

Training on
Planning Internet of Things (IoT) Networks

IoT Technology and Roadmap

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Bandung, September 25, 2018

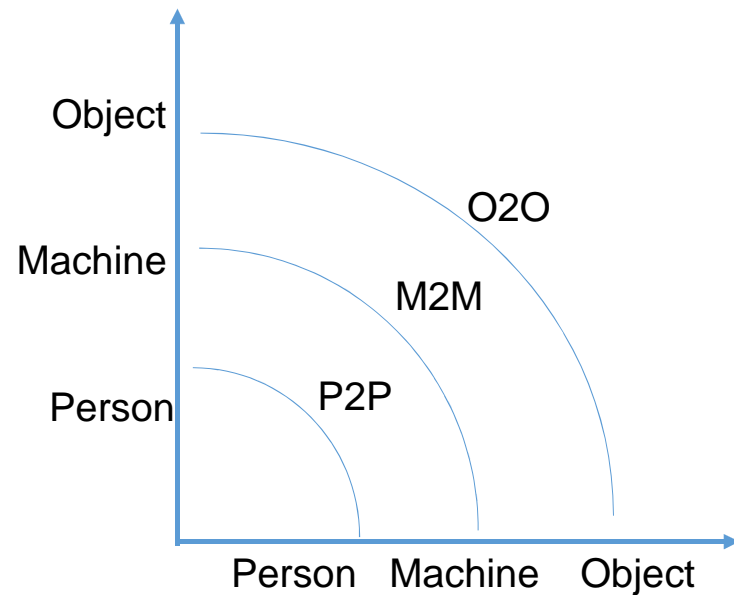
What is IoT: Definition

Recommendation ITU-T Y.2060:

- The IoT can be viewed as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies (ICT).

What is IoT : History

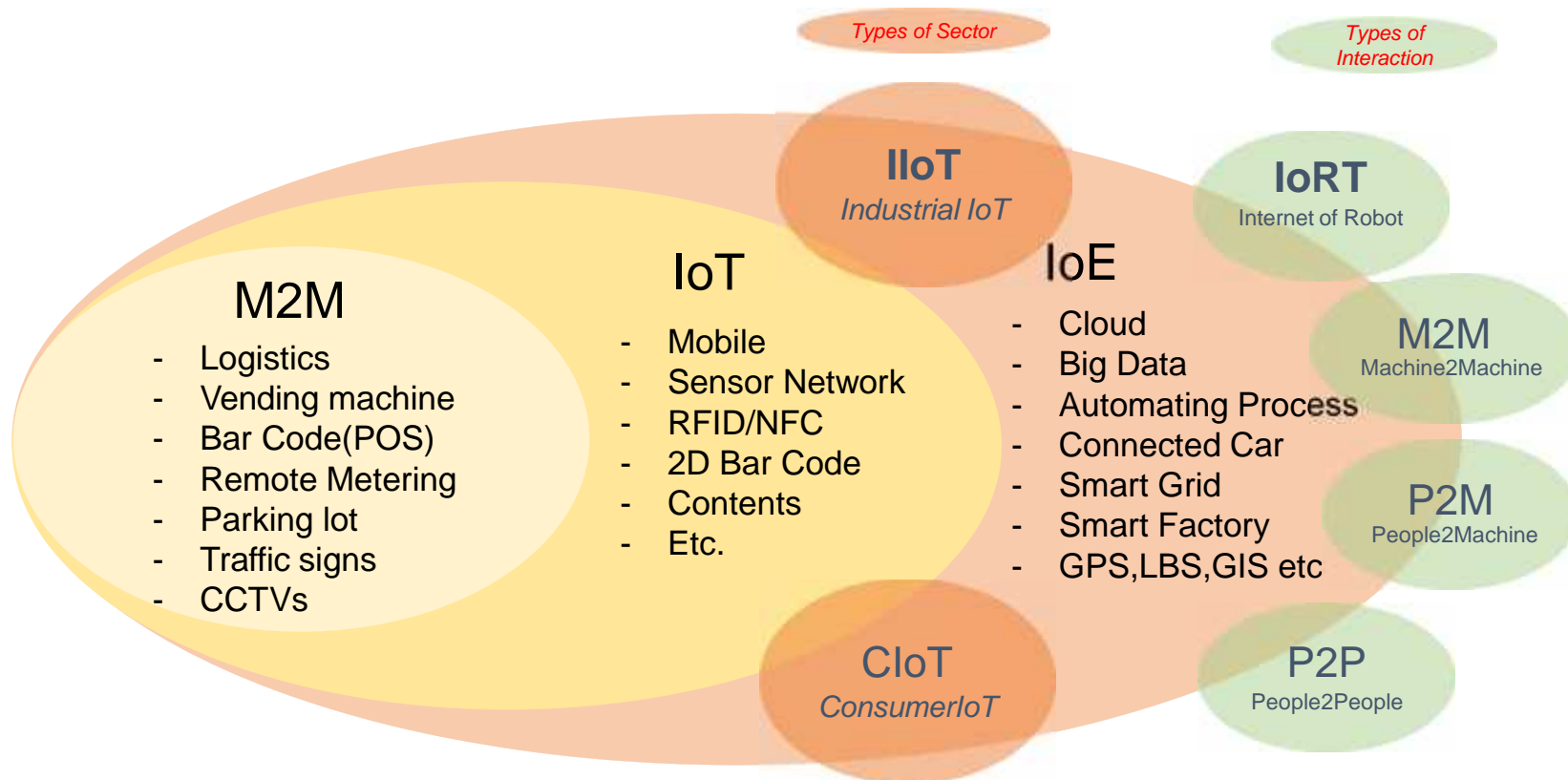
- ICT Solution for Things : The Evolving Steps



- '80s ~ '90s → Telemetry..etc..
- 2000s → Machine-to-Machine
* *Ubiquitous* : magic word
- 2010s → IoT (Internet of Things)

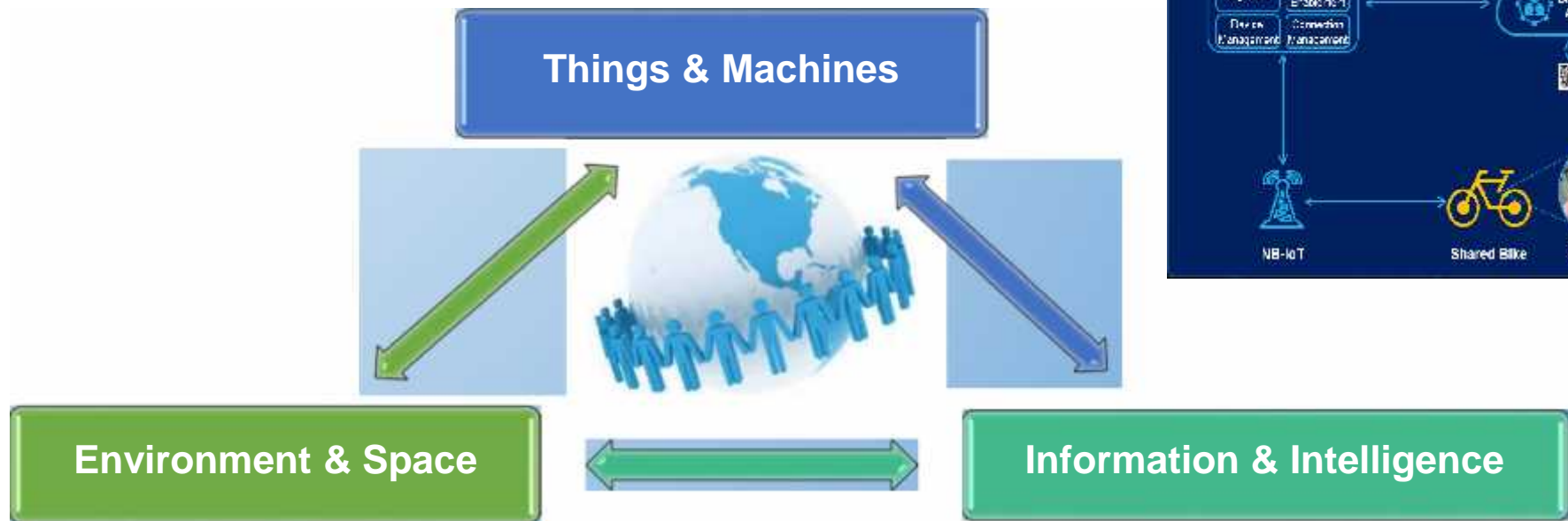
What is IoT : Terms used in IoT world

- Technologies, applications and requirement

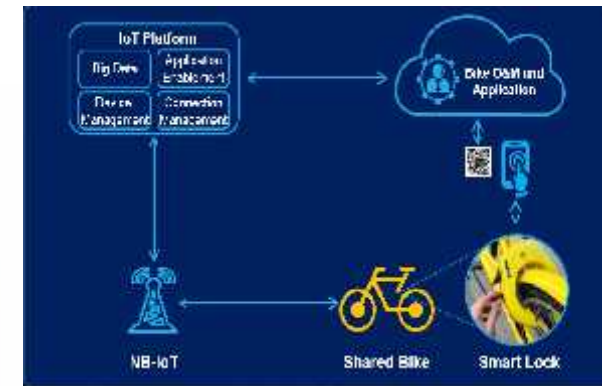


What is IoT : Simply To Say

Communicating Analog World by Digital Way



Use Case Example:



