

SRI LANKA GOVERNMENT ENTERPRICE ARCHITECTURE

The Whole of Government Approach

Contents

Sri Lanka Government Enterprise Architecture (SL-GEA)	3
1.0 Introduction	3
2.0 What is an Enterprise?	3
3.0 What is an Enterprise Architecture (EA)?	3
4.0 EA Frameworks (EAF)	4
5.0 EA Domains	4
6.0 Enterprise Architecture Reference Models	5
Performance Reference Model (PRM)	6
Business Reference Model (BRM)	6
Service Reference Model (SRM)	6
Data Reference Model (DRM)	7
Technical Reference Model (TRM)	7
6.0 Sri Lanka Government Enterprise Architecture (SL-GEA)	8
7.0 Foundational / Core Services	11
Lanka Government Network (LGN)	11
Lanka Government Cloud (LGC)	12
Sri Lanka Unique Digital Identify (SL UDI)	13
Lanka Interoperability Framework (LIFe)	14
National Data Exchange (NDX)	14
API Layer	15
Open Data	15
Lanka Government Payment Service (LGPS)	15
GovSMS Service	16
Single Window Portal (gov.lk)	16
8.0 Shared and Line of Business Services	17
9.0 References	19

Revision History

DATE	VERSION	AUTHOR	DESCRIPTION
25/04/2022	V 1.0	ICTA Technology Team	First Draft

Sri Lanka Government Enterprise Architecture (SL-GEA)

1.0 Introduction

The Sri Lanka Government Enterprise Architecture (SL-GEA) is the whole of government architectural approach for a digitally inclusive Sri Lanka. It is a decision-making policy framework, which helps agencies to develop scalable, secure, and resilient digital capabilities by promoting reuse and unlocking emerging technologies.

This will eventually improve how government services are delivered to citizens, government organizations and businesses in a seamless manner.

2.0 What is an Enterprise?

An Enterprise is an organization or a cross organizational entity which supports a defined business scope. It includes independent resources such as people, organizations, and technologies whose functions must be coordinated, and information and knowledge resources shared to support common priorities and activities.

3.0 What is an Enterprise Architecture (EA)?

An Enterprise Architecture (EA) is a complete expression of an enterprise. It basically describes the goals of an organization, how these goals are realized by business processes and how these business processes can be better served through technology.

Some of the key benefits of having a well-defined Enterprise Architecture are:

1. Strategic Alignment
2. Cross Agency Collaboration
3. Capability Development
4. Business System Integration
5. Change Management
6. Technology Convergence

4.0 EA Frameworks (EAF)

In a large enterprise, a defined framework is necessary to capture a vision of the entire organization in all its dimensions and complexities.

The EA Framework (EAF) is a communication model for developing an Enterprise Architecture. It is a set of models, principles, services, approaches, standards, design concepts, components, visualizations, and configurations that guide the development of specific aspect architectures.

It is a generic problem space and a common vocabulary within which individuals can cooperate to solve a specific problem.

There are multiple popular EAFs are in the market, such as:

1. The Open Group Architecture Framework (TOGAF)
2. Zachman Framework for Enterprise Architecture
3. US Government Federal Enterprise Architecture Framework (FEAF)
4. Gartner Enterprise Architecture Framework (GEAF)

All these EAFs are having its own evolution, purpose, scope, principles, structures, and approaches.

Developing a complete enterprise architectural model of every element in any enterprise is a complex and daunting task. Such an EA effort may prevent important cross business area collaboration processes, which are critical to the overall successful definition and implementation of the EA.

The level of enterprise architectural detail within the EA should be governed by the overall objectives of achieving collaboration, alignment, validation, and the ability to implement and assess the risk.

5.0 EA Domains

In TOGAF, there are four (04) main overlapping EA domains discussed. This is known as the BDAT Framework.

