The National Plan for UAE Smart Government Goals

Smart Government Blueprint / Reference Architecture

Mar 2015 – Dubai, UAE

This document presents UAE Smart Government Technology Blueprint

Document Overview

- This document presents the technology blueprint, the high-level enterprise architecture, and the logical architecture for UAE Smart Government across the established EA domains. It provides definitions of the various technology components within the logical architecture. Finally, this document highlights the technology building blocks of each project and project to project dependencies
- The High-Level Enterprise Architecture (EA) was defined as part of the Smart Government Strategy exercise.
- Based on the high-level EA, a technology blueprint (logical architecture) was defined by analyzing all initiatives charters, their underpinning projects, and inputs from on-going projects. Major architecture components / building blocks of each project were fleshed out and links to other key projects were established.
- Several workshops and meetings with various stakeholders were conducted to finalize and socialize the technology blueprint. The blueprint is intended to be used in conjunction with the PMO and it aims to provide a single lens for project managers and stakeholders to assist them in understanding technology components of each initiative and project, identifying dependencies with other projects and defining scope of RFPs when needed.
- This exercise will serve as a key input to the Enterprise Architecture Guidelines initiative planned as part of the Smart Government roadmap.

Source: BAH Analysis

Table of Contents

- **Introduction**
- Scope
- Approach
- High Level EA
- Reference Architecture
- Project Mapping
- Appendix A – Building Blocks Definitions

The UAE Smart Gov. Strategy yielded a total of 22 initiatives across seven priority areas, several of which are ongoing

1 Smart Infrastructure

- SI-1 National Network Infrastructure

2 Smart Identity

- ID-1 National Trusted Service Manager
- ID-2 National PKI Expansion
- ID-3 National Identity Assurance Service
- ID-4 Constituent Box

3 Engagement and Outreach

- EO-1 Public Awareness Campaign
- EO-2 Smart Community Centers
- EO-4 Government Online
- EO-5 National CRM System

4 Governance and Policy

- GP-1 Federal CIO Model
- GP-3 Smart Gov. Regulatory Framework
- GP-4 Service Modernization Criteria
- GP-5 Smart Service Performance Measurement
- GP-6 National Government EA Guidelines
- GP-7 National UX Guidance and Tools

5 Human Capital

- HC-1 Center of Digital Innovation

6 Smart Data Analytics

- SD-1 Smart Analytics
- SD-2 National Big Data System
- SD-3 National Spatial Data Infrastructure

7 Smart Service Modernization

- SM-1 Service Modernization
- SM-2 Smart Health
- SM-4 National ePayment Service

On-going Planned

Source: BAH Analysis

The initiatives are further broken down into projects, totaling 54 potential projects in total

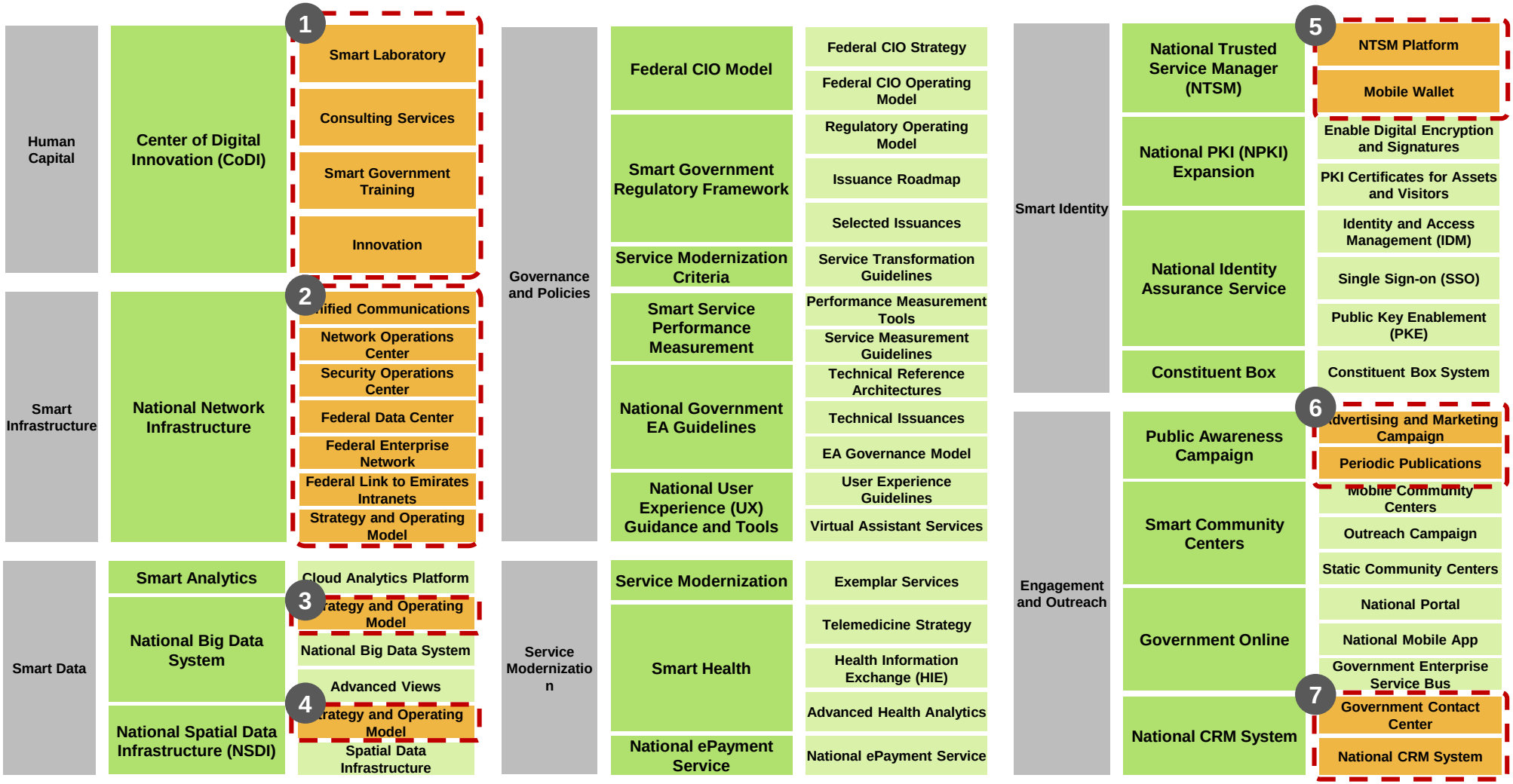
Human Capital	Center of Digital Innovation (CoDI)	Smart Laboratory
		Consulting Services
		Smart Government Training
		Innovation
Smart Infrastructure	National Network Infrastructure	Unified Communications
		Network Operations Center
		Security Operations Center
		Federal Data Center
		Federal Enterprise Network
		Federal Link to Emirates Intranets
		Strategy and Operating Model
Smart Data	Smart Analytics	Cloud Analytics Platform
	National Big Data System	Strategy and Operating Model
		National Big Data System
		Advanced Views
	National Spatial Data Infrastructure (NSDI)	Strategy and Operating Model
		Spatial Data Infrastructure

Governance and Policies	Federal CIO Model	Federal CIO Strategy
		Federal CIO Operating Model
	Smart Government Regulatory Framework	Regulatory Operating Model
		Issuance Roadmap
		Selected Issuances
	Service Modernization Criteria	Service Transformation Guidelines
	Smart Service Performance Measurement	Performance Measurement Tools
		Service Measurement Guidelines
	National Government EA Guidelines	Technical Reference Architectures
		Technical Issuances
		EA Governance Model
	National User Experience (UX) Guidance and Tools	User Experience Guidelines
		Virtual Assistant Services
Service Modernization	Service Modernization	Exemplar Services
	Smart Health	Telemedicine Strategy
		Health Information Exchange (HIE)
		Advanced Health Analytics
	National ePayment Service	National ePayment Service

Smart Identity	National Trusted Service Manager (NTSM)	NTSM Platform
		Mobile Wallet
	National PKI (NPKI) Expansion	Enable Digital Encryption and Signatures
		PKI Certificates for Assets and Visitors
	National Identity Assurance Service	Identity and Access Management (IDM)
		Single Sign-on (SSO)
		Public Key Enablement (PKE)
	Constituent Box	Constituent Box System
Engagement and Outreach	Public Awareness Campaign	Advertising and Marketing Campaign
		Periodic Publications
	Smart Community Centers	Mobile Community Centers
		Outreach Campaign
		Static Community Centers
	Government Online	National Portal
		National Mobile App
		Government Enterprise Service Bus
	National CRM System	Government Contact Center
		National CRM System

Source: BAH Analysis

19 of the 54 potential projects have already been launched, being managed under 7 programs



Source: BAH Analysis

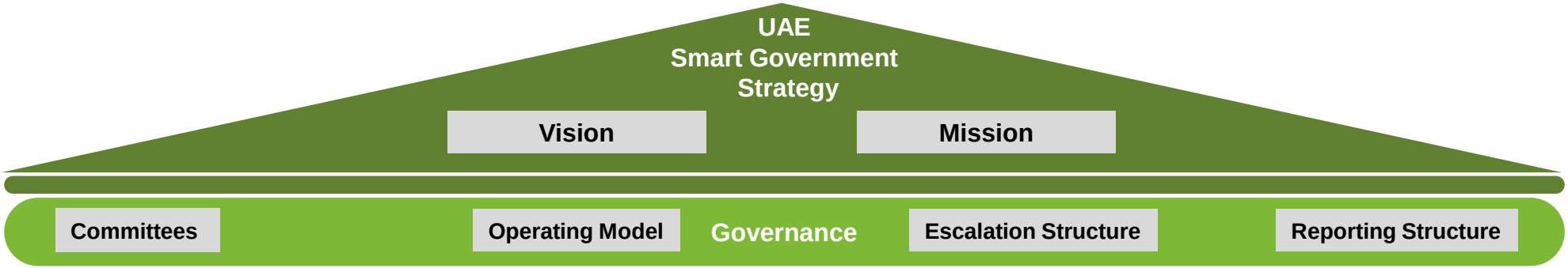
UAE Smart Government is facing several challenges jeopardizing the delivery of initiatives and projects

UAE Smart Government Challenges

NON-EXHAUSTIVE

Source: BAH Analysis

To address the challenges, UAE Smart Gov. will need to setup a PMO office, develop technology blueprint and kick off EA



Project Management (PM)

Project Management Office (PMO)

- Scope Planning
- Resource Management
- Schedule & Cost Management
- Risks & Issue Management
- Contracts & Supplier Management

Project Management Processes

- Onboarding Processes
- Define Project Processes
- Shared Repositories
- Tools

Technology Blueprint

High-Level Enterprise Architecture

- Enterprise Architecture Domains
- Domain Definitions and focus

High-Level Logical Architecture

- Building blocks and technology components in each layer
- Building block definitions

Project Dependencies

- Mapping of each project to High-Level Logical Architecture
- Dependencies of project on each other

Enterprise Architecture

Technical Reference Architecture

- Deep functional and operational details for each architectural domain

Baseline & Target Architecture

- Unified view of existing and future ICT resources

Standards & Guidelines

- Taxonomy of policies, standards, and guidelines
- Required and suggested guidance for the design, implementation, and operation of the ICT resources

Focus of this document

Table of Contents

- Introduction
- **Scope**
- Approach
- High Level EA
- Reference Architecture
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- Appendix A – Building Blocks Definitions
- Appendix B – Smart Government Initiatives Charters

The Smart Government Blueprint serves as a bridge between the high-level EA and the detailed EA

Roadmap towards detailed EA

High-Level EA

View to help model Smart Gov. capabilities and interactions

The high-level EA identifies the major architectural domains / layers of Smart Gov,, highlights major paradigm changes in modeling Smart Gov. capabilities, and specifies the scope of each domain

*** Completed as part of phase 1**

Technology Blueprint

View to help identify major technology building blocks needed to deliver UAE Smart Gov

The technology blueprint abstracts technology components needed to delivery Smart Gov initiatives within each EA domain and identify project dependencies

Detailed Reference Architecture & Guidelines

View that provide a comprehensive national Enterprise Architecture (EA) as a reference point and tool for entities to plan, design, and implement infrastructure and services based on a common and shared understanding of dependencies, integration, and technology

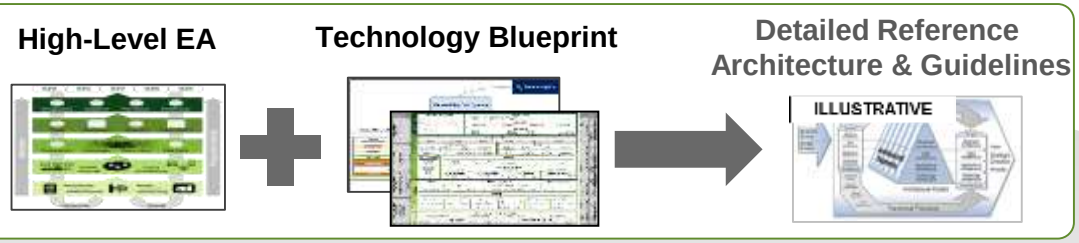
*** Project planned as part of the National Plan**

Increasing level of detail

Source: BAH Analysis

Out of Scope **In-Scope**

The proposed high level enterprise architecture has both near term and longer term applications to smart government



Near Term

- Alignment of initiatives to a single view of smart government capabilities
- Tool for the smart government PMO and its project teams
- Clear technology interactions and dependencies among key projects
- Lens for stakeholders to view smart government
- Identification of technology gaps in providing smart service delivery
- Balance initiatives across the entire EA

Longer Term

- Basis for the **National Government EA Guideline** and its subsequent reference architectures
- Governance and requirements for the **tendering process**
- Organize and govern issuances in the **National Regulatory Framework**
- Build consensus among stakeholders to help drive **technology convergence**
- Depict layer to layer **integration points** between stakeholders

Source: BAH Analysis

Short term focuses on the smart government PMO and aligning stakeholders to a single view of smart government

Near Term

- **Alignment of initiatives** to a single view of smart government
- Identification of **technology gaps** in providing smart services
- **Clear dependencies** to drive initiative sequencing
- Communicating a **single view of technology** to the stakeholders
- Tool for the **smart government PMO** and its project teams

1. Use the target state of each initiative to map them against the layers of the high level EA they directly impact

2. Use the high level requirements of each initiative to develop detailed business and functional requirements that take into account the layer to layer dependencies highlighted in the high level EA

3. Ensure all tenders for initiatives respect the design, information flow, and layers in the high level EA such that their proposed solutions include compliant architectures and designs

Source: BAH Analysis

Long term focuses on building consensus, issuing guidelines, and driving infrastructure convergence among stakeholders

Long Term

- Basis for the **National Government EA Guideline** and its reference architectures
- Governance and requirements for the **tendering process**
- Organize and govern issuances in the **Smart Government Regulatory Framework**
- Build consensus among stakeholders to help drive **technology convergence**
- Depict layer to layer **integration points** between stakeholders

Domains	Alignment of National Guidelines
1 Sensors Architecture	▪ Guideline for Customer Privacy ▪ Dimensionality and Normalization Guide ▪ Metadata Level Security Tagging Guide
2 Technology Architecture	▪ Network Management System Design ▪ Application Management Guidelines ▪ Cloud Computing Standards
3 Data Architecture	▪ Data Exchange and Interoperability ▪ Data Management and Modeling ▪ Data Hub Reference Architecture
4 Analytics Architecture	▪ Machine-to-Machine Design Guidelines ▪ Guide to Data Science Modeling ▪ Data and Information Extraction Guide
5 Services Architecture	▪ User Experience Design Policy ▪ Mobile Development Guidelines ▪ Service Modernization Guidelines

Example policies and standards that may arise from the Smart Government Regulatory Framework and map to the long term EA

Source: BAH Analysis

Table of Contents

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Our approach consists of three main phases, each involving inputs and interaction from major stakeholders

Blueprint Approach

	Requirements & Baseline	Analysis	Blueprint Development
Inputs	▸ Initiative Charters ▸ Smart Gov High-level EA ▸ Project-related Documentations	▸ Blueprint Requirements ▸ Charters	▸ Conceptual Architecture components with project dependencies
Key Activities	▸ Gather documentations ▸ Review all initiatives, imitative charters, dependencies and components ▸ Conduct workshop with project managers to understand their requirements and projects status	▸ Analyze all charters and underpinning projects to understand dependencies across various architectural layers ▸ Flesh out major components of the conceptual EA architecture ▸ Link components to various projects	▸ Develop initial Smart Gov blueprint ▸ Review and Socialize with various stakeholders and project managers
Outcomes	▸ Blueprint Requirements and scope	▸ Conceptual Architecture components with project dependencies	▸ Initial Smart Gov Blueprint

Source: BAH Analysis

Analysis of all charters, workshops with project managers, and individual meetings helped develop the technology blueprint

Blueprint Development Approach

Charters & High level EA

Workshops & Interviews

BAH IC

Booz | Allen | Hamilton
100 YEARS

Desktop Research & Industry Standards

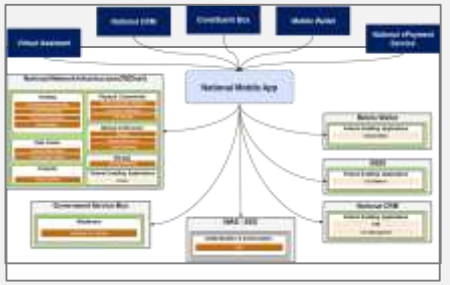
- FEAF
- TOGAF
- NIST
- CISA
- Cloud Security Alliance
- BAH Intellectual Capital

EA Domain Building Blocks

Technology Blueprint

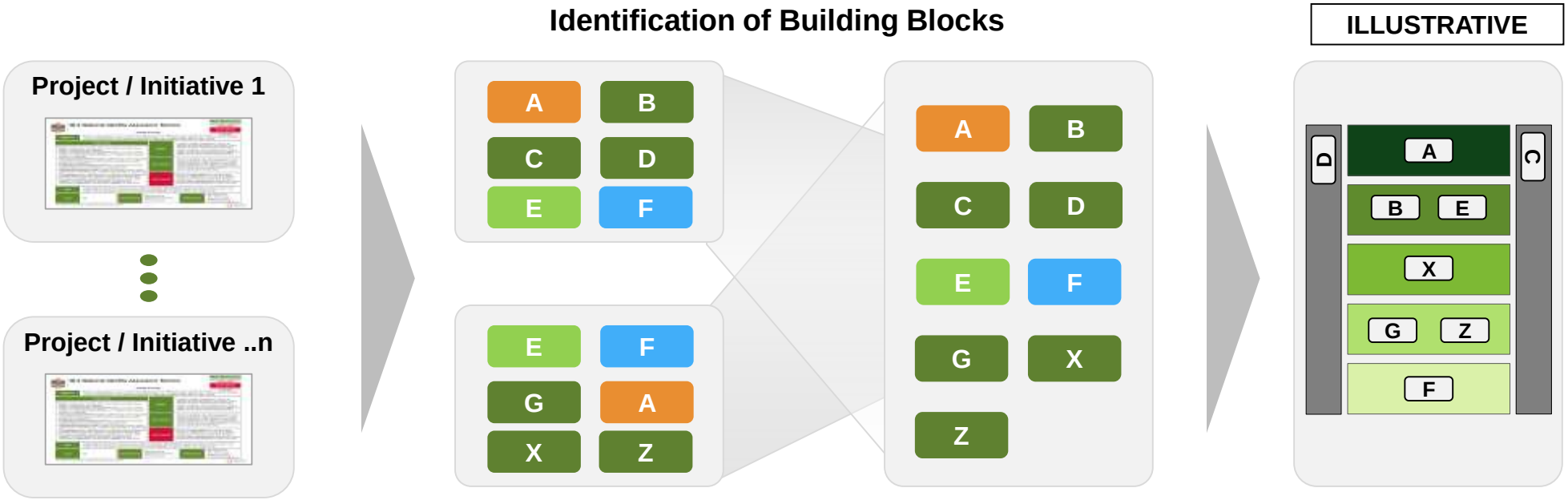
Project Mapping to Blueprint

Project to Project Dependencies



Source: BAH Analysis

Building blocks were identified, commonalities analyzed, and then each one of them was mapped to a specific EA domain



Analysis

- Initiatives charters, projects, documentations (e.g. RFPs) and industry best practices are analyzed to identity key functionalities, application components, technology platforms, design patterns, etc…

Building Blocks

- For each initiative / project, building blocks are extracted.
- Initiatives / projects might share the same building blocks

Commonalities

- Building blocks identified by initiatives are then consolidate. Commonalities and reusable components are identified

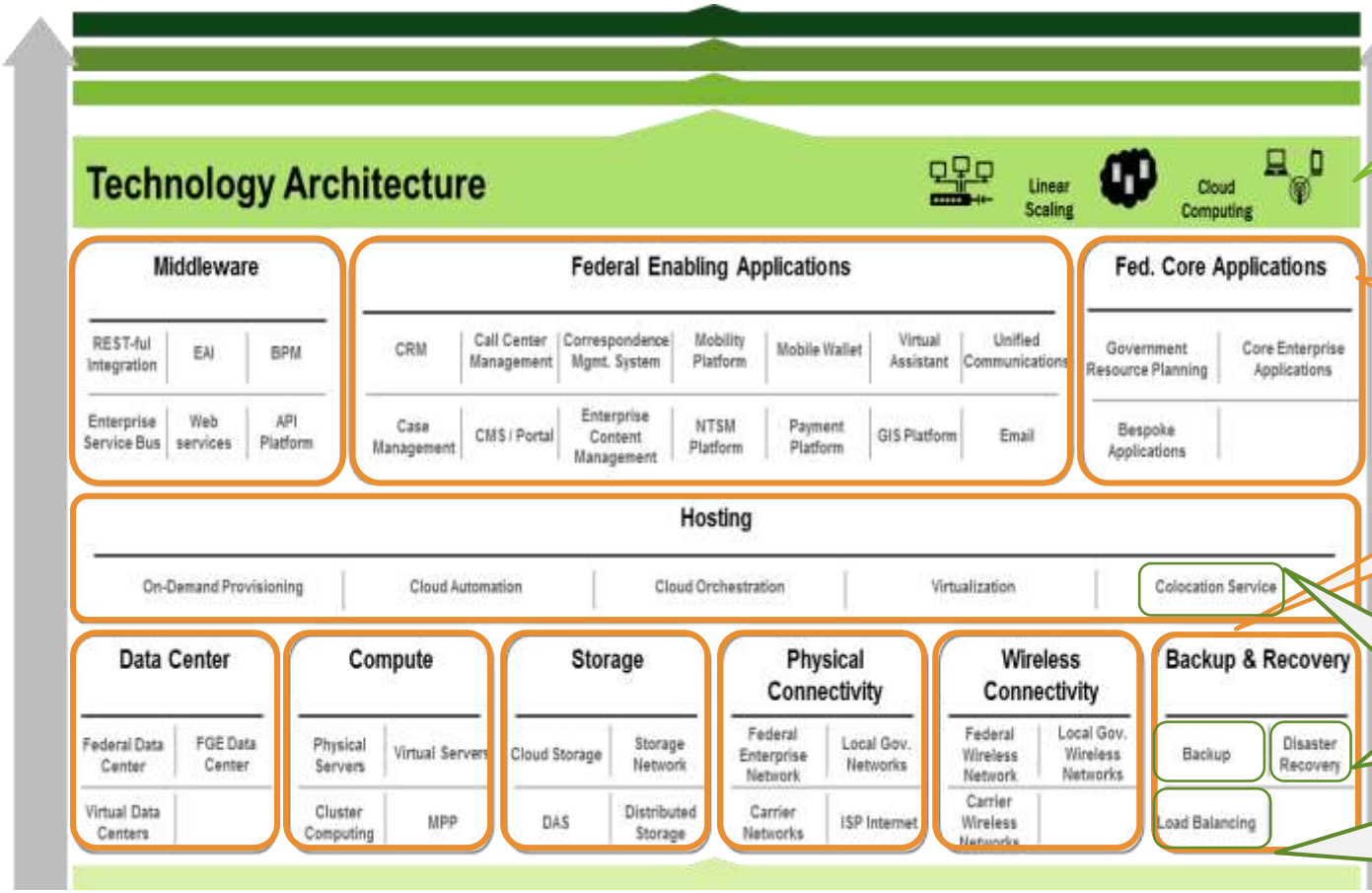
Mapping

- All building blocks are then mapped to the corresponding architectural domain, inline with the high-level EA guidelines

Source: BAH Analysis

For each EA domain, a view was developed laying out all building blocks that support the development of the Smart Gov.