IoT Technology: Everything Connects



Healthcare



Industrial



Consumer



City



Environment



Transport



Agriculture



Energy



Metering

IoT Technology: Short Range vs Long Range IoT

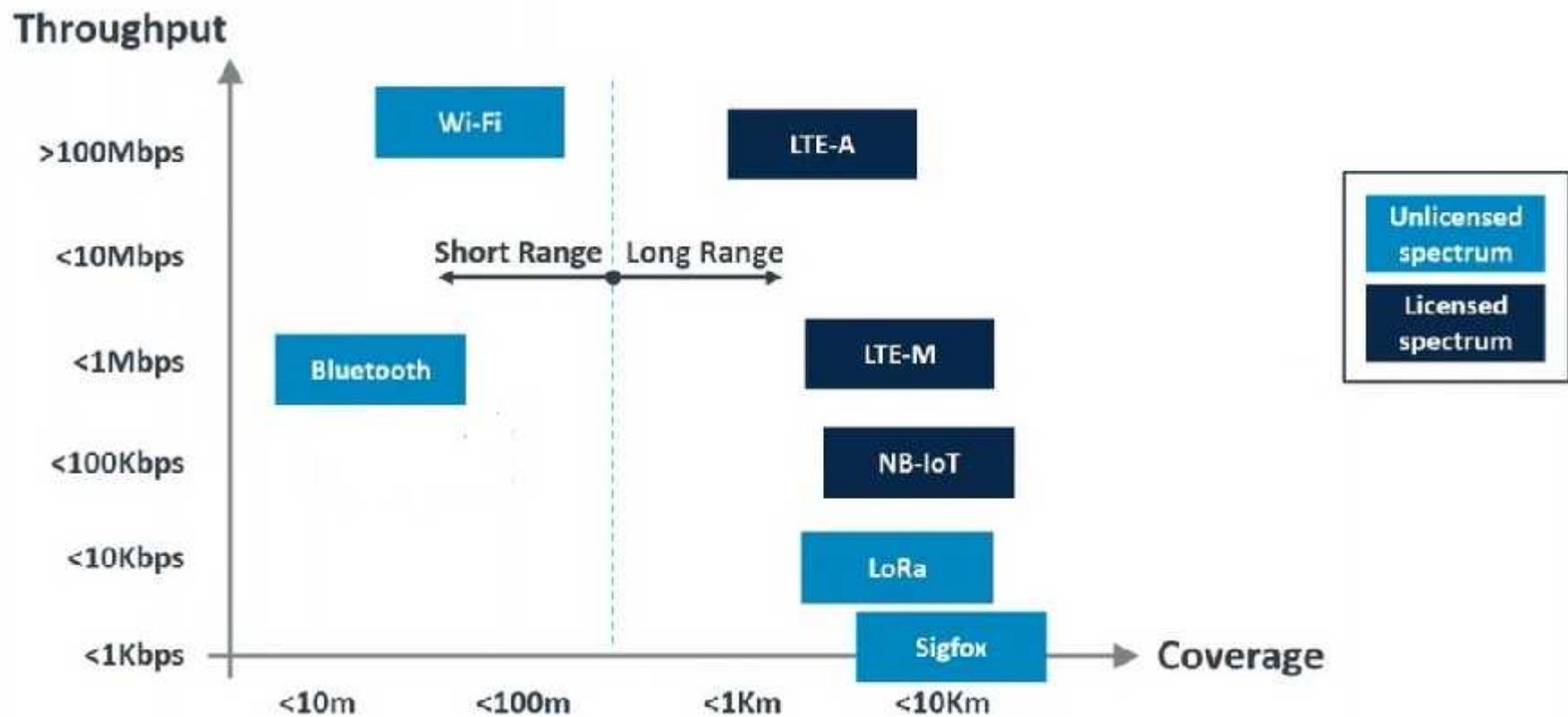
Local Area IoT



Wide Area IoT



IoT Technology: Connectivity Technologies



IoT Technology: LPWA Requirements

Low Power Wide Area wireless connects low bandwidth, low power devices and provides long-range coverage



**10+ Years
Battery Life**



**Deep
Penetration**



**Mass
Deployment**



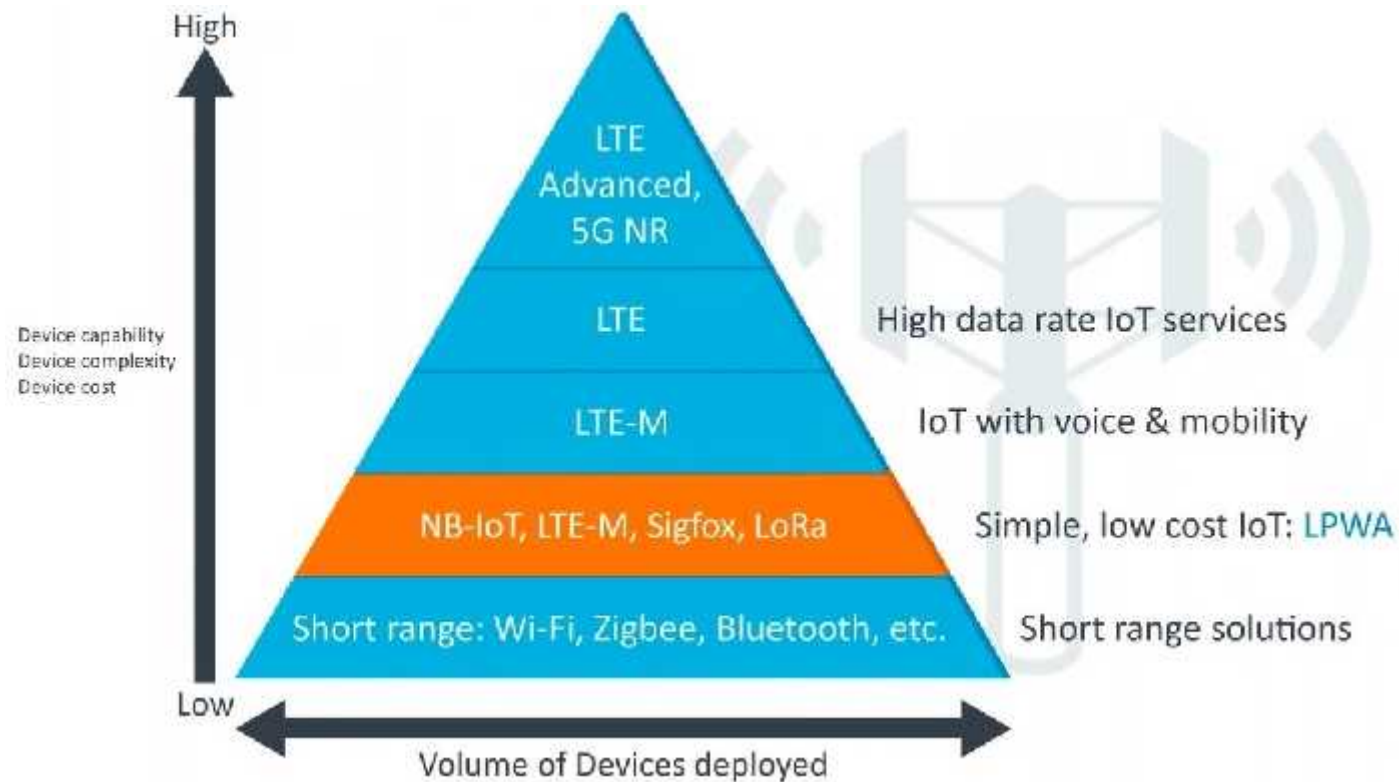
**Low
Bandwidth**



**Device
Cost**

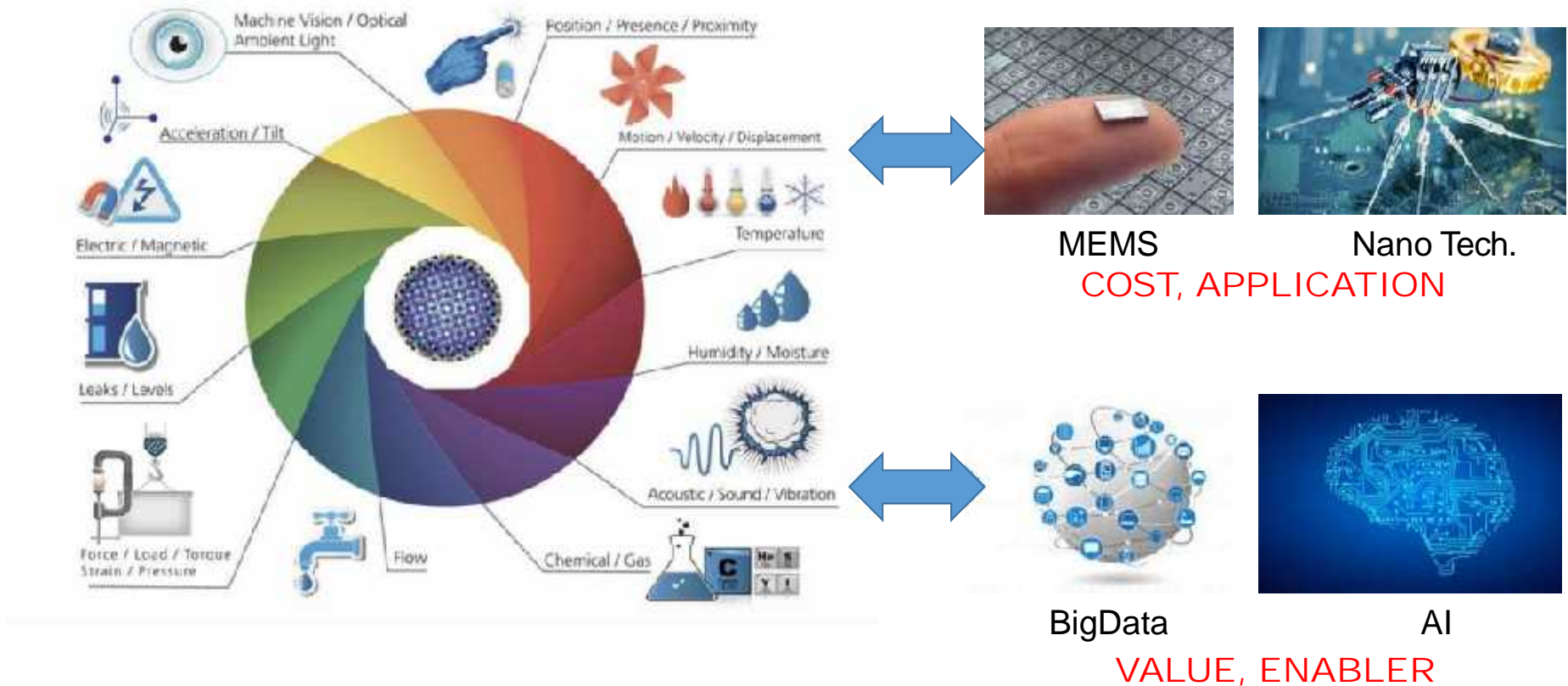
Includes cellular (NB-IoT, LTE-M/Cat-M1) *and* non-cellular (Sigfox, LoRa etc) technologies

