions Act No 8 of 2011

⁸ S.6 Access to Information Act No 6 of 2005

of the State or public body except where its release is likely to prejudice the security and sovereignty of the state or interfere with the right to privacy of any other person⁹. The Act sets out procedures for obtaining this information

S.3 of the Computer Misuse Act states that a person secures access to any program or data held in a computer if that person;

- ▶ Views, alters erases the program or data;
- ▶ Copies or moves it to any storage medium other than that which it is held or to a different location in the storage medium in which its held;
- ▶ Uses or destroys it; or
- ▶ Causes it to be output from the computer in which it is held whether by having it displayed or in any other manner.

A person has authorised access to any program or data held in a computer if the person is entitled to control access to the program or data held in question, or the person has consent to access that program data from any person who is charged with giving it consent¹⁰

3.10.3 E-Government

In a bid to encourage and enforce the e-governance, NITA-U has developed a set of regulations that promote the use of internet and other appropriate technologies within and across Government agencies in providing Government information and services. These regulations also advocate for increased citizen participation in Government¹¹.

The regulations provide for the development of inter-operable Government information systems an aspect which will be vital to the integration of national databases¹².

The regulations require that every public body shall establish and maintain a website; where a body does not establish a website within six months after the commencement of these regulations, NITA-U shall establish a website for the public body¹³.

Under this regulation, all public bodies are required use the National Data Transmission Backbone (NBI) and Electronic Government Infrastructure (EGI) as the primary vehicle for all Government data, internet and voice services¹⁴. However results from the feasibility study indicate that there is a very small fraction of public bodies that are using the above mentioned infrastructure specifically 9 out of 32 are currently using it.

⁹ S.5 Access to Information Act No 6 of 2005

¹⁰ S.5 Computer Misuse Act No 2 of 2011

¹¹ National Information Technology Authority, Uganda (E-Government) Regulations, 2014

¹² S.4 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

¹³ S.6 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

¹⁴ S.10 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

The regulations state that public and private bodies may share information in the provision of e-Government¹⁵. This may present a loophole to public bodies to get out of sharing information for the provision of e-services which will prove a bottleneck in the integration of national databases. For a successful integration, NITA-U will need to draw up an agreement with the MDAs for data sharing which agreement must be followed by a sensitization program to educate stakeholders on the benefits of the integration. This way, NITA-U will be able to get buy-in for the integration vision from the different stakeholders.

The other laws that should be considered in the generation, modification, publishing and ownership of data by the different MDAs include;

3.10.4 Computer Misuse Act, 2011

The Computer Misuse Act no 2 of 2011 provides for various offences such as unauthorized access where a person who intentionally access or intercepts, interferes, produces, sells or offers to sell any program or data without authority or permission to do so; Access with intent to commit or facilitate the commission of a further offence; Unauthorised modification of computer material; Unauthorised use or interception of computer service; Unauthorised obstruction of use of computer; Unauthorised disclosure of access code; Unauthorised disclosure of information; Electronic fraud

A computer is treated as a “protected computer ” if the person committing the offence knows or ought reasonably to have known, that the computer or program or data is used directly in connection with or necessary for security, defence or international relations, existence or identity of a confidential source relating to enforcement of criminal law, provision of services directly related to communications infrastructure, banking and financial services, public utilities or public key infrastructure and protected public systems related to essential emergency services like police, civil defence and medical services¹⁶.

The punishments can either be a fine in monetary terms or a term of imprisonment. In the case of unauthorised access, one may be receive a fine not exceeding two hundred and forty currency points or imprisonment not exceeding ten years.¹⁷ Each currency point represents twenty thousand Uganda shillings.

For integration purposes, it is vital that all parties i.e. MDAs, private bodies and citizens be made aware as they transact of their rights around collecting, processing, sharing and retention of data. They must also be sensitized on the consequences of infringing on the rights of others. Penalties will also serve as a measure to protect personal data against unauthorised access, disclosure and misuse. NITA-U must therefore ensure the enforcement of these regulations and noncompliance be dealt with.

¹⁵ S.13 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

¹⁶ S.20 Computer Misuse Act, 2011

¹⁷ S.12 Computer Misuse Act, 2011

3.10.5 National Information Security Policy

NITA-U developed the National Information Security Policy which outlines the mandatory minimum security controls that all public and private sector organisations that use, own and/or operate protected computers, handle official communications and personal data must apply to reduce their vulnerability to cyber threats¹⁸. The policy comprises of four sections namely;

- ▶ Security governance; this section creates a framework for the other sections (information, personal and physical security) to function.
- ▶ Information security; this section covers the processes around storage, retrieval and transmission of data.
- ▶ Personnel security; the biggest threat to information and critical infrastructure is the human factor. The NISF highlights the checks that should be taken into consideration when vetting individuals that will be granted access to critical infrastructure and information assets. The framework goes ahead to outline continuous measures for managing personnel security
- ▶ Physical security; these guidelines provide for the protection against unauthorised physical access to information and critical infrastructure.

The three objectives for information security and privacy include confidentiality, integrity and availability and they are all critical to the success of the Integration of national databases project. From our observation when carrying out the feasibility study for the integration of national databases is that there are few institutions with have an approved information security policy. Of the 32 institutions interviewed, only 14 had a policy in place.

Immediate action needs to be taken by NITA-U in ensuring that all MDAs have an information security policy that meets the standards and timelines when this should be achieved. Failure to achieve this within the specified timelines, NITA-U must invoke the enforcement of the National Information Security Framework as the baseline.

Once enforced and complied with in the integrated environment, the framework will serve to ensure secure information access, exchange and storage as well as timely identification and addressing of vulnerabilities as well as ensuring business continuity in the provision of e-services.

3.10.6 Electronic Transactions

Electronic commerce is a growing trend in Uganda. This means that as the services that will emerge from integration of national databases will give rise to increased electronic transactions. The Electronic Transactions Act, 2011 provides for the use, security, facilitation and regulation of electronic communications and transactions; to encourage the use of e-Government services; promote technology neutrality; ensure that electronic transactions in Uganda conform to the best practices by international standards¹⁹.

¹⁸ National Information Security Policy, 2014

¹⁹ Electronic Transactions Act No 8 of 2011

As a result of the integration, a good number of the proposed e-services will require the creation, filing, issuance of documents and payment of services. The act provides for the acceptance of a document to be created and/or retained in form of a data message, issuance of an electronic licence and receipt of electronic payments²⁰. The service provider (MDA) may also specify²¹ in the gazette (an official journal/newspaper) the format in which the requirements must be presented as well as the format of the output of the service a provision that will be useful to the citizens.

The objective²² of this act is to;

- (a) enable and facilitate electronic communication and transactions;
- (b) remove and eliminate the legal and operational barriers to electronic transactions;
- (c) promote technology neutrality in applying legislation to
- (d) electronic communications and transactions;
- (e) provide legal certainty and public confidence in the use of electronic communications and transactions;
- (f) promote e-Government services through electronic communications and transactions with the Government, public and statutory bodies;
- (g) ensure that electronic transactions in Uganda conform to the best practices by international standards;
- (h) encourage investment and innovation in information communications and technology to promote electronic transactions;
- (i) develops a safe, secure and effective environment for the consumer, business and the Government to conduct and use electronic transactions;
- (j) promote the development of electronic transactions that are responsive to the needs of users and consumers; and
- (k) Foster economic and social prosperity.

3.10.7 Electronic Signatures

The Electronic Signatures Act provides for and regulates the use of electronic signatures and provide for other related matters; the Act provides for a secure environment in which to carry out transactions; it establishes a public key infrastructure for authenticity and security of documents; it recognizes different signature creating technologies; and provides for effective administrative structures e.g. establishment of Certification Authorities.

Electronic signatures encourage the automation of work flows which reduce transaction time especially in an environment where approvals are required to kick start processes. Take for example claiming benefits which has been suggested as an e-service; if this process was fully automated, NSSF would use a digital signature to authenticate the identity of a claimant and restrict the modification of electronic documents.

²⁰ S.22 Electronic Transactions Act No 8 of 2011

²¹ S.23 Electronic Transactions Act No 8 of 2011

²² S.4 Electronic Transactions Act No 8 of 2011

3.10.8 Registration of persons act

Is an Act to harmonize and consolidate the law on registration of persons; to provide for registration of individuals; to establish a national identification register; to establish a national registration and identification authority; to provide for the issue of national identification cards and aliens identification cards and for related matters²³. The bill intends to establish a National Identification and Registration Authority to create, manage, maintain and operate the national identification register²⁴. Clause 36 requires that a registration officer treats the personal data as confidential and shall not disclose this data unless required by law²⁵.

The bill proposes that the authority updates the information held within the register either by request from the owner of the personal data or information from other Government databases.²⁶

The information held within the register can be used for the following purposes²⁷;

- ▶ Issuing of passports
- ▶ Immigration and passport control
- ▶ National security
- ▶ Statistical functions
- ▶ Monitoring money laundering and human trafficking
- ▶ Taxation purposes
- ▶ Law enforcement
- ▶ Public administration
- ▶ Provision of social services like social security, health, education and welfare
- ▶ Facilitating the provision of information
- ▶ Any other purpose determined by the Minister

In regards to accessing the information within the national identification register, MDAs will be restricted to the information in their request and the authority will determine levels of access²⁸. While the bill proposes clauses that will govern the collection and processing of personal data, it does not provide for the protection of one's privacy. The data protection and privacy bill however has not yet been passed. It is vital that if the registration of persons' bill is passed before the data protection and privacy bill, data protection clauses to govern protection and access of personal data are included.

²³ The Registration of Persons Act No 10 of 2014

²⁴ Cl.5 The Registration of Persons Act No 10 of 2014

²⁵ Cl.36 The Registration of Persons Act No 10 of 2014

²⁶ Cl.39 The Registration of Persons Act No 10 of 2014

²⁷ Cl.40 The Registration of Persons Act No 10 of 2014

²⁸ Cl.42 The Registration of Persons Act No 10 of 2014

3.10.9 NITA- U (National Databank Management and Data Protection) Regulations 2015

These regulations provide for the creation of a National Data bank for the purpose of receiving, disseminating, storing and processing of eligible personal data and critical data provided by the relevant data controllers and the transmitting for use of such data by authorised persons. The regulations give NITA-U oversight powers over the National database, its inputs and outputs.

The regulations provide for the way personal data should be treated, this is important because the Integration of Government databases opens up opportunities of sharing and use of personal data amongst various MDAs. The regulations give details on how and who should collect/store the personal data and how it should be treated after collection including sharing it with other MDA, privacy, disclosure, inaccurate data and sharing personal data with foreign Governments.²⁹

Security of personal data by the data controller employees as well as third parties is catered for as part of these regulations. The regulations also provide for compliance and security checks by NITA-U to the MDAs. This will ensure compliance with standards and regulations. The regulation states the penalties attached to offenders which will have to detour would have been offenders.

3.10.10 The Registration of Persons (Births and Deaths) Regulations, 2015

In addition to the registration of persons act, 2015, the National Identification Registration Authority (NIRA) has come up with the registration of persons regulations. The regulations have been designed to cater for the registration of births and deaths and change of name and sex. Births occurring in a medical facility will be registered by facility administrator with the guidance of the registration officer in that area³⁰. The registration officer within an area must be notified about births that occur outside a medical facility³¹.

³²Reg 9 states that subject to the Act, upon registration of every birth, the authority shall allocate a National Identification Number to a child who is a citizen. The issuance of this number at birth will support the access of minors to services they are eligible to access with the supervision of an adult for example application for a passport.

²⁹ Part 5 THE NITA-U (NATIONAL DATA BANK MANAGEMENT AND DATA PROTECTION) REGULATIONS 2015

³⁰ Reg 6(3) The Registration of Persons (Births and Deaths) Regulations, 2015

³¹ Reg 7(1) The Registration of Persons (Births and Deaths) Regulations, 2015

³² The Registration of Persons (Births and Deaths) Regulations, 2015

3.10.11 E-Government related laws from other countries

Country	Legislation	Description
Moldova	Personal Data Protection	The purpose of the present law is to guarantee the protection of the person's rights and freedoms with regard to its personal data processing, including the protection of the rights to private life inviolability, to personal and family secret. ³³ .
	Access to Information	The interaction between the providers of information and individuals and/or legal entities during the exercise of their constitutional right to access information ³⁴ .
	Electronic Communications Act	This Act shall regulate the operation in civil electronic communications conducted by all providers of electronic communications networks and/or services, regardless of type of ownership, and shall establish the users' rights and obligations on the entire territory of the Republic of Moldova ³⁵ .
	Law on Informatics	Persons engaged in activities within the framework of information systems and networks shall ensure protection and confidentiality of the data. Data defined as public shall constitute an exception ³⁶ .
	Law on Informatization and State Information Resources	Individuals and legal entities possessing information constituting personal data shall receive and use it in accordance with their powers and

³³ Personal Data Protection, 2007

³⁴ Access to Information, 2000

³⁵ Electronic Communications Act No 241 of 2007

³⁶ Art. 28 Law of the Republic of Moldova on Informatics No 73-74 of 2001

Country	Legislation	Description
		shall bear responsibility under law for violation of the regime for protection, processing and use of the said information ³⁷ .
Estonia	Digital Signatures Act	This Act provides the necessary conditions for using digital signatures and digital seals, and the procedure for exercising supervision over the provision of certification services and time stamping services ³⁸ .
	Databases Act	This Act provides for the procedure for possession, use and disposal of state and local Government databases, for the general principles of maintenance of databases belonging to the state, local Governments and persons in private law, and for release and use of their data ³⁹ .
	Electronic Communications Act	The purpose of this Act is to create the necessary conditions for the development of electronic communication to promote the development of electronic communications networks and communications services without giving preference to specific technologies and to ensure the protection of the interests of users of electronic communications services by promoting free competition and the purposeful and just planning, allocation and use of radio frequencies and numbering ⁴⁰ .
	Information Society Services Act	This Act provides for the requirements

³⁷ Art.9 Law of the Republic of Moldova on Informatization and State Information Resources No 6-12 of 2004

³⁸ Digital Signatures Act, 2000

³⁹ Databases Act, 1997

⁴⁰ Electronic Communications Act, 2000

Country	Legislation	Description
		for information society service providers, the organisation of supervision and liability for violation of this Act ⁴¹ .
	Penal Code	The provisions of the General Part of the Penal Code apply to the imposition of punishments for offences provided for in the Code and other Acts ⁴² .
	Code of Criminal Procedure	This Code provides the rules for the pre-trial procedure and court procedure for criminal offences and the procedure for enforcement of the decisions made in criminal matters ⁴³ .
	Personal Data Protection Act	The purpose of this Act is protection of the fundamental rights and freedoms of natural persons in accordance with public interests with regard to processing of personal data.
Singapore	Computer Misuse Act	An Act to make provision for securing computer material against unauthorised access or modification; and for connected purposes ⁴⁴ .

⁴¹ Information Society Services Act, 2004

⁴² Penal Code, 2001

⁴³ Code of Criminal Procedure, 2003

⁴⁴ Computer Misuse Act 1990

3.11 Assessing NITA-U against the Integration Requirements

The assessment was focused on understanding the extent to which NITA-U has the relevant processes, resources and Technologies relevant for GSB to run. The prioritization of assessment was performed based on the top 15 e-services. In addition to the other aspects such as legal and regulatory environment, National systems and databases as well as the other relevant technologies, this assessment was categorized in key areas, i.e. Infrastructure Bandwidth Capacity and Availability, Physical and Environmental Controls Design at the NITA-U data Centre, Operations and Help Desk

Logical Security Design and Business Continuity/Disaster Recovery Planning

Infrastructure Bandwidth Capacity and Availability

Government of Uganda has a National Backbone/E-Government infrastructure (hereafter NBI/EGI). In assess over the public internet, the GSB shall be accessible via the NBI/EGI. This therefore implies that any infrastructure requirement requirements shall be in line with linking the GSB to the NBI/EGI.

Six of the providers (MDAs) of the top 15 e-services are connected to the NBI/EGI implying that there shall be need to connect the other MDAs to the NBI/EGI if their e-services are to be provided through the GSB.

Table 6: NITA-U Assessment of Integration requirements

MDA	Connected to NBI/EGI(Yes/No)	Router	Bandwidth (Mbps)	Comment
Ministry of Internal Affairs	Yes	NE40	4	Two Routers as Current Redundancy system
Uganda Registration Services Bureau	No	N/A	N/A	
Ministry of Health	Yes	NE40E	7	Two Routers as Current Redundancy system
Uganda AIDS Commission	No	N/A	N/A	
Ministry of Lands, Housing and Urban Development	No	N/A	N/A	
Ministry of Public Service	Yes	NE40E	7	Two Routers as Current Redundancy system

MDA	Connected to NBI/EGI(Yes/No)	Router	Bandwidth (Mbps)	Comment
National Agricultural Research Organisation	No	N/A	N/A	
National Agricultural Advisory Services	No	N/A	N/A	Being setup as a child under MoPS to use Switch and bandwidth to be apportioned
Uganda Police Force	Yes	N/A	N/A	Not for Internet but for IFMS. Connection is by use a Switch (8505)
Uganda Human Rights Commission	Yes	N/A	3	No redundancy but MDA is setup as a child under MoPS using a Switch
Ministry of Works and Transport	Yes	N/A	5	No Redundancy system. It's a child under MoIA using a Switch (8505)

Problem/Incident management

NITA-U has a procedure on identifying, raising/escalating, logging and monitoring Incident on systems hosted in the Data centre. This procedure is usually communicated as part of the SLAs and is contained in the escalation matrix. The SLA also includes KPI for incident management.

Backup and Data Recovery

NITA-U has a policy governing the backing up of data on systems that are hosted in the data centre. NITA-U plans to set up a disaster recovery site in 6 months period. Currently data backups are effected on disk a periodic basis using tools.

Logical security Design

NITA-U uses the EUDEMON firewall with through put favourable for the estimated number of transactions per minute. The Firewall support standards-based VPNs using IP Security, Layer 2 Tunnelling Protocol (L2TP), Layer 2 Forwarding Protocol (L2F), generic routing encapsulation (GRE), and multiprotocol label switching (MPLS) virtual private networks (VPNs).

IP-based network and control access to network resources is tracked using Bandwidth manager tool NITA-U uses Microsoft Forefront Endpoint Protection as the network based antivirus program

A National Information Security Framework exists and is communicated all MDAs. A process for assessing compliance to the national information security framework requirement exists.

Physical, Power and environmental controls

NITA- has the following power supply controls:

- ▶ Electrical system Automatic Transfer Switch (ATS)
- ▶ Uninterruptable Power Supply unit (UPS): under comment (uptime of 8 to 12 hours)
- ▶ On-site standby generator
- ▶ Power Surge Protections/Stabilisation system/devices

The following physical and environment controls exist at the data centre

- ▶ Raised ceiling for cables running
- ▶ Cabling neatly arranged
- ▶ Air conditioner
- ▶ Environmental alert device
- ▶ Smoke detection and Fire suppression equipment (FM200)
- ▶ Biometric Access door system
- ▶ Physical Lock Used
- ▶ Logging of Access to the Data centre carried out using the biometric system
- ▶ CCTV cameras are also in place.

4 Future state Design



4.1 Proposed Legal Framework Recommendations

4.1.1 Governance

i. Legislation

All private, public bodies and citizens must conform to the following laws and regulations;

- ▶ Data Protection and Privacy bill, 2014
- ▶ Electronic Transactions Act, Act 8 of 2011
- ▶ Electronic Signatures Act, Act 7 of 2011
- ▶ Computer Misuse Act, Act 2 of 2011
- ▶ National Information Security Policy, 2014
- ▶ Persons Registrations bill, 2014
- ▶ National Data Bank Management and Data protection regulations 2015
- ▶ Cyber Security Law (to be drafted and passed)

ii. Relationships and Agreements

The integration of national databases will result in the formulation of various relationships. The number of relationships will however depend on the approach to integration. These relationships will require agreements for smooth operation. The proposed agreements will be as result of the following relationships;

	Party A	Party B	Current legislation applicable	SLA composition
1	Public body	NITA-U	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act, Computer Misuse Act, National Information Security Policy	<ul style="list-style-type: none"> ▶ Definition of service to be provided ▶ Service life cycle ▶ Service requirements for both parties ▶ Service level measurements ▶ Roles and responsibilities ▶ Change management ▶ Risk transfer and sharing
2	Private body	NITA-U	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act, National Information Security Policy	
3	Public body	Public body	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act, National Information Security Policy	
4	Public body	Private body	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act,	

	Party A	Party B	Current legislation applicable	SLA composition
			Computer Misuse Act, National Information Security Policy	
5	Public body	Citizen	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act, National Information Security Policy	
6	Private body	Citizen	Data Protection and Privacy bill, Electronic Transactions Act, Electronic Signatures Act, National Information Security Policy	

Table 7: Table showing relationships arising from integration

4.1.2 Proposed legislation/regulations

Applying to all the relationships

- (a) Identity management; this would be put in place to ensure the identity documentation maintains given standard. It must also state what form of identification is acceptable for the different electronic transactions,
- (b) E-services management. Connection, disconnection and reconnection of systems and/or e-services from the bus. It must cover areas where a service has been removed due to noncompliance of standards or service is no longer required. The criteria used in connecting a service over another must also be defined.
- (c) Service Level Agreements; contracts between e-service providers and consumers that cut across the G2G, G2B and G2C environments
- (d) Information and document management which covers storage , amendment and deletion of data created as a result of the provision of e-services, enforcement of electronic forms to reduce the amount of paper work, the level of paper work required and electronic decision making

Administration;

- (a) Reg.4 of the National Information Technology Authority, Uganda (E-Government) Regulations, 2014, it states that NITA-U shall promote the establishment and maintenance of interoperable information systems within public bodies.⁴⁵We recommend that these regulations include the establishment of a steering committee with representation from the respective e-service providers. This will provide for an independent review board to oversee the integration. The role of the committee will be

⁴⁵ Reg.4 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

to facilitate the enforcement of laws and regulations, e-service agreements coordination and monitoring of the integrated systems

- (b) In addition to the steering committee, we recommend the appointment of team that will be directly in charge of the day to day administration of the integrated systems. The role of that team would be to carry out compliance checks, advice on regulatory issues and system upgrades. To achieve this mandate, the team must comprise of IT and legal specialists.
- (c) Financial obligations; the regulations require for every public body to maintain a website and where one is not established within six months of the commencement of these regulations, NITA will establish one for the public body at a cost to that body.⁴⁶ In addition to this regulation, we recommend that all financial obligations for each party involved in the integration be clearly written out. These include;
 - i. NITA-U's financial responsibility towards running the integration infrastructure and data warehouse
 - ii. MDAs obligations to establish and upgrade their own systems in order to achieve a seamless integration
 - iii. Revenue sharing as a result of the provision of e-services in cases where the e-service is chargeable
- (d) Harmonization of the roles between NITA-U and Uganda Communications Commission (UCC) in regards to the regulation of content. Each agency needs to be clear on what kind of content it is required to regulate.

4.1.3 Formal Policies and Procedures

In a centralized integration approach, all public and private bodies will be expected to adopt the same formal procedures where as in a decentralised integration approach, entities will be allowed to maintain their own policies however NITA-U will provide minimum baseline standards in accordance to the current ICT policies.

Change management; A formal procedure/policy regarding change control should be developed, implemented and maintained. The goal of these procedures is to manage the process of MDAs upgrading their systems and IT policies after they have been integrated in order to evaluate the impact of the upgrade on service availability.

Incident management; A formal incident management policy must be prioritized in order to ensure uniform procedures in incident reporting and handling for the integrated systems. The will policy includes but shall not be limited to the following;

⁴⁶ Reg.6 National Information Technology Authority, Uganda (E-Government) Regulations, 2014

- i. Security Incidents detected and the proposed security precautions.
- ii. Escalation procedures and communication protocols
- iii. Logging of incidents
- iv. New Interconnections by the MDAs internally or externally
- v. Personnel changes.

Business continuity; A documented, distributed and tested Business Continuity Policy (BCP) and Disaster Recovery Plan (DRP) must be developed that outlines how the critical integration operations will resume their functions in the event of a disaster. A comprehensive impact analysis need to be performed to ensure all areas that could be affected is included in these plans.

Compliance Policy

NITA-U must establish compliance requirements to avoid breach of any legal, regulatory or contractual obligations. Information systems must also comply with the security requirements as provided by NITA-U.

This will be designed to help protect the integration by monitoring its activities to eliminate known threats and prevent new ones from being introduced. The program will improve the understanding of risk to avoid repetition in the future. It will also provide a framework for governance to help ensure the best decisions are made with respect to risk acceptance.

All parties involved in the integration shall have agreement(s) which they must comply. Non-compliance will be dealt with as per the penalties provided for in the agreement(s) and laws. The administrative team will be in charge of checking compliance.

Intellectual Property Rights

Procedures must be put in place to ensure that terms and conditions and license requirements of the copyrighted software or any other proprietary information used are complied with at NITA-U and with the public/private institutions.

Awareness

There is a need to increase awareness of the existing cyber laws for all citizens. Activities performed online all have a cyberspace legal perspective. In addition, legal professionals should be highly sensitized about cyber laws especially if they are required to adjudicate cybercrime cases.

On that note, there is a need for specialized courts and particularly specialized individuals where cybercrime matters are resolved.

With regard to legal enforcement, there is need for them to be trained in how to handle and preserve evidence from cybercrimes.

4.2 Information Security

4.2.1 Security Framework considerations

The Security Framework has been designed to establish security practices for Uganda's e-governance structure. The guidelines will provide guidance on matters affecting security of the integrated infrastructure, national systems and respective users. All users (public and private body employees as well as citizens) will be expected to adhere to these guidelines.

A world class Enterprise Security Architecture practice is one that is fully integrated with enterprise architecture function and does not operate in isolation. It engages on all stakeholders providing guidance that enables the efficient management of security in the enterprise



4.2.2 Objectives

The primary goal of this framework is to protect

- (a) Confidentiality; information must not be disclosed to unauthorised individuals or entities
- (b) Availability; authorised users are able to access and utilise information resources
- (c) Integrity; information resources must remain unaltered by unauthorised users and consistency maintained.

4.2.3 Responsibility

The Integration steering committee will be responsible for the security framework however the administrative team will perform the day to day implementation and maintenance. The steering committee will be led by NITA-U. It will be a permanent composition of Ministry of ICT, Ministry of

internal affairs, Ministry of Finance Planning and Economic development and National Identification and registration Authority. The rest of the composition will be made up of representatives of the service providers.

The steering committee will also be responsible for management and implementation of the data architecture recommendation (Section 4.13 of this report)

All users of the integrated infrastructure must adhere to the framework and failure to do so will result in penalties.

4.2.4 Need for security

This section describes the integration security requirements. Security is a critically important issue for the integration. Without adequate security in place none of the proposed e-services can be provided in real-life environment. A security policy is therefore needed to define a secure operational environment for service deployment and create a 'chain of trust' among all actors that will make possible the implementation of the integration. The security policy must be sufficient for protecting data and processes, implementable and agreed upon by all partners. Security audit requirements are provided in this document. The security policy must be periodically re-examined. It must also be periodically audited to ensure conformance and compliance with its provisions.

Legal requirements

For dataflow, the actors should respect the national legislation on privacy and data protection and other related national legal provisions in effect;

- ▶ Data Protection and Privacy bill, 2014
- ▶ Electronic Transactions Act, Act 8 of 2011
- ▶ Electronic Signatures Act, Act 7 of 2011
- ▶ Computer Misuse Act, Act 2 of 2011
- ▶ National Information Security Policy, 2014
- ▶ Persons Registrations bill, 2014
- ▶ National Data Bank Management and Data protection regulations 2015
- ▶ Registration of Persons (Births and Death) Regulations 2015

4.2.5 Security rules

The following general security rules are specified and apply for the NITA-U interconnectivity network data exchange model:

- ▶ The integration network data flows must be adequately protected, as specified in international standards.
- ▶ Users of the integration infrastructure must be clearly identified by respective institutions before being able to enter the system.
- ▶ Data and Privacy protection procedures in place must have been audited and certified
- ▶ Authentication means must have been audited and certified by NITA-U according to international standards.
- ▶ Mutual Authentication between MDAs is needed, when initiating a cross border information flow.
- ▶ Security audits must be conducted yearly to audit the systems by ISO/IEC27001, ISO/IEC 17799 / ISO/IEC 27002, or equivalent level standards
- ▶ Audit must approve the fulfilment of the application, installation and operation of security principles

4.2.6 Detailed security requirements

The aim of this section is to describe the minimum security requirements. These have been split into three levels.

- ▶ 1st level - Security requirements for the integration network as a whole
- ▶ 2nd level - Security requirements for MDAs
- ▶ 3rd level - Minimum acceptable common security requirements for the different MDA Information Systems. This based on the fact that MDAs at different levels of security

The integration network must guarantee the security of data processing. This means that confidentiality, availability and integrity of data must be guaranteed through suitable security requirements. More precisely, the security requirements for the network as a whole must guarantee the following items:

- (a) Identification; a valid and unique electronic identity must be established. The standards to which this is unique/ valid must be agreed upon.
- (b) Authentication; the identity of users must be validated before each system access, transaction or message.
- (c) Access control; the confidentiality and integrity of the network information assets must be protected by preventing unauthorised access and use
- (d) Auditing; it must be ensured that each action which has an impact on security or privacy must be audited. In any case auditing information must not include personal client data.
- (e) Confidentiality; the unauthorized disclosure of personal information during the transfer, processing and storage must be strongly prevented. The use of cryptographic mechanisms should be adopted.

- (f) Availability; must be ensured that information resources are, according to the service level agreements agreed, available in a timely and reliable manner when
- (g) Non repudiation; it must be ensured that both the User-Originator and the User-Receiver of documents and messages cannot deny their actions of message production, sending and receiving
- (h) Traceability; it must be ensured that log data can be connected from different sources in a privacy-compliant way.
- (i) Logging of any operation, performed by whatever User (Active Actors), which has an impact on security.

Security requirements for MDAs include;

- (a) Identification: an MDA must have a unique electronic identity in a common cryptographic domain
- (b) Local User Identity &Access: identity and access management of each local User/technical staff must be performed before he/she starts processing. The mechanism used for Identity and access must prevent the User's identity from being repudiated.
- (c) Authenticating Network Access: each MDA must ensure that all connections to remote computers and servers and applications are authenticated.
- (d) Where digital signatures are applied, MDAs must be able to verify that the digital signature is valid and confirm the validity to any other MDA through a digital signature.
- (e) Access Control: an MDA must provide Access Control mechanisms which provide functionalities that allow, for a given user, the specification of which data and services the user can get access to, and which privileges the User has with regard to the data and services.
- (f) Confidentiality: an MDA must use strong cryptographic mechanisms to prevent the unauthorized disclosure of personal confidential information during the transfer and processing if this processing has confidentiality vulnerabilities.
- (g) Availability: an MDA best effort must ensure to respect of the agreed Service Level Agreements
- (h) Auditing: it must be ensured that each action which has an impact on security is recorded. If data to be recorded contains both transactional and personal data, an anonymization or pseudo-**anonymization** process should be used if possible or reasonable. Audit records must be maintained as long as the project lasts, unless otherwise legally required. The minimum content of audit logs should include;
 - ▶ User ID of the accessing user;
 - ▶ the role the user;
 - ▶ the institution of the accessing user;
 - ▶ the function performed by the accessing user;
 - ▶ the MDA-id of the Originator/Target;
 - ▶ A time stamp including time.

- (i) Logging Transactions: a secure audit record must be created each time a user requests and accesses a service.

The minimum acceptable security requirement for the different MDA Information Systems is derived from the requirements listed above;

- (a) Identity and Authorization of a User: must be performed before a user starts processing.
- (b) Access Control): an Access Control tool/mechanism which enables access to information on the basis of the User Identity and the role one plays must exist.
- (c) Confidentiality and Integrity: confidentiality and integrity of the information resources created or stored must be guaranteed. Data should be protected by the use of acknowledged cryptographic algorithms.
- (d) Audit & Accounting: a process which allows the collection and the consultation of the information of both the actions performed by the users and the events which impact on security must exist. These logs must be protected from unauthorized access.
- (e) Segregation of Duties, Services and Systems: MDAs must introduce network controls to segregate information services, users and information systems that are not involved in access to or hosting of e-services.
- (f) Protecting Against Malware: each MDA IT-system involved in the integration network must implement, according to ISO/IEC 27000, appropriate detection and prevention controls to protect against malicious software.

4.2.7 Access management

This will govern the way in which users of the integrated infrastructure will access information resources. Privileges must be allocated to individuals based on the requirements of their role, on authorization from appropriate personnel. Additional privileges more than what is required for the job function must be allowed after getting approval from appropriate personnel.

Password protection

- ▶ Passwords must not be shared with anyone and must be treated as confidential.
- ▶ Passwords must not be put in electronic communication such as email
- ▶ Do not write passwords down. Do not store passwords in a file on a computer system or mobile devices (phone, tablet) without encryption.
- ▶ Do not use the "Remember Password" feature of applications (for example, web browsers).
- ▶ Any suspicion that a password may have been compromised must be reported and the respective password changed immediately.

System configurations

- ▶ Systems must be configured to support authentication of individual users, not groups.

- ▶ Systems must be configured not to store passwords in clear text
- ▶ Systems must be configured not to transmit passwords in clear text over the network.

4.2.8 Other information security considerations

Data modification; Information obtained through the data warehouse may only be modified if it contains inaccuracies and such modification must first be approved by the MDA from whom the information originated and upon request by the MDA seeking to modify it. Such request shall be accompanied by the necessary proof of the inaccuracies sought to be corrected.

In cases where data has been collected from an individual, a citizen must be able to correct their personal data where it contains inaccuracies and is no longer relevant⁴⁷. The citizen must send a formal request to the respective entity that holds the data and wait for a written response on whether the request has been granted or not.

Backup; a formal procedure/policy regarding data and information backup should be developed, implemented and maintained. The policy should be communicated and made available to MDAs as well as the team at NITA-U, stressing its importance and adherence. NITA-U must review the backups performed on a regular basis to ensure that they are appropriate.

Monitoring; the integration infrastructure must be reviewed to identify and manage risks, track usage for improvements and any network violations that do occur.

⁴⁷ S.12 Data Protection and Privacy Bill (Draft), 2014

4.3 Proposed Top priority e-Services

From the responses provided to EY as part of the study, a list of 52 unique e-services was developed. These e-services included existing services, services that MDAs desire to receive and provide in future and services that citizens and businesses would wish to receive from the Government.

4.3.1 Methodology for selection of Priority e-Services

Out of all the identified e-services, 15 priority e-services were selected as those that the Government should focus on in the short term. These were selected based on a criterion that was developed by the project stakeholders for prioritization of the E-services. The criteria are as listed below;

1. Number of beneficiaries covered by the e-service especially women;
2. Back-office readiness at MDAs;
3. legal framework readiness;
4. leadership, political will and level of ownership at MDAs; and
5. Sustainability of the e-services.
6. EY also looked at the dependencies between the services.
7. Sector that the e-service supports.

Each of the e-services was evaluated against the above mentioned criteria .Where the service was compliant with the criteria, it was given a One (1) score and where it was not compliant with the criteria, it was given a Zero (0) score.

Based on the scoring above, the top priority e-services are as described below;

1) E- verification

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
National Identity Registration Authority (NIRA) National Identification and Registration Authority(NIRA) Ministry of Lands, Housing and Urban Development (MoLHUD) Administrator General(AG) Uganda	e-client verification	Banks, telecoms and other MDAs will be given access to specific National ID citizen information on request to verify their customers before providing services. This will be performed through the NIN (National ID Number). Presentation of this information to the businesses will be agreed upon in the service level agreement. The agreements will also contain information about service fees, access rights and conflict resolution. This is a private service and will require authentication before being accessed. This service is to be provided by Ministry of Internal Affairs (MOIA).	Businesses e.g. Banks and Telecoms MDAs e. g Ministries, NSSF, URA, MOIA(pass port team)	G2B, G2G	Name, NIN,	Names, Photo, DOB, passport number	Public	Yes	No

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Registration Services Bureau(URSB) Uganda Investment Authority (UIA) Face Technologies- Ministry of Works and Transport	Credit reference verification	Businesses will be able to verify the credit worthiness of an individual. By inputting Name and NIN of potential client, information regarding their loan history will be displayed. This is a private service and will require authentication before being accessed. This service is to be provided by Bank of Uganda.	Businesses	G2B,G2C	Name ,Financial Card Number	Name, loan amount, Lending institution	Financial	Yes	Yes
Bank of Uganda Courts Of Judicature Ministry of Health	E-license verification	Traffic police will be able to validate the authenticity of a driving license. A driving license number will be input into a driving license reader. This action will return the name of the driver and the status of the license (active or expired). This is a private service and will require authentication before being accessed. This service is to be provided by Face Technologies under Ministry of Works	Police	G2G	Driving License Number	License status, Name of driver	JLOS	Yes	No

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		and Transport							
	e-land	<p>Citizens, businesses and MDAs will be able to input a unique land title number into the portal which will query the Ministry Of Lands System for the land valid land owner. A transfer of land can be initiated applicable fees.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is to be provided by Ministry of Lands, Housing and Urban Development (MoLHUD)</p>	All citizens	G2C	Land Location, Title Number, Land Owner	Land Location, Title Number, Land Owner, Previous Owner, Date Of Transfer, Status, Size Of the Land	Public	Yes	No
	verify death and birth	The Administrator General's office will access information from the URSB system to enable them to confirm the death of citizens before transferring property(estate) to a new	Administrator General	G2C	Registration Number/ Company Name	Registration Status, Directors, Company	Public	Yes	No

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>administrator.</p> <p>This service is to be provided by Uganda Registration Services Bureau (URSB). This service will at a later stage be offered concurrently with Ministry of Internal Affairs</p> <p>This is a private service and will require authentication before being accessed.</p>				Address			
	verify registered companies	<p>Citizens are able to carry out a company search by business name or by registration number. The output is name of the business, Status, Type and registration date.</p> <p>This service is to be provided by Uganda Registration Services Bureau (URSB).</p> <p>This is a public service and will not</p>	All citizens	G2C	Registration Number/ Company Name	Name of the business, Status, Type and registration date	Public	Yes	Yes

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		require authentication before being provided.							
	verify asset transfer	<p>The Ministry of Housing, Land and Urban Development will need access to the Administrator General system to confirm and implement the deceased's will and enforce transfer the estates to a new administrators.</p> <p>This service is to be provided by Administrator General (AG).</p> <p>This is a private service and will require authentication before being accessed.</p>	Ministry of Land	G2G	New Estate Administrator	Land Location, Title Number, Land Owner, Previous Owner, Date Of Transfer, Status, Size Of the Land	Public	No	No
	verify court bailiffs	Citizens will input a bailiff name into the portal and verify their registration from the courts of judiciary before engaging them by visiting the Courts Of Judicature website	All citizens	G2C	Practice Number, Bailiffs Names	Practice Number, Partner Names, Address, Date Of	JLOS	Yes	Yes

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a public service and will not require authentication before being provided.</p> <p>This service is to be provided by courts of Judicature</p>				Registration			
	verify law advocates	<p>Citizens input a law advocate name into the portal and receive information on their registration status. The output would be the name of the advocate, the firm name , email , phone number , plot number, enrolment and renewal dates. This information will be stored at the central store and be updated quarterly.</p> <p>This is a public service and will not require authentication before being provided.</p> <p>This service is to be provided by courts of Judicature</p>	All citizens	G2C	Practice Number, Advocate Names	Practice Number, Partner Names, Address, Date Of Registration	JLOS	Yes	Yes

Aggregate Service Providers	Specific e-service	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
	e- doctor verification	<p>Citizens are able to verify the authenticity of a doctor before requesting their services. A name and unique identifier will be input into the portal and their registration status and qualifications will be displayed</p> <p>This service is provided by Ministry of Health and it is a private service.</p>	All citizens	G2C	Doctor name, ID number	Status(registered or not), qualifications	Health	No	No

2) e-registration

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Kampala Capital City Authority (KCCA) Public Procurement and Disposal of Public Assets Authority (PPDA) National Social Security Fund(NSSF)	e-citie registration	Businesses that operate within Kampala can register with KCCA through the government portal. This information will also be used to update e-citie application. This is a private service and will require authentication before being provided. This service is to be provided by Kampala Capital City Authority.	All businesses in Kampala	G2B	Names Of Business, Location, Nature of Business	COIN Number	Public	Yes	Yes
Telecoms Uganda Registration Services Bureau(URSB)	Registration of birth and death	Hospitals will register new births as well as deaths. They will then provide a provisional certificate to be used to identify them when picking up certificates from URSB. This provisional certificate will include fees	All hospitals and registered health centres.	G2B	DOB, Hospital, Parent Names,	Birth or death certificate	Public	Yes	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda Revenue Authority(URA)		required and date of pickup for the original.							
Ministry of Internal Affairs. (MOIA)		This is a private service and will require authentication before being accessed.							
Ministry of Works through Face Technologies	NSSF registration	This service is to be provided by Uganda Registration Services Bureau.							
National Council of higher education.		Citizens and business can register with NSSF through the portal to get an NSSF number. NSSF will be able to verify the identity of the citizens using their NIN. This will eliminate the need for users to physically walk into NSSF to provide their bio and biometric data. Users will complete a registration form online and submit to NSSF. NSSF will use the e-client verification service to verify identity.	All citizens and Businesses	G2C, G2B	Name, NIN, Registrati on form	NSSF number and Logon details for NSSF services.	Public	Yes	No
Uganda Investment Authority(UIA)		Users will receive communication							
Ministry of Trade									

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Ministry of Tourism and Ministry of Water and Environment		<p>from NSSF regarding status of registration using the email address and phone number provided on registration.</p> <p>This is a private service and will require authentication before being accessed.</p>							
Ministry of health	University registration	<p>Citizens will apply to universities by completing online application forms and attaching copies of academic qualifications. Applicants must also input receipt numbers showing payment of the application fee (paid through e-payment). Follow up will be done using a unique number provided on submission of the application form. Payment options are: online or mobile banking. Application outcomes will be communicated to the contacts provided on the application form.</p>	All citizens	G2C	Application Form, Receipt Number, Results, National Identification Number	Registration Number for Tracking, Meeting Date for Physical Verification	Academic	No	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by National Council of higher education.</p>							
	URA TIN registration	<p>Citizens and business can register with URA through the portal for a TIN. URA will verify the citizen identity using the National ID and the business their registration number.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided URA.</p>	All citizens	G2C	Names, Location , NIN, TIN application form	TIN	Public	Yes	Yes
	Registration of companies	<p>Citizens will be able to register their companies online with this service. Registration progress can be tracked online with the capability to download</p>	All citizens	G2C	Company Name, company	Status, company registration	Public	Yes	Yes

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>certificates.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Uganda Registration Services Bureau(URSB)</p>			type, registration form	certificate			
	Passport Application	<p>Citizens will be able to download and/or complete the passport application form from the government portal. Payments can be made at the designated banks by the Ministry of Internal Affairs. (For those able to do online banking , payment online will be possible through e-payment service) The citizens can then upload a copy of the receipt and the completed application form through the portal. On submission they will be</p>	All citizens	G2C	Receipt Number, National Identification Number	Status, Passport number Interview Day and pick update	Public	Yes	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>issued with an application number which can be used to track the application. Applicant will be notified by email or text message of the pickup date.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Ministry of Internal Affairs. (MOIA)</p>							
	Driving License application	<p>Citizens can apply for new driving licences or renew their old ones through the portal. Applications forms can be accessed online and progress tracked online.. The payment can be effected online using the e-payment service.</p> <p>This is a private service and will require authentication before being</p>	All citizens	G2C	National Identification Number, Receipt Number, Driving Test Results	Application Form, Status of the Driving License	Public	Yes	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>accessed.</p> <p>This service is provided by Ministry of Works through Face Technologies</p>							
	Register for PPDA	<p>Businesses that wish to participate in public procurements can register online with PPDA. The PPDA registration form will be completed online, payments made through the e-payment service and payment reference number submitted along with the registration form.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Public Procurement and Disposal of Public Assets Authority (PPDA)</p>	All citizens and businesses	G2C &G2B	Application forms, Payment details	Status of application , PPDA certificate	Public	Yes	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
	Registration for investment licenses	<p>Citizens and businesses will be able to register for investment licenses They will be able to download or complete and submit registration forms. Users will also be able to upload any support documents required.</p> <p>Any payments required will be effected through the e-payment service.</p> <p>This is a private service and will require authentication.</p>	Businesses and citizens	G2B,G2C	Details in registration form	Acceptance of application or rejection notice.	Public	No	No
	e- doctor registration	<p>Medical professionals will be able to register with the Ministry of Health. This service will enable the ministry to have an updated register of all professional along with their qualifications and medical practice locations</p>	All doctors	G2C	Name, qualification documents	Status(approved / rejected)	Health	No	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication.</p> <p>This is a private service provided by ministry of Health.</p>							

