Hãy nói theo cách của bạn

ICT ARCHITECTURES FOR SMART CITIES

SESSION 2:

BUILDING SMART CITIES SUSTAINABLY IN THE FOURTH INDUSTRIAL REVOLUTION CONTEXT

Le Quoc Huu
Chief ICT Architect for Smart City
Viettel Group

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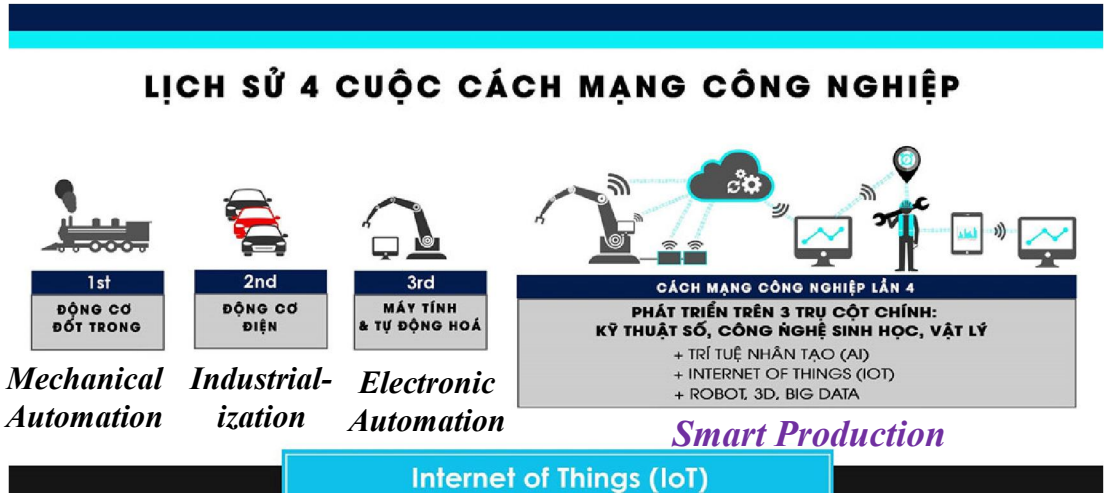
1. Smart Cities & the 4th Industrial Revolution

The 4th Industrial Revolution is a **Digital Technologies Revolution** for **Smart Production** basing on outstanding achievements of **Digital Technologies** ("**Technologies 4.0**") in **IT** (*AI, IoT, Big Data..*), **Biotechnology, Physics** (*Robot, 3D printing, self driving cars, Nano Technology*).



The 4th Industrial Revolution started from "**Industry 4.0**" with **Smart Factory** basing on high integration of **CPS** (*Cyber-Physical Systems*), which can autonomously perform data acquisition, data analysis, data exchange via IoT network and support decision making from the cyber system to control the physical system.

Smart Cities & the 4th Industrial Revolution

- The 4th Industrial Revolution is happening not only in industrial manufacturing but also includes big total changes in both economic and socio-cultural areas. It is happening in all socio- economic areas and has great socio- economic and environmental impacts at all levels.
- **The Industry 4.0** has been spread out to **Smart City**, which includes all urban socio-economic activities. "**Technologies 4.0**" are important drivers to make Smart Cities to be an inevitable trend in the 4th Industrial Revolution, in the mean time Industry 4.0 can be seen as a part (a domain) of Smart city.

3 core Digital Technologies in "Industry 4.0": **(Industrial) IoT, Big Data & AI**.

2. Smart Sustainable City Definition

There are many smart city definitions. **Viettel follows ITU's Guidelines for Smart sustainable cities:**

"*A smart sustainable city is an **innovative city** that **uses information & communication technologies (ICTs)** and other means **to improve quality of life, efficiency of urban operation and services & competitiveness**, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental, as well as cultural aspects*".

- This definition is the outcome basing on the analytics of **116** different smart city definitions which area available up to 2014. This is the only international definition of smart city and is widely accepted by 193 country members of ITU.

***Smart sustainable cities**: an analysis of **definitions** (ITU-T TR SSC Def)*

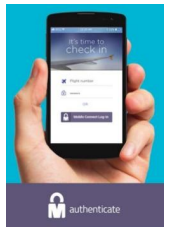
Technologies used for Smart City

All the Smart Technologies 4.0 are used for Smart City:

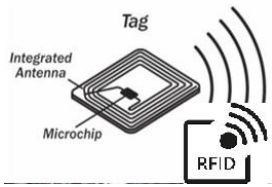
GIS, 3D Maps

PKI, *Mobile CA*

Mobile Technologies: ***4G, 4.5G, 5G*** *Networks*



Digital ID, Mobile Connect Mobile ID



RFID

IoT, Mobile IoT

Big Data

NFC

NFC FORUM

AR (*Augmented Reality*)

VR (*Virtual Reality*)

Block Chain

AI (*Artificial Intelligence*)

Smart sustainable cities Core pillars (Dimensions)

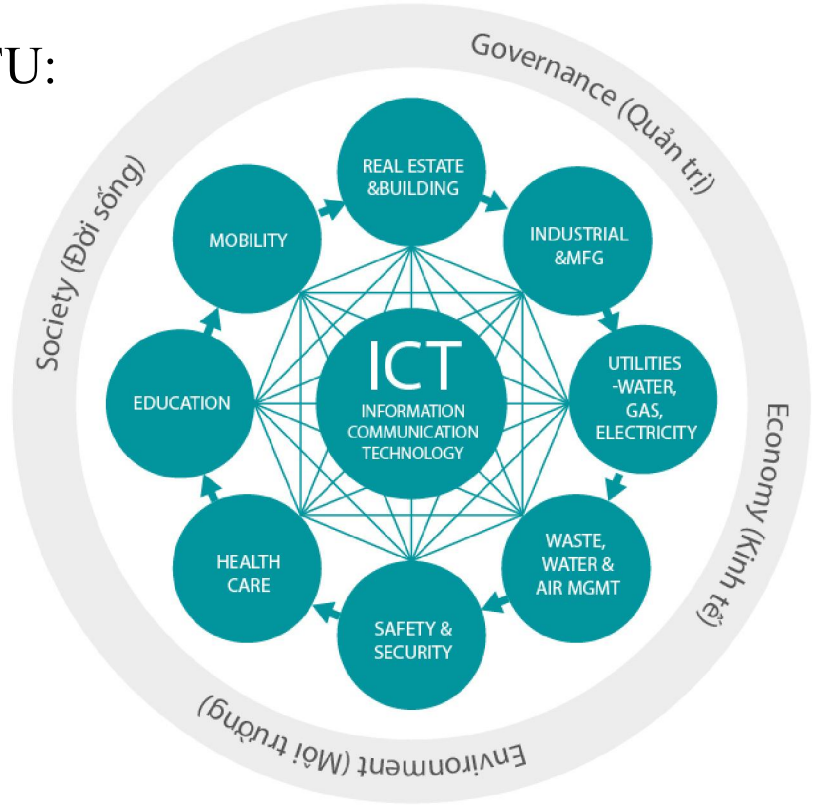
4 Core pillars of Smart sustainable cities by ITU:

1. **Governance**
2. **Economy**
3. **Environment**
4. **Society/Living**

2 new added pillars:

5. **People**
6. **Mobility**

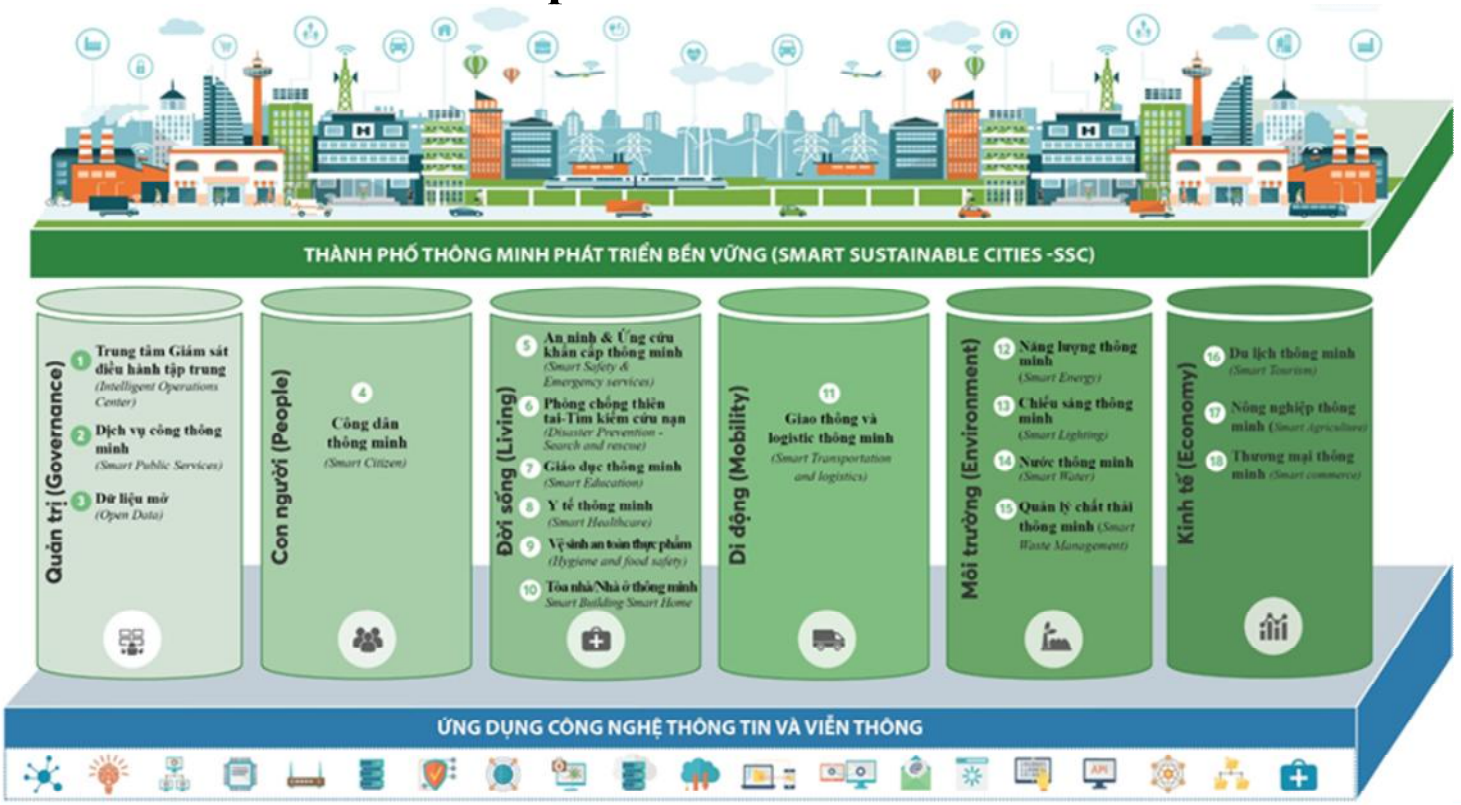
All the 6 pillars are based on an **ICT core**.



3. Viettel's Model for Smart Sustainable City ICT Architecture

A model of **18 smart domains** in the **6 pillars**:

- *Depending on the real needs & investment capability, each province/city will choose their smart domains to be implemented in certain period in their Smart city General ICT Architecture.*



Smart domains of Smart Sustainable City

No	Pillar	Domains
1	*Governance*	1. **Intelligent Operations Center**
		2. **Smart Public Services** **) Smart Urban Planning may be added*
		3. **Open Data**
2	*People*	4. **Smart Citizen**
3	*Living*	5. **Smart Safety & Emergency services**
		6. **Smart Disaster Prevention-Search & Rescue**

Smart domains of Smart Sustainable City (2)

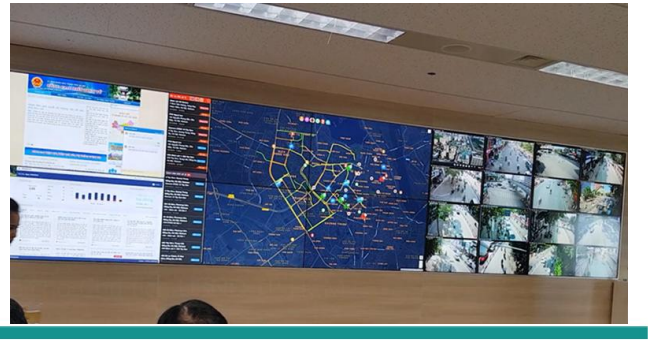
No	Pillar	Domain
3	*Living*	7. **Smart Education**
		8. **Smart Healthcare**
		9. **Smart Hygiene & Food Safety**
		10. **Smart Building/Smart Home**
4	*Mobility*	11. **Smart Transport & Logistics**
5	*Environment*	12. **Smart Energy**
		13. **Smart Lighting**
		14. **Smart Water**
		15. **Smart Waste Management**
6	*Economy*	16. **Smart Tourism**
		17. **Smart Agriculture**
		18. **Smart Commerce**

✍ ***Smart Industry*** *(Smart Factory) may be added*

The Role of Intelligent Operation Center

- **To integrate all domains,** city systems. IOC has following functional centers:
  1. **Traffic Monitoring & control**.
  2. **Public Safety Monitoring**.
  3. **Emergencies Services Dispatch**.
  4. **Disaster Prevention-Search & Rescue Center.**
  5. **Public Services Monitoring: Administrative public services, Public business services** (Education, Healthcare, Environment, …)**, Public interest service** (Mass Transit, Electricity, Water supply, Urban lighting…).
  6. **Cyber Security & Information Safety Monitoring**.
  7. **Press & media information Management**.
  8. **Call Center to support Public services. Reception the citizens reflects & opinions.**
  9. **Data Analytics**.