ILLUSTRATIVE



Building blocks are defined across each of the seven Smart Government architectural domains

Building block categories group together several building blocks with similar or related functionality

Each Buildings block represents an abstraction of functionalities, capabilities, application components, data entities, information services, platform services, or technology components

Source: BAH Analysis

Key industry standards and best practices were used to develop the Blueprint and define building blocks

Industry Standards

- Federal Enterprise Architecture Framework(FEAF)
- The Open Group Architecture Framework (TOGAF)
- National Institute of Standards and Technology (NIST)
- ISO 27001
- Cloud Security Alliance
- BAH Intellectual Capital

Source: BAH Analysis

NON-EXHAUSTIVE

Building Block Definitions

Definitions of all building blocks are detailed in appendix

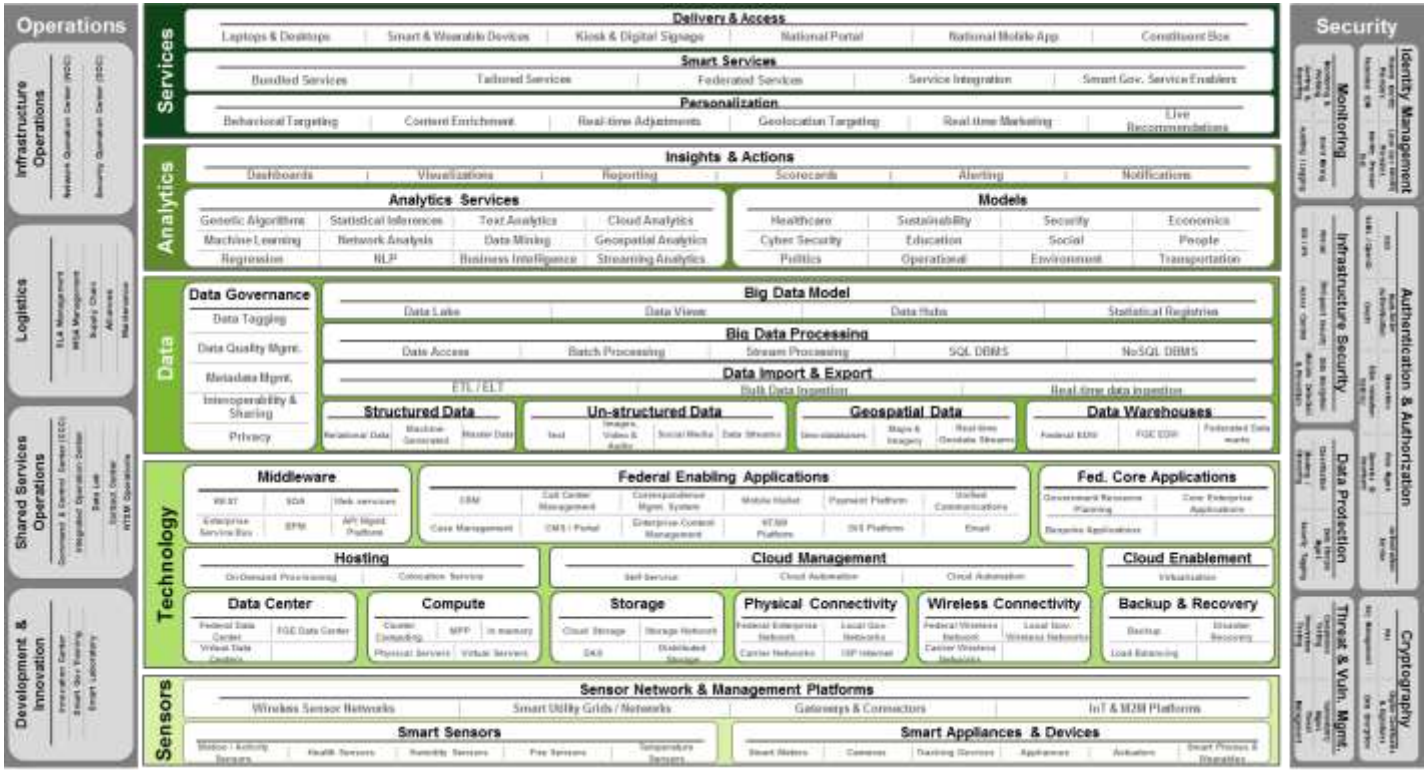
Technology Architecture

Data Center	Consists of all physical and virtual datacenters at federal or local government levels housing and maintaining all backend IT systems including servers, storage, networking and providing core physical environment services.	Federal Data Center	The Federal Data Center by FEDnet is a high assurance data center hosting government-wide services and providing hosting and colocation services to FGE's in a dynamic and highly scalable cloud infrastructure with disaster recovery capabilities.
		FGE Data Center	Data Centers managed or utilized by the various Federal Government entities to house and maintain their IT systems and host their enterprise services.
		Virtual Data Center	Virtual Data Centers (VDC) abstract the underlying hardware and provides automation and orchestration of infrastructure and services. VDC is a cloud service provided by FEDnet to Federal entities and is composed of several components (servers, storage, secure zones, firewalls, load balancers, etc…)
Compute	Consists of all physical servers, virtual servers, clusters, super computers, MPP hardware, clusters and grid computing to perform set of computations and operations to provide a dedicated service to users	Physical Servers	Physical services are front-end platforms running on dedicated physical hardware hosting services and able to respond to user requests. Servers include the hardware, compute and processing units, operating system, software, and networking protocols.
		Virtual Servers	Virtual Servers are servers sharing physical compute and storage resources on a host machine with other virtual servers and sits on top of abstraction/emulation layer (e.g. hypervisor)
		Cluster Computing	Cluster Computing delivers unified, single and scalable high-performance computing harnessing the power of several interconnected (loosely or tightly) computers. Commodity clusters are one example of clusters using commodity low-cost hardware
		MPP	Massively Parallel Processing (MPP) servers deliver high-performance computing using large numbers of processors (i.e. CPUs) running in parallel and coordinate fashion to execute single programs.

… leading to a multi-domain technology Blueprint for UAE Smart Government

ILLUSTRATIVE

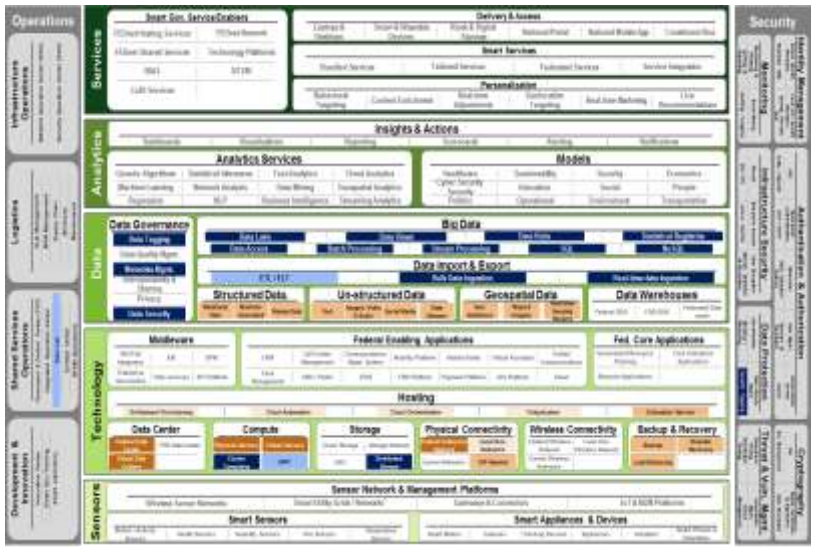
Smart Government Blueprint



Source: BAH Analysis

Project building blocks were then highlighted and dependencies on other building were categorized into 3 levels

Mapping to Project Building Blocks



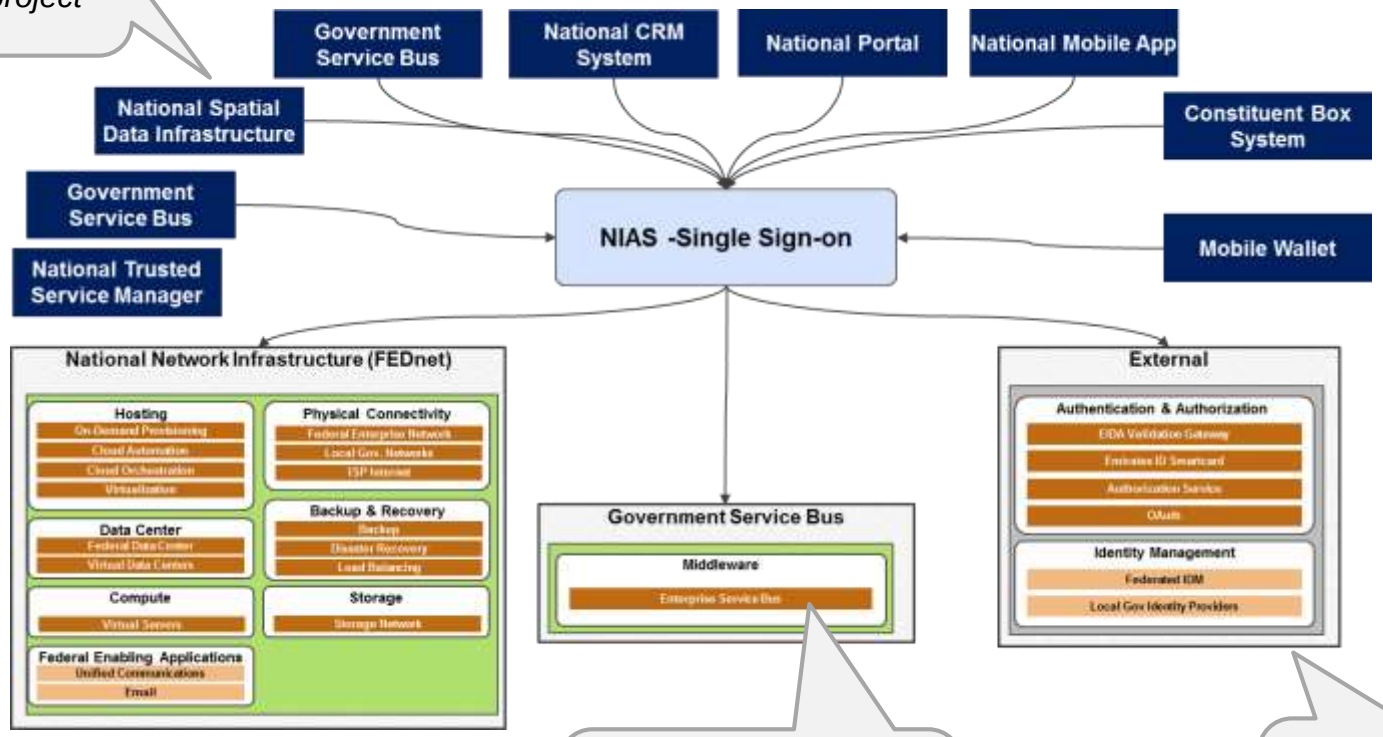
Legend	Description
Project Building blocks — **Direct Outcome**	• Represent building blocks that will be implemented as part of the project scope
Project Building blocks — **Potential Outcome**	• Represent building blocks that might potentially be included in the project scope if required
Project Dependencies — **High Dependency**	• Represent building blocks that are required for the successful implementation of the project and the realization of the final service / solution
Project Dependencies — **Medium Dependency**	• Represent building blocks on which the implementation of the project is significantly dependent but can still be accomplished without their realization
Project Dependencies — **Low Dependency**	• Represent building blocks that would add value to the project implementation and might be required to meet certain requirements but are not critical to project success

Source: BAH Analysis

Finally, 2-way dependencies between projects across various building blocks and architectural domains are showcased

ILLUSTRATIVE

Represents projects that are dependent on the selected project



Represents the building blocks on which the selected project is dependent on

Represents projects on which the selected project is dependent on

Table of Contents

- Introduction
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- Approach
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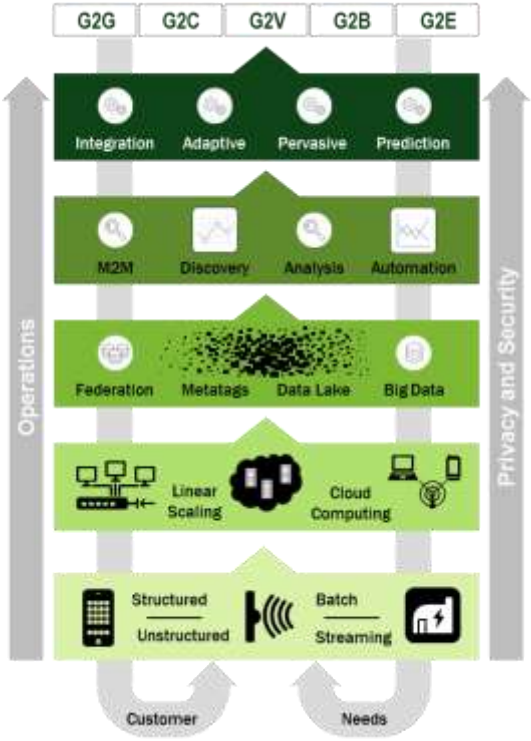
As part of Smart Gov. Strategy, a high-level EA was developed to help model Smart Gov. capabilities and their interactions

Inputs

- Smart Benchmarking
- Enterprise Architecture Frameworks
- Technology Trends
- Government v2.0
- Smart Cities
- Vision, Mission, and Strategic Pillars

Enterprise Architecture



Benefits

- Shared view of service design and delivery
- Connected and integrated view of smart concepts
- Focus on customer needs and requirements
- Abstraction of smart government technologies
- Highlight components needed to deliver smart services

Source: UAE Smart Government Strategy, BAH Analysis

This included benchmarking multiple governments to discover they all use derivatives of the U.S. Federal EA Framework

Country	Enterprise Architecture
Singapore	▪ Created a whole of government enterprise architecture in 2002 with business, data, applications, and technology domains
South Korea	▪ Created Government Enterprise Architecture Framework (GEAF) in 2003 with business, data, applications, and technology domains
United Kingdom	▪ Created Cross Government Enterprise Architecture (xEGA) in 2005 adding cross cutting security, integration, and performance viewpoints
Australia	▪ Created Australian Government Architecture (AGA) in 2008 adding cross cutting services and performance viewpoints
United States	▪ Created the Federal Enterprise Architecture (FEA) in 2012 adding cross cutting security, services, and performance viewpoints

Abu Dhabi

▪ Created an enterprise architecture that add access and integration domains beside cross cutting security and operations viewpoints

Observations

- All countries surveyed use enterprise architectures **based on the U.S. Federal Enterprise Architecture Framework (FEAF)** created in 1999
- Using FEAF provides a **simple mapping to TOGAF** and other popular enterprise architecture frameworks
- However, the underlying domains **remain unchanged since the Zachman Framework** created in 1987

Source: UAE Smart Government Strategy, BAH Analysis

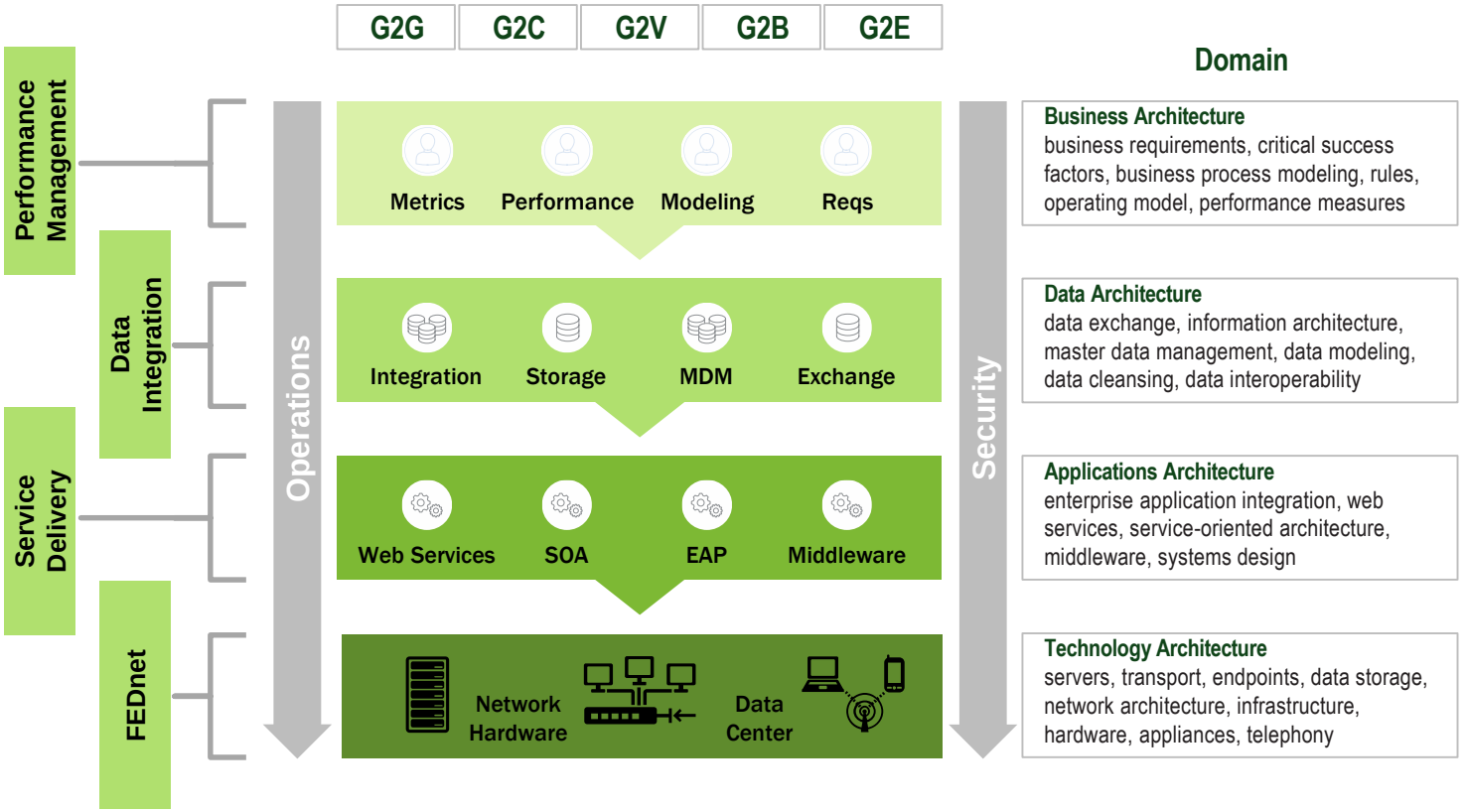
However, the U.S. Federal EA Framework is poorly suited to modeling smart government capabilities or their interactions

Difficult to Model

Smart Government

Big Data
Continuous Feedback
Real-time Monitoring
Machine Learning
Business Intelligence
Cloud Analytics

NON-EXHAUSTIVE



Traditional Assumptions

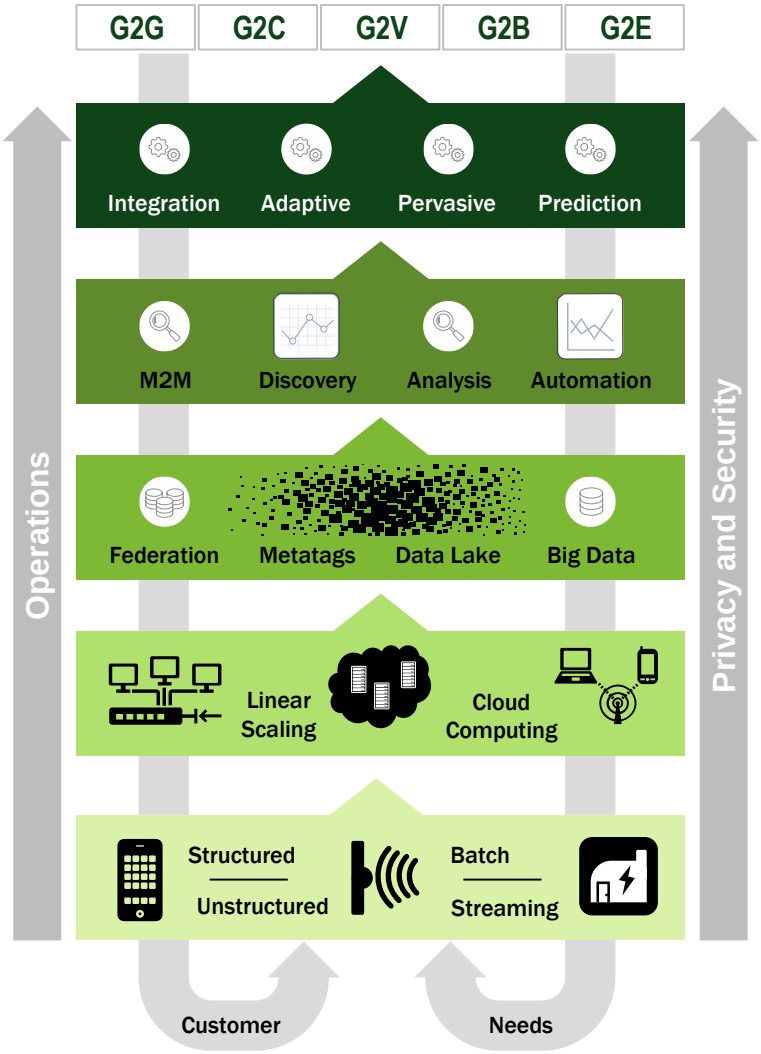
- Business architecture accurately captures customer needs
- Service delivery success cannot be evaluated real-time
- Data, applications, and technology infrastructure is inflexible

Source: UAE Smart Government Strategy, BAH Analysis

To address this challenge, a cyclical, customer-centric, and data driven approach to enterprise architecture was developed

Successfully Models

- **The intersection between smart cities and government**
- **Machine-to-machine automation and communication**
- **Data driven and predictive analysis and analytics**
- **Cloud computing, big data, and cloud analytics technologies**
- **Attentive, personalized, and response service design**
- **Federation of services and data across the whole of government**



Domain

Services Architecture
adaptive, personalization, intelligence, responsiveness, pervasive, customer-centrism, access channels, targeting

Analytics Architecture
machine-to-machine, analytics, analysis, business intelligence, statistical inference, automation, learning, modeling, simulation

Data Architecture
federation, information sharing, data lakes, metatagging, schema on read, big data, distributed, natural language processing

Technology Architecture
servers, heterogeneous networking, elastic compute, cloud computing, linear scaling, infrastructure, next generation networking

Sensors Architecture
cameras, actuators, smart grid, sensing, feedback, near field communication, radio frequency identification, Internet of things

Source: UAE Smart Government Strategy, BAH Analysis

Table of Contents

- Introduction
- Scope
- Approach
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- **Reference Architecture**
- Project Mapping
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Sensors architecture collects and aggregates data from multiple sources and communicates them to other systems

G2G | G2C | G2V | G2B | G2E

Sensor Architecture

Structured — Unstructured

Batch — Streaming

Sensor Network & Management Platforms

- Wireless Sensor Networks
- Smart Utility Grids / Networks
- Gateways & Connectors
- IoT & M2M Platforms

Smart Sensors

- Motion / Activity Sensors
- Health Sensors
- Humidity Sensors
- Fire Sensors
- Temperature Sensors
- Speed Sensors

Smart Appliances & Devices

- Smart Meters
- Cameras
- Tracking Devices
- Appliances
- Actuators
- Smart Phones & Wearables

Source: BAH Analysis

Technology architecture is the collected computing & network resources necessary to scale against government needs

G2G | G2C | G2V | G2B | G2E

Technology Architecture

Linear Scaling

Cloud Computing

Middleware

REST	SOA	Web services
Enterprise Service Bus	BPM	API Mgmt. Platform

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	Mobile Wallet	Payment Platform	Unified Communications
Case Management	CMS / Portal	Enterprise Content Management	NTSM Platform	GIS Platform	Email

Fed. Core Applications

Government Resource Planning	Core Enterprise Applications
Bespoke Applications	

Hosting

On-Demand Provisioning	Colocation Service

Cloud Management

Self-Service	Cloud Automation	Cloud Automation

Cloud Enablement

Virtualization

Data Center

Federal Data Center	FGE Data Center
Virtual Data Centers	

Compute

Cluster Computing	MPP	In memory
Physical Servers	Virtual Servers	

Storage

Cloud Storage	Storage Network
DAS	Distributed Storage

Physical Connectivity

Federal Enterprise Network	Local Gov. Networks
Carrier Networks	ISP Internet

Wireless Connectivity

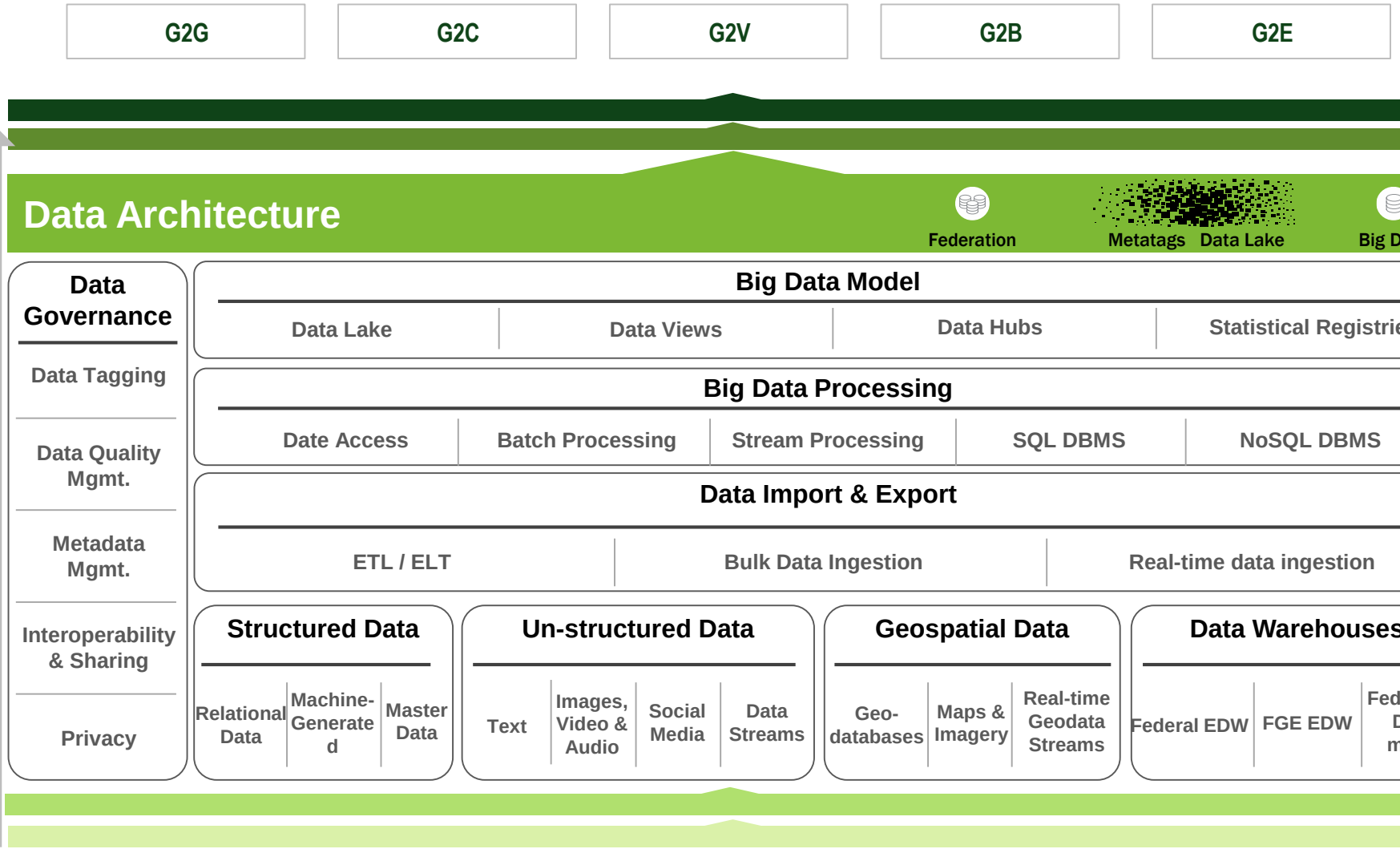
Federal Wireless Network	Local Gov. Wireless Networks
Carrier Wireless Networks	

Backup & Recovery

Backup	Disaster Recovery
Load Balancing	

Source: BAH Analysis

Data architecture is data federation across distributed data stores to facilitate integration, sharing and analytics



Source: BAH Analysis

Analytics architecture is the analysis and automation used to produce customer service insights and knowledge

