Urban Data Management and Modeling in Korean Smart City

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URBAN DATA MANAGEMENT AND MODELING
In Korean Smart City

CONTENTS

INTRO – Urban Planning History

URBAN PLANNING PARADIGM

1960s PHYSICAL PLANNING
1970s RATIONAL PLANNING
1980s COMMUNICATIVE PLANNING
1990s NEW URBANISM
2000s UBIQUITOUS CITY PLANNING
Present SMART CITY PLANNING

INDUSTRIAL CITY

CITIES DEVELOPED ALONG WITH INDUSTRIAL GROWTH

MODERNIST CITY

• TOWER IN THE PARK
• DRAMATIC INCREASE OF URBAN POPULATION

SUSTAINABLE CITY

• SOCIALLY SUSTAINABLE:
  ‐ WALKABLE CITY
  ‐ LIVABLE NEIGHBORHOOD

• ENVIRONMENTALLY SUSTAINABLE:
  ‐ RENEWABLE ENERGY
  ‐ GREEN BUILDING

URBAN ISSUES

SMART CITY

• CITY AS A PLATFORM: INTEGRATED TOTAL SOLUTION BASED ON ICT INNOVATION AND NEW THINKING

BENEFITS OF SMART CITY
· Efficiency of Urban Management
· Improvement in Quality of Life

TRANSFORMATION OF CITY

SINCE THE INDUSTRIAL REVOLUTION, CITIES GROWN BIGGER, FASTER, AND MORE DIVERSE

URBAN PLANNING PARADIGM HAS BEEN SHIFTED ACCORDING TO SOCIETAL CHANGE

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INTRO – Smart City Platform
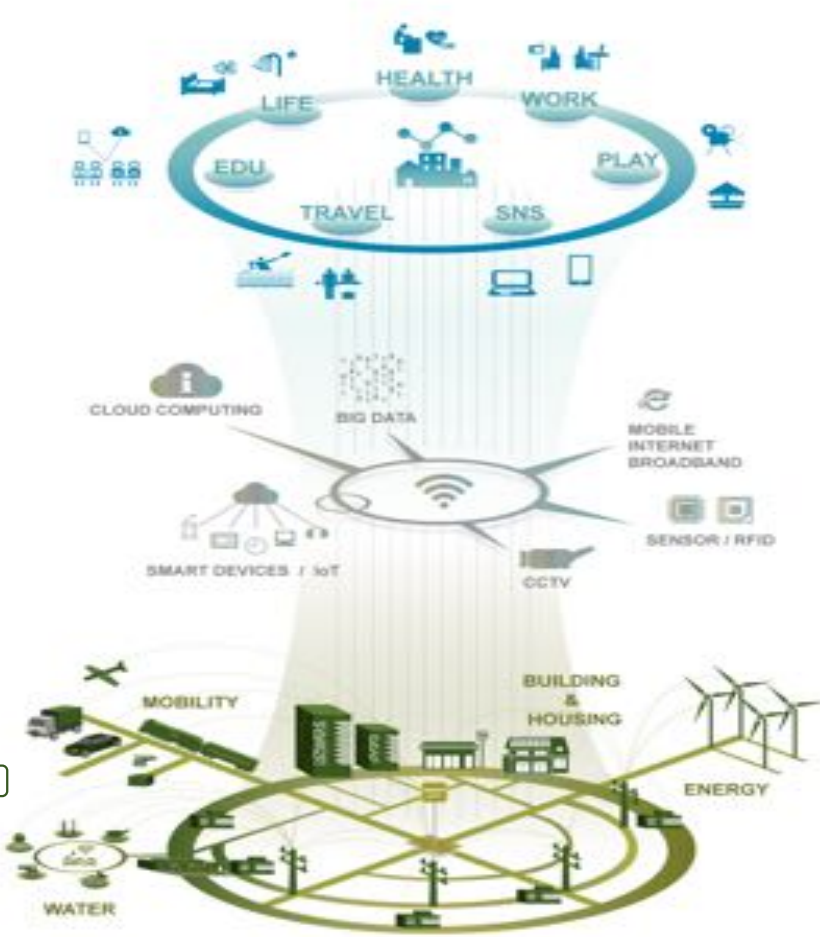
CITY MANAGEMENT & SERVICE

- Services
- Facilities
- Utilities

SMART CITY PLATFORM

- Data
- Devices
- Networks
- Service plan

PHYSICAL INFRASTRUCTURE

- Civil / Infra
- +
- Spatial Analysis
- +
- Land

INTEGRATION

· Vertical integration from sensors to real-time analysis
· Horizontal integration of isolated systems

INTEROPERATABILITY

· Ability of a system to use and share information or functionality, of another system by adhering to common standards
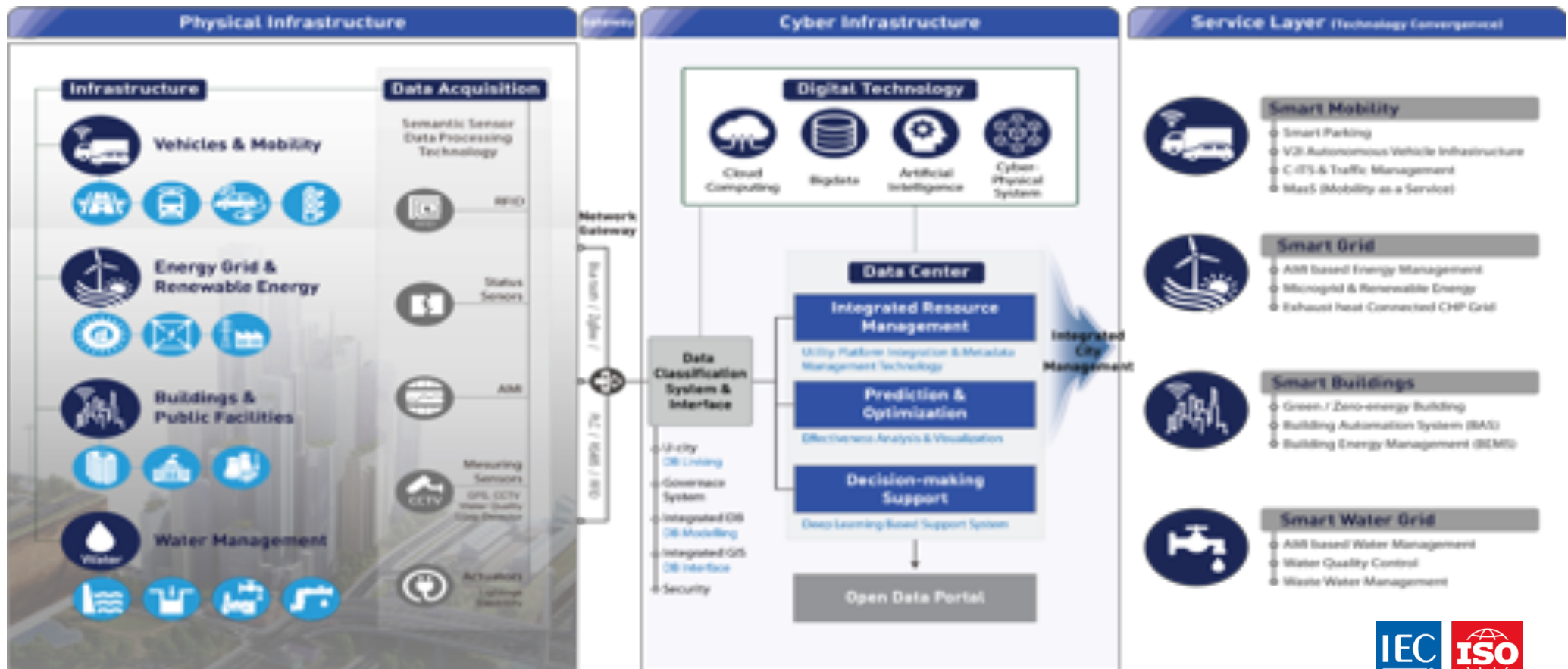
SUCCESSFUL DEVELOPMENT OF SMART CITY