3) E-Payment

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda Revenue Authority(URA) Ministry Of Public Services (MOPS) Ministry Of Finance National Information Technology Authority.	Online payment of government services	Citizens/businesses will be able to pay for government services by selecting the service required and the mode of payment (online banking, mobile money). This is a private service and will require authentication before being accessed. This service is provided by Uganda Revenue Authority(URA)	All citizens	G2C	MDA Name, Name	Payment Receipt	Public	Yes	Yes
	Online payment for other e-services	The service will facilitate payment of fees for the use of other e-services (provided by private institutions). Once payment has been completed; the system will provide a unique code that will be used to activate the service.	All citizens	G2C	e-service name , NIN	Receipt	Multi sectors	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication before being accessed.</p> <p>NITA-U will be the provider of this service.</p>							
	Payment Request For Civil Servants	<p>The Ministry of Public Service connects to the Ministry Of Finance Planning and Economic Development to upload a payment file to IFMS. The file is used to process payments/salaries for the government employees.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Ministry Of Public Services (MOPS)</p>	MoPS	G2G	Vote Names, Employee Number, Bank Account Numbers	Confirmation of Receipt	Public	Yes	Yes
	Online payment of service providers	All MDA's need access to IFMIS (Ministry of Finance Planning and Economic Development)to upload		G2G	Vote Names, Employee	Confirmation of Payment	Public	Yes	Yes

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>payment invoices for service providers for the Ministry to process payments. The payment request is sent to Bank Of Uganda to be effected</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Ministry Of Finance.</p>			Number, Bank Account Number, Name of Supplier, Job Completed				

4) E-health

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Ministry of health(MOH) Uganda AIDS Commission(UAC) Uganda Heart Institute(UHI) National Drug Authority Ministry of Local Government	Update Of the National Health Database	UAC and MOH will upload information on HIV statistics. The format and periodic updates will be agreed upon beforehand. UHI will post statistics and information regarding heart disease. MOLG will also post updates on the status of health related issues from the different regions. MOH will use this information to update the Health database; some of which will be shared with the citizens.	Ministry of Health	G2G	Updated Records	Patient Names, Location, Disease, Diagnosis, Responses to Diagnosis, Time Spent on Medication	Health	Yes	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Uganda Heart Institute (UHI), Uganda AIDS Commission (UAC) and Ministry of Local Government.</p>							
	Update On Vulnerable Children	<p>Ministry of Gender will receive information from UAC vulnerable and HIV positive children. this information will be used in OVCNIS for planning purposes</p>	Ministry Of Gender Labour and Social Development	G2G	Children Names, and DOB	Names, Location, Age, parents, HIV status	Health	Yes	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Uganda AIDS Commission(UAC)</p>							
	e-child	<p>Citizens will be able to access child health information for instance nutrition; immunization .Users will be able to locate the nearest places where they can access child health services.</p> <p>This is a private service and will require authentication before being accessed.</p>	All citizens	G2C	Names, Locations	Treatment Centres, Ongoing Project, Health Advice	Health	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is provided by Ministry of health(MOH)							
	e-mum	<p>Citizens will be able to access maternal health information. This includes recommended practices for the different stages of pregnancy, safety and post-partum care. It will help the expectant mothers locate maternal health services.</p> <p>This is a private service and will require authentication before being accessed.</p>	All citizens	G2C	Mobile Number , Topic	Information	Health	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is provided by Ministry of health(MOH)							
	E- health Locator	<p>Users will be able to access a list of pharmacies/ health centres and choose one(s) convenient for them.</p> <p>This service is provided by Ministry of health and National Drug Authority.</p>	All citizens	G2C	Pharmacy Locations / Reg Numbers	Pharmacy location, License Number, Directors	Health	Yes	No
	e-counsellor	Citizens will be able to access HIV information which includes prevention and care it will provide a locator for access to HIV services.	All citizens	G2C	Mobile Number , date of Conceiving	Reminders	Health	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>This is a private service and will require authentication before being accessed.</p> <p>This service is provided by Ministry of health(MOH)</p>							

5) E-education

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda National Examinations Board(UNEB), Ministry of Education National Council for Higher Education Universities	e-results	Students are able to view their UNEB results on mobile. User texts index number to USSD code provided and a message containing the results is sent back This is a private service and will require authentication (student ID) before being provided. This service is provided by Uganda National Examinations Board(UNEB)	All citizens	G2C	Examination Centre, Name, Index Number	Name, Age, Examination Centre, Location, Year of Sitting	Academic	Yes	Yes
	e- Candidate Registration	Schools register their candidates online for UNEB exams. This applies to urban schools. Rural schools. Rural schools save their candidates details on portable	Businesses- Schools	G2B	Registration Form	Name, Institution, Level of Education	Public	Yes	Yes

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>drives and upload them at the nearest location with internet access without having to come all the way to UNEB offices. Students can check their registration status by entering their index numbers.</p> <p>This is a private service and will require authentication before being accessed.</p>				<p>on to be offered,</p> <p>Proprietor,</p> <p>Location,</p> <p>Registration Number</p>			
	registration of sports associations	<p>The National Council for Sports will be able to register sports associations online with the Ministry of Education and Sports. MOE will be able to have statistics on the number of sports associations and monitor their activities.</p> <p>This is a private service and will</p>	Sports Associations	G2G	Sports Association Names	<p>Names, Registration number, Date of Registration, Financial statemente</p>	Public	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Existing
		require authentication before being accessed. This service is provided by Ministry of Education and Sports.				nts			
	Registration for student loan scheme	Citizens will be able to apply for the government student loan scheme This is a private service and will require authentication before being accessed. This service is provided by Ministry of Education	All citizens	G2C	University acceptance letter, Application form, Payment details	Status of application (accepted, rejected, processing ongoing)	Academic	No	No
	E-learning	Students will be able to access the learning portal and get access to approved curriculum notes and other learning material.	All citizens	G2C,B2C	Topic of study	Specific subject course material	Education	Yes	Yes(Under MTN)

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>The service will be provided by both government and businesses. It currently exists through a learning portal for MTN.</p>							

6) E-Agriculture

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
<p>National Agricultural Research Organisation(NARO)</p> <p>National Agricultural Advisory Services (NAADS)</p> <p>Ministry of Agriculture</p> <p>Uganda National Metrology Authority</p>	<p>Agricultural Research Information</p>	<p>NARO will be able to post Agricultural research results on the Agricultural portal. This information will be available to government, businesses and citizens for a small fee.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is to be provided by National Agricultural Research Organisation</p>	<p>Ministry of Agriculture, National Agricultural Advisory Services, Uganda Industrial Research Institute</p>	G2G	Crop Name,	<p>Crop Name, Yields, Experts, Origin,</p>	Agricultural	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
	Web access to Agricultural Information	<p>Citizens will be able to access agricultural information which includes the different food prices, markets, seasons, weather, common pests, prevention methods. It will also help farmers locate extension workers to provide extension services (irrigation) within their areas.</p> <p>This is a public service and will not require authentication before being provided</p>	Citizens	G2C	Names, Locations	Weather Forecast, News, Buyers, Sellers	Agricultural	No	No
	Agricultural Information and	NAADS will be able to post Agricultural research results on	Ministry of Agriculture, Ministry Of	G2G	Crop Name, Export	Crop Name, Yields,	Agricultural	No	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
	Statistics	<p>the Agricultural portal. These will be available to government , businesses and citizens for free</p> <p>This is a public service and will not require authentication before being provided.</p> <p>This service is to be provided by National Agricultural Advisory Services (NAADS) Ministry of Agriculture and Uganda National Metrology Authority</p>	Trade, Ministry Of Foreign Affairs		location , Dates of Export	Exports, Export location, Dates of Export, Amount Paid			

7) E- justice

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda Police Directorate of Public Prosecution (DPP) Judiciary Uganda Human Rights Commission (UHRC)	e- case	<p>Citizens are able to report crimes to the police through the portal. They can also check the status of their reported cases.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is to be provided by Uganda Police.</p>	All citizens	G2C	Names, Locations, Contact Details, Case Number	Status of case(ongoing, in court, solved ,closed),Name of officer in charge ,	JLOS	Yes	No
	e-complaint	The Citizens will be able to report complaints of human rights abuse through the portal. This information will be relayed back to the UHRC information system where the complaint can be followed up	All citizens	G2C	MDA reports	Progress Report	JLOS	Yes	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>by UHRC.</p> <p>This is a private service and will require authentication before being accessed.</p> <p>This service is to be provided by Human Rights Commission.</p>							
	e-compliance	<p>MDA's have access the Database and search engine system to update information about human rights issues.</p> <p>UHRC monitors progress on the promotion of human rights according to international standards.</p> <p>This is a private service and will require authentication before being accessed.</p>		G2G	Government Agencies	G2G	MDA reports	Progress Report	JLOS

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is to be provided by Human Rights Commission							
	passed judgements register	<p>The Citizens are able to find and read the rulings issued in court by judges by inputting the case number into the portal. This will apply to rulings that have not been sealed by the court. .</p> <p>This is a public service and will not require authentication before being provided.</p> <p>This service is provided by Judiciary Uganda</p>	All citizens	G2C	Case Name	Defendant Names, Respondent Names, Case Type, Trial Date, Lawyers, Judges	JLOS	Yes	Yes
	schedule for court case details	The Judiciary provides the upcoming court schedules to citizens, by visiting their website. By entering the case	All citizens	G2C	Case Name	The Ruling passed by the Judge	JLOS	Yes	Yes

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>name, citizens can get details of when cases will be heard, court location and judges appointed to preside over the cases.</p> <p>This is a public service and will not require authentication before being provided.</p> <p>This service is provided by Judiciary Uganda</p>							

8) E - Pension

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
<p>National Social Security Fund (NSSF)</p> <p>Ministry of Public Service(MoPS)</p> <p>Ministry of Internal Affairs</p> <p>Administrator General (AG)</p> <p>Uganda Registration Services Bureau(URSB)</p>	E- statement	<p>Citizens contributing to NSSF are able to view their pension statements.</p> <p>Members eligible to access their pension will need to access the NSSF through the portal and apply for their benefits.</p> <p>NSSF will also be provided with information from URSB to ensure that all the eligible registered companies in Uganda have fulfilled their statutory requirements.</p> <p>This is a private service and will require authentication before</p>	All citizens- Private sector	G2C	NSSF Number	Financial Statement	Public	Yes	Yes

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		<p>being accessed.</p> <p>This service is to be provided by NSSF and URSB</p>							
	E- Government Pensions	<p>Government employees will be able to apply to MoPS for their pension. MoPS will be able to verify age details from the National ID data base e.g. Date of Birth details. If the individual has passed on, MoPs will get information from Administrator General on the next of kin who will receive the pension.</p> <p>This is a private service and will require authentication before being accessed.</p>	All citizens- Public sector	G2C		Financial Statement	Public	Yes	No

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is to be provided by MoPS and AG.							

9) E-Employ

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Ministry of Public Service Ministry of Gender Labour and Social Development	E- payroll	<p>All MDA's whose salaries are paid through the public service will need access to the IPPS in order to add, transfer or remove employees.</p> <p>The Ministry of Public Service through IPPS will need access to the national ID register in order to verify the validity of the government employees and update it to remove all deceased. This will help reduce instances of ghost workers</p> <p>This is a private service and will require authentication before being accessed.</p>	All MDAs	G2G	IPPS No, names, DOB, title, institution, vote code, salary scale	Employee record	Public	Yes	No

	E- job	<p>Citizens will be able to apply for public service jobs online. Applicants will upload application forms and academic qualifications to IPPS. On submission, each applicant will be given a unique number which can be used to track the status of the application.</p> <p>This is a private service and will require authentication before being accessed.</p>	Citizens	G2C	Names, DOB, Academic qualifications	Job application	Public	No	No
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10) E- record

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Law Development Centre Office of the Prime Minister National Planning Authority Parliament National Information Technology Authority Uganda Communications Commission	Online access to government documents	This service is designed make information from different government institutions available the public. These will include but not limited to standards, laws, bills, policies, guidelines and research. The service will also have performance and evaluation reports from different government projects provided by the Office of the Prime Minister.	MDAs, Businesses, Citizens	G2C	name of document, reference number if any, keyword	List of available publications that fit search criteria	Public	No	No

Office of the prime Minister		<p>The service can also be extended to the private sector who can post documents for public viewing for a fee.</p> <p>This is a private service and will require authentication before being accessed.</p>							
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11) E- GIS

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
<p>Kampala Capital City Authority</p> <p>National Planning Authority</p> <p>Uganda national Roads Authority</p> <p>Ministry of Lands and Urban planning</p> <p>Ministry of energy and mineral development</p>	<p>Online access to geographic maps</p>	<p>The service will be a consolidation of maps (existing or planned) from the different MDAs. All MDA's ,businesses and citizens will be provided with access to the National Planning Authority, KCCA and UNRA GIS specific maps to access maps specific to their mandate which are critical to their operations</p> <p>This is both private and public. Some maps will be free to the general public and others will viewed for a fee.</p>	<p>MDAs, Businesses, Citizens</p>	<p>G2B, G2C, G2G</p>	<p>type of map, location, coordinate s, property name</p>	<p>maps (view)</p>	<p>Public</p>	<p>Yes</p>	<p>No</p>

12) E-citizen

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
National Water and Sewage Corporation(NWSC)	e- utility statements and E-citizen profile	Using this e-service, the citizen is able to view their entire online profile. A citizen is able to view information about their identity, request modifications, pay utilities and taxes for all their properties, view asset information e.g.	Citizens	G2C	ID number, TIN, Utility reference number, asset ID/reference	ID details, utility account details, pending bills and taxes	Public	Yes	Yes
Umeme									
Ministry of Land									
Ministry of Internal Affairs		This is a private service and will require authentication before being accessed.							
Police									

13) E - Standards

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda National Bureau of Statistics (UNBS)	Online access and verification of goods, agricultural produce and drugs	Businesses will need to access standards for drugs through NDA or goods through UNBS that they export, import or manufacture to ensure that they are compliant.	Businesses, Citizens	G2B, G2C	Product name, standard reference/name	Confirmation of certification, Details of certified product, standard document	Public, Health, agricultural	Yes	No
National Drug Authority (NDA)		The service will also be available to citizens to confirm the certification of products before purchase. . This applies to manufacturers of consumables, seeds, fertilizers, and drugs.							
Uganda Communication Commission (UCC)		The business component of the service is private and will require authentication before being provided.							
National Information		The citizen portal will not require authentication							

Technology Authority(N ITA-U)		This service is to be provided by NDA and UNBS.							
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14) E- procurement

Service Provider	Specific e-services	Description	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Public Procurement and Disposal of Public Assets Authority (PPDA) Uganda Registration Services Bureau (URSB)	e- tender	The service will facilitate the publishing of government tenders and provide a channel for business/individuals to submit responses to the tenders. For a fee, the private sector can utilize this service to publish their tenders as well. It will also enable government establish the validity of respondents by checking their registration status with the Uganda registration services Bureau This is a private service and will require	MDAs, Businesses	G2B, G2G	Institution name, tender reference	tender bid, status,	Public	Yes	No

		authentication before being accessed. This service is to be provided by PPDA and URSB.							
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15) E- Tax

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
Uganda Revenue Authority	Registration for TIN , Payment of Taxes	<p>Citizens will be able to register for TIN (e-registration) .They will not require to physically go to URA as the National Identification number will be used to validate them. The citizens are able to register for taxes online and effect payment through the e-payments module on the portal (online or mobile).</p> <p>This is a private service and will require authentication before being accessed</p>	Citizens, Businesses	G2B, G2G	ID no., Name, DOB, Company reg no.	TIN, payment receipt	Public	Yes	Yes (However verification using NIN is required)

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is to be provided by URA							
	Confirmation of Tax Compliance	<p>URA will be able to access URSB to confirm that all registered companies have fulfilled their tax requirements.</p> <p>Entering the registration number and/or company name will return details of whether a company is compliant or not.</p> <p>This is a private service and will require authentication before being accessed.</p>	URA	G2G,G2B,G2C	Company name	Registration status	Public	Yes	No

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		This service is to be provided by URA							
	Motor Vehicle Transfer and registration	<p>Businesses and citizens access the portal using a Tax Identification Number, NIN and Password in order to transfer ownership of Motor Vehicles The Motor Vehicles will be transferred after acknowledgement from the previous owner and payment of the related taxes.</p> <p>The portal can be used to register new vehicles.</p> <p>This is a private service and will require authentication before</p>	Citizens, Businesses	G2B, G2G	Tax Identification Number (TIN)	Motor Vehicle Transfer Forms/ Payment Status/ Tax Payment Forms/	Public	Yes	Yes (However verification using NIN is required)

Service Provider	Specific e-services	Descriptions	Consumers	Consumer group classes	Input	Output	Sector	System Existing	Service Exiting
		being accessed. This service is to be provided by URA							

4.4 Prioritisation of the specific e-services

The table shows the prioritization of the e-services within each aggregated service. The criteria used to prioritize are;

- ▶ Number of beneficiaries
- ▶ Back-office readiness
- ▶ Legal framework
- ▶ Leadership political will and level of ownership at MDAs
- ▶ Sustainability
- ▶ Dependencies

No	Name of Service
e-verification	
1	e-client verification
2	e-land
3	verify death and birth
4	verify asset transfer
5	Credit reference verification
6	E-license verification
7	e- doctor verification
8	verify court bailiffs
9	verify law advocates
e-registration	
1	Registration of birth and death
2	Passport Application
3	Driving License application
4	NSSF registration
5	University registration
6	e- doctor registration
7	Register for PPDA

8	Registration for investment licenses
9	ecitie registration
10	URA TIN registration
11	Registration of companies
12	Sim card registration
e-payment	
1	Online payment of Government services
2	Online payment for other e-services
3	Payment request for civil servants
4	Online payment of service providers
e-health	
1	Update of the national health database
2	Update on vulnerable children
3	e-mum
4	e-child
5	e-health locator
6	e-counsellor
e-education	
1	e-results
2	e-candidate registration
3	Registration for student loan scheme
4	Registration of sports associations
e-agriculture	
1	Agricultural research information
2	Web access to agricultural information
3	Agriculture information and statistics
e-justice	
1	e-case
2	Schedule for court case details

3	e-complaint
4	e-compliance
5	Passed judgements
e-pensions	
1	e-Government pensions
2	e-statement
e-employ	
1	e-payroll
2	e-job
e-records	
1	Online access to Government documents
e-GIS	
1	Online access to geographic maps
e-citizen	
1	e- utility statements and E-citizen profile
e-standards	
1	Online access and verification of goods, agricultural produce and drugs
e-procurement	
1	e-tender
e-tax	
1	Registration for TIN and payment of taxes
2	Confirmation of tax compliance
3	Motor vehicle transfer and registration

4.5 Frequently requested for information

Based on our current state assessment and the priority e-services in sections 4.3 and 4.4, the frequently requested for information is as listed below;

By citizens;

1. **Citizen information**
 - ▶ Citizen Full Name
 - ▶ Citizen Photo as displayed on the National ID
 - ▶ Citizen Date Of Birth and birth certificate
 - ▶ Passport number
 - ▶ Biometric details: Finger prints
2. **Tax information**
 - ▶ TIN number and payment status
3. **Land information**
 - ▶ Land Location
 - ▶ Title Number
 - ▶ Land Owner
 - ▶ Previous Owner
 - ▶ Date Of Transfer
 - ▶ Status
 - ▶ Size Of the Land
4. **Available jobs**
5. **Available tenders**
6. **Utility account details**
7. **Payment information for Government services and other e-services**

By Government bodies;

1. Citizen information
2. Update Of the National Health Database
 - ▶ Patient Names, Location, Disease, Diagnosis, Responses to Diagnosis, Time Spent on Medication, cost of medication
3. Payment Request for Civil Servants
 - ▶ Vote Names
 - ▶ Employee Number
 - ▶ Bank Account Numbers
4. Online payment of service providers
 - ▶ Vote Names
 - ▶ Employee Number,
 - ▶ Bank Account Number,
 - ▶ Name of Supplier
 - ▶ Job Completed: completion certificates
 - ▶ Payment Amount

By businesses;

1. Citizen information for verification and registration
2. Credit verification information
 - ▶ Loan information: Amount and status
 - ▶ Lending institution

4.6 Minimum data sets for integration

Based on the study, EY developed minimum data sets that will be required for integration. These should be considered as part of the Open data project .See the datasets below;

ITEM	MINIMUM DATASET	DATA ELEMENTS	E-SERVICES THAT USE DATA SETS
1.	National Identification Number	Unique ID No., date of issue, date of expiration, place of issue, card no.	All e-services
2.	Full Name	First name, last name, middle name	e-verification, e-registration, e-citizen, e-payment, e-education, e-tax, e-procurement, e-pension, e-justice, e-employ
3.	Birth History	Date of birth, place of birth	e-verification, e-registration, e-citizen, e-education, e-pension, e-justice, e-employ
4.	Citizenship ,Country of residence and language	Date of Birth, Sex at Birth, Place of Birth (country, town)	e-verification, e-registration, e-citizen, e-education, e-employ
5.	Address	Physical address (country, district, county, parish, street)	e-verification, e-registration, e-citizen, e-education, e-justice, e-employ, e-GIS
6.	Contact Information	Telephone number, email address	e-verification, e-registration, e-citizen, e-payment, e-education, e-tax, e-procurement, e-pension, e-justice, e-employ
7.	Employment status	Occupation, employment status, employment title	e-registration, e-verification, e-pension, e-employ
8.	Employment Address	Physical address (country, district, city, street) Post office number	e-registration, e-verification, e-pension, e-employ

9.	TIN	Unique tax number, date of issue	e-tax, e-payment, e-verification, e-registration
10.	Company Registration Number	Unique registration number, date of registration, place of registration	e-verification, e-registration, e-payment, e-education, e-health, e-pension, e-tax, procurement, e-justice, e-standards, e-agriculture
11.	Company Name	Full name, aliases	e-verification, e-registration, e-payment, e-education, e-health, e-pension, e-tax, e-procurement, e-justice, e-standards, e-agriculture
12.	Company Address	Physical address (country, district, city, street), post office address	e-verification, e-registration, e-payment, e-education, e-health, e-pension, e-tax, e-procurement, e-justice, e-standards, e-GIS
13.	Vote Code	Unique institution code	e-payment, e-verification, e-registration, e-tax, e-procurement, e-record, e-pension, e-employ
14.	Vote Name	Full name of institution	e-payment, e-verification, e-registration, e-tax, e-procurement, e-record, e-pension, e-employ
15.	Land Title	Unique land ID, first and last name of owner	e-verification, e-registration, e-citizen, e-payment, e-justice
16.	Land Title Address	Location, plot, block number	e-verification, e-registration, e-citizen, e-payment, e-justice, e-GIS
17.	Motor Vehicle	Chassis no., vehicle type, make and year of make	e-tax, e-justice
18.	Seed	Seed variety (unique ID, name, origin),	e-agriculture, e-standards
19.	Fertilizer	Fertilizer (name and manufacturer),	
20.	Case	Case unique no., date of reporting, description, status	e-justice, e-payment, e-citizen

21.	Payment receipt	Receipt no, service requested, amount, date of payment	e-verification, e-registration, e-citizen, e-justice, e-tax, e-standards, e-records, e-education, e-procurement
22.	Education	Institution name, degree, date of completion, type of institution,	e-education, e-employ, e-registration, e-citizen, e-payment

Table 8: Minimum integration data sets

NB: Each data set contains several data elements. The standardization of data elements is accomplished using relevant metadata provided in the appendix section 6.9 of the report.

4.7 Data model for Top priority e-Services

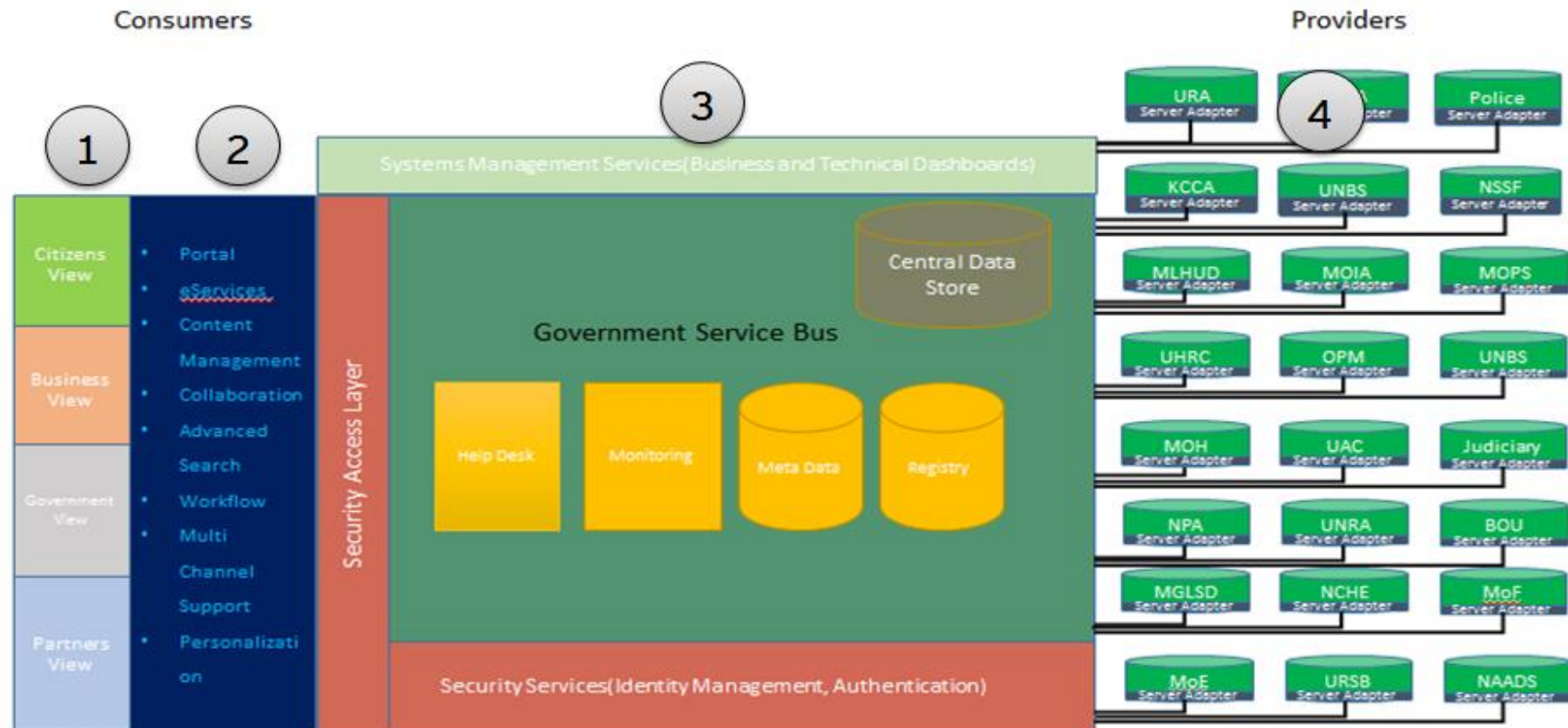


Figure 19: Model of the Top priority e-services

Key:

- 1 This is the integration interface that is accessed by the citizens, businesses, government and other various government partners.
- 2 This represents the portal that helps present the different services by aggregation of the different services.
- 3 This represents the government service bus that helps open up the different databases to the portal, and other government agencies. It contains a data store to store frequently accessed data reducing the load on the MDA databases.
- 4 This represents the national databases that will be connected to the integration solution in order to deliver the particular e-services

The detailed functionality of these components and requirements are in sections 4.9 to 4.11 of the report.

4.8 Quick Win e-Services

The Quick Win E-services are those E-services which will be implemented as soon as possible (12 month period). These 3 e-services will be the first to be implemented as part of the integration layer.

3 quick wins were selected as per terms of reference based on the on the following criteria;

1. The e-service is part of the top priority services
2. Provider of the given service has a system in place to provide e-service.
3. Fall within the priorities sectors
4. Whether the e-service can be implemented within 12 months.
5. The e-service should have high demand has the high impact on citizens
6. They should not be an existing service

Based on the above criteria, the top priority e-services were scored and the top 3 quick wins were identified. These are;

▶ **E-registration**

This service will support citizen registration for various Government services. The service will reduce on the time taken by citizens to make physical lines while registering for Government services. This will also reduce on the costs of transport for the citizen.

▶ **E-verification**

This service will support verification of identity of people to businesses and Government bodies. This enables quick service delivery since currently, validating identity and authenticity of documentation before providing services takes long. Most of the systems that support this service are already in place and therefore can be implemented in 12 months.

▶ **E- citizen**

Using this e-service, the citizen is able to view their entire online profile from a single place. A citizen is able to view information about their identity, request modifications, pay utilities and taxes, view asset information e.g. land owned and also view their crime records. The systems that support this service are already in place and the service is easy to implement as a quick win in 12 months period.

See section 6.4 of this report for the evaluation results of all the Top priority e-services.

4.8.1 Benefits/Impact of the Quick Wins

No	Name of E-service	Impact/Benefit
1	e-citizen	<ul style="list-style-type: none"> ▶ The citizen will be able to pick up details about themselves from the different organizations at a single click, for example NSSF balance, Credit Reference Bureau. ▶ The citizen will be able to access and pay different utility bills attached or registered against them by logging onto the e-citizen portal. ▶ The citizen will be able to view the different utility bills registered against them. ▶ Citizens will be able to request for update on particular information for example change of address or names which can be followed up with the physical legal documentation. ▶ Citizens will be able to access the other services on the portal such as passport application and driving permit application. ▶ The citizen will be able to view the validity of documentation such as the passport and driving permit. ▶ The citizen will be able to apply for a birth certificate for the registration services with ease. ▶ The citizen will be able to see notices issued by the citizens by the Government of Uganda.

2	e - registration	<ul style="list-style-type: none"> ▶ It will enable all citizens save time by doing the registration for different services online other than lining up to register for these services. ▶ There will be reduction in cost of operation as there will be less manpower needed possibly to only manage technology systems that provide the service. ▶ E-registration will increase on the efficiency of the registration process this will encourage citizens to register and access services offered by the different MDAs ▶ E registration will ensure that registration services for all stakeholder organisations be open and readily available 24/7. This means that registration transactions will no longer be limited to working hours. ▶ There will be improvement in accuracy during the registration process since there will be a link between the different systems. For example the National Identification will be used to make sure the names in the registration process are valid. ▶ E registration will promote security and integrity of the data captured during registration processes. Registration websites will have security features such as digital certificates, encryption that will ensure data transmission is carried out without interference from non-intended recipients with malicious intentions. ▶ E registration will make the registration process for the given stakeholder agencies considered convenient by the intended audience. This is because registration will be a click away using your mobile device from wherever you are at any given time of the day.
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3	E verification	<ul style="list-style-type: none"> ▶ E-Verification will enable citizen to access services offered to only Ugandan without need to physically get documentation from many MDAs. ▶ This will improve the process of asset transfer from one person to another. This is because authenticity will be easily established to support progress of a given transaction. ▶ E verification will help in curbing down on the rate of fraud and impersonation as details can be readily verified to confirm identity. ▶ This will also ease the process of registration of births and deaths, critical to national planning and resource allocation. ▶ It will enable financial institutions to quickly verify ownership of assets presented as collateral security to attain financial loans like land. This will reduce on the risks exposed to the financial institutions and also reduce on the process duration on the client side. ▶ E verification will help improve on the immigration process. Travel documents will be easily verified against information contained in the system to avoid use of fake document. ▶ It will also be used as a measure to improve on national security by easily identifying wrong elements carrying fake documents or having inconsistent records.
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4.8.2 How quick wins will leverage or benefit from integration.

The businesses, citizens and government institutions shall leverage on the integration solution's ability to use frequently requested information to speed up the delivery of e-services and hence improve efficiency.

Each of the aggregate e-services are composed of specific e-services to ensure the user has a one stop shop for services and there is no duplication of data provided for e-services provision. These services will also be provided much faster since all frequently requested for information by the citizens will be stored at the central store for quick access. This is as a result of integration.

Specifically, the quick wins will benefit from integration in the following ways;

1) E-Citizen

Unique identifier: National ID Number for each citizen.

Upon registration of a user to use the e-services portal, a profile is created for them that they access using a confidential username and password. Each profile only has information that the citizen is authorised to view and services each citizen is authorised to use.

On logon of a user to the portal, they will select the tab of e-citizen. This will evoke a query that will pick information from different databases and display them on the web page i.e. utilities, land owned, taxes paid or due, pending court cases or police cases and records, medical history etc.

Since Citizen Information was identified as information that is frequently requested for, most of this information will be stored at the central store for quick access and elimination of duplication of provision of information.

This will be possible since the NIN will be the unique identifier for all citizens.

2) E- Registration

Currently registration is done with a single MDA and each MDA has a different form with different identifiers. E- Registration is a centralised service. Once a user logs on, they are able to register for services without having to input information that has already ever been provided for the National ID. The MDA they are applying to can validate their identity with e-client verification. Citizens only have to input is specific information that might not have been captured.

For instances like passport application that require the exact same information, a citizen would only request for the passport and make necessary payments. MOIA would validate the identity and then provide the passport.

E-verification

This service will eliminate physical verification before a service is provided. Currently one has to verify identity with many different bodies before a service is provided. This will be eliminated as a result of the integration.

NB: Citizen unique identifier is national ID. Business unique Identifier is the registration number.

In addition, the provision and consumption of the e-services shall be streamlined by eliminating redundant processes and controls. Consequently the use of this e-service shall assist to reduce on the long queues at the MDAs.

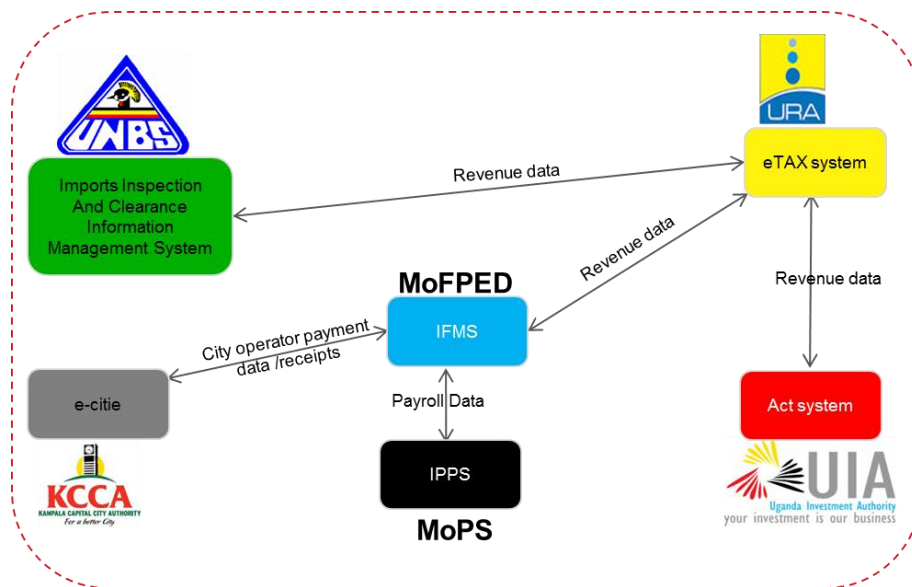


Figure 20: Current state of integration

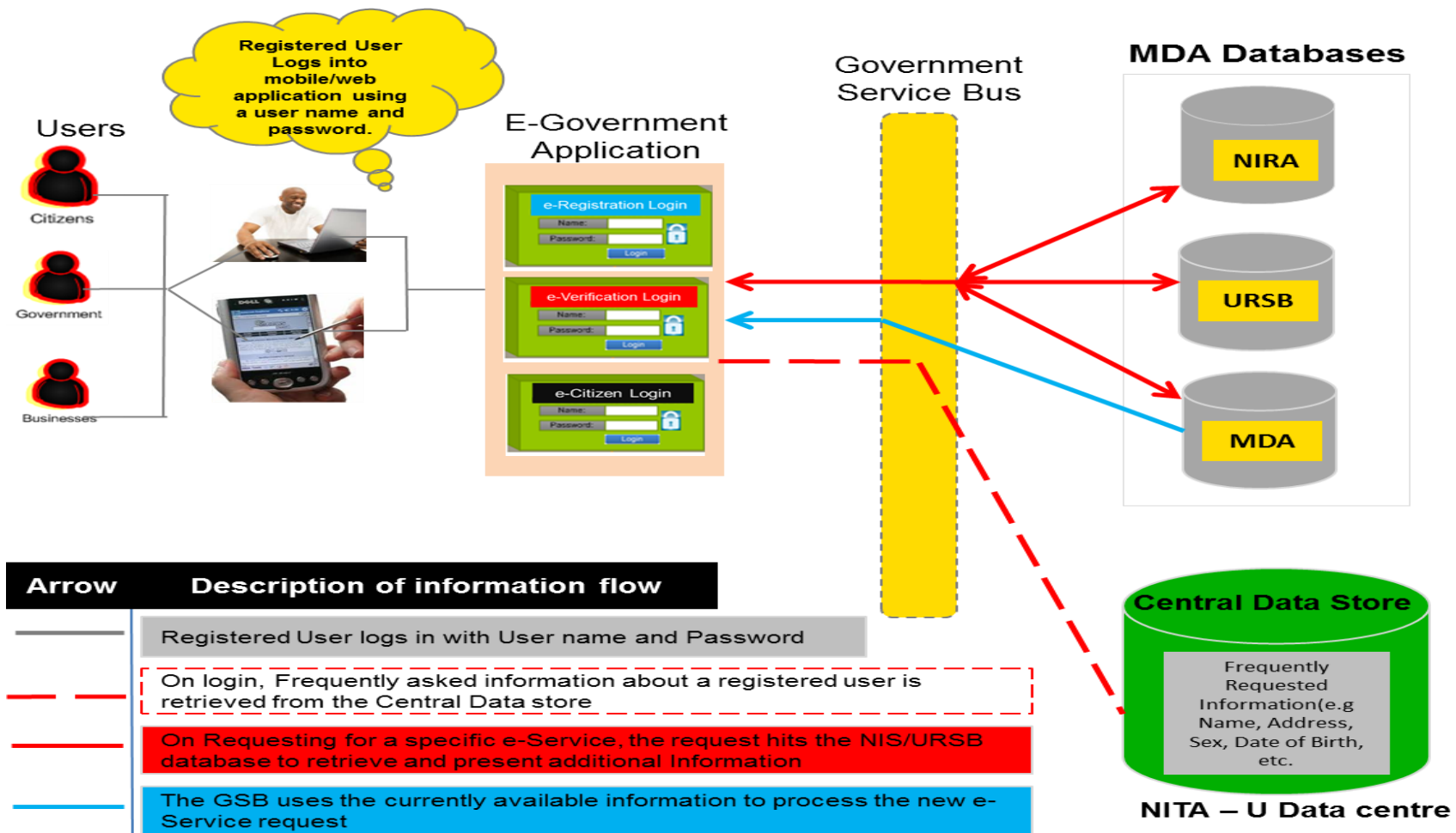


Figure 21: Proposed integration

4.8.3 Readiness assessment Template for Quick Win e-Services

The checklist below can be used a brief guide to ascertain the readiness of an MDA to provide e-services;

	Readiness assessment Criteria	Responsibility for Reporting
	Back-Office	
1.	Does MDA have a Source system for providing the e-Services?	MDA Business Data Owner/IT
2.	Does the Source system/National Database have an API? Please specify.	MDA Business Data Owner/IT
3.	Are the security configurations configured in the Source system/National database adequately compliant with National Standards?	MDA Business Data Owner/IT
	Legal and Regulatory	
4.	Does MDA have policies, guidelines and procedures related data classification and information sharing that are compliant with compliant the relevant national laws and regulations?	GSB and MDA Business Data Owner
5.	Is the need to share and obtain information compliant with the relevant MDA's Mandate and policies?	GSB and MDA Business Data Owner
6.	Does MDA have a procedure for measuring compliance to such laws or regulations, if any?	GSB and MDA Business Data Owner
7.	Is enforcement of respective legal and regulatory requirements embedded in configuration of MDA systems/National Database?	GSB and MDA Business Data Owner
	Business Continuity Planning	
8.	Does MDA have a disaster recovery plan incorporating the possibility of: ▶ running business the critical systems on alternate machines; and ▶ running business critical systems on alternative sites.	Business and Data Recover Lead
9.	Has the disaster recovery plan been tested using the production environment?	Business and Data Recover Lead
10.	Has a Business Continuity Plan been developed such that operations and reporting will not be compromised by the non-availability of systems or communications that's support the e-service(s)?	Business and Data Recover Lead
11.	Have users and data owners been consulted regarding requirements for backup and recovery and Business Continuity Planning?	Business and Data Recover Lead
	Governance	
12.	MDA has a clear policies and procedure governing the use of the National Database/source systems?	MDA Business Data Owner/IT
13.	MDA's Policies and procedures are adequately aligned to the National standards and Policies?	MDA Business Data Owner/IT
14.	Does MDA have a clear process for enforcing and monitoring compliance to the MDA Information sharing or ICT policy?	MDA Business Data Owner/IT
15.	MDA has clear responsibilities assigned to specific individuals in regard to management of the National Database or Source system?	MDA Business Data Owner/IT
16.	Has the MDA confirmed compliance with the NITA-U Security Policies regarding access to Systems (including the GSB) housed at the Data centre?	MDA Business Data Owner/IT
17.	Have all Service Level Agreements/Contract requirements and involved parties been identified and signed?	GSB Team and MDA Business Data

		Owner/IT
	Operations, Maintenance and Monitoring	
18.	Have adequate staff been identified and trained to operate the Help Desk with a defined process to determine staff levels/skills?	GSB Team and MDA Business Data Owner
19.	Is there a defined fault/issue logging procedure for the capture of post-go live problems and has this been communicated to all users?	GSB Team
20.	Does a tested and fit-for-purpose technical infrastructure exist to support the logging of faults and facilitate; <ul style="list-style-type: none"> ▸ monitoring of service levels; ▸ capturing call priorities; ▸ tracking of recurring problems; and ▸ resolution sharing with the user and knowledge sharing amongst the Support Team. 	GSB Team
21.	Is there an escalation procedure in place to take action regarding recurring problems, for example, further user training, program changes etc.	GSB Team
22.	In the event of problems with the core system, is there a communication process to inform users?	GSB Team
23.	Has training been held for employees on Learning & Development self-service systems?	MDA Business Data Owner/IT
24.	IT Setup & Infrastructure	
25.	MDA has setup of local and global technical components (e.g. Firewall, Router, Switch, SFTP) been checked to be able to connect to GSB/Integration layer?	MDA Business Data Owner/IT
26.	Have the Technical Components been set up and configured in compliance with National Standards?	GSB Team
27.	Does the MDA Firewall maximum through-put rate exceed the expected maximum number of transactions per minute?	MDA Business Data Owner/IT
28.	Is the MDA connected to the NBI/EGI either directly or indirectly, if yes- it connected using router or Switch?	GSB Team
29.	Has the GSB office been set up with sufficient network capacity to support the systems and users being employed in the GSB?	GSB Team
30.	Has a telephony system been set up that can support the volume of calls and number of users required by the GSB, including systems for call handling and routing?	GSB Team
31.	Have PCs been procured for all GSB employees?	MDA Business Data Owner/IT
32.	Have LAN and WAN requirements been considered and a policy put in place?	MDA Business Data Owner/IT
33.	Does proposed capacity and speed of LAN/WAN enable users to carry out tasks on the network with sufficient speed and in sufficient numbers to enable the GSB to meet its service level requirements?	GSB Team and MDA Business Data Owner/IT
34.	Has connectivity to LAN or WAN been set up to enable users to access appropriate networks?	MDA Business Data Owner/IT
35.	People	
36.	Has MDA provided staff that will support provision of e-services to the integration solution?	MDA Business Data Owner
37.	Has MDA provided staff that shall provide Integration Technical assistance at the site?	MDA Business Data Owner
38.	Have current job positions been mapped to future roles in the organization design?	MDA Business Data Owner
39.	Have help desk and other technical support staff been identified for training (internal or external) to ensure	MDA Business Data Owner

	that their level of expertise is adequate for their area of responsibility?	
40.	Data Preparation	
41.	Have all items of data required in the GSB been identified and categorized e.g. Configuration Data, Master Data, Transactional Data etc.	MDA Business Data Owner
42.	Have data that require cleansing at Circle level been identified and categorised	MDA Business Data Owner
43.	Have roles and responsibilities been defined for data cleansing?	MDA Business Data Owner
44.	Has a data quality and volume assessment been carried out on each data item identified for transfer to the integration layer?	MDA Business Data Owner
45.	Have data elements which are not captured in the Source system (provider systems) been identified?	MDA Business Data Owner
46.	Have steps been taken to populate all new data requirements for integration?	MDA Business Data Owner
47.	Have controls been implemented to mitigate risk of data loss or inappropriate manipulation during data cleansing?	MDA Business Data Owner
48.	Have the timescales for data cleansing completion been agreed, communicated and progress check-points been established?	MDA Business Data Owner
49.	Has the data cleansing approach been signed off by MDA Data Owner compliance team	MDA Business Data Owner
50.	Is there a formal sign-off of the data quality scheduled with identified business data owners?	MDA Business Data Owner
51.	Have data owners post Integration been identified and communicated?	MDA Business Data Owner
52.	Have cleansing schedules been determined for ensuring data quality in the Integration system?	MDA Business Data Owner
53.	Have people who will participate in the cleaning and migration of the data been identified?	MDA Business Data Owner
54.	Are funds to support the data clean-up and migration process available?	MDA Business Data Owner
	Change Management	
55.	Does MDA have a formal procedure on identifying, authorising, testing and approving changes to IT systems used for its business activities?	MDA Business Data Owner/IT
56.	Have procedure for management of changes to the Integration-layer of the GSB been formalised and communicated to the MDA?	MDA Business Data Owner/IT
57.	Has training been held for employees on using the integration layer?	MDA Business Data Owner/IT

4.8.4 Data model for the Quick Win e-Services

Based on the Quick win e-services, the data model is as below;

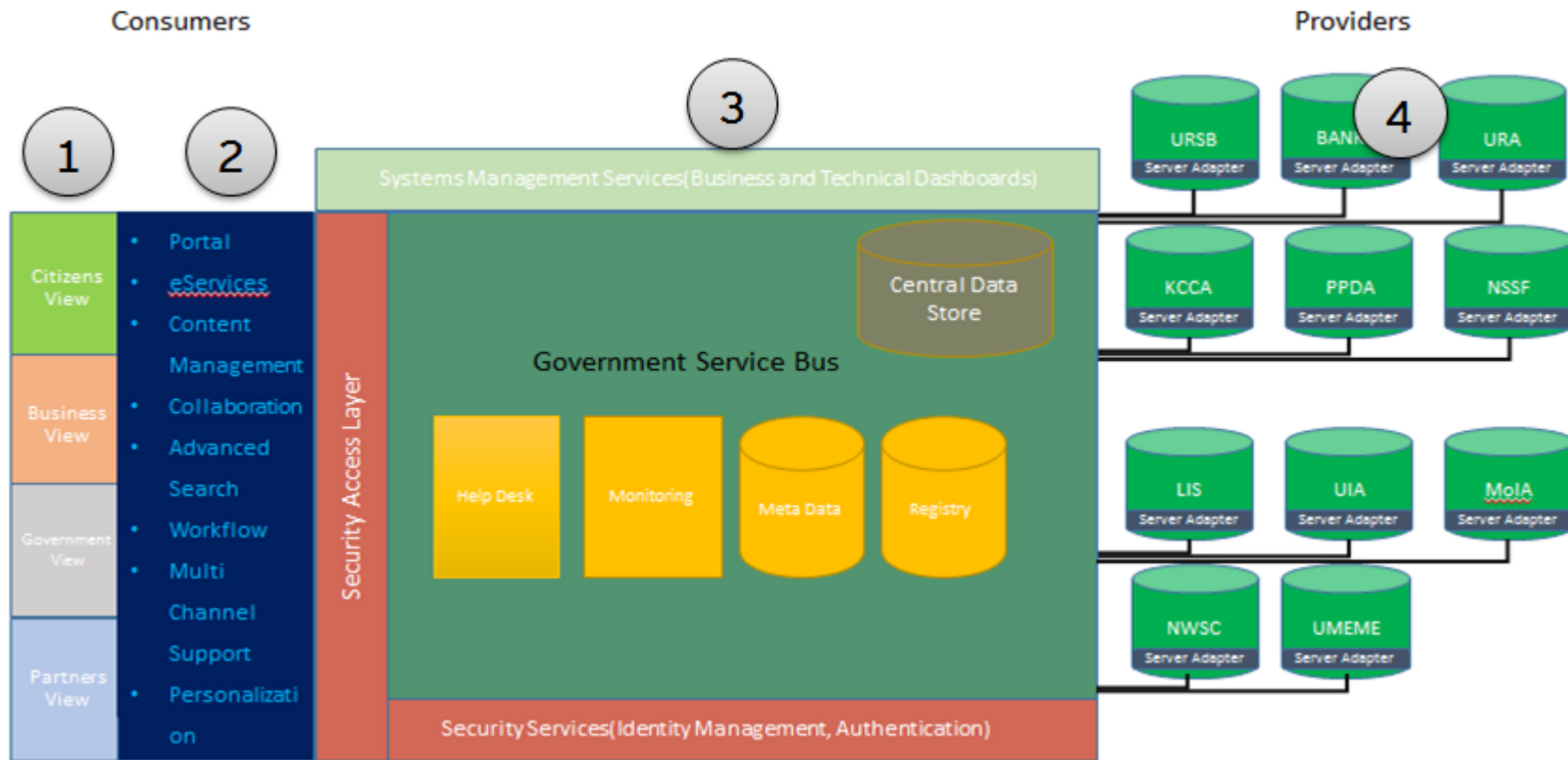


Figure 22: Data model for the Quick Win e-services

Key:

- 1 This is the integration interface that is accessed by the citizens, businesses, government and other various government partners.
- 2 This represents the portal that helps present the different services by aggregation of the different services.
- 3 This represents the government service bus that helps open up the different databases to the portal, and other government agencies. It contains a data store to store frequently accessed data reducing the load on the MDA databases.
- 4 This represents the national databases that will be connected to the integration solution in order to deliver the particular e-services

The detailed functionality of these components and requirements are in sections 4.9 to 4.11 of the report.