1. **B**usiness Architecture
2. **D**ata Architecture
3. **A**pplication Architecture
4. **T**echnology Architecture

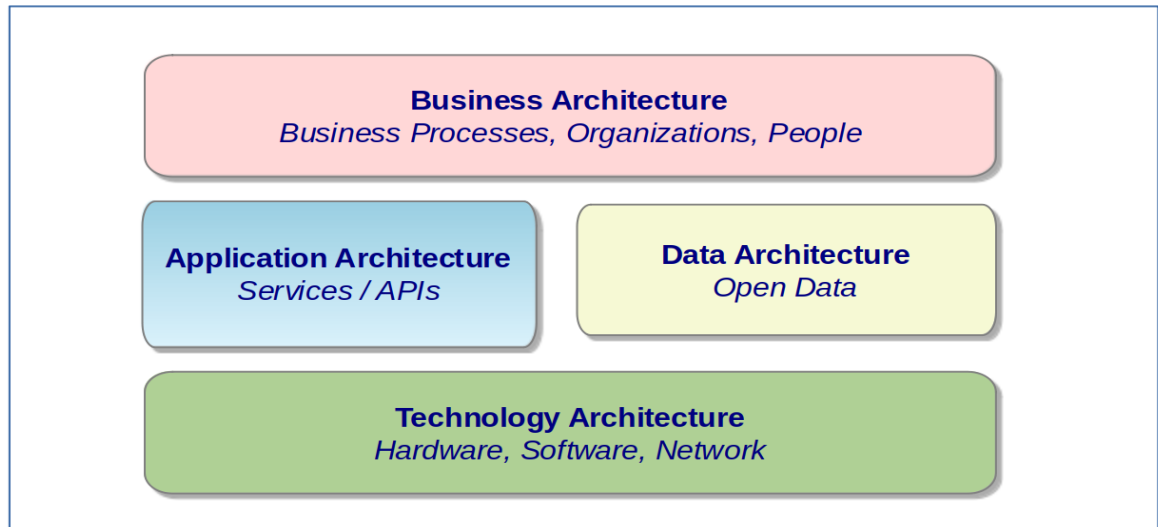


Figure 01 – BDAT Framework

6.0 Enterprise Architecture Reference Models

While doing the government digital transformation, it is essential to transform business processes by re-engineer them. In Enterprise Architecture terms, we can leverage *Enterprise Architecture Reference Models* to conceptualize the process.

In a typical FEA [5] Enterprise Architecture setting, Reference Models can facilitate cross agency analysis to identify duplicative investments, gaps, and opportunities for collaboration within and across government agencies.

With this approach, all government agencies can find wasteful and duplicative investments / applications, areas where investments could be made and where departments and agencies can collaborate each other to improve government operations and services.

There are five (05) Reference Models identified in a typical FEA setting and these could be very much applied to Sri Lanka GEA as well.

1. Performance Reference Model (PRM)
2. Business Reference Model (BRM)
3. Service Reference Model (SRM)
4. Data Reference Model (DRM)
5. Technical Reference Model (TRM)

Performance Reference Model (PRM)

PRM is a framework for performance measurement providing common output measurements throughout the Government. It allows agencies to better manage the business of government at a strategic level by providing a means for using an agency's enterprise architecture (EA) to measure the success of information systems investments and their impact on strategic outcomes.

This can be used to:

1. Promote strong alignment between business initiatives and agency and government strategies and outcomes.
2. Facilitate efficient and effective business operations.
3. Develop accurate cost models for ICT capabilities and services.
4. Increase effectiveness of infrastructure and cross agency capital investments
5. Increase transparency in operations and reporting on progress and performance.

Business Reference Model (BRM)

BRM is a function driven framework, which explains the business operations of the government independent of the government agencies.

BRM allows agencies to classify the functions of government program into a defined structure. It provides value to business architecture by providing:

1. A functional view of agency business.
2. A standard classification of business functions
3. Identifying reusable services

Service Reference Model (SRM)

SRM provides a framework, which classify service components with respect to how they support business/ performance objectives. It helps to identify opportunities for re-use of business components and services.

Government *agency level service classification* is the key output of this effort.

SRM provides value by providing a framework for:

1. Cataloging services
2. Identifying gaps and duplicate or redundant services
3. identifying reusable services

Data Reference Model (DRM)

Provides a flexible framework that supports information sharing and reuse across the government. This provides a uniform data management practice by enabling agencies to agree, establish and support a common language and standards for information sharing.

Government wide *Interoperability Frameworks (IF)* are being used for this purpose.

Technical Reference Model (TRM)

TRM is a component-driven technical framework used to identify standards, specifications, and technologies that and enable the delivery of service components and capabilities.

This can be used to:

1. Generate software and hardware inventories
2. Classify ICT standards
3. Identify Gaps, duplicate and redundant technology components

6.0 Sri Lanka Government Enterprise Architecture (SL-GEA)

Like most of the countries, which are ranked higher in e-Government rankings [1], Sri Lanka also have adopted a connected Digital Strategy Road map aligning to Enterprise Architectural concepts [2].