· Combination of bottom-up approach with top-down approach

INTRO – Smart City Infrastructure & Service Layer

- For the integration, each system should be integrated vertically

KOREAN SMART CITY ACTIVITIES – Urban Development History

1960s-1970s

SEEKING

- 5 YEAR ECONOMIC DEVELOPMENT PLAN

FAST RECOVERY FROM KOREAN WAR

1980s

INITIALIZING

- EXPANSION OF SEOUL
- RAPID DEVELOPMENT OF INDUSTRIAL CITIES

1990s

STABILIZING

- METROPOLITAN NEW TOWN CONSTRUCTIONS

* ONLY 5 YEARS TO COMPLETE BUNDANG NEW TOWN, FROM PLANNING TO CONSTRUCTION

2000s

MATURING

- URBAN REGENERATIONS:
  - CONTESTED SITES
  - DECLINING URBAN CENTERS
  - INDUSTRIAL HERITAGE
- COMMUNITY PLANNING
- SUSTAINABLE / SMART CITY

STAGES OF CITY DEVELOPMENT IN KOREA

CITY DEVELOPMENT IN KOREA PASSES INTO THE MATURITY STAGE

KOREA HAS ACCUMULATED KNOWLEDGE ABOUT SOLUTIONS TO RELEVANT URBAN ISSUES FOR BOTH MATURED CITIES &NEW CITIES

U-City (Ubiquitous)

U-eco City (Ubiquitous+Ecological)

K-Smart City

- A city where ubiquitous services are provided through city infrastructure using ubiquitous city technologies

- A city that promises to provide an environment-friendly urban milieu with advanced ubiquitous infrastructures and services for residents and visitors

- A customized city based on the convergence of ICT (Information and Communication Technology) with city development & management

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KOREAN SMART CITY ACTIVITIES - Projects

- There have been more than 70 projects in Korea driven by several government ministries. However, the horizontal Integration has not been completed yet
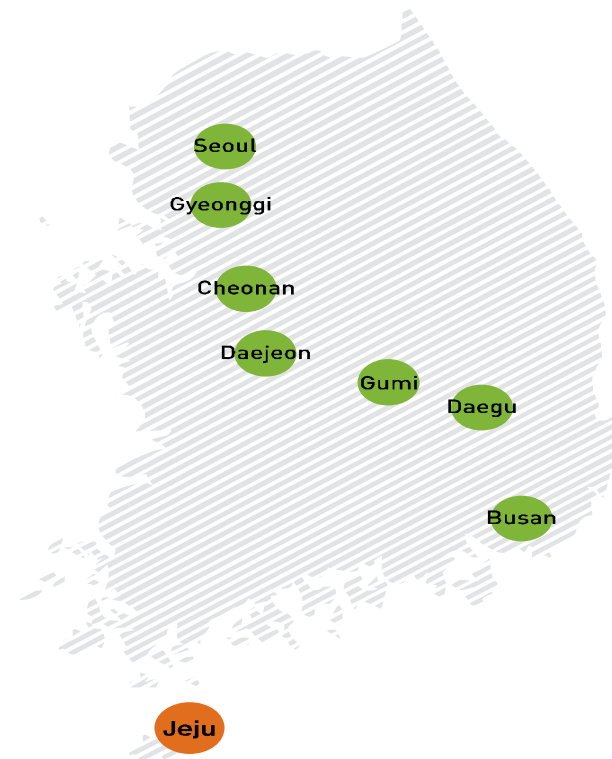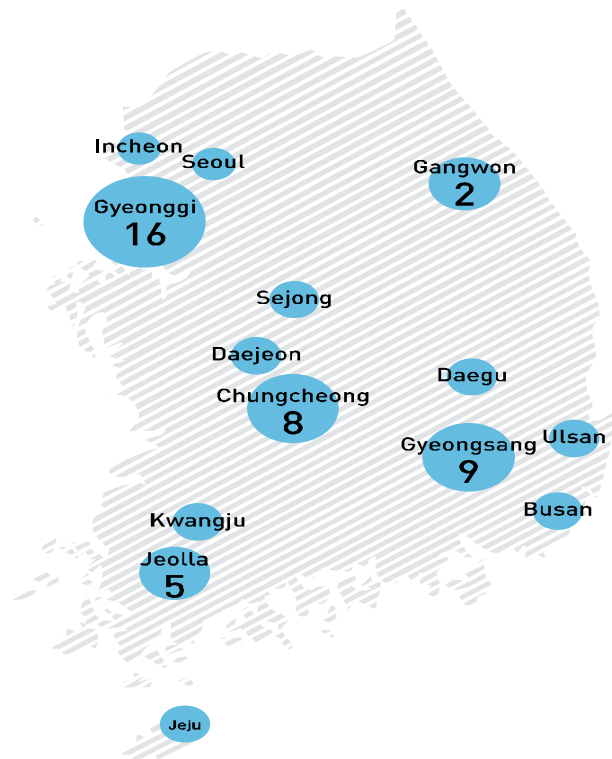
MOLIT U-City Projects   **IoT Platform Testbed**   **Smart Grid Testbed**