IoT Technology: The Connectivity Pyramid

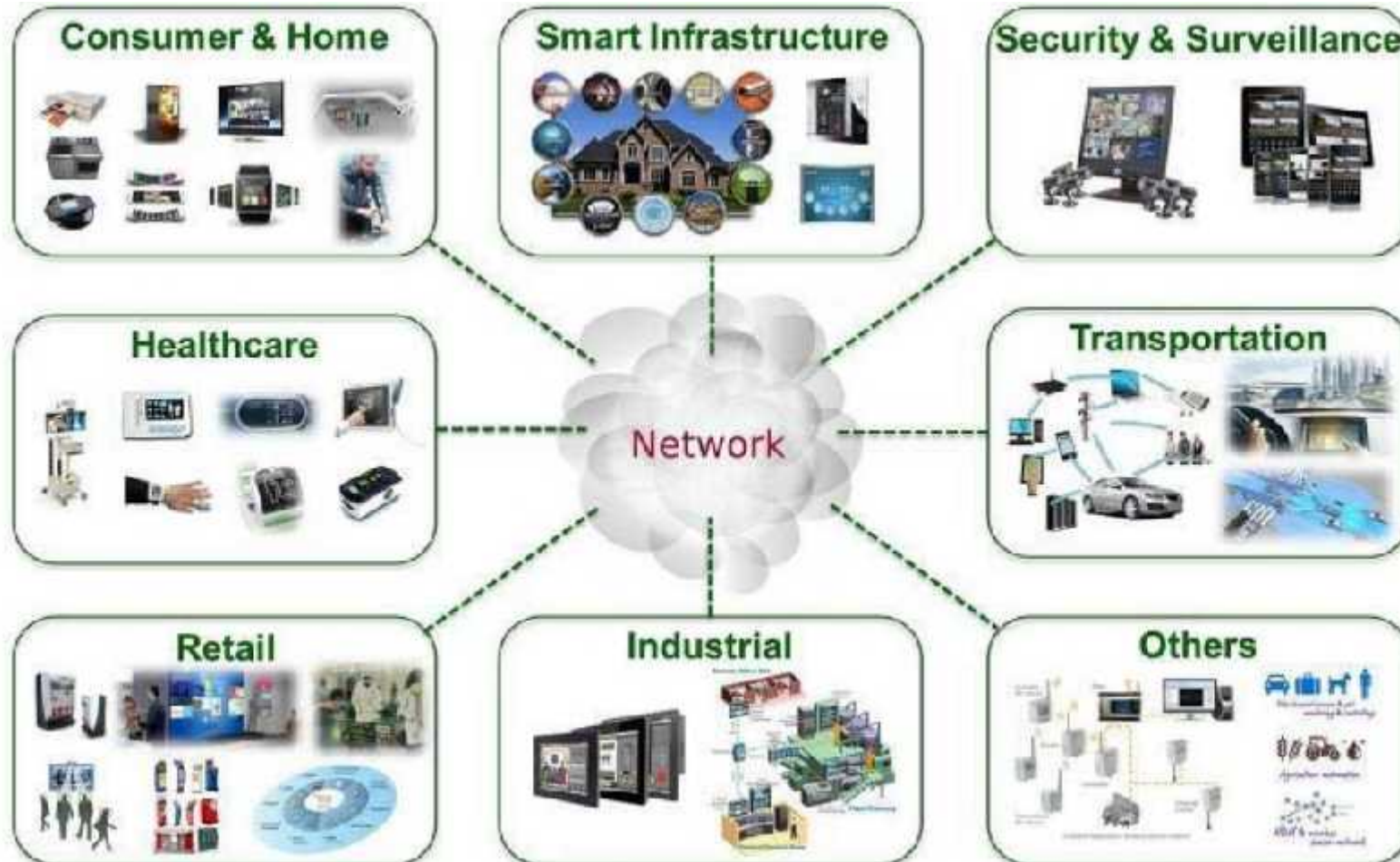


IoT Dynamics: Change of Things

- THINGs still and continually changing the horizons



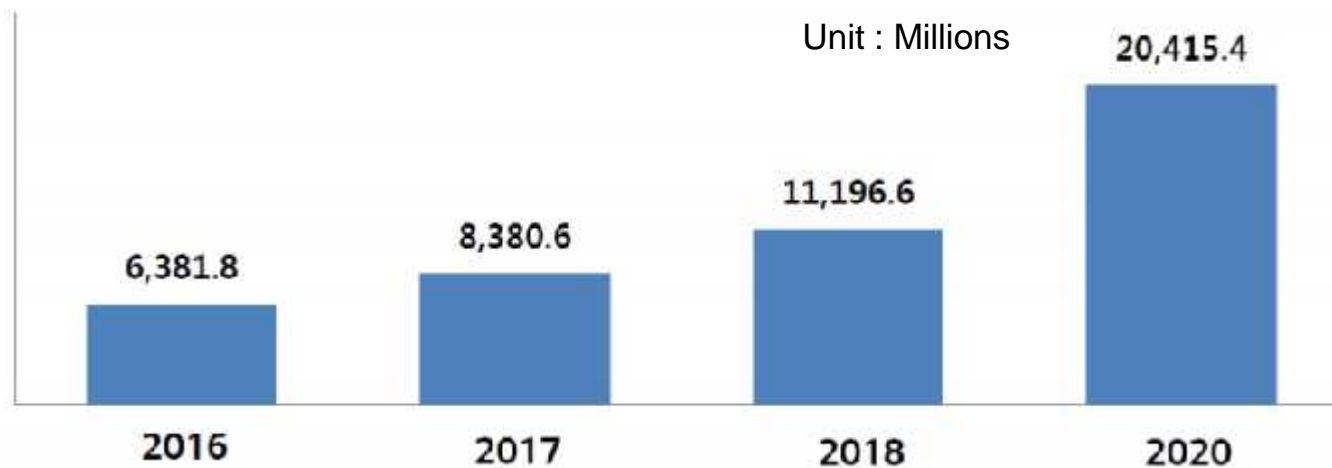
IoT Dynamics: Change of Things in Various Sector



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IoT Dynamics: Change of Internet

- Number of IoT Devices expected to reach 20B

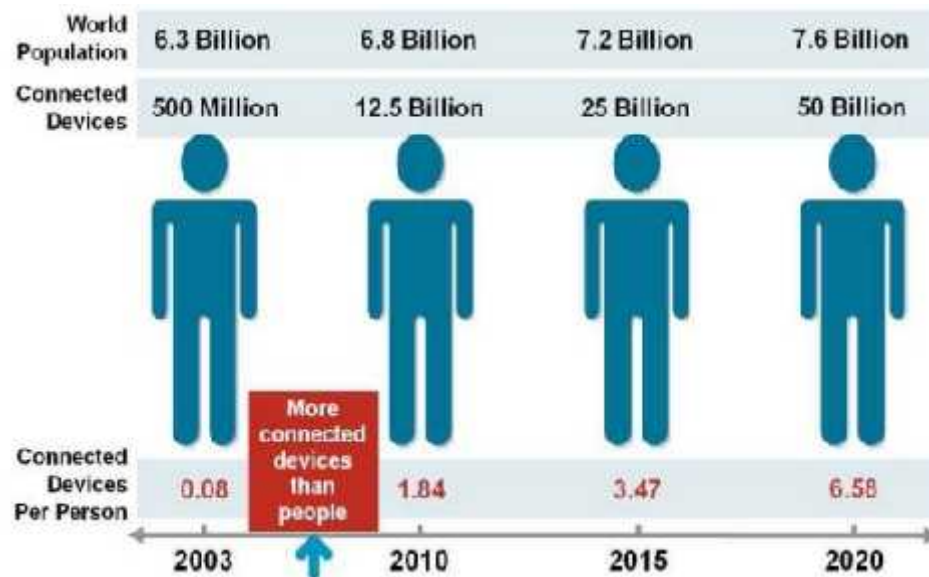


Source : Gartner 2017

- Why? Can be linked Wired, WI-FI, Mobile Wireless, Bluetooth, etc..
 - Devices capable of connection varies

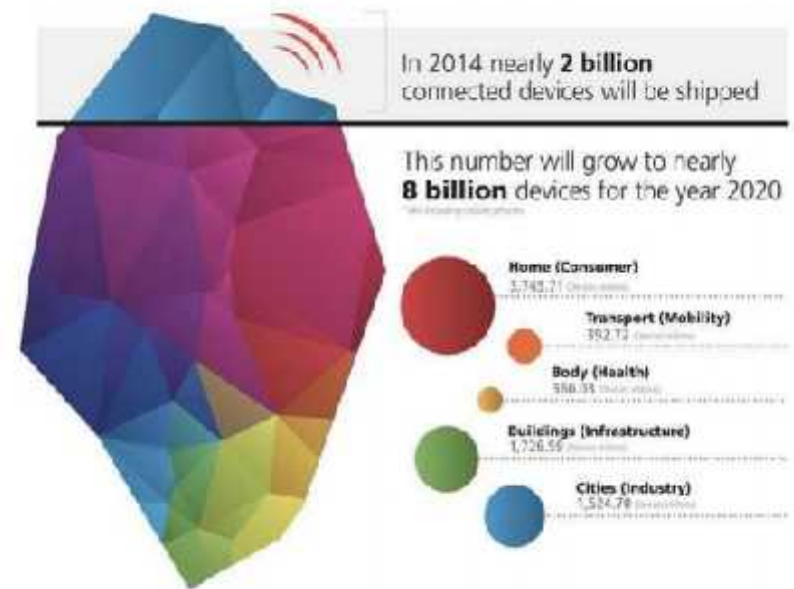
IoT Dynamics: Change of Things in volume

- Complicated, Mesh Network started



Source : Cisco IBSG, April 2011

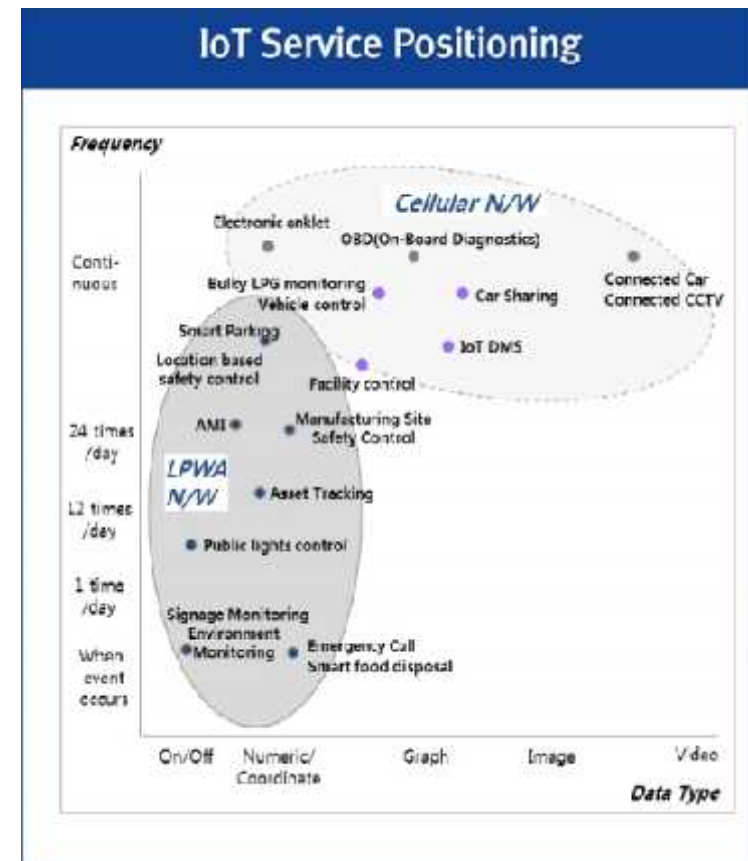
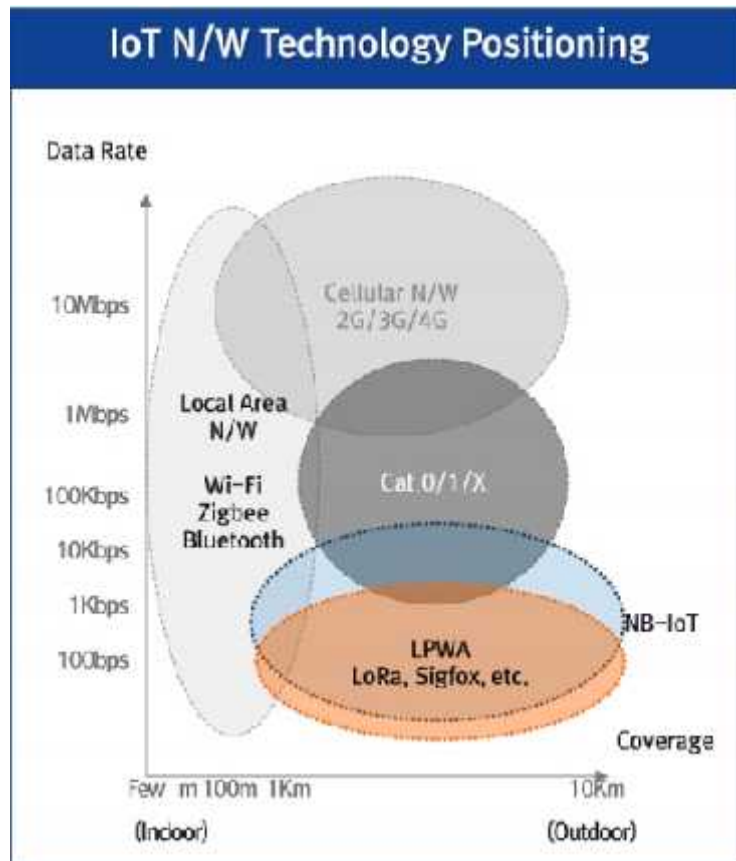
Connected Devices (excl. Mobile phone, Component)