G2G	G2C	G2V	G2B	G2E

Analytics Architecture

M2M | Discovery | Analysis | Automation

Insights & Actions

Dashboards	Visualizations	Reporting	Notifications	Alerting	Scorecards

Analytics Services

Genetic Algorithms	Statistical Inferences	Streaming Analytics
Machine Learning	Cloud Analytics	Geospatial Analytics
Regression	Business Intelligence	Data Mining
NLP	Network Analysis	Text Analytics

Models

Healthcare	Social	Sustainability
People	Security	Politics
Economics	Operational	Cyber Security
Environment	Education	Transportation

Source: BAH Analysis

Services architecture is the proactive delivery of customer services based on analytical and inferential insights

G2G | G2C | G2V | G2B | G2E

Services Architecture

Integration | Adaptive | Pervasive | Prediction

Delivery & Access

- Laptops & Desktops
- Smart & Wearable Devices
- Kiosk & Digital Signage
- National Portal
- National Mobile App
- Constituent Box

Smart Services

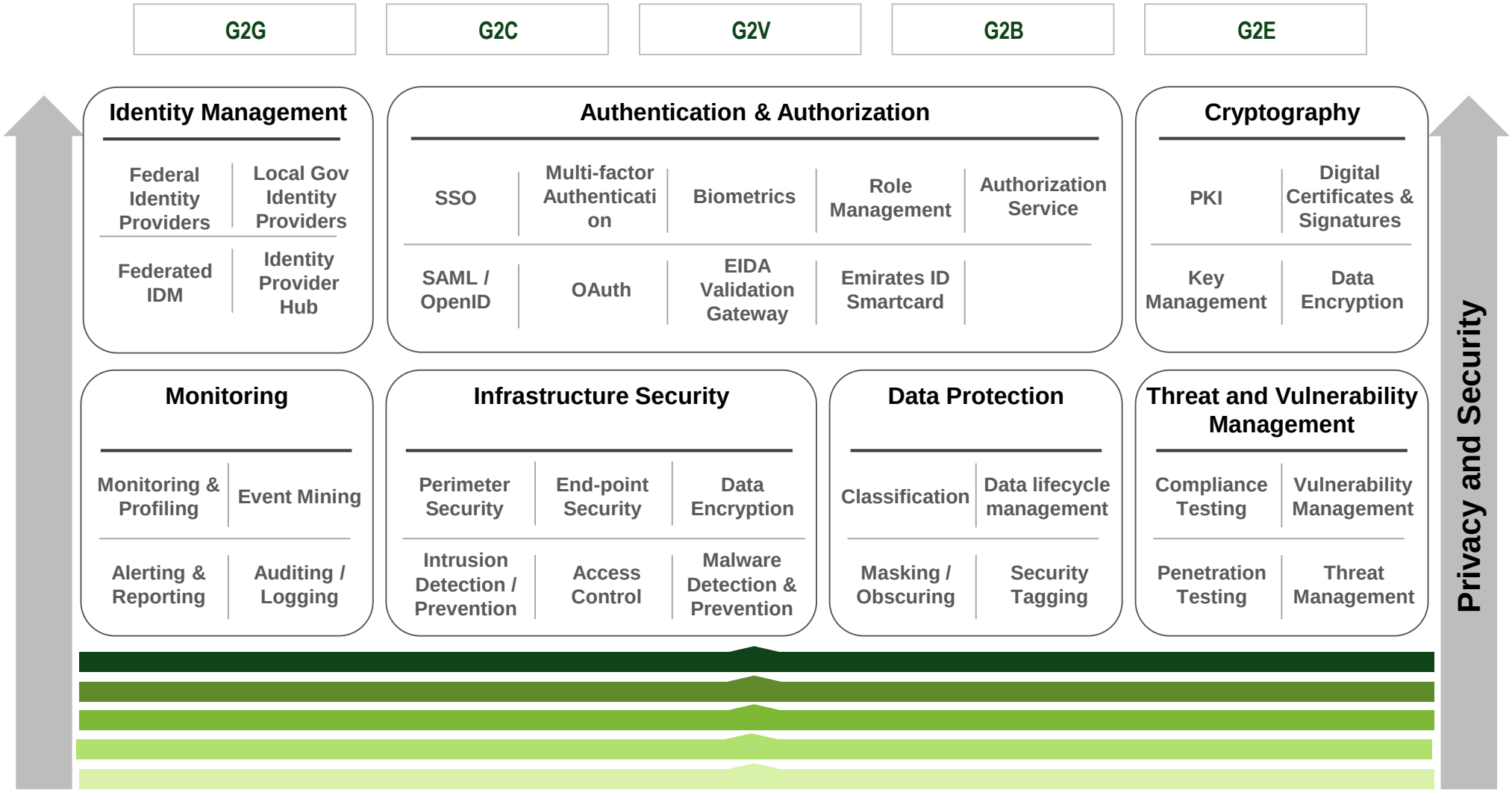
- Bundled Services
- Tailored Services
- Federated Services
- Service Integration
- Smart Government Service Enablers

Personalization

- Behavioral Targeting
- Content Enrichment
- Real-time Adjustments
- Geolocation Targeting
- Real-time Marketing
- Live Recommendations

Source: BAH Analysis

Privacy and Security is the constant balance to ensure the safety of constituents while providing ease of access



Source: BAH Analysis

Operations is the continual focus on service delivery throughout the customer experience lifecycle

G2G	G2C	G2V	G2B	G2E

Operations

Development & Innovation	Shared Services Operations	Logistics	Infrastructure Operations
Innovation Center	Command & Control Center (CCC)	SLA Management	Network Operation Center (NOC)
Smart Gov Training	Integrated Operation Center	MSA Management	Security Operation Center (SOC)
Smart Laboratory	Data Lab	Supply Chain	
	Contact Center	Alliances	
	NTSM Operations	Maintenance	

Source: BAH Analysis

The UAE Smart Gov. Blueprint shows a holistic view of all building blocks across all architectural domains

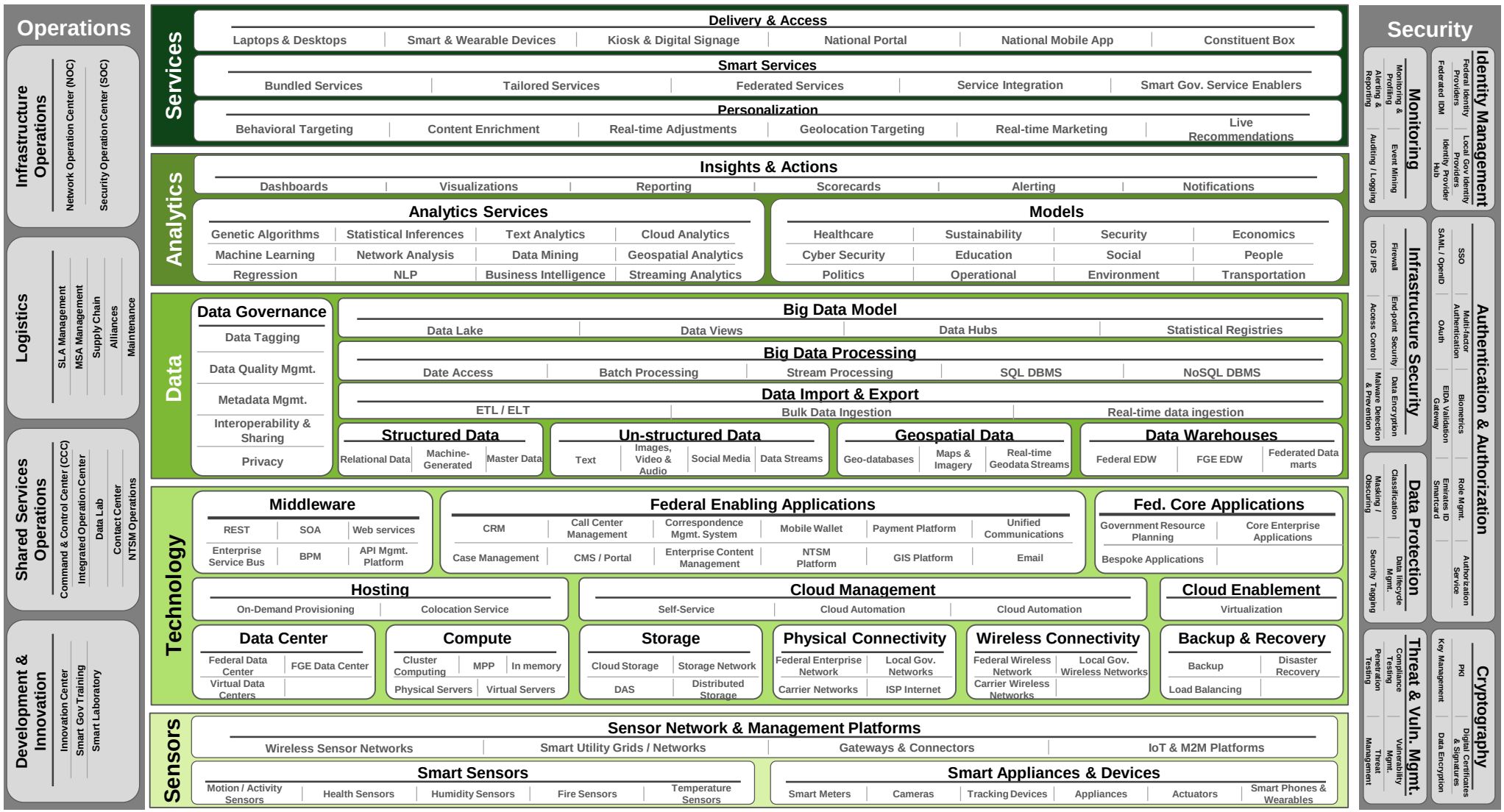


Table of Contents

- Introduction
- Scope
- Approach
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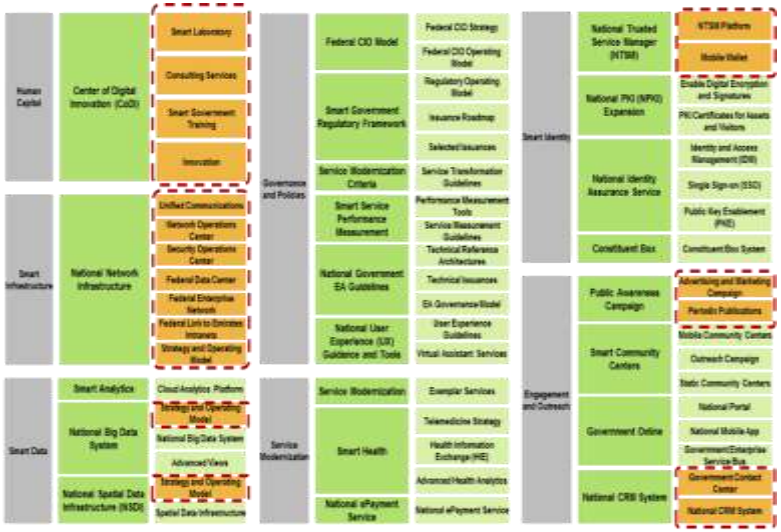
17 projects were selected to be mapped to the technology blueprint, and two view highlighting depend

Full List of Potential Projects



Selected Projects

Smart Identity		Engagement and Outreach
NTSM Platform	Mobile Wallet	Government Enterprise Service Bus
National PKI Expansion: Certificates for Assets and Visitors	Single Sign-on (SSO)	National CRM System
National PKI Expansion: Public Key Enablement (PKE)	Identity and Access Management (IDM)	National Portal
National PKI Expansion: Enable Digital Encryption and Signatures	Constituent Box System	National Mobile App
Smart Data	**Smart Infrastructure**	**Service Modernization**
National Big Data System	National Network Infrastructure	National ePayment Service
Spatial Data Infrastructure	**Human Capital**	
Cloud Analytics Platform	Center of Digital Innovation	Advanced Health Analytics

Filtering Criteria

Technology Implementation Projects

All projects that yield a technology building block (i.e. application component, technology component, infrastructure component, etc..)

Source: BAH Analysis

Selected Projects Dashboard

Projects Dashboard

Smart Identity

- NTSM Platform
- National PKI Expansion
  - Certificates for Assets and Visitors
  - Public Key Enablement (PKE)
  - Enable Digital Encryption and Signatures
- Mobile Wallet
- Single Sign-on (SSO)
- Identity and Access Management (IDM)
- Constituent Box System

Engagement and Outreach

- Government Enterprise Service Bus
- National CRM System
- National Portal
- National Mobile App

Smart Data

- National Big Data System
- Spatial Data Infrastructure
- Cloud Analytics Platform

Smart Infrastructure

- National Network Infrastructure

Human Capital

- Center of Digital Innovation

Service Modernization

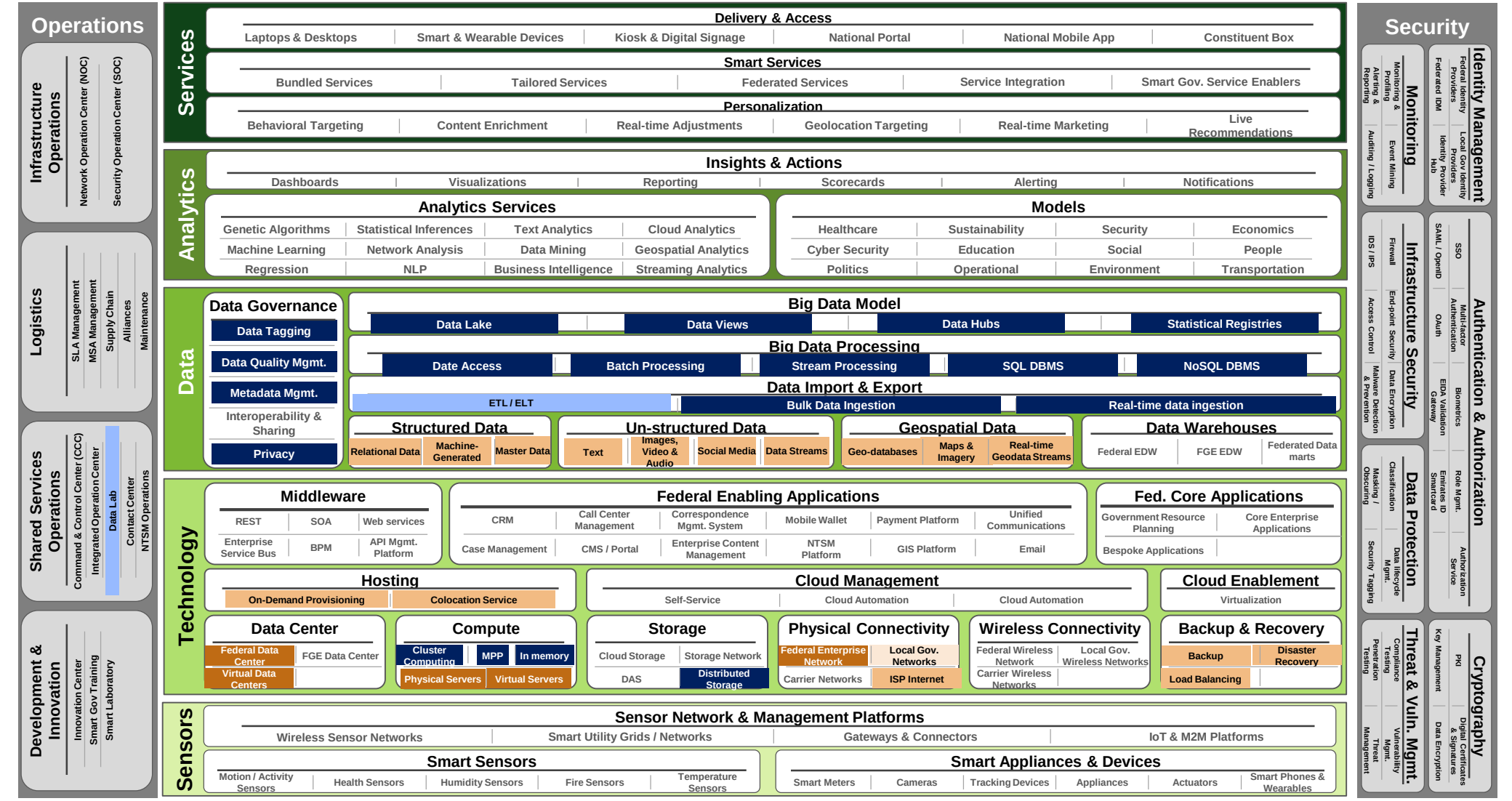
- National ePayment Service
- Advanced Health Analytics

** Click on project for details.*

*** Greyed out items have not been mapped yet and can be mapped in the future*

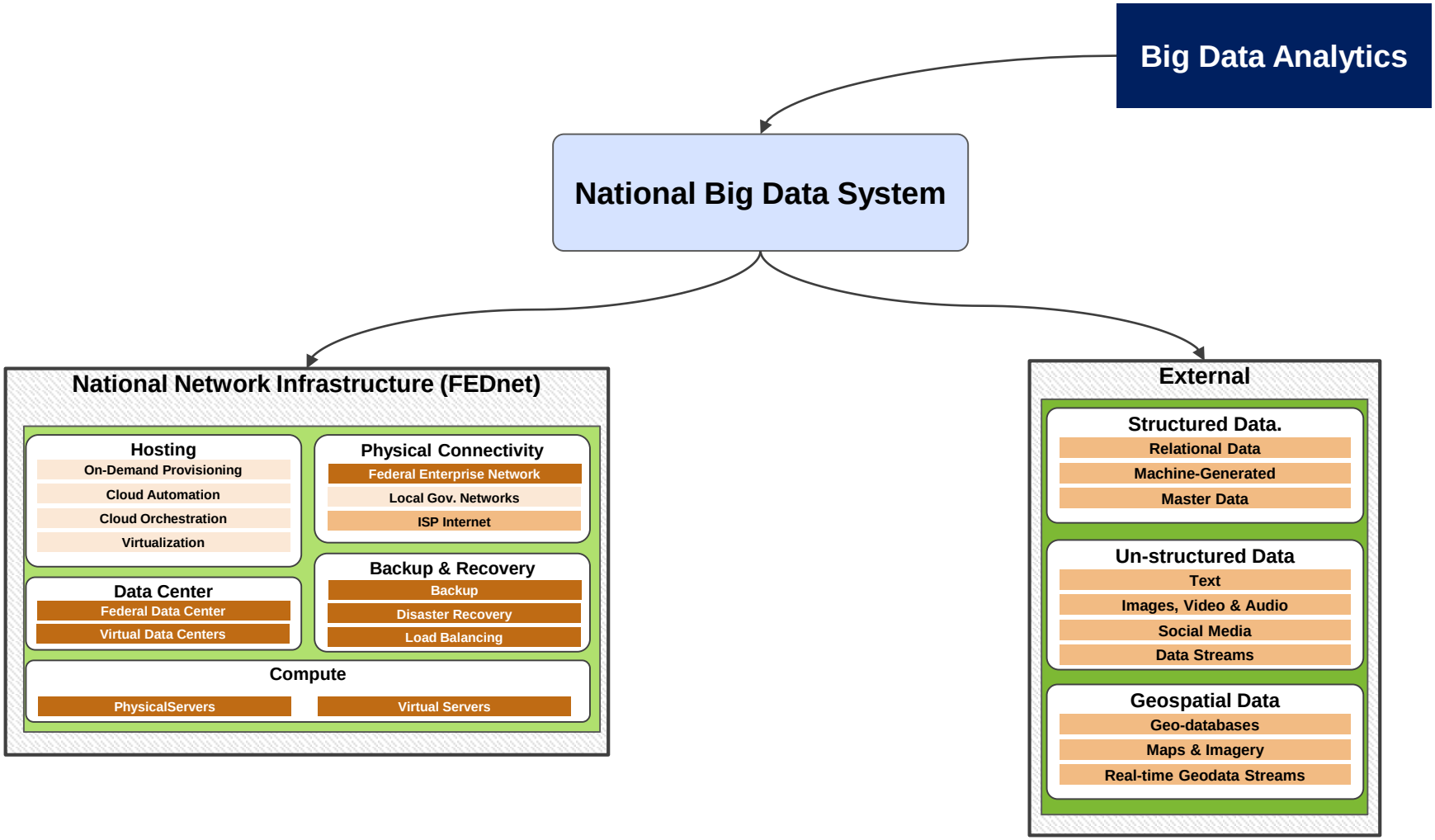
National Big Data System
Mapping to Building Blocks

Go Back



Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

National Big Data System
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

NIAS -Single Sign-on (SSO) Mapping to Building Blocks

Go Back

Operations

- **Infrastructure Operations**: Network Operation Center (NOC); Security Operation Center (SOC)
- **Logistics**: SLA Management; MSA Management; Supply Chain; Alliances; Maintenance
- **Shared Services Operations**: Command & Control Center (CCC); Integrated Operation Center; Data Lab; Contact Center; NTSM Operations
- **Development & Innovation**: Innovation Center; Smart Gov Training; Smart Laboratory

Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | National Portal | National Mobile App | Constituent Box

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | Content Enrichment | Real-time Adjustments | Geolocation Targeting | Real-time Marketing | Live Recommendations

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services
Genetic Algorithms | Statistical Inferences | Text Analytics | Cloud Analytics
Machine Learning | Network Analysis | Data Mining | Geospatial Analytics
Regression | NLP | Business Intelligence | Streaming Analytics

Models
Healthcare | Sustainability | Security | Economics
Cyber Security | Education | Social | People
Politics | Operational | Environment | Transportation

Data

Data Governance
- Data Tagging
- Data Quality Mgmt.
- Metadata Mgmt.
- Interoperability & Sharing
- Privacy

Big Data Model
Data Lake | Data Views | Data Hubs | Statistical Registries

Big Data Processing
Date Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware
REST | SOA | Web services
Enterprise Service Bus | BPM | API Mgmt. Platform

Federal Enabling Applications
CRM | Call Center Management | Correspondence Mgmt. System | Mobile Wallet | Payment Platform | Unified Communications
Case Management | CMS / Portal | Enterprise Content Management | NTSM Platform | GIS Platform | Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications
Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center
Virtual Data Centers

Compute
Cluster Computing | MPP | In memory
Physical Servers | Virtual Servers

Storage
Cloud Storage | Storage Network
DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | Local Gov. Networks
Carrier Networks | ISP Internet

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks
Carrier Wireless Networks

Backup & Recovery
Backup | Disaster Recovery
Load Balancing

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

- **Monitoring**: Monitoring & Profiling; Alerting & Reporting; Event Mining; Auditing / Logging
- **Identity Management**: Federated IDM; Federal Identity Providers; Identity Provider Hub; Identity
- **Infrastructure Security**: IDS / IPS; Firewall; Access Control; End-point Security; Malware Detection & Prevention; Data Encryption
- **Authentication & Authorization**: SAML / OpenID; SSO; OAuth; Multi-Factor Authentication; EIDA Validation Gateway; Biometrics; Emirates ID Smartcard; Role Mgmt.; Authorization Service
- **Data Protection**: Classification; Masking / Obscuring; Data lifecycle Mgmt.; Security Tagging
- **Threat & Vuln. Mgmt.**: Compliance Testing; Penetration Testing; Vulnerability Mgmt.; Threat Management
- **Cryptography**: PKI; Key Management; Digital Certificates & Signatures; Data Encryption

Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

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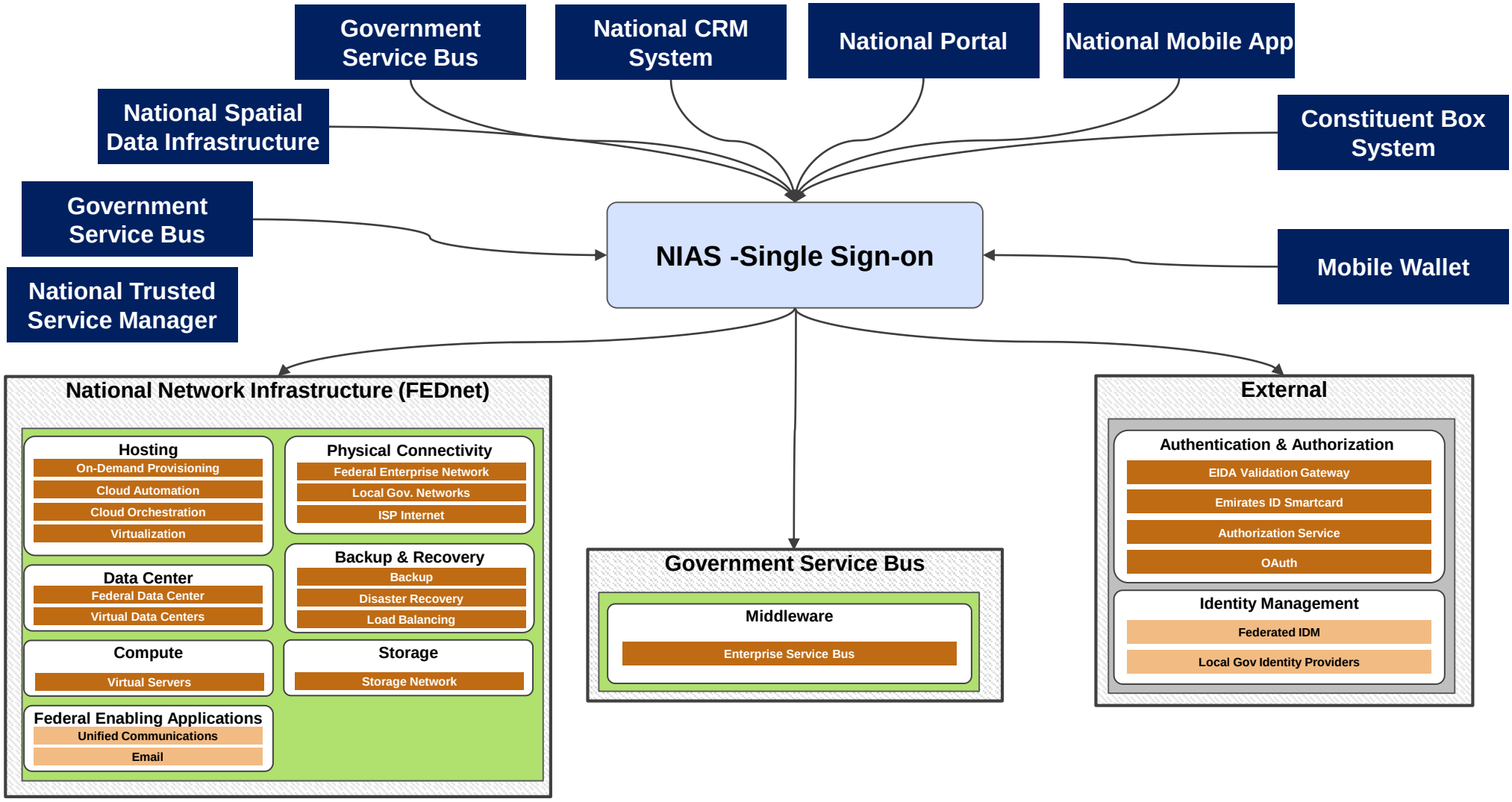
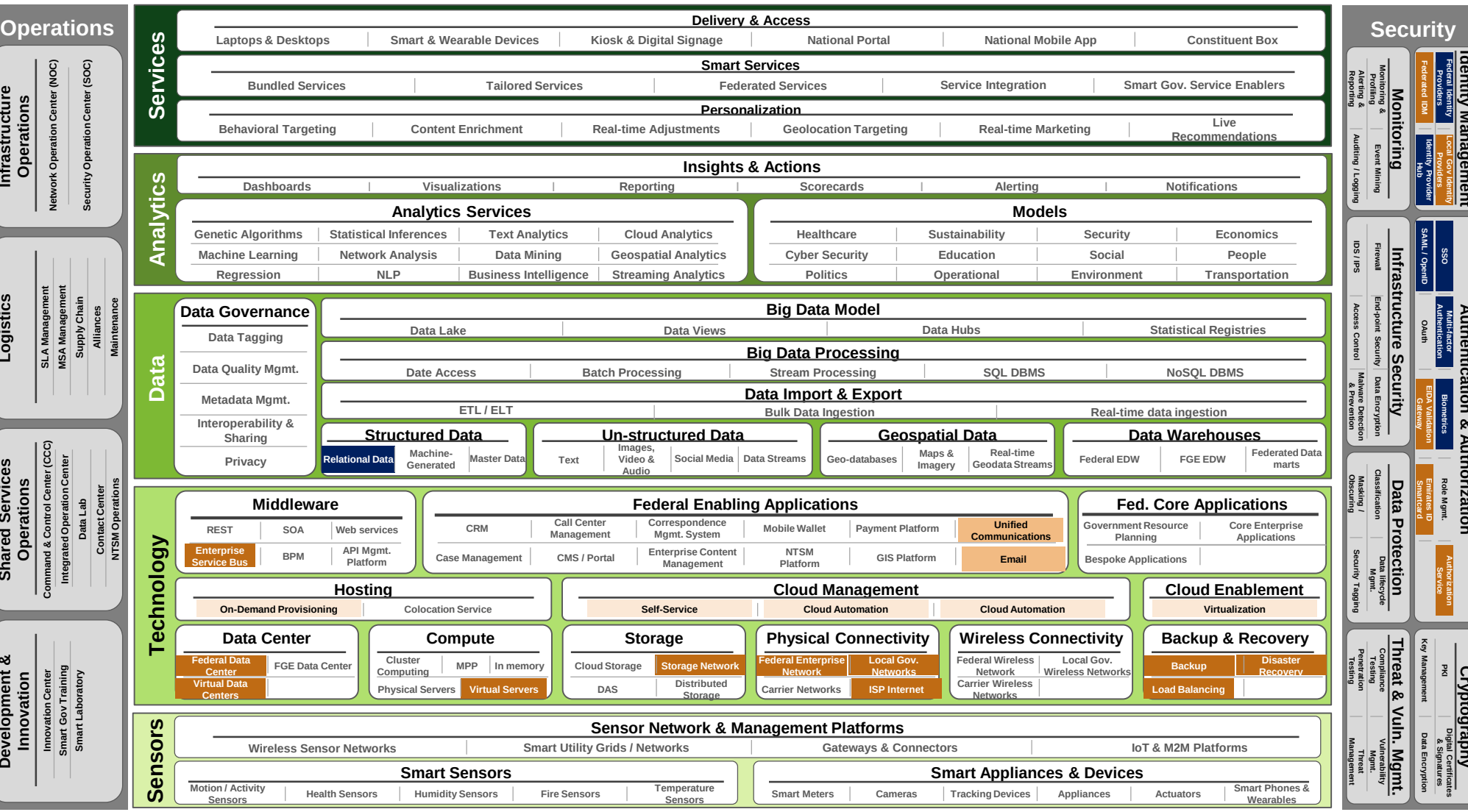
NIAS -Single Sign-on (SSO)
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

Identity and Access Management (IDM) Mapping to Building Blocks

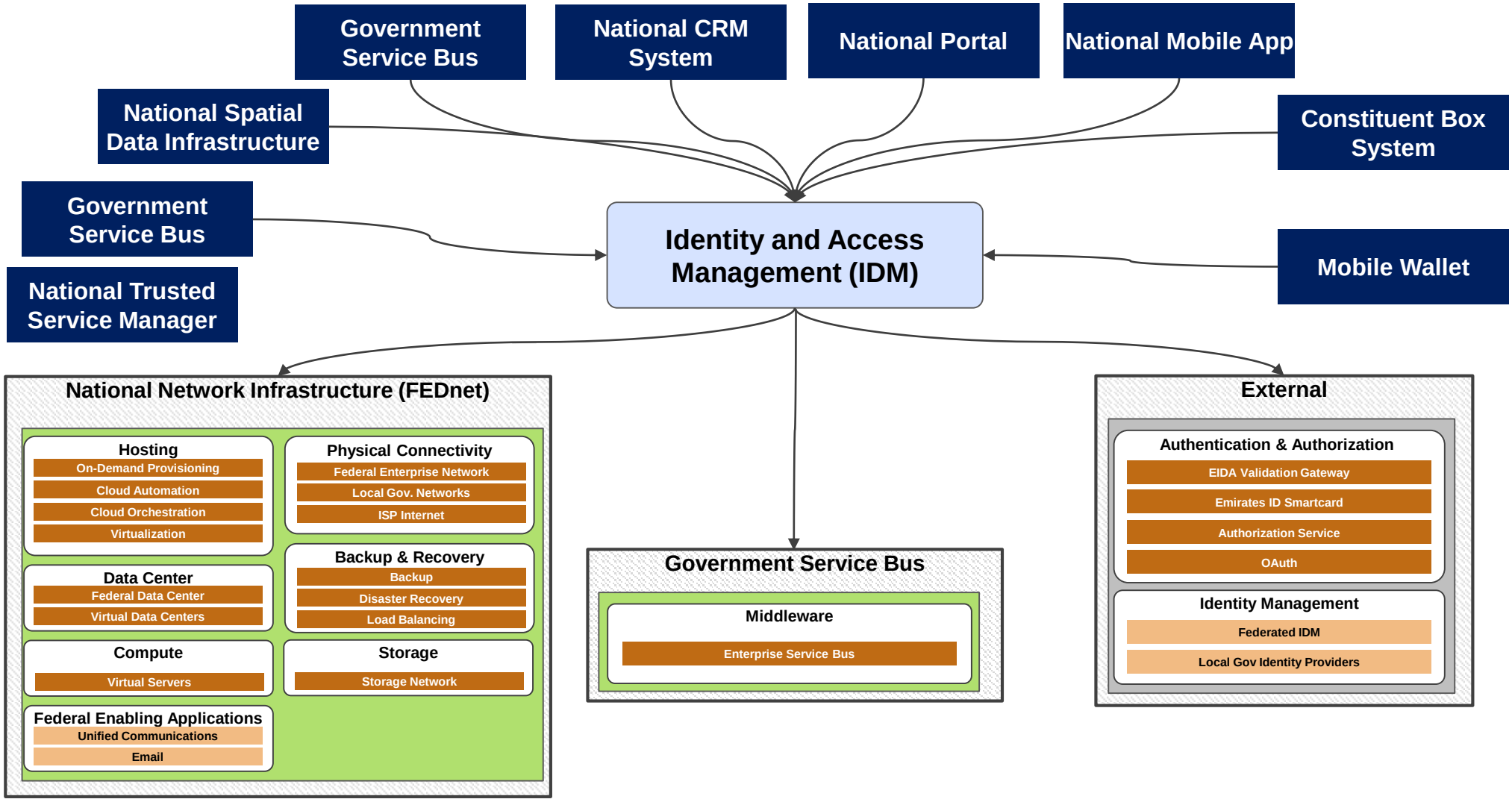
Go Back



Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

Identity and Access Management (IDM) Project & Building Block Dependencies

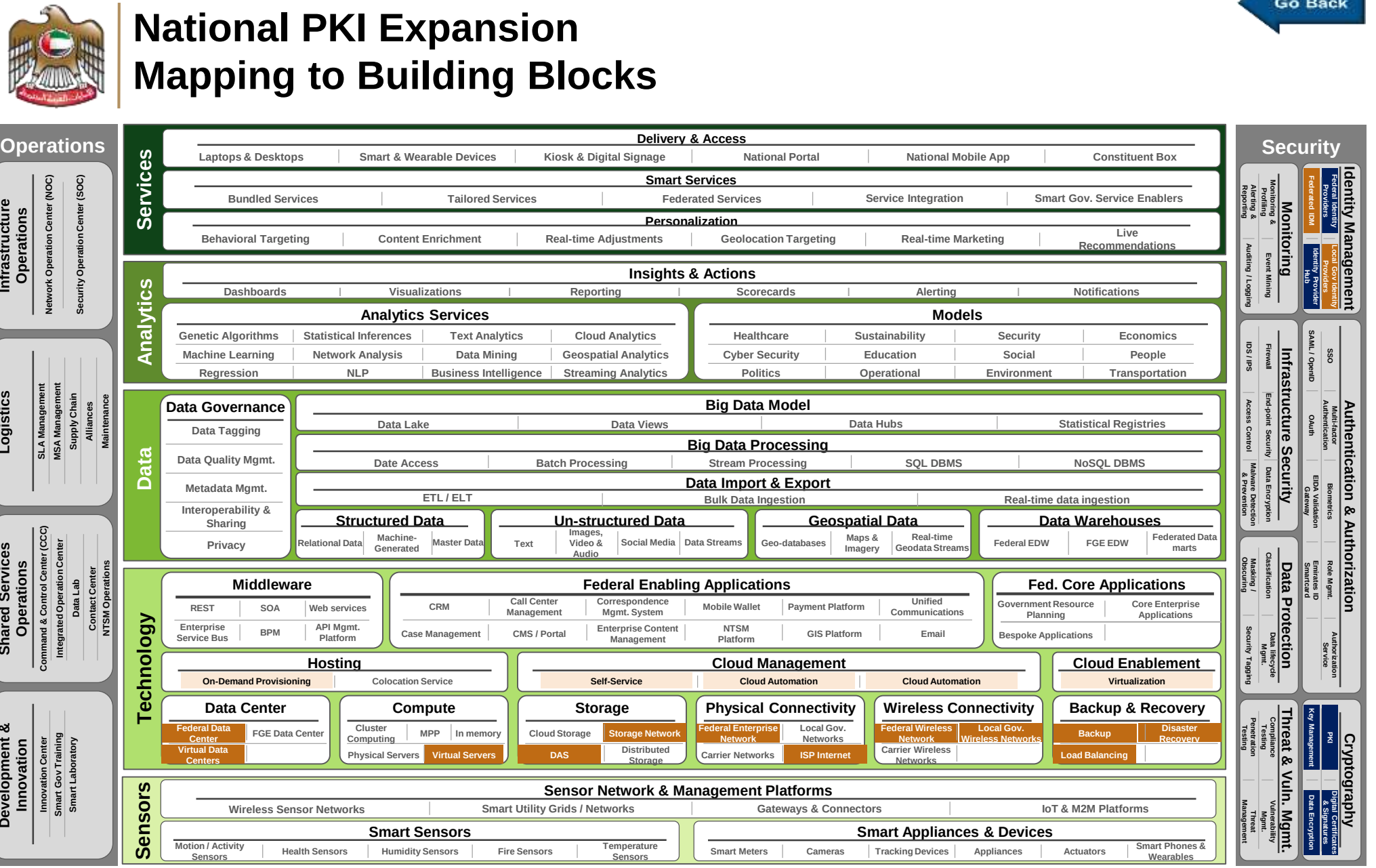
Go Back



High Dependency | Medium Dependency | Low Dependency

National PKI Expansion
Mapping to Building Blocks

Go Back



Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

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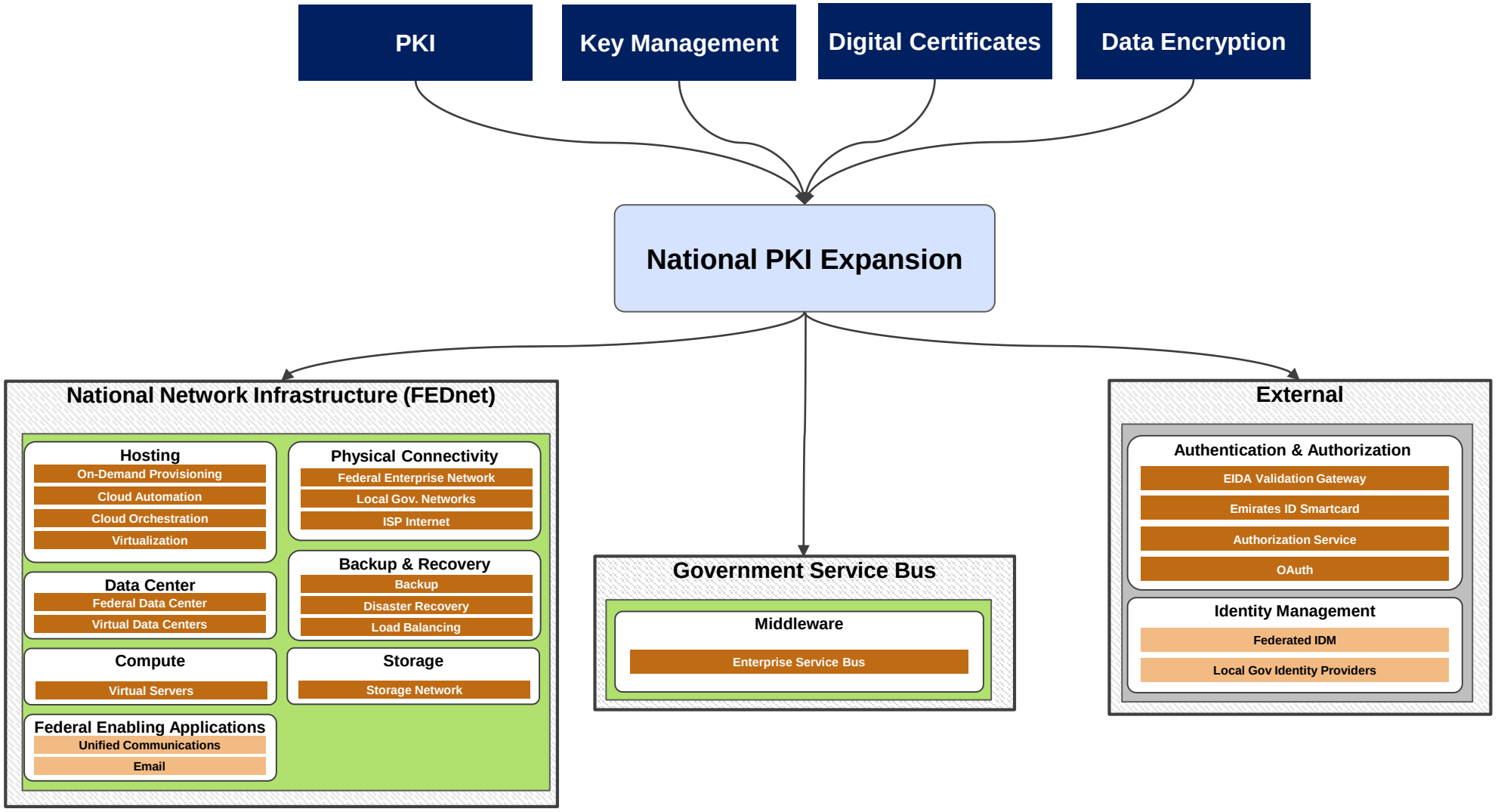
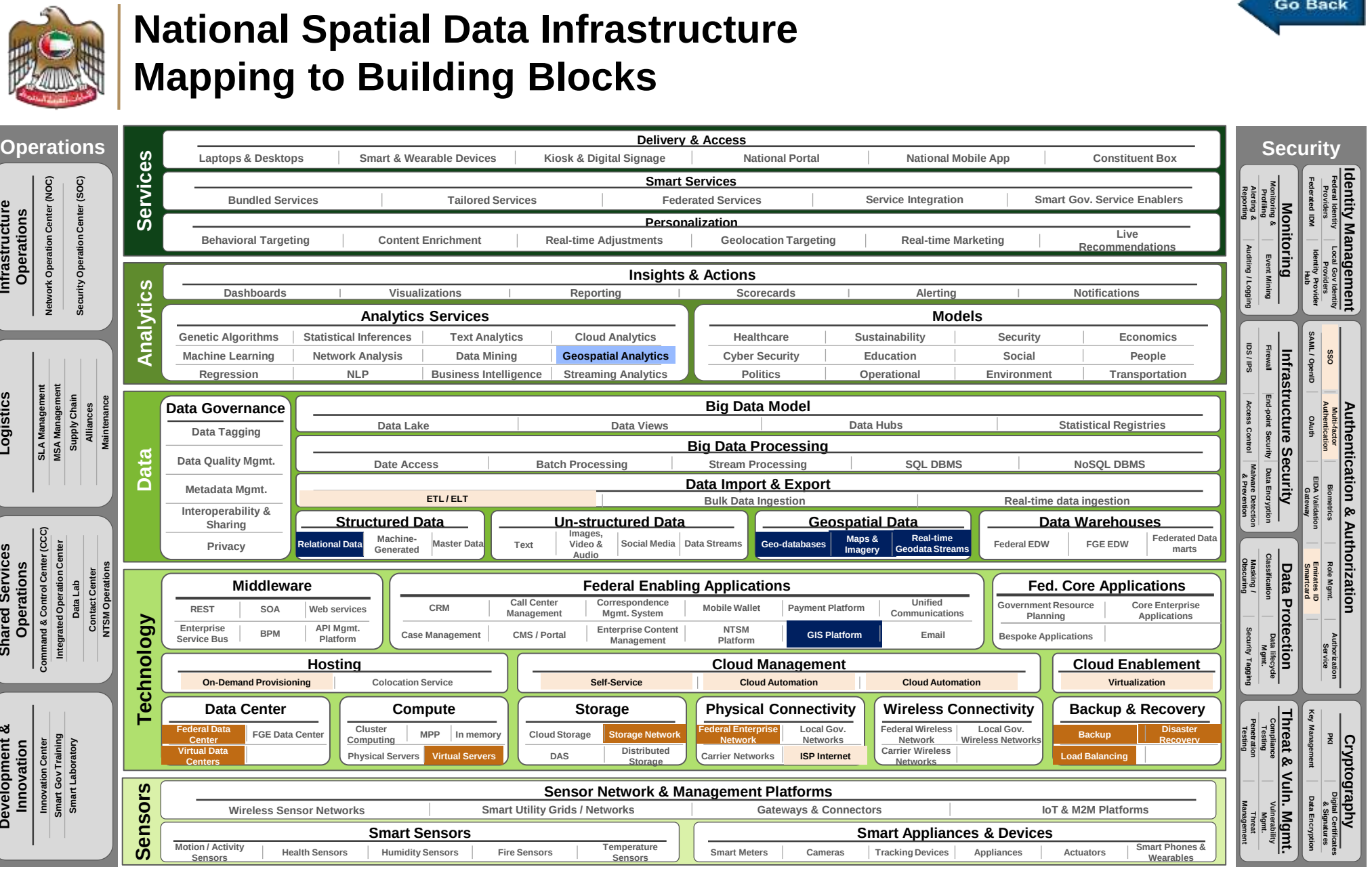
National PKI Expansion
Project & Building Block Dependencies



High Dependency
Medium Dependency
Low Dependency

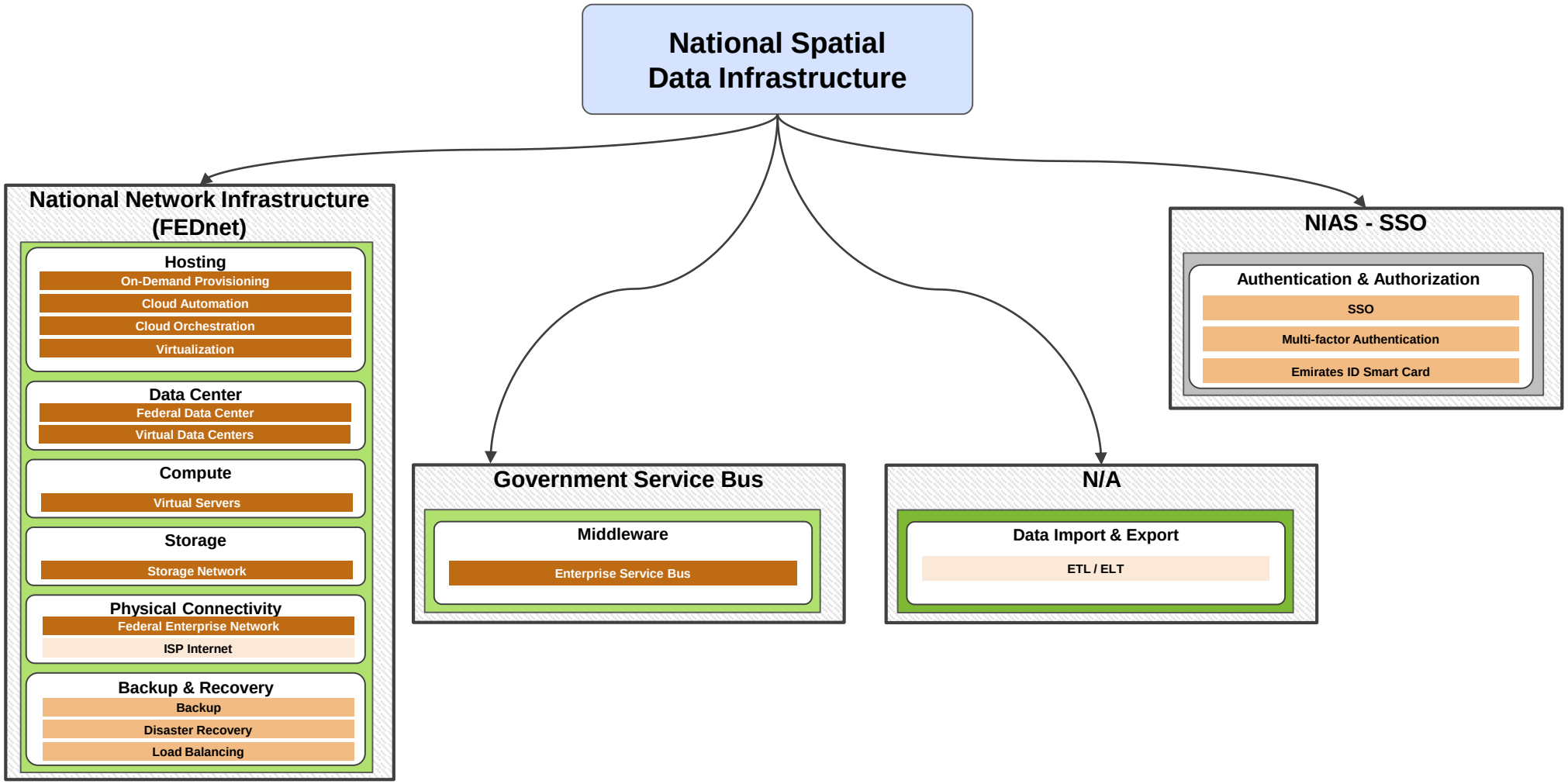
National Spatial Data Infrastructure Mapping to Building Blocks

Go Back



Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

National Spatial Data Infrastructure
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

National Network Infrastructure Mapping to Building Blocks

Go Back

Operations

- **Infrastructure Operations**
  - Network Operation Center (NOC)
  - Security Operation Center (SOC)
- **Logistics**
  - SLA Management
  - MSA Management
  - Supply Chain
  - Alliances
  - Maintenance
- **Shared Services Operations**
  - Command & Control Center (CCC)
  - Integrated Operation Center
  - Data Lab
  - Contact Center
  - NTSM Operations
- **Development & Innovation**
  - Innovation Center
  - Smart Gov Training
  - Smart Laboratory

Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | National Portal | National Mobile App | Constituent Box

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | Content Enrichment | Real-time Adjustments | Geolocation Targeting | Real-time Marketing | Live Recommendations

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services

Genetic Algorithms	Statistical Inferences	Text Analytics	Cloud Analytics
Machine Learning	Network Analysis	Data Mining	Geospatial Analytics
Regression	NLP	Business Intelligence	Streaming Analytics

Models

Healthcare	Sustainability	Security	Economics
Cyber Security	Education	Social	People
Politics	Operational	Environment	Transportation

Data

Data Governance
- Data Tagging
- Data Quality Mgmt.
- Metadata Mgmt.
- Interoperability & Sharing
- Privacy

Big Data Model
Data Lake | Data Views | Data Hubs | Statistical Registries

Big Data Processing
Date Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware

REST	SOA	Web services
Enterprise Service Bus	BPM	API Mgmt. Platform

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	Mobile Wallet	Payment Platform	Unified Communications
Case Management	CMS / Portal	Enterprise Content Management	NTSM Platform	GIS Platform	Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications
Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | Virtual Data Centers

Compute
Cluster Computing | MPP | In memory | Physical Servers | Virtual Servers

Storage
Cloud Storage | Storage Network | DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | Local Gov. Networks | Carrier Networks | ISP Internet

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks | Carrier Wireless Networks