Incheon
Seoul
Gangwon
2
Gyeonggi
16
Sejong
Daejeon
Daegu
Chungcheong
8
Gyeongsang
9
Ulsan
Busan
Kwangju
Jeolla
5
Jeju

Seoul
Gyeonggi
Cheonan
Daejeon
Gumi
Daegu
Busan
Jeju

KOREAN SMART CITY ACTIVITIES - Projects

Seoul

- IT Super Highway
- Public Wi-Fi
- Citizen Suggestion System
- Smart Complaint Report
- Bukchon IoT Project
- e-Government (WeGo)
- Transport Operation
- Information Service (TOPIS)
- Bus Operating System
- Participative Community Mapping
- M-Voting (Smartphone App)

Busan

- Traffic Congestion Analysis Service
- Smart Traffic Signal Service
- Smart Parking Service
- Security Map Service
- Smart Missing Child Prevention
- Maritime Safety
- Smart Big Board Emergency
- Management
- Smart Crosswalk Service
- Air Pollution Prediction Service
- Social Disaster Management

Dongtan

- CCTV Surveillance
- License Plate Recognition
- Illegal Parking Crackdown
- Real-time Traffic Signal Control
- Bus Information
- Traffic Information
- Smart Parking
- Media Board, U-Placard Portal
- Water Leakage Monitoring
- Environmental Pollution Monitoring

Songdo

- Smart Traffic
- Smart Facility
- Advertising Signage
- Convergence Services
- Smart Disaster Prevention
- Smart Crime Prevention
- Public-Private Profit Model Plan

▪ **IFEZ introduces a public and private-combined service model that enables the data sharing based on a cloud system**

Public Service (IFEZ)   **Private Service(Biz)**

Smart Mobility	Smart Surveillance		Smart Home	Smart MICE
Smart Infrastructure	Smart Safe		Smart Education	Smart Building
Smart Environment	Smart Info.		Smart Healthcare	Smart Parking

Efficiency + Safety + Livability   Quality of Life

Cloud-based Framework for e-Gov and Total Solution

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Overview

Vision	To realise a data-based sustainable smart city and improve citizen's quality of life
Goal	To resolve city problems such as traffic congestion, energy consumption and safety issues, and to revitalize the urban economy with innovative solutions
Budget & Period	Budget: US$115.9 million Period : 2018 ~ 2022 (5 yrs)
Leading Ministries	Ministry of Land, infrastructure and Transport & Ministry of Science and ICT

Program Structure

Project 1 — Smart City Model & Development of Generic Technology (Coordinating Project)

- To develop key common technologies for smart city data hub, efficient management system for trial projects and relevant collaboration system and establish guidelines for data governance

Project 2 — City-specific Trials for Service Advancement (Civic City)

- Apply problem-solving approaches through developing services/technologies for smart cities and having them validated with a basic infrastructure where there is the need to address the citizens' problems

Project 3 — Living Lab. Field Trials for Technical Innovation and Business Creation (Inno City)

- Apply sustainable growth approaches with designing a smart city model that involves local communities to support sustainable growth of urban economy and revitalizing industries through the application of digital technologies to the cities in need.