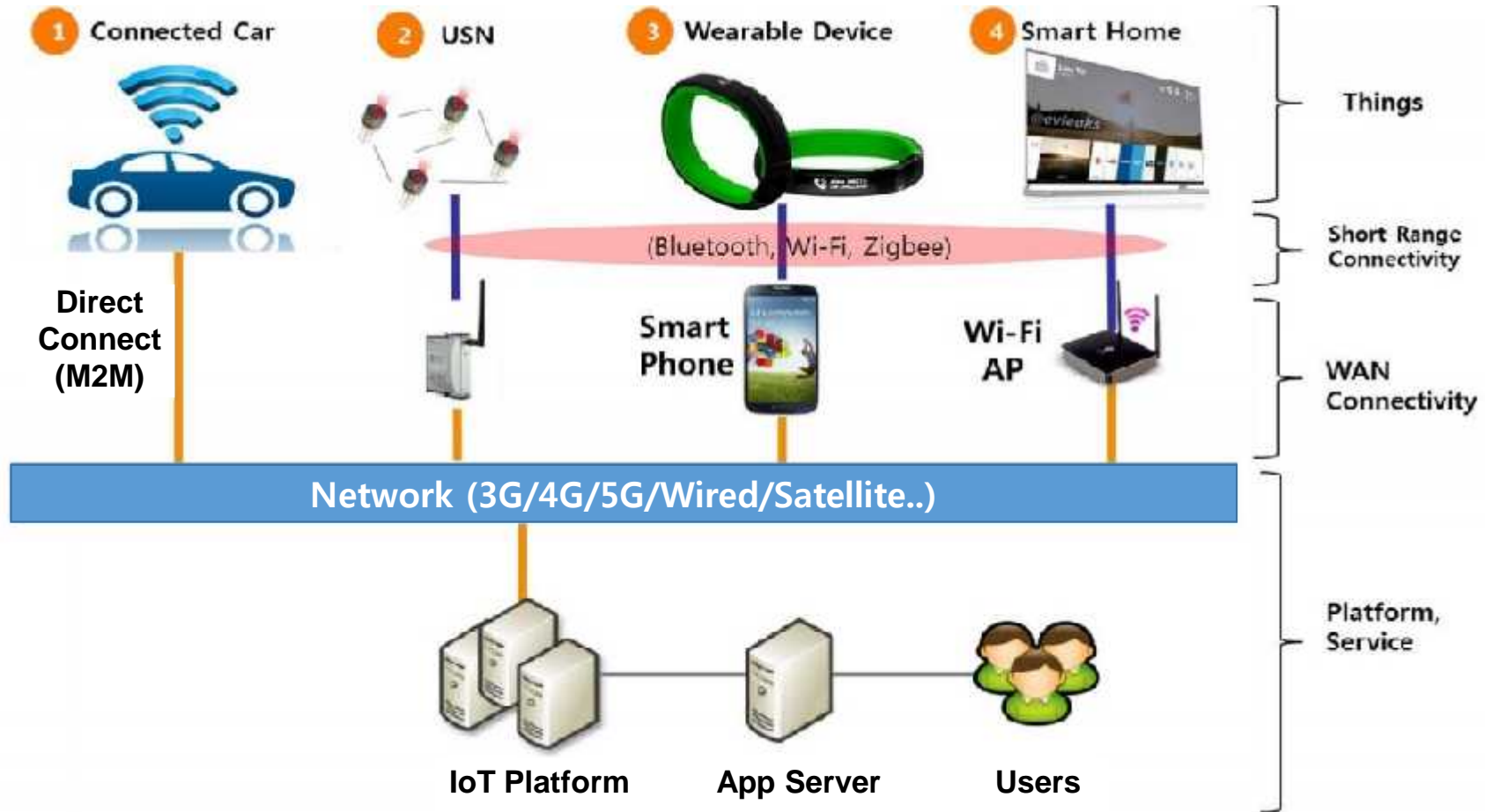
Source: <http://www.postscapes.com/what-exactly-is-the-internet-of-things-infographic/>

IoT Dynamics: Change of Internet (cont.)

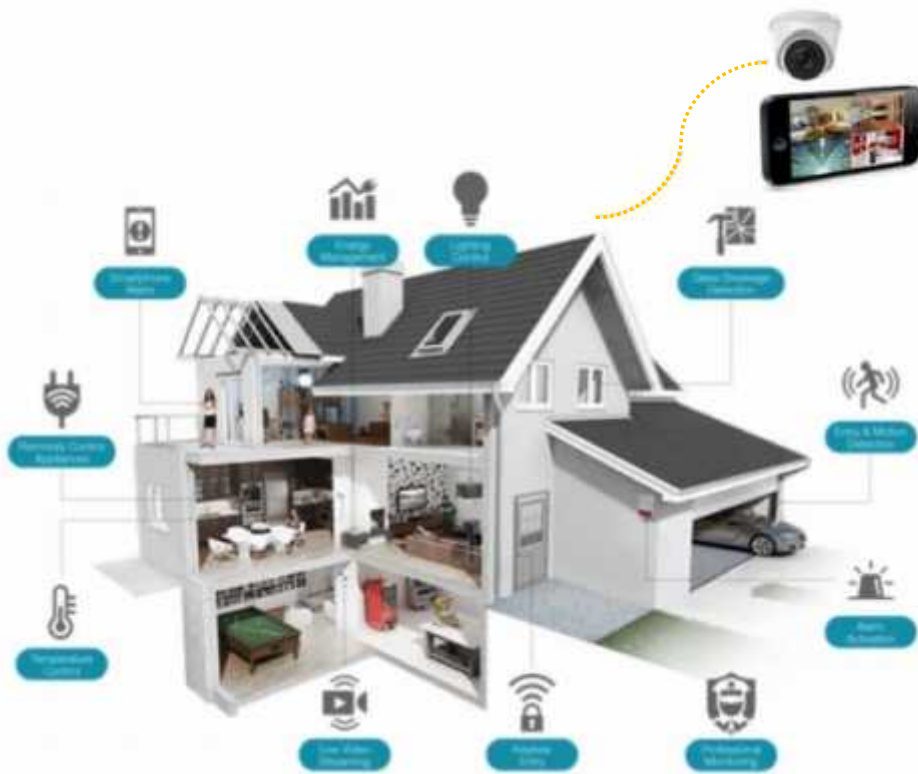
- Technologies and services positioned for each usages and applications



IoT Dynamics: Cases of IoT Connectivity



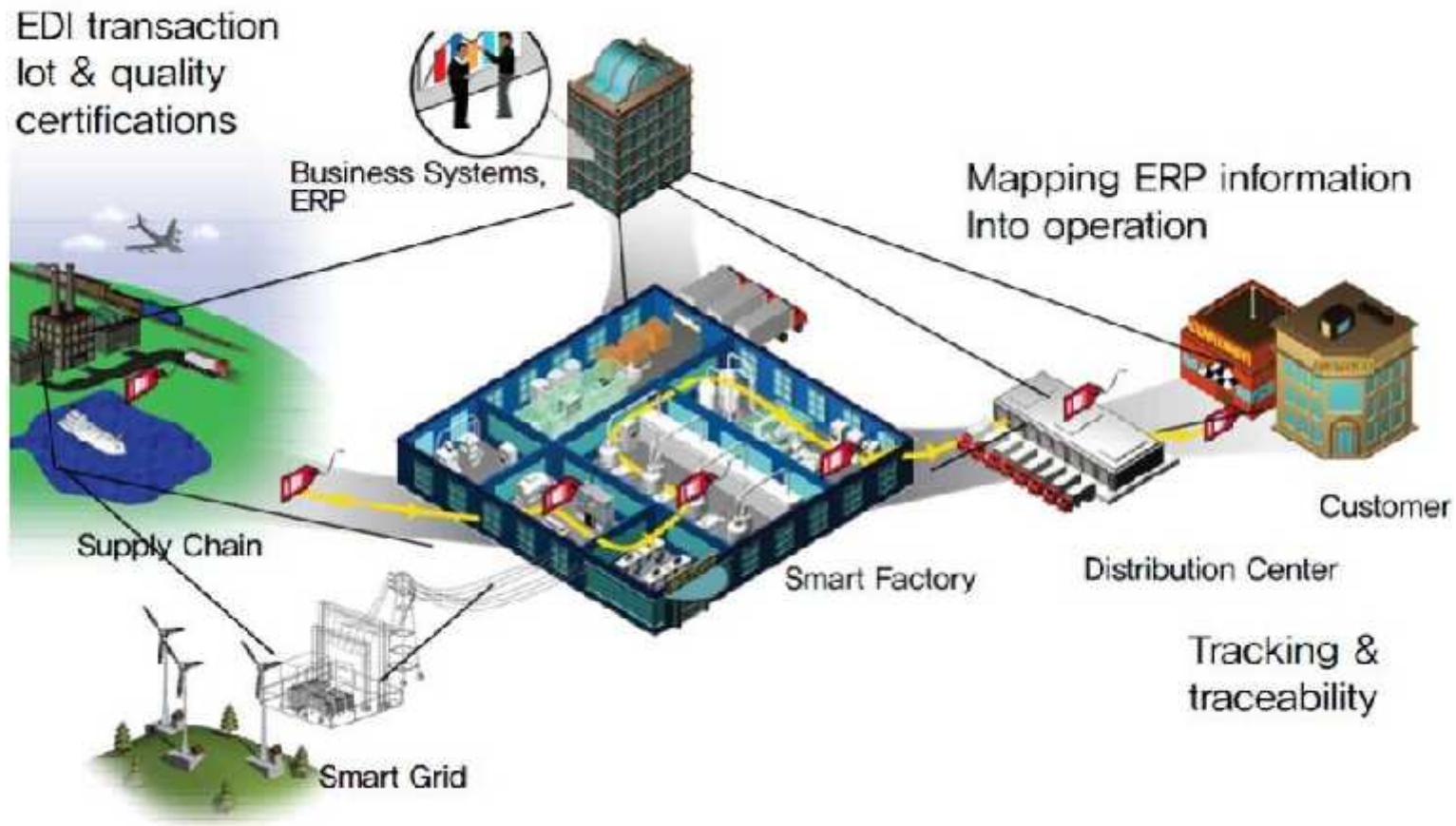
Use Case: Customer IoT, Smart Home



IoT Devices	Home	Shop
TV	2	-
Set-top	2	-
WiFi router	3	1
Labtop,PC	3	1
Printer	1	-
CCTV	3	3
Speaker	3	1
Door Panel	1	-
Heater	1	-
Mobile Phone, Tablet	3	1
Projector		1
Car	1	1
Electricity meter	1	1
Home AI console	1	
Auto Cleaner	1	
Automatic Blinder	1	
Home Styler	1	