4.9 Integration Solution Architecture Design

Based on the current state assessment results (from both primary and secondary data) and the selected top priority e-services, we developed technical designs for the integration solution. We recommend the use of an Enterprise Service Bus to enable this integration. The ESB will be called the Government Service Bus (GSB). The benefits of this solution are;

- ▶ Enables easy and quick data sharing between Government MDAs , Government and citizens as well as Government and Businesses
- ▶ Reduction in duplication of data and efforts
- ▶ Cost reduction. For example the cost of processing of paper documents and maintain labour to do this work and data entry for each new implementation within Government.
- ▶ Improves service delivery of Government. Citizens will receive services online from Government which will also improve their way of life and save their time and effort required to get these services.
- ▶ Time saving for both MDAs and Citizens. Integration will reduce on the amount of time spent getting information physically from the MDAs. This will improve efficiency.
- ▶ Improvement of data quality and data integrity.

4.9.1 Justification for the use of the ESB

- ▶ ESB can enable connecting more than 10 different applications. The Government integration solution should be able to support connection of several applications seamlessly. This means that creating point to point connections are not a feasible option
- ▶ ESB enables the use of more than one type of communication protocol. ESB enables cross protocol messaging and transformation. For example HTTP, SOAP and FTP. Based on the current state assessment this feature will be important for integration since many different protocols are used at the different MDAs.
- ▶ Enables messaging routing capability e.g. forking, aggregating, message flows and content based routing
- ▶ Enables publication of services for consumption by other applications
- ▶ Where services are going to be incorporated from external service providers over which the MDAs have no control e.g. driving license through face technologies the ESB can monitor SLAs that the external provider guarantees

- ▶ Increasing agility by reducing time to market the new initiatives
- ▶ ESBs have multiple reporting capabilities and functionality. This will be a key feature that different MDAs will leverage on.

4.9.2 Phases of Implementation

The project will be implemented in a phased approach by the Government. The phases of implementation will be three. This is because;

1. Phased approach enables buy in from the MDAs. Once they see the benefits from the first phase, they will become more willing to connect.
2. Phased approach enables sensitization to be effective to the citizens. Services are introduced in phases giving citizens a chance to learn about the services and adopt using them.
3. Gives Government a chance to learn from mistakes of the previous phases and address the challenges before the next phase.
4. Enables skills transfer to the local staff that will be supporting the GSB.
5. Cost of implementation of the entire infrastructure at once is too high and yet some of this will not be used initially.
6. Based on secondary research, all countries studied also used a phased approach to implementation i.e. Estonia, Moldova, Republic of South Korea, Singapore and USA

The proposed phases will be as described below;

i. Phase one

Under this phase, the selected 3 quick wins e-services will be implemented. This Phase will take a period of 18 months to be completed.

Expected results from this phase:

- ▶ Contracting of the ESB provider. This includes contract signing, deploying of hardware equipment and having a fully approved project plan.
- ▶ Fully implemented primary site ESB components. This includes all hardware and software components.
- ▶ Fully signed and agreed upon contract between NITA and the 3 service providers.
- ▶ Approved and agreed upon management framework.
- ▶ Fully implemented quick win e-services (e-verification, e- passport and e-land)
- ▶ Sensitized citizens, businesses and other Government MDAs

- ▶ Completion of E-leadership capacity training

ii. Phase Two

As part of this phase, the top priority services (the remaining 12) will be implemented, the Disaster recovery site will be developed and all components of the ESB will be implemented. This phase is expected to last for a period of 36 months.

Expected results from this phase:

- ▶ Fully implemented top priority e-services.
- ▶ Implementation of the DR site for the ESB infrastructure
- ▶ Sensitized citizens, businesses and other Government MDAs
- ▶ Fully signed and agreed upon contract between NITA and the 12 service providers.

iii. Phase three

This phase will be 6 months. This is a detailed post implementation review phase. Expected results from this phase:

- ▶ Completed Post implementation review and comments addressed
- ▶ Handover of the management of the solution to the government
- ▶ Completion certificates signoff and all payments effected.

4.9.3 Deployment strategies;

There are four available options for Government to deploy the Enterprise Service Bus integrated solution. Government will have to weigh the pros and Cons of each strategy.

1) Deployment of Centralized Vs Decentralized e-services

There are three possible e-services deployment strategies. These are as explained below;

Option 1: Centralised e-services

Under this type of deployment, e-services are deployed on a common portal/GSB for all MDAs, citizens and businesses. This option enables back end integration via the GSB between portal and ministry systems. This scenario shifts the burden for design and deployment of eservices from MDAs to the central GBS platform.

Advantages of centralised e-services

- ▶ Quick deployment of e-services
- ▶ Easy management of e-services
- ▶ Easier to implement security when e-services are centralised.
- ▶ It is easier for citizens to access e-services from a common portal

Disadvantage of centralised e-services;

- ▶ Less ownership from the MDAs is a key disadvantage of this option.

See below an illustration of the centralized e-services

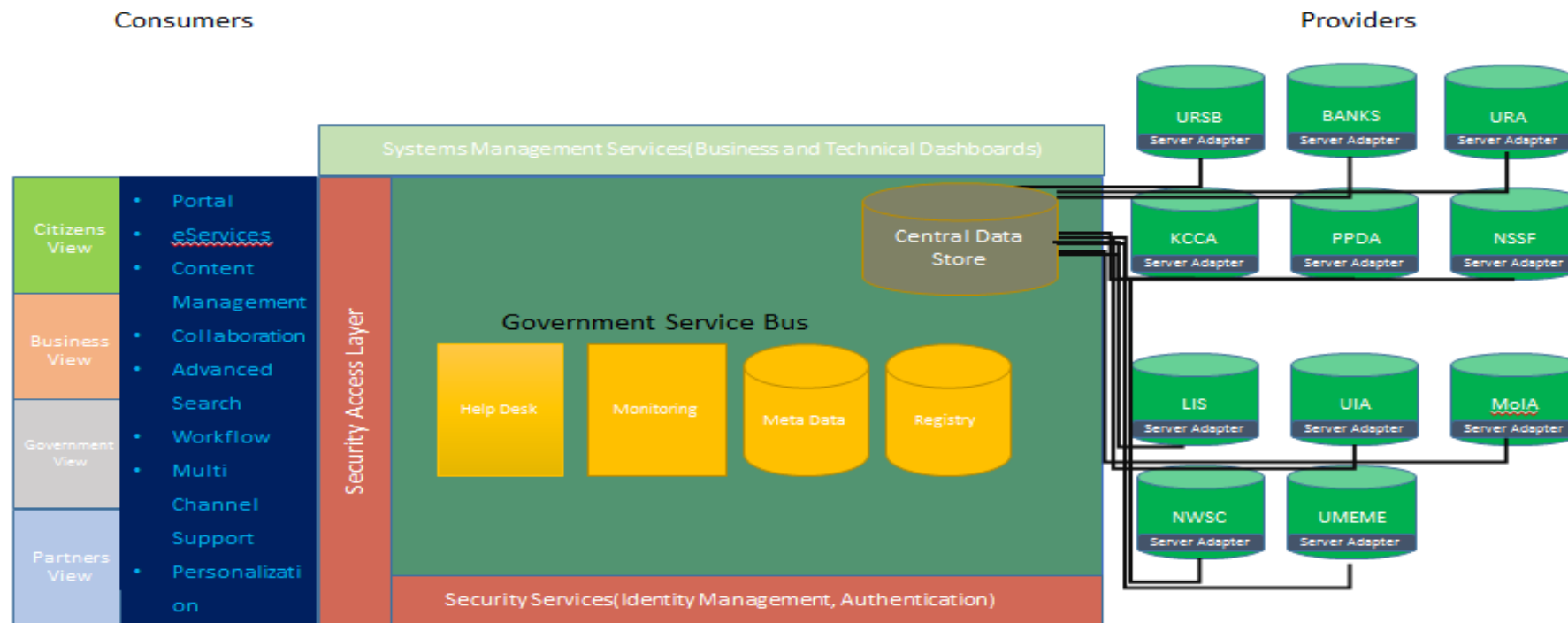


Figure 23: Centralised e-services

Option 2: Decentralised e-services

Under this type of deployment, e-services are deployed as decentralized solutions on MDA systems and enable integration between MDAs and central portal via the GSB. This scenario will be the easiest option to deploy.

Advantages of decentralised e-services;

- ▶ Full ownership of the e-services by the MDAs which increases their participation.

Disadvantages of decentralised e-services

- ▶ Slow deployment of e-services
- ▶ Management of e-services is performed at MDA level which is not easy. These e-services are not the main objectives of the MDAs

- Implementation of decentralised security is difficult since MDAs are at different maturity levels.

See below an illustration of the Decentralised e-services

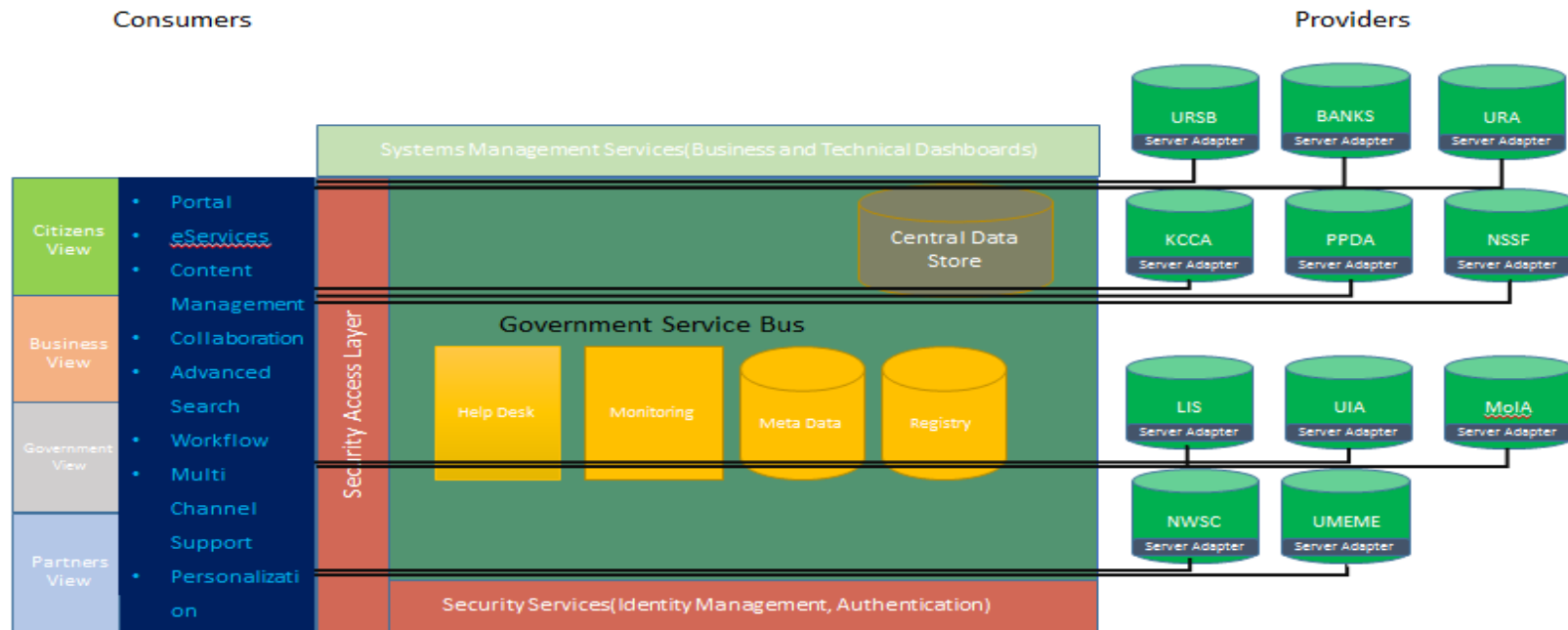


Figure 24: Decentralised e-services

Option 3: Deploy a hybrid e-services

Under this type of deployment, e-services are deployed using both the centralised and decentralised approaches. The advantage of this deployment is that it has the advantages of both the centralised and the decentralised deployment strategies.

2) Deployment of a central Security Design Vs De centralised security design

There are two possible security design deployment strategies; these are:

Option 1: Centralised security design

Deploying a successful Portal/GSB solution will require a central security solution that enables ministry to ministry identity management and to enable e-services end to end security. Such a solution is recommended to be deployed in multiple phases depending on Portal and GSB projects time line and depends on ministries security requirements, readiness and level of expertise.

Advantages

- ▶ Implementation, tracking and management of security across the entire integration layer are easier using this approach. For example implementation of the security framework is easier with design.
- ▶ This design can be implemented even in a situation where the MDAs do not have very strong security controls.

Disadvantages

- ▶ Specific incidents at the MDAs that provide the services might not be monitored and yet these may affect the e-service delivery

Option 2: Decentralised security design

Under this deployment option, the security is managed at the MDA level. This model requires strong project management team to manage and ensure that all MDAs are operating in line with the set security framework.

For this design to be effective, all MDAs must have strong security controls. They should have IT policies that have been approved and they should comply with the National Information Security Policy. Based on our analysis of the current state at the MDAs, this will not be a viable option for Government.

3) Deployment of centralized Vs decentralized business processes

There are two possible Business Process Management deployment strategies

Option 1: Centralised Business processes

Under this option, centralized business process services are deployed. This scenario enables the deployment of business processes that requires cross ministry integration (long running processes spanning multiple systems etc.) to be deployed on central Portal/GSB.

Advantages

- ▶ Complete visibility into all the important processes, across various departments of an organization
- ▶ No duplication of efforts
- ▶ Automatic and coherent workflow from one department/function to another, to ensure a smooth transition and quicker completion of processes

Disadvantages

- ▶ The specific requirements of some business processes may not be considered
- ▶ Less involvement from the ministries since they do not have full control over the design and deployment of their business processes

Option 2: Decentralised Business processes

Under this option, decentralized business process services are deployed. This scenario enables ministries to design and deploy their business processes on their own platform/system. GSB is used for cross ministries e-services integration. The advantages of the centralised strategy are the disadvantages of the decentralised strategy and Vice Versa.

4) Deployment of a centralized Vs decentralized GSB

Option 1: Centralized Topology

This is where the Service Buses are deployed using a well-defined hierarchical relationship. For example, they may be configured with a master or a central supervisor Service Bus and a number of subordinate Service Buses. The role of the master Service Bus (Government Service Bus) will be to serve requests from subordinate Service Buses and is to provide routing, and aggregation of messages to and from multiple service providers, and transformation. The main Service Bus will also act as the main security gateway for the incoming traffic. The subordinate Service Buses in this case will be scoped to one or more MDAs that are individually or collectively responsible for providing Services. This example requires the configuration of multiple ESBs.

Advantages:

- ▶ This topology allows individual organizational units to be able to effectively control all aspects of the Services that they provide or are otherwise responsible to provide services. This increases their involvement since they any failure to provide the service is directly their responsibility.

- ▶ Load balancing since some of the tasks are handled at by the subordinate ESB. This improves the efficiency of the Master Service Bus.
- ▶ Monitoring of activities of all the service buses is simpler through the Master Bus.
- ▶ Under this implementation the centralised security design is possible with all its benefits.

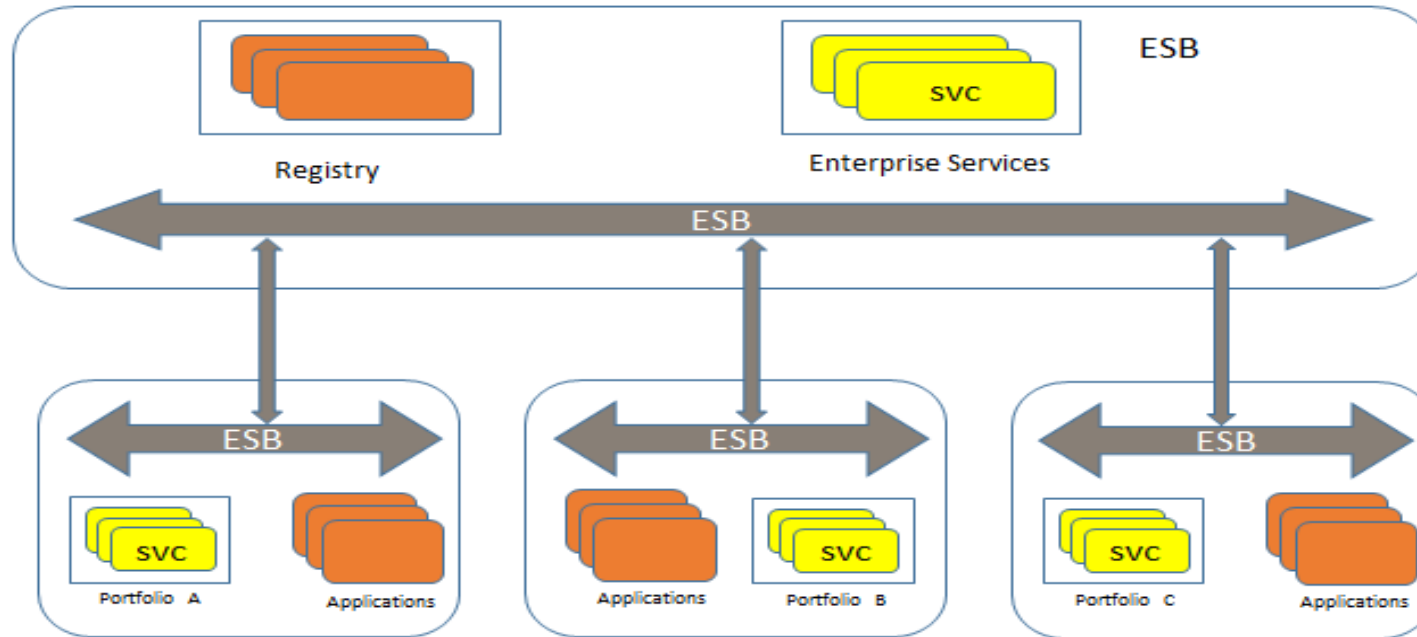


Figure 25: Centralised -GSB

Option 2: Distributed Topology

Distributed topology, consists of multiple autonomous Service Buses communicating with each other directly as peers.

Each Service Bus hosts a number of Services and accepts requests from a number of clients. There is no central hub that all requests pass through.

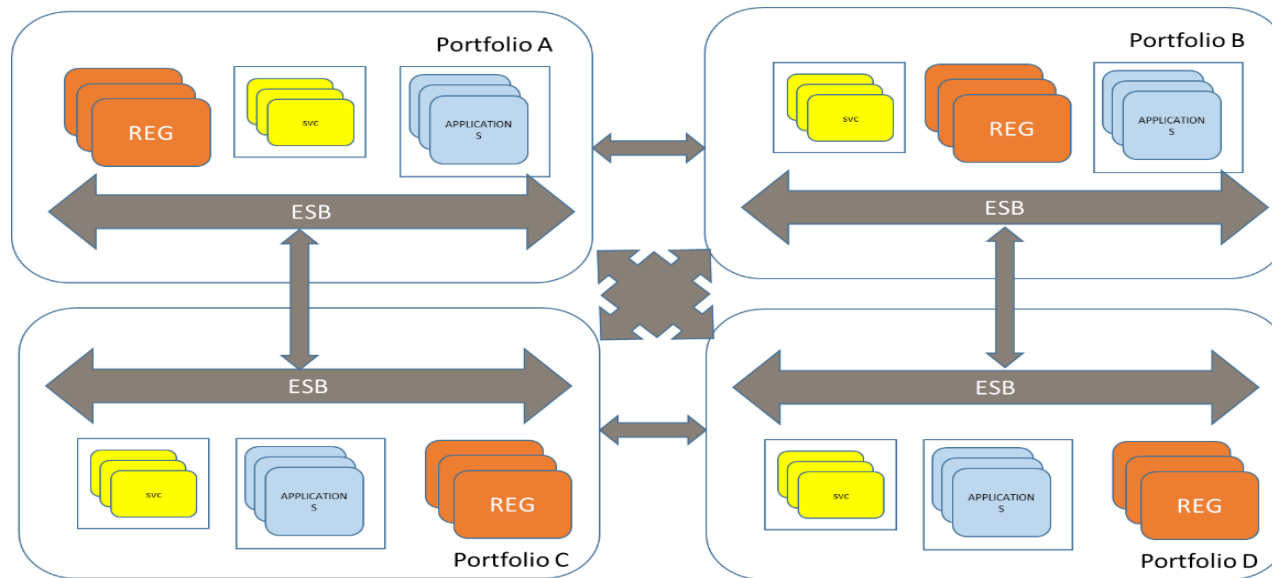


Figure 26: Decentralised GSB

Advantages

- ▶ This design gives even more control to the MDAs to manage the services they provide.

Disadvantages

- ▶ Implementation of security under this topology would be decentralised and this requires a strong project management team at the MDAs and strong security controls which we did not see at the MDAs.
- ▶ Monitoring of activities of all the ESBs to get an oversight view for decision making is difficult.
- ▶ Under this topology, decentralised business processes are used. This comes at a cost of duplication of efforts, and less focus on the over role priority of e-services since MDA focuses only on what they provide.

Option 3: Hybrid Topology

Hybrid topology is one that utilizes both central and distributed Service Bus topologies. Although there is a central bus in the topology, bus-to-bus communication is also allowed under certain circumstances. There can be large variations of this topology since there are many topology options between centralized and distributed.

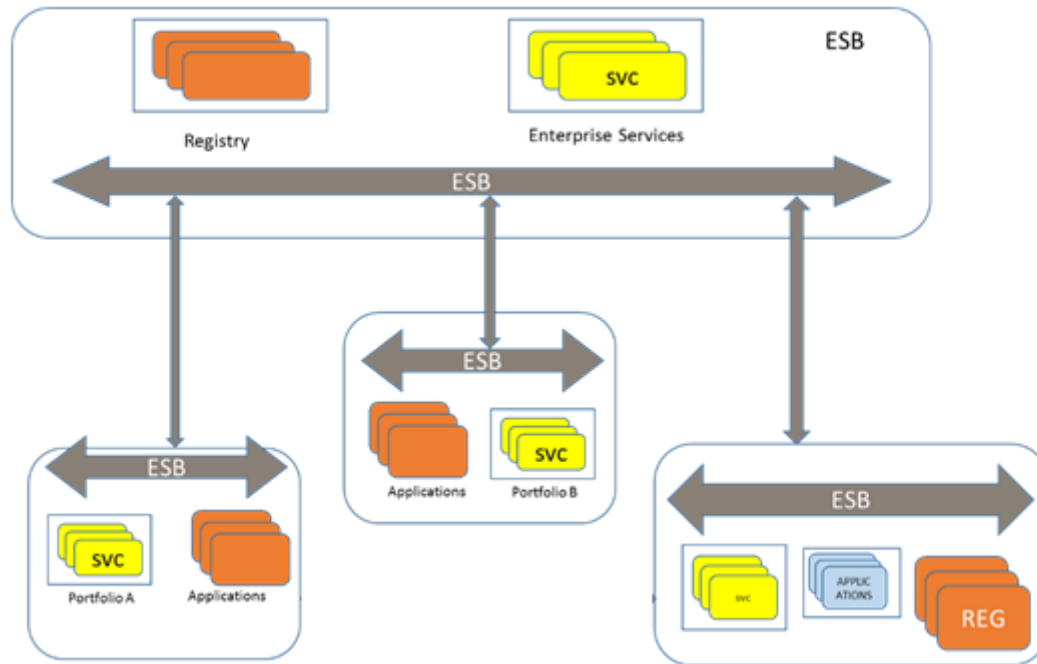


Figure 27: Hybrid e-services

Based on the advantages and disadvantages mentioned above, we recommend that the Government implements;

▶ Centralised e-services

We recommend that a centralised approach is used for implementation of the e-services.

▶ Hybrid security design

Based on the current state of security controls at the MDAs, the centralised security design will be the most secure strategy for handling the e-services. However security at the respective MDAs should also be a concern to the integrated solution to avoid security risks from the MDA side or data compromise.

This will be implemented in three phases;

- I. Every MDA has an approved information security policy (decentralised management)
- II. Every MDA has an approved information security policy in line with the National Information Security Policy (managed centrally)
- III. Every MDA has an approved information security policy in line with the Integration security framework (managed centrally)

▶ Centralised Business Process

Based on the Current state assessment, and the disadvantages of the de centralised business processes, this is the best suited topology for the GSB. This will be implemented in phase two of the project. For the Quick Wins implementation, de centralised business processes will be used.

▶ Hybrid bus Topology

Based on the Current state assessment, this is the best suited topology for the GSB. Initially a centralised topology will be deployed (during the 5 year project period). Once the usage of the e-services has picked up, the decentralised buses may be deployed to providers that have high volume of transactions. These decentralised buses however will be subordinate to the central bus.

4.10 Logical solution design

We are proposing the logical architecture for the GSB as illustrated below;

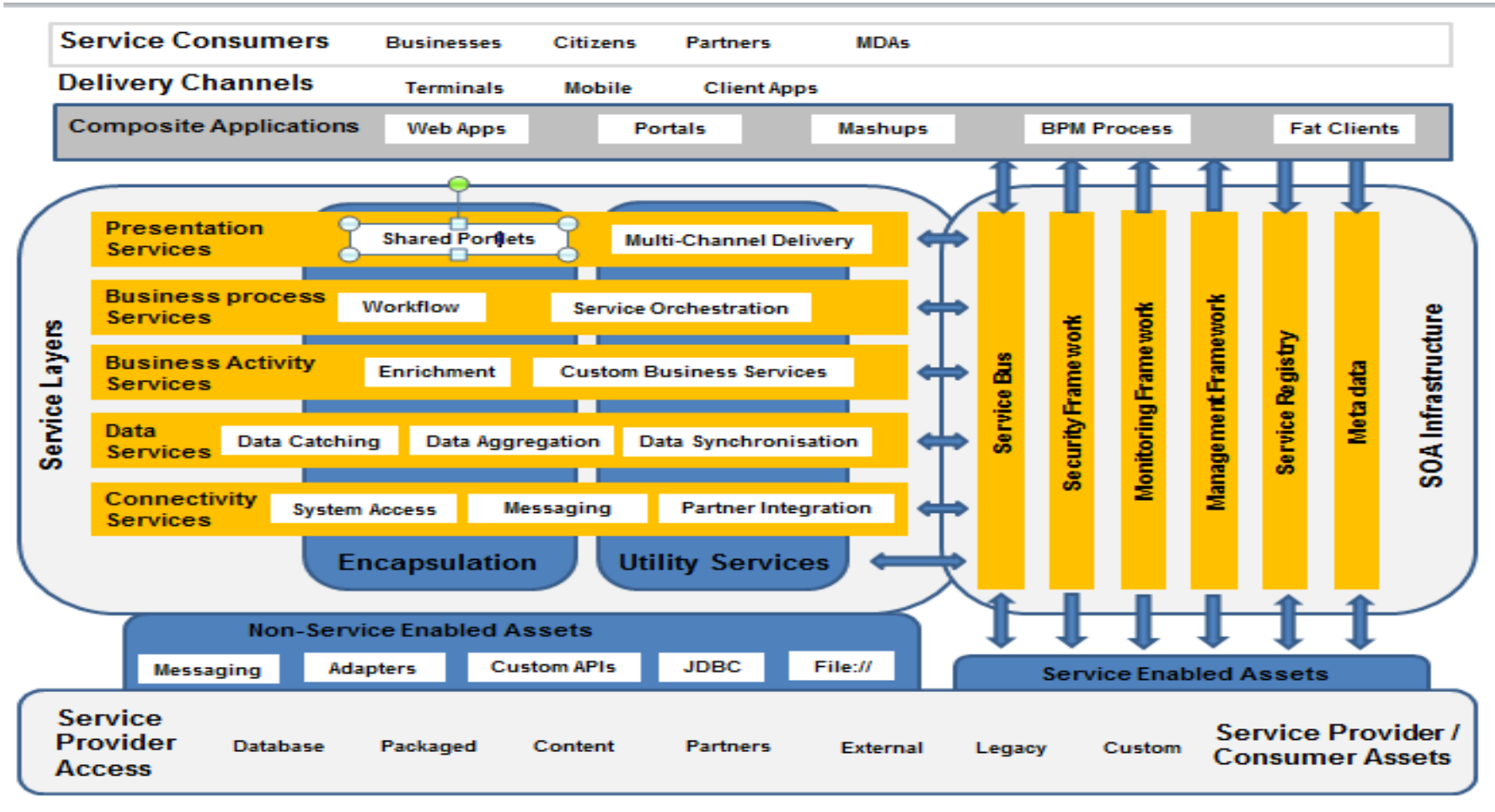


Figure 28: Logical Architecture

4.10.1 Components of the logical architecture

1) Service Providers

Service providers are the entities that provide services to the consumers. The service providers own the service. The service providers will have contracts with all consumers they will share data with. They will also have a data sharing contract with NITA-U, if NITA_U will have to do any processing to consolidated data they share with third parties. See section 4.1 for the recommended legal state. They will ensure that qualities of service are stated, offered, and adhered to. Service Providers can be Legacy systems, packaged applications, partner applications, messaging systems, custom-built standalone services, business processes, and combinations of these. Examples of service providers have been mentioned earlier in this report. See section 4.3 of the report for the e-services and the service provider for each.

2) Service consumers

These are the consumers of services. Consumers do not offer any SOA capabilities and are not required to conform to SOA principles. This is on an assumption that they are not also Service providers. Service consumers can be businesses, citizens and Government. Consumers will have to adhere to the data sharing contracts they have with the providers.

3) Composite Applications

These are applications built primarily for Services. These Services may belong to any of the Service layers. Composite applications could be web applications, Portals, Mashups and Fat Clients

4) Service enabled assets

Service enabled applications or assets are service providers deployed with embedded services. These could for example be Packaged Applications, Partner Applications (which includes SaaS, cloud, etc.), and Custom Applications within the MDAs.

5) Non-service enabled assets

Non-service enabled assets do not provide or consume services. These could for example be Adapters, Custom APIs

6) Utility services

These are services that are not directly related to performing business operations but perform infrastructure related services. That is, any service that is not providing the connectivity, data management, business, or presentation logic associated with a business activity. They are cross cutting through all the service layers. Auditing, logging, notification, policy lookup, access control

7) Encapsulation

Encapsulation is the inclusion of a function from lower layers or simply wrapping a legacy asset in order to use its functionality inside another Service

8) SOA Infrastructure

I. Government Service Bus

- ▶ The Service Bus will be a channel for communication between all participants of the SOA
- ▶ The service bus will enable different technologies to interact without the need to construct unique integration code, i.e., point-to-point custom connections.
- ▶ The service Bus will support consolidation for the MDAs that do not have systems but require services from other MDAs
- ▶ The Service Bus will have to be scalable to support more MDAs and services in future.
- ▶ Enforce security framework

Components of the service bus;

a) Mediation component

Mediation can be broadly defined as resolving the differences between two or more systems in order to integrate them seamlessly.

b) Transformation component

This component has the ability to manipulate and transform messages as they travel from consumer to producer and optionally back to the consumer. Message transformation might include aggregation, enrichment, filtering and wrapping

c) Routing component

Routing refers to the ability to control where a message is sent or which service endpoint is invoked. This can be accomplished by extracting data that affects routing decisions from the contents of the request message (content-based routing), message header or via configuration data (config-based routing). Routing includes Route, filter, aggregate, and re-sequence messages based on content and rules

d) Protocol services component

This component handles transport protocol negotiation between multiple formats (such as HTTP, JMS, JDBC).

II. Security Framework

The security framework addresses the ability to secure messages as well as the ability to ensure that functions and data are accessible to the correct audience and under the right conditions. See section 4.2 for the security framework.

III. Meta data repository

The metadata repository is primarily a human interface for asset capture and presentation. It holds data about services and the entire infrastructure. It is integrated with the Service Registry. Examples of metadata include interface descriptions, endpoint address, and policies covering service level agreements, security relationships, etc.

The Meta data repository will have the following functionality;

- ▶ Compliance and policy checks,
- ▶ Asset management and Portfolio management
- ▶ Asset lifecycle management
- ▶ Usage tracking
- ▶ Service discovery
- ▶ Version management and Dependency analysis
- ▶ Reporting capabilities.

IV. Service Registry

The service registry or repository contains and manages the metadata that describes the services in a service-oriented solution. This is where who, what, where, and how information is stored. The registry for example will hold the following information;

- ▶ Information about the party who publishes information about a service

- ▶ Contain business services information
- ▶ Specifications for services or value sets
- ▶ Technical information about a service entry point and implementation specifications
- ▶ The registry will have information about the identified e-services.
- ▶ Information about the party who publishes information about a service
- ▶ Technical information about a service entry point and implementation specifications
- ▶ Information about the consumers and the providers.
- ▶ The registry will be updated as and when more services are added to the architecture

V. Monitoring framework

Centralized place for tracking and analysing data related to both the SOA infrastructure and the services participating in the SOA. It analyses, stores, and acts upon runtime data to ensure the optimal operation of the runtime environment.

Provides the information back to the operations team which enables informed decisions to be made about scaling the infrastructure or whether there is room to expand the usage of the infrastructure and its Services across additional applications and Service consumers

The framework will have the following capabilities;

- ▶ Service usage: Track what Services are being accessed and by which consumers.
- ▶ Version usage: Track which versions of a Service are being used and by whom.
- ▶ Performance: Response time data optionally plotted over time of day and days of the week, for each Service.
- ▶ Exceptions: Functional (Service invocation errors) and business exceptions.
- ▶ Availability: How often the Service is available or unavailable.
- ▶ Security violations: Attempts to use a Service without proper access rights

VI. Governance and management framework

Control or manage various aspects of the SOA environment. This is where the governance standards are also captured. Monitoring data may feed into the Management Framework in order to automate management activities.

This framework will have the following capabilities

- ▶ Data governance framework
- ▶ Data Integration Framework
- ▶ Service level agreements management
- ▶ Logging and monitoring
- ▶ Versioning support
- ▶ Resource browsing
- ▶ Environment propagation
- ▶ Security support

9) Service Layers

I. Presentation services

These services handle how information will be presented to consumers mainly through Web services .For the citizens , businesses and MDAs that do not have systems, information will be provided through a web portal. The GSB will have the ability to Display only information that has been requested for by an authorised consumer

II. Connectivity services

These services obtain data from legacy applications and provide a way of interacting with these applications through APIs and adapters rather than directly to the MDA database

III. Business Activity services

They expose business operations via Service interfaces to establish a single, rationalized way to perform business functions. Operations may be simple atomic business functions, such as obtaining a stock quote, or complex / long running, such as starting a workflow process or kicking off a batch process.

IV. Business Process Services

Business Process Services are units of business logic just like Business Activity Services, but the logic is likely to represent more complex operations such as orchestrating the interaction with multiple systems to handle a customer service enquiry.

V. Data Services

- ▶ Since data originates from various databases and applications, data services will access data from various sources using many different technologies and present data in a business-friendly form
- ▶ Data services will have the ability to access data directly or may use connectivity services
- ▶ Data caching, transformation Data aggregation, data synchronization services will be available to enable quick response times, consistency and accuracy of information

4.10.2 Advantages of this logical design

The logical design was developed with the following advantages;

- ▶ Helps in identifying the major components of the proposed integration solution.
- ▶ Identifies various areas, boundaries and scope of the solution
- ▶ Easy reference for the solution implementer to understand the requirements of the Government.

4.11 High level e-services architecture

Based on the logical architecture design above, we recommend the illustration below as the high level e-services Architecture. This was designed based on the logical architecture. It demonstrates the hybrid e-services design that has both the centralised and the decentralised e-services.