IEC ISO
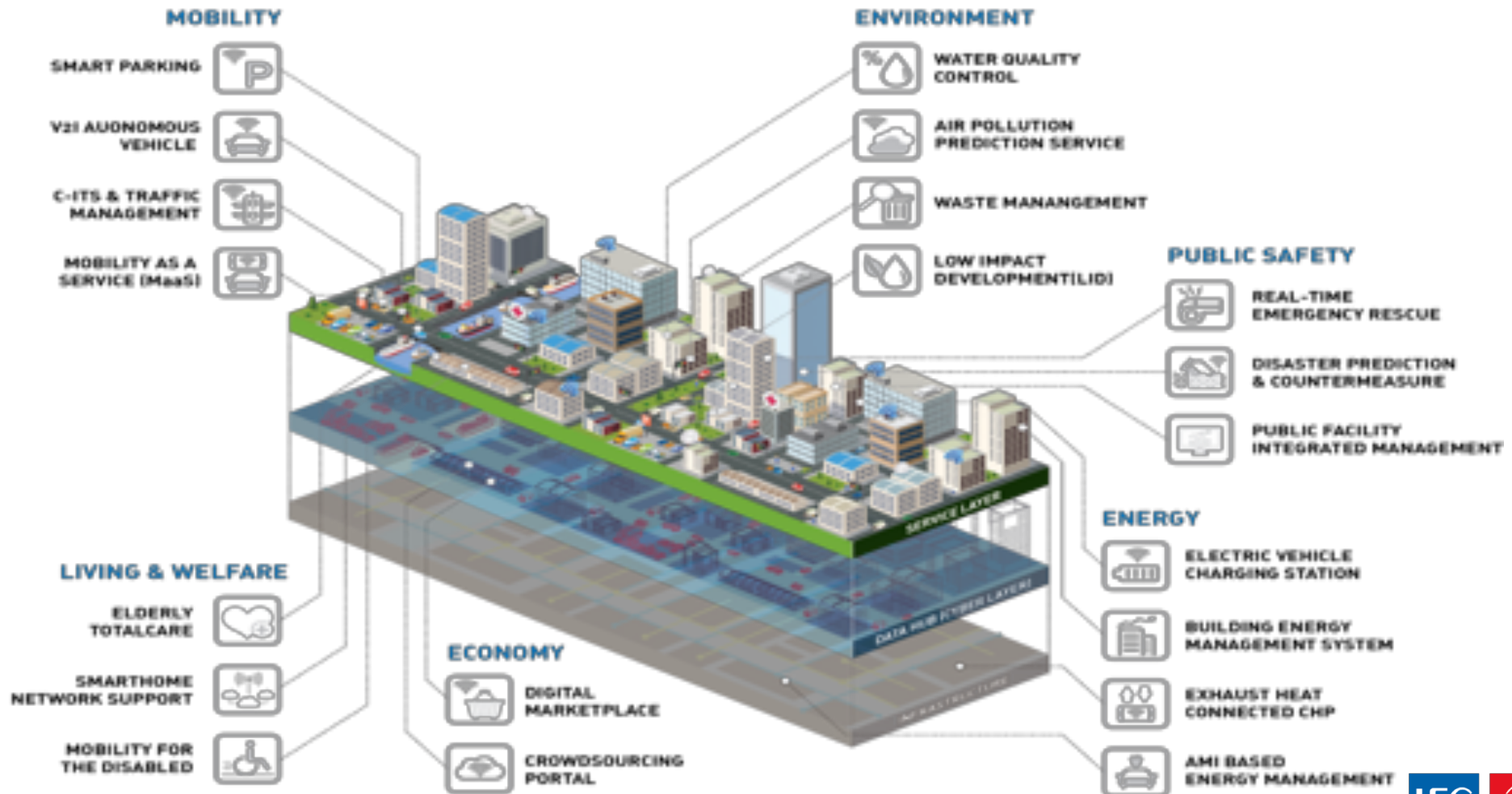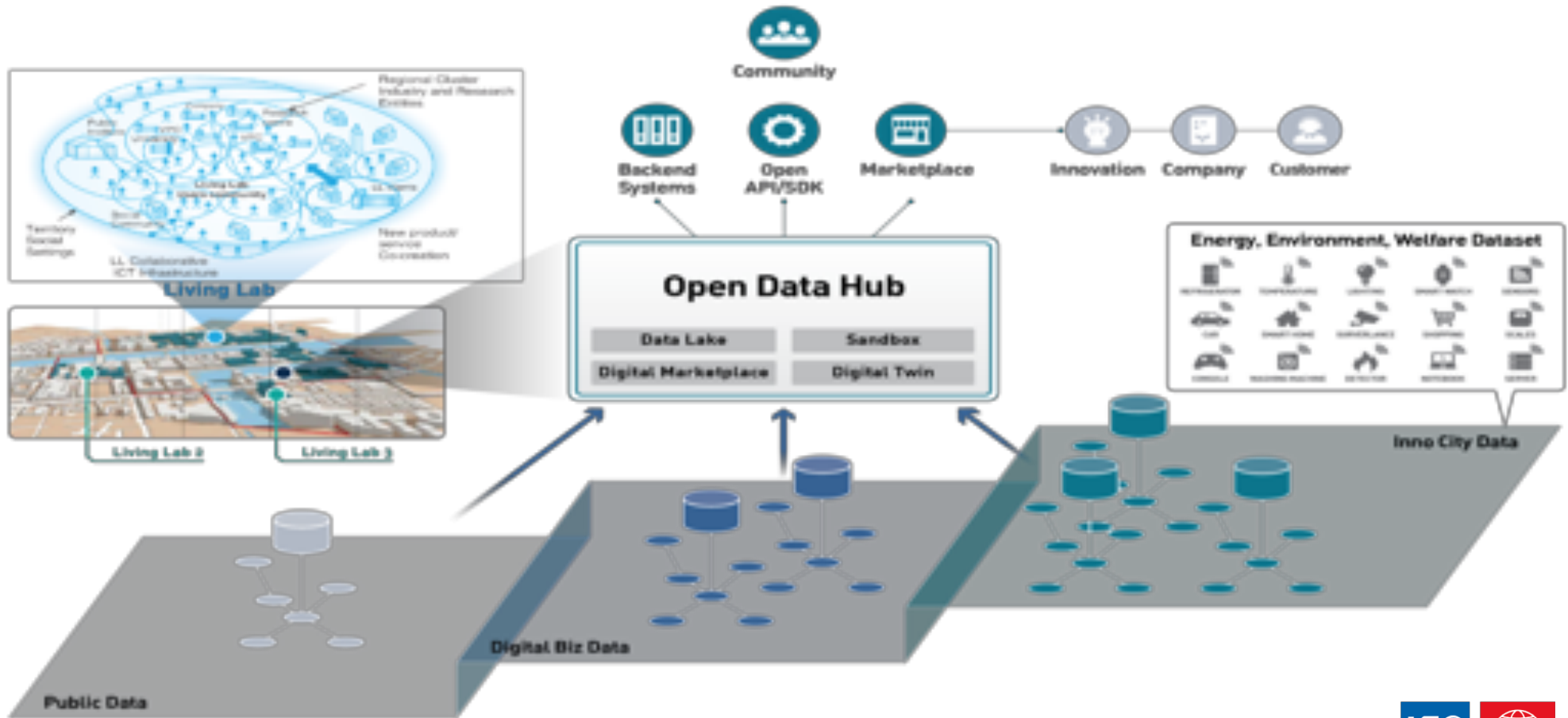
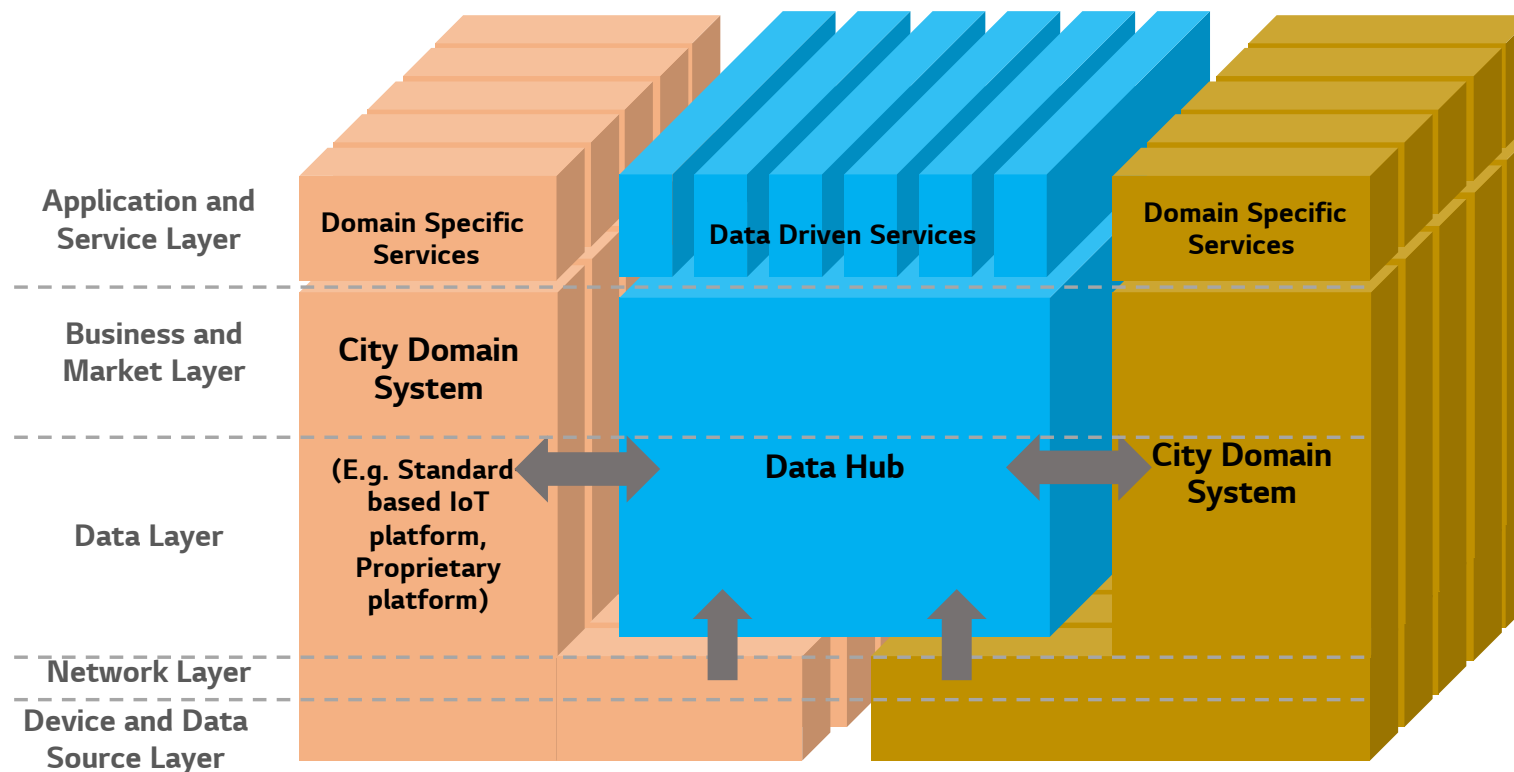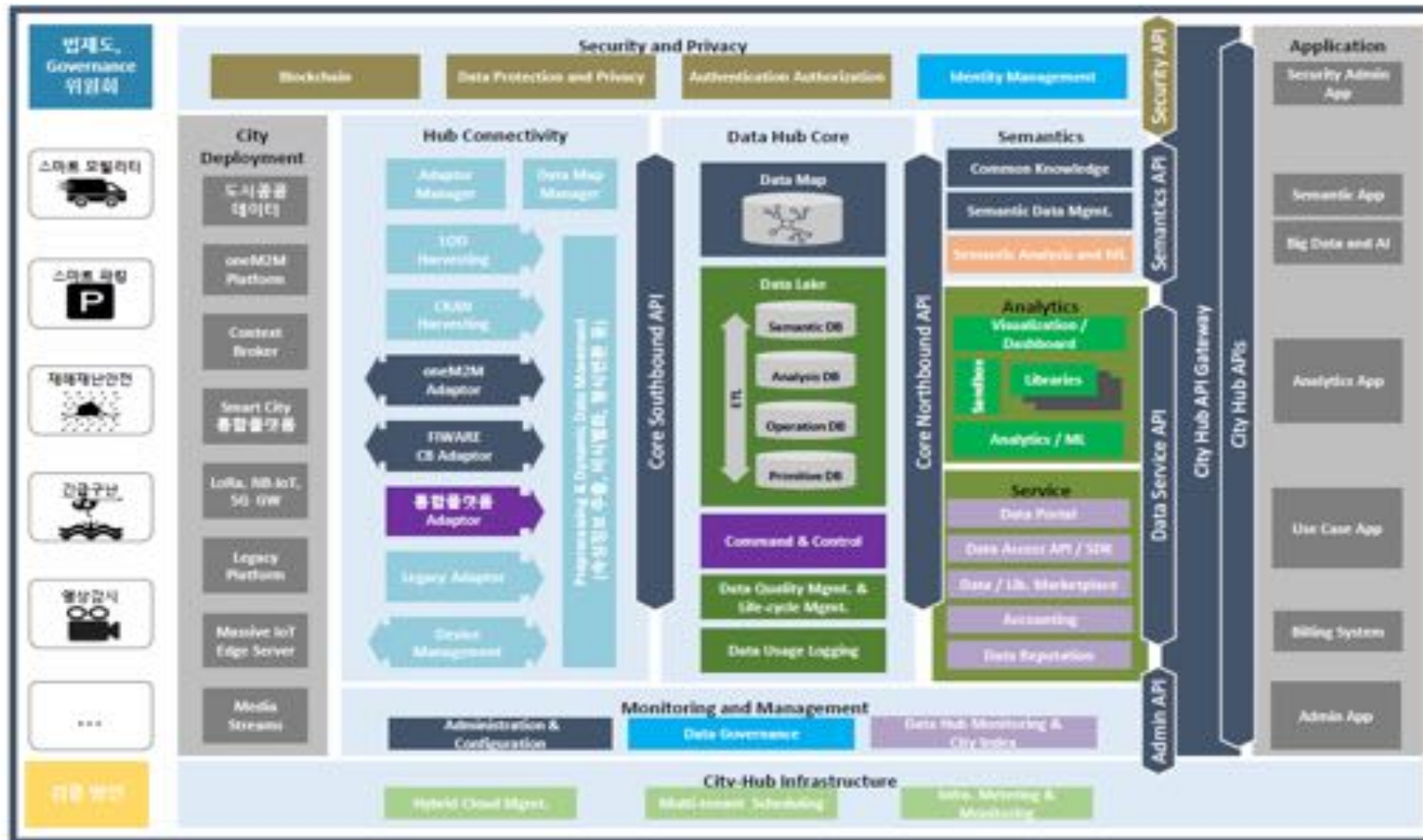- Data-centric Smart City