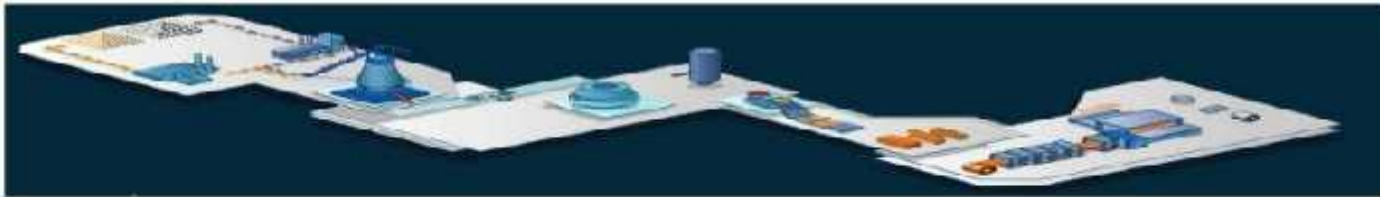
Use Case: Industry IoT

- Smart factory located in active core, but can be limited by social IoT capability



Use Case: Smart Planting

- Active adapting area – High expectation area



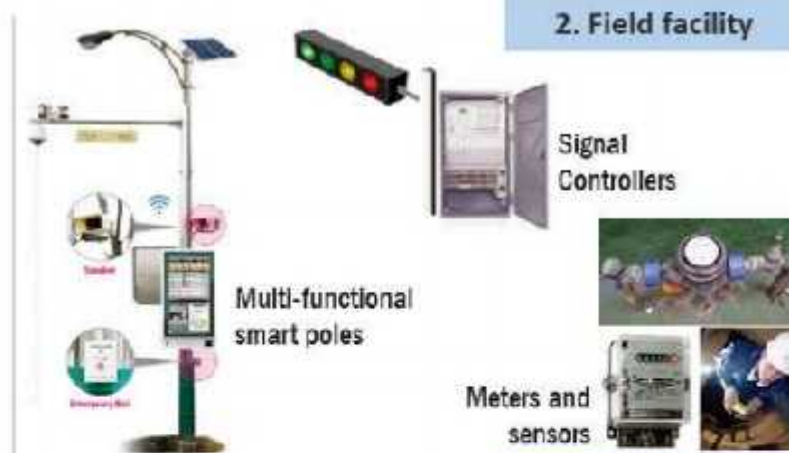
Source: POSCO

Use Case: Smart City

1. Operation Room



2. Field facility



3. Public vehicle



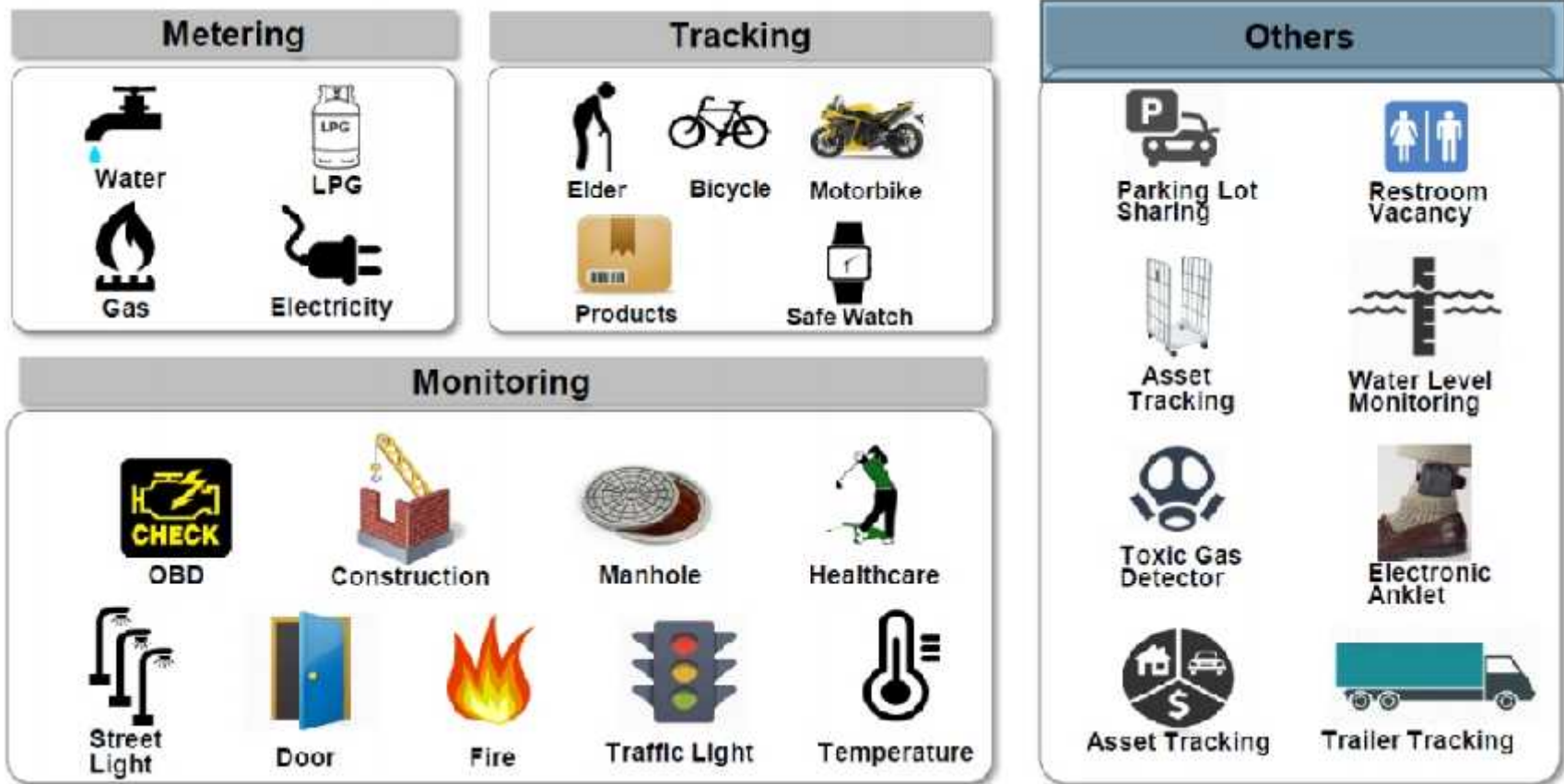
4. Nomadic device



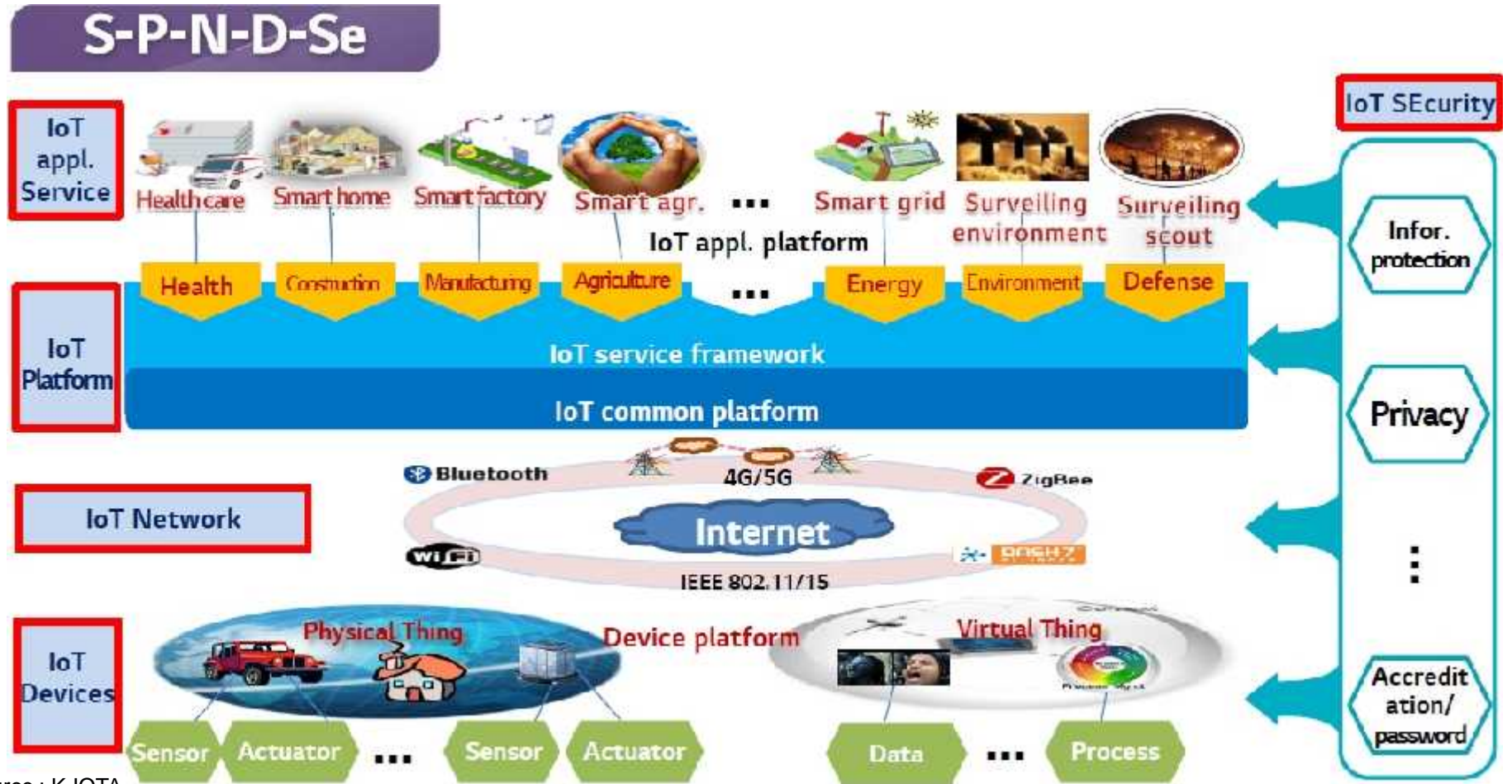
Source :Korea NIA consulting process for India SmartCity