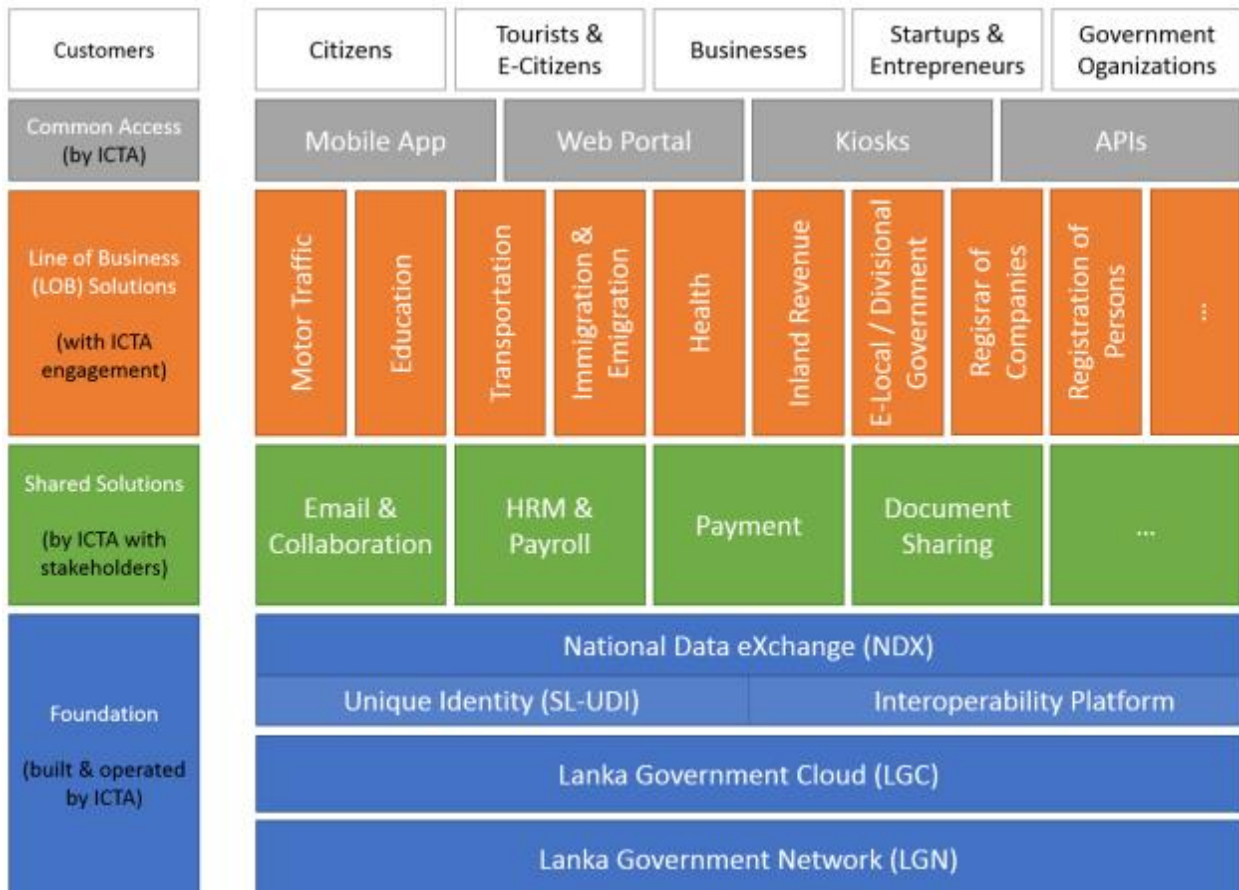


Figure 02 - Digital Government Strategy Blueprint [2]

The Sri Lanka Digital Strategy Blueprint (Figure 02) primarily focuses on

three (03) key *values*:

1. Citizen First
2. Government as Platform
3. Empowered Government Officer

and, it has four (04) key strategies:

1. **Citizens and business focused solutions** – A more user and business centric approach is adopted
2. **Shared digital services and platforms** – A set of key and strategically important digital services are developed
3. **Developing a highly available and secure systems** – All the digital services, which are developed will be resilient to threats and high loads. These services will be supported with a more robust digital infrastructure
4. **Unified approach towards a digital transformation** – Digital services developed can be integrated in a seamless manner giving more emphasis to government agency level data and technological interoperability.