Model is necessary to resolve urban problems, ensure sustainable growth and accomplish a robust digital economy
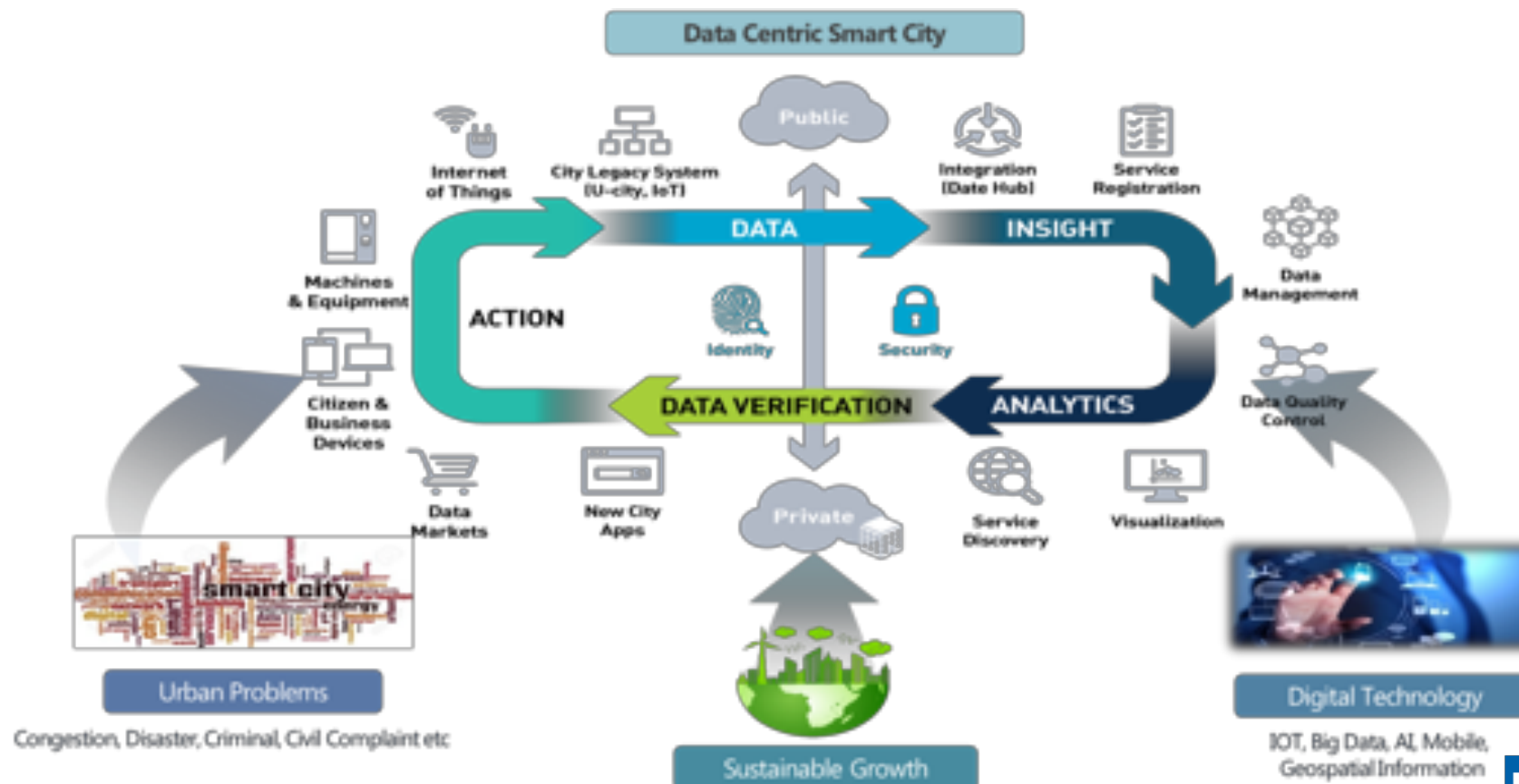
DATA USE AND MANAGEMENT – Smart City Data Hub