Use Case: Social IoT categories

- Subjects to sensing/monitor/measure for advanced society

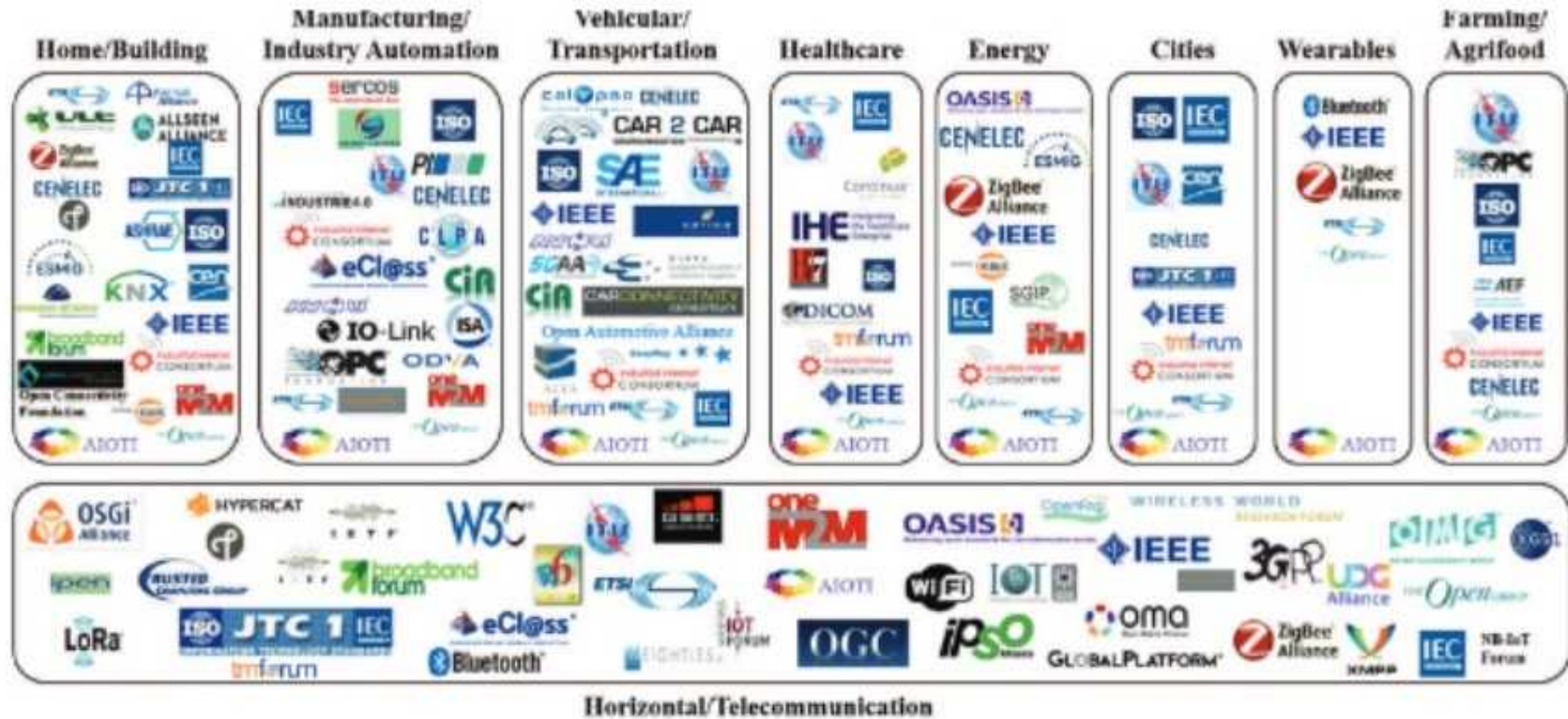


Layers, Ecosystem



Source : K-IOTA

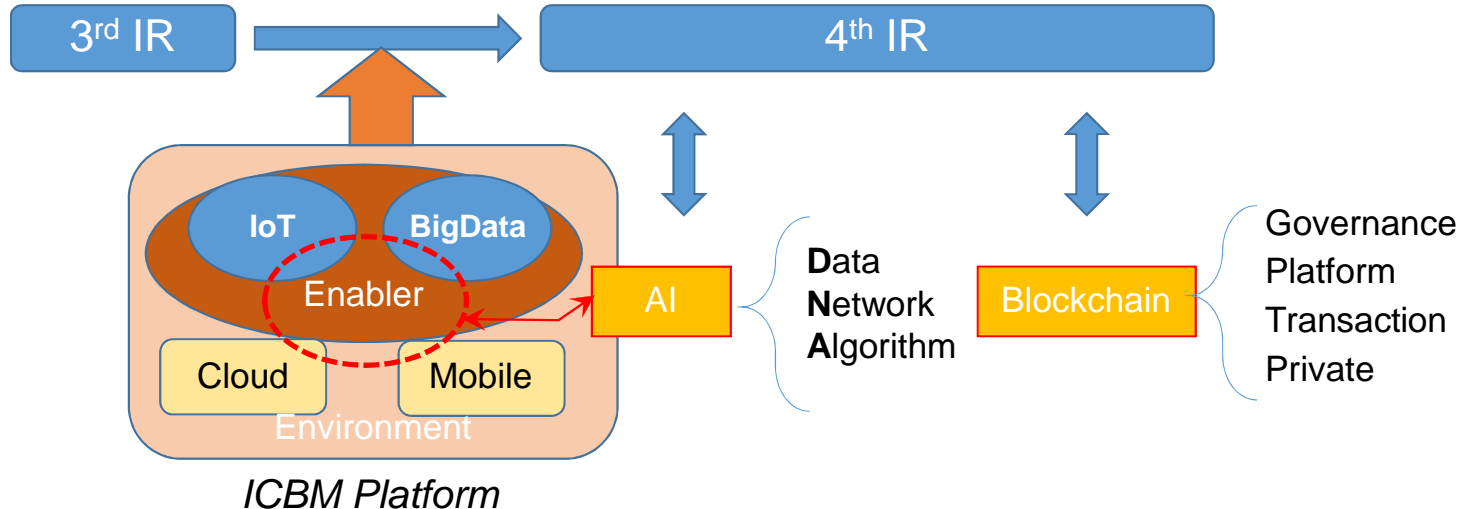
Standardization Landscape



Source: AIO TI WG03 (IoT Standardisation) – Release 2.7

IoT as a Basis of 4th Industrial Revolution

- IoT worked as hot keyword during 2006~2010 for R&D and ICT Industry
- Home IoT products started 2010~ but still in initial stages
- SmartCity, SmartEnergy as for public project broadening and cultivating IoT
- Industry 4(SmartFactory/Manufacturing) focused in 2015~



Paradigm Shift

- Impact of social/economical paradigm

Resource Distribution

Ownership/Proprietary economy → Shared/Utilizing economy

Core competitiveness

Massive economy → Long-tail economy

Market driver

Producer centric → Consumer centric

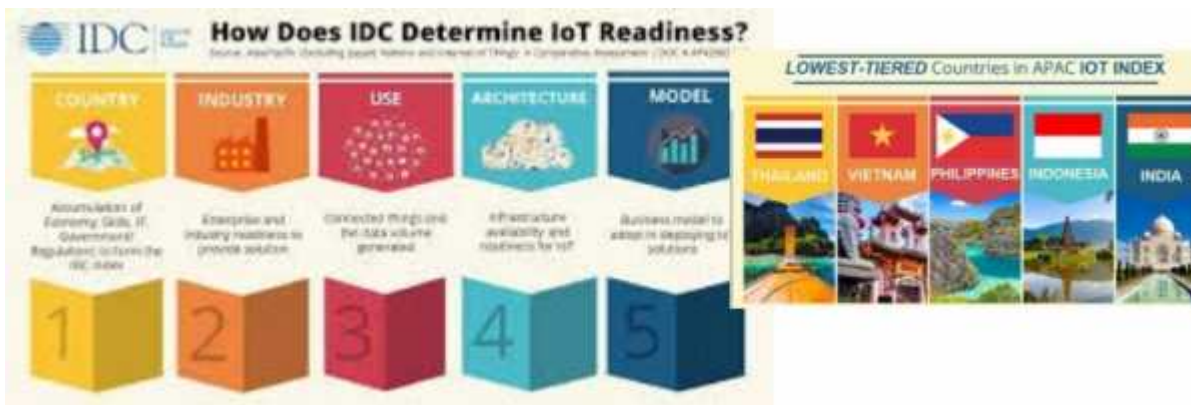
Control authority

Central control → Distributed/Autonomous control

Struggles to survive

- IoT Readiness Index among G20

Source : IDC(International Data Corp.)



Ranks	2013	2016
1	USA	USA
2	KOREA	KOREA
3	JAPAN	UK
4	UK	AUSTRALIA
5	CHINA	JAPAN

- IoT WW Competitiveness Report

- With the maker/components, progress of industrial maturity, IoT(robot) adaptation rates, etc.

(Ministry of Internal Affairs/Japan, 2017)

Ranks	2017	Score
1	USA	61
2	CHINA	54
3	JAPAN	54
4	KOREA	51
5	TAIWAN	50

Several Countries status (based on 2017/E) (1/2)

- IoT industries started to penetrated, and moving into AI



Announcing Smart City Challenge (2015)

Awarding U\$40M to the city which suggests a future traffic system

Selecting city project with the idea which can enhance safety, reduce carbon emission, smooth transportation of mankind and goods through platform of revolutionary data



Establishing research hub for IoT(2016)

IoTUK is in charge, dealing with investigation such as core issues: privacy, trust, security, economic value added, standards, policy for 3 years.



Announcing new ICT countermeasures toward the era of IoT/BigData(2017)

In 2017, established a plan with nurtures human resource with ability of effective management and operation of the network with various IoT devices

Plan to establish an interrelationship between industry-academy-government which nurtures human resources of IoT network



Announcing plan Internet Plus(2015), IoT action plan(2013)

Plan to let social capital invest into silver industry by various models as private facilities, enterprise participation and combining government and private sector * aiming 100 smart silver center, 100 leading companies



Announced IoT master plan (2014)

Established IoT penetration strategy (2015)

IoT as base frame of 4th Industrial revolution strategy (2017)

Several Countries status (based on 2017/E) (2/2)

- Government exploits SmartCity, SmartEnergy sector first



Announcing SmartNation (2014), Smart City Challenge (2015)
Governmental support SmartCity for safety, health and cluster projects.
Wearable healthcare band pilot project undergoing



Establishing research hub for IoT(2016)
Smart Electricity project. PPP based Smart Cities project nationwide for developing regional hub.