Backup & Recovery
Backup | Disaster Recovery | Load Balancing

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

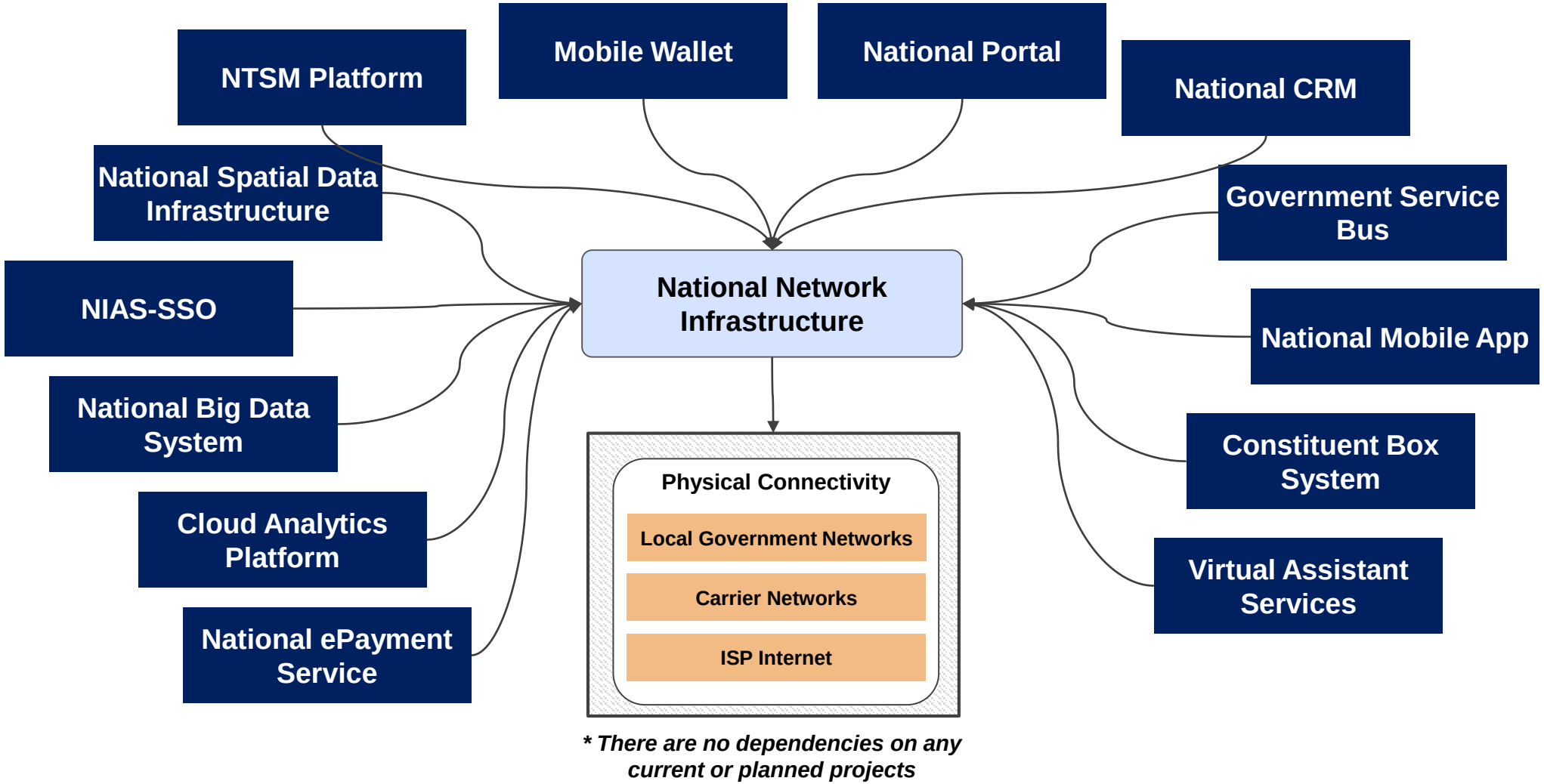
Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

- **Monitoring**
  - Monitoring & Profiling
  - Alerting & Reporting
  - Event Mining
  - Auditing / Logging
- **Identity Management**
  - Federal Identity Providers
  - Local Gov Identity Providers
  - Federated IDM
  - Identity Provider Hub
- **Infrastructure Security**
  - Firewall
  - IDS / IPS
  - End-point Security
  - Access Control
  - Data Encryption
  - Malware Detection & Prevention
- **Authentication & Authorization**
  - SSO
  - SAML / OpenID
  - Multi-factor Authentication
  - OAuth
  - Biometrics
  - EIDA Validation Gateway
  - Role Mgmt.
  - Emirates ID Smartcard
  - Authorization Service
- **Data Protection**
  - Classification
  - Masking / Obscuring
  - Data lifecycle Mgmt.
  - Security Tagging
- **Threat & Vuln. Mgmt.**
  - Compliance Testing
  - Penetration Testing
  - Vulnerability Mgmt.
  - Threat Management
- **Cryptography**
  - PKI
  - Key Management
  - Digital Certificates & Signatures
  - Data Encryption

Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

National Network Infrastructure Project Dependencies



** There are no dependencies on any current or planned projects*

High Dependency | Medium Dependency | Low Dependency

Government Online – Government Service Bus Mapping to Building Blocks

Go Back

Operations

- Infrastructure Operations: Network Operation Center (NOC); Security Operation Center (SOC)
- Logistics: SLA Management; MSA Management; Supply Chain; Alliances; Maintenance
- Shared Services Operations: Command & Control Center (CCC); Integrated Operation Center; Data Lab; Contact Center; NTSM Operations
- Development & Innovation: Innovation Center; Smart Gov Training; Smart Laboratory

Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | National Portal | National Mobile App | Constituent Box

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | Content Enrichment | Real-time Adjustments | Geolocation Targeting | Real-time Marketing | Live Recommendations

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services

Genetic Algorithms	Statistical Inferences	Text Analytics	Cloud Analytics
Machine Learning	Network Analysis	Data Mining	Geospatial Analytics
Regression	NLP	Business Intelligence	Streaming Analytics

Models

Healthcare	Sustainability	Security	Economics
Cyber Security	Education	Social	People
Politics	Operational	Environment	Transportation

Data

Data Governance
Data Tagging | Data Quality Mgmt. | Metadata Mgmt. | Interoperability & Sharing | Privacy

Big Data Model
Data Lake | Data Views | Data Hubs | Statistical Registries

Big Data Processing
Date Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware

REST	SOA	Web services
Enterprise Service Bus	BPM	API Mgmt. Platform

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	Mobile Wallet	Payment Platform	Unified Communications
Case Management	CMS / Portal	Enterprise Content Management	NTSM Platform	GIS Platform	Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications | Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | Virtual Data Centers

Compute
Cluster Computing | MPP | In memory | Physical Servers | Virtual Servers

Storage
Cloud Storage | Storage Network | DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | Local Gov. Networks | Carrier Networks | ISP Internet

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks | Carrier Wireless Networks

Backup & Recovery
Backup | Disaster Recovery | Load Balancing

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

- **Monitoring**: Monitoring & Profiling; Alerting & Reporting; Event Mining; Auditing / Logging
- **Identity Management**: Federated IDM; Federal Identity Providers; Local Gov Identity Providers; Identity Provider Hub
- **Infrastructure Security**: IDS / IPS; Firewall; End-point Security; Access Control; Malware Detection & Prevention; Data Encryption
- **Authentication & Authorization**: SAML / OpenID; SSO; Multi-factor Authentication; OAuth; Biometrics; EIDA Validation Gateway; Emirates ID Smartcard; Role Mgmt.; Authorization Service
- **Data Protection**: Classification; Masking / Obscuring; Data lifecycle Mgmt.; Security Tagging
- **Threat & Vuln. Mgmt.**: Compliance Testing; Penetration Testing; Vulnerability Mgmt.; Threat Management
- **Cryptography**: Key Management; PKI; Digital Certificates & Signatures; Data Encryption

Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

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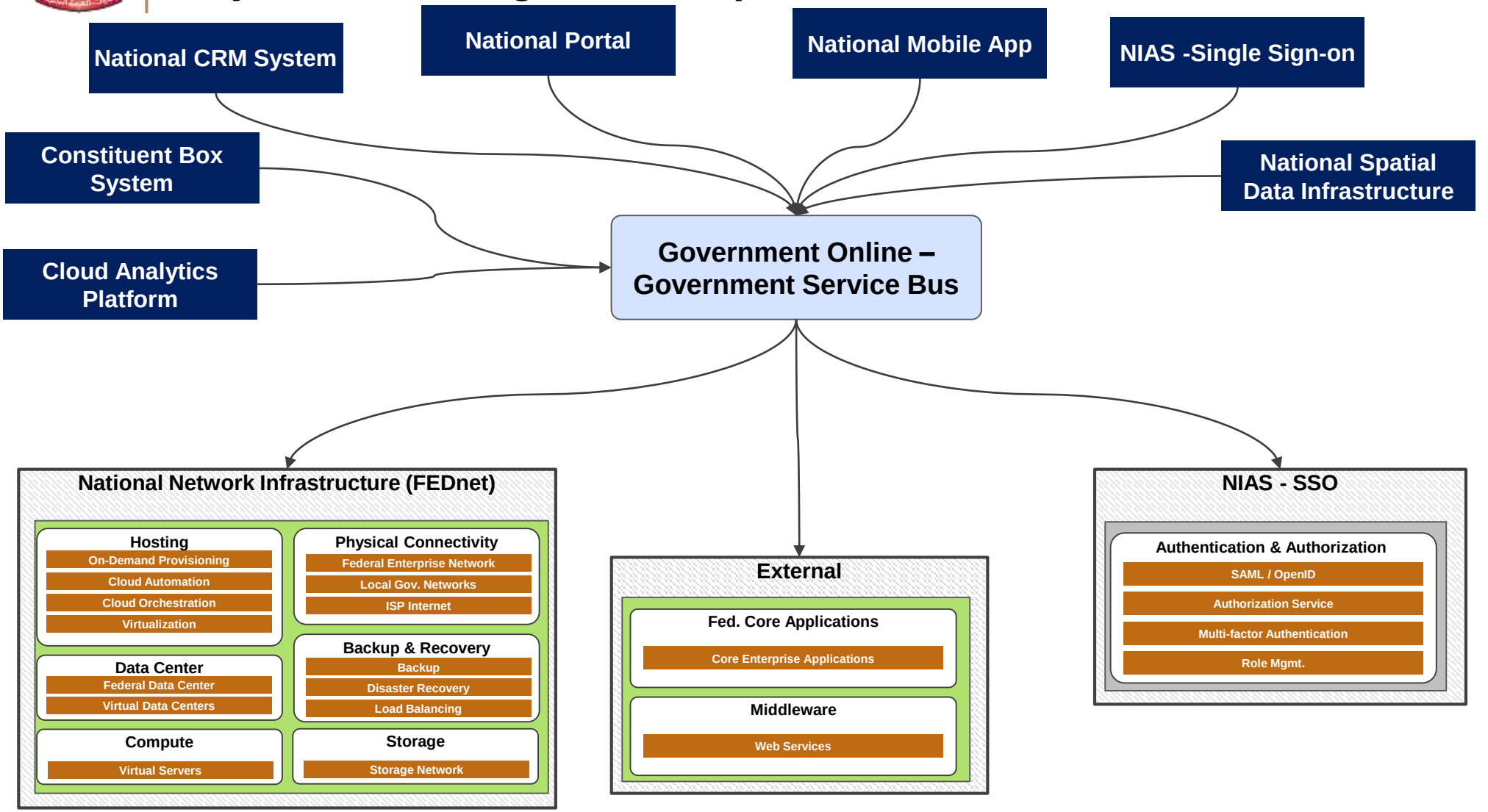
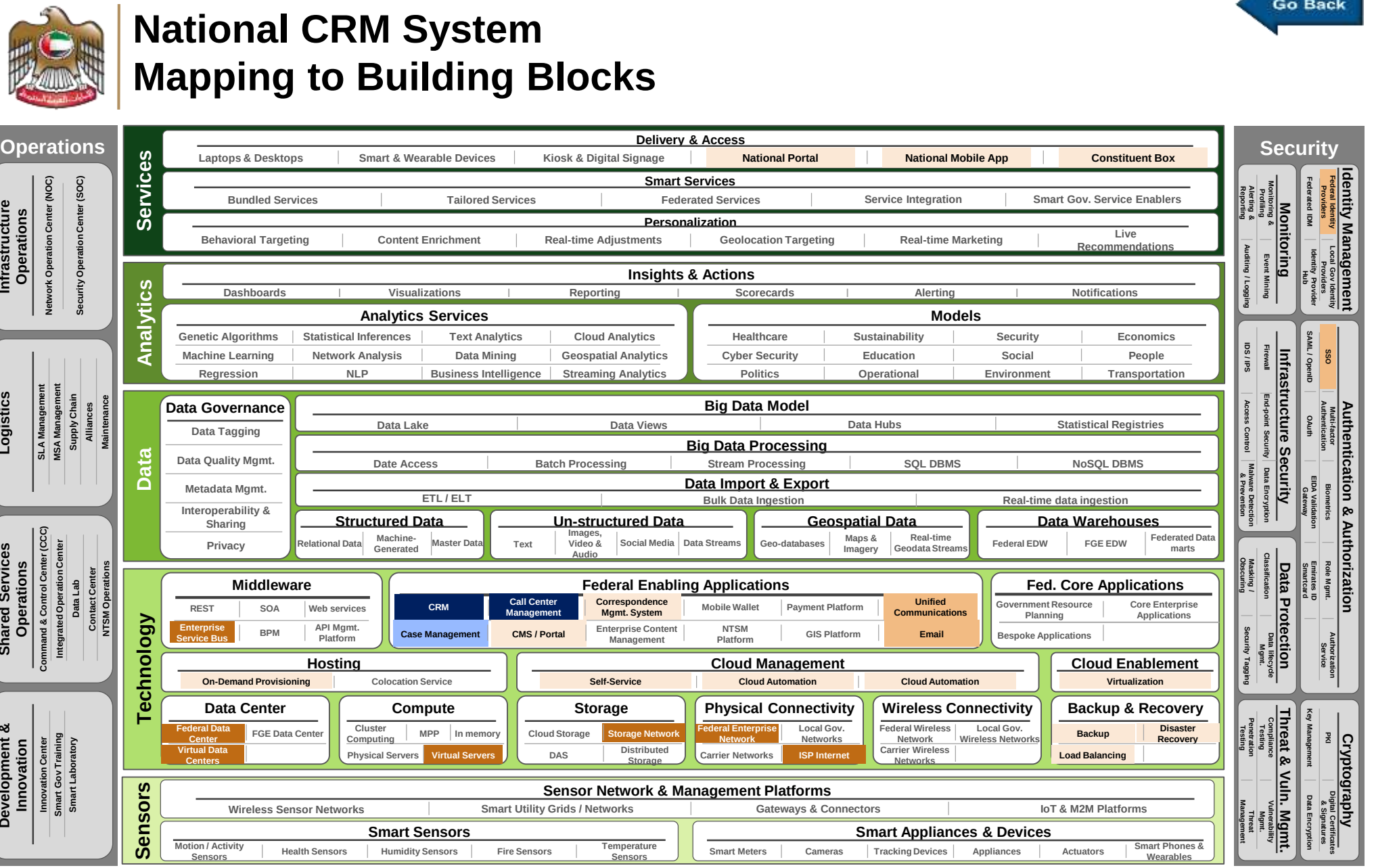
Government Online – Government Service Bus Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

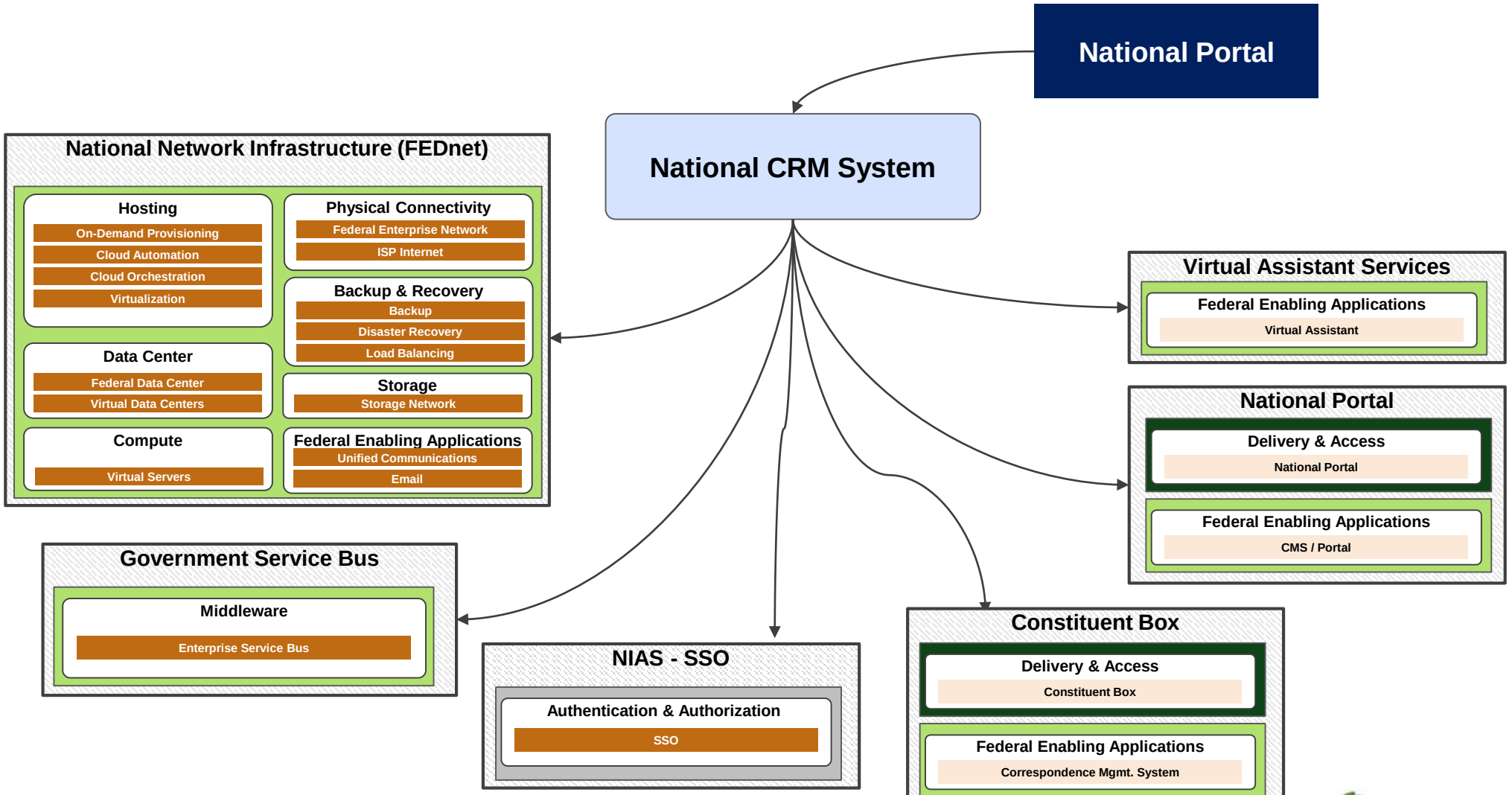
National CRM System
Mapping to Building Blocks

Go Back



Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

National CRM System
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

Government Online – National Portal Mapping to Building Blocks

Go Back

Operations

- **Infrastructure Operations**: Network Operation Center (NOC); Security Operation Center (SOC)
- **Logistics**: SLA Management; MSA Management; Supply Chain; Alliances; Maintenance
- **Shared Services Operations**: Command & Control Center (CCC); Integrated Operation Center; Data Lab; Contact Center; NTSM Operations
- **Development & Innovation**: Innovation Center; Smart Gov Training; Smart Laboratory

Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | **National Portal** | **National Mobile App** | **Constituent Box**

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | **Content Enrichment** | **Real-time Adjustments** | **Geolocation Targeting** | **Real-time Marketing** | **Live Recommendations**

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services

Genetic Algorithms	Statistical Inferences	Text Analytics	Cloud Analytics
Machine Learning	Network Analysis	Data Mining	Geospatial Analytics
Regression	NLP	Business Intelligence	Streaming Analytics

Models

Healthcare	Sustainability	Security	Economics
Cyber Security	Education	Social	People
Politics	Operational	Environment	Transportation

Data

Data Governance
Data Tagging | Data Quality Mgmt. | Metadata Mgmt. | Interoperability & Sharing | Privacy

Big Data Model
Data Lake | Data Views | Data Hubs | Statistical Registries

Big Data Processing
Date Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware

REST	SOA	**Web services**
Enterprise Service Bus	BPM	**API Mgmt. Platform**

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	Mobile Wallet	**Payment Platform**	Unified Communications
Case Management	**CMS / Portal**	Enterprise Content Management	NTSM Platform	GIS Platform	Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications | Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | **Cloud Automation** | **Cloud Automation**

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | **Virtual Data Centers**

Compute
Cluster Computing | MPP | In memory | Physical Servers | **Virtual Servers**

Storage
Cloud Storage | **Storage Network** | DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | **Local Gov. Networks** | Carrier Networks | **ISP Internet**

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks | Carrier Wireless Networks

Backup & Recovery
Backup | **Disaster Recovery** | **Load Balancing**

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

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- **Identity Management**: Federated IDM; Federal Identity Providers; Local Gov Identity Providers; Identity Provider Hub
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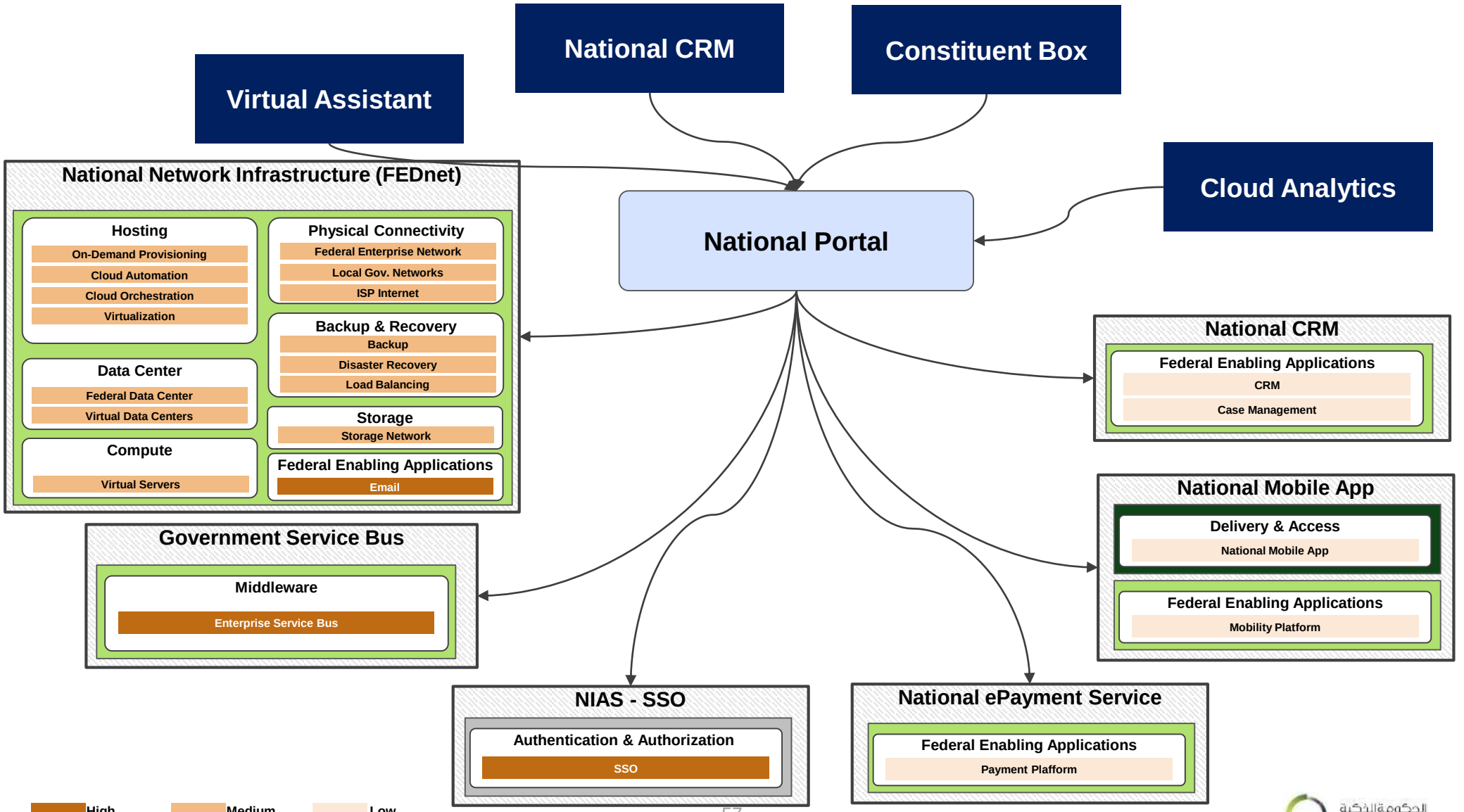
- **Authentication & Authorization**: SAML / OpenID; **SSO**; OAuth; Multi-factor Authentication; EIDA Validation Gateway; Biometrics; Emirates ID Smartcard; Role Mgmt.; Authorization Service
- **Data Protection**: Classification; Masking / Obscuring; Data lifecycle Mgmt.; Security Tagging
- **Threat & Vuln. Mgmt.**: Compliance Testing; Penetration Testing; Vulnerability Mgmt.; Threat Management
- **Cryptography**: Key Management; PKI; Data Encryption; Digital Certificates & Signatures

Direct Outcome | **Potential Outcome** | **High Dependency** | **Medium Dependency** | **Low Dependency**

Government Online – National Portal
Project & Building Block Dependencies



High Dependency
Medium Dependency
Low Dependency

Government Online – National Mobile App Mapping to Building Blocks

Go Back

Operations

- **Infrastructure Operations**: Network Operation Center (NOC); Security Operation Center (SOC)
- **Logistics**: SLA Management; MSA Management; Supply Chain; Alliances; Maintenance
- **Shared Services Operations**: Command & Control Center (CCC); Integrated Operation Center; Data Lab; Contact Center; NTSM Operations
- **Development & Innovation**: Innovation Center; Smart Gov Training; Smart Laboratory

Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | **National Portal** | **National Mobile App** | **Constituent Box**

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | **Content Enrichment** | **Real-time Adjustments** | **Geolocation Targeting** | **Real-time Marketing** | **Live Recommendations**

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services

Genetic Algorithms	Statistical Inferences	Text Analytics	Cloud Analytics
Machine Learning	Network Analysis	Data Mining	Geospatial Analytics
Regression	NLP	Business Intelligence	Streaming Analytics

Models

Healthcare	Sustainability	Security	Economics
Cyber Security	Education	Social	People
Politics	Operational	Environment	Transportation

Data

Data Governance
Data Tagging | Data Quality Mgmt. | Metadata Mgmt. | Interoperability & Sharing | Privacy

Big Data Model
Data Lake | Data Views | Data Hubs | Statistical Registries

Big Data Processing
Date Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware

REST	SOA	Web services
Enterprise Service Bus	BPM	**API Mgmt. Platform**

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	**Mobile Wallet**	Payment Platform	Unified Communications
Case Management	**CMS / Portal**	Enterprise Content Management	NTSM Platform	**GIS Platform**	**Email**

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications | Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | Virtual Data Centers

Compute
Cluster Computing | MPP | In memory | Physical Servers | **Virtual Servers**

Storage
Cloud Storage | **Storage Network** | DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | **Local Gov. Networks** | Carrier Networks | **ISP Internet**