In addition to *values* and *strategies* discussed, there are three main levels are shown in the Digital Strategy Road map (Figure 02).

1. Foundational / Core Services
2. Shared Solutions / Services
3. Line of Business (LoB) Solutions / Services

The BDAT Framework (Figure 01), has been the base of designing the Sri Lanka Government Enterprise Architecture (SL-GEA).

While designing the Digital Sri Lanka strategy,

- Foundational / Core Services → Mapped to *Technical, Data* and *Application* architecture domains
- Shared Services and Line of Business Services → Mapped to Business Architecture domain

In the Sri Lanka GEA (SL-GEA) context, the BDAT Framework can be mapped to a layered architecture (Figure 03).

In Figure 03, there are four (04) different layers identified.

1. Application and Data Layer
2. Service Layer
3. Integration Layer
4. Service Delivery Layer

Out of these four layers, the Application / Data layer and Service layer are conceptualized within **organizational level**, and they represent application / data back-ends along with service APIs.

The integration layer and the service delivery layer are conceptualized within **national level** and reside within ICTA owned government core infrastructure.

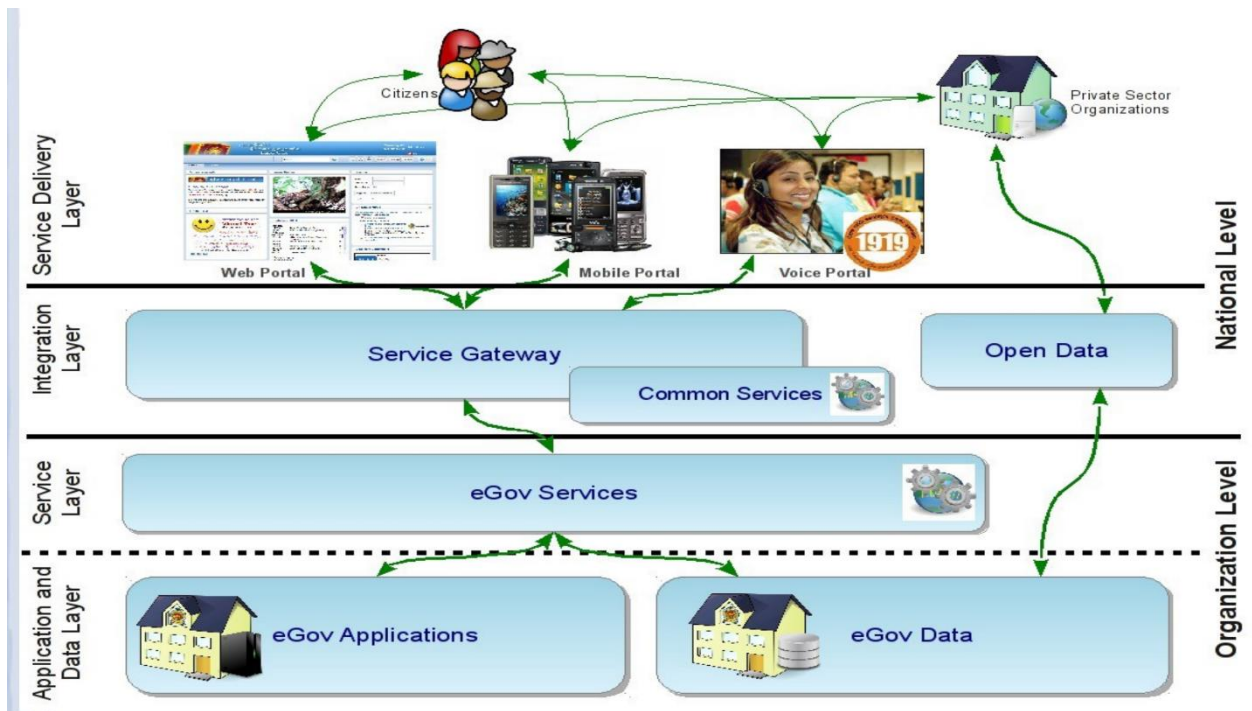


Figure 03 – The Layered Architecture

7.0 Foundational / Core Services

The Foundational / Core Services of Sri Lanka Digital Road map can be visualized as in Figure 04.