National M2M Policy roadmap(2015), Draft IoT policy (2016) based on Digital India Nation Plan
Smart Cities(100), 14 SmartGrid pilots
Support of startup for IoT, PPP projects undergoing



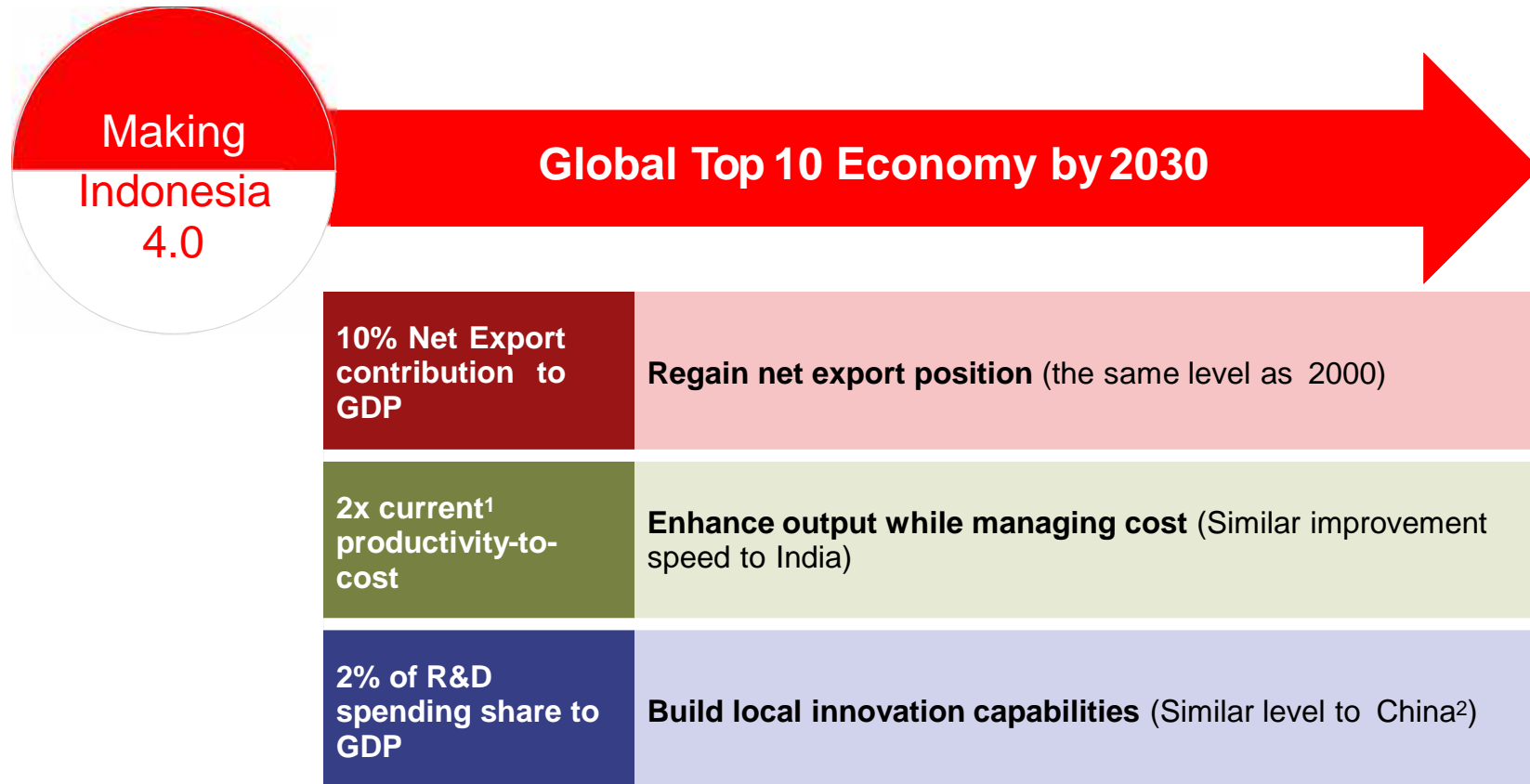
National IoT Strategic roadmap (2015)
Healthcare, Smart Villages, Smart electricity projects initiated.
Kuala Lumpur/Klang valley for smarter region



SmartCity initiatives undergoing
IT support center with Korea, e-banking with Japan, Smart Manufacturing with Germany, etc.
Various form of pilot projects undergoing.

Indonesia IIoT Roadmap

Making Indonesia 4.0 Aspirations



1. Based on 2016

2. Indonesia's R&D spending per GDP is currently around 0.1-0.3%

Source: World Bank, A.T. Kearney

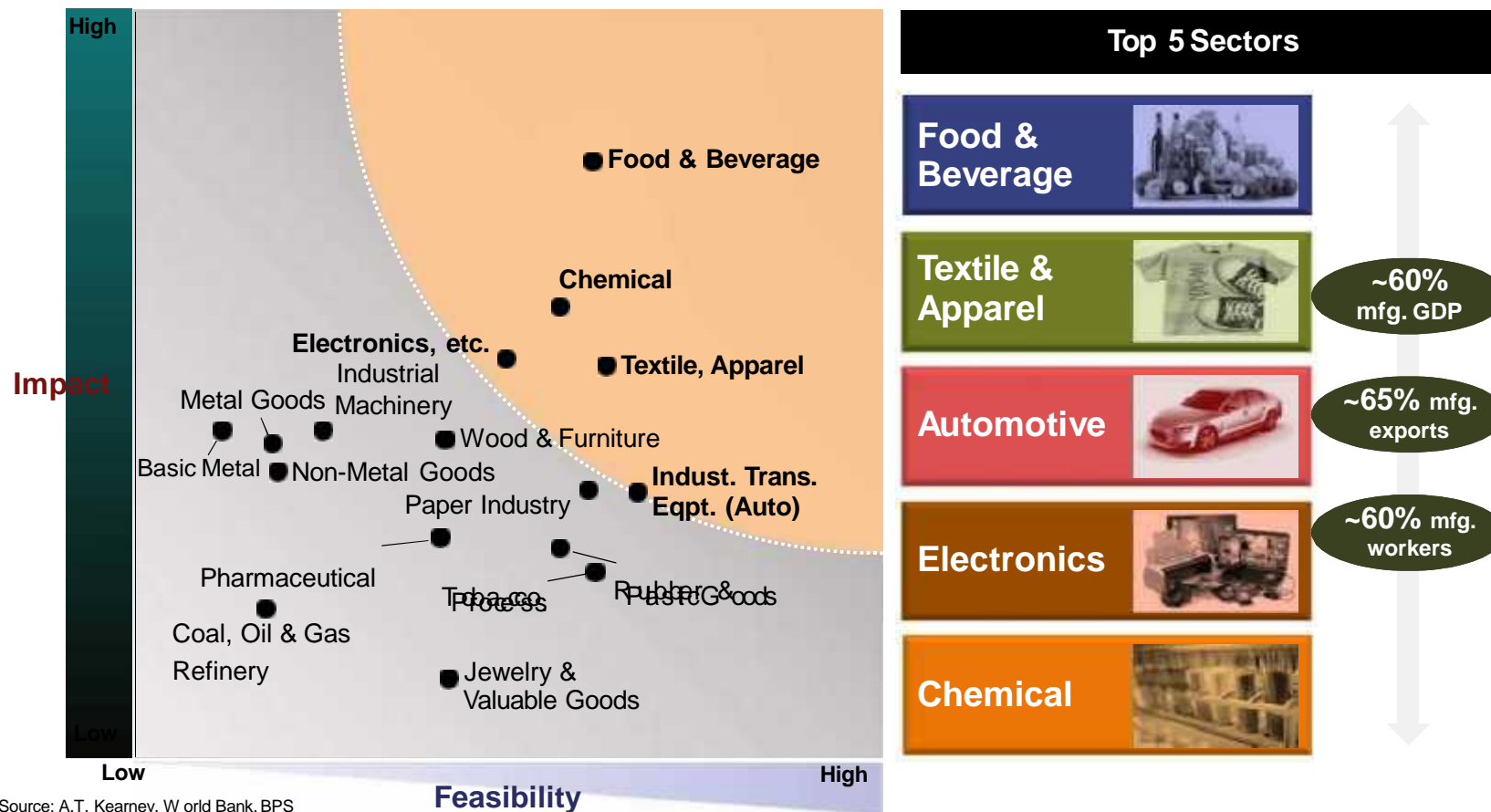
Indonesia IIoT Roadmap

Five Focus Sectors for “Making Indonesia 4.0”



Indonesia IIoT Roadmap

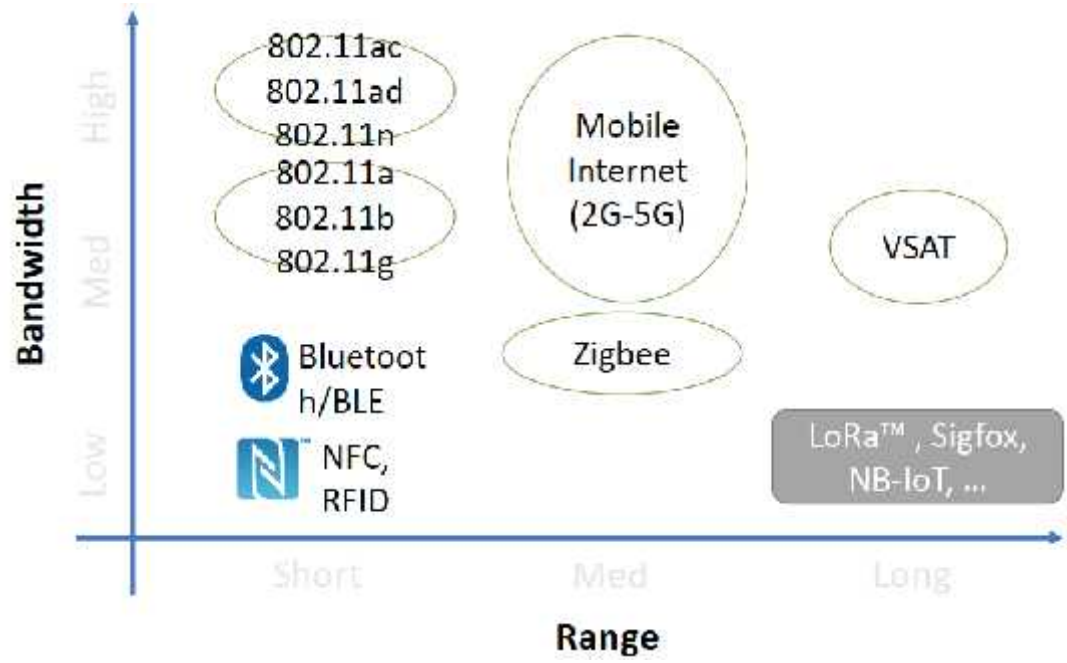
Sector Prioritization Matrix



Indonesia Planned IoT Technical Regulation and Initiatives



EVALUATING EXISTING TECHNOLOGIES



Non 3GPP and Non Satellite

SRD

- zigbee
- Bluetooth™
- WiFi™

LPWA

- LoRa™
- sigfox

3GPP Standard

- 2G
- 3G
- 4G LTE
- 5G
- NB-IoT
- LTE-M

Satellite

- THURAYA
- iridium
- ORBCOMM™
- inmarsat
- etc.