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks | Carrier Wireless Networks

Backup & Recovery
Backup | **Disaster Recovery** | **Load Balancing**

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

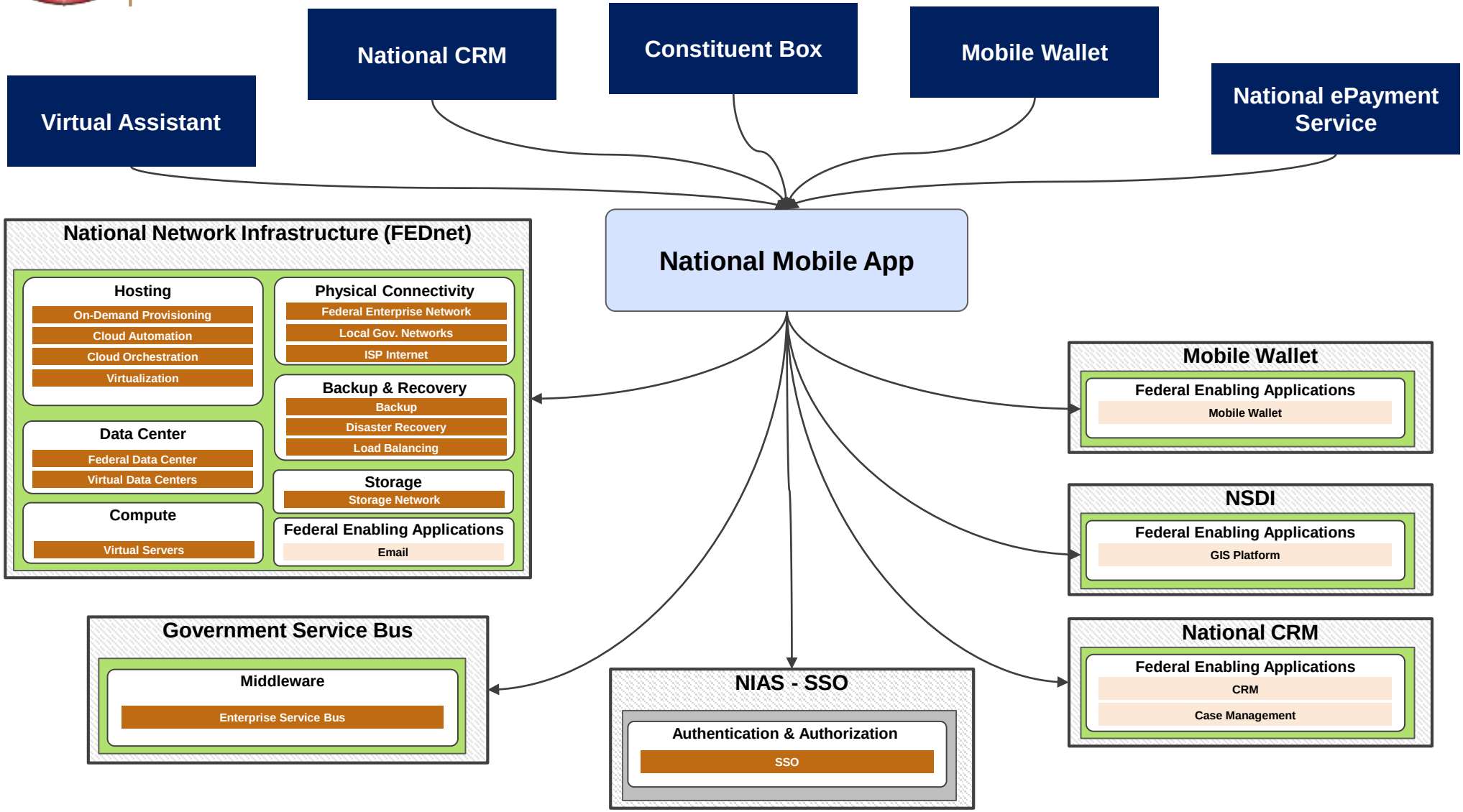
- **Monitoring**: Monitoring & Profiling; Alerting & Reporting; Auditing / Logging; Event Mining
- **Identity Management**: Federated IDM; **Federal Identity Providers**; Local Gov Identity Providers; Identity Provider Hub
- **Infrastructure Security**: IDS / IPS; Firewall; Access Control; End-point Security; Malware Detection & Prevention; **Data Encryption**
- **Authentication & Authorization**: SAML / OpenID; **SSO**; OAuth; Multi-factor Authentication; EIDA Validation Gateway; Biometrics; Emirates ID Smartcard; Role Mgmt.; Authorization Service
- **Data Protection**: Masking / Obscuring; Classification; Security Tagging; Data lifecycle Mgmt.
- **Threat & Vuln. Mgmt.**: Penetration Testing; Compliance Testing; Threat Management; Vulnerability Mgmt.
- **Cryptography**: Key Management; PKI; Data Encryption; Digital Certificates & Signatures

Direct Outcome | **Potential Outcome** | **High Dependency** | **Medium Dependency** | **Low Dependency**

الحكومة الذكية
mgovernment

Government Online – National Mobile App Project & Building Block Dependencies

Go Back



High Dependency | Medium Dependency | Low Dependency

Constituent Box System
Mapping to Building Blocks

Go Back

Operations

- **Infrastructure Operations**: Network Operation Center (NOC); Security Operation Center (SOC)
- **Logistics**: SLA Management; MSA Management; Supply Chain; Alliances; Maintenance
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Services

Delivery & Access
Laptops & Desktops | Smart & Wearable Devices | Kiosk & Digital Signage | **National Portal** | **National Mobile App** | **Constituent Box**

Smart Services
Bundled Services | Tailored Services | Federated Services | Service Integration | Smart Gov. Service Enablers

Personalization
Behavioral Targeting | Content Enrichment | Real-time Adjustments | Geolocation Targeting | Real-time Marketing | Live Recommendations

Analytics

Insights & Actions
Dashboards | Visualizations | Reporting | Scorecards | Alerting | Notifications

Analytics Services

Genetic Algorithms	Statistical Inferences	Text Analytics	Cloud Analytics
Machine Learning	Network Analysis	Data Mining	Geospatial Analytics
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Healthcare	Sustainability	Security	Economics
Cyber Security	Education	Social	People
Politics	Operational	Environment	Transportation

Data

Data Governance
Data Tagging | Data Quality Mgmt. | Metadata Mgmt. | Interoperability & Sharing | Privacy

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Fed. Core Applications
Government Resource Planning | Core Enterprise Applications | Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | **Virtual Data Centers**

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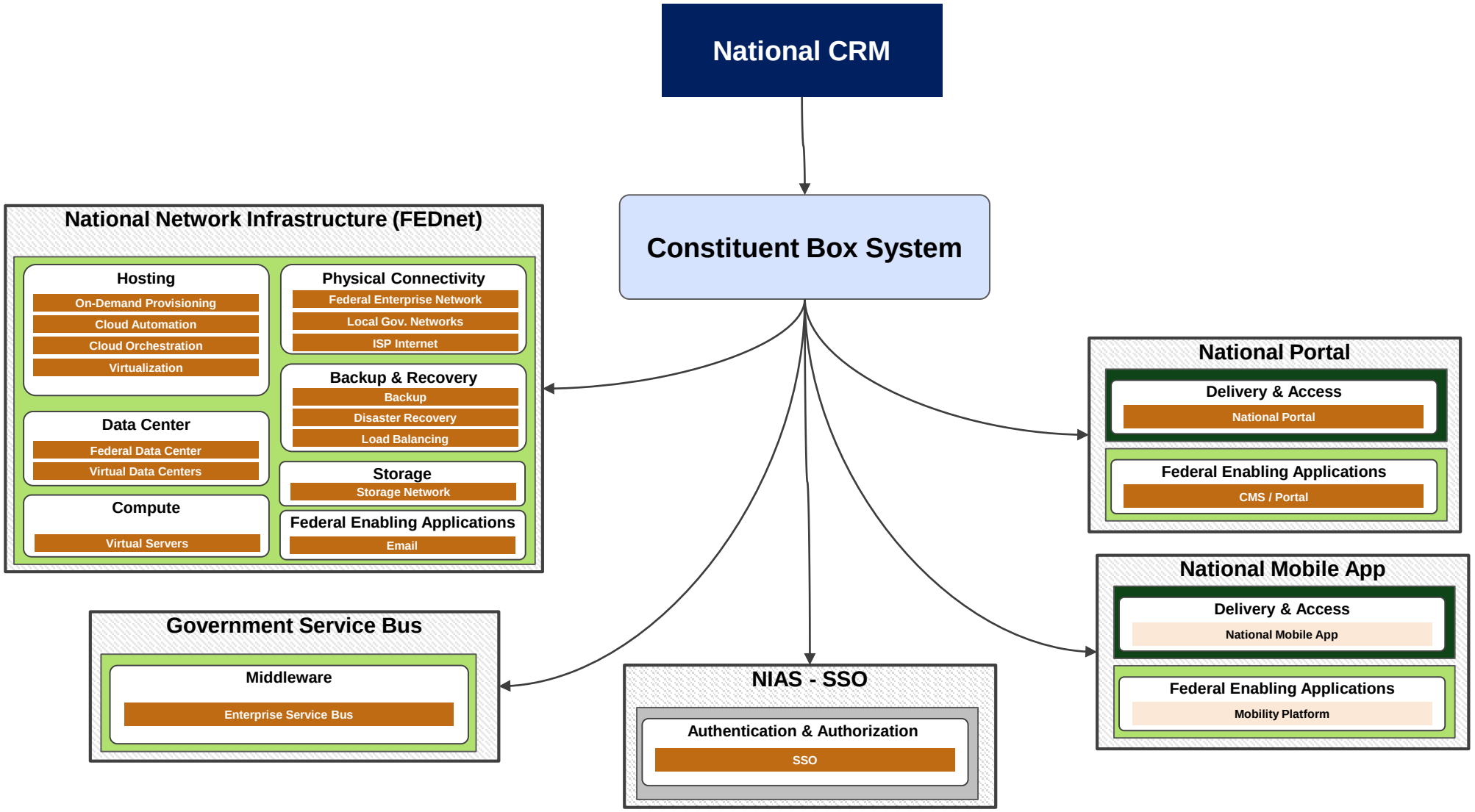
Constituent Box System
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

Mobile Wallet
Mapping to Building Blocks

Go Back

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Data Governance
Data Tagging
Data Quality Mgmt.
Metadata Mgmt.
Interoperability & Sharing
Privacy

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Case Management | CMS / Portal | Enterprise Content Management | **NTSM Platform** | GIS Platform | Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications
Bespoke Applications

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Cloud Management
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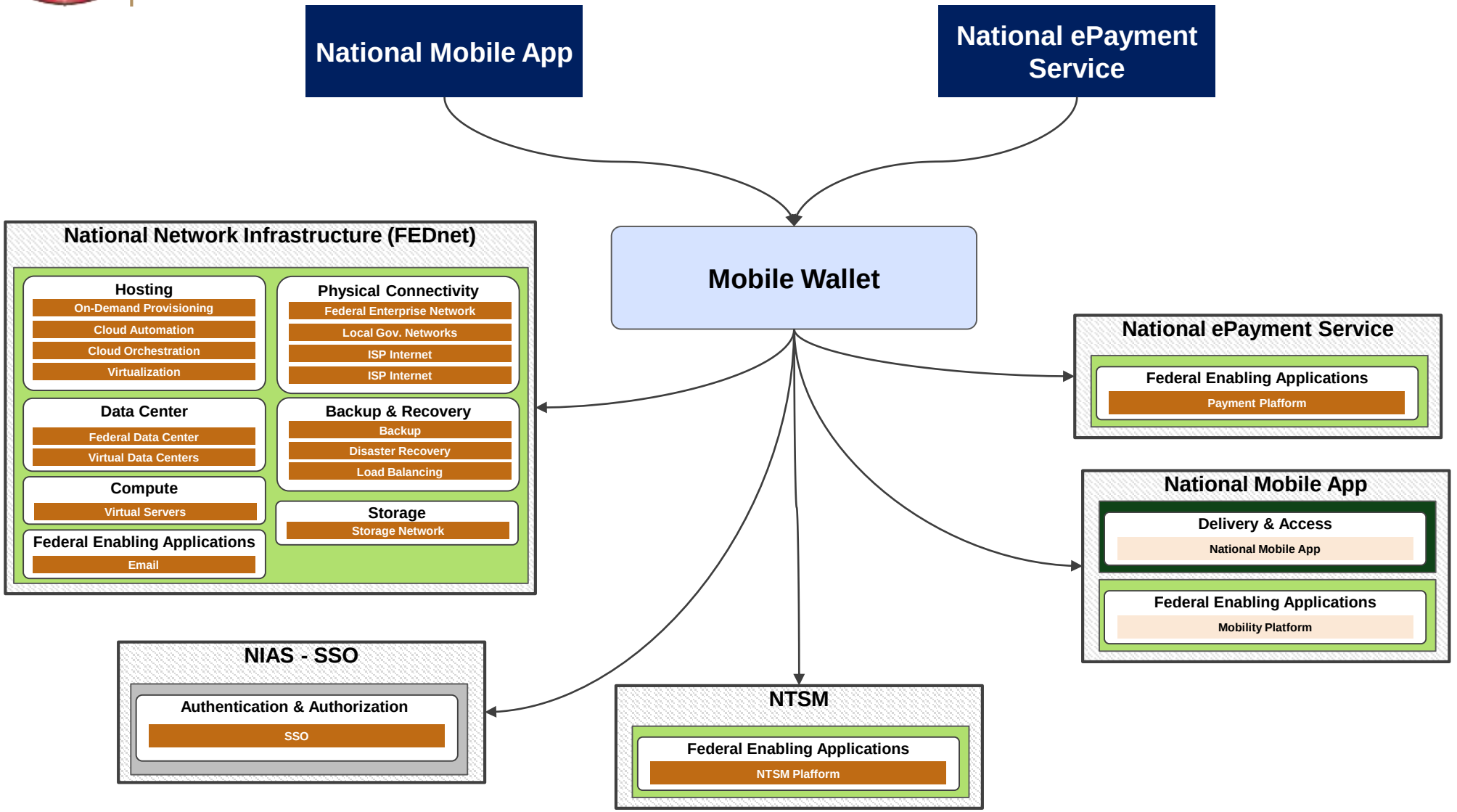
Mobile Wallet
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

National Trusted Service Manager Mapping to Building Blocks

Go Back

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Fed. Core Applications
Government Resource Planning | Core Enterprise Applications | Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center | Virtual Data Centers

Compute
Cluster Computing | MPP | In memory | Physical Servers | Virtual Servers

Storage
Cloud Storage | Storage Network | DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | Local Gov. Networks | Carrier Networks | ISP Internet

Wireless Connectivity
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Backup & Recovery
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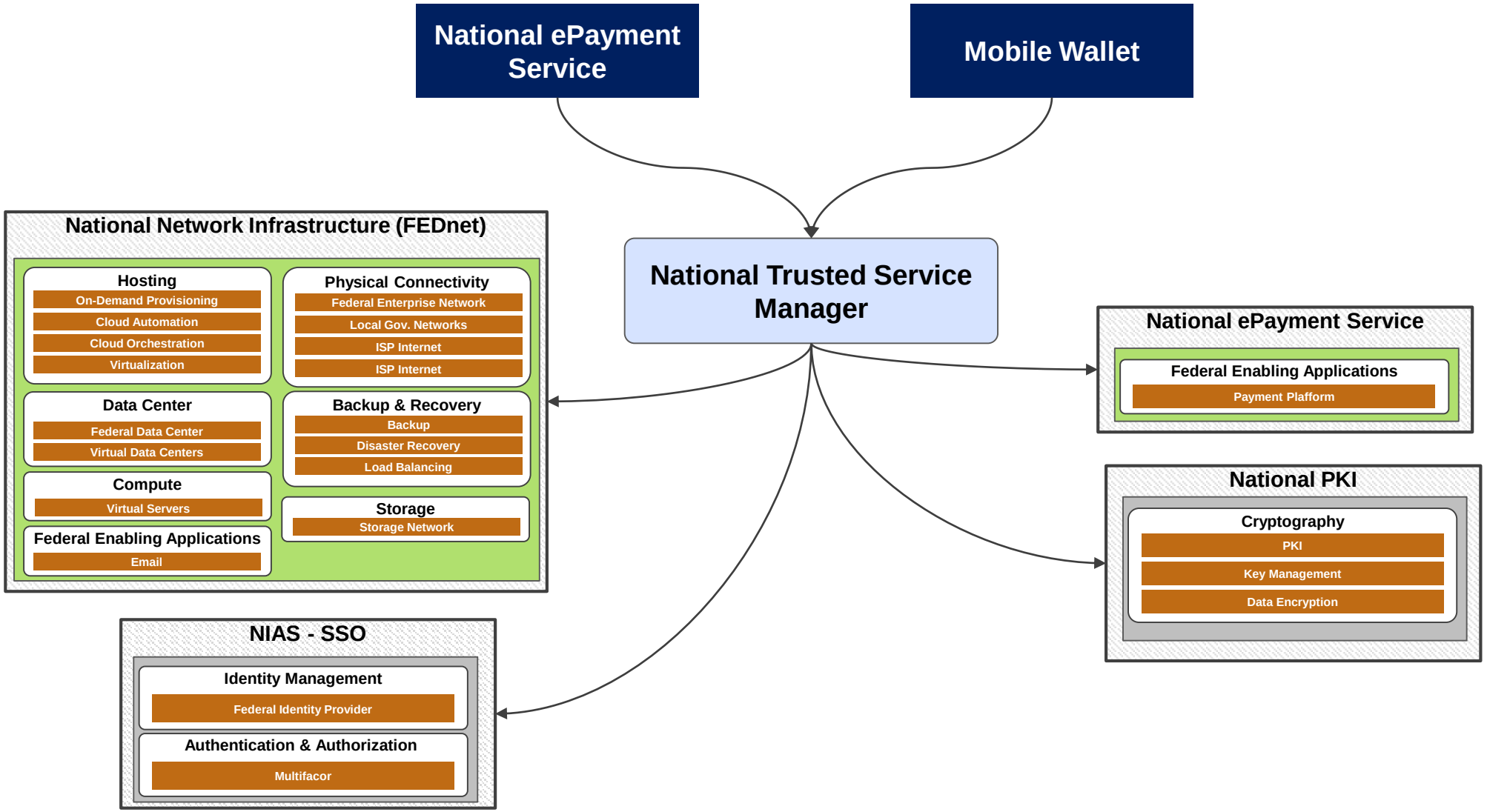
Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

الحكومة الذكية mgovernment

National Trusted Service Manager Project & Building Block Dependencies



High Dependency
Medium Dependency
Low Dependency

Center of Digital Innovation
Mapping to Building Blocks

Go Back

Operations

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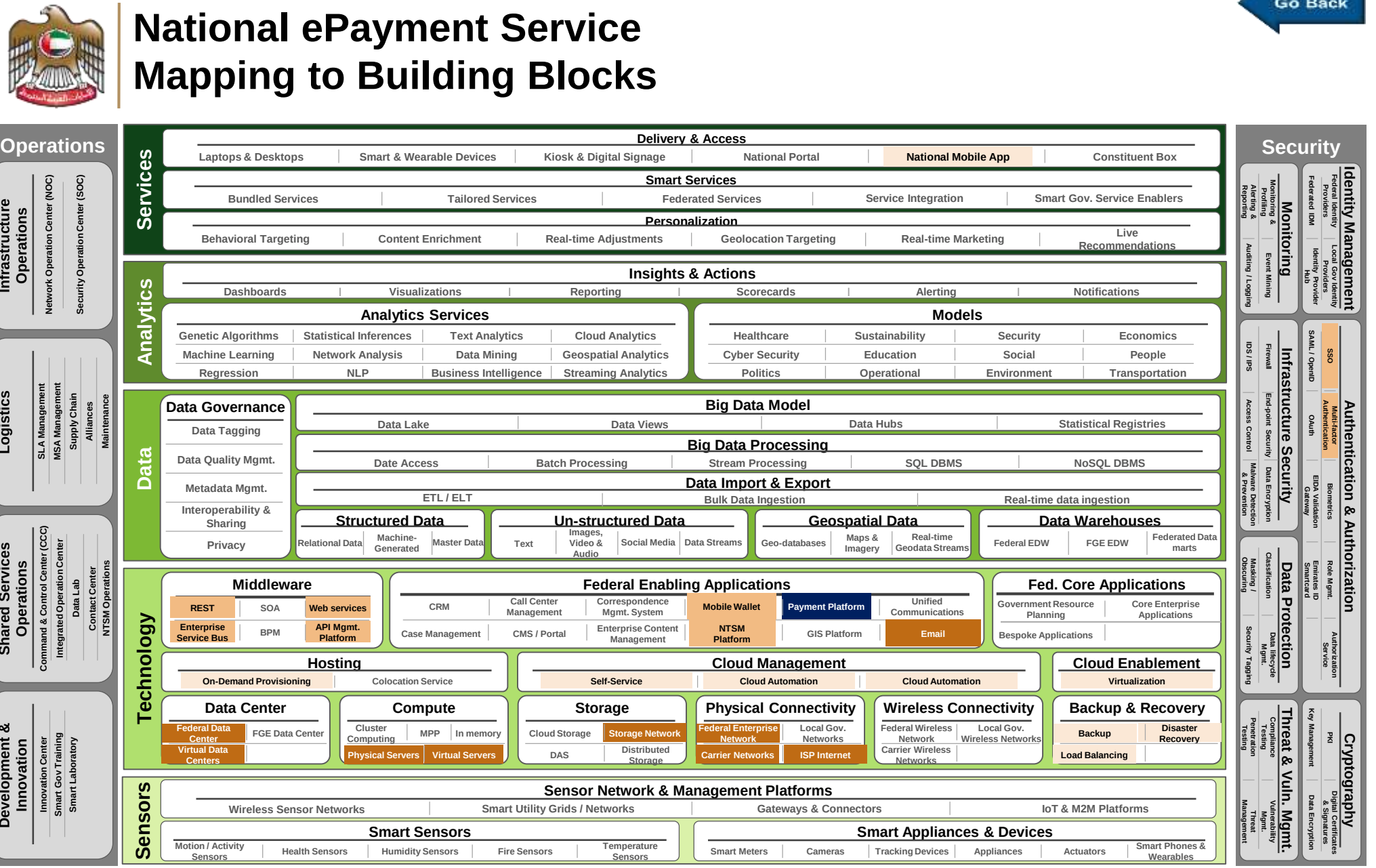
Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

الحكومة الذكية mgovernment

National ePayment Service Mapping to Building Blocks

Go Back



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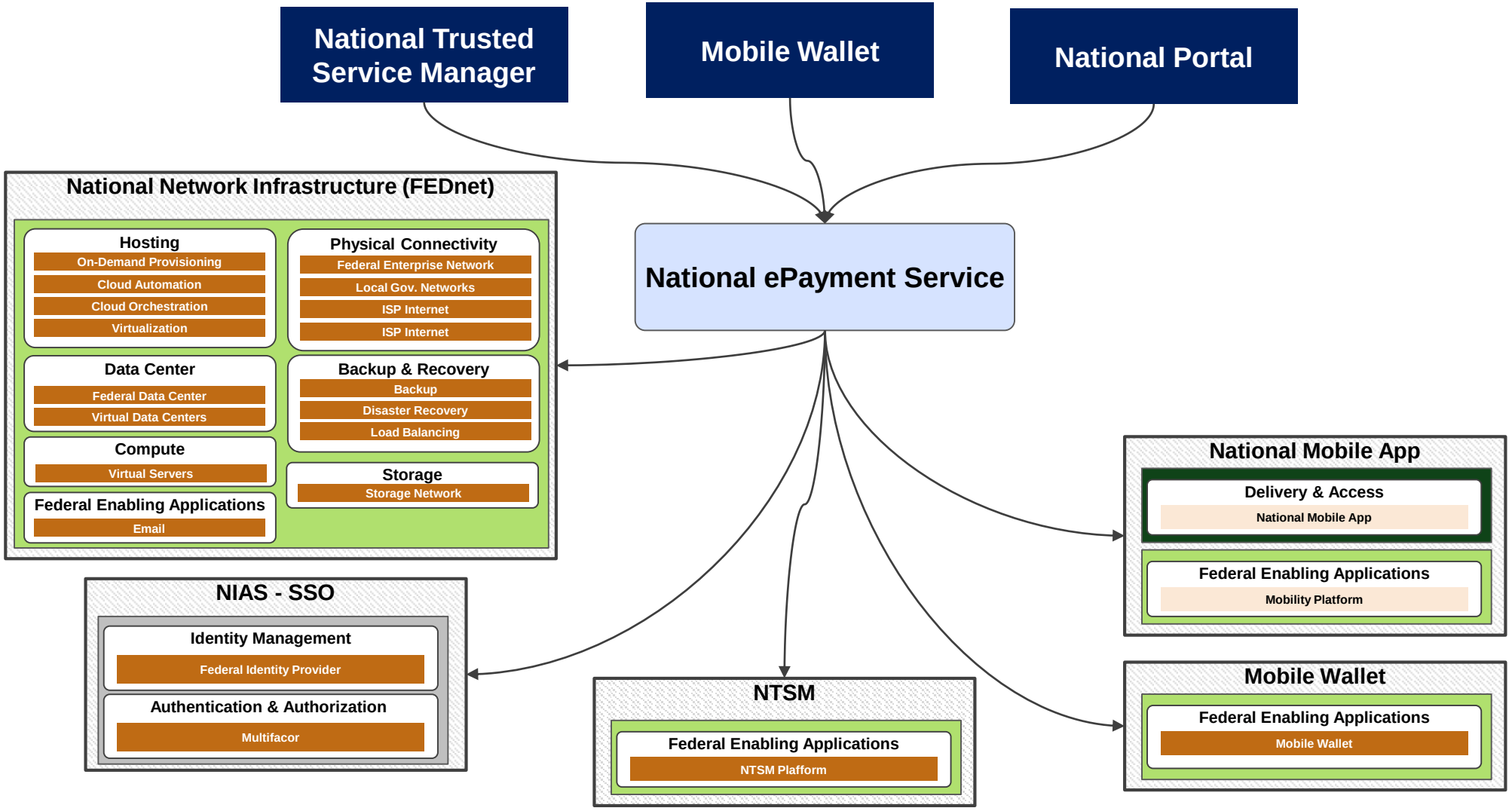
National ePayment Service
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

Cloud Analytics Platform
Mapping to Building Blocks

Go Back

Operations

Infrastructure Operations
- Network Operation Center (NOC)
- Security Operation Center (SOC)