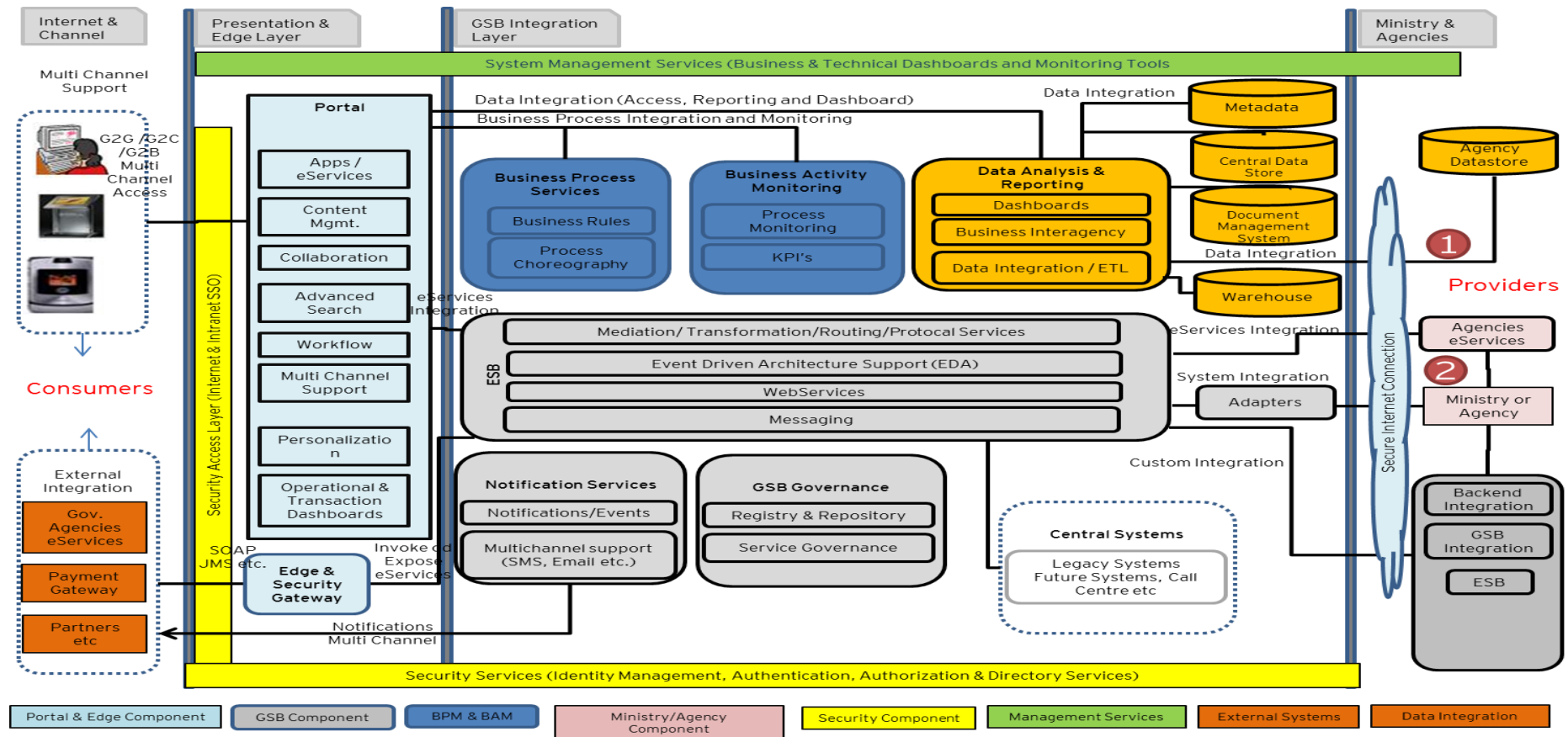


Figure 29: E-services High level architecture

The high level e-services architecture was mapped to the logical architecture as shown below;

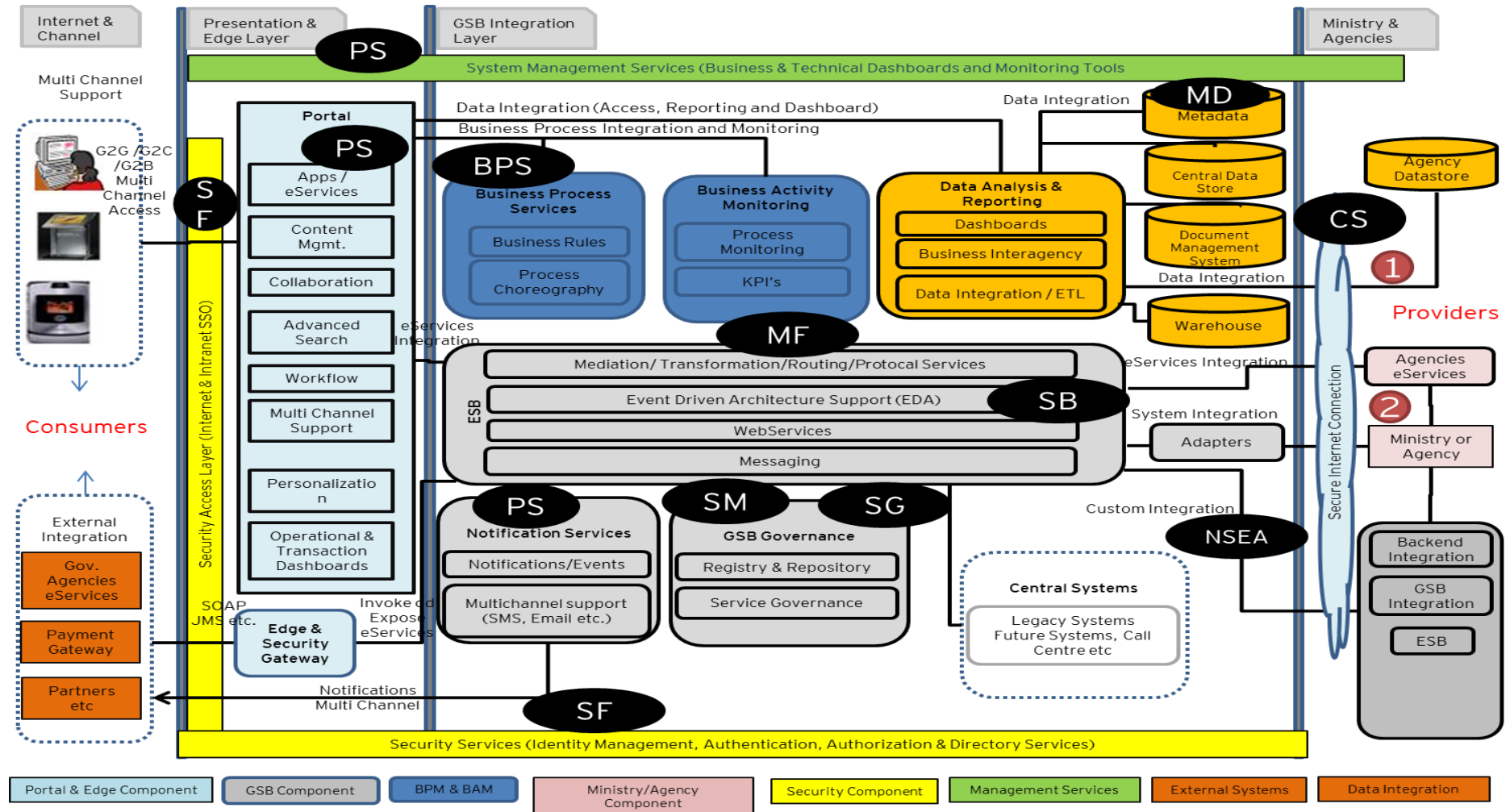


Figure 30: Mapping of logical to e-services architecture

Key of the mapping for the high level e-services against the logical design

Abbreviation	Description	Abbreviation	Description
SF	Security Framework	MF	Monitoring framework
PS	Presentation Service	SB	Service Bus
SM	Management framework	NSEA	Non service enabled assets
SG	Service Governance/ Governance framework	MD	Meta Data
BPS	Business process Services	CS	Connectivity Services
Consumers	All MDAs that do not have systems will access information as consumers. Consumers can also be businesses, partners and citizens.		
1	MDAs that do not have e-services and they will have to be created from the integration layer will connect this way.	2	MDAs who already have existing e-services will connect this way

Table 9: Key for the mapping of the logical to the e-services architecture

4.11.1 Components of the high level architecture;

i. Central data store;

This will be a database that will be located at NITA. It will store all information that would have been identified as frequently requested for (cache). The central store will also hold the consolidated data from the providers that will be used to quickly and efficiently provide the e-services to the consumers.

ii. Data Warehouse

This component is a compilation of information/data prearranged so that it can be used effortlessly for querying and data analysis. The data warehouse will receive information from the different applications from providers and operational systems.

All other components are as discussed in section 4.10.1 of this report.

4.12 Integration Solution Specifications

4.12.1 Functional Specifications

The functional features of Government Service Bus are detailed in the table below;

Table 10: Functional requirements

Architecture Components	Service Layers	Functional Requirements	
1.Ministry and Agencies Component			
At the Service Present layer, the Solution should be able to support the delivery of the following e-services provided by the MDAs.			
1.1 Agency services	SP		
1)		Name of e-service	E-Verification
		Name of Service provider	Ministry Of Internal Affairs
		e-service class reference	S001
		e-service mapping reference	D001
		Name of National system	National Information Security System
		Application Database	To be provided by the MDAs
		API	To be provided by the MDAs
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	All MDA's, JLOS, Businesses e.g. Banks, Telecoms, Regional Partner States
E-service category	Public		

Architecture Components	Service Layers	Functional Requirements	
		Estimate demand for E-service	Daily
		Service request data input	First Name / Last Name/ National Identification Number
		Service response data output	National Identification Number/ Image / Gender / DOB/ First Name /Last Name
		Implementation priority (1.2.3)	1
		E-service functional description	<p>The Government entities and ministries, Businesses such as banks and telecoms, and regional partner states will require to access information from the National Identification System in order to view information on the Names, Gender, Date of Birth and National Identification Number to verify citizen identity.</p> <p>In future when the infrastructure is available MDAs will also be able to validate identity of an individual using their biometric data such as the finger prints.</p>
		Mean time availability	99.9%
		Estimated number of transactions	6,500 per min

Architecture Components	Service Layers	Functional Requirements	
		Storage space	To be provided by the MDAs
		Response Rate	2 sec
		Receipt Acknowledgement	Confirmation note
2)		Name of e-service	Registration and Verification Births and Death
		Name of Service provider	Uganda Registration Services Bureau
		e-service class reference	S005
		e-service mapping reference	D002
		Name of National system	Mobile VRS
		Application Database	To be provided by the MDAs
		API	To be provided by the MDAs
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Government
		E-service category	Public
		Estimate demand for E-service	Daily
		Service request data input	National Identification Number
		Service response data output	Names, Date of Birth, Date of Death
		Implementation priority	1

Architecture Components	Service Layers	Functional Requirements	
		(1.2.3)	
		E-service functional description	This will enable the registration of new birth and death from the authorised entities such as hospitals around the country using the URSB system. It will also be grant access to the Administrator General's office to enable them to confirm the death of citizens before transferring the estates to a new administrator. This service will at a later stage be offered concurrently with Ministry of Internal Affairs.
		Mean time availability	99.9%
		Estimated number of transactions	10,000per min
		Response Rate	2 sec
		Storage Space	To be provided by the MDAs
		Receipt Acknowledgement	Confirmation e-mail
3)			
		Name of e-service	E- Passport
		Name of Service provider	Ministry Of Internal Affairs
		e-service class reference	S002
		e-service mapping reference	D001

Architecture Components	Service Layers	Functional Requirements	
		Name of National system	Passport processing system
		Application Database	To be provided by the MDAs
		API	To be provided by the MDAs
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		E-service category	Public
		Estimate demand for E-service	Daily
		Service request data input	Receipt Number, National Identification Number
		Service response data output	Application Forms, Application Status, Interview Day and Location
		Implementation priority (1.2.3)	1
		E-service functional description	The Citizens will access the Government portal where they can download the online passport application form. They can then complete it. They then make payment to banks that would have been agreed upon to manage this payment. (For those able to do online banking , payment online will be possible) The citizens can then

Architecture Components	Service Layers	Functional Requirements	
			upload a copy of the receipt and the completed application form through the portal. On submission they will be issued with an application number which they can input at a later stage to track the application process. On completion of the application processing, the citizen will receive a mobile message or web notification of the pickup dates for the passport.
		Mean time availability	99.9%
		Estimated number of transactions	8,500,000 per min
		Response Rate	2 sec
		Storage Space	To be provided by the MDAs
		Receipt Acknowledgement	E-mail
4)		Name of e-service	e-land
		Name of Service provider	Ministry Of Lands Housing and Urban Development
		e-service class reference	S016
		e-service mapping reference	D004
		Name of National system	Land Information System
		Application Database	SQL

Architecture Components	Service Layers	Functional Requirements	
		API	The API to be custom developed by vender. API should be compatible with Land Information system and the GSB
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	UNRA, Uganda Investment Authority, Justice Law and Order Sector
		E-service category	Public
		Estimate demand for E-service	Daily
		Service request data input	Land Location, Title Number, Land Owner
		Service response data output	Land Location, Title Number, Land Owner, Previous Owner, Date Of Transfer, Status, Size Of the Land
		Implementation priority (1.2.3)	1
		E-service functional description	As part of this service, MDAs, citizens and businesses will be able to input a land title number into a Ministry Of Lands System. They will then receive a result of the land owner. This will help in solving land problems. It will also be

Architecture Components	Service Layers	Functional Requirements	
			accessed by the Administrator General system, in order to confirm and enable them implement the deceased's will and enforce the transferring the Estates to a new administrators.
		Mean time availability	99.9%
		Estimated number of transactions	1,600 per min
		Response Rate	2 sec
		Storage Capacity	20TB
		Receipt Acknowledgement	e-mail
5)		Name of e-service	e-payroll
		Name of Service provider	Ministry Of Public Service
		e-service class reference	S008
		e-service mapping reference	D006
		Name of National system	Integrated Personal Payroll System
		Application Database	Oracle 11g
		API	The API to be custom developed by vendor. API should be compatible with Integrated Personal Payroll System and the GSB
		Single e-Service presentation	Portal

Architecture Components	Service Layers	Functional Requirements	
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Government
		E-service category	Public
		Estimate demand for E-service	Weekly
		Service request data input	Vote Name, Login Details
		Service response data output	Vote Employees, Salary, Posting Station, Salary Scale
		Implementation priority (1.2.3)	2
		E-service functional description	All MDA's whose salaries are paid through the public service will need access to the IPPS in order to add new employees to their votes and remove employees transferred from the vote.
		Mean time availability	99.9%
		Estimated number of transactions	1,300 per min
		Response Rate	2 sec
		Storage Size	160GB
		Receipt Acknowledgement	E-mail
6)		Name of e-service	e-mum

Architecture Components	Service Layers	Functional Requirements	
		Name of Service provider	Ministry Of Health
		e-service class reference	S029
		e-service mapping reference	D003
		Name of National system	DHIS
		Application Database	MySQL
		API	The API to be custom developed by vendor. API should be compatible with District Health Information System and the GSB
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		E-service category	Health
		Estimate demand for E-service	Daily
		Service request data input	Mobile Number , Topic
		Service response data output	Information
		Implementation priority (1.2.3)	2
		E-service functional description	Citizens will be able to access maternal information which includes the different

Architecture Components	Service Layers	Functional Requirements	
			pregnancy stages and recommended practices, advice on how to keep to both mother and baby safe. It will also help the expectant mother locate the nearest places where they can access maternity services. And how to deal with some challenges that are related with pregnancies such are recommended foods and do's and don'ts
		Mean time availability	99.9%
		Estimated number of transactions	23,040,000
		Response Rate	2 sec
		Storage Size	
		Receipt Acknowledgement	Email/SMS/ Confirmation note
7)		Name of e-service	e-child
		Name of Service provider	Ministry of Health
		e-service class reference	S030
		e-service mapping reference	D003
		Name of National system	DHIS
		Application Database	MySQL
		API	The API to be custom developed by vendor. API

Architecture Components	Service Layers	Functional Requirements	
			should be compatible with District Health Information System and the GSB
		Single e-Service presentation	Portal/ Mobile
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		E-service category	Health
		Estimate demand for E-service	Weekly
		Service request data input	Names, Locations
		Service response data output	Treatment Centres, Ongoing Project, Health Advice
		Implementation priority (1.2.3)	2
		E-service functional description	Citizens will be able to access child health information which includes the different food substances that are important for child development and in with foods they can be found. It will also show the different immunizations and the recommended time for having them administered. The Parents can also locate the nearest places where they can access

Architecture Components	Service Layers	Functional Requirements	
			child health services.
		Mean time availability	99.9%
		Estimated number of transactions	23,040,000 per min
		Response Rate	2 sec
		Storage Size	To Be Provided by MDA
		Receipt Acknowledgement	SMS/E-mail/Confirmation note
8)		Name of e-service	e-university
		Name of Service provider	Universities
		e-service class reference	S018
		e-service mapping reference	
		Name of National system	Ad hoc systems are managed by different Universities
		Application Database	Ad hoc systems are managed by different Universities
		API	The API to be custom developed by vendor. API should be compatible with Ad hoc University systems and the GSB
		Single e-Service presentation	Portal

Architecture Components	Service Layers	Functional Requirements	
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Government
		E-service category	Academic
		Estimate demand for E-service	Quarterly
		Service request data input	Updated Records
		Service response data output	Student's Names, Scores, Courses,
		Implementation priority (1.2.3)	2
		E-service functional description	Citizens will require applying to join Universities by filling online application forms and attaching copies of academic documents and receipt numbers. They will be able to follow up on the status using the application number issued to them. The payment will also be effected online using online or mobile banking. On acceptance to a university , the applicant will receive an sms and email from the university
		Mean time availability	99.9%
		Estimated number of transactions	2,400 per min

Architecture Components	Service Layers	Functional Requirements	
		Response Rate	2 sec
		Storage Size	N/A: Ad hoc systems are managed by different Universities
		Receipt Acknowledgement	Yes
9)		Name of e-service	e-HIV information
		Name of Service provider	Uganda AIDS commission
		e-service class reference	S028
		e-service mapping reference	D003
		Name of National system	Portal
		Application Database	SQL
		API	The API to be custom developed by vendor. API should be compatible with HIV database and the GSB
		Single e-Service presentation	Web and Mobile
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		E-service category	Health
		Estimate demand for E-service	Daily
Service request data input	Mobile Number, Location		

Architecture Components	Service Layers	Functional Requirements	
		Service response data output	Health Centres offering HIV services, Information on prevention
		Implementation priority (1.2.3)	2
		E-service functional description	Citizens will be able to access HIV information which includes prevention and precautions; it will also help the users locate the nearest places where they can access HIV services. It will show centres where testing for HIV can be performed and contacts in to these health facilities
		Mean time availability	99.9%
		Estimated number of transactions	17,000,000 per min
		Response Rate	2 sec
		Storage Size	10 GB
		Receipt Acknowledgement	E-mail/SMS/Confirmation note
10)		Name of e-service	Application for Jobs
		Name of Service provider	Ministry Of Public Service
		e-service class reference	S009
		e-service mapping reference	D006
		Name of National system	IPPS

Architecture Components	Service Layers	Functional Requirements	
		Application Database	Oracle 11g
		API	The API to be custom developed by vendor. API should be compatible with Integrated Personal Payroll System and the GSB
		Single e-Service presentation	Web Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		E-service category	Public
		Estimate demand for E-service	Periodically
		Service request data input	Vacancy Serial Numbers
		Service response data output	Application Forms ; Names, Age, Qualification, Experience
		Implementation priority (1.2.3)	2
		E-service functional description	Citizens will be able to apply for Government jobs by posting their applications and uploading academic documents to the IPPS. They will be given unique registration numbers that can be used to track the status of their job applications.
		Mean time availability	99.9%

Architecture Components	Service Layers	Functional Requirements	
		Estimated number of transactions	4,500,000 per min
		Response Rate	2 sec
		Storage Size	160 GB
		Receipt Acknowledgement	E-mail/SMS/Confirmation note
11)		Name of e-service	Agricultural Information and Statistics
		Name of Service provider	National Agricultural Advisory Services
		e-service class reference	S024
		e-service mapping reference	D006
		Name of National system	N/A: Currently, there is no Information system in place for this service
		Application Database	N/A: Currently, there is no Information system in place for this service
		API	The API to be custom developed by vendor. API should be compatible with Information to be provided and the GSB
		Single e-Service presentation	Web Portal and Mobile
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens, Government and Business
		Service Category	Agricultural

Architecture Components	Service Layers	Functional Requirements	
		Estimate demand for E-service	Daily
		Service request data input	Crop Name, Export location, Dates of Export
		Service response data output	Crop Name, Yields, Exports, Export location, Dates of Export, Amount Paid
		Implementation priority (1.2.3)	2
		E-service functional description	NAADS will be able to post Agricultural research results on the Agricultural portal. These will be available to Government , businesses and citizens for free
		Mean time availability	99.9%
		Estimated number of transactions	8,5000,000
		Response Rate	2 sec
		Storage Size	N/A: Currently, there is no Information system in place for this service
		Receipt Acknowledgement	E-mail/Confirmation note
12)		Name of e-service	Agricultural Research Information
		Name of Service provider	National Agricultural Research Organisation
		e-service class reference	S024

Architecture Components	Service Layers	Functional Requirements	
		e-service mapping reference	D006
		Name of National system	N/A: Currently, there is no Information system in place for this service
		Application Database	N/A: Currently, there is no Information system in place for this service
		API	The API to be custom developed by vendor. API should be compatible with Information to be provided and the GSB
		Single e-Service presentation	Web Portal and Mobile
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens, Government
		Service Category	Agricultural
		Estimate demand for E-service	Weekly
		Service request data input	Crop Name,
		Service response data output	Crop Name, Yields, Experts, Origin,
		Implementation priority (1.2.3)	2
		E-service functional description	NARO will be able to post Agricultural research results on the Agricultural portal. These will be

Architecture Components	Service Layers	Functional Requirements	
			available to Government, businesses and citizens at a small fee.
		Mean time availability	99.9%
		Estimated number of transactions	17,000,000
		Response Rate	2 sec
		Storage Size	N/A: Currently, there is no Information system in place for this service
		Receipt Acknowledgement	E-mail/Confirmation Mode
13)		Name of e-service	Application For Driving Licenses
		Name of Service provider	Ministry Of Works and Transport
		e-service class reference	S026
		e-service mapping reference	D007
		Name of National system	To be provided by MDA
		Application Database	To be provided by MDA
		API	To be provided by MDA
		Single e-Service presentation	Web Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		Service Category	Public

Architecture Components	Service Layers	Functional Requirements	
		Estimate demand for E-service	Daily
		Service request data input	National Identification Number, Receipt Number, Driving Test Results
		Service response data output	Application Form, Status of the Driving License
		Implementation priority (1.2.3)	2
		E-service functional description	The Citizens will need to apply for new driving licences and get renewals by connecting to the ministry of works for application forms and following up with the status of their application using the driving permit number. The payment will also be effected online using the e-payment service.
		Mean time availability	99.9%
		Estimated number of transactions	8,500,000
		Response Rate	2 sec
		Storage Size	To be provided by MDA
		Receipt Acknowledgement	E-mail

Architecture Components	Service Layers	Functional Requirements	
14)		Name of e-service	Complaint Management (e-complaint)
		Name of Service provider	UHRC, Police
		e-service class reference	S033
		e-service mapping reference	D00
		Name of National system	Crime Records Management System, HURIS - Human Rights Integrated Information System
		Application Database	MySQL
		API	The API to be custom developed by vendor. API should be compatible with Crime Records Management System, the HURIS - Human Rights Integrated Information System and the GSB
		Single e-Service presentation	Portal
		Bulk Information	ESB/ Central Data Store
		Type of consumers	Citizens
		Service Category	JLOS
		Estimate demand for E-service	Daily
		Service request data input	Complaint Forms
		Service response data output	Case Number
Implementation priority	2		

Architecture Components	Service Layers	Functional Requirements	
		(1.2.3)	
		E-service functional description	The Citizens have access to the Human Rights information System to report complaints they have in line with human rights abuse. Citizens also have to access the police system to report complaints. They then receive a complaint number that they can follow up.
		Mean time availability	99.9%
		Estimated number of transactions	17,000,000
		Storage Size	To be provided by MDA
		Response Rate	2 sec
		Receipt Acknowledgement	Message
2. Data Integration Component			
2.1 Agency data store	DS	The solution should be able support the import/export of data from/into formats (such as MS word Test, Excel, etc.) that can be used by MDAs that currently do not have management information system.	
2.2 Meta data	MD		
1)		The solution's metadata management functionality should provide an acceptable response to support the transfer of metadata to an ESB in real time	
2)		The solution's metadata management functionality should provide an online	

Architecture Components	Service Layers	Functional Requirements
		catalogue of services and associated artefacts, such as Web Service Description Language (WSDL) files
3)		The solution's metadata management functionality should provide the following acceptable response to support the transfer of metadata to an ESB in real time
4)		The solution's metadata management functionality should provide a single point of access for cataloguing, promoting and publishing
5)		The solution should allow for metadata management that enables access control for all the features above.
2.3 Central data	DS	
1)		The solution's central data store should be able to effectively store 50 TB of data from the MDAs
2.4 Warehouse data	DS	
1)		The solution shall include a data warehouse for quick access to often used extracts of data and for drill-downs.
2)		The solution shall allow creating individualised dashboards for graphical representations of key information
2.5 Data Analysis & Reporting	DS	
The GSB solution should support the generating of standard and custom reports on e-Services. The solution should allow for viewing the e-Services reports using web and mobile platforms.		
1)		The solution allow for generating a consolidated report based on the preferred list of MDAs

Architecture Components	Service Layers	Functional Requirements
2)		The solution should allow for generating, storage and export of health information for the different districts databases as in a form provided by the Ministry of Health.
3)		The solution should be able to report on the education sector statistics such as the school enrolment, dropout statistics for the different districts using information from the Education Management Information System.
4)		The solution should be able avail reports needed for planning the database from the community information system.
5)		The solution should be able to produce reports on orphans and vulnerable children as required by the ministry of gender labour and social development.
6)		The solution should be able to produce reports on from the Uganda Heart Institute, Uganda AIDS commission and Uganda Cancer Institute as requested by the Ministry of Health.
7)		The solution should be able to avail reports about immigration as requested by the police and other law enforcement agencies.
2.5.1 Dash Boards	PS	
1)		The solution should be able to convey the analytics via a variety of technology, including e-mail, pager, browser and mobile device.
2)		The solution should have ability to personalize the display so that the information being displayed is organized in a manner that makes the most sense to the user.
3)		The solution should have tools that enable users to establish data that is of high

Architecture Components	Service Layers	Functional Requirements
		quality for its intended use in operations, decision making and planning.
4)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and collecting statistics and information about that data. The purpose of these statistics may be to find out whether existing data can easily be used for other purposes.
5)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and collecting statistics and information about that data. The purpose of these statistics may be to give metrics on data quality, including whether the data conforms to company standards.
6)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and collecting statistics and information about that data. The purpose of these statistics may be to assess whether metadata accurately describes the actual values in the source database.
7)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and collecting statistics and information about that data. The purpose of these statistics may be to track data quality
8)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and

Architecture Components	Service Layers	Functional Requirements
		collecting statistics and information about that data. The purpose of these statistics may be to have an enterprise view of all data for uses such as master data management, where key data is needed, or data governance, for improving data quality.
9)		The solution should have tools that support the process of examining the data available in an existing data source (for example, a database or a file) and collecting statistics and information about that data. The purpose of these statistics may be to establish an understanding of data challenges early in any data-intensive project, so that late project surprises are avoided. Finding data problems late in the project can incur time delays and project cost over-runs.
10)		The solution should have tools that support the process of discovering meaningful correlations, patterns and trends by sifting through large amounts of data stored in repositories.
11)		The solution should have dashboards that can be used for monitoring and an access control mechanism for the dashboards.
12)		
2.5.2 Data Integration /ETL	DS	
1)		The solution should support the ability to support bulk load processing (add/changes/soft-deletes) to include data format, supported frequency and operational/performance best practices.
3.GSB Component		

Architecture Components	Service Layers	Functional Requirements
3.1 Mediation/transformation/Routing /Protocol Services	SB	
1)		The proposed technology should utilize and support web services and the SOA model and be open, reusable, and cost effective, minimize the impact on partners, enhance the management of growth in the number of interfaces and support SOA technologies including, like SOAP, WSDL, and UDDI.
2)		The proposed technology should provide for the implementation of a single, centrally managed ESB to maintain critical enterprise functions and business process management as well as to provide transaction-based processing.
3)		The solution's exchange layer should consist of a business processing layer that has the ability to know when to generate data exchange, and how to process data exchanges received from outside entities according to business rules of the agency it supports.
4)		The solution should have the ability to use standards-based communication protocols such as TCP/IP, HTTP, HTTP/S, and SMTP.
5)		The solution should have the ability to convert between the protocol native to the messaging platform and other protocols, such as RMI, IIOP and .NET remoting.
6)		The solution should provide functionality that supports translation among the formats, structures and semantics required to implement communication among applications.
3.2 Event Driven Architecture Support (EDA)	SB	

Architecture Components	Service Layers	Functional Requirements
1)		The solution should offer stability in balancing high volume transaction loads, provide redundancy with failover protection at a server and network device level, and optimize utilization of acquired resources by implementing a clustered solution
2)		The solution should have the ability to interface with content from other information sources and applications including ERP systems, Document Management repositories, etc. among other internal applications within the organization.
3)		The solution should provide dynamic service virtualization and implement service binding to create associations between SOA consumer and provider modules at runtime.
3.3 Web Services	PS	
1)		The solution should include the ability to send and receive transactions between loosely coupled systems. This will require the use of a transaction exchange layer.
2)		The solution's exchange layer should consist of a re-usable, bi-directional, adapter framework, or interface environment, in which data exchanges can be sent from the participating application and received from other participating applications.
3)		The solution should support syntactic conversion and semantic transformation, including ease-of-use and reuse, number of built-in functions, ease of extending the transformation function with custom-coded logic and XML support (for

Architecture Components	Service Layers	Functional Requirements
		example, schema or Extensible Stylesheet Language Transformations [XSLT]).
4)		Support for the execution of process logic that is short term – seconds or minutes (also called dialogue management or application-level protocols). State may (or may not) be maintained for the duration of the logic (for example, a process implementing an interface).
5)		Support for the execution of process logic that varies from short term (seconds or minutes) to long term (hours, days, weeks). State should be maintained for the duration of the logic (for example, an integrating process for RosettaNet).
6)		The solution should support multiple deployment strategies such as WS-I compliant implementation of base Web services standards, including SOAP, WSDL and UDDI, as well as higher-level Web services standards, such as WS-Security. REST Support for XML-based messages, processing and HTTP, XHTML
7)		The solution should support for building frameworks and extensible tools that enable the design, configuration, assembly, deployment, monitoring, and management of software designed around a service-oriented architecture.
8)		The solution should have an architecture that enables the ESB to apply optional intermediary functions to messages in flight and mediation functions can be added to the core bus to, for example, inspect, validate, reroute, transform, enrich, log and track messages as they pass through.
9)		The solution should support typed messages and messages for which contents are explicitly defined and documented.

Architecture Components	Service Layers	Functional Requirements
10)		Support for industry-standard messaging and interfaces that are relevant to the Government infrastructure such as – HL/7, Financial Information Exchange (FIX), and Society for Worldwide Interbank Financial Telecommunication (SWIFT), RosettaNet and others.
11)		The solution should provide functionality that supports translation among the formats, structures and semantics required to implement communication among applications.
3.4 Messaging	CS	
1)		The proposed solution should incorporate secure data exchange mechanisms and technologies such as cryptography, key management, access control, authentication, and data integrity where appropriate.
2)		The proposed solution must ensure that all ESB network data crossing over a public network segment or over VPN or Internet connections includes at least 128 bit or higher encryption. Public networks being defined as any network equipment or data transmission line that is NOT in direct control of the network card.
3)		The proposed solution should support and explain how message level security will be achieved.
4)		The proposed solution should support and explain how end to end identity propagation will be achieved.
5)		The solution should have the ability to track a message from its origin to its destination (inside a firewall), inquire on the status of that document and

Architecture Components	Service Layers	Functional Requirements
		address exceptions (for example, resend the message if a target times out).
6)		The proposed solution should support and explain how authentication will be achieved.
7)		The proposed solution should support and explain how identity/ authenticated subject establishment will be achieved.
8)		The proposed solution should support and explain how identity propagation will be achieved.
9)		The proposed solution should support and explain how confidentiality will be achieved.
10)		The proposed solution should support and explain how Transport level security - SSL/VPN will be achieved.
11)		The proposed solution should explain how specifications and protocols selection will be achieved.
12)		The solution should establish the standard message exchange formats such as schema standardization, protocol standardization, WSDL-SOAP standardization and service contracts
13)		The solution should establish the standard message design formats such as schema design, Security Policy design, WSDL (design time) and WSDL (runtime - during Pilot)
14)		The solution should monitor messaging traffic, process state and behaviour, and application parameters and behaviour for all nodes in a LAN or WAN.
3.5 Notifications	PS	

Architecture Components	Service Layers	Functional Requirements
3.5.1 Notifications/Events		
1)		The solution should be able provide for the translation of code values, transformation services, establish case and charge tracking numbers, subscription and notification services, and logging and auditing functions;
2)		The solution should have publishing approval workflows to ensure that content goes through approvals before it is published. Workflow should also include notifications.
3.5.2 Multichannel Support		
1)		The solution should consist of a variety of components including a user interface, application servers, persistent data storage;
2)		The solution should be able to support multiple notification channels such as SMS and E-mail at the presentation layer.
3.6 GSB Governance		
	SM/SG	
3.6.1Registry & Repository Service		
1)		The solution should have a repository that manages the development, versioning and deployment of assets used in integration.
2)		The solution should have a repository that publishes the information so that assets can be reused.
3)		The solution should have a repository that provides traceability and impact assessment.
3.6.2Service governance		

Architecture Components	Service Layers	Functional Requirements
1)		The solution should incorporate enterprise repository - Service definitions & metadata as part of design time governance
2)		The solution should incorporate compliance driven service design and development as part of design time governance
3)		The solution should incorporate interface specification as part of design time governance.
4)		The solution should incorporate dependency analysis as part of design time governance.
5)		The solution should incorporate Service Component Architecture (SCA) compatibility as part of design time governance.
6)		The solution should support registry (metadata to be used at runtime, can be queried by a service bus) for run time governance
7)		The solution should address exception and fault handling as part of the run time governance
8)		The solution should address Web Services Interoperability WS-I basic profile compliance as part of the run time governance
9)		The solution should address Security interoperability as part of the run time

Architecture Components	Service Layers	Functional Requirements
		governance
10)		The solution should address service assembly design as part of the run time governance
11)		The solution should support system monitoring and management features that keep the IT infrastructure running at peak efficiency at all times by enabling the remote monitoring and management of distributed applications, services and information sources, and by enabling the automated resolution of predefined conditions and events.
4.BPM &BAM Component		
4.1 Business Process Services	BPS	
4.1.1 Business rule		
1)		Support for human-based activities in the form of roles, responsibilities, tasks, to-do lists or dynamic reprioritization.
2)		Maintain accurate records of configuration and changes to user access rights for auditing purposes
4.1.2 Process Choreography		
1)		The solution should have standards support for Business Process Modelling Language (BPML), XML Process Definition Language (XPDL), WSFL, Business Process Execution Language (BPEL), WS and other standards.
2)		The solution should have tools that manage the execution of activities in a

Architecture Components	Service Layers	Functional Requirements
		business process, regardless of whether those activities are performed by humans, by programs or even by intelligent devices in a manner that automates the flow of execution through that process.
3)		The solution should support the automation of long-running, multistep processes spanning multiple applications that require their state to be managed for long periods of time (hours, days or weeks).
4)		Quality of service (QOS) the solution should have the ability to provide priority to different applications, services, users or message flows and guarantee of a certain level of performance for a service.
5)		The solution should have Complex event processing that extracts the information value from multiple input "base" events and generates summary-level complex events that provide insight into current and future business conditions.
4.2 Business Activity Monitoring	MF	
4.2.1 Process monitoring		
1)		The solution's business services should support monitoring and management, it should have the ability to display the progress of executing process instances and repair stalled or broken process instances.
2)		The solution's business services should support monitoring and management, it should have the ability to display the progress of executing process instances and repair stalled or broken process instances.

Architecture Components	Service Layers	Functional Requirements
3)		The solution's business process services should support records metrics on completed and failed processes.
4)		The solution should have the capability to analyse metrics on completed and failed process instances, and suggests modifications to the existing process specification.
5)		The solution should support analytical tools and support typical business process analysis, such as activity-based costing, critical-path analysis and simulation.
6)		The solution should the ability capture events in order to monitor the application infrastructure and externally to detect events that are of potential interest.
7)		The solution should be able to filters events, discard the irrelevant; compute sums, averages and other aggregate functions; and uses rules to look for relationships among the events (for example, trends or events that may be related by causality).
8)		The solution should be able to convey the analytics via a variety of technology, including e-mail, pager, browser and mobile device.
9)		The solution should have ability to personalize the display so that the information being displayed is organized in a manner that makes the most sense to the user.
10)		The solution should have tools that enable users to establish data that is of high quality for its intended use in operations, decision making and planning.

Architecture Components	Service Layers	Functional Requirements
11)		The solution should have tools that support the process of discovering meaningful correlations, patterns and trends by sifting through large amounts of data stored in repositories.
4.2.2 KPI	MF	
1)		The solution should provide real-time access to critical business performance indicators to improve the speed and effectiveness of business operations. At its broadest level, business activity monitoring is the convergence of operational business intelligence and real-time application integration.
2)		The solution should also have classic business intelligence analytics that enable the organization of event data into structures that can be consolidated, pivoted, mined and so forth.
3)		The solution should have tools that enable users to establish data that is of high quality for its intended use in operations, decision making and planning.
5.Security Component		
<p>The GSB should satisfy the security objectives of confidentiality, availability and integrity. The solution should be configured to enforce security requirements of the following national legislation on privacy and data protection and other related national legal provisions in effect;</p> <ul style="list-style-type: none"> ▶ Data Protection and Privacy bill, 2014 ▶ Electronic Transactions Act, Act 8 of 2011 ▶ Electronic Signatures Act, Act 7 of 2011 ▶ Computer Misuse Act, Act 2 of 2011 		

Architecture Components	Service Layers	Functional Requirements
<ul style="list-style-type: none"> ▶ National Information Security Policy, 2014 ▶ Persons Registrations bill, 2014 		
5.1 security service	SF	
1)		Provision of complete user lifecycle management, password management and role governance
2)		Solution should help reduce risk with zero- day deprovisioning of users when they leave the organization or change roles
3)		The proposed provisioning solution should either have the ability to compute user identity data in real time on an as-needed basis from one, or more, authoritative systems of record, or it should require a centralized, static enterprise directory or other repository that needs to maintain and synchronize.
4)		The solution should integrate with a wide range of identity servers, applications, middleware, operating systems and platforms
5)		The solution should maintain accurate records of configuration and changes to user access rights for auditing purposes
6)		The solution should reconcile accounts automatically and on demand to rapidly and reliably discover invalid “orphaned” accounts and unnecessary entitlements, and to initiate either automatic or manual remediation processes
7)		The solution should bundle a best- of- breed directory with data integration and synchronization tools to help solve integration challenges
8)		The solution should support identity management on a group basis, simplifying

Architecture Components	Service Layers	Functional Requirements
		and reducing the cost of user administration
9)		The solution should support or improve self-service identity validation and on boarding, including: <ul style="list-style-type: none"> ▶ Self-registration ▶ Self-maintenance of personal data ▶ Controls on what can be managed through self-service
10)		The solution should strengthen compliance and security through separation- of- duty enforcement and automatic recertification of user entitlements
11)		The product should help enforce pre- established policies for how user access should be granted throughout access request and provisioning processes
12)		The solution should enforce segregation of duty controls in provisioning workflows.
13)		The solution enables the discovery of orphan accounts, explain how it does this.
14)		Addresses common preventive and detective identity controls required by regulatory mandates
15)		Support identity management on a group basis, simplifying and reducing the cost of user administration
5.1.2 Authentication		
1)		Provide self- service interfaces for user enrolments, user validation, account updates and password management
2)		Strengthen compliance and security through separation- of- duty enforcement and automatic recertification of user entitlements

Architecture Components	Service Layers	Functional Requirements
3)		Provide access to both approval and operational workflows, allowing customization of the provisioning activity
4)		The proposed solution should be able to provide or improve provisioning and de-provisioning of user accounts
5)		The proposed solution should be able to provide or improve provisioning and de-provisioning of credentials
6)		The proposed solution should be able to provide or improve provisioning and de-provisioning of access rights
7)		The solution should ensure that only authorized personnel can request access rights.
8)		
5.1.3Authourisation		
1)		Provides standards- based (XACML) entitlements management (roles, rules and attributes) for data security and access control
2)		Simplify the design, implementation and validation of role and access structure across the integration
3)		Enforce pre- established policies for how user access should be granted throughout access request and provisioning processes
4)		The solutions should implement or improve the administration of accounts and access rights. It should allow for centralized and delegated approaches.
5)		The solution should support an approach to building a single source of truth for individual data elements and composite views.

Architecture Components	Service Layers	Functional Requirements
6)		Integrate user provisioning with role management, separation of duties and recertification with open interfaces for integration with continuous business controls systems
5.1.4 Directory		
1)		Bundles a best- of- breed directory with data integration and synchronization tools to help solve integration challenges
2)		Reconcile accounts automatically and on demand to rapidly and reliably discover invalid "orphaned" accounts and unnecessary entitlements, and to initiate either automatic or manual remediation processes
3)		The solution should serve as the identity data foundation for web applications and identity management initiatives
4)		The solution should provide cross-silo visibility into all available identities within the enterprise
5)		The solution should integrate with security information and event management solutions to provide in-depth user intelligence
6)		The solution should unify the enterprise-wide "universe of identities," including cloud-based identities, to improve security for data, applications and infrastructure.
7)		The product should easily synchronize with other directories to provide a single, authoritative, enterprise-level view of data.
8)		The product should provide a highly scalable identity infrastructure to meet the needs of all organizations, from small and midsized businesses to those with

Architecture Components	Service Layers	Functional Requirements
		millions of users
9)		The product should offer intelligent search and social networking support for identity store browsing
10)		The product should help manage application-specific identities across organizational silos and firewalls
5.2 Security Access Layers	SF	
5.2 .1 Internet &Intranet SSO		
1)		Should have the ability to implement single sign-on to allow access to information sources through different portal interfaces
2)		The product should provide an enterprise single sign- on and session management solution that integrates with the broadest possible range of applications
3)		The product should provide an enterprise single sign- on and session management solution that integrates with the broadest possible range of applications
4)		The product should offer a wide choice of authentication factors, including user IDs and passwords, USB smart tokens, building access badges, active RFID and biometric devices such as Bio- Key
5)		The product should increase security through strong authentication to a variety of endpoints, including laptops, tablets, kiosks and virtual desktops
6)		The solution should utilize a web authorization approach that offers high performance and scales to tens of millions of users and hundreds of applications

Architecture Components	Service Layers	Functional Requirements
7)		The solution should offer proven reverse- proxy technology, which is a superior approach from a change and configuration management perspective
8)		The solution should provide session- management services that enable immediate termination of all active sessions of a malicious user
9)		The solution should simplify cloud management with support for the System for Cross- domain Identity Management (SCIM) standard
10)		The solution should centrally manage user access to on- IT environments and off- premises cloud and web applications services in heterogeneous
11)		The solution should supports broad and flexible integration with strong third- party authentication solutions
6.Management services Component	PS	
6.1System Management Service	PS	
1)		The solution's access certification solution should allow dynamically constraining the list of users and systems presented to the business user.
2)		
3)		The solution should support many different types of certification review cycles. For example: certification of personnel, certification of application, certification of entitlements, etc.
4)		The solution should support detect segregation of duty violations and enforce controls within the employee access certification review cycle.
5)		If an account is provisioned natively by one of our system administrators (not through your provisioning solution), the solution should access certification

Architecture Components	Service Layers	Functional Requirements
		review workflow and show us what our users have access to.
6.1.1 Business & Technical dashboards & monitoring tools	MF	
1)		The solution should be able to capture all the steps of a provisioning process in a transaction repository for audit and reporting at a later date.
2)		The solution should provide capabilities that will allow us to send email notifications or route help desk tickets as part of the provisioning process even if we choose not to build or deploy provisioning connectors for certain systems.
3)		The solution should have access certification solution automatically send notifications to line-of-business managers who need to complete an access certification review.
4)		The solution should support Role Based Access Control (RBAC) and provide a strong model to enforce the separation of duties.
5)		The solution should be able to integrate with Microsoft Active Directory to manage authentication.
6)		
7)		The solution should provide a step-by-step audit log of the review process.
8)		The solution should enable direct remediation (change, disable or delete) of users who have taken advantage of inappropriate access rights to engage in behaviour that violates policy or security guidelines. Explain the other remediation options are available.
9)		The solution's Role Management Solution should help us design, build and

Architecture Components	Service Layers	Functional Requirements
		maintain roles in an automated fashion.
10)		The solution should support existing user profiles to determine their common access, so organizations can make appropriate decisions about what roles to create.
11)		The solution should provide a dashboard; explain who views the dashboard and content of the dashboard.
7. Portal & Edge Component	PS	
7.1 Portal	PS	
7.1.1 Apps/e- services	PS	
1)		Support for groups and communities such as to allow various users to create and/or join special interest groups and communities
2)		Support for sub-sites for different user communities. It should be possible to create a sub-site that has a totally different look and feel for different user groups but running on the same platform.
7.1.2 Content management	SPA	
1)		The solution should have tools that enable users to establish data that is of high quality for its intended use in operations, decision making and planning.
2)		Ability to allow end users to upload or download different content formats including, but not limited to, PDF, Microsoft Office formats (.doc,.docx,.xls,.xlsx,.ppt,.pptx), video, Audio etc.
3)		Provides project management tracking for content development.
4)		Easy to use editing tools for users with minimal skill set to be able to add,

Architecture Components	Service Layers	Functional Requirements
		update and manage content.
5)		Ability to include tools that allow portal content to be pushed through external APIs such as Facebook or Twitter
7.13 Collaboration	SPA	
1)		The solution portal should have the ability to provide chat capabilities to allow external users to chat with internal users while on the Portal and to further provide support for collaborative activities
2)		Provide polls and content/solution rating capabilities and provide a backend facility for analysing the results of polls.
3)		Availability of a discussion forum where any authorized user can start a topic and have other users discuss.
7.1.4 Advanced search	PS	
1)		The solution should provide an enhanced search that allows users to explore their business intelligence content.
2)		The solution should provide quick and secure accesses to both structured and unstructured information using a standard search interface.
3)		The solution should provide an enhanced search that allows users to search all stored content that has been indexed and return back the result set.
7.1.5 Workflow	BPS	
1)		Track/bookmark activities that a user was carrying out on the site in order to remember where user had reached with a certain process when he/she logs back into the site.