FREQUENCY



3GPP Standards

Band 1 (2100 MHz) LTE-M & NB-IoT
Band 3 (1800 MHz) LTE-M & NB-IoT
Band 5 (800 MHz) LTE-M & NB-IoT
Band 8 (900 MHz) LTE-M & NB-IoT
Band 31 (450 MHz) LTE-M & NB-IoT
Band 40 (2300 MHz) LTE-M

Other frequency bands that will be allocated for cellular mobile networks that allow for LTE-M and NB-IoT

Other frequency bands that will be allocated for 5G IoT



Satellite

L-Band (1.52 – 1.66 GHz)
S-Band (2.52-2.67 GHz)
C and ext. C Band (3.4-4.2 GHz, 5.92 GHz – 7.07 GHz)
Ku-Band (10.95- 11.7 GHz, 13.75-14.5 GHz)
Ka-Band
Q-Band
V-Band

Non 3GPP and Non Satellite

2,4 GHz
5,8 GHz
919-925 MHz (draft)
5,x GHz (draft)

A trial of collocation of cellular service and LPWA operating at 919-925 MHz frequency band is being carried out

STANDARDIZATION



3GPP Standard

2G - GSM, GPRS
3G - WCDMA, HSDPA
4G- LTE
NB IoT dan LTE-M (draft)

Evolution of NB-IoT and LTE-M (if any)
5G IoT (in the process of observation)



Satellite

Existing regulations

Non-3GPP and Non- Satelit

Sigfox (draft)
Lora (draft)
WiFi
Bluetooth
Zigbee

TECHNOLOGY, FREQUENCY, AND STANDARDIZATION ROADMAP



2019 2020 2021 2022 2023



Provision of NB-IoT and LTE-M band allocations that are in line with the provision of cellular mobile network frequency bands



5G IoT observation



Utilization of IoT with Multifunctional Satellites (High Throughput Satellite) in the rural area



Satellite IoT utilization in line with satellite policy in Indonesia



Observation of non cellular and non satellite LPWA Technology Development





POLICY RELATED TO TECHNOLOGY, FREQUENCY, AND STANDARDIZATION



Field trial



IOT LAB



Startup guidance to minimize the usage of illegal Frequency and Devices



Revision of LPWA Technical Specification



Revision of Govt. Regulation of certification tariff to Encourage startup

++ DOMESTIC TESTING LAB

Addition of Domestic Test Centers

▲ ▲ GOVT. TESTING LAB

Strengthening Govt. Testing Lab



National Industry Development



5G IoT Studies



Preparation of HR at the Directorate General of SDPPI



Participation in International Standards



National Industry Promotion in international forums



link and match between global player and national industry

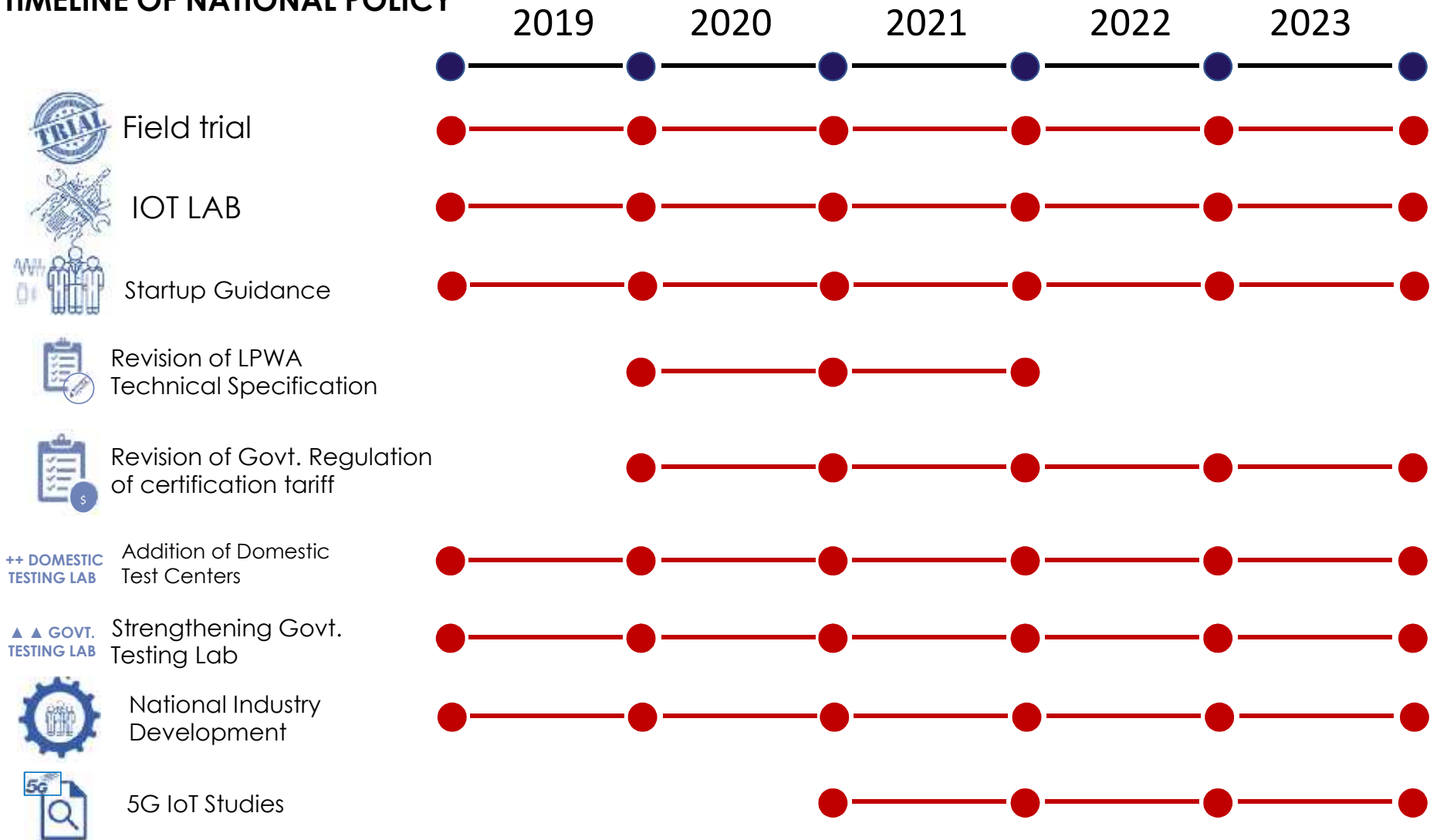


Mutual Recognition Agreement with Foreign Testing Centre

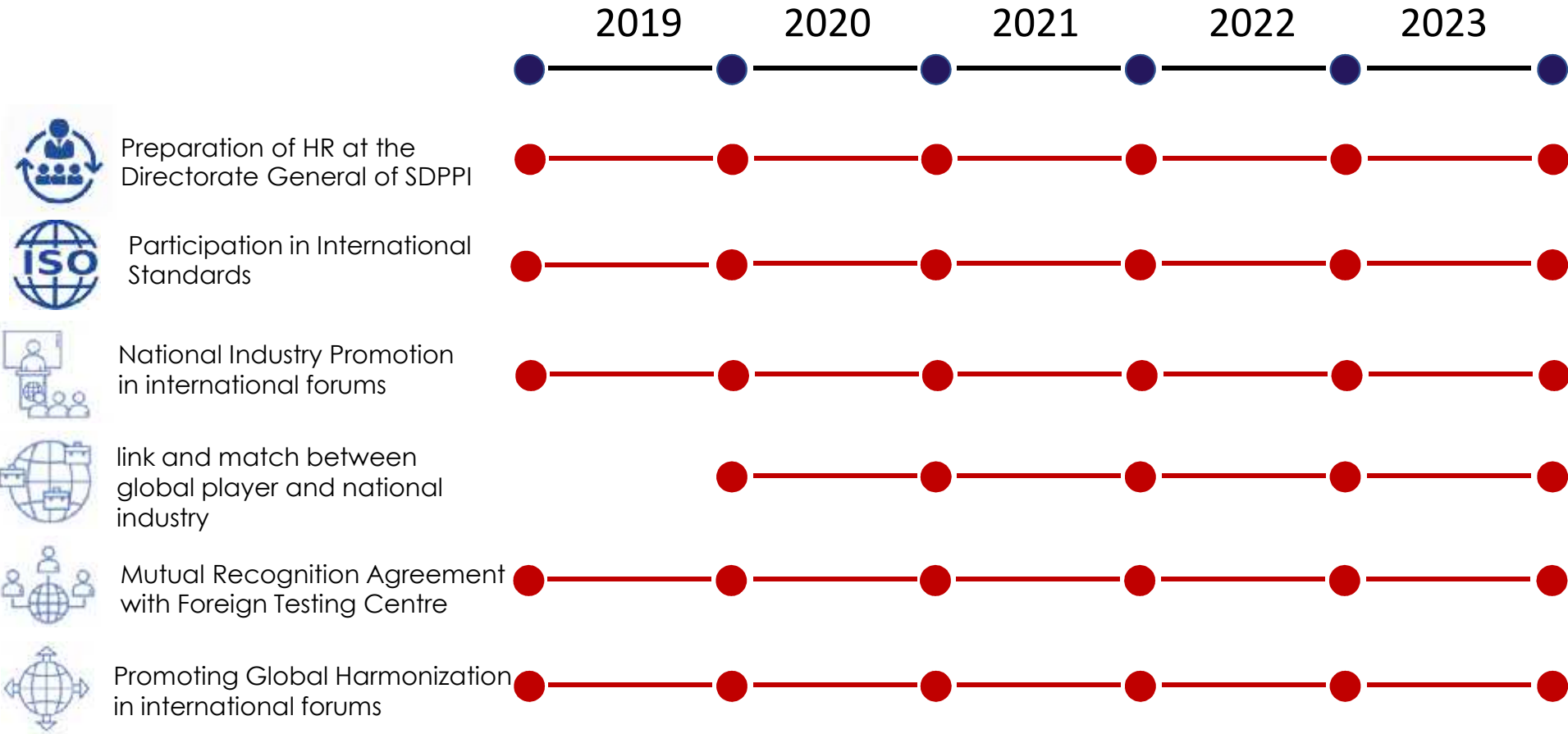


Promoting Global Harmonization in international forums

TIMELINE OF NATIONAL POLICY



TIMELINE OF INTERNATIONAL POLICY





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THANK YOU