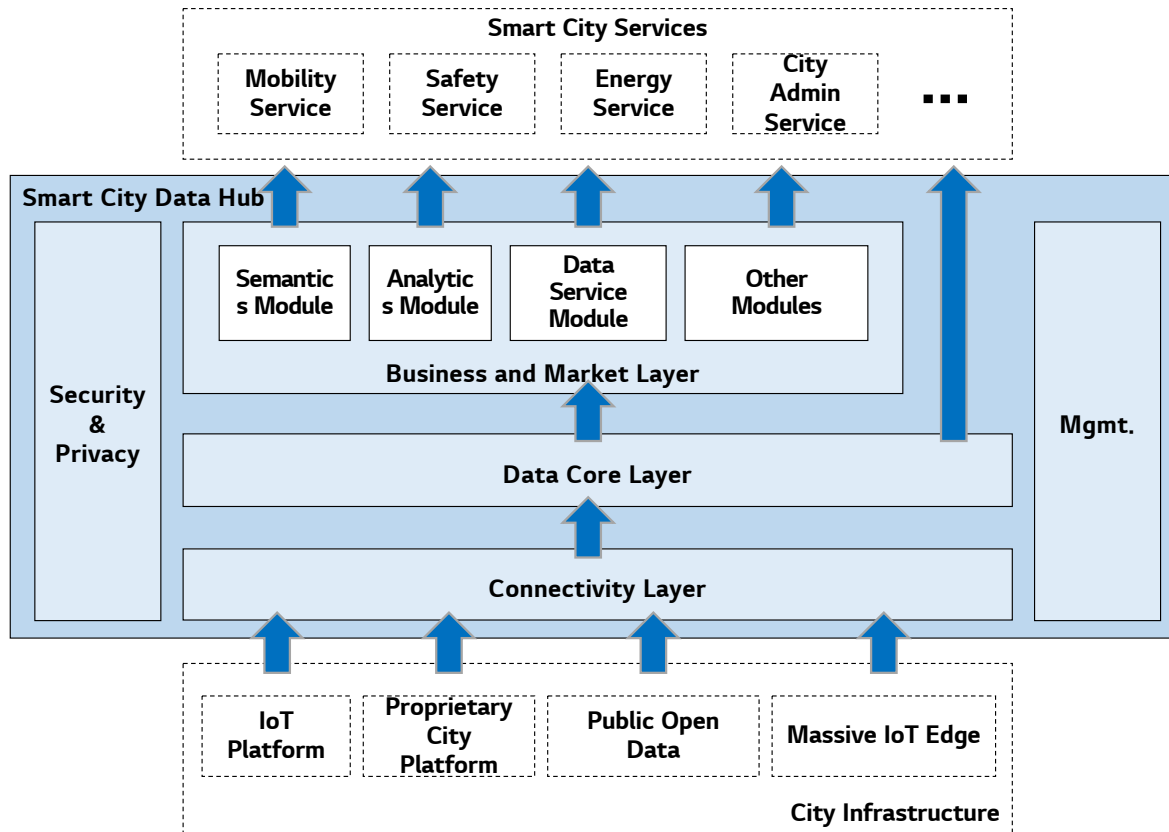- **Smart City Data Hub –an Integrative Model connected to legacy systems**