Some of the key core services are:

1. Lanka Government Network (LGN)
2. Lanka Government Cloud (LGC)
1. 3, National Data Exchange (NDX)
3. SL UDI (Sri Lanka Unique Digital Identify)
4. Interoperability Framework (IF) – life.gov.lk
5. Lanka Government Payment Service (LGPS)
6. GovSMS Portal
7. Open Data Portal (data.gov.lk)
8. Single Window Portal (gov.lk)

Out of these services, LGN, LGC and the Interoperability Framework (IF) have been in operation for some time now. SL UDI and NDX projects have been conceptualized.

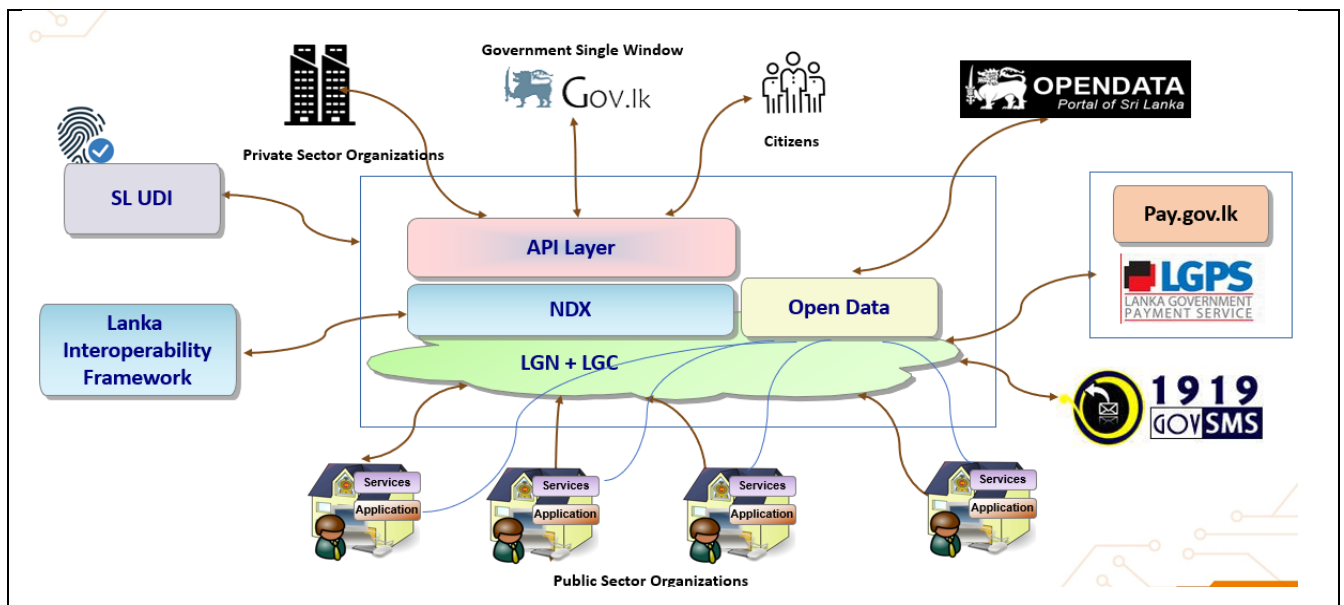


Figure 04 – SL-GEA Core Services

Lanka Government Network (LGN)

Lanka Government Network is high available, high speed, secure, reliable, and centrally managed dedicated government network linking most of the government institutions to a single digital

infrastructure. It is encouraging public sector employees to get better acquainted with Information and Communication Technology (ICT), assuring efficiency and smooth flow of information as well as improving standards of service in the public sector to be able to provide efficient citizen services.

LGN connects government organizations in a cost-effective and secure manner to provide centralized Internet, Email, and video conferencing services, enable access to Lanka Government Cloud (LGC) services from any government organization. Also, it provides trusted and secure connectivity to all government organizations to exchange government data and information.

The main objectives of Lanka Government Network are as follows.

- To provide high speed Wide Area Network connectivity to 860 government locations to connect with LGN main backbone.
- To provide Wi-Fi facility to access government services for employees and for citizens.
- To establish a common digital infrastructure to government for share information and provide digital content and electronic services to public.
- To facilitate the government organizations to utilize this LGN network for effective and efficient service delivery.
- To provide uninterrupted, reliable, and fast Internet connectivity to the government organizations/buildings.
- To provide trusted and secure connectivity to other government organizations to exchange government data.
- To secure integration of government organization's existing Local Area Networks into LGN 2.0
- Integrated with Lanka Government Cloud (LGC)
- Centralized Technical support and assistance

Lanka Government Cloud (LGC)

Lanka Government Cloud (LGC) [11] is the Sri Lanka Government private cloud, and it minimizes or eliminates purchasing and maintaining of servers and/or data centers by government organizations, which could be time consuming, ineffective, and insecure.