Logistics
- SLA Management
- MSA Management
- Supply Chain
- Alliances
- Maintenance

Shared Services Operations
- Command & Control Center (CCC)
- Integrated Operation Center
- Data Lab
- Contact Center
- NTSM Operations

Development & Innovation
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- Event Mining
- Auditing / Logging
- Alerting & Reporting

Identity Management
- Federal Identity Providers
- Local Gov Identity Providers
- Identity Provider Hub
- Federated IDM

Infrastructure Security
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- IDS / IPS
- End-point Security
- Access Control
- Malware Detection & Prevention
- Data Encryption

Authentication & Authorization
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- EIDA Validation Gateway
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Data Protection
- Classification
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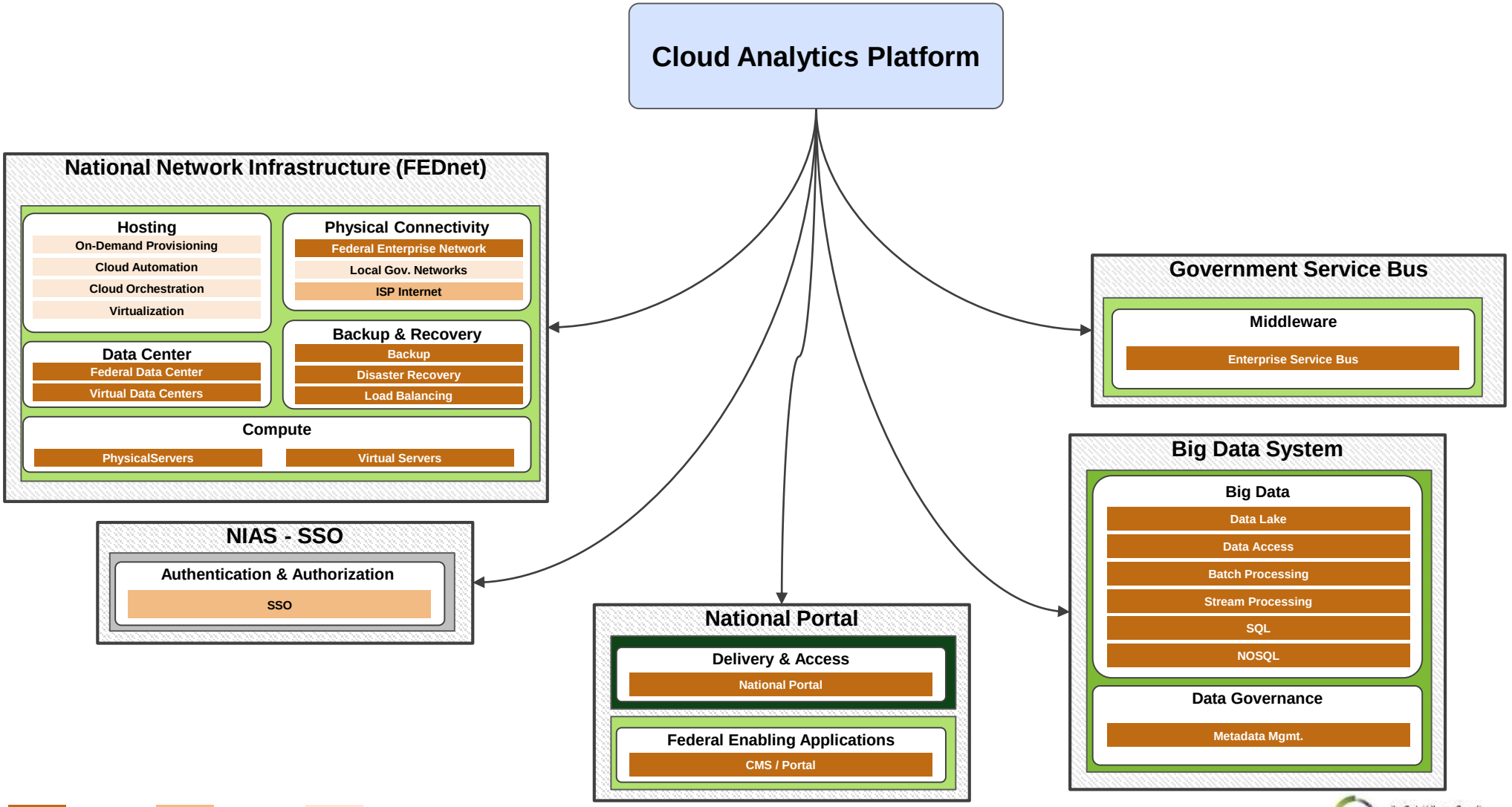
Cloud Analytics Platform
Project & Building Block Dependencies



High Dependency | Medium Dependency | Low Dependency

Health Analytics
Mapping to Building Blocks

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Date `Access | Batch Processing | Stream Processing | SQL DBMS | NoSQL DBMS

Data Import & Export
ETL / ELT | Bulk Data Ingestion | Real-time data ingestion

Structured Data
Relational Data | Machine-Generated | Master Data

Un-structured Data
Text | Images, Video & Audio | Social Media | Data Streams

Geospatial Data
Geo-databases | Maps & Imagery | Real-time Geodata Streams

Data Warehouses
Federal EDW | FGE EDW | Federated Data marts

Technology

Middleware
REST | SOA | Web services
Enterprise Service Bus | BPM | API Mgmt. Platform

Federal Enabling Applications
CRM | Call Center Management | Correspondence Mgmt. System | Mobile Wallet | Payment Platform | Unified Communications
Case Management | CMS / Portal | Enterprise Content Management | NTSM Platform | GIS Platform | Email

Fed. Core Applications
Government Resource Planning | Core Enterprise Applications
Bespoke Applications

Hosting
On-Demand Provisioning | Colocation Service

Cloud Management
Self-Service | Cloud Automation | Cloud Automation

Cloud Enablement
Virtualization

Data Center
Federal Data Center | FGE Data Center
Virtual Data Centers

Compute
Cluster Computing | MPP | In memory
Physical Servers | Virtual Servers

Storage
Cloud Storage | Storage Network
DAS | Distributed Storage

Physical Connectivity
Federal Enterprise Network | Local Gov. Networks
Carrier Networks | ISP Internet

Wireless Connectivity
Federal Wireless Network | Local Gov. Wireless Networks
Carrier Wireless Networks

Backup & Recovery
Backup | Disaster Recovery
Load Balancing

Sensors

Sensor Network & Management Platforms
Wireless Sensor Networks | Smart Utility Grids / Networks | Gateways & Connectors | IoT & M2M Platforms

Smart Sensors
Motion / Activity Sensors | Health Sensors | Humidity Sensors | Fire Sensors | Temperature Sensors

Smart Appliances & Devices
Smart Meters | Cameras | Tracking Devices | Appliances | Actuators | Smart Phones & Wearables

Security

Monitoring
Monitoring & Profiling | Event Mining | Auditing / Logging | Alerting & Reporting

Identity Management
Federal Identity Providers | Local Gov Identity Providers | Identity Provider Hub | Federated IDM

Infrastructure Security
Firewall | End-point Security | Malware Detection & Prevention | IDS / IPS | Access Control | Data Encryption

Authentication & Authorization
SSO | Multi-factor Authentication | Biometrics | SAML / OpenID | OAuth | Role Mgmt. | Authorization Service | EIDA Validation Gateway | Emirates ID Smartcard

Data Protection
Classification | Masking / Obscuring | Data lifecycle Mgmt. | Security Tagging

Threat & Vuln. Mgmt.
Compliance Testing | Vulnerability Mgmt. | Penetration Testing | Threat Management

Cryptography
PKI | Digital Certificates & Signatures | Key Management | Data Encryption

Direct Outcome | Potential Outcome | High Dependency | Medium Dependency | Low Dependency

Table of Contents

- Introduction
- Scope
- Approach
- High Level EA
- Reference Architecture
- Project Mapping
- **Appendix A – Building Blocks Definitions**
- Appendix B – Smart Government Initiatives Charters

Sensors architecture collects and aggregates data from multiple sources and communicates them to other systems

G2G | G2C | G2V | G2B | G2E

Sensor Architecture

Structured — Unstructured

Batch — Streaming

Sensor Network & Management Platforms

- Wireless Sensor Networks
- Smart Utility Grids / Networks
- Gateways & Connectors
- IoT & M2M Platforms

Smart Sensors

- Motion / Activity Sensors
- Health Sensors
- Humidity Sensors
- Fire Sensors
- Temperature Sensors
- Speed Sensors

Smart Appliances & Devices

- Smart Meters
- Cameras
- Tracking Devices
- Appliances
- Actuators
- Smart Phones & Wearables

Source: BAH Analysis

Sensors Architecture
Building Blocks Definition

Sensor Architecture

Sensor Network & Management Platforms	Includes all the sensor management capabilities required to administer, manage and connect sensors and smart devices deployed across FGE's and LGE's and allow them to communicate and exchange data in a secure manner	**Wireless Sensor Networks**	A wireless sensor network consists of distributed and dispersed sensor nodes working together to monitor and record environmental and physical conditions and communicate this data to a central locations.
		Smart Utility Grids / Networks	Smart utility Grids and networks are intelligent and automated utilities delivery systems and networks integrated with communications and information technology and capable of gathering, sensing, monitoring, and acting on information
		Gateways & Connectors	Sensor Gateways and connectors are integral part of sensor networks for managing communication between sensor nodes, gathering data, and configuring the network
		IoT & M2M Platforms	End-to-End Internet-of-Things and Machine-to-Machine platforms for managing sensors and devices throughout the lifecycle from connectivity, to data and device management, towards integration and utilizations

Sensors Architecture
Building Blocks Definition

Sensor Architecture

Illustrative

Smart Sensors

Includes different types of sensors and smart sensors able to general a correct representation of physical conditions into electric signals and digital data with the possibility to perform basic processing and functionalities

Motion / Activity Sensors	Activity Sensors are capable of tracking motion and measure activity levels
Health Sensors	Health Sensors are capable of monitoring body conditions, medications, health statuses
Humidity Sensors	Humidity sensors are capable of monitoring the humidity levels in various spaces and locations
Fire Sensors	Fire Sensors and flame detectors detect the presence of flames or heat from fire and used as part of fire alarm systems.
Temperature Sensors	Temperature Sensors are able to detect temperature levels and send them back to aggregators and gateways
Speed Sensors	Speed Sensors are able to detect the speed of objects

Sensors Architecture
Building Blocks Definition

Sensor Architecture

Smart Appliances & Devices

Includes various smart appliances, phones, and devices enabled with two-way communication and intelligent systems to respond to changes and requests.

Illustrative

Smart Meters	Smart meters are electronic devices that can measure the consumption of electricity, water, or gas enabling two-way communications and controllers.
Cameras	Cameras provide continuous video data streams with varying amount of information based on camera types and use and communicate these streams back to centralized systems
Tracking Devices	Tracking Devices for tracking objects such as vehicles and people using various technologies (Cameras, GPS-based, etc..) and for variety of purposes
Appliances	Appliances (e.g. Smart Appliances) are appliances capable of communicating messages and responding to requests and exchanging data with centralization systems
Actuators	Actuators are devices that are capable of applying specific motions to control systems or objects by responding to changes or specific requests
Smart Phones & Wearables	These include smart mobiles and connected wearable devices that can operate interactively and autonomously

Technology architecture is the collected computing & network resources necessary to scale against government needs

G2G | G2C | G2V | G2B | G2E

Technology Architecture

Linear Scaling

Cloud Computing

Middleware

REST	SOA	Web services
Enterprise Service Bus	BPM	API Mgmt. Platform

Federal Enabling Applications

CRM	Call Center Management	Correspondence Mgmt. System	Mobile Wallet	Payment Platform	Unified Communications
Case Management	CMS / Portal	Enterprise Content Management	NTSM Platform	GIS Platform	Email

Fed. Core Applications

Government Resource Planning	Core Enterprise Applications
Bespoke Applications	

Hosting

On-Demand Provisioning	Colocation Service

Cloud Management

Self-Service	Cloud Automation	Cloud Automation

Cloud Enablement

Virtualization

Data Center

Federal Data Center	FGE Data Center
Virtual Data Centers	

Compute

Cluster Computing	MPP	In memory
Physical Servers	Virtual Servers	

Storage

Cloud Storage	Storage Network
DAS	Distributed Storage

Physical Connectivity

Federal Enterprise Network	Local Gov. Networks
Carrier Networks	ISP Internet

Wireless Connectivity

Federal Wireless Network	Local Gov. Wireless Networks
Carrier Wireless Networks	

Backup & Recovery

Backup	Disaster Recovery
Load Balancing	

Source: BAH Analysis

Technology Architecture
Building Blocks Definition

Technology Architecture

Data Center	Consists of all physical and virtual datacenters at federal or local government levels housing and maintaining all backend IT systems including servers, storage, networking and providing core physical environment services.	**Federal Data Center**	The Federal Data Center by FEDnet is a high assurance data center hosting government-wide services and providing hosting and colocation services to FGE's in a dynamic and highly scalable cloud infrastructure with disaster recovery capabilities.
		FGE Data Center	Data Centers managed or utilized by the various Federal Government entities to house and maintain their IT systems and host their enterprise services.
		Virtual Data Center	Virtual Data Centers (VDC) abstract the underlying hardware and provides automation and orchestration of infrastructure and services. VDC is a cloud service provided by FEDnet to Federal entities and is composed of several components (servers, storage, secure zones, firewalls, load balancers, etc…)
Compute	Consists of all physical servers, virtual servers, clusters, super computers, MPP hardware, clusters and grid computing to perform set of computations and operations to provide a dedicated service to users	**Physical Servers**	Physical services are front-end platforms running on dedicated physical hardware hosting services and able to respond to user requests. Servers include the hardware, compute and processing units, operating system, software, and networking protocols.
		Virtual Servers	Virtual Servers are servers sharing physical compute and storage resources on a host machine with other virtual servers and sits on top of abstraction/emulation layer (e.g. hypervisor)
		Cluster Computing	Cluster Computing delivers unified, single and scalable high-performance computing harnessing the power of several interconnected (loosely or tightly) computers. Commodity clusters are one example of clusters using commodity low-cost hardware
		MPP	Massively Parallel Processing (MPP) servers deliver high-performance computing using large numbers of processors (i.e. CPUs) running in parallel and coordinate fashion to execute single programs.

Technology Architecture
Building Blocks Definition

Technology Architecture

Storage	Provides shared storage capabilities to servers and computes across networks or through direct access technologies	**Cloud Storage**	Cloud storage provides a service for users and federal entities to store and access data. The service provider is responsible for managing, maintaining, and backing up data and underlying hardware to ensure availability and scalability
		Storage Network	Storage Network provides shared storage to servers and computers across a network or various access channels using various protocols. It mainly consists of Network Attached Storage (NAS) devices providing file-level data storage and Storage Area Network (SAN) devices providing block-level data storage
		DAS	Direct-attached storage (DAS) are dedicated storage devices directly attached to servers. DAS provides a low-cost option compared to Storage Networks and is often used with commodity computing / clusters
		Distributed Storage	Distributed storage provides reliable and scalable platforms to store and access data by distributing storage and processing on multiple nodes or may span large number of commodity clusters (e.g. HDFS)
Backup & Recovery	Consists of backup and recovery services for ensuring continuation of operations in case of disasters and events	**Backup**	Backup services cover the process of managing, copying and archiving of data stored in servers and storage devices into other storage media of various types using different models. This allows to recover data to a certain point in time if required (e.g. in case of data loss).
		Disaster Recovery	Disaster Recovery(DR) covers the policies, processes, and tools to enable organization to recover critical IT systems and infrastructure and provide failover in case of critical events or disasters. This includes establishing remote DR sites, routine offsite backups and replications,, recovery tools and others, cloud solutions, etc…
		Load Balancing	Load balancing allows the distribution of requests and traffic among multiple resources, servers, clusters, networks, etc.. This improves availability and reliability, eliminates single points of failures, optimizes resources, enhances availability and allows for scalability

Technology Architecture
Building Blocks Definition

Technology Architecture

Physical Connectivity	Consist of all wired and physical networks connecting various entities internally and externally using various types of networks (e.g. LAN, WAN, MAN, etc..)	**Federal Enterprise Network**	A unified, secure and reliable enterprise network that interconnects the different FGEs and provide a single network and security boundary for the federal government of the UAE. Entities are connected thrown Wide Area Networks (WAN) via Multi-Protocol Label Switching (MPLS) technology.
		Local Gov. Networks	Enterprise network specific to the different local governments (e.g. ADSIC, DSG) used as a secure and reliable channel for electronic data communications among departments and local entities.
		Carrier Networks	Networks owned and operated by Carriers (e.g. Du, Etisalat) or Managed Service Providers (MSP) and provided as a service to the entities. These include managed leased lines/circuits, Ethernet services (e.g. MPS), IP Virtual Private Networks (VPN) and others.
		ISP Internet	ISP Internet, managed by Carriers/ISPs, provide symmetrical and asymmetrical internet connectivity to government entities through various methods (e.g. Leased Lines)
Wireless Connectivity	Provides wireless connectivity to various government entities using various technologies and protocols.	**Federal Wireless Network**	A unified, secure, and reliable enterprise network that interconnects FGE's wirelessly through various wireless and mobile telecommunication technologies to allow for specific services such as mobile computing
		Local Gov. Wireless Networks	Enterprise wireless network specific to the different local governments (e.g. ADSIC, DSG) used to provide secure wireless connectivity to government entities.
		Carrier Wireless Networks	Mobile and wireless networks managed and provided by Carriers using various telecommunication technologies (e.g. WiFi, 3g, 4g, LTE, WiMAX, etc..)

Technology Architecture
Building Blocks Definition

Technology Architecture

Hosting	Refers to the multi-tenant shared and dedicated hosting services providing management, maintenance and support of infrastructure (e.g. firewalls, load balancing, security, network storage, backups, servers, etc..) for clients often bound by Service Level Agreements (SLAs)	**On-Demand Provisioning**	On-Demand Provisioning provides an environment that allows scaling the infrastructure to support business needs and allows delivering IT capabilities on demand with minimal intervention, ensuring high flexibility. It require
		Cloud Automation	Could Automation provides automated cloud management services to users and government entities and includes the capability to dynamically order, deploy, monitor, manage, configure, secure and retire IT infrastructures and services with minimal human intervention. It is a key component for delivering a cloud-based IT-as-a-service solution such as FEDnet Hosting services.
		Cloud Orchestration	Cloud Orchestration provides the tools necessary to orchestrate the various steps in the cloud provision process and streamline them allowing for “planned” automation and provisioning of tasks within the cloud environment.
		Virtualization	Virtualization introduces a layer of “abstraction” between hardware resources and systems. It creates a virtual version of networks, servers and storage allowing for sharing of actual physical resources among several virtual instances.
		Colocation Service	Colocation services provide data center space, equipment, power, cooling, physical security and connectivity to external entities and internet for rental by other users (i.e. FGE’s)

Technology Architecture
Building Blocks Definition

Technology Architecture

Middleware	Middleware increases the flexibility, interoperability, and portability of existing infrastructure by linking or “gluing” two otherwise separate applications.	**REST**	REST a design pattern that provides enterprise integration between services through REST-ful API’s or web services utilizing primarily HTTP protocol along with XML or JSON formats.
		SOA	Service Oriented Architecture (SOA) is a design pattern in which application components provide services to other components via a communications protocol
		BPM	Business Process Management (BPM) consists of the processes and technologies for modelling, managing, automating and integrating business processes across the enterprise.
		Enterprise Service Bus	Enterprise Service Bus (ESB) refers to an integration architecture and middleware technologies to manage the communications between heterogeneous enterprise applications using SOA through a common communication bus. The Government Service Bus (ESB) is an ESB implementation to enable a SOA approach for integration among various FGE’s,
		Web Services	Web Services provide a web-based open standards method to exchange data between applications / devices and over a network.
		API Mgmt. Platform	API (Application Programming Interface) platforms provide the infrastructure, applications and technologies required to design, expose, manage, and secure API’s

Technology Architecture
Building Blocks Definition

Technology Architecture

Federal Enabling Applications

Consist of all enterprise applications available at the Federal level to be utilized for delivering Federal services or enabling FGE's to deliver federated services.

CRM	A National CRM system to unify all constituent feedback mechanisms, manage and track cases, route issues to FGEs, and serve as the backend to the Government Contact Center and other communication channels
Case Management	A case management solution that provide capabilities to manage the lifecycle of claims and investigations within government entities.
Call Center Management	Call Center Management solution to serve as the backend of the Government Contact Center for allowing automatic call routing using Automated Call Distribution (ACD) technologies, integration with various access channels, IVR technologies, satisfaction surveys, workforce management and optimization, and virtual assistants.
CMS / Portal	Content Management System (CMS) provides the capabilities to create, author, store, manage, organize, monitor and access content, documents and web pages.
Correspondence Mgmt. System	Correspondence Management System manages and track the incoming and outgoing correspondence process and administrative and government communication internally and externally
Enterprise Content Management	Enterprise Content Management (ECM) involves several processes and tools allowing enterprises to manage, organize, store, preserve and deliver content of various types. Some of these tools include document management, content management, knowledge management. Records management, collaboration, etc..
Mobility Platform	Mobility platform consists of Enterprise Mobility Management solution delivering mobile device management, mobile application management, mobile content and email management capabilities to provide entities with secure, flexible and consistent mobile experience.

Technology Architecture
Building Blocks Definition

Technology Architecture

Federal Enabling Applications

Consist of all enterprise applications available at the Federal level to be utilized for delivering Federal services or enabling FGE's to deliver federated services.

TSM Platform	A platform that provides mobile lifecycle management capabilities (i.e. secure element lifecycle management, payment application provisioning) and end-to-end security encryption between banks and smart phones to help in executing Trusted Service Manager (TSM) activities
Mobile Wallet	Mobile wallet is primarily a mobile application that interconnects service providers and identity providers in a market where their capabilities can be securely and intuitively provisioned to constituents. This becomes the basis of mobile payment options as service providers rely on identity providers to offer ePayment solutions as mobile applications.
Payment Platform	ePayment service for the whole of government to better meet the financial transaction needs of constituents and entities. Available over multiple access channels as a stand alone service to include mobile (e.g., app) and web (e.g., applet)
Virtual Assistant	A multichannel virtual assistant solution that provides the capabilities to conduct human-like natural voice interactions with users to deliver personalized service and assistance
GIS Platform	A Geographic Information System (GIS) provides the capability to capture, collect, store, visualize, manipulate, analyze, preserve, and publish spatial and geographical data built on top of a spatial data infrastructure (SDI)
Unified Communications	Unified Communications provide the platform and tools to provide secure, trusted, integrated and real-time communication services to entities and users facilitating seamless collaboration through various channels including audio, video and web conferencing
Email	Email platform to provide email services to FGE's in a secure, flexible and scalable manner.

Technology Architecture
Building Blocks Definition

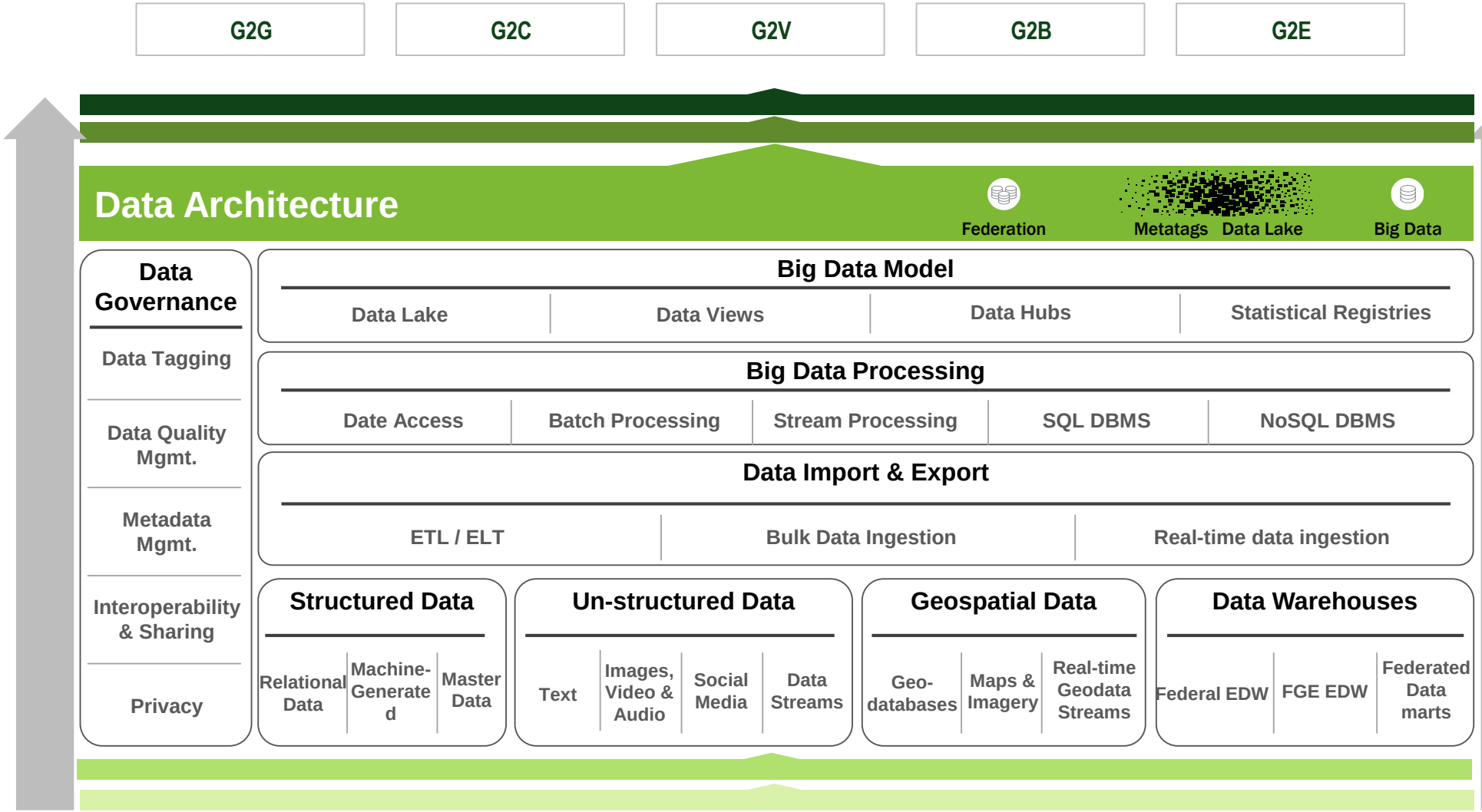
Technology Architecture

Federal Core Applications

Consists of core enterprise applications critical to the government and FGE's core business and processes

Government Resource Planning	The Government Resource Planning (GRP) includes the capabilities supporting the management of enterprise planning and back-office operations which cover Financial management, human resources, Supply Chain Management, Procurement Management, and Inventory Management
Core Enterprise Applications	Core Enterprise Applications include various applications critical to the core operation of FGE's
Bespoke Applications	Bespoke Applications include custom-built, in-house developed or COTS solutions that are deployed to meet some specific business need within FGE's

Data architecture is data federation across distributed data stores to facilitate integration, sharing and analytics



Source: BAH Analysis

Data Architecture
Building Blocks Definition

Data Architecture

Structured Data	Consists of data repositories with high degree of organization such as data residing in Relational Data	**Relational Data**	Relational Data is data generated by transactional enterprise applications and often stored in Relational Database Management System (RDMS) in a structured schema format or other forms of repositories or files (e.g. excel)
		Machine-Generated	Machine-generated data are sometimes referred to as semi-structured data and include logs, stored sensor data, click-stream, etc…
		Master Data	Master or Reference Data represents common and critical business data that is often shared among various business units and enterprise applications such as products, materials, employees, partners, vendors, etc…
Un-structured Data	Consists of all data and information that does not have a specific format, cannot be modeled into a structured schema or has not been organized into one such as blogs, text documents, videos, streams etc..	**Text**	Texts and images that could be in form of documents, emails, blogs, web pages etc..
		Social Media	Social media information generated on social media sites and services in addition to blogs
		Images, Video & Audio	Images, Videos and Audio files are non-textual information stored in variety of files and generated in media like documents (e.g. JPEG, MP3, MPEG, etc..)
		Data Streams	Data moving at high speeds such as transient sensor data, web traffic, satellite data, live video streams, etc..