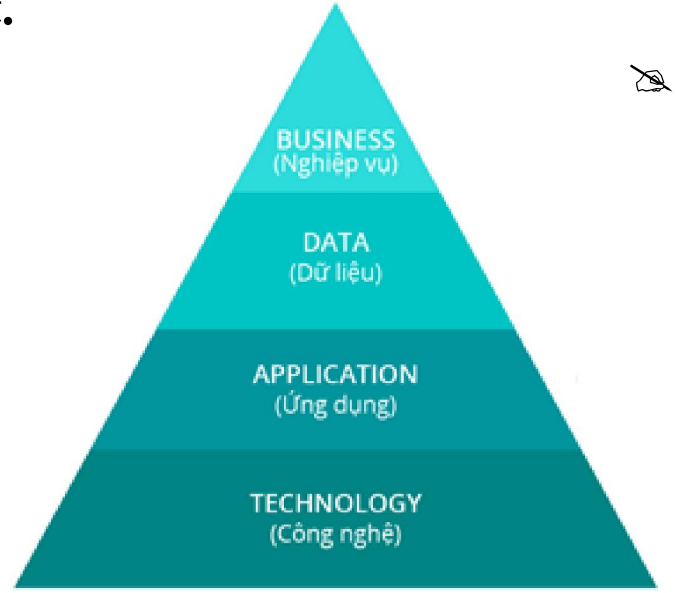
- **Platform – Technical Infrastructure**:
  - **IOC Platform***:* is a core of the *Smart City Platform*.
  - **Technical Infrastructure: Data Center - Video Wall, ...**
  - **Communication Networks: Fiber optic network**.



4. ICT Architectures for Smart City

In order to build the Smart Cities:

- **First of all, a General ICT Architecture for Smart Sustainable City should be built.**
- **After that, step by step the ICT Architectures for smart domains in priority should be built.**



- All the ICT Architectures for Smart Sustainable City should be built following **Enterprise Architecture**, which includes:
  - **Business** Architecture.
  - **Data** Architecture.
  - **Application** Architecture.
  - **Technology** Architecture.

Why need to build ICT Architectures for Smart City?

❑ Smart City:

- Is a **System of systems**, which interact each with other: ITS, Smart Healthcare system…
- It takes **long time to build from 10-15 year** -> Should have a reasonable & feasible **Implementation Roadmap**.

➡ **A General ICT Architecture for Smart Sustainable City should be built in order:**

- To help the City Authority to have an **overview about the system architecture**, to ensure **system integration capability and synchronized operations** of subsystems, architectural layers.
- To define **Master Implementation Plan** and to build implementation projects.

✎ ***System architecture*** *is a* ***conceptual model*** *that* ***defines the structure, behavior****, and more* ***views of a system****.*

✎ ***1:10:100 Rule****: An error in* ***System Architecture*** *(high level design) will cost* ***10 times more*** *during* ***System Design & Development*** *and* ***100 times more*** *during* ***Implementation!.***

8 Architectural Rules for Smart Sustainable City

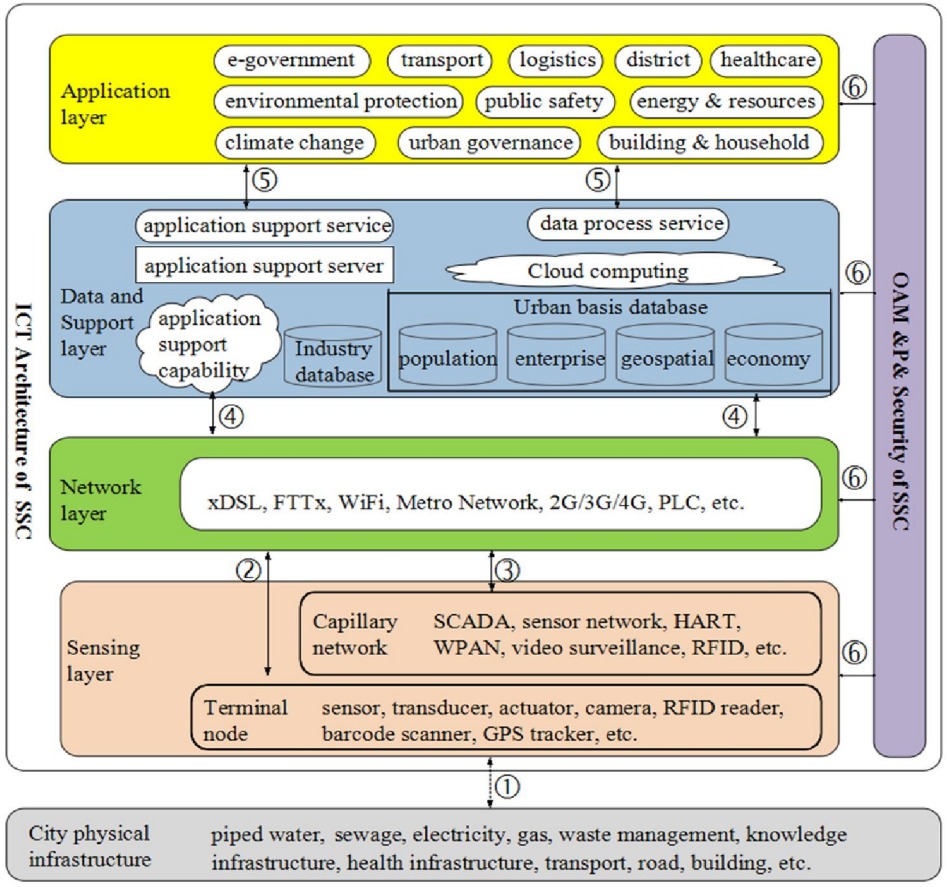
1. **Layered structure.**
2. **Interoperability.**
3. **Scalability.**
4. **Flexibility.**
5. **Fault tolerant.**
6. **Availability, manageability & resilience.**
7. **Standards-based.**
8. **Technology and/or vendor independence.**