The main objective is to eliminate all constraints and limitations to the government organizations for adopting to cloud computing strategy and thereby increase ICT usage to enhance the effectiveness and efficiency of government processes.

IaaS and PaaS

Currently it does provide *Infrastructure as a Service (IaaS)* services to its clients. Now ICTA is in the process of conceptualizing an integrated *Platform as a Service (PaaS)* comprising some of the key core services such as Identity Management Solution, API Management Solution, Kubernetes Cluster Management Solution, etc. This would further streamline the current core infrastructure and will eliminate duplicates and enforce central governance across all core services. Furthermore, it will improve the infrastructure scalability of all tenant level applications.

Sri Lanka Unique Digital Identify (SL UDI)

SL-UDI is the Sri Lanka Government's national level program for the establishment of a Unique Digital Identity Framework.

The objective of having a Sri Lanka Unique Digital Identity is to secure and trusted digital credentials as well as a platform for authentication replacing the requirement to create multiple digital identities.

UDI provides both physical and digitally by having a bio-metric back-end and a set of digital credentials. The tight coupling of physical and digital credentials yields a unique digital identity that enables a citizen to authenticate and transact seamlessly either physically or on-line.

SL-UDI project consists of multiple services.

- 1. Pre-registration / Enrollment** – Provides citizens an option to submit mandatory demographic details. For this, citizen needs to complete demographic details, upload any identity documents and finally schedule an appointment.
- 2. Enrollment / Registration** – One the citizen pre-registered, he/ she is required to go through the enrollment process at an enrollment center.
- 3. UDI number generation, validation, and issuance** – This goes through a set of checks such as validation, de-duplication, quality checks and finally the generation of the UDI number.
- 4. E-NIC card issuance** – Once the UDI number is generated and gone through the required quality checks, citizens are issued with an e-NIC card.
- 5. e-KYC authentication** – An authentication API provided by the SL-UDI system for any online real-time authentication at the point of service delivery of various agencies that have been subscribed to SL-UDI.

6. Lifecycle updates - This allows citizens to update their demographic details either online or in an assisted mode in an enrollment center. This will ensure that the demographic information in the system is up to date.

Lanka Interoperability Framework (LIFe)

To comply with data interoperability among various government entities / domains, Sri Lanka Government initiated the Lanka Interoperability Framework, which is known as LIFe [7].

Currently following domains have been completed.

- Personal Domain
- Land Domain
- Vehicle Domain
- Project Coordination Domain

ICTA now is in the process of completing two more domains (Health and Education) with the help of respective domain ministries (Ministry of Health and Ministry of Education) in its Digital Government Strategy 2020 - 2024.

National Data Exchange (NDX)

The National Data Exchange (NDX) is an integral part of the Sri Lanka Government Digital core infrastructure.

NDX is all about keeping data uniformity across the whole government rather having duplicated back-ends with multiple data formats. Having multiple data sources across the government for the same domain is an anti-pattern when it comes to the Whole of Government approach.

While integrating with multiple back-end services, there are instances that you find legacy back-ends along with newly built ones. In such instances, to communicate with newly back-ends (complying to LIFe standards), legacy back-ends need some data transformation / mediation at some layer. NDX basically does this task for you in a secure manner complying to Enterprise Integration Patterns [9].

If you develop your back-ends as greenfield systems, then you may stick to the latest technology protocols and data formats defined under LIFe. In such situations, you can easily bypass the Service Bus mediation and eliminate one more layer in the end-to-end communication.

In addition to Service Bus, new generation API Gateways also support mediation patterns though it does not go to ESB level maturity.

API Layer

An API layer is introduced to direct *North-South* bound traffic in the infrastructure. Primarily the API layer will be funneled through a well-defined *API Gateway* to external entities such as citizens and businesses, which reside outside the government core infrastructure.

This layer is responsible for API management, governance, and security.