Data Architecture
Building Blocks Definition

Data Architecture

Geospatial Data	Includes all data, data streams, documents, and repositories storing spatial information	**Geo-databases**	Geo-databases are repositories used to model, store and manage spatial and attribute data on top of a relational database management system (RDBMS).
		Maps & Imagery	Maps & Imagery gathered from ground surveys, aerial or satellite imagery stored in various formats
		Real-time Geodata Streams	Real-time Geodata Streams involve real-time data streams with associated spatial information from variety of sources such as GPS, air traffic control, vessel positions, mobile data, etc…
Data Warehouses	Consists of all non-relational and dimensional data warehouse and marts used to aggregate data for reporting and analytics	**Federal EDW**	Federal Enterprise Data Warehouse (EDW) represents a centralized repository of significant government-wide data used for business intelligence and analytics purposes.
		FGE EDW	Federate FGE's Enterprise Data Warehouse represents a centralized repository of each FGE significant data for reporting, business intelligence and analytics purposes.
		Federated Data Marts	Federated Data Marts hosted at various FGE's for presenting subset of FGE's EDW focusing on a single subject or business domain.

Data Architecture
Building Blocks Definition

Data Architecture

Data Import & Export	Involves the loading, transformation, ingestion and exporting of bulk and real-time data from operational systems to data repositories	**ETL / ELT**	Extract, Transform and Load (ETL) is a mechanism / tool for manipulating, change and migration of data between heterogeneous systems, databases and repositories.
		Bulk Data Ingestion	Bulk Data Ingestion represents the process and tools (e.g. Apache Sqoop) for efficiently transferring bulk data between various systems, primarily between Big Data platform(e.g. Hadoop HDFS, NoSQL) and relational databases.
		Real-time data ingestion	Real-time data ingestion consists of the process and tools (e.g. Apache Flume) for collecting, aggregating and moving large amounts of real-time streaming data to other systems, primarily to the Big Data platform.

Data Architecture
Building Blocks Definition

Data Architecture

Data Governance

Involves the decision rights, policies, processes and tools to ensure data is properly managed and protected through its lfiecycle

Data Tagging	Data Tagging involves assigning metadata and security tags on data during processing / ingestion which helps organize data and facilitate specialized retrievals
Data Quality Mgmt.	Data Quality Management processes and technologies to assess, measure, profile, monitor, and manage quality of data and allow for transformations as per defined rules
Metadata Mgmt.	Metadata Management processes, tools and repositories to harvest, extract, assign, manage metadata throughout the data lifecycle.
Interoperability & Sharing	Interoperability and Sharing frameworks and standards that define the rules and policies around data exchange and sharing.
Privacy	Information and data Privacy covers the policies, processes and tools that limit the dissemination and exchange of collected personal data .
Data Security	Involves the protection of data from unauthorized access or attempts of sabotage and destruction. See Definition in Security Domain

Data Architecture
Building Blocks Definition

Data Architecture

Big Data Processing	Includes the core components of a Big Data management and access platform allowing the access and processing of data in data lakes through various technologies	**Data Access**	Data Access offers the capabilities to access and interact with various types of data (e.g. batch, streaming, real-time, etc…) in various ways including opportunities for 'schema-on-read' access. Examples of tools include Apache Hive, Pig, and tez.
		Batch Processing	Batch Processing involves tools to process bulk data in batches. Examples of tools include Hadoop MapReduce
		Stream Processing	Streaming processing involves tools to process high-volumes of real-time data and streams in a distribute scalable environment. Example of Streaming Processing tools include Apache Storm
		SQL	Tools to allow data access and SQL scripting on top of data warehouses specific for aggregating, summarization and analysis. Example of tools is Apache Tez
		NoSQL	NoSQL databases provide data storage mechanisms other than traditional tabular / relational formats of SQL databases (RDMS). Several types of NoSQL databases exist, including Columnar, Graph, Key-value and others. Example of tools include Hbase (Columnar)
Big Data Model	Includes the repositories and data models that allow to store, aggregate, access, and publish data to specific groups	**Data Lake**	Data Lake is a single consolidated large object-based repository of information containing all the organization (e.g. Federal government, FGE's, LGE's, etc..) structured, unstructured and streaming data. Data Lakes are built on top of Big Data platforms and repositories
		Data Views	Data Views are created using subset of Data Lakes at the time of analysis through the use of indices and relationships in order tailor the data to the specific needs of the business.
		Data Hubs	Data Hubs are collections of data, organized under specific subjects and domains (e.g. Land, People, Business, etc..), ready for sharing.
		Statistical Registries	Statistical registries are used to collect and share statistical, survey, and aggregated information on specific domains among communities and government entities

Analytics architecture is the analysis and automation used to produce customer service insights and knowledge

G2G	G2C	G2V	G2B	G2E

Analytics Architecture

M2M | Discovery | Analysis | Automation

Insights & Actions

Dashboards	Visualizations	Reporting	Notifications	Alerting	Scorecards

Analytics Services

Genetic Algorithms	Statistical Inferences	Streaming Analytics
Machine Learning	Cloud Analytics	Geospatial Analytics
Regression	Business Intelligence	Data Mining
NLP	Network Analysis	Text Analytics

Models

Healthcare	Social	Sustainability
People	Security	Politics
Economics	Operational	Cyber Security
Environment	Education	Transportation

Source: BAH Analysis

Analytics Architecture
Building Blocks Definition

Analytics Architecture

Analytics Services

Includes traditional and Big Data Analytics tools, methods, and techniques that operate on existing data repositories (data lakes, data warehouses, etc…) to produce analysis, modeling, testing needed for decision making

Genetic Algorithms	Genetic Algorithms are algorithms used in various analytics services to find decisions that yields the best answer out of several possible options.
Machine Learning	Machine learning is used to learn classifiers and prediction models in the absence of an expert and employs many algorithms in the areas of decision trees, association learning, artificial neural networks, inductive logic programming, support vector machines, clustering, Bayesian networks, genetic algorithms, reinforcement learning, and representation learning.
Regression	Regression is a statistical analysis tool for investigating and analyzing the relationship among variables, to estimate why a phenomenon occurred and predict future outcomes. Regression analysis is widely used for predictive analytics.
Text Analytics	Text Analytics or text mining involves analyzing large datasets of textual information through patterns, trends, extraction and retrieval techniques to derive insights and find useful information for various business applications (e.g. security, health, marketing, academic, etc..)
NLP	NLP is used to process unstructured and semi-structured documents for the purposes of information retrieval, sentiment analysis, statistical machine translation, and classification.
Network Analysis	Network analysis using graph theory and social network analysis are used to understand association and relationships between entities of interests.

Analytics Architecture
Building Blocks Definition

Analytics Architecture

Analytics Services

Includes traditional and Big Data Analytics tools, methods, and techniques that operate on existing data repositories (data lakes, data warehouses, etc…) to produce analysis, modeling, testing needed for decision making

Statistical Inferences	Traditional statistical methods using univariate and multivariate analysis on relatively small datasets are employed to make inferences, test hypotheses, and summarize data.
Cloud Analytics	Cloud Analytics involves specific tools and technologies, building on existing analytics tools, to help gain insights from large data sets across private and public clouds.
Business Intelligence	Business intelligence tools focus on understanding and analyzing historical data to enable informed business decisions from an operational and performance perspectives.
Streaming Analytics	Streaming Analytics provides the capabilities to analyze and extract perishable insights from high-velocity data moving in real-time.
Geospatial Analytics	Geospatial Analytics involves applying statistical methods and predictive techniques to analyze massive amounts of batch and streaming geodata from variety of sources to understand trends, behaviors, and properties of subjects.
Data Mining	Data mining is used to discover patterns in large datasets and draws from multiple fields including artificial intelligence, machine learning, statistics, and database systems.

Analytics Architecture
Building Blocks Definition

Analytics Architecture

Insights & Actions

Involves all the tools required for building on analysis results to produce necessary visualizations, dashboards, reports that will help extract the insights and turn them in actions

Visualizations	Visualizations tools consist of scientific visualizations, information visual analytics to present data in graphical formatting while incorporate the analytical reasoning with these visualization through customizable, flexible and interactive user interfaces. Examples of visualization include: Histograms, Charts, Geospatial, Networks & Graphs, Plots, Survival Charts, etc…
Reporting	Reporting involves collection of data and presenting in the form of customized or prebuilt reports to decision makers
Scorecards	Scorecards provide the capability to monitor and report on certain metrics against objectives depicting progress over time.
Dashboards	Dashboards provides a lightweight, easy-to-read, and easy-to-build interface showing historical trends and real-time monitoring to analyze transactions, behaviors, patterns, threats, and other activities.
Alerting	Alerting introduces the capability of producing automated real-time alerts based on defined events with visualizing and ability of notifications.
Notification	Notification capability involves proactively notifying the users of events, alerts, or issues through various communication channels.

Analytics Architecture
Building Blocks Definition

Analytics Architecture

Models

Encompasses the different analytics models across various business domains of relevance to the Smart Government and government entities

Healthcare	Health care analytics have different applications in Clinical Decision Support (CDS) systems and in evaluating datasets for disease management and clinical research
Social	Social Analytics involves analyzing social behaviors, identity trends in customer sentiments (through social media) and understanding social patterns among people
Sustainability	Sustainability Analytics brings together the main pillar of sustainability (social, economic and environmental) to identity associations, relationships and provide predictions
People	People Analytics in the area of human resource management bring correlations and associations between disparate data to benefits businesses, hiring, and employments
Security	Security Analytics analyze events, past threats, trends, sensor data intelligence data across defense, intelligence and national security domains to predict and respond to threats
Politics	Politics analytics involves the analysis of social data & political events and campaigns to mine data about constituents behaviors in order to enhance political campaigns through effective targeting
Economic	Economic Analytics make use of smart analytics technique to analyze information of economic significance and derive predictive and even prescriptive insights to aid decision making at macro-level
Operational	Operational economics focuses on analyzing operational data in order to gain new insights about operational efficiencies and effectiveness with focus on improving productivity and making smarter decisions (e.g. Analytics on citizen services)
Cyber Security	Cyber Security Analytics involves analyzing vast amount of InfoSec data to derive trends and bring the capability to predict, detect, and stop threats and shorten the remediation time after attacks
Environment	Environmental Analytics looks at historic and real-time data on environmental conditions to identify trends to identify potential issues and predict the impact of which on economics and sustainability
Education	Education Analytics mines information about learners, students, and teachers to help optimize learning environments and make better decision on education policies and programs
Transportation	Transportation Analytics analyzes transportation data from various resources for the purpose of enhancing reducing congestions and building a reliable and safer transportation networs.

Services architecture is the proactive delivery of customer services based on analytical and inferential insights

G2G | G2C | G2V | G2B | G2E

Services Architecture

Integration | Adaptive | Pervasive | Prediction

Delivery & Access

- Laptops & Desktops
- Smart & Wearable Devices
- Kiosk & Digital Signage
- National Portal
- National Mobile App
- Constituent Box

Smart Services

- Bundled Services
- Tailored Services
- Federated Services
- Service Integration
- Smart Government Service Enablers

Personalization

- Behavioral Targeting
- Content Enrichment
- Real-time Adjustments
- Geolocation Targeting
- Real-time Marketing
- Live Recommendations

Source: BAH Analysis

Services Architecture
Building Blocks Definition

Services Architecture

Smart Services	Consists of all smart services delivered by the smart government to all constituents	**Bundled Services**	Bundled Services involve multiple services provided by one or more FGEs bundled, categorized and prioritized together based on constituent lifecycle for convenience and ease of use
		Tailored Services	Tailored Services offer new and enhanced services tailored to specific constituent needs.
		Federated Services	Federated Services are all non-bundled specific services provided to constituents by the various service providers (i.e. FGEs)
		Service Integration	Service Integrations involves interconnecting otherwise disparate and isolated services to deliver an integrated set of services.

Services Architecture
Building Blocks Definition

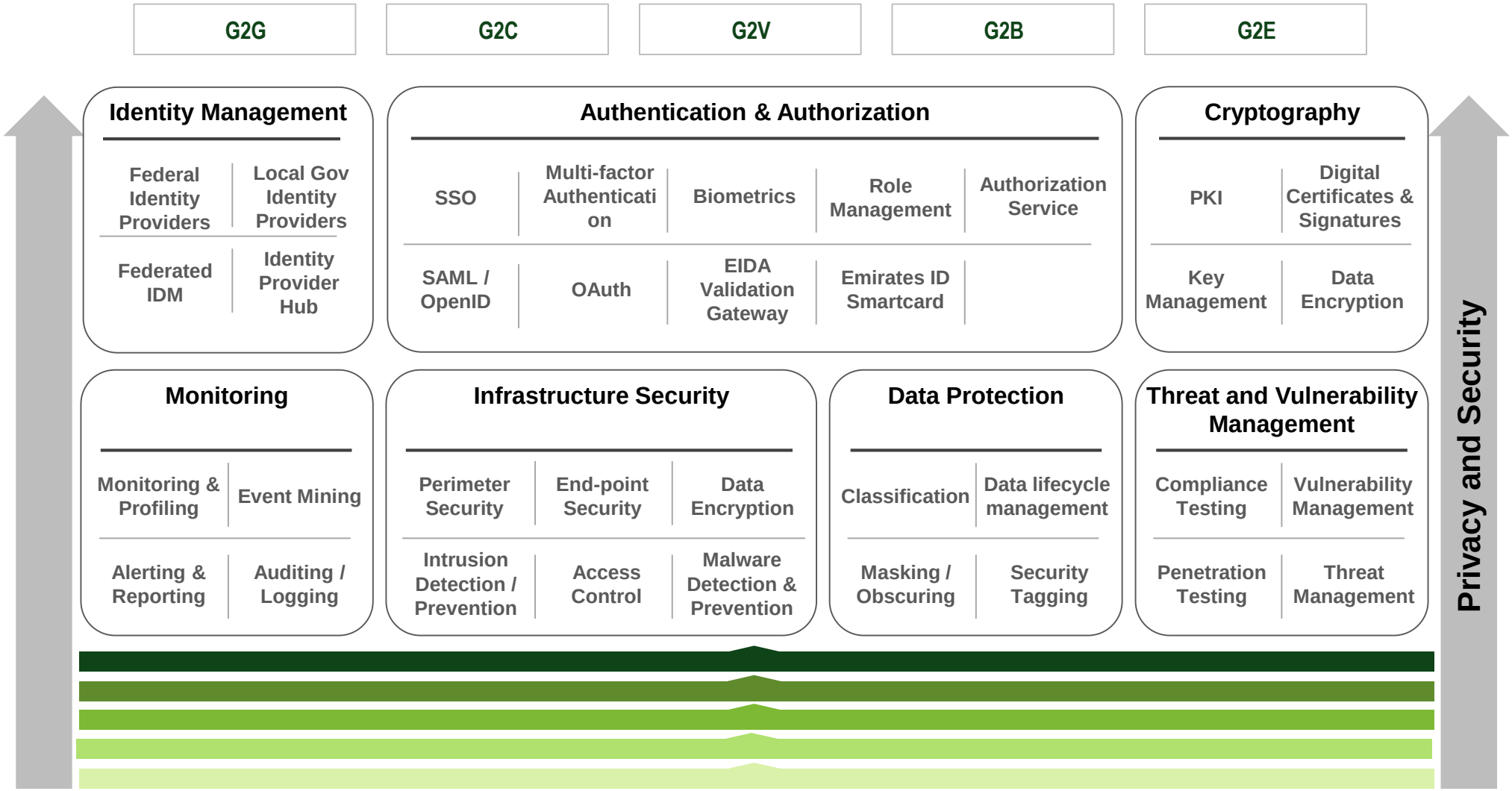
Services Architecture

Delivery & Access

Consists of the collection of all mechanisms, tools, technologies and interfaces for automated dispensing of services to allow constituents access to all services

Laptops & Desktops	Laptops & Desktops used to access services via multiple channels and mechanisms
Smart & Wearable Devices	Smart & wearable devices consists all electronic devices that can perform certain computations, be connected through network, interact with other devices or systems or humans via various methods or technologies.
Kiosk & Digital Signage	Kiosks are physical structures often deployed in public places that are equipped with computer terminals and interactive technologies that provide access to information and services through various channels.
National Portal	A National portal provides a one-stop shop over the web that enable access and discovery of all Smart Government services and resources
National Mobile App	A National Mobile App provides a single mobile app for the UAE federal government as a container for widgets developed by FGEs.
Constituent Box	Constituent Box provides an accessible, secure, and trusted platform to manage electronic correspondence between government and constituents (e.g., businesses, citizens, and residents) based on constituent choice and preference

Privacy and Security is the constant balance to ensure the safety of constituents while providing ease of access



Source: BAH Analysis

Privacy & Security Building Blocks Definition

Privacy and Security Architecture

Identity Management	Consists of a set of policies, processes and technologies that establish and manage user identities and rules for systems	**Federal Identity Providers**	A Federal Identity Provider is a system responsible for storing, managing, and authenticating identification information at a federal level (typically based on Emirates ID)
		Local Gov Identity Providers	A Local Government Identity Provider is a system responsible for storing, managing, and authenticating identification information at a local government level (e.g. ADSIC, Dubai Smart Government)
		Federated IDM	Federated Identity Management encompasses the common set of policies, processes and technologies that establish and manage user identities and rules for systems / services access across several organizations.
		Identity Provider Hub	An Identity provider hub is responsible for routing authentication requests from the Service Provider to the appropriate Identity Provider in a Federated Identity Management System
Cryptography	Consists of the various techniques used to secure communications and exchange of information	**Digital Certificates & Signatures**	Digital Certificates is a mechanism / electronic document, usually signed by a Certificate Authority (CA), used to verify the identity of a public key holder. A Digital Signature involves a technique used to guarantee the authenticity of an electronic document.
		PKI	Public-Key Infrastructure (PKI) is a key management system that aims to secure communications, transactions and exchanged of information based on the use of digital certificates
		Key Management	Key Management covers the processes, policies, procedures, people, technologies and protocols required to manage cryptographic keys throughout their lifecycle. PKI is a type of key management system.
		Data Encryption	Data Encryption involves several encoding techniques, protocols and technologies for ensuring integrity, security, and confidentiality of data.

Privacy & Security Building Blocks Definition

Privacy and Security Architecture

Authentication & Authorization

Consists of the policies, processes, technologies and standards used to identify individuals, verify identities, and control access to government resources and services.

SSO	Single Sign-On (SSO) is A solution that integrates multiple (disparate) systems using a single access control mechanism, allowing a user to sign on once and access each system without being required to sign in to each system separately
Multi-factor Authentication	Multi-factor Authentication is a security system used to safeguard access to applications and services by requiring more than one method of authentication from independent categories of credentials
Biometrics	Biometrics involves the technologies and tools used for measurement and statistical analysis of human bodily characteristics (such as fingerprints, eye scans, etc…) which can be used as unique identifiers for authentication and access control to systems.
SAML / OpenID	Security Assertion Markup Language (SAML) and OpenID are protocols / standards used for authentication in the context `of Federated Identity Management. They allow secure exchange and communication of user authentication, entitlements, and attribute information.
OAuth	OAuth is an open standard / protocol used mainly for authorization
Role Management	Role Management involves the management of authorization using roles. It enables the specification of resources, privileges and rights that a certain user is allowed to access.
Authorization Service	Authorization Service is responsible for managing user authorizations and grating access to different applications
Emirates ID Smartcard	Emirates ID Smartcard is UAE's main mandatory Identification card issued by Emirates Identity Authority (EIDA) to all citizen and legal residents that provides identity information in addition to being able to store multiple ID applications.
EIDA Validation Gateway	EIDA Validation Gateway is a online service provided by EIDA to constituents allowing them to identity individuals, verify identities for authenticity, and match profiles stored in EIDA's repositories.

Privacy & Security
Building Blocks Definition

Privacy and Security Architecture

Monitoring	Security Monitoring for tracking events, identifying security threats, mitigating them and measuring compliance levels to defined security policies	**Monitoring & Profiling**	Monitoring & Profiling include the monitoring, assessment, categorization, analysis, profiling, and prediction of security threats
		Event Mining	Event Mining covering the online monitoring, analysis, identification of associations and trends in security events
		Alerting & Reporting	Alerting & Reporting provide the capabilities for automated alerts and notifications of security events and threats.

Privacy & Security Building Blocks Definition

Privacy and Security Architecture

Infrastructure Security

Consists of all the policies, technologies, tools and systems used to protect IT infrastructure, including information, application, networks and hardware from internal or external attacks and reducing their threat

Firewall	Firewall refers to network device that is designed to prevent unauthorized access to or from a private network
End-point Security	End-point Security refers to the an information security methodology for protecting corporate network for unauthorized access through enforcing security compliance to all end-point devices accessing the network
Data Encryption	Data Encryption involves several encoding techniques, protocols and technologies for ensuring integrity, security, and confidentiality of data.
Intrusion Detection / Prevention	Intrusion Detection and Prevention Systems (IDPS) involve the processes, devices, applications and technologies used for network security by monitoring networks and systems activities, analyzing them for signs of possible incidents which are either threats or violations to security policies, attempting to stop them, and finally reporting on them.
Access Control	Access Control covers the processes, tools, mechanisms and technologies to govern, manage, and control access requests from subjects to enterprise objects (e.g. resources, systems, applications and infrastructure). This includes authentication, authorization, audit, and access management.
Malware Detection & Prevention	Malware Detection & Prevention consists of the policies, processes, techniques, and tools used to protect enterprise resource against malware threats by providing threat detection, prevention and mitigation capabilities

Operations is the continual focus on service delivery throughout the customer experience lifecycle

G2G	G2C	G2V	G2B	G2E

Operations

Development & Innovation	Shared Services Operations	Logistics	Infrastructure Operations
Innovation Center	Command & Control Center (CCC)	SLA Management	Network Operation Center (NOC)
Smart Gov Training	Integrated Operation Center	MSA Management	Security Operation Center (SOC)
Smart Laboratory	Data Lab	Supply Chain	
	Contact Center	Alliances	
	NTSM Operations	Maintenance	

Source: BAH Analysis

Operations
Building Blocks Definition

Operations

Development & Innovation

Consists of all development, training and innovation centers to drive innovation and research and engage government entities in smart government service delivery

Innovation Center	Innovation center focused on driving the adoption of mobile technology by FGEs in order to further the goals of smart government. Focuses on training, hands on development and testing support, and reach back to the ancillary capabilities in the Smart Laboratory, Consulting Services, and Smart Government Training.
Smart Gov Training	Dedicated training for FGE staff for smart government covering goals, concepts, differentiation, and delivery strategies. Focused on mobile development but capable of adapting to deliver course content relevant to the needs of FGE staff and the goals of smart government.
Smart Laboratory	Dedicated laboratory to research and develop new and innovative methods to build and deliver smart government services. Leverages latest practices and technologies to conduct cutting edge investigation into the application of technology to government service delivery and best serve constituents across the UAE.

Operations
Building Blocks Definition

Operations

Shared Services Operations

Covers the operations of all shared services in the Smart Government including an Integrated Operation Center.

Command & Control Center (CCC)	
Integrated Operation Center	An Integrated Operation Center (IOC) with a holistic view on Smart Government operations is responsible to oversee all the Smart Government operations and monitor, manage and react to information aggregated from the various sources including the NOC, SOC, CCC.
Data Lab	A Data Lab staffed with trained data scientists to operate the big data system, maximize its value and produce deductive inferences and visualize them for decision making purposes
Contact Center	A Centralized contact center for national government providing contact center operations to all constituents allowing them to l a single number, send an email to a single address, and use other singular communication channels to simply and easily contact federal government without worrying about which FGE to call, which department to contact, or the quality of the customer service they will receive.
NTSM Operations	The NTSM Operations team is responsible for operating and managing all operations of the National Trusted Service Manager.

Operations Architecture Building Blocks Definition

Operations

Logistics	Consists of all Smart Government operations related to logistics, supply chain, contracts management and vendor and alliance management	**SLA Management**	Service-Level Agreement (SLA) Management provides the methodologies, processes, and tools to manage, monitor, and maintain service quality through a service lifecycle.
		MSA Management	
		Supply Chain	Supply chain management and operations aim at managing the supply chain and procurement lifecycles for the smart government in order to leverage on economies of scale and ensure standardized and consistent delivery of services
		Alliances	Operational and strategic alliances and partnerships (e.g. Public-Private partnerships) that facilitate the development, deployment and operations of smart government services.
		Maintenance	
Infrastructure Operations	Involves the monitoring, management, control and operations of the National Network Infrastructure in the Federal Governement	**Network Operation Center (NOC)**	Network Operation Center (NOC) provides centralized monitoring, management, control, and maintenance of all FEDnet's networks to enhance availability and reliability of services.
		Security Operation Center (SOC)	Security Operation Center (SOC) provides security monitoring service that deal with event and alarm monitoring in the SIEM security console of the Dedicated SOC, analyzing the incidents and escalating to the SIRT if needed