5. Architectural Views of Smart Sustainable City

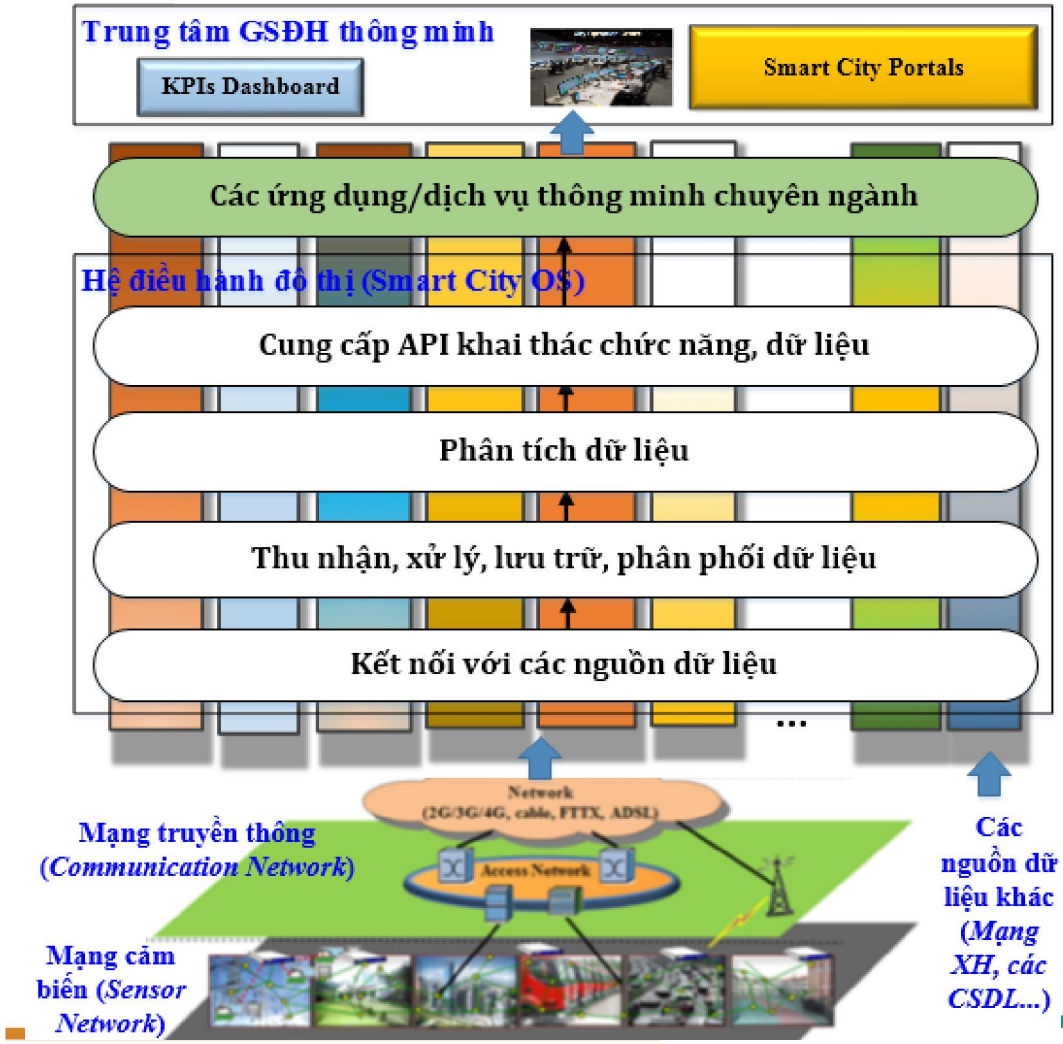
Architectural view is a description of requirements related to an aspect:

- The **Functional view.**
- The **Implementation view.**
- The **Management view.**
- The **Security view.**
- The **Data Management view.**
- The **User view.**
- The **Physical view.**
- The **Computing view.**
- The **Communications view.**
- The **Business Process Domain View.**
- The **Software Engineering View.**

The Communications View



- **Sensors Layer**:
  - *End devices: Sensors, actuators, cameras, RFID/NFC readers, QR Code Scanner…*
  - *Pillar Network*: SCADA, WPAN (*Wireless Personal Area Network*).
- **Networks**:
  - ADSL/Fiber optic network.
  - WiFi, LAN, Metro, WAN networks.
  - Mobile networks 2G/3G/4G, LPWA…
  - PLC (*Power-line communication*).



The Business Process Architecture

General Business Process Architecture of Smart Sustainable City

- *Business Architectures of specific domains are describes in domain-specific ICT Architectures.*

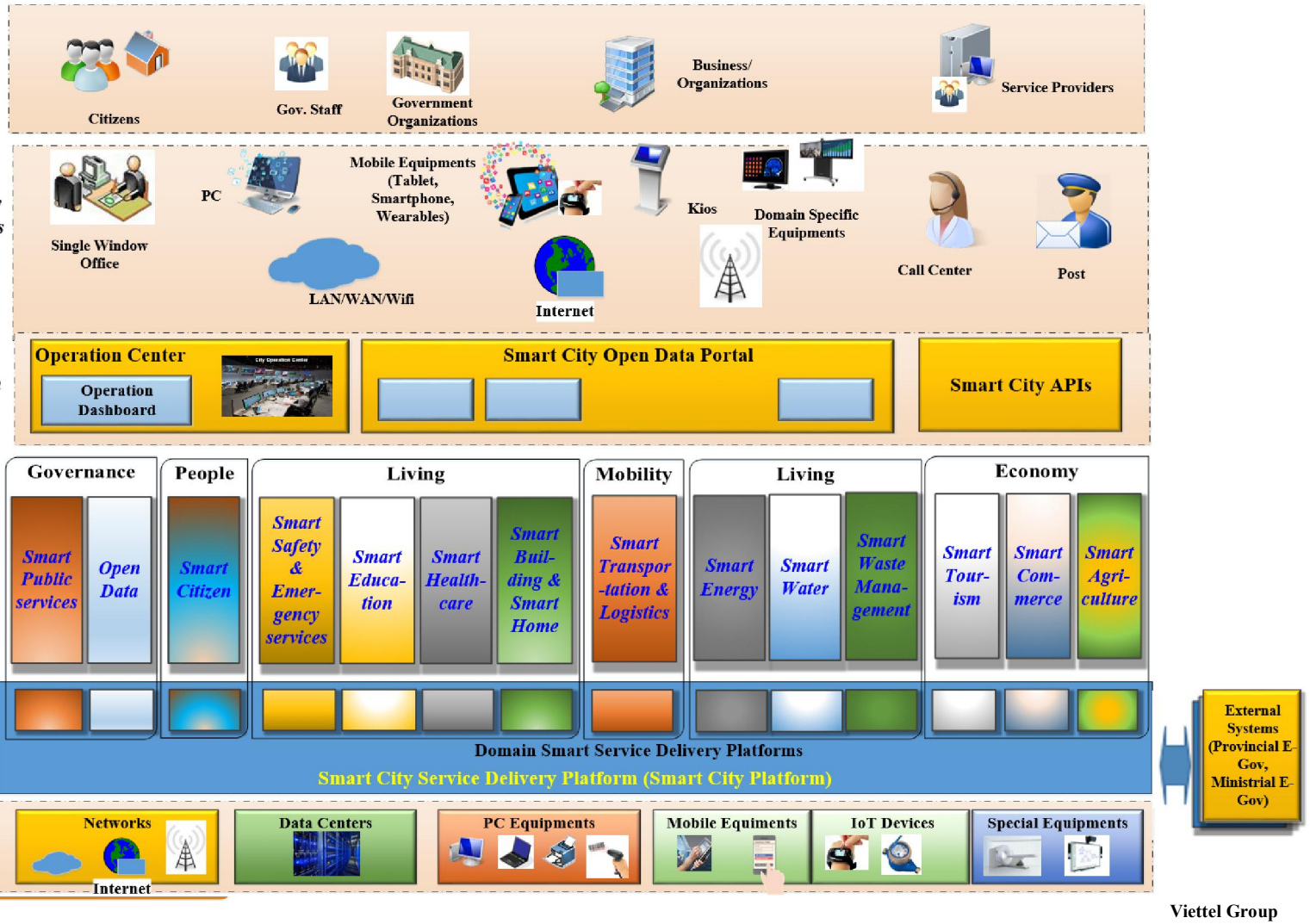
The Software Engineering View

A layered Architecture which includes 6 layers:

1. **Users Layer;**
2. **Delivery Channels;**
3. **Presentation Layer;**
4. **Application Layer;**
5. **Integration Layer;**
6. **Infrastructure Layer.**

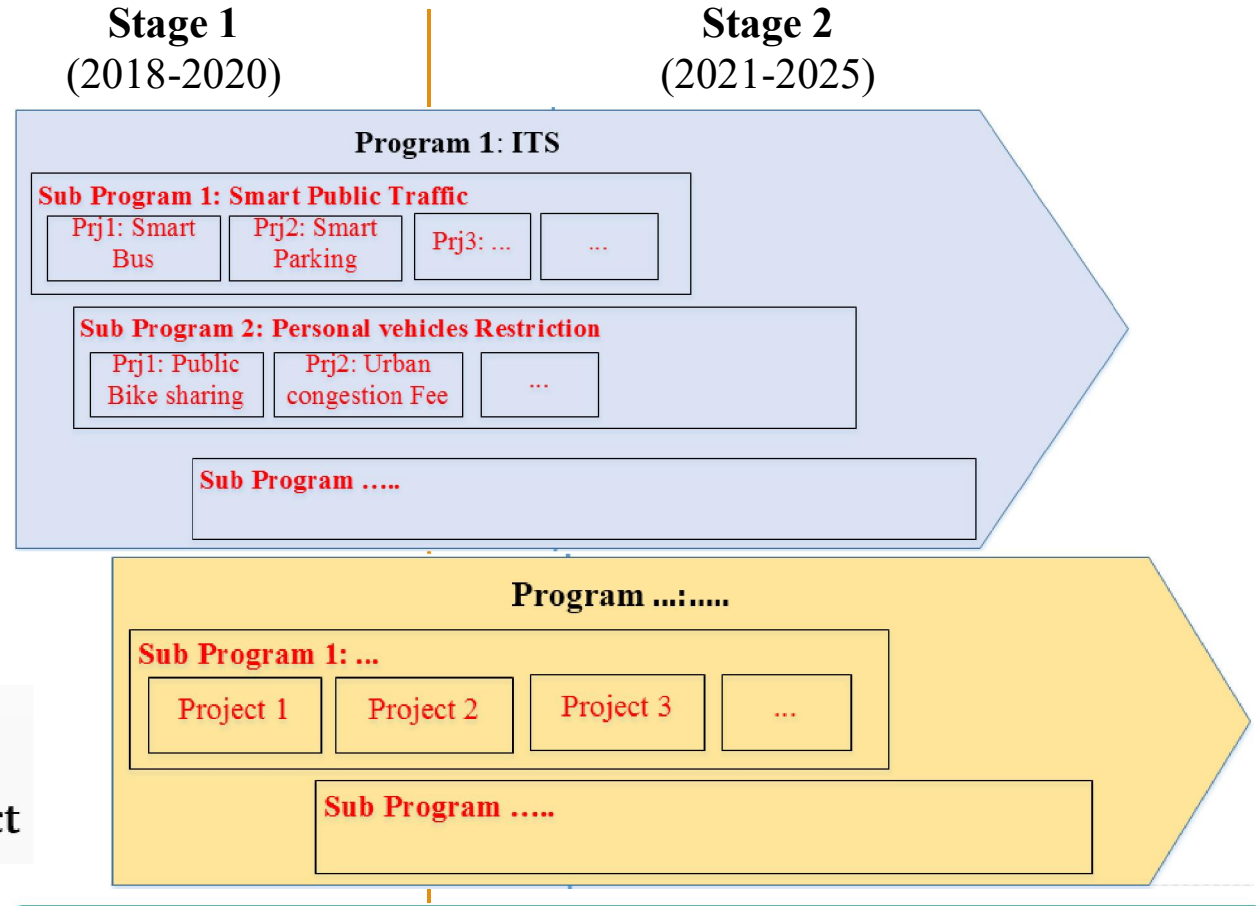
The General ICT Architecture for Smart Sustainable City will have a general description for each layer.

The Software Engineering View



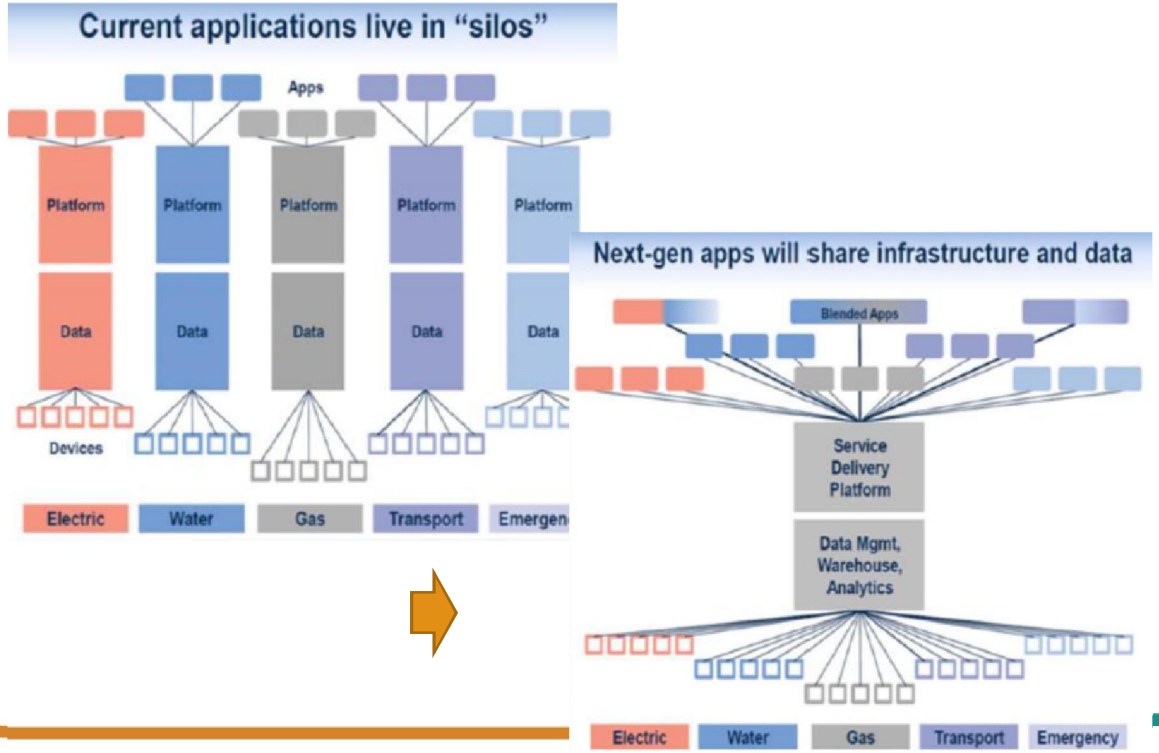
The Implementation View

- Split into implementation stages.
- Split into implementation programs, projects:



6. Smart City Platform

A common Smart City service delivery Platform should be built to avoid "data silos" :



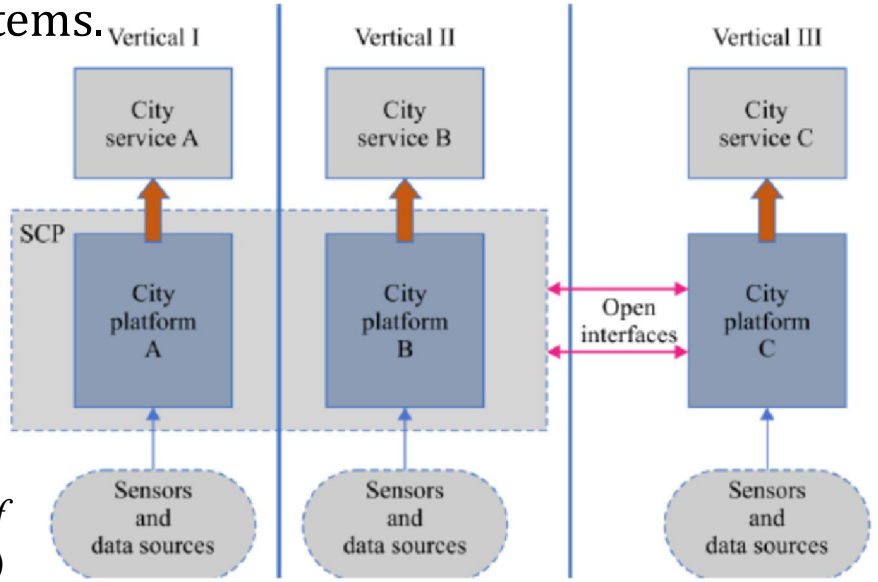
The **Smart City Platform** (SCP) include:

- **Modules providing share services** for smart city.
- **Domain-specific service delivery platforms.**

SCP-Smart City Platform

- **The Smart City Platform includes many component-platforms**:
  - **EAI** (*Enterprise Application Integration*) ***Platform***.
  - ***Video & IoT Platform***.
  - ***Big Data Analytic Platform***.
  - Security & Platform Management subsystems.
- **Special attention should be paid to the SCP's *Interoperability*** with domain-specific platforms & systems (SCADA,…), with other smart city platforms (vendor's platforms, SCPs of neighboring provinces/cities) via ***Open Interfaces***.

ITU Y.4200: *Requirements for the Interoperability of smart city platforms (2/2018)*