Architecture Components	Service Layers	Functional Requirements
2)		The vendor should be able to describe their provisioning solution's workflow management capabilities.
3)		Publishing approval workflows to ensure that content goes through approvals before it is published. Workflow should also include notifications.
4)		The solution should support approval workflows.
5)		The solution should be able to escalate approval workflows if approvals are not processed in a timely fashion. The vendor should be able to explain how this can be achieved.
6)		The solution should be able to solution support access request functionality
7)		Allows content from other systems to be pushed to the portal, based on user roles, providing highly visual alerts and notifications
8)		The solution supports provisioning workflow to react to changes in our business environment. For example, if we configure "John Doe" in Finance as a person who can request access (but not approve), what happens if he changes departments? Will these changes require any custom coding or complex configuration modifications?
9)		The solution supports various types of provisioning actions (i.e. create, change, disable, delete, etc.)
10)		Allows alerts to be created that notify users of updates or additions to content
11)		Provides alerts capabilities to notify of upcoming Calendar events to facilitate collaborative tasks
7.1.6Multichannel Support	PS	

Architecture Components	Service Layers	Functional Requirements
1)		Interactive capabilities to enable end-user-generated content and comments.
2)		Ability to work across all major web browsers i.e. Microsoft Internet Explorer, Mozilla Firefox, Opera, Google Chrome
3)		Integration with a third-party Document Management System to allow the Portal to upload content into the DMS as well as present content that is already resident within the DMS
4)		The solution should be able to support out-of-the-box connectors, explain how many are commercially available.
5)		Explain the level of detail your provisioning connectors provide? For example, can your provisioning connectors put people into the correct groups and organizational units?
6)		The solution should support building provisioning connectors for proprietary applications or non-supported systems, offer a provisioning connector development tool kit. Explain the programming languages are available within the development toolkit and who would build these connectors (i.e. your company, ours or a third party).
7.1.7 Personalisation	PS	
1)		Provide full customization of look and feel of portal design to meet brand requirements of the organization.
2)		Availability of rich text editors within the site to allow easy end user formatting of content.

Architecture Components	Service Layers	Functional Requirements
3)		Ability to export portal content into PDF or other formats.
4)		Allows user to personalize content by selecting content to appear that is relevant to that person
5)		Support for end-user customizations that allow user to organize his/her profile according to desired preferences e.g. layout of widgets on home page, default language etc.
7.1.8Operational & transaction Dash Board	PS	
1)		Ability to interface with content from other information sources and applications including ERP systems, Document Management repositories, etc. among other internal applications within the organization.
2)		Ability of the portals to comply to accepted standards including HTML, DHTML, XHTML, CSS, AJAX
3)		Provides features that allow for the automatic creation of navigation or menus when content is created
4)		Provides the ability to automatically repair/redirect menu links when content is deleted/moved
7.2. Edge & Security Gateway	SF	
1)		Provide role-based security that defines who has access to edit/manage different types of content.
2)		Should have the ability to implement single sign-on to allow access to information sources through different portal interfaces
7.3 Secure Internet Connection		

Architecture Components	Service Layers	Functional Requirements
1)		The Portal solution should enable scaling supporting deployment options including load-balancing, clustering, and failover. The solution should provide a secure connection for all the communications over the internet.
2)		The proposed solution must ensure that all ESB network data crossing over a public network segment or over VPN or Internet connections includes at least 128 bit or higher encryption. Public networks being defined as any network equipment or data transmission line that is NOT in direct control of the network card.
3)		The proposed solution must incorporate secure data exchange mechanisms and technologies such as cryptography, key management, access control, authentication, and data integrity where appropriate.
8. External System Component	SF	
8.1. Government Agencies e-service	CDC	
1)		The solution should provide the ability to provision to web services-enabled applications.
2)		Provision of a business- friendly, intuitive user interface to support request and approve access for users
3)		The solution should support provisioning activities to be scheduled to take place at a specified date or time frame, or based on an attribute in the user's profile.

Architecture Components	Service Layers	Functional Requirements
		Or explain an alternative.
8.2. Payment gateway	CDC	
8.3 Partners	CS	
9. Certifications		
1)		The solution should comply with internal security audit requirements as well as a variety of industry and Government regulations: HIPAA/Meaningful Use, PCI DSS, SOX, FTC, PHI, etc. Explain in detail how the solution will enables us to comply with these regulations.
2)		The solution should have access certification, review, attestation and remediation capabilities. For each requirement below, indicate whether this is out-of-the-box functionality, requires customization, requires a third-party solution or is not available.
3)		The solution's access certification solution should provide a mechanism for translating IT-specific entitlement definitions to content that can be readily understood by non-technical business users.
4)		The solution's access certification solution should lock down certification reviews so that they represent content at a specific snapshot in time, suitable for audit purposes.
5)		The solution should provide levels of access entitlement that can be displayed as part of the compliance review.
6)		The solution should provide an access certification portal with preconfigured workflows that implement a complete end-to-end access certification process.

Architecture Components	Service Layers	Functional Requirements
7)		The solution should have access certification review workflows assigned to line-of-business managers so they can attest to the access of employees, or others, that they supervise or are responsible for.
8)		The solution should dynamically determine who should perform access certification for a particular business unit or organization, based on their identity or role.
10. Document Management System		
1)		The Document Management System solution must enable users to quickly select and access the desired information through the Government portal.
2)		The Document Management System solution must fully support internet/intranet web based technology where the various MDA's will provide all the necessary mechanisms to store and retrieve information requested by the user, system level security for both users and data and associated system management functions.
3)		The Document Management System solution must provide version control. Version control must automatically update the version number whenever a previously "checked-out" document is returned to the information repository and prevent more than one person from checking documents out for modification.
4)		The Document Management System solution shall have robust end user functionality that supports portal and server side data validation, field masking,

Architecture Components	Service Layers	Functional Requirements
		calculations, look-ups, conditional tabbing, conditional fields, word count and expandable text fields.
5)		The Document Management System solution shall be web based accessed as requested from the Government portal accessed through the internet/intranet.
6)		The solution should have a module that supports digital signatures
7)		The Document Management System solution must support annotation (metadata) and redaction of the document uploaded on the Government portal.
8)		The proposed Document Management System solution must support delivery and routing of forms via Email Simple Mail Transport Protocol, FTP, HTTP and HTTPS.
9)		The Document Management System solution must include a robust workflow engine capable of supporting adhoc and structured routing that can be maintained by non-programming personnel.
10)		The proposed workflow Document Management System solution must have the ability to audit date, time, user name, action and detail. In addition, the workflow solution must have the functionality to analyse real-time work flow activity and to simulate routing changes before placing into a production environment.
11)		Role versus user - The workflow solution shall utilize a role based system that defines a role within the work task or activity and then assigns as many users as necessary.
12)		The Document Management System solution must be able to support forms that

Architecture Components	Service Layers	Functional Requirements
		require a unique serial number. For example Government issues receipts, driving permits and national identification cards.
13)		The Document Management System solution shall support various image formats such as .jpg, .tif, .bmp, and .png
14)		The Document Management System solution must have the ability to store and manage forms within a single repository or library.
15)		The Document Management System solution must have the ability to integrate e-form fields with library metadata fields. In addition the solution must have the capability to search for and find e-forms within a library based on metadata value searches.
16)		The Document Management System solution shall have the ability to generate reports based on metadata value searches.
17)		The Document Management System solution must support batch scanning, duplex scanning, remote scanning, and quality assurance of scanned images by the different MDA's.
18)		The Document Management System solution must support various methods for manual and automated indexing inclusive of manual entry, lookups, autofill, bar codes, OCR and ICR.
19)		The Document Management System solution should support retrieval via Boolean, metadata and other search methods. The suppliers shall list search methodologies.
20)		The Document Management System solution must support simultaneous

Architecture Components	Service Layers	Functional Requirements
		multiple document viewing, zooming, and image rotation of the uploaded documents.
21)		The Document Management System solution must work and support the Government Service Bus, providing storage for the documents uploaded by various MDA's and Government portal users
22)		<p>The Document Management System solution must scale to meet increasing transaction volume in the following ways:</p> <ul style="list-style-type: none"> ▶ The ability to increase the number of system users without component replacement. ▶ The ability to support other technologies, i.e. OCR, form management, etc. ▶ The ability to support multiple servers and optical jukeboxes in a distributed manner. ▶ The ability to support symmetrical multi-processing.
23)		The Document Management System must allow security application at the document or file level. Security shall provide segregation of data amongst users (the different MDAs) and have the capability to segregate system functionality by user. Security must include read, update, annotation, highlighting, "mark-up," and creation control.
24)		The Document Management System solution must be capable of using Secure Socket Layer encryption for archival and retrieval of documents via the internet.

Architecture Components	Service Layers	Functional Requirements
25)		<p>The Document Management System solution should have been certified with the following industry standards; please indicate certification status for each of the below:</p> <ul style="list-style-type: none"> ▶ DMWare ▶ AIIM/Document Management Alliance (DMA) Specification ▶ Open Document Management API (ODMA) ▶ WfMC - Application Programming Interface (Interface 2&3) ▶ WfMC - Audit Data Specification ▶ WfMC - Interoperability, Internet, e-mail MIME Binding ▶ ANSI/AIIM MS53 - 1993 Recommended Practice; File Format for Storage and Exchange of Image
26)		<p>The Document Management System solution must provide the ability for MDA's to quickly digitize documents and/or microfilm and route these documents to the person performing the indexing operation. Requirements associated with this portion of the system must include:</p> <ul style="list-style-type: none"> ▶ The ability to support both batch processing and single document scanning and indexing ▶ The ability to support document rescanning ▶ The ability to support both simplex and duplex scanning ▶ The capability of the scanner to scan at the resolution meeting specific requirements of the document, such as 200, 300, or 600 DPI ▶ The ability to set page breaks when batch scanning documents of fixed

Architecture Components	Service Layers	Functional Requirements
		<p>length</p> <ul style="list-style-type: none"> ▶ The ability to preset common fields for indexing purposes when scanning in batch mode ▶ The ability to support auto-indexing of documents using barcodes, OCR or ICR
27)		<p>The Document Management System solution must provide the ability to do the following:</p> <ul style="list-style-type: none"> ▶ Check and validate the complete scanning and indexing process ▶ Ensure data indexing accuracy of the uploaded documents ▶ Facilitate the re-scanning of poor quality images ▶ Verify readability of each page of each document uploaded ▶ Verify proper indexing of each document uploaded ▶ Verify proper page counts for each document ▶ Verify proper security for each document, file section, and file.
28)		<p>The Document Management System solution must provide the ability for users to logically link a single file to multiple folders and allow an authorized user to create a copy of a file within a specific folder or set of folders while maintaining only one physical copy of the document within the system. The system should provide information related to which folders are linked through a query mechanism available to authorized users.</p>
29)		<p>The Document Management System solution must provide for either the desired data formats for example HTML, XML data conversion etc.</p>

4.12.2 Technical Specifications

The GSB will have a central platform where all management activities will be monitored from. See below the high level illustration of the GSB central platform; the detailed specifications are in appendix 6.5 of the report

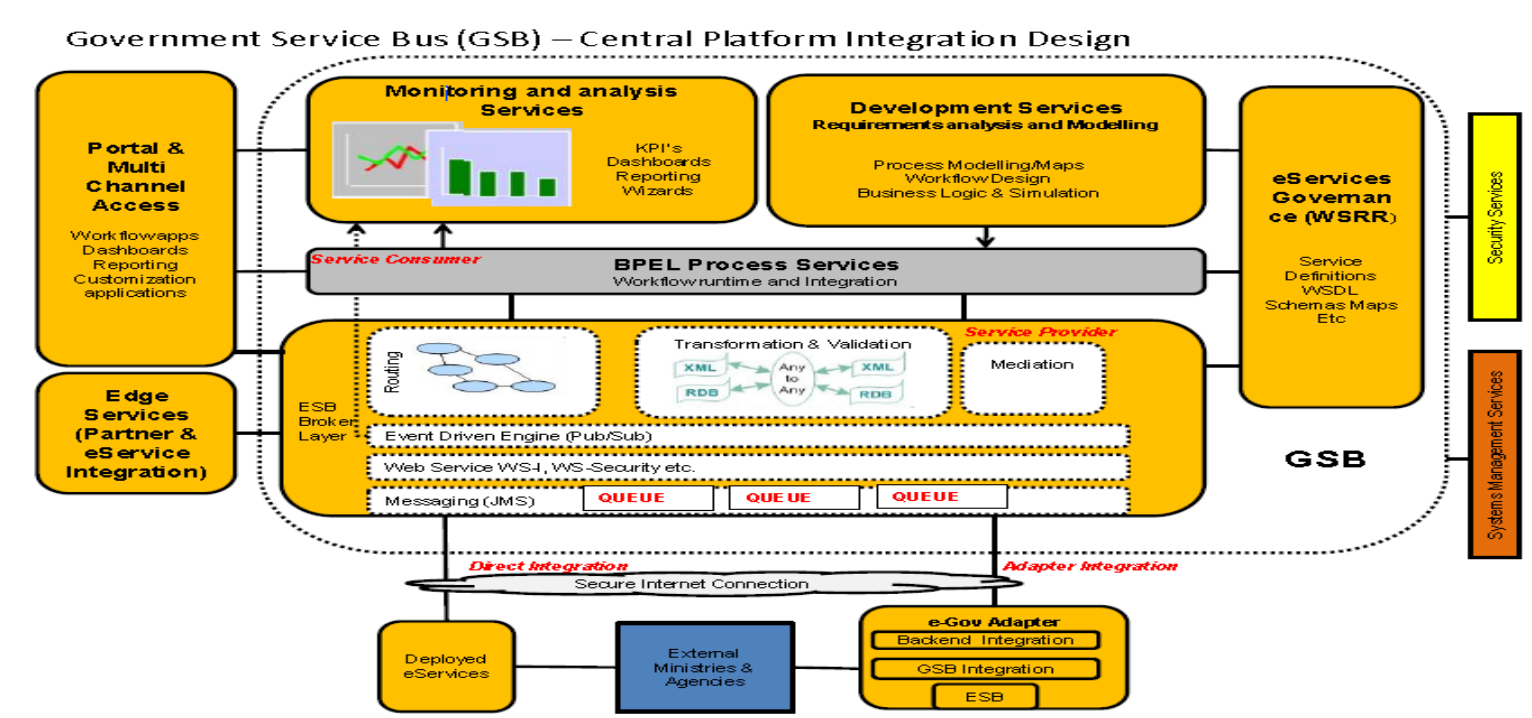
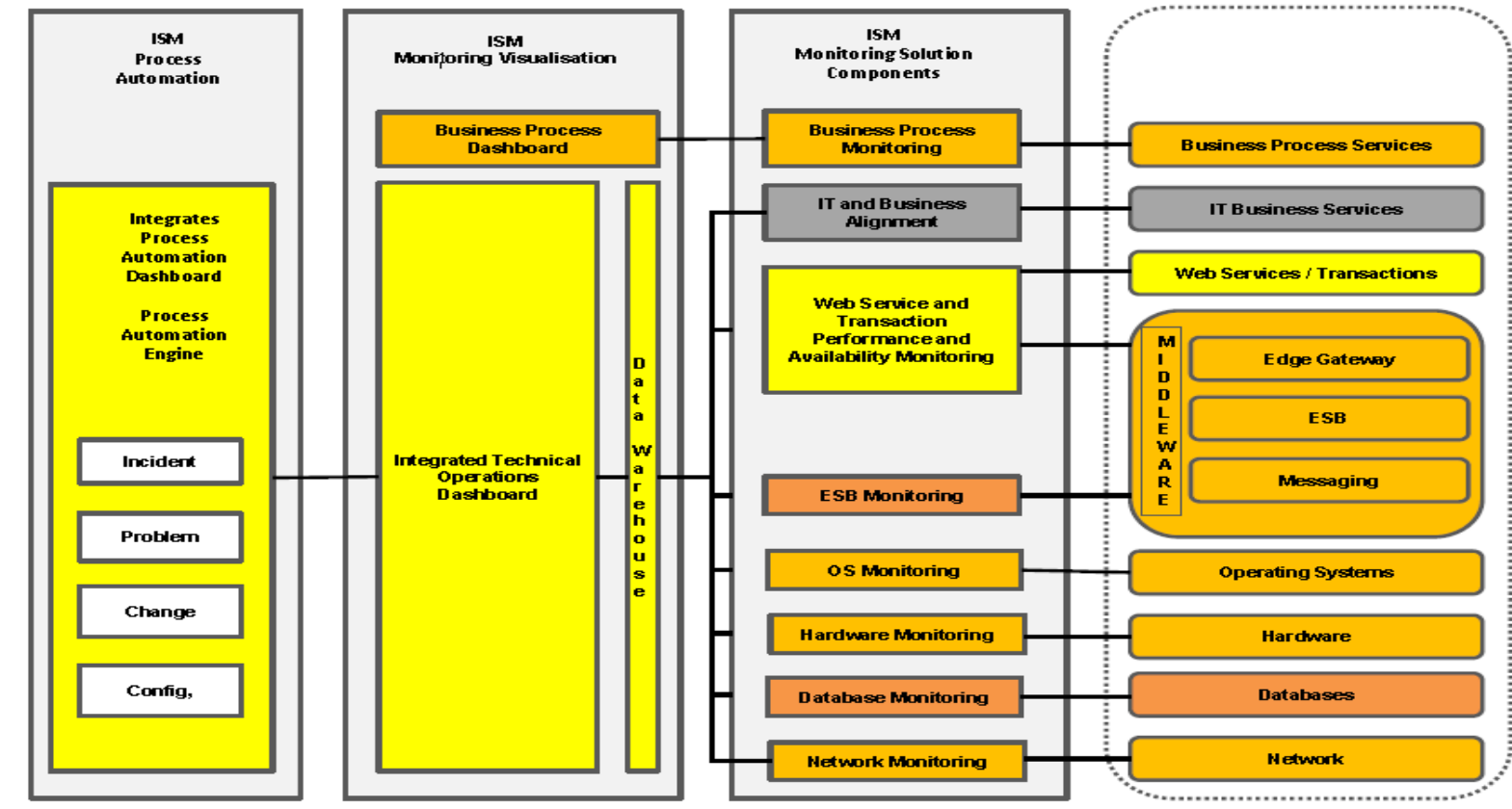


Figure 31: GSB central management platform

Specifically the management design will be as illustrated below.

GSB – Central Service Management Design



Monitoring solution specifications

The integrated solution should have the ability to carry out the following types of monitoring;

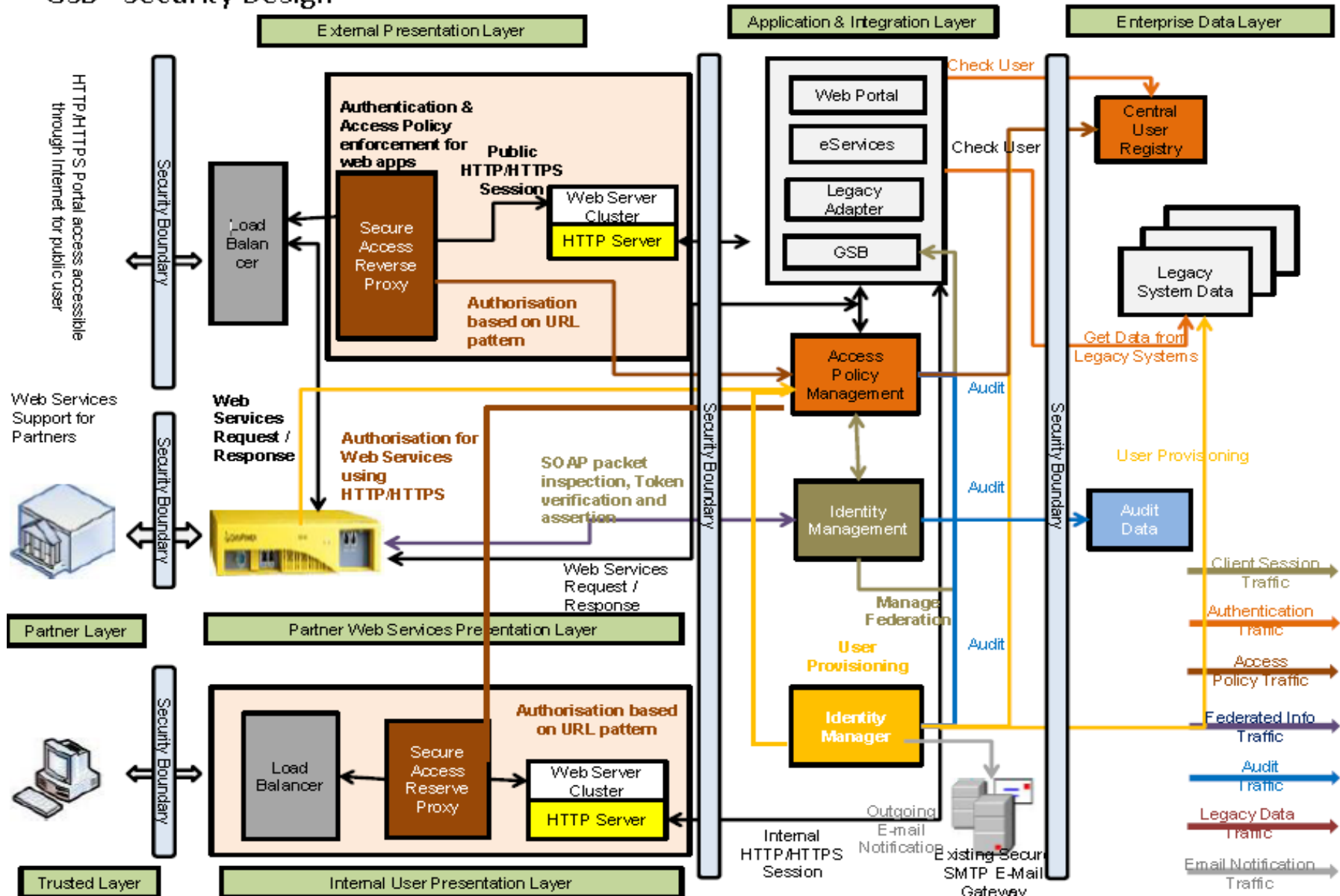
- 1) Business process monitoring
- 2) ESB (GSB) monitoring
- 3) Operating system monitoring

- 4) Hardware performance monitoring
- 5) Database monitoring
- 6) Network Monitoring

4.12.3 Technical Security Design

Based on the central security design, see below the security design for the GSB. The security specifications are in line with the proposed legal framework and the information security recommendations.

GSB –Security Design



4.12.4 E-services Security

Services will either be public or private services. Both these services will be accessed via the ESB portal or user mobile devices.

Public services will be accessed by all Ugandan Citizens and will not require any identification. All public services were identified in the descriptions of the services. If a user has not registered with NITA-U, they will only be able to access the public services.

A citizen, business or Government agency will have to register in order to use the services that have been classified as private e-services. For the initial registration for these services, users will have to register to use the e-services web portal. NITA-U will be responsible for verification of the identity of the users. Once verification of the user digital certificate is completed, NITA-U will create a user profile and give the user a username and password. A user will be required to change the password once they log on. This module operates on the assumption that the public key infrastructure will be set up and that citizens and businesses will have access to digital certificates. If a user requires transacting or receiving any e-services, their verified digital signature will be used as identification.

In the case of businesses and MDAs, each user who will access the e-services will be identified, verified and given an individual digital signature and account. All devices that will be used for the e-service will be registered to use the e-services web portal clearly identifying expected access hours.

The devices will be authenticated before the service is provided to the businesses. This will ensure that if an unauthorised device tries to access the service, or the service is accessed in non-business hours, a notification is sent to the NITA helpdesk to follow-up.

All users upon registration should only be able to access the information authorised under their profile. A user will also be required to set a password in line with the agreed password standards and they will be required to change passwords every 90 days.

NITA_U will also be responsible for explaining to the registered users the importance of maintaining these login credentials secure.

All users accessing the private services must be authenticated. Authentication is carried out in line with the Access policy and the e-service access requirements. The access policy will also define who accesses what service and user and devices provisioning. Whoever accesses the e-service must

comply with the policy. Security policy is defined at the specific e-services. Service registry is where all the services are registered including all details about the e-service.

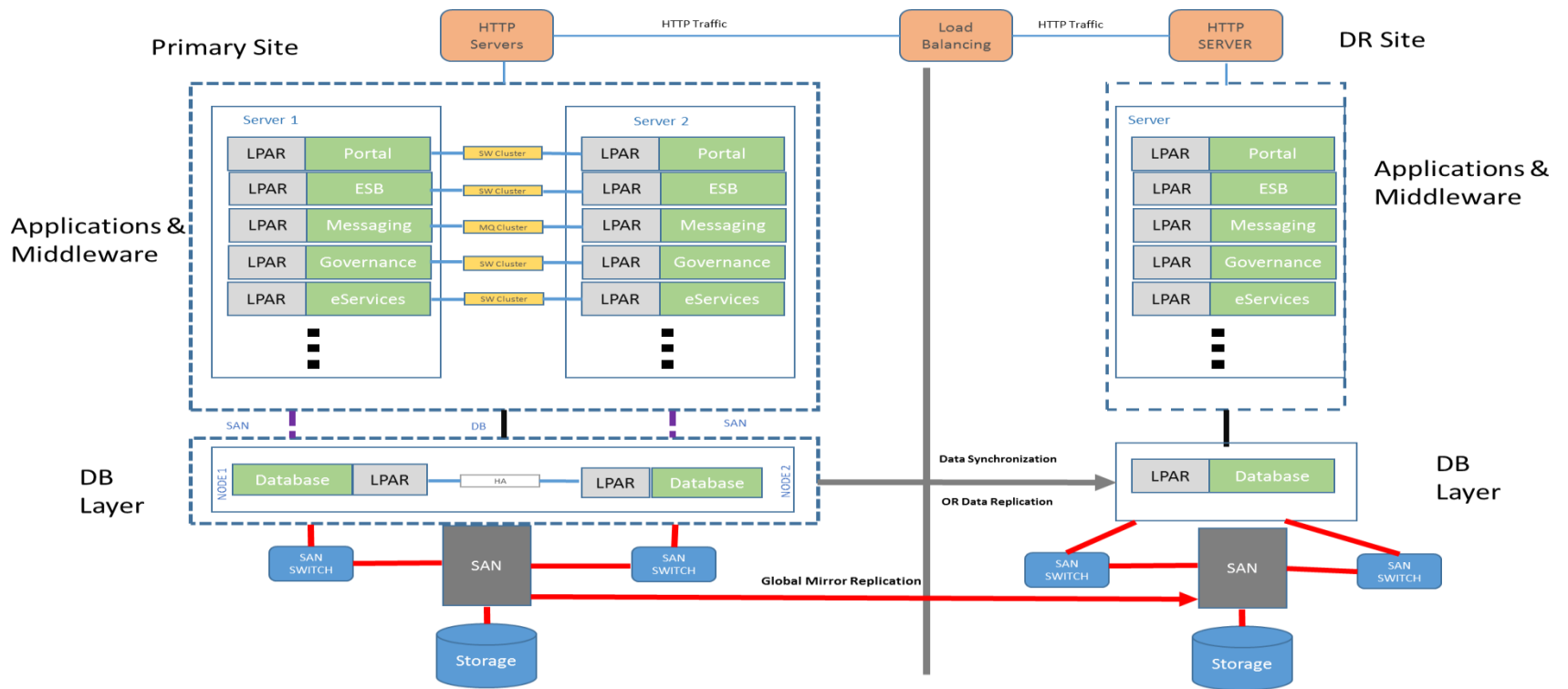
Authentication can be through the portal as well as the service bus depending on the type of access the user has. Authentication of users to access the e-services should be performed through their digital signatures.

Audit of the traffic has to be carried out and logged (identity manager, access manager). Activity logs are to be maintained for periods mentioned in the security policy.

NITA-U should implement an event management service to ensure MDAs receive notifications about services provided.

4.12.5 Disaster Recovery site Design

We noted that currently NITA-U does not have a disaster recovery site implemented. This presents a risk of unavailability of the systems in case any complete destruction this that primary site. However there are plans to implement the disaster recovery site in the next 6 months in Jinja. It's strongly recommended that the implementation of the disaster recovery site so as to the guarantee the 99.99% availability requirements. In addition, the implementation of the disaster recovery site to take into consideration the need for high availability and reliability of the GSB. The figure below shows key considerations for Disaster recovery site implementation.



4.12.6 Application programming interfaces considerations

During the Study, we observed that none of the MDAs provided information about the APIs. None of the MDAs have service enabled assets with in built API. In light of this, the vendor shall custom-develop APIs for the national system to be integrated. Such APIs should be compatible with both National system (and Database) and the Government Service Bus.

4.13 Key considerations for the data architecture

Data Architecture will be a set of rules, policies, standards and models that will be used to govern and define the type of data collected and how data will be used, stored, managed and integrated from the different MDAs to provide e-services. The Key Considerations for developing a Data Architecture include:

1. Data Governance

NITA-U will have to understand and address data management issues. NITA should consider the establishment, implementation, operation, monitoring, review and maintenance of a Data Governance framework. This will ensure that appropriate controls are in place to manage the MDA data. This framework should clearly state the ways of how to collect, share / use, report and store data as stated in legislative and other compliance obligations.

NITA-U should consider the following objectives while developing its Data Governance framework;

- ▶ NITA should consider the definition, approval levels and communication of data strategies, policies, standards, architecture, procedures and metrics.
- ▶ How to track and enforce conformance to data policies, standards, architecture and procedures. Periodic data governance audits should be enforced for all the participating MDAs and GSB with an objective to review conformance to the data policies, standards, architecture and procedures in place
- ▶ How the delivery of the data management projects and services are going to be sponsored, tracked and overseen.
- ▶ How NITA - U and stakeholders are going to manage and resolve data related issues. NITA can consider handling these issues at steering committee meetings or during smaller with the affected MDAs, businesses or citizens.

NITA - U should consider the following principles of Data Governance

Integrity: Data Governance participants should practice integrity with their dealings with each other; they should be truthful and forthcoming when discussing drivers, constraints, options and impacts for data-related decisions.

Transparency: Data Governance and Stewardship processes should exhibit transparency; it should be clear to all participants and auditors how and when data-related decisions and controls were introduced into the processes.

Auditability: Data-related decisions, processes, and controls subject to Data Governance should be auditable; they should be accompanied by documentation to support compliance-based and operational auditing requirements.

Accountability: Data Governance should define accountabilities for cross-functional data-related decisions, processes and controls.

Stewardship: Data Governance should define accountabilities for stewardship activities that are the responsibilities of individual contributors, as well as accountabilities for groups of Data Stewards.

Checks-and-Balances: Data Governance should define accountabilities in a manner that introduces checks and balances between business and technology teams as well as between those who create/collect information, those who manage it, those who use it, and those who introduce standards and compliance requirements.

Standardization: Data Governance should introduce and support standardization of enterprise data.

Change Management: Data Governance should support proactive and reactive Change Management activities for reference data values and the structure/use of the data.

2. Data Management

Data management is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets.

Nita -U should also consider the following areas during development of the data management policy

- ▶ A clear definition of which application components in the landscape will serve as the system of record or reference for integration solution master data.
- ▶ Will there be an enterprise-wide standard that all application components, including software packages, need to adopt (in the main packages can be prescriptive about the data models and may not be flexible)?
- ▶ how data entities are utilized by business functions, processes, and services
- ▶ how and where MDA data entities are stored, transported, and reported
- ▶ Level and complexity of data transformations required to support the information exchange needs between applications
- ▶ Requirements for software in supporting data integration from the MDA applications?
- ▶ Important data should be identified: Data elements for each of the MDA systems were identified as part of this study. Please see sections 4.6 and 6.9 of the report

- Data used in performing a major GSB operation.
- Data needed in reporting Data required by regulatory authorities. (NITA, UCC, MOICT, NIRA etc.)
- Data disseminated internally to NITA only or made available to MDAs, Businesses and citizens.

Data Classification: Identification and classification of the MDA's critical data should be performed by a team of senior-level representatives from each MDA. These team members must have knowledge of the relevant contributing business systems and processes, and the requirements of their respective MDAs. This process should be over seen by NITA.

Data Center Physical access Controls: NITA-U should define the standards for the physical security controls for MDA and NITA -U data centers because this is where sensitive information is processed or stored. This should be carried out with reference to Section 7.4 of the National Information Security Policy and best practices.

Data Classification: Different types of data are generated by the service provider MDAs. It is important to maintain standards with respect of metadata, data layout and data access policy. These standards should be mentioned within the National data standards policy. Data Classification criteria should be developed, adopted and implemented in order to classify data integrated and that over the Government Service Bus (GSB).

Data Access: Access management focuses on how to control who gains access to critical data. NITA - U should develop an access procedure to MDA data including who has access to databases, interfaces and data and for what purpose the access was required. Reference should also be made to Section 5.6 of the National Information Security Policy.

Since some data will have to be access to some data provided through web applications (e-service), a standard service charge structures should be developed, endorsed and approved and access requests audited by the nominated Data Protection Officer.

Table 11: Sample data access criteria for the different data classes

<i>Data classes / Data roles</i>	Restricted data				Private data				Public Data			
<i>Data Rights</i>	<i>R</i>	<i>W</i>	<i>M</i>	<i>D</i>	<i>R</i>	<i>W</i>	<i>M</i>	<i>D</i>	<i>R</i>	<i>W</i>	<i>M</i>	<i>D</i>
Data Owner												
Data Controller												
Data Administrator												
MDA queries												
Citizens												
Quality Assurance Team												

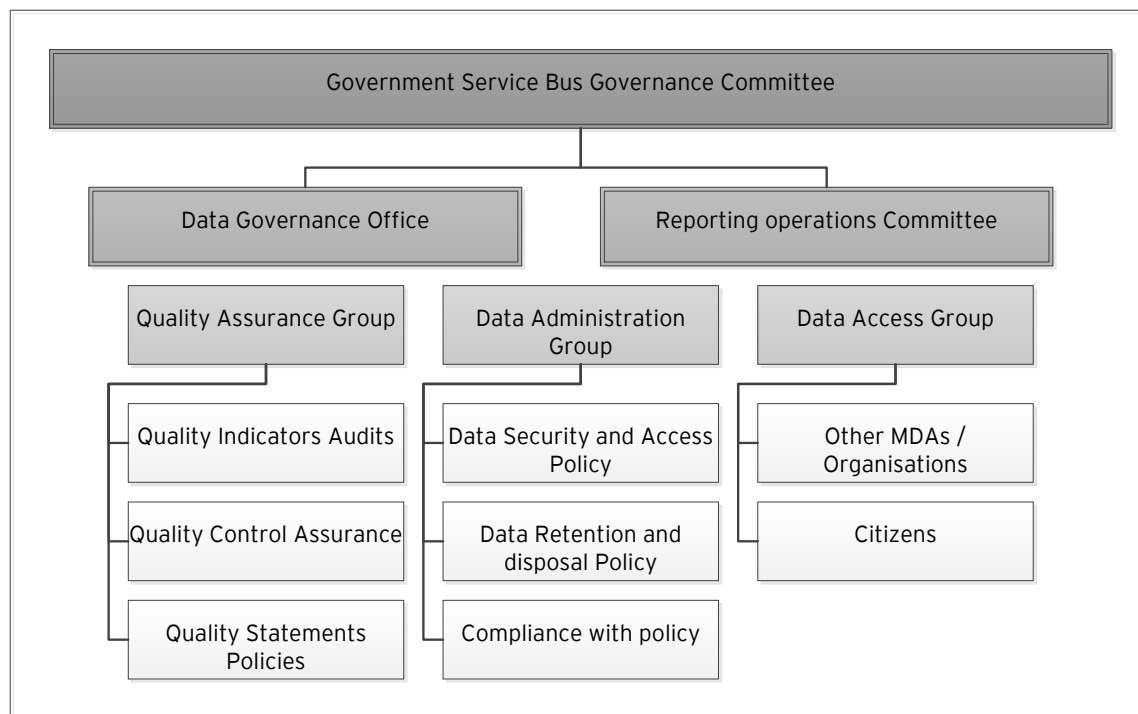
R - Read, W - Write, M - Modify, D - delete

*The Table above represents the user access matched against the types on data. NITA - U should use a table such as above to define user access to the different data classes

Data Usage: NITA-U should develop a data usage policy to ensure that data is not misused or abused, and is used ethically, according to an applicable law and with due consideration of the individual MDA / Organisation privacy. It should be noted that the use of data depends on the security levels assigned to the different users. Reference should be made to

Data Governance structure: The necessary organisational structure and standard bodies should be developed to manage data entity aspects of the GSB and the Integration. A data governance structure should be developed and adopted for the GSB for easy governance. Please find below our sample data governance structure.

Figure 32: Sample Data Governance structure



Data Governance Management System: Data management is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets. A data management system should be developed by NITA-U to ensure the plans, policies, programs and best practices are operations at the different MDAs and the GSB.

Data Governance in relation to People: Data related skills and roles needed for the GSB implementation and maintenance should be identified and specified / the resources should be acquired especially the critical skills or training should be conducted for the existing skills to meet the requirements through a well-defined program.

Data Governance Policy and Procedures: should be documented and applied which defines the processes and procedures to be followed in order to meet these Policy statements. The Data Governance Procedure should be reviewed and updated as required.

Data Integrity and Integration: Data integrity refers to the validity, reliability, and accuracy of data. Data integrity relies on a clear understanding of the

business processes underlying the data and the consistent definition of each data element.

Data integration, or the ability of data to be assimilated across information systems, is contingent upon the integrity of data and the development of a data model, corresponding data structures, and domains.

Since data elements are to be integrated across MDAs and Organisations and electronic systems, Data Integrity and integration policy should be developed to ensure that data over the GSB has a high degree of integrity since MDAs, Other Organisations and Citizens are to rely on this data for information and decision support. Appropriate controls should be applied to ensure that data remains valid, reliable and accurate.

Data inventory and ownership: All data assets should be clearly identified and an inventory of all important assets should be maintained. All data assets should be assigned a dedicated owner and steward.

Data Quality Management: NITA -U should plan, implement and control activities that apply quality management techniques to measure, assess, improve and ensure the fitness of data for use. These activities include, defining and assigning responsibilities and formal procedures should be created and followed for everyone who handles data, defining cross-functional cooperation between NITA -U and MDAs, defining data quality steps in problem realization and assessment

3. Data Protection

NITA Uganda should set its commitment to protecting MDA individual data. This should also be key in the contracts that will be signed between NITA and the service provider MDAs. National Laws governing Data Protection, Principles of data protection as stated in The Data protection and Privacy Bill, 2014, should also be considered during the development of the contracts: In addition the following should also be considered:

NITA-U should consider the following while developing its Data Protection policy;

- ▶ Should establish appropriate retention periods for MDA data at the central store.
- ▶ Should ensure that MDA data is protected over the GSB in line with the security specifications of the GSB. NITA should also ensure that they monitor and provide adequate security measures to protect MDA data over the GSB.
- ▶ Should ensure that a nominated permanent staff is responsible for data protection compliance and provides a point of contact for all data protection issues.
- ▶ Should provide adequate training for all staff handling or who have access to MDA data over the integrated solution on data protection best practices and risks.
- ▶ Should ensure that queries about data protection, from MDAs, Organisations and Citizens, is dealt with effectively and promptly. This can be

- enforced through signing contracts with the MDAs,
- ▶ Should regularly review data protection procedures and guidelines for the integrated solution.

Nita -U should consider the following areas in data protection policy

Data security: Data should remain protected and secure in accordance with the requirements of applicable legislation. These are stated in Part IV-Security of Data, of The Data protection and Privacy Bill, 2014

Data privacy and disclosure: Data should remain private and should only be disclosed to authorised parties in accordance with the requirements of applicable legislation. Privacy Impact Assessments should be conducted prior to the undertaking of any business initiative, project or act which has the potential to incur privacy risks. A formal privacy breach procedure should be applied for all suspected and actual breaches to the privacy of data. Reference should also be made to part VIII-Offence, of The Data protection and Privacy Bill, 2014.

Data compliance: Data should remain compliant with the Institute's various obligations including those specified within relevant legislation

Data availability, retention and disposal: Data should not be held for longer than is necessary. Records / Data management policy should be developed to guide on what is necessary for each kind of data. Submitted MDA Data should be reviewed periodically to check that they are accurate and up to date and determine whether retention is still necessary

Acquisition of MDA data: Guideline should be put in place for those wishing to obtain data for the different MDAs / Organisations. There should be explicit consent.

Processing of MDA data: In this context, processing is used in the narrow sense of editing, amending or querying data; MDA data should not be processed except for the purpose for which it was obtained for a similar, analogous purpose: If the new purpose is different, MDA consent must be obtained. Reference should also be made to PART V-Rights of data subjects, of The Data protection and Privacy Bill, 2014.

Review: Policies and procedures should be reviewed periodically to take account of the changes in the law and guidance issued nationally and internationally

Disciplinary consequences of the Policies: Disciplinary consequences should be developed and implemented any case of breach of the any of the policies and procedures during data protection over the GSB

4. Data Sharing

Data sharing is one of the key objectives for the integration of national databases. According to the NITA - National Information Security Policy (NISP) v1.0_0 - Information Security: section 5.4, IS3 state that; "All organisations, particularly those within / connecting to Government must require internal and external entities to show compliance with mandated NISF requirements and approved security policies before sharing or allowing connections to protected computer assets". This should be the first consideration for NITA-U during the development of the data Sharing policy.

NITA - U should develop data sharing guidelines considering the following;

- ▶ The volume, type, content and format of the final dataset.
- ▶ The standards that will be utilized for data collection and management.
- ▶ The metadata, documentation or other supporting material that should accompany the data for it to be interpreted correctly.
- ▶ The method used to share data.
- ▶ The timescale for public release of data.
- ▶ The long-term preservation plan for the dataset whether a data sharing agreement will be required.
- ▶ Any reasons why there may be restrictions on data sharing, for example, intellectual property protection and commercialization.
- ▶ Proprietary Data
- ▶ Confidentiality, ethical or consent issues that may arise with the use of data involving human subjects.

Intellectual Property Rights and Proprietary Data: Intellectual property issues or plans for commercialization that may affect data sharing should be addressed in the data sharing plan.

Standards, Metadata and Documentation: The data sharing plan or policy should include encouragement of MDAs and other organisation providing data to utilize community standards to describe and structure data; a dataset with all the necessary information describing the data and their format

Responsibilities to Data owners / data controllers and Administrators: In order to reduce the risk of fraud and misuse of data, NITA-U should ensure that all users understand their information security responsibilities. Further, responsibilities of the different data roles should be specified and clearly understood by the roles to prevent conflict and allow for segregation of incompatible duties within the logical access process. Reference should be made to Section 6.2 of the National Information Security Policy.

For example segregation of incompatible duties matrix should be developed for data access over the GSB and databases

<i>User group / Role</i>	Data Owner	Data Controllers	Data Administrators	Data Users	Quality Assurance Group
Data Entry					
Data Modification					
Data Deletion					
Grant / Modify User access					
Quality Assurance					
GSB Administration					

Note: The user groups and roles listed in the table above are not exhaustive, NITA - U should develop their own User groups and roles basing on their data requirements.

Table 12: Table showing the system user groups against the system roles

5. Data Migration

The Data Architecture should identify data migration requirements and also provide indicators as to the level of transformation, weeding, and cleansing that will be required to present data in a format that meets the requirements and constraints of the target application. EY has provided a readiness assessment checklist (section 4.8.3 of the report) that can guide NITA on key considerations.

When an existing application at the MDA is replaced, there will be a critical need to migrate data to the new application. Before migration, critical data should have been saved at the central store to ensure continuity of provision of the e-services.

4.14 Current Technology mapping

EY conducted a research to understand the current ESB technologies on the market. Currently the market has both open source and proprietary ESB technologies. The pros and cons of both and a recommendation were derived for the Government of Uganda.

Comparison Area	Proprietary technologies	Open source technologies
Functionality	High range of functionality	Not all functionality is catered for and might require support from other vendors for a complete solution.
Examples	Oracle Service Bus, IBM service Bus, Microsoft BizTalk server	WSO2 ESB, Talend ESB, Fuse ESB, Mule ESB
Management and Monitoring	Very powerful management and monitoring capabilities	Less powerful management and monitoring capabilities. Might require additional support from other vendors or tools
Support	24/7 enterprise support depending on the SLAs	24/7 enterprise support depending on the SLAs
Licensing	Licensing costs high	Licensing costs low
Implementation Cost	High	low
Flexibility	Cannot make changes to the product though the product has been developed to cater for an extensive range of services.	Can modify product based on requirements
Training	Full training courses offered, both onsite or at a certified centre.	Training is not well defined for open source technologies.

Table 13: Comparison of proprietary to open source ESB technologies

Based on the comparison above, we recommend that the Government of Uganda uses proprietary technologies. The main advantage they offer is the extensive functionality, support and scalability that the Government will require.

Based on the developed high level architectures, we mapped the components of the design to the existing technology providers in the market. The architecture was mapped against Oracle, IBM and Microsoft technologies.