In addition to that it can be used to do any data transformation / mediation, which are routed through this layer. That means this can provide similar features, which NDX can provide you as well. However, mediations at the API Gateway level are very much an anti-pattern in a more distributed microservices based back-end design. But mediation at the API Gateway level is always a possibility in exceptional circumstances.

Open Data

Disseminating classified data from government back-ends to citizens, businesses and all the other relevant stakeholders.

National Data Sharing Policy

The National Data Sharing Policy [13] has been already drafted ensuring the data sharing guidelines at government agency level. This complements well with the Data Protection Act [10], which has been recently drafted in 2022.

Currently the open data portal is hosted [9] in the core infrastructure pulling some of the key data sets from some of the government department level back-ends.

Lanka Government Payment Service (LGPS)

An abstract payment service, allowing government departments to connect to a single interface rather connecting to multiple payment service providers.

Currently most of the local banks are partnered with LGPS to enable government payments.

Pay.gov.lk

A newer version of LGPS is in development now (pay.gov.lk), adding the latest payment security features along with added functionality.

GovSMS Service

This is the SMS service given to all back-end services, which have been connected via core infrastructure. Citizens can use 1919 short code to access this service.

Single Window Portal (gov.lk)

Currently, all the government services are disseminated to the public via a single window web site gov.lk. Citizens can search for government services from the portal and access respective services via this portal.

It has been conceptualized to centrally manage all the government web site via gov.lk in its next version. With this approach there will be uniformity in all government websites and security will be centrally managed as well.

Government organizations are encouraged to expose their services via gov.lk to ease the accessibility of government services to encourage the single window concept.

8.0 Shared and Line of Business Services

From 2010 to 2020, Sri Lanka Government Core Infrastructure Line of Business Services were exposed through a Service Oriented Architecture (SOA) approach [14]. In early 2010, with this design, ICTA was able to launch its first transactional based e-service application, which is known as *e-Revenue License application* [15], where citizens could renew their vehicle revenue license online.

Along with e-Revenue License application, there were quite a few transactional online e-services were exposed via this SOA based infrastructure formerly known as *Lanka Gate* [16][17].