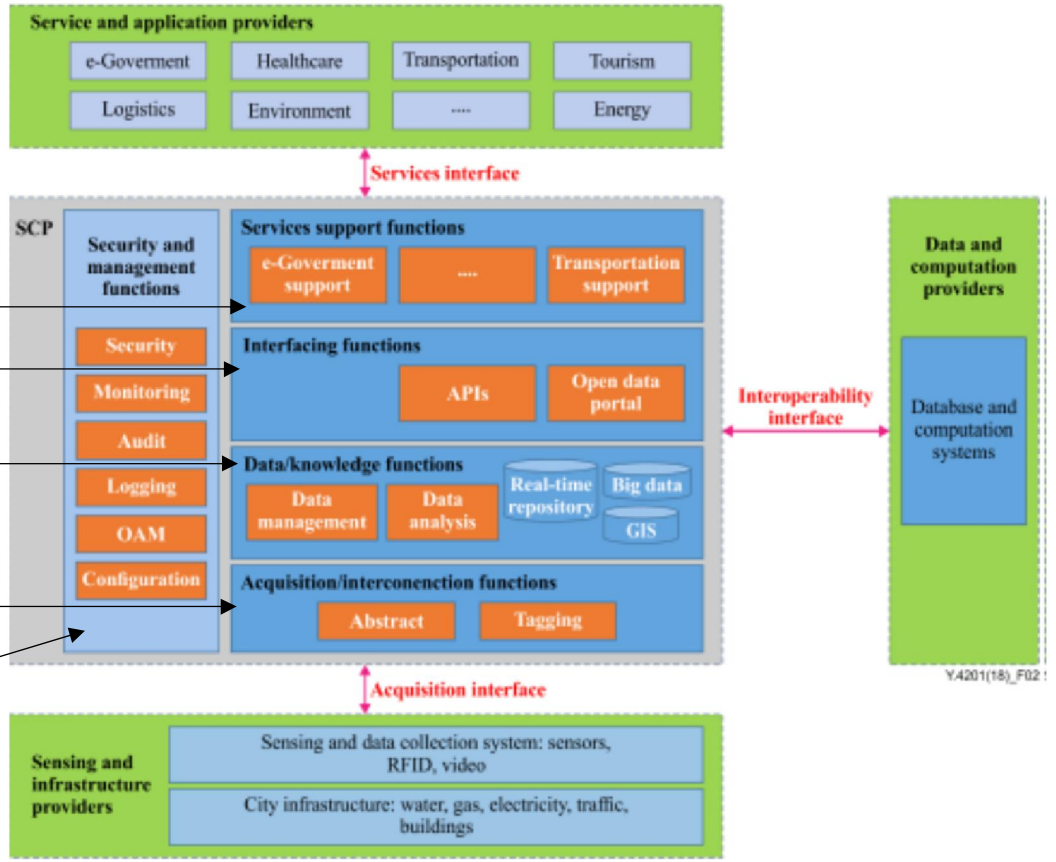


SCP-Smart City Platform Reference Framework

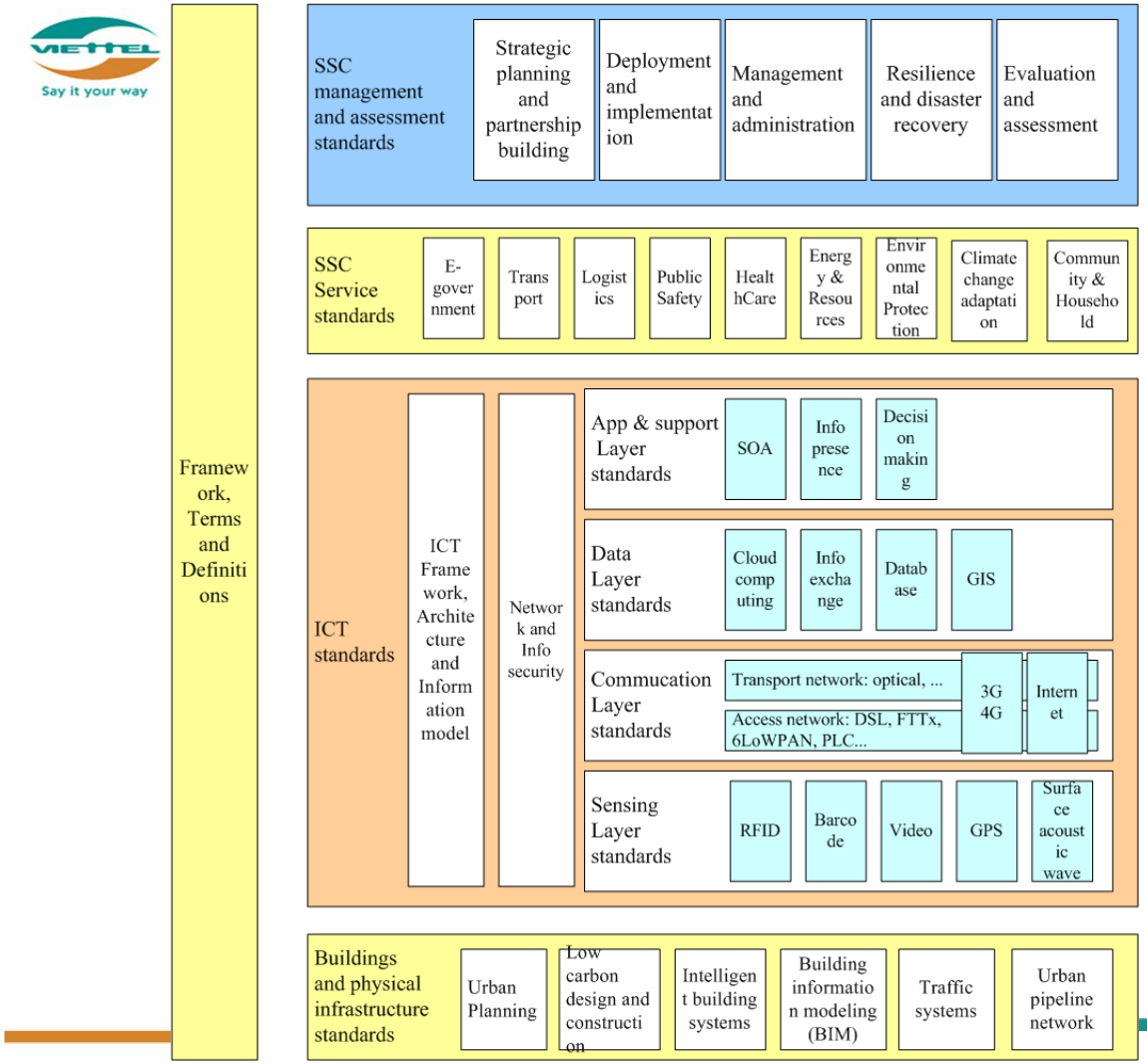
ITU-T Y.4201 *High-level requirements & reference framework of smart city platform (2.2018)*

Functional blocks:

- **Services support Functions.**
- **Interfacing Functions.**
- **Data/Knowledge Functions.**
- **Acquisition/Interconnection Functions.**
- **Security & Management Functions.**



7. Smart City standards

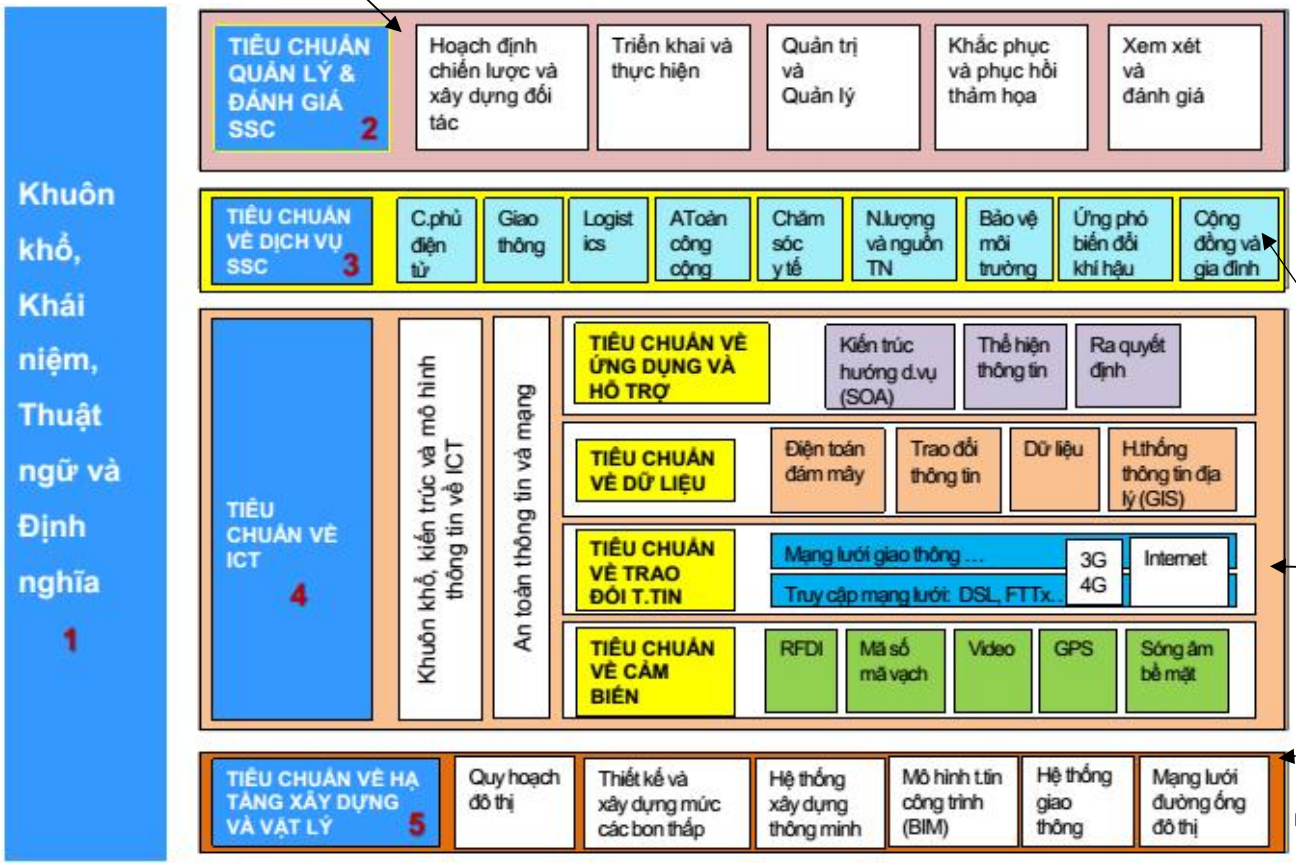


The conformance with Smart City Standards & Technical regulations is very important to ensure interoperability, synchronization of activities between architectural layers, technologies, subsystems and domains.