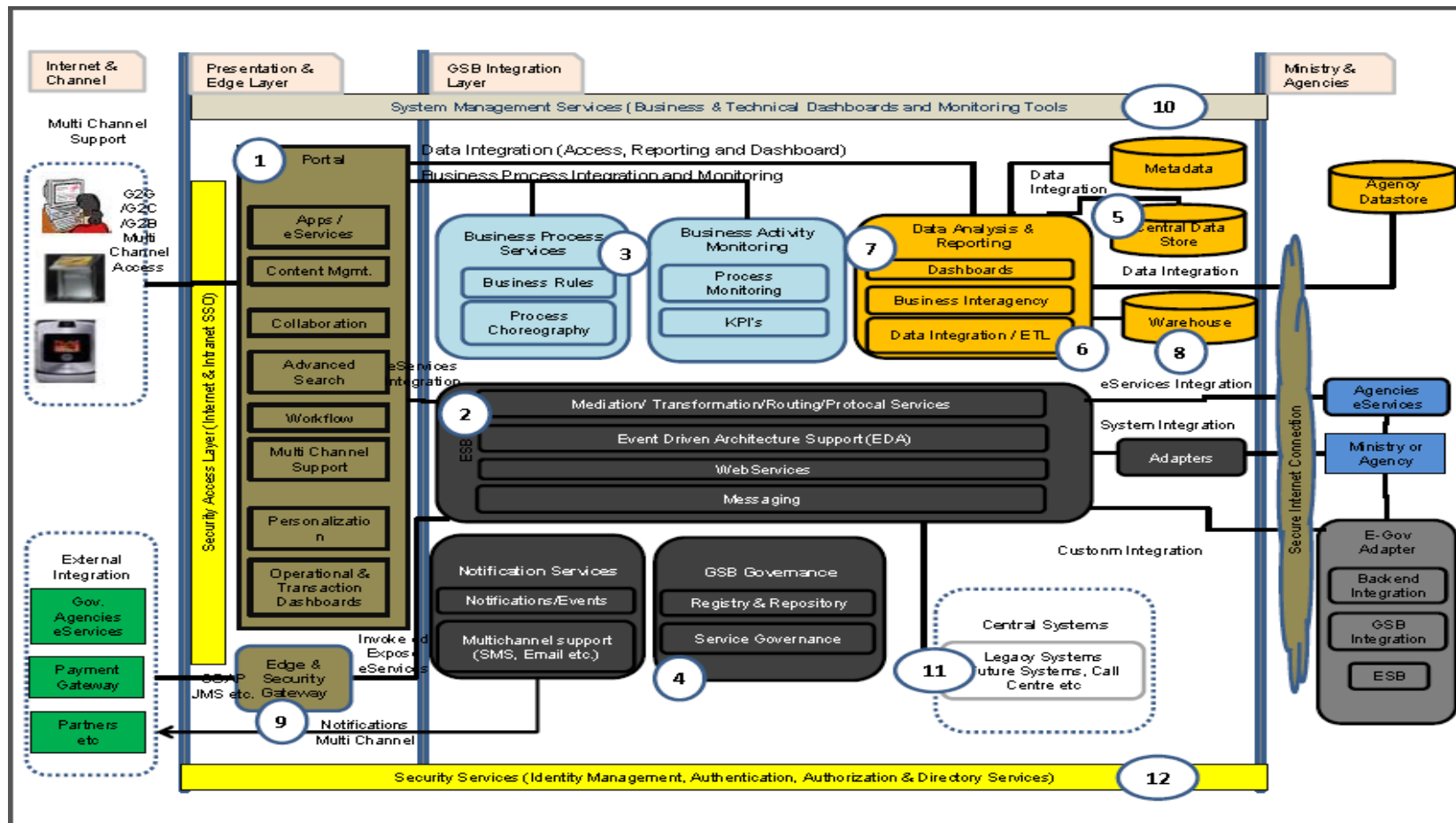


Figure 33: Product Mapping

No	IBM Technologies	Oracle Technologies	Microsoft
1	IBM WebSphere Portal	Oracle Webcenter Portal	O365 for cloud services and SharePoint Server

			2013 for on premise
2	IBM Information Broker (IIB)	Oracle SOA Suite	Azure Service Bus for cloud services and BizTalk Server for on premise services
3	IBM Business Process Manager	Oracle BPM Suite	https://msdn.microsoft.com/en-us/library/dd879258(v=bts.10).aspx
4	WebSphere WSSR	Oracle Enterprise Repository	Azure SQL Database for cloud services and SQL DB
5	Info Sphere Master Data Management	Oracle Enterprise Repository	Azure SQL Services for cloud services and SQL Server For on prem
6	InfoSphere Data Stage	Oracle Data Integrator	Azure HDInsight, Machine Learning, Stream Analytics, Data Factory, Event Hubs and SQL Server for on prem
7	Cognos Business Intelligence	Oracle BI Foundation Suite	Azure HDInsight, Machine Learning, Stream Analytics, Data Factory, Event Hubs and SQL Server for on prem
8	IBM Pure Data for Analytics	Oracle BI Foundation Suite	Azure HDInsight, Machine Learning, Stream Analytics, Data Factory, Event Hubs and SQL Server for on prem
9	IBM Data Power	Oracle API Gateway	Azure Identity & Access Management & Active Directory

10	APM , TBSM & SCCD	Oracle Enterprise Manager, (free) Management Packs	Azure Management services for cloud and System Centre Suite for on prem
11	IBM FileNet ECM (for instance)	Oracle Webcenter Content	Microsoft Dynamics CRM and need to clarify on Legacy Systems
12	IBM Identity & Access Management, Data Privacy and Data Growth, Guardium	Oracle Identity and Access Management Suite	Azure Identity & Access Management & Active Directory

Table 14: IBM and Oracle product mapping

4.15 Summarised cost Estimates

The Cost for the integrated solution will be in two components. This will be the Capital Expenditure (CAPEX) of the integrated solution and the operational expenditure (OPEX) of the solution and people managing it.

4.15.1 CAPEX requirements;

An indicative CAPEX amount equivalent to 13,721,000 USD will be required at the implementation of the ESB. This cost is inclusive of support from the vendor, hardware and software needed for both the primary and disaster recovery sites. It also includes costs for the test equipment. This cost however does not include infrastructure costs for the NITA data centre and the Business intelligence solution costs.

No	Technology Component	Total Price
	ESB Portal	1,000,000.00
	Enterprise Service Bus	2,320,000.00
	Business process Manager	230,000.00
	Identity And Access Manager	605,000.00
	Web Management suit	1,646,000.00
	Connection Adapters	280,000.00

	Database Enterprise Edition	950,000.00
	Hardware costs	3,690,000.00
	Estimated Implementation Cost (Including a support fee which is 22% of the implementation fee)	3,000,000.00
	TOTAL COST	13,721,000.00

4.15.2 OPEX requirements

We propose the following OPEX monthly budget to ensure efficient operation of the ESB.

- ▶ A head count of 10 people would suffice to manage the ESB infrastructure and communicate with stakeholders within and without. The salary scale proposed is based on Government of Uganda salary structure.
- ▶ E-services fees are based on the current fees of the services (non- e services). The fee will also include a standard fee to NITA to manage operations.
- ▶ Rental fees for the space where the service bus will be hosted will be costs to NITA-U. These include Power and Water costs. They have not been included in this costing.
- ▶ Operational costs for example allowances for steering committee member sittings. The steering committee will sit 4 times a year
- ▶ Technical staff training
- ▶ Citizen sensitization cost
- ▶ Workshops for business sensitization
- ▶ Change Management Costs

The table below shows the roles of the proposed integration team. Regardless of whether NITA-U hires new staff for these roles or use their current resources, all of these resources will require training. However if NITA-U chooses to use their current resources, they must ensure that other NITA-U operations are not disrupted.

#	Role	Description
1.	Quality Assurance team	<ul style="list-style-type: none"> ▶ Solution design and data migration review ▶ Oversee the implementation of the solution ▶ Project milestones review ▶ Health checks ▶ Service testing before and after deployment

2.	Web services application developer	<ul style="list-style-type: none"> ▶ Code web service applications ▶ Troubleshoot bugs
3.	Integration architect	<ul style="list-style-type: none"> ▶ Interface with MDAs to resolve technical issues ▶ Oversee implementation and consequent configurations/installations
4.	Data architect	<ul style="list-style-type: none"> ▶ Develop standards for naming, describing, quality, modeling, storing, cleansing, transforming, searching and delivering data ▶ Prepare data governance documentation ▶ Data analytics
5.	Business analyst	<ul style="list-style-type: none"> ▶ Business process reviews ▶ Capture and conceptualize user requirements ▶ Service definition and modelling
6.	System administrator	<ul style="list-style-type: none"> ▶ Access right management (grant or deny access, remove users) ▶ Installation of new features
7.	Information security specialist	<ul style="list-style-type: none"> ▶ Check compliance of MDAs and citizens to national information security framework ▶ Perform risk and vulnerability assessments
8.	Monitoring and performance analyst	<ul style="list-style-type: none"> ▶ Analyze data from monitoring module to ensure availability
9.	Application subject matter expert	<ul style="list-style-type: none"> ▶ In depth problem resolution
10.	Help desk	<ul style="list-style-type: none"> ▶ Monitoring architecture activities for potential issues to availability ▶ Receiving and troubleshooting queries

4.15.3 Breakdown of OPEX costs;

Technical Training cost	
Course	Cost Per day per Group(USD)
Portal	10,500
Enterprise Service Bus	30,800
Architectural fundamentals	
Gateway	
Enterprise Repository	
Business Process Management	8,800
Identity And Access Management Suite	8,800
Essentials and Administration	
Provisioning	
Web Management suite	4,400
Database Enterprise Edition	14,000
Connection Adapters	8,800
Hardware training	7,900
Total training	94,000

Table 15: Technical training costs

Change Management Costs	
Phase 1	
Item	Cost (USD)
Data preparation	90,000
Data Migration	90,000
Testing	81,000
Total	261,000
Phase 2	
Item	Cost (USD)
Data preparation	360,000
Data Migration	360,000
Testing	324,000
Total	1,044,000

Table 13: Change Management Costs

Staff salary				
Staff salary	Qty	Gross salary	Total Gross Salary	Total Annual Salary Cost
Senior Manager	1	\$ 3,448	\$ 3,448	\$ 41,379
Manager	2	\$ 2,069	\$ 4,138	\$ 49,655
Senior Officer	3	\$ 1,034	\$ 3,103	\$ 37,241
Officer	4	\$ 517	\$ 2,069	\$ 24,828
Total				\$ 153,103

Table 16: Staff Salary

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
E-verification	Ministry of Internal Affairs (MOIA)	e-customer verification	2500 per request	2,500	1,000	1,500
		Credit reference bureau	2500 per request	2,500	1,000	1,500
	Ministry of Lands, Housing and Urban Development (MoLHUD)	E-license verification	Free	No Charge	No Charge	No Charge
		Administrator General(AG)	e-land	12,500 per request	12,500	2,500
	Uganda Registration Services Bureau(URSB)	verify death and birth	Free	No Charge	No Charge	No Charge
	Uganda Investment Authority (UIA)	verify registered companies	Fee	No Charge	No Charge	No Charge
	Face Technologies-Ministry of Works and Transport	verify asset transfer	Free	No Charge	No Charge	No Charge
		verify court bailiffs	Free	No Charge	No Charge	No Charge
	Bank of Uganda	verify law advocates	Free	No Charge	No Charge	No Charge
E-registration	Kampala Capital City Authority (KCCA)	E-citie registration	Free	No Charge	No Charge	No Charge
		Registration of birth and death		7,500	2,500	5,000
	Public Procurement and Disposal of Public Assets	NSSF registration	Free	No Charge	No Charge	No Charge

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
	Authority (PPDA)	University registration	Application fees	52,500	2,500	50,000
	National Social Security Fund(NSSF)	URA TIN registration		No Charge	No Charge	No Charge
	Telecoms	Registration of companies	Application fees			
	Uganda Registration Services Bureau(URSB)	Passport Application	Application fees	87,500	2,500	85,000
		Driving License application	Application fees	68,500	2,500	66,000
		Register for PPDA				
E-Payment	Uganda Revenue Authority(URA)	Online payment for Government services		1500	750	750
	Ministry Of Public Services (MOPS)	Online payment for other e-services		1500	750	750
	Ministry Of Finance	Payment Request For Civil Servants		No Charge	No Charge	No Charge
		Online payment of service providers		No Charge	No Charge	No Charge
E-health	Ministry of health(MOH)	Update Of the National Health Database		No Charge	No Charge	No Charge
	Uganda AIDS Commission(UAC)					
	Uganda Heart Institute(UHI)	Update On Vulnerable		No Charge	No Charge	No Charge

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
		Children				
		e-child	SMS charges apply mobile message	600 - SMS	No Charge	600- SMS
		e-mum	SMS charges apply mobile message	600 - SMS	No Charge	600- SMS
		E- health Locator		No Charge	No Charge	No Charge
		e-counsellor		600 -SMS	No Charge	600 - SMS
E-education	Uganda National Examinations Board(UNEB), Ministry of Education National Council for Higher Education Universities	e-results		600	No Charge	600
		e- Candidate Registration	Registration Fees	Registration Fees + 2,500	2,500	Registration Fees
		registration of sports associations				
		Registration for student loan scheme				
E-Agriculture	National Agricultural Research Organisation National Agricultural Advisory Services (NAADS) Ministry of Agriculture Uganda National Metrology	Agricultural Research Information	SMS charges apply mobile message	600	No Charge	600
		Web access to Agricultural Information	SMS charges apply mobile message	600	No Charge	600
		Agricultural Information and	SMS charges apply mobile message	600	No Charge	600

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
	Authority	Statistics				
E- justice	Uganda Police Directorate of Public Prosecution(DPP) Judiciary Uganda Human Rights Commission(UHRC)	e- case	Case processing fees	Case processing fees	Case processing fees	Case processing fees
		e-complaint	No Charge	No Charge	No Charge	No Charge
		e-compliance	No Charge Yes	No Charge	No Charge	No Charge
		passed judgements register	No Charge	No Charge	No Charge	No Charge
		schedule for court case details	No Charge	No Charge	No Charge	No Charge
E - Pension	National Social Security Fund Ministry of Public Service Ministry of Internal Affairs Administrator General Uganda Registration Services Bureau(URSB)	E- statement	Free to contributors	No Charge	No Charge	No Charge
		E- Government Pensions	Free to pensioners	No Charge	No Charge	No Charge
E-Employ	Ministry of Public Service Ministry of Gender Labour and Social Development	E- payroll	Free	No Charge	No Charge	No Charge
		E- job	Free	No Charge	No Charge	No Charge
E- record	Law Development Centre	Online access to	Payment required	10,000	2,500	7,500

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
	Office of the Prime Minister National Planning Authority Parliament National Information Technology Authority Uganda Communications Commission	Government documents	for access to some publications			
E- GIS	Kampala Capital City Authority National Planning Authority Uganda national Roads Authority	Online access to geographic maps	Payment required for detailed maps	20,000	2,500	17,500
E-citizen	National Water and Sewage Corporation Umeme Ministry of Land Ministry of Internal Affairs Police	e- utility statements and E-citizen profile	Free	No Charge	No Charge	No Charge

E-services OPEX costs						
Aggregate E-service	Service Provider	Specific e-services	Cost implications(UGX)	Cost of e-service to consumer(UGX)	Cost to NITA side(UGX)	Cost to Provider Side(UGX)
E - Standards	Uganda National Bureau of Statistics National Drug Authority	Online verification of goods, agricultural produce and drugs	Free to check certification, payment required for access to documents	No Charge	No Charge	No Charge
E-procurement	Public Procurement and Disposal of Public Assets Authority (PPDA) Business Uganda Registration Services Bureau (URSB)	e- tender	Payment required	50,000	5,000	45,000
E- Tax	Uganda Revenue Authority	Registration for TIN , Payment of Taxes	Free	No Charge	No Charge	No Charge
		Confirmation of Tax Compliance	Free	No Charge	No Charge	No Charge
		Motor Vehicle Transfer and registration	Transfer fees	Transfer fees	Transfer fees	Transfer fees

Table 17: E-services cost

Sensitization costs			
Radio Costs	Daily * 3	Monthly (21 days)	Annually
Central Radio	\$ 100	\$ 2,100	\$ 25,200
Eastern Radio	\$ 50	\$ 1,050	\$ 12,600
Western Radio	\$ 60	\$ 1,260	\$ 15,120
Northern Radio	\$ 15	\$ 315	\$ 3,780
Total Radio Cost	\$ 225	\$ 4,725	\$ 56,700
TV costs	Prime time (60 seconds)	Monthly (21 days)	Annually
UBC TV	\$ 300	\$ 3,600	\$ 43,200
NTV	\$ 500	\$ 6,000	\$ 72,000
Bukedde TV	\$ 600	\$ 7,200	\$ 86,400
Total TV Cost		\$ 16,800	\$ 201,600
Brochures and flyers per e-service	unit cost	Quantity	Total
	\$ 0	\$ 10,000	\$ 3,000

Table 18: Sensitization costs

Allowances and workshops	Unit cost	Quantity	Total
Sitting allowance per sitting for steering committee	\$ 70	\$ 10	\$ 700
Workshops for businesses	\$ 30	\$ 100	\$ 3,000

Table 19: Allowances and Workshops

NB: These are the un-negotiated costs from the vendors for the purpose of budgeting

4.16 Expected Project risks

Key Risk	Description
<p>Definition of integrated processes and requirements that support the needs of integrated solution</p> <p>Potential Impact: Customisation & increased cost</p>	<ul style="list-style-type: none"> ▶ There is always the possibility that key requirements may not be met by the integrated solution either because they were not adequately defined during the planning phase or because the business model or processes may change in the future.
<p>Robust approach to agree common processes and minimise customisations</p> <p>Potential Impact: Increased scope & cost</p>	<ul style="list-style-type: none"> ▶ Increasing the number of standardised processes across MDAs will help to reduce the project cost and implementation risk. ▶ A 'design authority' or similar project governance forum is often made accountable for agreeing a new standardised process model, and ensuring no unnecessary customisations are embedded in the selection or design of a new system
<p>Detailed, baseline budget and plan</p> <p>Potential Impact: Under-scoping & budgeting</p>	<ul style="list-style-type: none"> ▶ A detailed, baseline budget and plan is essential to track and manage the project costs and minimise the risk of project cost over-runs
<p>Internal delivery capability and capacity</p> <p>Potential Impact: Scope creep and cost change</p>	<ul style="list-style-type: none"> ▶ External resources will be required to support the limited internal delivery capability and capacity at NITA-U ▶ Identification of key resource gaps early in the project will assist in securing the appropriate external support, whether via external delivery partners, individual contractors, redeployment of existing staff or new staff hires ▶ Assessment processes around key project staff are critical to sourcing process
<p>Vendor/partner engagement model</p>	<ul style="list-style-type: none"> ▶ A mix of both time-and-material (especially during early and support phases) and fixed price (for well defined, software and deliverable development activities) contracts can be suitable in new systems projects
<p>Change readiness</p> <p>Potential Impact: Disengaged users & unrealised benefits</p>	<ul style="list-style-type: none"> ▶ Alignment of people and processes across the various MDAs is essential to project success ▶ A focus on a clearly communicated case for change, and role and individual impact readiness and stakeholder management ensures MDAs are ready to accept the integrated solution and new systems where they did not have to achieve planned benefits ▶ The introduction of the integrated solution will change the way people at MDAs and NITA work, it is therefore critical that sufficient effort is dedicated to change management, training and user-readiness to increase solution acceptance and the chances of success post-implementation.
<p>Robust, ongoing quality assurance approach</p> <p>Potential Impact: Early</p>	<ul style="list-style-type: none"> ▶ A robust quality assurance approach is essential to ensuring that the project does not deviate from schedule or budget and that a high quality outcome is delivered for the business. ▶ Typical assurance approaches look four areas:

mitigation of high impact risks	<ul style="list-style-type: none">○ Is the MDA appropriately engaged and will the proposed change support the desired business outcomes?○ Are risks identified and managed to ensure business outcomes? Are deliverables of appropriate quality and do they have business acceptance?○ Are the delivery areas appropriately planned, designed and executed to achieve business outcomes?○ Have benefits been defined, are they being tracked and will they be sustainable?
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5 Implementation Roadmap



5.1 The Implementation Road Map

Based on the priority e-services and the proposed integration design, EY recommends that NITA adopts the road map in figure 34 and 35 to implement the GSB and the e-services. The diagram below represents a summary of the steps to be taken and their recommended sequence.

5.1.1 Plan assumptions

- ▶ Total project months are 60 (5 years).
- ▶ Each month has 20 working days
- ▶ Phase one is 18 months
 - Procurement will take 6 months
 - Implementation of the quick win e-services and implementation of the primary site ESB components will take 12 months
- ▶ Phase two is 36 months
 - Remaining top priority e-services will be implemented as part of this phase.
- ▶ Phase three is 6 months and this is the post implementation review phase
- ▶ Public Key Infrastructure will have been implemented
- ▶ Engagement of the providers starts immediately the phase starts.
- ▶ The procured solution provider will be in charge of implantation of phases one and two as well as hardware installations, training and support. This will ensure;
 - Economies of scale
 - Time saving. No repeated procurements and re-understanding of the environment.
 - Specific training in line with the procured solution to make the administrators even more effective during operations.

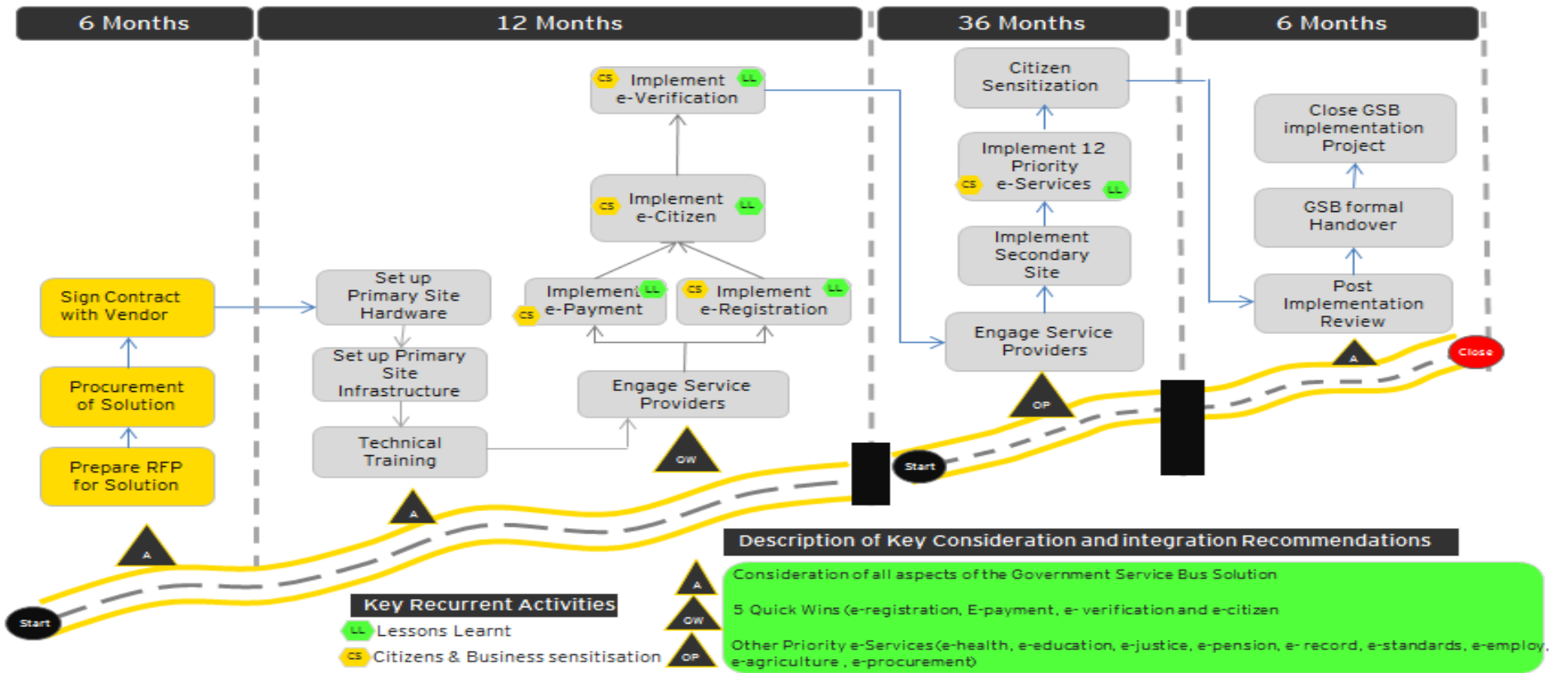


Figure 34: High Level Implementation Road Map

5.2 The Road Map: From "As-Is" state to "To-Be" state

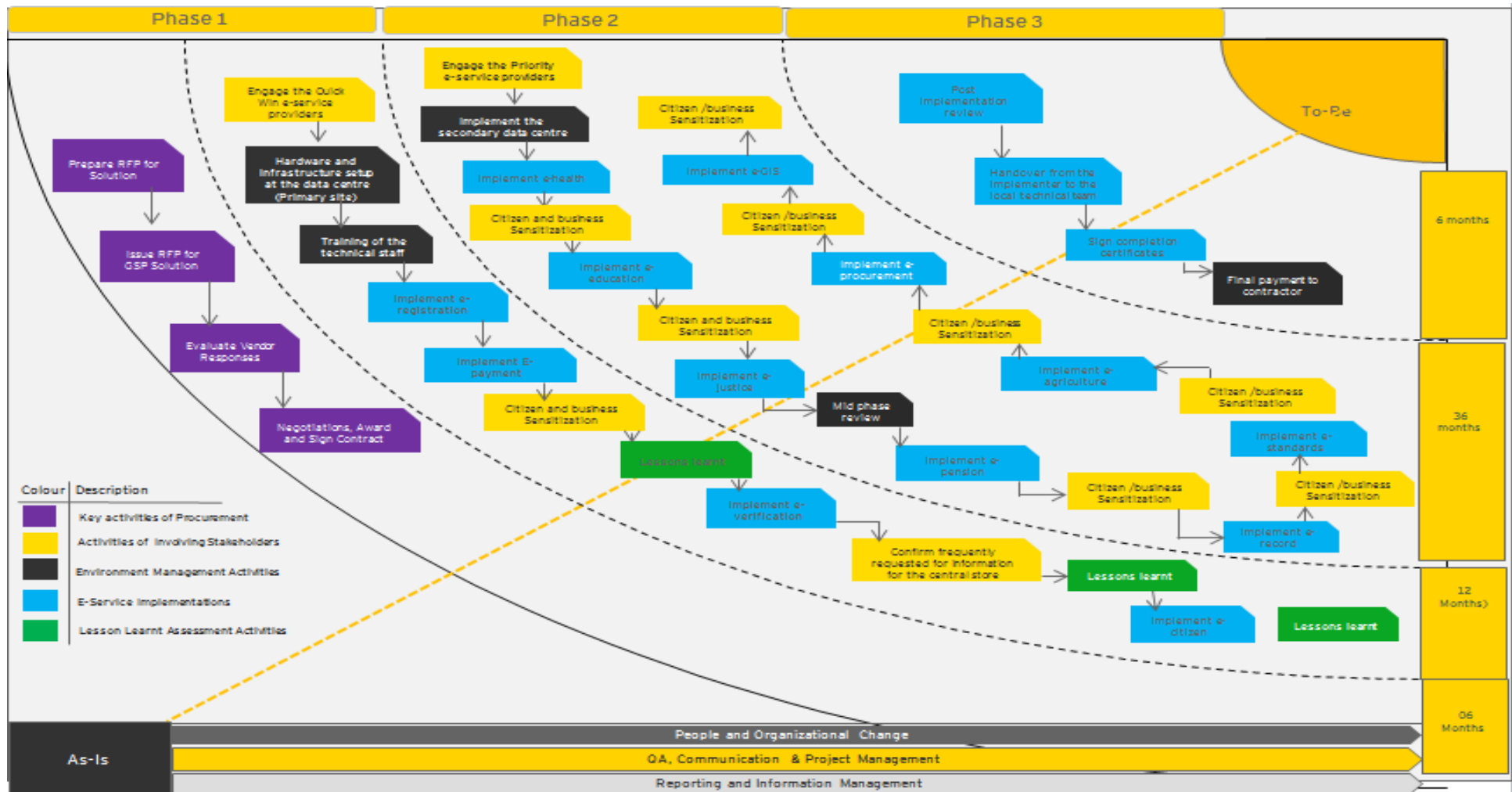


Figure 35: As is to Be Roadmap

5.3 Detailed Baseline Implementation plan

Based on the proposed design, the implementation plan below will be followed. It has been developed based on the proposed phases;

Task Name	Duration	Start	Finish	Predecessors
Implementation of the integrated solution	1022 days	Thu 01/10/15	Mon 21/10/19	
PHASE ONE	352 days	Thu 01/10/15	Tue 21/02/17	
Procurement of solution provider	92 days	Thu 01/10/15	Thu 11/02/16	
Finalization of the bid documents and RFP advertisement	30 days	Thu 01/10/15	Thu 12/11/15	
Pre-Bid meeting	1 day	Fri 13/11/15	Fri 13/11/15	4
Current Data center review as part of the pre bid exercises	1 day	Fri 13/11/15	Fri 13/11/15	5SS
Bidders responding to RFP	45 days	Mon 16/11/15	Tue 19/01/16	6
Receiving of the proposals	1 day	Mon 16/11/15	Mon 16/11/15	6
Evaluation of the bids including key reference sites evaluation	60 days	Tue 17/11/15	Thu 11/02/16	8
Contracting of the solution provider	30 days	Fri 12/02/16	Tue 29/03/16	
Contract negotiations and Final requirements analysis and scoping.	20 days	Fri 12/02/16	Fri 11/03/16	9
Contract signing and payment of initial setup fees	10 days	Mon 14/03/16	Tue 29/03/16	11
Engage the Quick Win e-service providers	60 days	Fri 12/02/16	Tue 10/05/16	
Detailed on-boarding of all senior management at quick win Provider MDAs	20 days	Fri 12/02/16	Fri 11/03/16	11SS
Business process re-engineering and system development for MDAs without systems	60 days	Fri 12/02/16	Tue 10/05/16	14SS
Agreement on the implementation timelines, data exchange formats, costing and infrastructure setup	30 days	Fri 12/02/16	Tue 29/03/16	14SS
Signing of the SLAS with quick win providers	30 days	Wed 30/03/16	Tue 10/05/16	16
Initial payment for hardware purchase and shipping	21 days	Fri 12/02/16	Mon 14/03/16	14SS
Hardware and infrastructure setup at the data center (Primary site)	65 days	Wed 30/03/16	Fri 01/07/16	
Server setup in the data center	15 days	Wed 30/03/16	Tue 19/04/16	12
Implementation of the Government Service Bus(GSB)	30 days	Wed 20/04/16	Tue 31/05/16	20
Implementation of the GSB governance component	5 days	Wed 01/06/16	Wed 08/06/16	21
Implementation of the GSB Business Process services and the	10 days	Fri 10/06/16	Thu 23/06/16	22

Business Activity monitoring components				
Implementation of the GSB notification services	5 days	Fri 10/06/16	Thu 16/06/16	23SS
Implementation of the GSB data analysis and reporting services	5 days	Fri 10/06/16	Thu 16/06/16	23SS
Implementation of the GSB security services	10 days	Fri 10/06/16	Thu 23/06/16	23SS
Implementation of the GSB system management services.	2 days	Fri 10/06/16	Mon 13/06/16	23SS
Implementation (Upgrade or re development) of the government services portal	20 days	Wed 01/06/16	Fri 01/07/16	21
Training of the technical staff	35 days	Mon 04/07/16	Fri 19/08/16	
ESB and portal training	15 days	Mon 04/07/16	Fri 22/07/16	28
ESB monitoring, management and security	20 days	Mon 25/07/16	Fri 19/08/16	30
Implement e-registration	110 days	Mon 22/08/16	Mon 23/01/17	
Physical registration for e-services at NITA-U	30 days	Mon 22/08/16	Mon 03/10/16	31
Deploy e-registration service for use on portal	70 days	Tue 04/10/16	Mon 09/01/17	
Registration of birth and death module	10 days	Tue 04/10/16	Mon 17/10/16	33
Passport Application Module	20 days	Tue 18/10/16	Mon 14/11/16	35
Driving License application Module	10 days	Tue 04/10/16	Mon 17/10/16	35SS
NSSF registration Module	20 days	Tue 04/10/16	Mon 31/10/16	35SS
University registration Module	20 days	Tue 04/10/16	Mon 31/10/16	35SS
e- doctor registration	20 days	Tue 18/10/16	Mon 14/11/16	37
Register for PPDA	10 days	Tue 04/10/16	Mon 17/10/16	35SS
Registration for investment licenses	15 days	Tue 18/10/16	Mon 07/11/16	41
e-citie registration	10 days	Tue 04/10/16	Mon 17/10/16	35SS
URA TIN registration	20 days	Tue 18/10/16	Mon 14/11/16	43
Registration of companies	20 days	Tue 18/10/16	Mon 14/11/16	44SS
Sim card registration	40 days	Tue 15/11/16	Mon 09/01/17	45
Launch e-registration	1 day	Tue 10/01/17	Tue 10/01/17	46
Citizen and business Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 10/01/17	Mon 23/01/17	47SS
Implement E-payment	30 days	Tue 10/01/17	Tue 21/02/17	
Implement Online payment of Government services	20 days	Tue 10/01/17	Tue 07/02/17	46
Implement Online payment for other e-services	20 days	Tue 10/01/17	Tue 07/02/17	50SS

Implement payment of government services	20 days	Tue 10/01/17	Tue 07/02/17	50SS
Implement Payment request for civil servants	20 days	Tue 10/01/17	Tue 07/02/17	50SS
Implement Online payment of service providers	21 days	Tue 10/01/17	Tue 07/02/17	50SS
Citizen and business Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 08/02/17	Tue 21/02/17	55SS
Lessons learnt	6 days	Thu 01/10/15	Thu 08/10/15	
Conduct a lessons learnt session with the implementer, steering committee ,business and citizen representatives	1 day	Thu 01/10/15	Thu 01/10/15	
Make adjustments to the deployment process for the next e-service	5 days	Fri 02/10/15	Thu 08/10/15	58
Implement e- verification	80 days	Mon 12/10/15	Wed 03/02/16	
Business engagement e.g. banks and Telecoms through workshop	10 days	Mon 12/10/15	Fri 23/10/15	59
Deploy e-verification service to MDAs and citizens	70 days	Mon 26/10/15	Wed 03/02/16	
e-client verification(businesses and MDAs)	20 days	Mon 26/10/15	Fri 20/11/15	61
e-land	30 days	Mon 26/10/15	Fri 04/12/15	63SS
e-birth and death verification	30 days	Mon 26/10/15	Fri 04/12/15	63SS
e- doctor verification	40 days	Mon 26/10/15	Fri 18/12/15	63SS
verify asset transfer	15 days	Mon 21/12/15	Tue 12/01/16	66
verify court bailiffs	10 days	Mon 21/12/15	Tue 05/01/16	67SS
verify law advocates	10 days	Mon 21/12/15	Tue 05/01/16	67SS
e- license verification	30 days	Mon 21/12/15	Wed 03/02/16	67SS
Implement e-tax additional features	30 days	Mon 26/10/15	Fri 04/12/15	63SS
credit reference verification	60 days	Mon 26/10/15	Tue 19/01/16	63SS
Implement e-payment for verification services	40 days	Mon 26/10/15	Fri 18/12/15	63SS
Launch e-verification and e-tax	1 day	Mon 21/12/15	Mon 21/12/15	73
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	6 days	Mon 21/12/15	Tue 29/12/15	74SS
Confirm frequently requested information for the central store	10 days	Wed 30/12/15	Wed 13/01/16	
Confirm frequently requested information for the central store	10 days	Wed 30/12/15	Wed 13/01/16	75
Lessons learnt	20 days	Thu 14/01/16	Thu 11/02/16	

Conduct a lessons learnt session with the implementer, steering committee ,business and citizen representatives	10 days	Thu 14/01/16	Thu 28/01/16	77
Make adjustments to the deployment process for the next e-service	10 days	Fri 29/01/16	Thu 11/02/16	79
Implement e-citizen	60 days	Fri 12/02/16	Tue 10/05/16	
Deploy e-citizen service to citizens.	50 days	Fri 12/02/16	Tue 26/04/16	
E-profile implementation	40 days	Fri 12/02/16	Tue 12/04/16	80
E-utilities implementation	50 days	Fri 12/02/16	Tue 26/04/16	80
Launch e-citizen service	1 day	Wed 27/04/16	Wed 27/04/16	84
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 27/04/16	Tue 10/05/16	85SS
Phase closeout	30 days	Wed 11/05/16	Thu 23/06/16	
ESB usage and benefits analysis	10 days	Wed 11/05/16	Tue 24/05/16	86
Sign completion certificates and Phase payment	20 days	Wed 25/05/16	Thu 23/06/16	88
PHASE TWO	720 days	Fri 24/06/16	Thu 02/05/19	89
Engage the Priority e-service providers	80 days	Fri 24/06/16	Mon 17/10/16	
Detailed on-boarding of all senior management at priority Provider MDAs	20 days	Fri 24/06/16	Fri 22/07/16	89
Engage telecom companies to understand requirements for mobile based services and costs	20 days	Mon 25/07/16	Fri 19/08/16	92
Agreement on the implementation timelines, data exchange formats, costing and infrastructure setup	20 days	Mon 25/07/16	Fri 19/08/16	92
Business process re-engineering and system development for MDAs without systems	40 days	Mon 25/07/16	Mon 19/09/16	92
Signing SLAs with priority service providers	20 days	Tue 20/09/16	Mon 17/10/16	95
Implement the secondary data center	60 days	Fri 24/06/16	Mon 19/09/16	
Implementation of ESB and components at a selected disaster recovery site.	45 days	Fri 24/06/16	Fri 26/08/16	89
Testing of switch over of quick win e-services between the primary and secondary sites	15 days	Mon 29/08/16	Mon 19/09/16	98
Agreement on which data center will support which e-services.	10 days	Mon 29/08/16	Fri 09/09/16	99SS
Implement e-health	90 days	Mon 12/09/16	Mon 16/01/17	
Implement Update Of the National Health Database	20 days	Mon 12/09/16	Mon 10/10/16	100

Implement Update On Vulnerable Children	20 days	Mon 12/09/16	Mon 10/10/16	102SS
E- health Locator	20 days	Mon 12/09/16	Mon 10/10/16	102SS
Software development	60 days	Mon 12/09/16	Mon 05/12/16	102SS
Implement e-mum	20 days	Tue 06/12/16	Mon 02/01/17	105
Implement e-child	20 days	Tue 06/12/16	Mon 02/01/17	105
Implement e-counsellor	20 days	Tue 06/12/16	Mon 02/01/17	105
Launch e-health	1 day	Tue 03/01/17	Tue 03/01/17	108
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 03/01/17	Mon 16/01/17	109SS
Implement e-education	90 days	Tue 03/01/17	Mon 15/05/17	
Implement e-results	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement e-candidate registration	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement e-learning	20 days	Tue 03/01/17	Tue 31/01/17	108
Software Development	60 days	Tue 03/01/17	Wed 29/03/17	108
Implement Registration for student loan scheme module	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement Registration of sports associations module	20 days	Thu 30/03/17	Fri 28/04/17	115
Launch e-education	1 day	Tue 02/05/17	Tue 02/05/17	117
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 02/05/17	Mon 15/05/17	118SS
Implement e-justice	60 days	Tue 02/05/17	Wed 26/07/17	
Implement e-case	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement Schedule for court case details module	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement e-complaint	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement e-compliance	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement Passed judgements module	50 days	Tue 02/05/17	Wed 12/07/17	117
Launch e-justice	1 day	Thu 13/07/17	Thu 13/07/17	125
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Thu 13/07/17	Wed 26/07/17	126SS
Mid phase review	40 days	Thu 27/07/17	Wed 20/09/17	
E-services benefits & technical implementation review	40 days	Thu 27/07/17	Wed 20/09/17	127
Phase lessons learnt workshop	5 days	Thu 27/07/17	Wed 02/08/17	129SS
Implement e-pension	60 days	Thu 03/08/17	Thu 26/10/17	

Implement e-Government Pensions	50 days	Thu 03/08/17	Thu 12/10/17	130
Implement e-statement	50 days	Thu 03/08/17	Thu 12/10/17	130
Launch e-pension	1 day	Fri 13/10/17	Fri 13/10/17	133
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Fri 13/10/17	Thu 26/10/17	134SS
Implement e- record	30 days	Fri 13/10/17	Thu 23/11/17	
Implement Online access to government documents	20 days	Fri 13/10/17	Thu 09/11/17	133
Launch e-record	1 day	Fri 10/11/17	Fri 10/11/17	137
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Fri 10/11/17	Thu 23/11/17	138SS
Implement e-standards	60 days	Fri 10/11/17	Tue 06/02/18	
Implement Online access and verification of goods, agricultural produce and drugs	50 days	Fri 10/11/17	Mon 22/01/18	137
Launch e-standards	1 day	Tue 23/01/18	Tue 23/01/18	141
Sensitization for the MDAs through day training	10 days	Tue 23/01/18	Tue 06/02/18	142SS
Implement e-employ	100 days	Tue 23/01/18	Wed 20/06/18	
Software development	60 days	Tue 23/01/18	Mon 23/04/18	141
Implement e-payroll	30 days	Tue 24/04/18	Tue 05/06/18	145
Implement e-job	30 days	Tue 24/04/18	Tue 05/06/18	145
Launch e-employ	1 day	Wed 06/06/18	Wed 06/06/18	147
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 06/06/18	Wed 20/06/18	148SS
Implement e-agriculture	110 days	Wed 06/06/18	Fri 09/11/18	
Software development	60 days	Wed 06/06/18	Thu 30/08/18	147
Implement Online access to Agricultural Research Information	30 days	Fri 31/08/18	Fri 12/10/18	151
Implement Web access to Agricultural Information	30 days	Fri 31/08/18	Fri 12/10/18	151
Implement Access to Agriculture information and statistics	30 days	Fri 31/08/18	Fri 12/10/18	151
Launch e-agriculture	1 day	Mon 15/10/18	Mon 15/10/18	154
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	20 days	Mon 15/10/18	Fri 09/11/18	155SS
Implement e-procurement	50 days	Mon 15/10/18	Fri 21/12/18	
Implement e-tender	40 days	Mon 15/10/18	Fri 07/12/18	154

Launch e-procurement	1 day	Mon 10/12/18	Mon 10/12/18	158
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Mon 10/12/18	Fri 21/12/18	159SS
Implement e-tax	30 days	Mon 10/12/18	Tue 22/01/19	
Implement Registration for TIN and payment of taxes module	20 days	Mon 10/12/18	Tue 08/01/19	158
Implement Confirmation of tax compliance module	20 days	Mon 10/12/18	Tue 08/01/19	158
Implement Motor vehicle transfer and registration module	20 days	Mon 10/12/18	Tue 08/01/19	158
Launch e-procurement	1 day	Wed 09/01/19	Wed 09/01/19	164
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 09/01/19	Tue 22/01/19	165SS
Implement e-GIS	50 days	Wed 09/01/19	Wed 20/03/19	
Implement Online access to geographic maps	40 days	Wed 09/01/19	Tue 05/03/19	164
Launch e-GIS	1 day	Wed 06/03/19	Wed 06/03/19	168
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 06/03/19	Wed 20/03/19	169SS
Phase closeout	30 days	Thu 21/03/19	Thu 02/05/19	
ESB usage and benefits analysis	10 days	Thu 21/03/19	Wed 03/04/19	170
Sign completion certificates and Phase payment	20 days	Thu 04/04/19	Thu 02/05/19	172
PHASE THREE	120 days	Fri 03/05/19	Mon 21/10/19	173
Post Implementation review	80 days	Fri 03/05/19	Fri 23/08/19	173
Handover from the implementer to the local technical team	15 days	Mon 26/08/19	Fri 13/09/19	175
Project close	25 days	Mon 16/09/19	Mon 21/10/19	176
Sign completion certificates	5 days	Mon 16/09/19	Fri 20/09/19	176
Final payment to contractor	20 days	Mon 23/09/19	Mon 21/10/19	178

Task Name	Duration	Start	Finish	Predecessors
Implementation of the integrated solution	1022 days	Thu 01/10/15	Mon 21/10/19	
PHASE ONE	352 days	Thu 01/10/15	Tue 21/02/17	
Procurement of solution provider	92 days	Thu 01/10/15	Thu 11/02/16	
Finalization of the bid documents and RFP advertisement	30 days	Thu 01/10/15	Thu 12/11/15	
Pre-Bid meeting	1 day	Fri 13/11/15	Fri 13/11/15	4