▪ **Access to city data via one hub with using data centric functions**

- **Data-driven interworking**
- **Data integration**
- **Data sharing and trading (marketplace)**
- **Data analysis and visualization**

... Enabling cross-domain smart city services

DATA USE AND MANAGEMENT – Data Catalogue

▪ **Data Catalogue for City Stakeholders, Data Marketplace, etc.**

• **Project 2 (Civic City)**	**Mobility**	**Disaster / Security**	**Municipal Administration**	*New Service Model (TBD)*
	• Parking Availability • Traffic Congestion	• Flood • Collapse • Incident / Crime	• *(TBD)*	• *(TBD)*
• **Project 3 (Inno. City)**	**Environment**	**Energy**	**Welfare**	*New Service Model (TBD)*
	• Weather Report/Forecast • Fine Dust Report/Forecast	• House • Building • Factory • Public Infrastructure	• Senior Citizens • Disabled People	• *(TBD)*

* on-going draft

DATA USE AND MANAGEMENT - Scenario

- **Things and cities will be connected with each other – Hyper-connected Society (energy metering, air quality, inclusive social care, digital marketplace, etc.)**
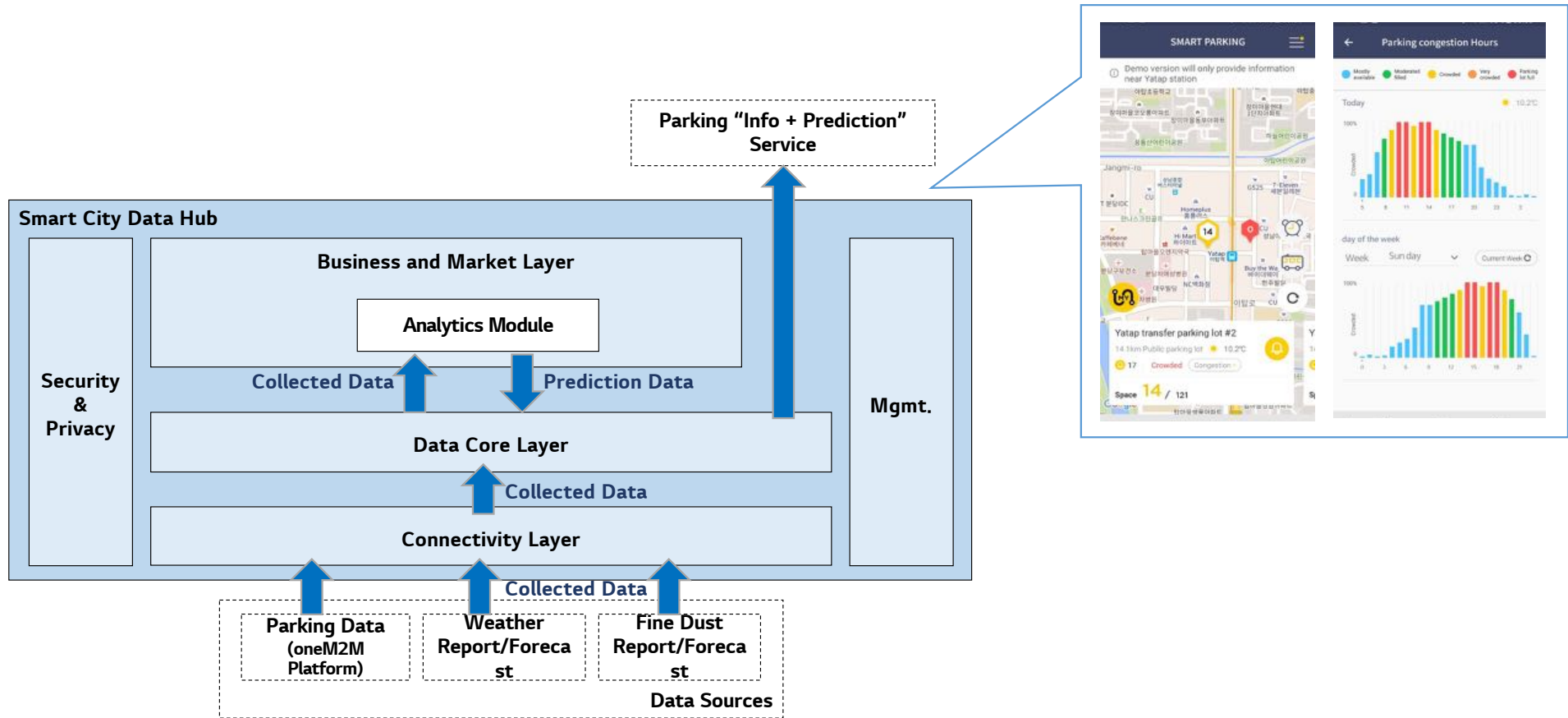
- **City Mobility Scenario Example**