ITU's Framework & Roadmap of Smart Sustainable City Standards

Smart City National Standards system develop by Vietnamese Directorate for standards, metrology & quality

Management & assessment Standards



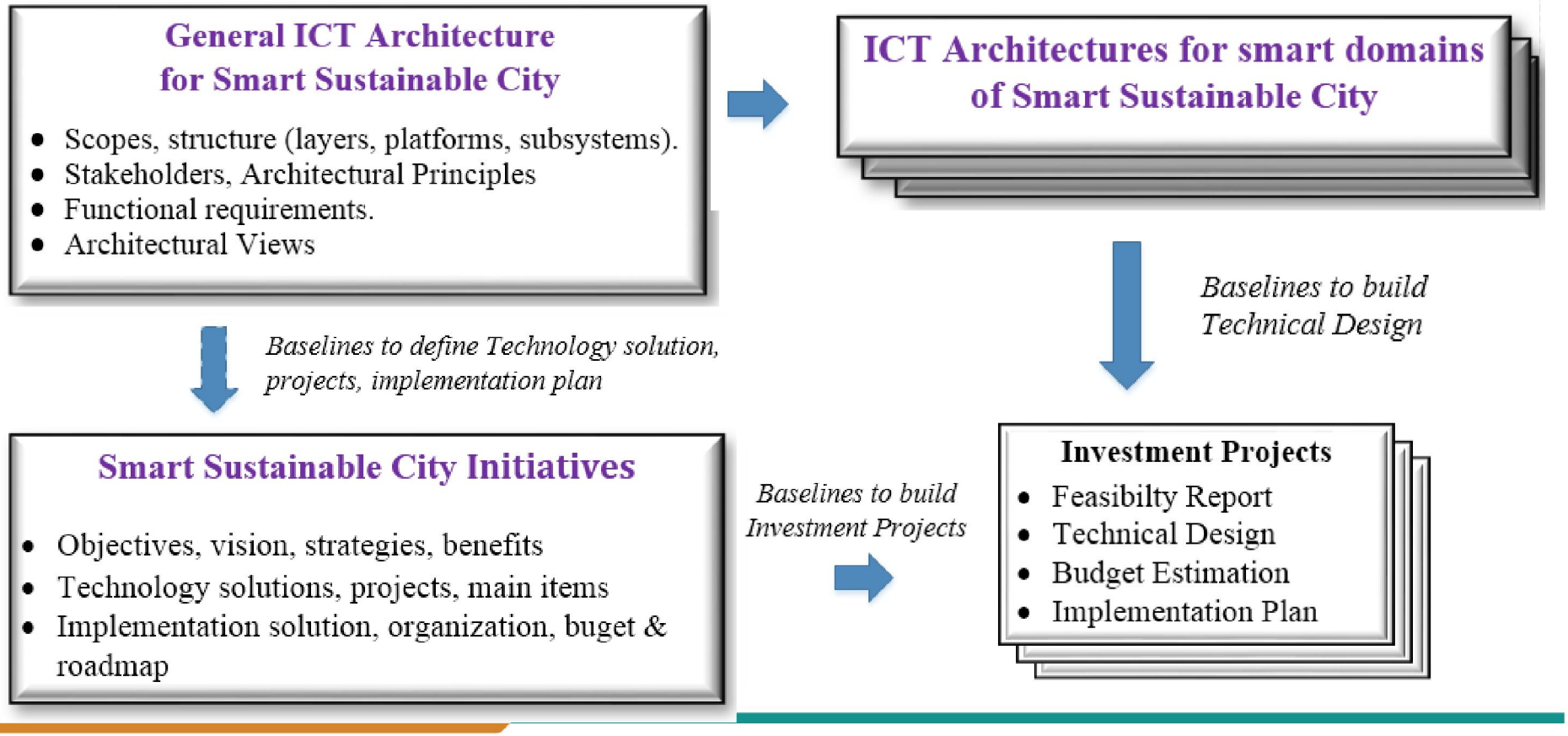
To build smart & sustainable city, the conformance with International & National Standards about Smart City is necessary.

Domain-specific smart services Standards

ICT Standards

Physical Infrastructure Standards

8. Relationship between Smart City ICT Architectures and Smart City Initiatives, Projects



9. Demand for Smart City ICT Architectures in Viet Nam

Up to 30/6/2018 Viettel has signed strategic MOU to develop smart cities with **21 provinces, cities** belonging to the central government:

No.	Provinces	Signing Date
1	Đa Nang	9/7/2016
2	Phu Yen	6/12/2016
3	Hai Duong	8/12/2016
4	Binh Phuoc	20/12/2016
5	Hung Yen	21/12/2016
6	Thai Nguyen	25/12/2016
7	Thua Thien Hue	28/12/2016
8	Phu Tho	2/2/2017
9	Thai Binh	7/2/2017
10	Hoa Binh	29/3/2017
11	Lao Cai	18/5/2017

No.	Provinces	Signing Date
12	Son La	27/5/2017
13	Daklak	2/6/2017
14	Bac Giang	6/6/2017
15	Ha Tinh	5/9/2017
16	Bac Ninh	10/9/2017
17	Tay Ninh	30/10/2017
18	Ho Chi Minh City	17/11/2017
19	Quang Tri	18/11/2017
20	Quang Nam	12/1/2018
21	Dong Nai	12/1/2018

Demand for Smart City ICT Architectures in Viet Nam (2)

- The demand for Smart City ICT Architectures is very big:
  - **7 provinces want to build a General ICT Architecture**: Da Nang, Thua Thien Hue, Thai Nguyen, Bac Giang, Hung Yen, Binh Phuoc, Tay Ninh.
  - **80 domain-specific ICT Architectures for smart domains** in 21 provinces need to be built.
- The domains which has highest demand:
  1. **Smart Education** (16),
  2. **Smart Healthcare** (13),
  3. **Smart Transportation** (12),
  4. **Smart Public Services** (11),
  5. **Smart Tourism** (08).

10. Viettel's experience in developing of Smart City ICT Architectures

- **General ICT Architectures**:
  1. **General ICT Architecture Framework for Danang Smart Sustainable City** *(11th January 2018).*
  2. MIC Ministry Research Topic No. **ĐT.034/17** «**Research & Proposal for General ICT Architecture for smart cities in Viet Nam**» (December 2017).
- **Domain-specific ICT Architectures for Da Nang**:
  - **ICT Architecture for Education in Da Nang 2016-2020** (February 2017).
  - **ICT Architecture for Healthcare in Da Nang 2016-2020** (July 2017).

✍ Viettel is developing Smart City ICT Architectures for some other provinces.

Hãy nói theo cách của bạn

Viet Nam is entering the Industry 4.0, the development of Smart Cities will be an important motivation to push the "Industry 4.0 Express".

Developing of ICT Architectures for smart cities will help to set up "railway rails" to guide and to speed up this "Industry 4.0 Express"!

Viettel Group has all necessary capabilities & experience and is ready to cooperate with provinces/cities to develop ICT Architectures for Smart City and to help them to catch up the "Industry 4.0 Express"

Le Quoc Huu – Chief ICT Architect for Smart City
huulq@viettel.com.vn Mb: **0965.996688**