Current Data center review as part of the pre bid exercises	1 day	Fri 13/11/15	Fri 13/11/15	5SS
Bidders responding to RFP	45 days	Mon 16/11/15	Tue 19/01/16	6
Receiving of the proposals	1 day	Mon 16/11/15	Mon 16/11/15	6
Evaluation of the bids including key reference sites evaluation	60 days	Tue 17/11/15	Thu 11/02/16	8
Contracting of the solution provider	30 days	Fri 12/02/16	Tue 29/03/16	
Contract negotiations and Final requirements analysis and scoping.	20 days	Fri 12/02/16	Fri 11/03/16	9
Contract signing and payment of initial setup fees	10 days	Mon 14/03/16	Tue 29/03/16	11
Engage the Quick Win e-service providers	60 days	Fri 12/02/16	Tue 10/05/16	
Detailed on-boarding of all senior management at quick win Provider MDAs	20 days	Fri 12/02/16	Fri 11/03/16	11SS
Business process re-engineering and system development for MDAs without systems	60 days	Fri 12/02/16	Tue 10/05/16	14SS
Agreement on the implementation timelines, data exchange formats, costing and infrastructure setup	30 days	Fri 12/02/16	Tue 29/03/16	14SS
Signing of the SLAS with quick win providers	30 days	Wed 30/03/16	Tue 10/05/16	16
Initial payment for hardware purchase and shipping	21 days	Fri 12/02/16	Mon 14/03/16	14SS
Hardware and infrastructure setup at the data center (Primary site)	65 days	Wed 30/03/16	Fri 01/07/16	
Server setup in the data center	15 days	Wed 30/03/16	Tue 19/04/16	12
Implementation of the Government Service Bus(GSB)	30 days	Wed 20/04/16	Tue 31/05/16	20
Implementation of the GSB governance component	5 days	Wed 01/06/16	Wed 08/06/16	21
Implementation of the GSB Business Process services and the Business Activity monitoring components	10 days	Fri 10/06/16	Thu 23/06/16	22
Implementation of the GSB notification services	5 days	Fri 10/06/16	Thu 16/06/16	23SS
Implementation of the GSB data analysis and reporting services	5 days	Fri 10/06/16	Thu 16/06/16	23SS
Implementation of the GSB security services	10 days	Fri 10/06/16	Thu 23/06/16	23SS
Implementation of the GSB system management services.	2 days	Fri 10/06/16	Mon 13/06/16	23SS
Implementation (Upgrade or re development) of the government services portal	20 days	Wed 01/06/16	Fri 01/07/16	21
Training of the technical staff	35 days	Mon 04/07/16	Fri 19/08/16	
ESB and portal training	15 days	Mon 04/07/16	Fri 22/07/16	28

ESB monitoring, management and security	20 days	Mon 25/07/16	Fri 19/08/16	30
Implement e-registration	110 days	Mon 22/08/16	Mon 23/01/17	
Physical registration for e-services at NITA-U	30 days	Mon 22/08/16	Mon 03/10/16	31
Deploy e-registration service for use on portal	70 days	Tue 04/10/16	Mon 09/01/17	
Registration of birth and death module	10 days	Tue 04/10/16	Mon 17/10/16	33
Passport Application Module	20 days	Tue 18/10/16	Mon 14/11/16	35
Driving License application Module	10 days	Tue 04/10/16	Mon 17/10/16	35SS
NSSF registration Module	20 days	Tue 04/10/16	Mon 31/10/16	35SS
University registration Module	20 days	Tue 04/10/16	Mon 31/10/16	35SS
e- doctor registration	20 days	Tue 18/10/16	Mon 14/11/16	37
Register for PPDA	10 days	Tue 04/10/16	Mon 17/10/16	35SS
Registration for investment licenses	15 days	Tue 18/10/16	Mon 07/11/16	41
e-citie registration	10 days	Tue 04/10/16	Mon 17/10/16	35SS
URA TIN registration	20 days	Tue 18/10/16	Mon 14/11/16	43
Registration of companies	20 days	Tue 18/10/16	Mon 14/11/16	44SS
Sim card registration	40 days	Tue 15/11/16	Mon 09/01/17	45
Launch e-registration	1 day	Tue 10/01/17	Tue 10/01/17	46
Citizen and business Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 10/01/17	Mon 23/01/17	47SS
Implement E-payment	30 days	Tue 10/01/17	Tue 21/02/17	
Implement Online payment of Government services	20 days	Tue 10/01/17	Tue 07/02/17	46
Implement Online payment for other e-services	20 days	Tue 10/01/17	Tue 07/02/17	50SS
Implement payment of government services	20 days	Tue 10/01/17	Tue 07/02/17	50SS
Implement Payment request for civil servants	20 days	Tue 10/01/17	Tue 07/02/17	50SS
Implement Online payment of service providers	21 days	Tue 10/01/17	Tue 07/02/17	50SS
Citizen and business Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 08/02/17	Tue 21/02/17	55SS
Lessons learnt	6 days	Thu 01/10/15	Thu 08/10/15	
Conduct a lessons learnt session with the implementer, steering committee ,business and citizen representatives	1 day	Thu 01/10/15	Thu 01/10/15	
Make adjustments to the deployment process for the next e-service	5 days	Fri 02/10/15	Thu 08/10/15	58

Implement e- verification	80 days	Mon 12/10/15	Wed 03/02/16	
Business engagement e.g. banks and Telecoms through workshop	10 days	Mon 12/10/15	Fri 23/10/15	59
Deploy e-verification service to MDAs and citizens	70 days	Mon 26/10/15	Wed 03/02/16	
e-client verification(businesses and MDAs)	20 days	Mon 26/10/15	Fri 20/11/15	61
e-land	30 days	Mon 26/10/15	Fri 04/12/15	63SS
e-birth and death verification	30 days	Mon 26/10/15	Fri 04/12/15	63SS
e- doctor verification	40 days	Mon 26/10/15	Fri 18/12/15	63SS
verify asset transfer	15 days	Mon 21/12/15	Tue 12/01/16	66
verify court bailiffs	10 days	Mon 21/12/15	Tue 05/01/16	67SS
verify law advocates	10 days	Mon 21/12/15	Tue 05/01/16	67SS
e- license verification	30 days	Mon 21/12/15	Wed 03/02/16	67SS
Implement e-tax additional features	30 days	Mon 26/10/15	Fri 04/12/15	63SS
credit reference verification	60 days	Mon 26/10/15	Tue 19/01/16	63SS
Implement e-payment for verification services	40 days	Mon 26/10/15	Fri 18/12/15	63SS
Launch e-verification and e-tax	1 day	Mon 21/12/15	Mon 21/12/15	73
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	6 days	Mon 21/12/15	Tue 29/12/15	74SS
Confirm frequently requested information for the central store	10 days	Wed 30/12/15	Wed 13/01/16	
Confirm frequently requested information for the central store	10 days	Wed 30/12/15	Wed 13/01/16	75
Lessons learnt	20 days	Thu 14/01/16	Thu 11/02/16	
Conduct a lessons learnt session with the implementer, steering committee ,business and citizen representatives	10 days	Thu 14/01/16	Thu 28/01/16	77
Make adjustments to the deployment process for the next e-service	10 days	Fri 29/01/16	Thu 11/02/16	79
Implement e-citizen	60 days	Fri 12/02/16	Tue 10/05/16	
Deploy e-citizen service to citizens.	50 days	Fri 12/02/16	Tue 26/04/16	
E-profile implementation	40 days	Fri 12/02/16	Tue 12/04/16	80
E-utilities implementation	50 days	Fri 12/02/16	Tue 26/04/16	80
Launch e-citizen service	1 day	Wed 27/04/16	Wed 27/04/16	84
Citizen Sensitization through brochures, NITA and Provider	10 days	Wed 27/04/16	Tue 10/05/16	85SS

site, Radio and TV adverts.				
Phase closeout	30 days	Wed 11/05/16	Thu 23/06/16	
ESB usage and benefits analysis	10 days	Wed 11/05/16	Tue 24/05/16	86
Sign completion certificates and Phase payment	20 days	Wed 25/05/16	Thu 23/06/16	88
PHASE TWO	720 days	Fri 24/06/16	Thu 02/05/19	89
Engage the Priority e-service providers	80 days	Fri 24/06/16	Mon 17/10/16	
Detailed on-boarding of all senior management at priority Provider MDAs	20 days	Fri 24/06/16	Fri 22/07/16	89
Engage telecom companies to understand requirements for mobile based services and costs	20 days	Mon 25/07/16	Fri 19/08/16	92
Agreement on the implementation timelines, data exchange formats, costing and infrastructure setup	20 days	Mon 25/07/16	Fri 19/08/16	92
Business process re-engineering and system development for MDAs without systems	40 days	Mon 25/07/16	Mon 19/09/16	92
Signing SLAs with priority service providers	20 days	Tue 20/09/16	Mon 17/10/16	95
Implement the secondary data center	60 days	Fri 24/06/16	Mon 19/09/16	
Implementation of ESB and components at a selected disaster recovery site.	45 days	Fri 24/06/16	Fri 26/08/16	89
Testing of switch over of quick win e-services between the primary and secondary sites	15 days	Mon 29/08/16	Mon 19/09/16	98
Agreement on which data center will support which e-services.	10 days	Mon 29/08/16	Fri 09/09/16	99SS
Implement e-health	90 days	Mon 12/09/16	Mon 16/01/17	
Implement Update Of the National Health Database	20 days	Mon 12/09/16	Mon 10/10/16	100
Implement Update On Vulnerable Children	20 days	Mon 12/09/16	Mon 10/10/16	102SS
E- health Locator	20 days	Mon 12/09/16	Mon 10/10/16	102SS
Software development	60 days	Mon 12/09/16	Mon 05/12/16	102SS
Implement e-mum	20 days	Tue 06/12/16	Mon 02/01/17	105
Implement e-child	20 days	Tue 06/12/16	Mon 02/01/17	105
Implement e-counsellor	20 days	Tue 06/12/16	Mon 02/01/17	105
Launch e-health	1 day	Tue 03/01/17	Tue 03/01/17	108
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 03/01/17	Mon 16/01/17	109SS
Implement e-education	90 days	Tue 03/01/17	Mon 15/05/17	

Implement e-results	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement e-candidate registration	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement e-learning	20 days	Tue 03/01/17	Tue 31/01/17	108
Software Development	60 days	Tue 03/01/17	Wed 29/03/17	108
Implement Registration for student loan scheme module	20 days	Tue 03/01/17	Tue 31/01/17	108
Implement Registration of sports associations module	20 days	Thu 30/03/17	Fri 28/04/17	115
Launch e-education	1 day	Tue 02/05/17	Tue 02/05/17	117
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Tue 02/05/17	Mon 15/05/17	118SS
Implement e-justice	60 days	Tue 02/05/17	Wed 26/07/17	
Implement e-case	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement Schedule for court case details module	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement e-complaint	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement e-compliance	50 days	Tue 02/05/17	Wed 12/07/17	117
Implement Passed judgements module	50 days	Tue 02/05/17	Wed 12/07/17	117
Launch e-justice	1 day	Thu 13/07/17	Thu 13/07/17	125
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Thu 13/07/17	Wed 26/07/17	126SS
Mid phase review	40 days	Thu 27/07/17	Wed 20/09/17	
E-services benefits & technical implementation review	40 days	Thu 27/07/17	Wed 20/09/17	127
Phase lessons learnt workshop	5 days	Thu 27/07/17	Wed 02/08/17	129SS
Implement e-pension	60 days	Thu 03/08/17	Thu 26/10/17	
Implement e-Government Pensions	50 days	Thu 03/08/17	Thu 12/10/17	130
Implement e-statement	50 days	Thu 03/08/17	Thu 12/10/17	130
Launch e-pension	1 day	Fri 13/10/17	Fri 13/10/17	133
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Fri 13/10/17	Thu 26/10/17	134SS
Implement e-record	30 days	Fri 13/10/17	Thu 23/11/17	
Implement Online access to government documents	20 days	Fri 13/10/17	Thu 09/11/17	133
Launch e-record	1 day	Fri 10/11/17	Fri 10/11/17	137
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Fri 10/11/17	Thu 23/11/17	138SS

Implement e-standards	60 days	Fri 10/11/17	Tue 06/02/18	
Implement Online access and verification of goods, agricultural produce and drugs	50 days	Fri 10/11/17	Mon 22/01/18	137
Launch e-standards	1 day	Tue 23/01/18	Tue 23/01/18	141
Sensitization for the MDAs through day training	10 days	Tue 23/01/18	Tue 06/02/18	142SS
Implement e-employ	100 days	Tue 23/01/18	Wed 20/06/18	
Software development	60 days	Tue 23/01/18	Mon 23/04/18	141
Implement e-payroll	30 days	Tue 24/04/18	Tue 05/06/18	145
Implement e-job	30 days	Tue 24/04/18	Tue 05/06/18	145
Launch e-employ	1 day	Wed 06/06/18	Wed 06/06/18	147
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 06/06/18	Wed 20/06/18	148SS
Implement e-agriculture	110 days	Wed 06/06/18	Fri 09/11/18	
Software development	60 days	Wed 06/06/18	Thu 30/08/18	147
Implement Online access to Agricultural Research Information	30 days	Fri 31/08/18	Fri 12/10/18	151
Implement Web access to Agricultural Information	30 days	Fri 31/08/18	Fri 12/10/18	151
Implement Access to Agriculture information and statistics	30 days	Fri 31/08/18	Fri 12/10/18	151
Launch e-agriculture	1 day	Mon 15/10/18	Mon 15/10/18	154
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	20 days	Mon 15/10/18	Fri 09/11/18	155SS
Implement e-procurement	50 days	Mon 15/10/18	Fri 21/12/18	
Implement e-tender	40 days	Mon 15/10/18	Fri 07/12/18	154
Launch e-procurement	1 day	Mon 10/12/18	Mon 10/12/18	158
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Mon 10/12/18	Fri 21/12/18	159SS
Implement e-tax	30 days	Mon 10/12/18	Tue 22/01/19	
Implement Registration for TIN and payment of taxes module	20 days	Mon 10/12/18	Tue 08/01/19	158
Implement Confirmation of tax compliance module	20 days	Mon 10/12/18	Tue 08/01/19	158
Implement Motor vehicle transfer and registration module	20 days	Mon 10/12/18	Tue 08/01/19	158
Launch e-procurement	1 day	Wed 09/01/19	Wed 09/01/19	164
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 09/01/19	Tue 22/01/19	165SS

Implement e-GIS	50 days	Wed 09/01/19	Wed 20/03/19	
Implement Online access to geographic maps	40 days	Wed 09/01/19	Tue 05/03/19	164
Launch e-GIS	1 day	Wed 06/03/19	Wed 06/03/19	168
Citizen Sensitization through brochures, NITA and Provider site, Radio and TV adverts.	10 days	Wed 06/03/19	Wed 20/03/19	169SS
Phase closeout	30 days	Thu 21/03/19	Thu 02/05/19	
ESB usage and benefits analysis	10 days	Thu 21/03/19	Wed 03/04/19	170
Sign completion certificates and Phase payment	20 days	Thu 04/04/19	Thu 02/05/19	172
PHASE THREE	120 days	Fri 03/05/19	Mon 21/10/19	173
Post Implementation review	80 days	Fri 03/05/19	Fri 23/08/19	173
Handover from the implementer to the local technical team	15 days	Mon 26/08/19	Fri 13/09/19	175
Project close	25 days	Mon 16/09/19	Mon 21/10/19	176
Sign completion certificates	5 days	Mon 16/09/19	Fri 20/09/19	176
Final payment to contractor	20 days	Mon 23/09/19	Mon 21/10/19	178

6 Appendices



6.1 List of MDAs in scope

A. The provided list of MDAS as per the TOR was as listed below;

1. Uganda Registration Services Bureaus(URSB)
2. Judiciary,
3. Uganda National Examinations Board(UNEB),
4. Uganda Revenue Authority
5. National Planning Authority (NPA)
6. National Agricultural Advisory Services (NAADS),
7. Ministry of Finance, Planning and Economic Development
8. Ministry of Public Service,
9. Ministry of Water & Environment
10. Uganda Prisons service,
11. Ministry of East African community Affairs (MEACA),
12. Electricity Regulatory Authority (ERA),NEMA
13. Ministry of Health
14. Uganda Heart Institute
15. National Drugs Authority (NDA)
16. Uganda AIDS Commission (UAC)
17. Ministry of Education(MoE)
18. Education Service Commission
19. Parliament of Uganda
20. Ministry of Internal Affairs(MoIA)
21. Ministry of Local Government (MoLG)
22. Uganda Human Rights Commission(UHRC)
23. Ministry of Trade, Industry and Cooperatives
24. Uganda Industrial Research Institute (UIRI)
25. Kampala Capital City Authority
26. Uganda Investment Authority (UIA)
27. Directorate of Public Prosecution(DPP)
28. The Ministry of Gender, Labour and Social Development
29. Department of Administrator
30. Uganda Police Force
31. Ministry of Justice and Constitutional Affairs (MOJCA)
32. The Uganda Human Rights Commission (UHRC)
33. The Law Development Centre (LDC)
34. Centre for Arbitration and Dispute Resolution (CADER)
35. Ministry of Lands, Housing and Urban Development (MoLHUD)
36. Public Procurement and Disposal of Public Assets Authority (PPDA)

37. Uganda Tourism Board

B. The MDAS listed below were not part of the original list of MDAs but have been included as part of the feasibility study;

- 38. Uganda Communication Commission
- 39. National Water and Sewerage Corporation
- 40. National Social Security Fund
- 41. Airtel Uganda Limited
- 42. MTN Uganda Limited
- 43. Office of the Prime Minister
- 44. Uganda National Meteorological Authority
- 45. DNA

C. For the MDAs that were mentioned above, EY was provided with a database in scope as shown in that table below;

No	Services	System/Database	Description	MDAs	Comment
1	Intellectual Property Registration	IPAS System JAVA	Manages Intellectual Property	Uganda Registration Services Bureaus(URSB)	
2	Business Registration	TRIM	Manages Business registration	URSB	
3	Electronic Recruitment, Personnel Records	Integrated Personal Payroll System (IPPS)	Manages personal and payroll records information	Public Service(MoPs), Judiciary, Judicial Service Commission	
4	Government financial management	Integrated financial management system (IFMS)	Manage financial transactions	Min of Finance	
5	Health	District health Information System(DHIS)		Ministry of Health(MoH)	
6		UHI patient DB access system	Manages patient data storage	Uganda Heart Institute	

7		Licensed pharmacy system	List showing licensed pharmacies	National Drugs Authority (NDA)	
8		National HW Database	HW Stake holders services database	Uganda AIDS Commission (UAC)	
9		Data warehouse		MoH	No data ware
10	Birth & Death Registration	Mobile VRS	Mobile registration system for birth & deaths	URSB	
11	Education	Electronic teachers databank system	Capture, Store and retrieve teachers information	Education Service Commission	
12		Examination Processing	Capture candidates' data	UNEB	
13	Planning	Community information system	Manages community level information	National Planning Authority(NPA)	
14	Production (agricultural) and Market Information Services	Farmers database		NAADS	Does not exist
15		Ground rent management system		KCCA	These are now part of e-citie system
16		Property rates management system		KCCA	
17		Revenue assessment register system		KCCA	
18		Act system	Investor database system + Investor license	Uganda Investment Authority (UIA)	

			application		
19	National Identification	Special Pass & Work Permit System	Work permit, Special Pass records	MoIA	
20		NSIS	National Security Information System	MoIA	
21		Driving Permit System	Driving permit records	MoW	
22		Passport System	Passport records	MIA	
23	Integrated e-Justice	Court case administration system (CCAS)	Manages court case records	Judiciary	
24		PROCAM	Prosecution's Case Administration and Management	Directorate of Public Prosecution(DPP)	
25		Database of prisoners	Prisoners records	Uganda Prison Service (UPS)	
26		MySQL database management system		Department of Administrator General	
27		Case file management system	Suspects and investigations records	Uganda Police	
28	Land	Land Information System(LIS)	Land Records under LIS	Ministry of Lands, Housing and Urban Development (MoLHUD)	
29	Tax	eTAX system	Manages the domestic tax business (VAT,TIN,etc)	URA	

30		Business licensing motive system		KCCA,URSB	
31		ASYCUDA	Manages the customs business	URA	
32	Financial	Employee registration and benefits processing		NSSF	
33	Telecomms	SIM card registration		UCC/Telecom companies	
34	Banks	Account holders Register for borrowers	Compuscan	BOU/UBA/Financial institutions	
35	Insurance	Identification of insurers		UIRA / UIA / Insurance companies	UIA system (ACT) to be phased out in August 2015.
36	Utilities	Identification of customers		NWSC, Umeme, Pay TV companies etc.,	
37	Universities and tertiary institutions	Identification of students	Interface with CEMAS	NCHE, BTVET / Universities - MoFPED / CEMAS	
39	Law Development centre(LDC)				Do not have National Databases
40	ERA				Do not have National Databases
41	Centre for Arbitration and Dispute Resolution(CADER)				Do not have National Databases
42	Uganda Industrial Research Institute(UIRI)				Do not have National Databases
43	Uganda Human Rights Commission				Have Two databases that

	(UHRC)				were considered national databases
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6.2 Data Collection Tool

The data collection tool is excel based and has three tabs that the respondent had to give feedback on. These were

1. National Systems and interfaces
2. Data for e-services
3. Infrastructure and Security

National Systems and interfaces

As part of this tab, the respondent was expected to provide information about the National systems they have in place that they use to provide services to Government agencies, businesses and citizens. Specifically, the following information was required;

- I. Software application information
- II. Data base management system information
- III. Information exchange standards

Screen shots showing the National System questions on the tool;

Software Application Information	Name of National System
	Main business activity supported by National System
	Nature of System/Application
	For Cloud-based Applications, provide Name of Cloud Service provider
	Software Application Type
	Software Application Version
	Application Environment
	Application Server OS
	Application Server Type(Hardware)
	Application Server Processor Type
	Application Server RAM
	Application Server Hard disk Type
	Application Licensing Type
	Duration of Current License(if Applicable)
	Application Mode of development
	Application Vender(<i>Developer/contractor of the system</i>)
	Number of Users(licensed number of Users)
	Date of System Inception Date(Start date)
	Date of Completion of Implementation of System
	Approximate Transaction Volutions processed in a day
For Financial management related systems, provide approximate money value for total daily transactions.	

Database Management System Information	DB platform
	DB version
	Operating System
	Database Server OS Version
	Application Programming Interface(API)
	Data centre Location
	Does the MDA use SSL certificates between the OS and the Database?
	If the MDA uses SSL, provide the approximate cost in Ugx
Information Exchange Standards	Application message format
	Encryption used
	Message Protocol used

Screen shots showing the interface questions on the tool;

Monitoring Techniques	<p>Does your Institution monitor performance of Interfaces(select a choice in the right-hand cell next to each method)</p> <p>If your Institution Monitors performance of Interfaces, select a method is used(select a choice in the right-hand cell next to each method)</p> <p>a. Automated Monitoring (Using Specialised IT tools which may be licensed or Open source)</p> <p>b. Manual Monitoring (Including physical verification of records transferred into a destination system)</p> <p>c. Both Methods (Combining both Automated and manual methods)</p>
Monitoring Tools	<p>If you used Automated tools, List the tools you use to monitor the interfaces and the specific purpose for each tool.</p>
Monitoring process	<p>Which of the following monitoring procedures does your institution use?</p> <p>a. Escalation to interface owner(internal)</p> <p>b. Contingency plans in the event of long-term interface failure</p> <p>c. Escalation to application specialists</p> <p>d. Interface monitoring timetable</p> <p>e. None</p>
Interfaces between Internal Systems/Databases	<p>Which of the National Systems managed by your Institution are interfaced with Each other</p> <p><i>Note: You can only choose from the systems provided in the drop-down.</i></p> <p><i>Please select systems in pairs to show that they are integrated. If a system is integrated with multiple systems then add a new for each system a given national system is interfaced with</i></p>
Interfaces with External Systems/Databases	<p>Which of the National Systems owned by your Institution are interfaced with National systems of other MDAs</p> <p><i>(Please select systems in pairs to show that they are integrated. If a system is integrated with multiple systems then add a new to show such occurrences)</i></p>
Future State Integration to other Systems	<p>Which National System/Database would you need to have your MDA's System/Database intrgated with, and what business value would that add to your MDA</p> <p><i>(Please select systems in pairs to show that they are integrated. If a system is needs to be integrated with multiple systems then add a new to show such occurrences). For each integration, provide the benefit in terms of value addition.)</i></p>

Interface documentation	5 6 Documented Controls	<p>Does your Institution have relevant interface documentation? Which of the following key interface documentation does your institution have:</p> <ol style="list-style-type: none"> 1. Interface Control Document or Interface Control Drawing (ICD) 2. Interface Definition Document (IDD) 3. Interface Requirements Document (IRD) -
Interface Controls	7 Embedded Controls	<p>Which Key controls are embedded in Interface(s) currently existent within your organisation</p> <ol style="list-style-type: none"> 1. On screen feedback to highlight completion status 2. Identification and/or hard-coding of source and target files 3. Security over source and target files 4. Use of control tables to control destination addresses 5. Transaction reports showing number of successful validated records or errors 6. Access control to run, monitor interfaces 7. Controls to prevent interference 8. Restart mechanisms in case of transfer failure 9. Control counts of numbers of records transported
Interface Monitoring and Reporting	8 9 Monitoring Techniques	<p>Does your Institution monitor performance of Interfaces (select a choice in the right-hand cell next to each method) If your Institution Monitors performance of Interfaces, select a method is used (select a choice in the right-hand cell next to each method)</p> <ol style="list-style-type: none"> a. Automated Monitoring (Using Specialised IT tools which may be licensed or Open source) b. Manual Monitoring (Including physical verification of records transferred into a destination system) c. Both Methods (Combining both Automated and manual methods)
	10 Monitoring Tools	<p>If you used Automated tools, List the tools you use to monitor the interfaces and the specific purpose for each tool.</p>
	11	<p>Which of the following monitoring procedures does your institution use?</p> <ol style="list-style-type: none"> a. Escalation to interface owner (internal) b. Contingency plans in the event of long term interface failure

Data for e-services

As part of this tab, EY wanted to understand the following questions;

1. Whether the MDA has a website
2. Whether the MDA provides any e-services (G2G,G2B,G2C) currently either over the web or mobile
3. The name of the e-service
4. The consumer group to whom the e-service is provided
5. The prioritization of the services by the MDA
6. The data records that are required for the e-service to be provided.

Screen shots showing the e-services questions on the tool;

e-services using web-platforms	12	MDA Website	Does your Institution have a website or Web-portal? (Indicate answer by selection from the next cell in the right)	Selected Yes/No	Comment
			<td>If the answer to the above question is yes, does your institution provide any services to the using the web? <i>Note: Select Yes or No.</i></td> <td></td> <td></td>	If the answer to the above question is yes, does your institution provide any services to the using the web? <i>Note: Select Yes or No.</i>	
	14	e-Services	In relation to the National Systems selected(in Qn 1)What services does your Institution provide using Web platform to the following groups of Consumers of government services? <i>Note: If multiple e-services can be provided using the same system, then select the same system on different lines and add the respective e-service.</i>		
			Name of National System	Consumer Group	e-service

e-services using mobile platforms	15	Mobile e-services	Selected Yes/No	Comment	
	16		Does your institution provided services on mobile platforms(using mobile devices such as PDAs, iPads, etc.?) If Yes, List the services provided by your institution on mobile platforms to the different groups of consumers of government services. <i>Note: Select a National Database and then consumer category. Thereafter state the e-service and give it a priority(e.g. 1, 2, 3, etc).</i>		
			Name of National system	Consumer Group	e-service

e-services using web-platforms	Name of National System	Consumer Group	e-service	Priority of e-Service	Data record1	Data record2
	0	0				
	0	0				
	0	0				
	0	0				
	0	0				
	0	0				
	0	0				

e-services using mobile platforms	Name of National system	Consumer Group	e-service	Priority of e-Service	Data record1	Data record2
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			
	0	0	0			

Infrastructure and Security

As part of this review, we asked the MDAs to provide information from firewalls, antivirus, disaster recovery planning, shared services and information security controls.

Screen shots showing the infrastructure and security questions on the tool;

Infrastructure		Selected	Yes/No	Comment
Does your Institution have a corporate network?				
If your answer in the question above is Yes, check all the appropriate tick boxes to indicate the type(s) of network your Institution has or is connected to?		Selected	Yes/No	Service Provider
a. Wide Area Network [WAN]				
b. Local Area Network [LAN]				
c. Metropolitan Area Network [MAN]				
d. National Backbone Network [NBN]				
Does your Institution have or use shared IT services?				
If your answer in (Q2) above is Yes, which shared IT services does your Institution have or use?		Selected	Yes/No	Comment
a. Data Warehouse				
b. Relational Database Management System (RDMS)				
c. Enterprise Resource Planning (ERP) System				
d. National Backbone Infrastructure (Network)				
e. Extranet				
f. Intranet				
Are there any guidelines issued by the IT department with regard to individual IT architectures of Government Institutions that they need to conform to?				
In relation to Information Technology as a whole; does your Institution have the following?		Selected	Yes/No	Comment
a. Policies				
b. Procedures				
c. Guidelines				
d. Blueprints				
Security Controls Available at MDA				
In relation to your institution, what is the status of Information security Management?		Selected	Yes/No	Comment
a. No formal ICT Security policies and practices				
b. Drafting formal ICT Security policy				
c. Planning to draft formal ICT Security policy and procedures within the next 12 months				
d. Formal program and practices in use and approved by management				

<i>c. Planning to draft formal ICT Security policy and procedures within the next 12 months</i>		
<i>d. Formal program and practices in use and approved by management</i>		
Does your institution have a Firewall?		
What type of firewall does your Institution have?	Selected	Yes/No Comment
a. Network-Level / Packet Filter		
b. Circuit Level		
c. Application Level		
d. Stateful Multi-Level		
Which form of antivirus protection does your Institution use?:	Selected	Yes/No Comment
a. Network level antivirus program		
b. Computer level antivirus program		
c. Both of the above		
What type of Anti-Virus Software does your Institution use?:	Selected	Yes/No Comment
a. Symantec Norton		
b. McAfee		
c. Kaspersky		
d. ESET NOD32		
e. Panda		
f. Microsoft Security Essentials		
g. Other - Please Specify		
In relation to your Institution, what is the status of disaster recovery management?	Selected	Yes/No Comment
<i>a. No formal policies and practices</i>		
<i>b. Drafting formal plans and procedures</i>		
<i>c. Planning to draft formal plans and procedures within the next 12 months</i>		
<i>d. Formal program and practices in use and approved by management</i>		

6.3 Respondent Information

SN	Respondent Name	Respondent: Title / Position	Name of Ministry/Department/Agency	Completion Date
1	Charles Lubulwa	Data warehouse Manager	Uganda Revenue Authority	25 February 2015
2	Jimmy Amatre	Principal Information Scientist	Ministry of Local Government (MoLG)	25 February 2015
3	Sam Walusimbi	IT support assistant	Ministry of East African community Affairs (MEACA),	28 February 2015
4	Ronald Byaruhanga	IT Officer	Ministry of Water & Environment	23 February 2015
5	Ronald Mayambala	Manager IT Applications	Kampala Capital City Authority	25 February 2015
6	Jackie Namyalo	Head of IT	National Planning Authority (NPA)	25 February 2015
7	Okello Wilberforce	IT Officer	Uganda Prisons service,	25 February 2015
8	Mr. Kikabi David Sunday	ICT Manager	Judiciary	19 February 2015
9	BUKENYA GYAVIIRA	SYSTEMS ADMINISTRATOR	National Agricultural Advisory Services (NAADS)	23 February 2015
10	Fred Kakooza	Head of IT	Uganda Investment Authority (UIA)	18 February 2015
11	Jimmy M Muyanja	Executive Director	Centre for Arbitration and Dispute Resolution (CADER)	25 February 2015
12	Isaac Twinomujuni	ICT officer	Uganda AIDS Commission (UAC)	20 February 2015
13	Julian Ahebwa	Senior Database Analyst	Public Procurement and Disposal of Public Assets Authority (PPDA)	02 March 2015
14	Mr Kambere Sam Rogers	Information scientist	Ministry of Justice and Constitutional Affairs (MOJCA)	09 March 2015
15	Munanura Dan and Ayebazee Lee	Ag. Commissioner Information Technology and Information Management; Ag. Senior superintendent Information	Uganda Police Force	10 March 2015

		systems		
16	Enock Musoke Kibalizi	Head IT	Uganda Heart Institute	23 February 2015
17	Mariam Namukasa	Systems Administrator	The Law Development Centre (LDC)	26 February 2015
18	Kambugu William	ICT officer	Ministry of Lands, Housing and Urban Development (MoLHUD)	11 March 2015
19	Dr. Wakabi Peter	Head of ICT	Uganda National Examinations Board(UNEB),	12 March 2015
20	Kateregga Patrick	IT officer	Uganda Tourism Board	11 March 2015
21	Oguma Boaz	ICT manager	Uganda Industrial Research Institute (URI)	10 March 2015
22	Sulaiman Omita	Head of ICT	Uganda Human Rights Commission(UHRC)	09 March 2105
23	Anselm Olweny	Senior Registry and Information	Electricity Regulatory Authority (ERA),	06 March 2015
24	Denis Ondakara / Benjamin Nyero/ Peter Okubu	IT	Directorate of Public Prosecution(DPP)	12 March 2015
25	Teddy Namugerwa	Senior Information scientist	Ministry of Internal Affairs	05 March 2015
26	Ninsiima Noah	IT Consultant / Network Administrator IPPS	Ministry of Public Service	17 March 2015
27	Ssali Tamale	System Administrator	Ministry of health	09 March 2015
28	Andrew Rutebuka	Head of Information Technology	National Drug Authority	16 March 2015
27	Arthur Kwesiga	IT	Uganda Registration Services Bureau(URSB)	04 March 2015
30	Kenneth Ayebazibwe	Head of IT	Ministry of Gender, Labour and Social Development	24 February 2015
31	Eriko Gilbert	System Analyst	Ministry of Finance, Planning and Economic Development	24 March 2015
32	Evelyn Osiime	Manager Application Development	National Water and Sewage Cooperation	01 April 2015

6.4 Evaluation for the Quick Win e-services

A score of 0.5 means that for the aggregate e-service, some of the specific e-services within it meet the criteria and some do not meet the criteria. 1 means compliance and 0 means non-compliance with the criteria

	Aggregate E-service	Specific e-services	Service Provider	Part of the top priority services	System in Place	High Demand	Existing Service	Priority Sector	Implementable in 12 months	Total
1	E-verification	E- business E-passport E-license E-land verify death and birth verify registered companies verify asset transfer verify court bailiffs verify law advocates	Ministry of Internal Affairs Ministry of Lands Uganda Investment Authority Administrator General Uganda Registration Service Bureau	1	1	1	1	0.5	0.5	5
2	E-registration	Register for PPDA E-citie registration NSSF registration University registration		1	1	1	1	0.5	1	5.5

		URA TIN registration								
3	E- payment	Online payment of service providers Online payment of Government services Online payment for other e-services		1	1	1	0.5	0.5	1	5
4	e- health	Update Of the National Health Database Update On Vulnerable Children e-child e-mum e-counsellor		1	0.5	1	1	1	0	4.5
5	e- education	e-results e- Candidate Registration registration of sports associations Registration for student loan scheme		1	0	1	0.5	1	0.5	4

6	e- agriculture	Agricultural Information and Statistics Agricultural Research Information Web access to Agricultural Information		1	0	1	1	1	0	4
7	e- justice	e- case e-complaint e-compliance passed judgements register schedule for court case details		1	0.5	1	0.5	1	0.5	4.5
8	E- pension	E- statement E- Government Payroll		1	1	1	0.5	0	0.5	4
9	E- tax	Registration for TIN Payment of Taxes Confirmation of Tax Compliance Motor Vehicle Transfer and registration		1	1	1	0	0	0	3
1 0	E- employ	E- jobs E-payroll		1	0.5	1	1	0	1	4.5

1 1	E- record	Online access to Government documents		1	1	0	1	0	1	4
1 2	E-GIS	Online access to geographic maps		1	0.5	0	0.5	0	0.5	2.5
1 3	E- Citizen	E- utility statements E-citizen profile		1	1	1	0.5	1	0.5	5
1 4	E- standards			1	1	0	1	1	0	4
1 5	E- procurement	e- tender		1	1	0	1	0.5	0.5	4

6.5 Detailed Technical specifications

6.5.1 Technical Specifications

1.1. Overview
The centralized integration data store (for BI and Analysis) and the integration Service Bus (GSB) shall be hosted at the NITA-U data centre. Due to the nature of NITA-U structure, Nita-U may need to accommodate additional resources at any one moment in time without the added expense on infrastructure.
1.2. Architecture
The GSB shall be implemented based on the proposed GSB Architecture in section 4.9 of the report
1.3. Connectivity Infrastructure
NITA-U's current Infrastructure is fit to provide secure interconnectivity and functionality required for the GSB and technical requirement for the Integration solution
1.4. Data centre Infrastructure
The Data Centre is adequately strengthened with Physical, environmental and Security controls. Whilst the current UPS uptime of between 8 to 12hours is adequate considering the additional power supply provisions, There shall be need to maintain the same uptime after installation of the GSB. This shall necessitate increasing the batteries for the UPS.
1.5. Network Management
NITA-U current has adequate mechanisms for fault management, configuration management, accounting management, performance management, and security management. However for GSB, there shall be need to have tool that specifically enforces the above principles in the GSB
1.6. Development Strategy
Product roadmaps for the various elements of the vendor solution are required on two levels: a detailed release program for the next 12 months and a long-term development strategy.
1.7. Server Hardware
1.7.1. Server Properties
The desired hardware options include: IBM, HP, Dell or any product from other recommended hardware manufacturers

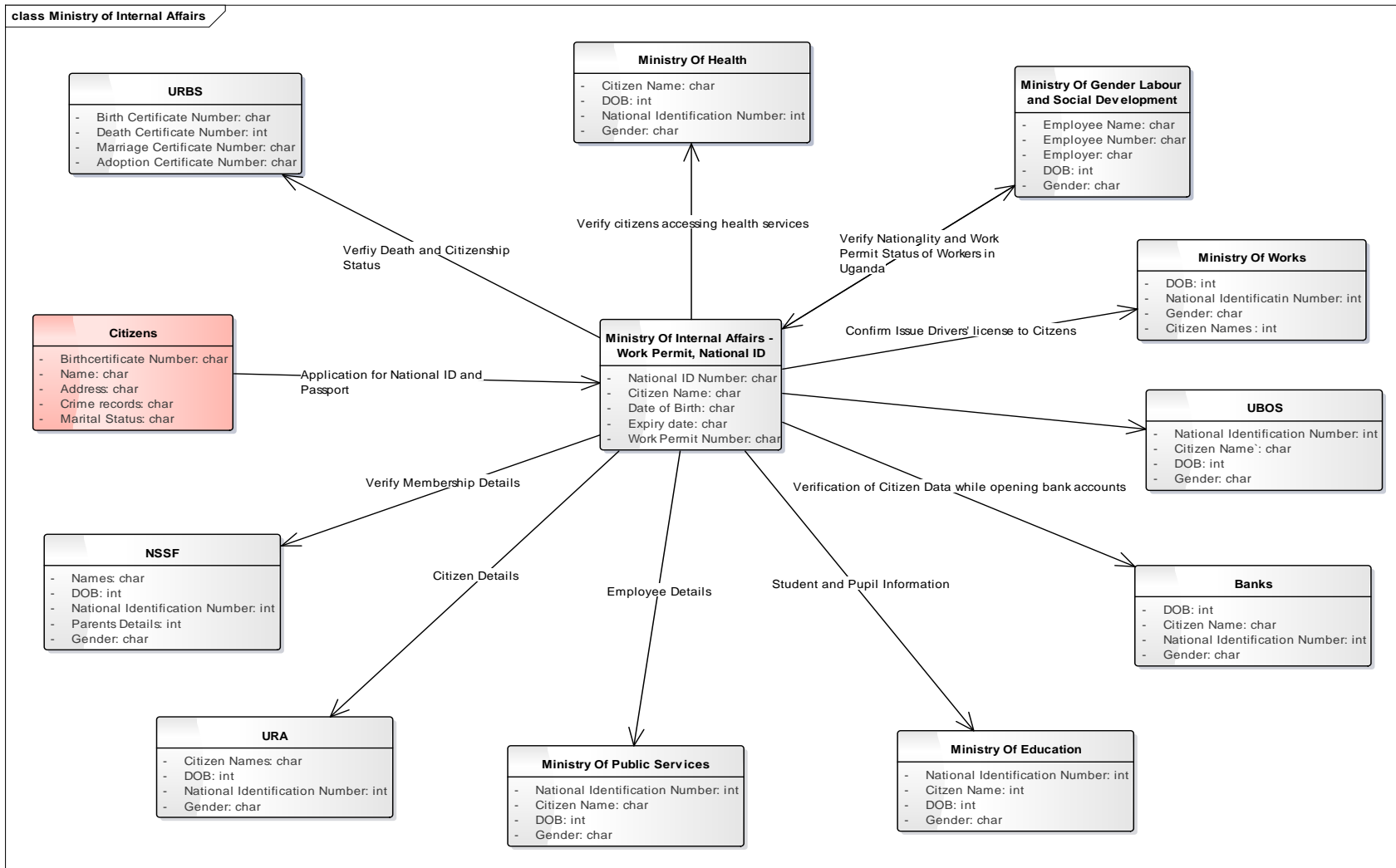
The Servers shall be implemented in a RAC set up with 2 nodes.
Each Server shall have 96 CPU Cores. However number of cores may be verified depending on the target maximum workload
The Server/Rack CPUs shall have a clock speed of 5GHz
The Server/Rack shall be WoL and PXE capable.
The Server shall be hot swappable
Vendor shall provide documentation of or reference to information published on the internet documenting compliance with requirements
1.7.2.Server peripherals
Detailed below are the minimum hardware requirements of GSB. These should be related to hardware performance levels and recommend best practice approach to meet the stated performance requirements.
At least 19" Electronic Industries Alliance Standard Width rack mountable and provide appropriate rack mount kit.
Server shall have all cables and parts required to attach all included peripherals to other Server chassis as required for normal operation (e.g. power cords, keyboard / mouse cables, video cables, network and internal disk cables).
Shall provide for an alternate way of installing operating system and application software and performing firmware upgrades. This device shall be dynamically re-configurable and assignable to any one of the Servers in the chassis for the purpose of transferring data to and from the floppy disk to and from the Server.
Server chassis shall provide a device capable of reading a CD/DVD-ROM disc at a minimum 48x speed or provide an alternate way of installing operating system and application software and performing firmware upgrades. This device shall be dynamically re-configurable and assignable to any one of the Servers in the chassis for the purpose of transferring data to and from the CD/DVD ROM disc to and from the Server
The Server Chassis power supply shall operate at a nominal input voltage of 200VAC to 240VAC and with a power rating that supports a fully loaded system running at a 100% duty-cycle 24 hours a day, 365 days a year. A fully loaded system is defined by this specification as: <ul style="list-style-type: none"> • All expansion slots and ports are populated with devices certified for operation in said system by the system Vendor; • Processor, memory and internal storage are configured at the maximum allowable level as documented by the system Vendor. • The aforementioned power requirement is to be fulfilled without modification to said system, peripherals or power supply. The aforementioned requirement(s) apply equally to systems with a single power supply configuration, as well as a system with an online fail-over power supply configuration. Failure to meet these requirements, to the letter, will void any contract
Server chassis may be configured with redundant power (2PSU) functionality to mitigate risk of internal power loss.
Server chassis shall be configured to provide full power to all Server slots whether the Server slots are populated at time of initial acquisition or not.