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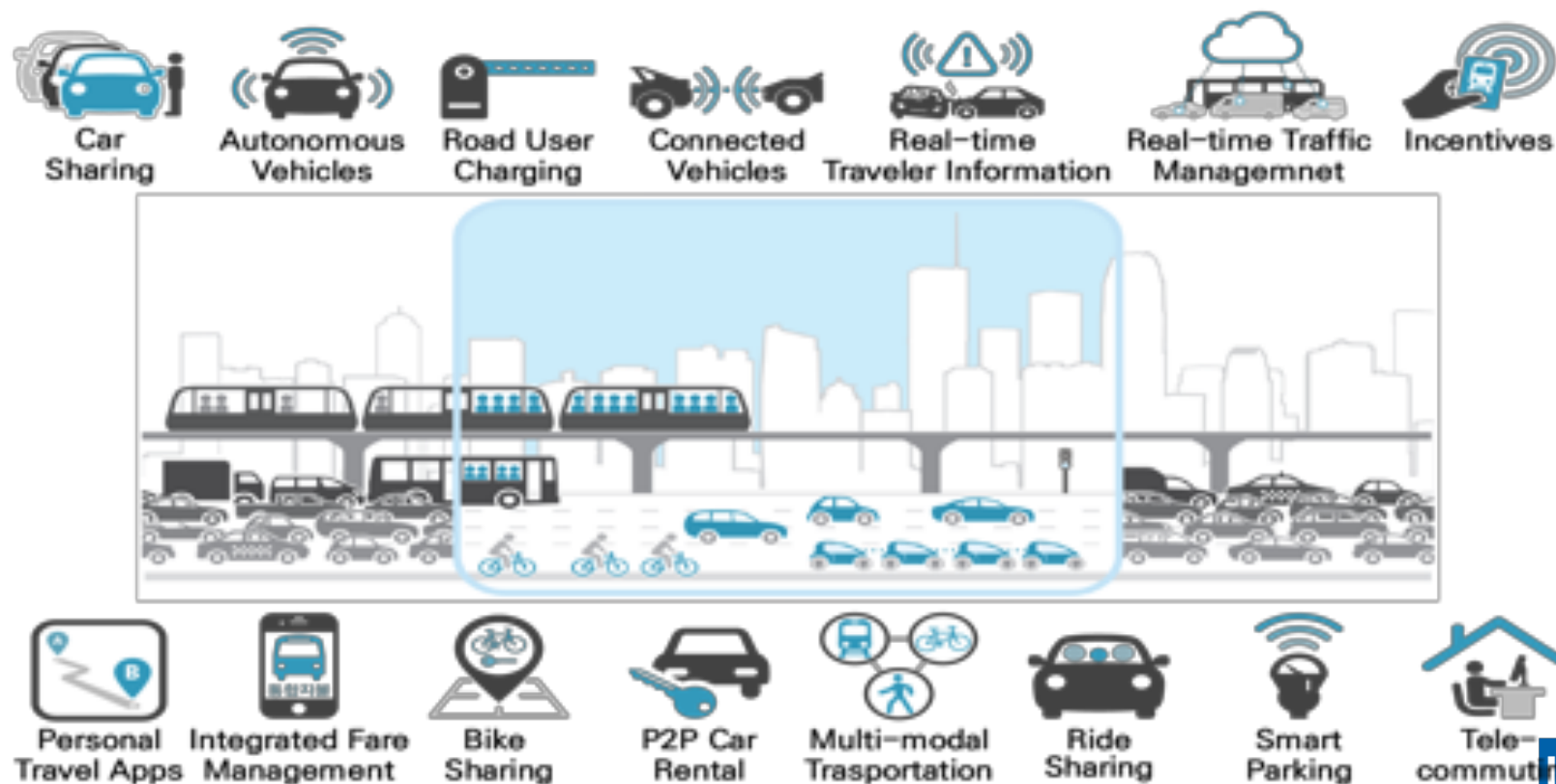
DATA USE AND MANAGEMENT – Data Flow of PoC (2018)

- **Parking availability can be predicted through the analysis of contextual data**

Parking "Info + Prediction" Service

Smart City Data Hub

Business and Market Layer

Analytics Module

Collected Data → **Prediction Data**

Security & Privacy

Mgmt.

Data Core Layer

Collected Data

Connectivity Layer

Collected Data

Parking Data (oneM2M Platform) | **Weather Report/Forecast** | **Fine Dust Report/Forecast**

Data Sources

< Entity Relationships >

Parking Spot

refParkingLot

refParkingSpot

Parking Lot

AirQuality Observ.

AirQuality Forecast

Weather Observ.

Weather Forecast

Inputs to Congestion Level
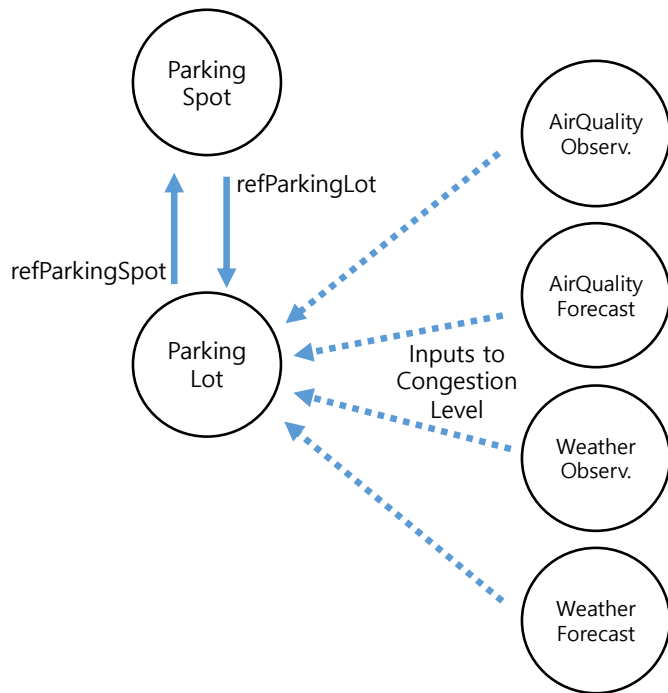
< off street parking >

Property	Expected Type	Optionality
id	**string**	**mandatory**
type	string	mandatory
location	geo:json	mandatory
address	PostalAddress	optional
name	string	mandatory
category	List of string	mandatory
paymentType	List of string	mandatory
Price Rate	Price Rate Type	optional
priceCurrency	string	optional
image	string	optional
Total Spot Number	positive integer	optional
Available Spot Number	integer	optional
Opening Hours	List of Opening Hours	optional
contactPoint	Contact Point Type	optional
locationTag	List of string	optional
dateCreated	Date Time	mandatory
dateModified	Date Time	optional
parkingLotURI	string	mandatory
Congestion Prediction	List of Forecast Type	optional

< air quality observation >

Property	Expected Type	Optionality
id	string	mandatory
type	string	mandatory
location	geo:json	mandatory
address	PostalAddress	optional
so2	integer	mandatory
co	integer	mandatory
o3	integer	mandatory
no2	integer	mandatory
pm10	float	mandatory
pm25	float	mandatory
airQualityLevel	integer	mandatory
airQualityIndexRef	string	optional
dataObserved	Data Time	mandatory
locationTag	List of string	optional
dateCreated	DateTime	mandatory
dateModified	Date Time	optional

▪ **Application of Standards for City Data Hub**

Thank you!