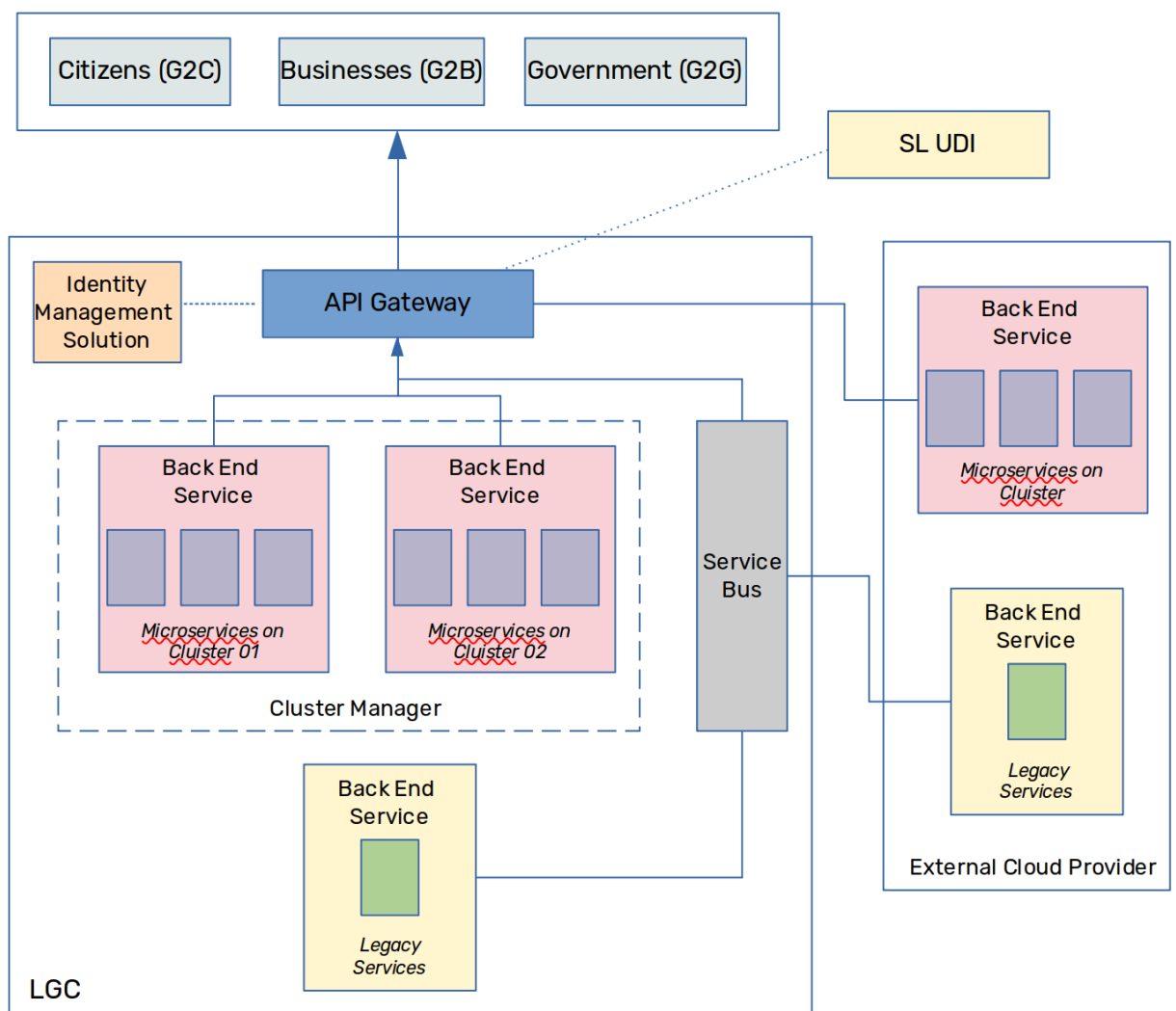


Figure 04 – SL-GEA Government Business Layer Integration

After adopting this architecture for more than a decade, from 2020 onward, ICTA core services changed its back-end infrastructures to support more decentralized approach by adopting Microservices Architecture (MSA). This was further strengthened with the support of container based LGC 2.0 design.

However, there a quite few monolithic legacy back-ends still this new infrastructure needs to deal with. Considering this, ICTA came up with a more hybrid approach supporting both Monolithic and Microservices back-ends (Figure 04).

In this approach, all the new services will be developed using the *Microservice Architecture (MSA)* architectural pattern [12] and the rest of the legacy back-ends will be connected via a Service Bus (*Enterprise Service Bus – ESB*).

If any external party wants to connect to the government infrastructure (North-South communication), they will be funneled through the more strategic API layer, where *API Gateway* works as the key architectural component.

If any government entity wants to consume some of the back-end APIs, those could be exposed via another API Gateway instance confined only to the internal (LGN) communications.

Citizen / Government level government services will be primarily authenticated via the SL UDI platform and authorization could be routed through a separate Identity Management solution.

9.0 References

1. UN e-Government Survey: <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020>
2. The Digital Government Strategy (2020-2024): <https://www.icta.lk/icta-assets/uploads/2021/06/01.-Digital-Government-Strategy.pdf>
3. Open Group TOGAF 9.2 Architectural Approach: <https://pubs.opengroup.org/architecture/togaf9-doc/arch/>
4. Zachman Architecture: <https://www.zachman.com/about-the-zachman-framework>
5. Federal Enterprise Architecture: <https://obamawhitehouse.archives.gov/omb/e-gov/FEA>
6. Gartner Enterprise Architecture: <https://www.gartner.com/en/doc/738504-enterprise-architecture-2021>
7. Lanka Interoperability Framework: <https://life.gov.lk>
8. Sri Lanka Open Data Portal: <https://data.gov.lk>
9. Enterprise Integration Patterns: <https://www.enterpriseintegrationpatterns.com/>
10. ICT Legal Framework: <https://www.icta.lk/legal-framework/>
11. Lanka Government Cloud (LGC) : <https://lgc.gov.lk/>
12. TOGAF Series Guide: Microservices Architecture (MSA)
13. National Data Sharing Policy: https://life.gov.lk/index.php?option=com_content&view=article&id=2&Itemid=115&lang=en
14. Service Oriented Architecture (SOA): https://en.wikipedia.org/wiki/Service-oriented_architecture
15. e-Revenue License on-line application: <https://www.gov.lk/services/erl/es/erl/view/index.action>
16. Introduction to Lanka Gate: <https://www.slideshare.net/sanjayak/introduction-to-lanka-gate>

17. Sri Lanka Government Enterprise Architecture:

<https://www.slideshare.net/crishantha/enterprise-architecture-in-the-current-egovernment-context-in-sri-lanka>