Server chassis shall be configured with the necessary modules and/or controllers to enable specified Server functionality.										
Server chassis shall be configured to provide full redundant cooling to all Server slots whether the Server slots are populated at the time of initial acquisition or not.										
Server chassis shall be configured to provide KVM capability from an external keyboard, video monitor and mouse to all Servers installed in the chassis - one Server at a time.										
Server chassis shall provide a redundant chassis and Server management capability through any one or a combination of firmware, software and hardware. Chassis and Server management shall be accomplished through a web interface.										
Server chassis and Server management capability shall monitor the chassis and Servers for failure for report to an administrator and for logging to an event log.										
Server chassis and Server management shall provide a capability for firmware upgrades.										
Server chassis and Server management shall provide a capability for configuring all configurable hardware (e.g. modules or controllers) in the Server chassis and all configurable hardware in all installed Servers.										
1.7.3.Server Memory:										
Server shall contain a minimum Total Random Access Memory of 500GB DDR3 or DDR4 memory and can be expanded to at least without requiring replacing the initial memory.										
Server Random Access Memory (RAM) shall include an error correcting (ECC) feature.										
Server RAM shall have the option for additional DDR3, DDR4 or DDR5 SDRAM memory.										
Hard Disk Storage										
The hard disk for the centralized data store should be store information processed through the GSB and that may be required for Business intelligence purpose. This is estimated as below.										
<table border="1"> <thead> <tr> <th>2015 Disk Storage Space(TB)</th> <th>2016 Disk Storage Space(TB)</th> <th>2017 Disk Storage Space(TB)</th> <th>2018 Disk Storage Space(TB)</th> <th>2019 Disk Storage Space(TB)</th> </tr> </thead> <tbody> <tr> <td>50.55</td> <td>55.62</td> <td>61.19</td> <td>67.30</td> <td>81.44</td> </tr> </tbody> </table>	2015 Disk Storage Space(TB)	2016 Disk Storage Space(TB)	2017 Disk Storage Space(TB)	2018 Disk Storage Space(TB)	2019 Disk Storage Space(TB)	50.55	55.62	61.19	67.30	81.44
2015 Disk Storage Space(TB)	2016 Disk Storage Space(TB)	2017 Disk Storage Space(TB)	2018 Disk Storage Space(TB)	2019 Disk Storage Space(TB)						
50.55	55.62	61.19	67.30	81.44						
Some information is still pending from NSID and Passport										
1.7.4.Server Operating System software										

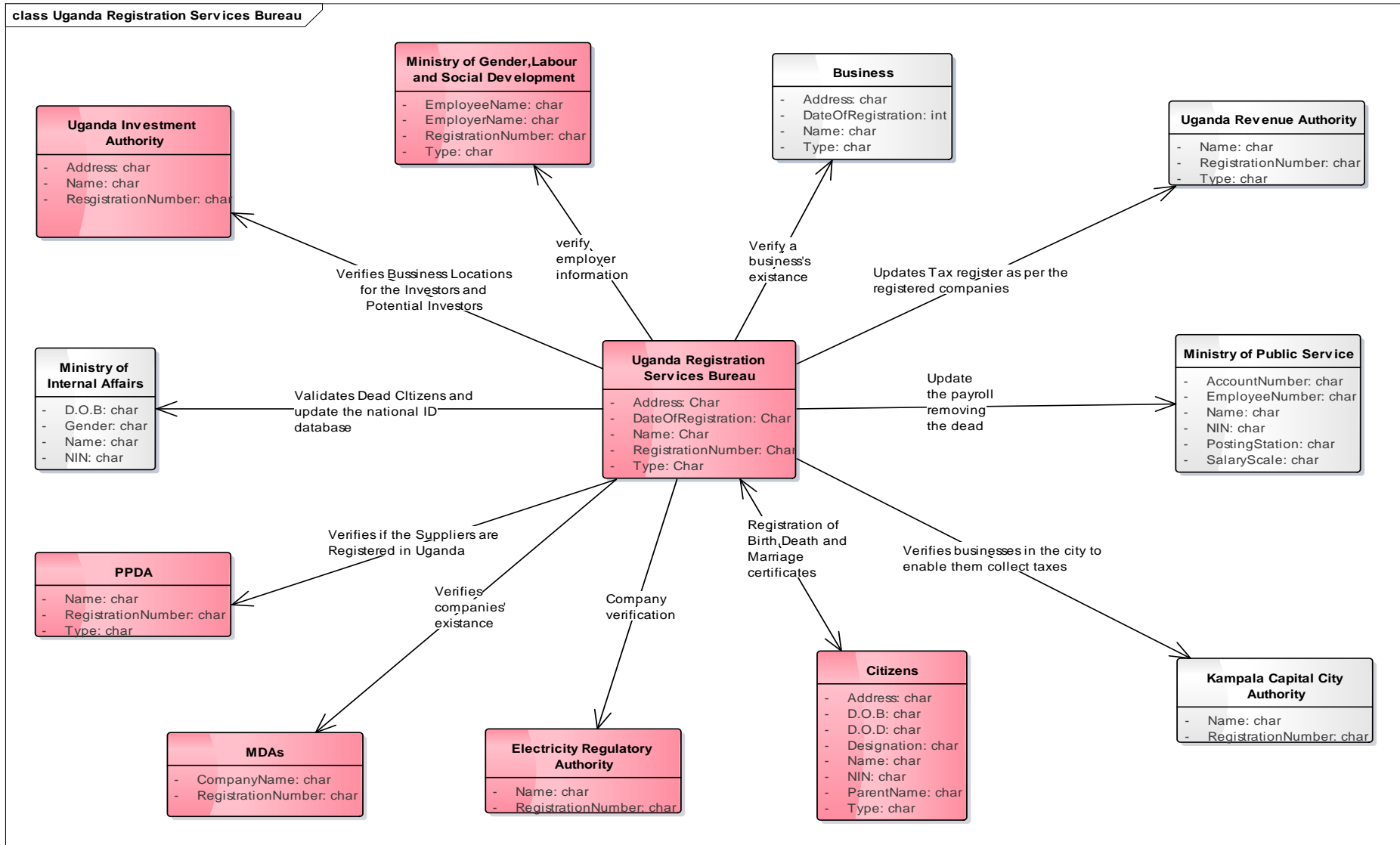
Depending on the proposed Hardware that should be compatible with various Operating systems, the vender shall offer with the Operating System (OS) and respective license options										
All offered Servers shall be certified to the proposed Operating system										
All hardware components shall have a minimum 36-month warranty that shall go into effect at the time of installation by the GSB. By definition, "all hardware" consists of the Server chassis and the blades therein and its internal components (cards, disk drives, power supply, etc.), monitor (when required), keyboard (when required), and cables.										
The warranty shall provide 24 x 7 phone and web technical support for vendor supplied hardware and software, utilities and drivers.										
The warranty shall provide next business day on-site parts and labor maintenance performed by factory trained, authorized technicians for three full years, including rural areas.										
During the warranty period, the contractor shall be responsible for all repair costs associated with the hardware equipment, except where there is evidence that the NITA-U physically abused the equipment.										
The warranty shall provide higher levels of service (e.g., same day 4 hour response time) as an available option										
During the warranty period, the vender shall be responsible for all repair costs associated with the hardware equipment, except where there is evidence that the NITA-U physically abused the equipment.										
The warranty shall provide higher levels of service (e.g., same day 4 hour response time) as an available option										
1.7.5. Aggregate Bandwidth Requirements										
Based on the estimated workload, the target bandwidth threshold is as follows over a period of 5 years.										
<table border="1"> <thead> <tr> <th>Estimated Gbps (2015)</th> <th>Estimated Gbps (2016)</th> <th>Estimated Gbps (2017)</th> <th>Estimated Gbps (2018)</th> <th>Estimated Gbps (2019)</th> </tr> </thead> <tbody> <tr> <td>2.466133333</td> <td>2.712746667</td> <td>2.984021333</td> <td>3.282423467</td> <td>3.610665813</td> </tr> </tbody> </table>	Estimated Gbps (2015)	Estimated Gbps (2016)	Estimated Gbps (2017)	Estimated Gbps (2018)	Estimated Gbps (2019)	2.466133333	2.712746667	2.984021333	3.282423467	3.610665813
Estimated Gbps (2015)	Estimated Gbps (2016)	Estimated Gbps (2017)	Estimated Gbps (2018)	Estimated Gbps (2019)						
2.466133333	2.712746667	2.984021333	3.282423467	3.610665813						
Hard disk Storage Space										

6.6 E-service mapping

D001: e-verification

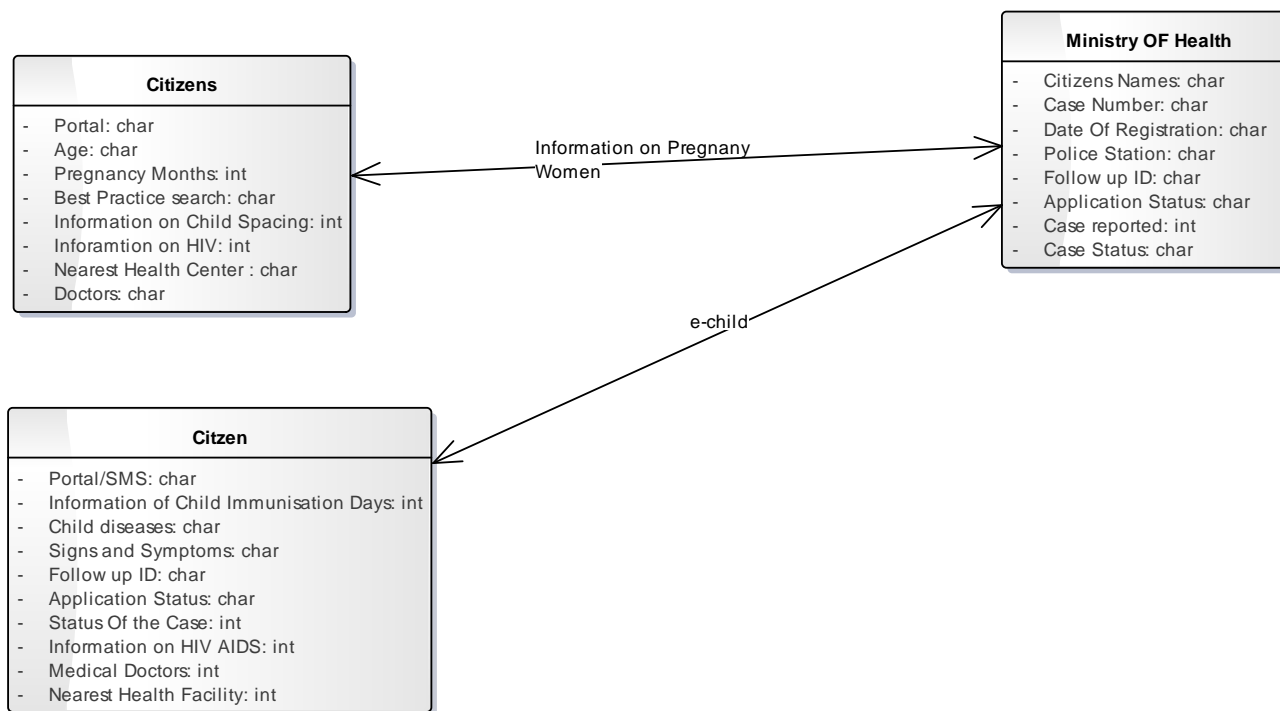


D002: Registration of Births and Deaths

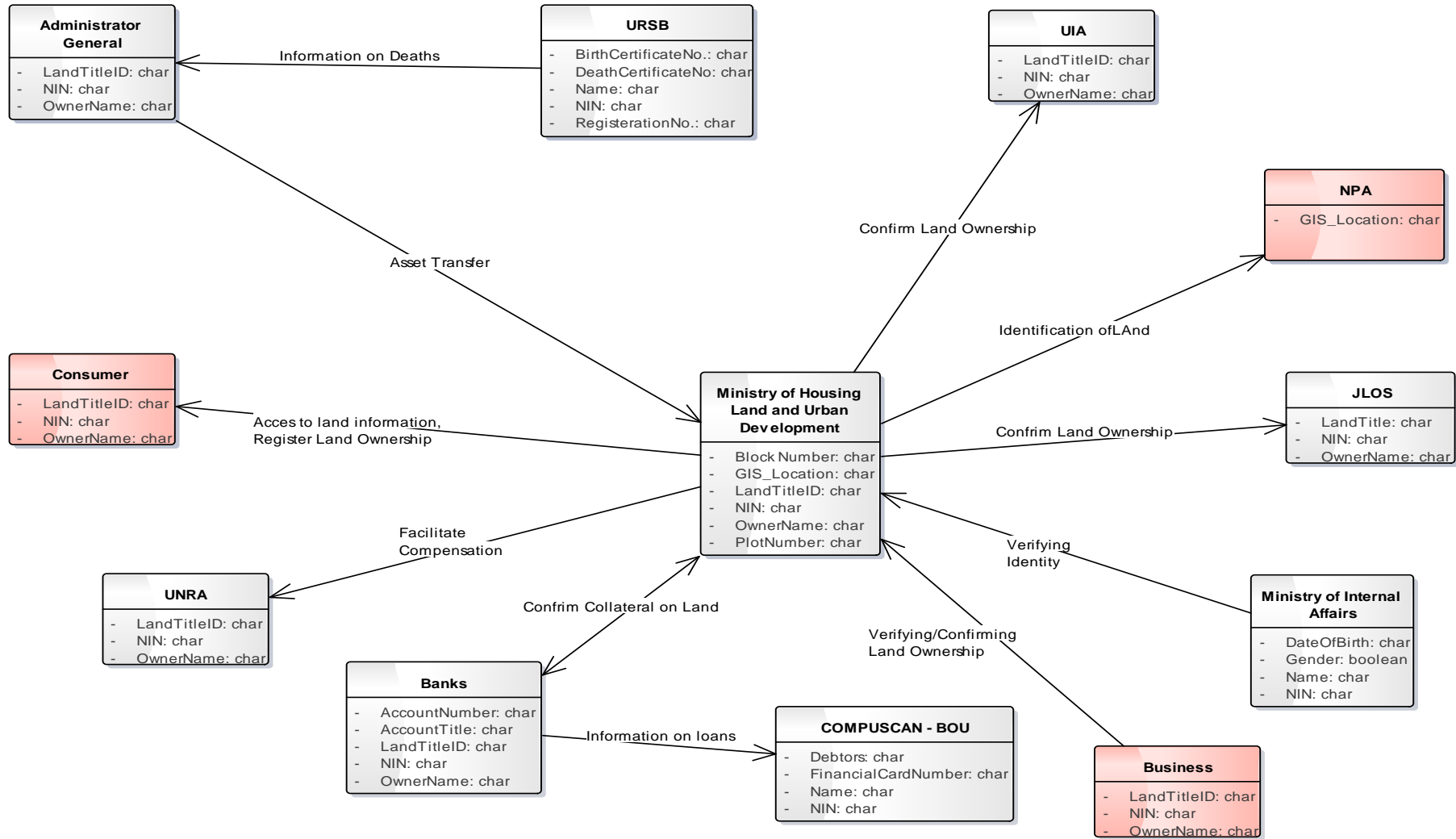


D003: e-mum, child

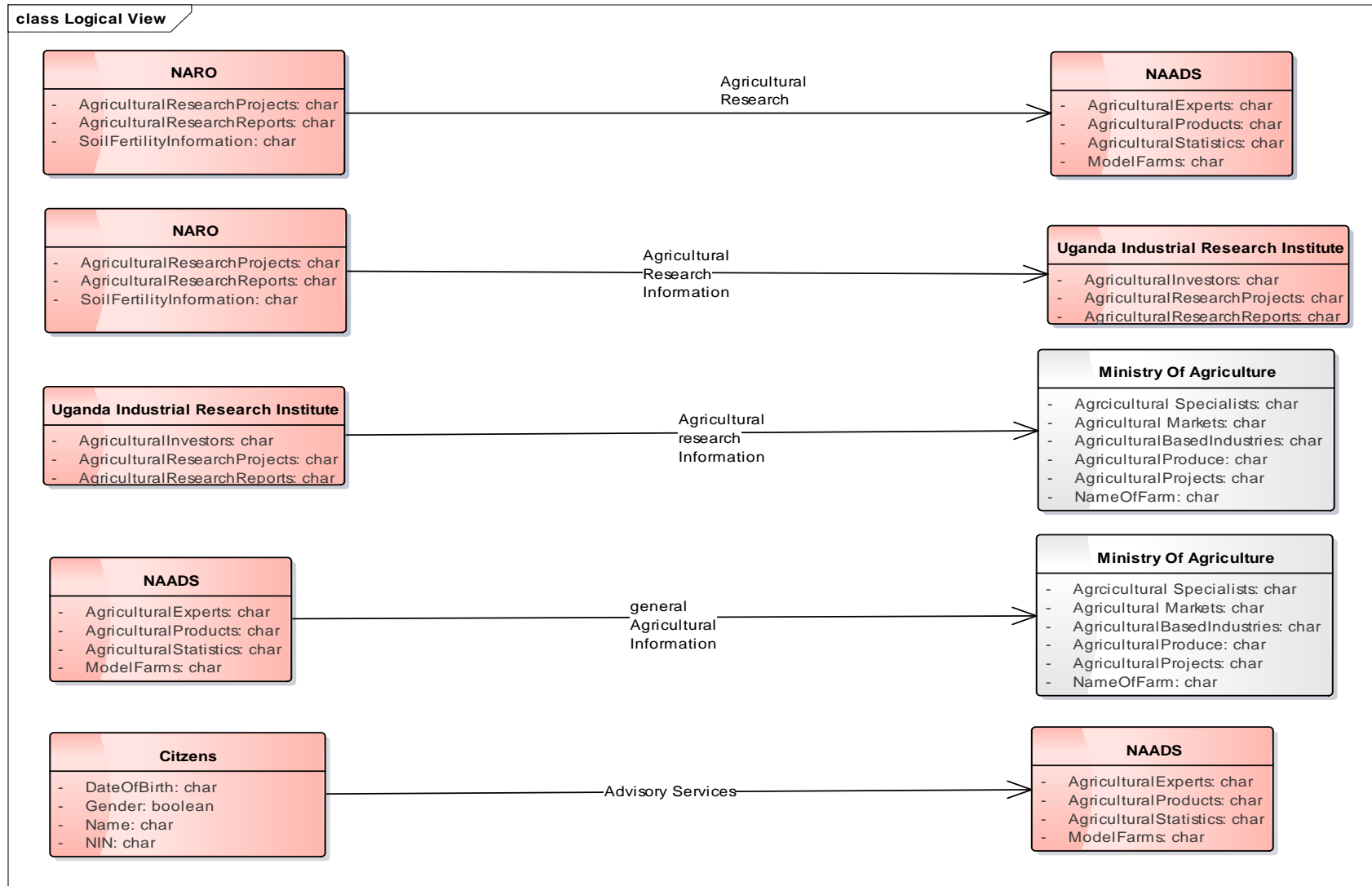
class Logical View



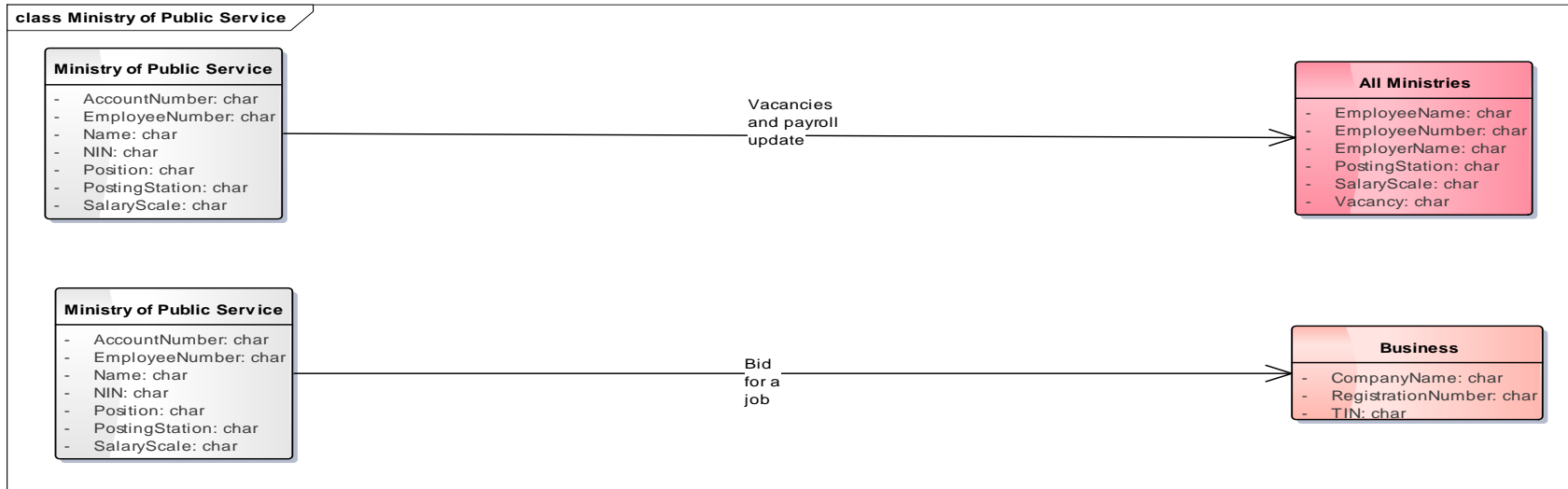
class Ministry Of Housing, Land and Urban Development



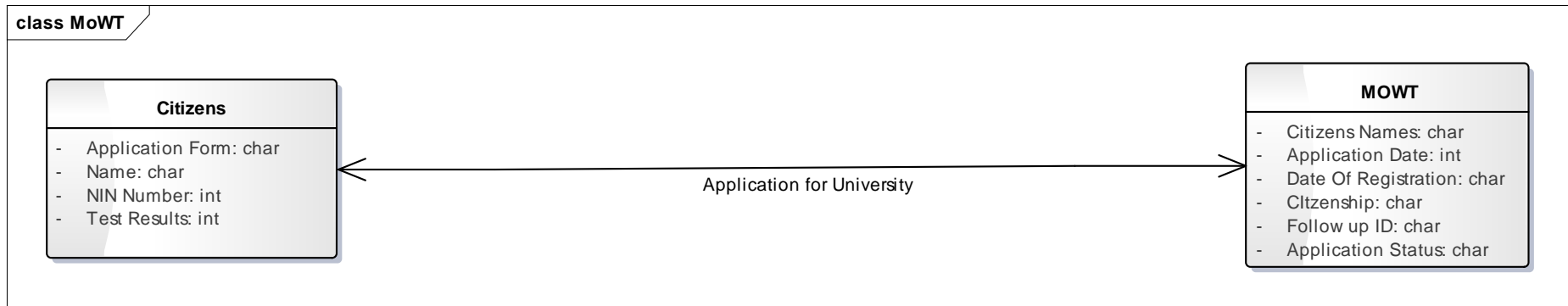
D005: e-agriculture



D006: e-jobs

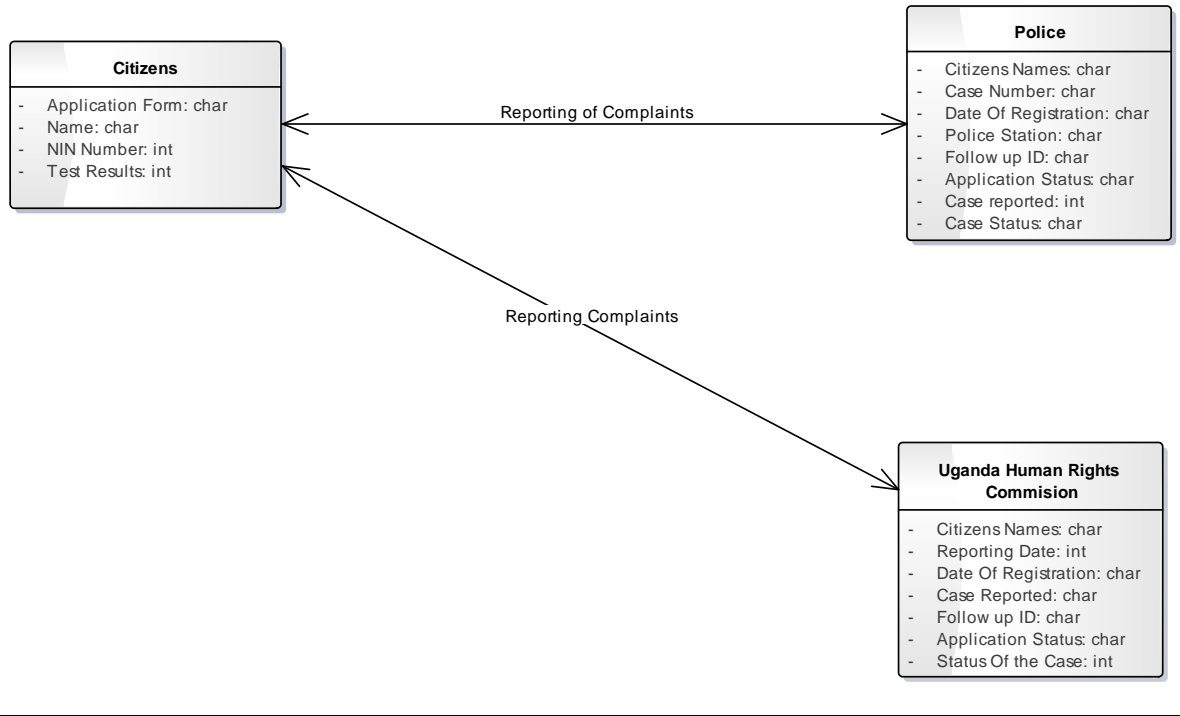


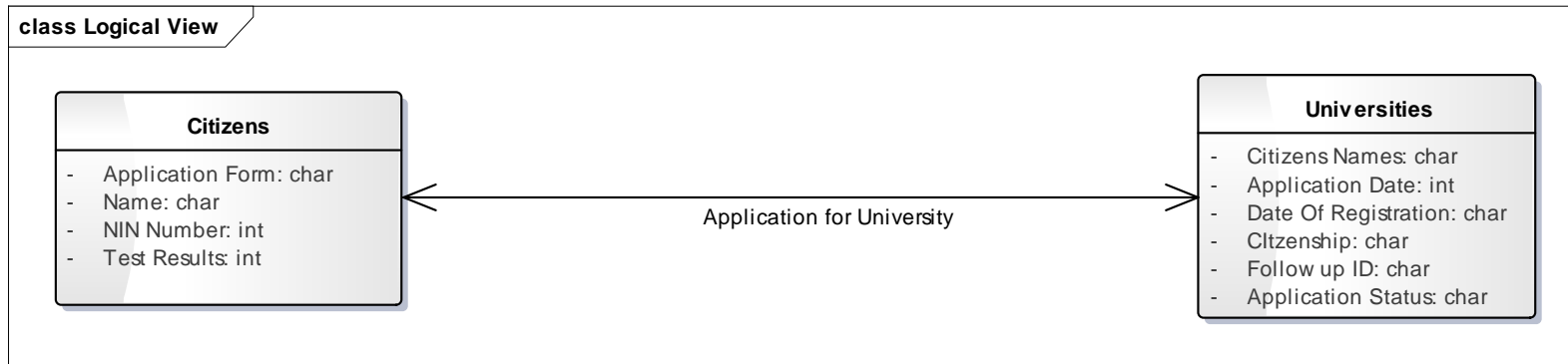
D007: Driver's License Application



D008: JLOS

class Logical View





6.7 Government Service Bus Cost Estimates

SNo	Technology Component	Production		DR		Test		List Price	Total Price
		Quantity	Named User	Quantity	Named User	Quantity	Named User		
		1	WebCenter Portal	4		2			
2	Service Oriented Architecture Suite	8		4		4		57,500.00	920,000.00
3	Application Program Interface Gateway	2		2		1		55,000.00	275,000.00
4	Enterprise Repository	2		2		1		145,000.00	725,000.00
5	Management Pack for Service Oriented Architecture	8		4		4		25,000.00	400,000.00
6	Business Process Management Suite	2		1		1		57,500.00	230,000.00
7	Identity And Access Management Suite		5,000		500		50	110.00	605,000.00
8	Web Tier	4		4		2		5,000.00	50,000.00
9	WebLogic Suite	14		7		7		45,000.00	1,260,000.00

10	Management Pack for WebLogic	14		7		7		12,000.00	336,000.00
11	E-Business Suite Adapter	4		2		2		17,500.00	140,000.00
12	SAP adapter	4		2		2		17,500.00	140,000.00
13	Database Enterprise Edition	8		8		4		47,500.00	950,000.00
14	Real Application Clusters (RAC)	8		8		4		23,000.00	460,000.00
15	Active Data Guard	8		8		4		11,500.00	230,000.00
16	Tuning Pack	8		8		4		5,000.00	100,000.00
17	Diagnostic Pack	8		8		4		7,500.00	150,000.00
18	Database Server	1		1				225,000.00	450,000.00
19	Service Oriented Architecture Server	1		1				250,000.00	500,000.00
20	Shared Storage 50TB	1		1				180,000.00	360,000.00
21	Server Management Software	96		48				10,000.00	1,440,000.00

Sub-Total									10,721,000.00
Estimated Implementation Cost including 1 year support									3,000,000.00
Total Cost Estimate									13,721,000.00

- ▶ This is an indicative BOM & Pricing Includes High Availability so you can see Production, DR & Development Licenses. It also includes the Middle ware (SOA), Hardware and Software Components to make it an end to end solution.
- ▶ This doesn't include bandwidth cost. The current average market price is estimated at \$300 per Mbps per month.

6.8 Priority e-services grouping

Category	E-service
Informational services These services are focused on providing information to citizens , businesses and Government users of the web services portal	e- agriculture
	E - health
	E- GIS
	E- standards
	E- education
	E-record
Transactional services These are services that support online transactions , i.e. services that involve filling-in submission and processing of electronic forms or data to support transactions or processes	e- verification
	e- registration
	e- payment
	e- tax
	e- pension
	E- education
	E-justice
E-employ	
Performance services These services report of performance of different sectors as	E- record

well as handling performance management	
Participatory These services involve feedback between the users of the portal and providers for example polls.	E-citizen

6.9 Meta data for data sets

DE 1.1 National Identification Number

Definition and Applicability			
Contextual Definition	The National identification number is a combination of values that uniquely identifies individuals in a country. The National identification number (NIN) can be system-generated based on a pre-set algorithm.		
Applicability	Applicable to all citizens of Uganda		
Data Representation			
Data Type:	Characters		
Format	Alphanumeric		
Maximum Character Length	25		
Suggested values	Value	Meaning	Range
	Full Name	[see Full Name]	Variable
	Nationality	Nationality of the card holder	Variable
	NIN	National Identification Number	Variable
	Card No	Card of the National ID	numeric
	Date of Expiry	[View DE 1.3]	Date
	Date of Birth	[View DE 1.3]	Date

DE 1.2 Full Name

Definition and Applicability	
Contextual Definition	For a person in the Uganda, <i>Full name</i> refers to a combination of last name (surname/family name), first name (forename), middle name, maiden name (when applicable), and any other names that appear in original national

	identification documents.		
Applicability	Applicable to all individuals in Uganda.		
Data Representation			
Data Type:	String		
Format	Alpha characters		
Maximum Character Length	Variable		
Permissible values	Value	Meaning	Range
	Last name/Surname	Surname or family name	Variable
	First name	First Name	Variable
	Middle Name	Middle Name	Variable
	Other Name	Other Name	Variable

DE 1.3 Date

Definition and Applicability	
Contextual Definition	A calendar date is a day represented within a calendar system.
Applicability	Date of birth Date of retirement Date of application (re-licensure, re-registration, re-certification; training) Date of issue and expiration (of unique identification numbers, license numbers, and other documents) *all other places where "date" is recorded
Data Representation	
Data Type:	String

Format	British English calendar, day-month-year, numeric only		
Maximum Character Length	8		
Suggested Values	Value	Meaning	Range
	DD	Day	01-31
	MM	Month	01-12
	YYYY	Year	1890-Current year
Origin	ISO 8601: 2004, Representation of dates and times; RFC 3339, Date and time on the internet		

DE 1.4 Country

Definition and Applicability	
Contextual Definition	A territory that is legally identified as a distinct sovereign entity (independent nation or state) where the person was born.
Applicability	Country of birth (denotes where the person was born) Citizenship at birth (indicates the person's first citizenship at the time of birth) Citizenship at present (indicates citizenship at the time of record creation, updated subsequently if the person is naturalized or obtains citizenship of a country or countries other than the country of birth).
Data Representation	
Data Type:	String
Format	Alphabet only
Maximum Character Length	3 (see origin in last row)
suggested Values	Value Meaning
	Country 1 Country of birth
	Country 2 Country of residence

	Country 3	Country of citizenship
Origin	ISO 3166:2006, Codes for the representation of names of countries and their subdivisions.	

DE 1.5 Language

Definition and Applicability			
Contextual Definition	Ability of a citizen to read, write and speak more than one language.		
Applicability	Applicable to all citizens		
Data Representation			
Data Type:	Characters		
Format	Alphabet only		
Maximum Character Length	4 (see origin in last row)		
Suggested values:	Value	Meaning	Range
	Language	Read	0000-9999
	Language	Write	0000-9999
	Language	Speak	0000-9999
Origin:	ISO 639-6:2009, Codes for the representation of names of languages		

DE 1.6 Photograph

Definition and Applicability	
Contextual Definition	An electronic image of each citizen in Uganda. The definition also applies to an electronic copy of the birth certificate, stored as part of the person's documented evidence of birth.
Applicability	Applicable to all citizens and people born in Uganda but not Ugandans(alien)
Data Representation	

Data Type:	Image
Format	Should be in line with the ANSI/INCITS (M1) 385-2004 and ISO SC37 19794-5 Face Recognition Data Interchange Format
Additional Notes	<p>Photograph 1: Photograph of the individual that will be used to identify them. This will be used on the National ID, the NNSF card, the passport driving license and education certificates.</p> <p>Photograph 2: Electronic copy of birth certificate can be placed in the field.</p>

DE 1.7 Address (Physical)

Definition and Applicability			
Contextual Definition	Geographic description of physical location (such as home or workplace) that can be identified and located on earth.		
Applicability	Business /company address Residential (home) address Place of issue (for identity documents) Place of birth		
Data Representation			
Data Type:	Character		
Format	Alphanumeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	Line 1	Village	1-32
	Line 2	Parish	1-32
	Line 3	Sub county	1-32

	Line 4	County	1-32
	Line 5	District	1-32

DE 1.8 Education

Definition and Applicability			
Contextual Definition	History of academic or professional training obtained from an institution certified by Ministry of Education or National Council of higher education or National Information Technology Authority or an international certified body. This also includes the highest academic level.		
Applicability	Applicable to all citizens.		
Data Representation			
Data Type:	Variable		
Format	Variable		
Maximum Character Length	Variable		
Suggested Values	Value	Meaning	Range
	Name of the Institution	Full name of the accredited university, college, school, institute, etc.	Alphanumeric
	Country	[see <i>DE 1.4</i>]	Alphanumeric
	Degree or Certificate	Location of the institution	Alphanumeric
	Completion date	[see <i>DE 1.3</i>]	String

DE 1.9 Postal Code

Definition and Applicability	
Contextual Definition	Alphanumeric digits that represent a geographic locality associated with the full address of a citizen, business and MDA in Uganda.
Applicability	Applicable to all citizens, businesses and MDAs.
Data Representation	
Data Type:	String
Format	Alphanumeric only
Maximum Character Length	9

DE 1.10 Email address

Definition and Applicability	
Contextual Definition	Email address, unlike physical address, identifies a person or entity using a local part and a domain part such that the electronic communication can be delivered to an inbox.
Applicability	Professional email address Personal email address
Data Representation	
Data Type:	String
Format	Alphanumeric only
Maximum Character Length	Variable-length character encoding

DE 1.11 Employment Address

Definition and Applicability			
Contextual Definition	Geographic description of physical location (workplace) that can be identified and located on earth.		
Applicability	Applicable only to citizens that are currently employed and will be required for different registrations for example:- TIN Number registration NSSF Registration Company registration PPDA Registration		
Data Representation			
Data Type:	Character		
Format	Alphanumeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	County	Physical location of business	1-32
	Sub county	Physical location of business	1-32
	Town	Physical location of business	1-32
	Street	Physical location of business	1-32
	P.O.BOX	Postal Address of business	1-09

DE 1.12 TIN

Definition and Applicability	
Contextual Definition	This is a unique number which is used by Tax Payers when it comes to paying government taxes for example vehicle registration taxes, import and export taxes, company taxes and other taxes.
Applicability	This is required by all legible tax payers in Uganda and can be used when paying taxes and fines for example Verification Of Tax Payment Motor Vehicle transfer Land Transfer Employment Registration Driving License Registration Passport Registration Court fees
Data Representation	
Data Type:	Character
Format	Numeric
Maximum Character Length	10

DE 1.13 Company Registration Number

Definition and Applicability	
Contextual Definition	This is the unique number given to a company on registration by the Uganda registration Services Bureau(URSB)
Applicability	Applies to all companies registered in Uganda, It can be applied when registering companies for NSSF Registration PPDA Registration

	TIN Registration
Data Representation	
Data Type:	String
Format	Alphanumeric
Maximum Character Length	14

DE 1.14 Company Name

Definition and Applicability	
Contextual Definition	This is the unique name given to a registered company in Uganda.
Applicability	Applies to all companies registered in Uganda, It can be applied when registering companies for NSSF Registration PPDA Registration TIN Registration
Data Representation	
Data Type:	String
Format	Alphanumeric
Maximum Character Length	10

DE 1.15 Vote Code

Definition and Applicability	
Contextual Definition	This refers to the unique identifier allocated to the different Ministry, Department or Agency for identification purposes.

Applicability	This applies to all the government Ministry, Department or Agency. It is important in the following instances Payments by Citizens to MDAs Employee Payment Registration Verification Access to e-services
Data Representation	
Data Type:	Character
Format	Numeric
Maximum Character Length	3

DE 1.16 Vote Name

Definition and Applicability	
Contextual Definition	This refers to the unique name given to every government Ministry, Department or Agency
Applicability	This applies to all the government Ministry, Department or Agency. It is important in the following instances Payments by Citizens to MDAs Employee Payment Registration Verification Access to e-services
Data Representation	
Data Type:	String
Format	Alphabet only

Maximum Character Length	32
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DE 1.17 Land Title

Definition and Applicability	
Contextual Definition	This refers to the documentation the shows the bona fide owner of a given piece of land in Uganda.
Applicability	This applies to all the registered land in Uganda and is important for all land related transactions for example Land Registration Land Transfer Land Status
Data Representation	
Data Type:	Character
Format	Alphanumeric
Maximum Character Length	32

DE 1.18 Land Address

Definition and Applicability	
Contextual Definition	Geographic description of land that can be identified and located on earth.
Applicability	This applies to all the registered land in Uganda and is important for all land related transactions for example Land Registration Land Transfer Land Status
Data Representation	

Data Type:	Character		
Format	Alphanumeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	County	Physical location of land	1-32
	Sub county	Physical location of land	1-32
	Zone	Physical location of land	1-32
	Plot Number	Physical location of land	1-32
	Block Number	Physical location of land	1-32

DE 1.19 Motor

Definition and Applicability			
Contextual Definition	This defines vehicles that are registered in Uganda		
Applicability	It applies to the cars and motorcycles		
Data Representation			
Data Type:	String		
Format	Alphanumeric		
Maximum Character Length	10		
Suggested values	Value	Meaning	Range
	Reg Number	Registration Number	1-32
	Name	Make of Vehicle	1-32
	Type	Physical location of land	1-32
	Year	Year of manufacture	1-32

	Chassis	Chassis Number	1-32
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DE 1.20 Case

Definition and Applicability			
Contextual Definition	A case is a dispute between opposing parties resolved by a court or by some equivalent legal process. A legal case may be either civil or criminal		
Applicability	Applicable to all citizens, businesses and MDAs.		
Data Representation			
Data Type:	Character		
Format	Alpha Numeric		
Maximum Character Length	Variable		
Suggested values	Value	Meaning	Range
	Name	Full name of the case.	Alphanumeric
	Number	Unique Identifier of the case.	Alphanumeric
	Country	[see <i>DE 1.4</i>]	Alphanumeric
	Judgment	Ruling passed on the case	Alphanumeric
	Completion date	[see <i>DE 1.3</i>]	String

DE 1.21 Payment receipt

Definition and Applicability	
Contextual Definition	This is the receipt issued to the citizen or company after a payment for a good or service has been made
Applicability	It applies to all the payments done on the integration layer for example payment for e-services

Data Representation			
Data Type:	String		
Format	Alphanumeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	Name	Full name of Payer	1-32
	Payment	Payment for	1-32
	Amount	Amount Paid	1-32
	Mode	Payment mode	1-32

DE 1.22 Seed

Definition and Applicability			
Contextual Definition	The grains or ripened ovules of plants used for sowing		
Applicability	All agricultural services		
Data Representation			
Data Type:	Character		
Format	Alpha Numeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	Name	Full name of the seed.	1-32
	Number	Unique Identifier of the seed.	1-32
	Origin	Country of origin [see <i>Country</i>]	1-32
	Grade	Grade of the seed	1-32

DE 1.23 Fertiliser

Definition and Applicability			
Contextual Definition	A chemical or natural substance added to soil or land to increase its fertility.		
Applicability	Fertilizer standards and brands information will be available as part of the services below; All agricultural services E-standards		
Data Representation			
Data Type:	Character		
Format	Alpha Numeric		
Maximum Character Length	32		
Suggested Values	Value	Meaning	Range
	Name	Full name of the fertiliser.	1-32
	Manufacturer	Name of manufacturer.	1-32
	Origin	Country of origin [see <i>Country</i>]	1-32
	Grade	Grade of the seed	1-32

6.10 Validation Workshop Feedback

Group 1

Do you feel like these e-services will add value to the citizens?

YES

What e-services do you feel need to be added to the current list of proposed e-services?

- ▶ An e-service about feedback from citizens about different government services should be added on the e-services list.
- ▶ There should be an e-service about the ongoing government programs to help the citizens find out the progress of projects and monitor performance that are ongoing.

What challenges do you feel will affect the implementation of the proposed e-services?

- ▶ Not everyone in the country is connected to the power grid; hence the citizens that are not connected will be left out.
- ▶ There is need for legal harmonisation between the different MDAs on the roles to be played in the management of the ESB to prevent misuse.
- ▶ The National Identification and Registration Authority-Uganda Regulations and the National Identification and Registration Authority-Uganda act as part of the legal review for the integration solution.
- ▶ Cost of the internet infrastructure to access the e-services
- ▶ Localisation of the content so that it is understood by most citizens.

Group 2

Do you feel like these e-services will add value to the citizens?

The e-services will add value to the citizens in the following ways: time saving, accurate information, cost saving, improved revenue collection, improved national planning accountability and delivery.

What challenges do you feel will affect the implementation of the proposed e-services

- ▶ A security breach on the integration layer may endanger the lives of the citizens.
- ▶ Information misuse by the controlling agents is possible
- ▶ Abuse of the systems by the managers
- ▶ Infrastructure limitation
- ▶ Costs for the Internet
- ▶ Hardware and software should be compatible with most devices for example mobile phones
- ▶ Users should be educated and encouraged to use these e-services.
- ▶ They should be easy to use by the citizens

What challenges do you feel will affect the implementation of the proposed e-services?

e-services that can be included

- ▶ Insurance (Health)
- ▶ Tourism
- ▶ Transport routes, costs and parking fees
- ▶ e-weather for general weather updates

Group 3

Do you feel like these e-services will add value to the citizens?

Yes they will add value to the citizens through ease of doing business with the government, time saving, cost saving, high quality data across government and the MDAs and ease in decision making and planning.

What challenges do you feel will affect the implementation of the proposed e-services?

- ▶ Lack of backups may lead to downtime, from the MDA providing the different e-services.
- ▶ Language barrier as the literacy levels in Uganda are high.
- ▶ Lack of Power Infrastructure (electricity), to support the use of e-services in some parts of the country.
- ▶ High Costs of the Internet
- ▶ Resistance on the uptake of the e-services

What e-services do you feel need to be added to the current list of proposed e-services?

e-services that could be added include;

- ▶ E-learning for example on how to plant, weed, harvest the different crops whose production is being encouraged.
- ▶ E-voting
- ▶ E-visa instead of the stamping of the passport leaves

Group 4

Do you feel like these e-services will add value to the citizens?

Yes

Timely delivery of information to the citizens

What e-services do you feel need to be added to the current list proposed e-services

e-services that can be added

- ▶ e-learning
- ▶ e-certification
- ▶ e-warrants

What challenges do you feel will affect the implementation of the proposed e-services?

- ▶ Citizens' privacy should be considered while implementing the integrated solution.
- ▶ There should be sensitization campaigns to educate the citizens about the use of the e-services
- ▶ Conflict of interest between the MDA's on their role on the management of the integrated solutions and the e-services.
- ▶ Risks of Identity theft impersonation and vulnerabilities related to cyber crime
- ▶ Non Readiness and compliance by the MDA

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