

# ICT Standardization for Smart Sustainable Cities

– Architectures, Protocols & Key techs

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# ITU-T SG20 Structure

ACRONYM	TITLE
<b>WP1/20</b>	
Q1/20	End to end connectivity, networks, interoperability, infrastructures and Big Data aspects related to IoT and SC&C
Q2/20	Requirements, capabilities, and use cases across verticals
Q3/20	Architectures, management, protocols and Quality of Service
Q4/20	e/Smart services, applications and supporting platforms
<b>WP2/20</b>	
Q5/20	Research and emerging technologies, terminology and definitions
Q6/20	Security, privacy, trust and identification for IoT and SC&C
Q7/20	Evaluation and assessment of Smart Sustainable Cities and Communities
<b>Regional groups</b>	
<b>SG20RG-LATAM</b>	ITU-T SG20 Regional Group for the Latin American Region
<b>SG20RG-EECAT</b>	ITU-T SG20 Regional Group for Eastern Europe, Central Asia and Transcaucasia
<b>SG20RG-ARB</b>	ITU-T SG20 Regional Group for the Arab Region
<b>SG20RG-AFR</b>	ITU-T SG20 Regional Group for the Africa Region
<b>Other groups under SG20</b>	
<b>JCA-IoT and SC&amp;C</b>	Joint Coordination Activity on Internet of Things and Smart Cities and Communities



# Q3/20: Architectures, management, protocols and Quality of Service

## Scope

This Question addresses IoT functional architectures, protocols, management mechanisms, and QoS (including performance) of IoT and Smart Sustainable Cities and Communities (SC&C), which needed to construct architectural frameworks for the following reasons:

- to control network attachment procedures (including mobility management);
- to control session establishment and release, to control network resources (including QoS control);
- to interact with services and applications and to interact with legacy networks, etc.

## Main Tasks

Developing Recommendations, Reports, Handbooks, Guidelines, etc. as appropriate on:

- Conducting studies on general reference models on IoT and vertical industry needs;
- Developing frameworks to identify the basic architectural compositions and views on IoT;
- Determining the requirements that the connectivities and protocols are intended to support;
- Identifying performance requirements of connectivity technologies that will enable them to meet the IoT requirements;
- Identifying mechanisms for achieving QoS and its measurement principles required for IoT and SC&C;
- Identifying interfaces for interoperability between different IoT network elements;
- Defining interworking with legacy systems;
- Developing intelligence control related technologies that will provide support to IoT applications and services for various verticals and systems;
- Identifying mechanisms for achieving architectural interoperability for IoT and SC&C;
- Providing the necessary collaboration for joint activities in this field within ITU and between ITU-T and SDOs, consortia and fora.

More details in: <https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/Pages/q3.aspx>




# Q3/20 main progress


## Approved Recommendations (2015-2016)

 Y.4451 (ex Y.IoT-cdn)	Q3/20	Framework of constrained device networking in the IoT environments	2016-08
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## Approved Recommendations (2017-2021)

 Y.4115 (ex Y.IoT-DE-RA)	Q3/20	Reference architecture for IoT device capabilities exposure	2017-03
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 Y.4416 (ex Y.NGNe-IoT-arch)	Q3/20	Architecture of the Internet of things based on next generation network evolution	2018
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 Y.4417 (ex Y.IoT-son)	Q3/20	Framework of self-organization network in the IoT environments	2018
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 Y.4418 (ex Y.gw-IoT-arch)	Q3/20	Functional architecture of gateway for Internet of things applications	2018
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 Y.4421 (ex Y.UAV.arch)	Q3/20	Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks	2021-Q2
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 Y.4455 (ex Y.IoT-NCE)	Q3/20	Reference architecture for IoT network service capability exposure	2017-09
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 Y.4460 (ex Y.dev-IoT-arch)	Q3/20	Architectural reference models of devices for IoT applications	2019-04
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 Y.4462 (ex Y.IoT-ics)	Q3/20	Requirements and functional architecture of open IoT identity correlation service	2019-Q2
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 Y.4467 (ex Y.AERS-msd)	Q3/20	Minimum set of data structure for automotive emergency response system	2019-12
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 Y.4468 (ex Y.AERS-mtp)	Q3/20	Minimum set of data transfer protocol for automotive emergency response system	2019-12
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 Y.4469 (ex Y.SCCE-arch)	Q3/20	Reference architecture of spare computational capability exposure of IoT devices for smart home	2020-Q4
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 Y.4470 (ex Y.SSC-AISE-arc)	Q3/20	Reference architecture of artificial intelligence service exposure for smart sustainable cities	2020-Q4
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 Y.4471 (ex Y.NDA-arch)	Q3/20	Functional architecture of network-based driving assistance for autonomous vehicles	2020-Q4
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 Y.4476 (ex Y.IoT-rf-dlt)	Q3/20	OID-based resolution framework for transaction of distributed ledger assigned to IoT resources	2021-Q2
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## Approved Recommendations Y.4500 (2017-2021)

Y.4500.1 (ex Y.oneM2M.ARC)	Q3/20	oneM2M- Functional Architecture	2017-09	Y.4500.15 (ex Y.oneM2M.TF)	Q3/20	oneM2M- Testing framework	2018-01
Y.4500.2 (ex Y.oneM2M.REQ)	Q3/20	oneM2M- Requirements	2018-01	Y.4500.20 (ex Y.oneM2M.PB.WebSocket)	Q3/20	oneM2M- WebSocket Protocol Binding	2018-01
Y.4500.4 (ex Y.oneM2M.SLCP)	Q3/20	oneM2M- Service Layer Core Protocol Specification	2018-01	Y.4500.22 (ex Y.oneM2M.FDC)	Q3/20	oneM2M- Field Device Configuration	2018-01
Y.4500.5 (ex Y.oneM2M.DM.OMA)	Q3/20	oneM2M- Management enablement (OMA)	2018-10	Y.4500.23 (ex Y.oneM2M.HAIM)	Q3/20	oneM2M-Home Appliances Information Model and Mapping	2018-01
Y.4500.6 (ex Y.oneM2M.DM.BBF)	Q3/20	oneM2M Management enablement (BBF)	2018-01	Y.4500.32 (ex Y.oneM2M.MAF.MEF)	Q3/20	oneM2M- MAF and MEF Interface Specification	2018
Y.4500.8 (ex Y.oneM2M.PB.CoAP)	Q3/20	oneM2M- CoAP Protocol Binding	2018-01				
Y.4500.9 (ex Y.oneM2M.PB.HTTP)	Q3/20	oneM2M- HTTP Protocol Binding	2018-01				
Y.4500.10 (ex Y.oneM2M.PB.MQTT)	Q3/20	oneM2M- MQTT Protocol Binding	2018-01				
Y.4500.11 (ex Y.oneM2M.CT)	Q3/20	oneM2M- Common Terminology	2018-01				
Y.4500.12 (ex Y.oneM2M.BO)	Q3/20	oneM2M Base Ontology	2018-01				
Y.4500.13 (ex Y.oneM2M.InteropTest)	Q3/20	oneM2M- Interoperability Testing	2018-01				
Y.4500.14 (ex Y.oneM2M.IWK.LwM2M)	Q3/20	oneM2M- LwM2M Interworking	2018-01				

## Approved TRs (2017-2021)

Y.oneM2M.Ind.DE	Q3/20	oneM2M Industrial Domain Enablement	2017-09
Y.oneM2M.DG.SEM	Q3/20	oneM2M-Developer Guide of Implementing semantics	2017-09
Y.oneM2M.DG.AppDev	Q3/20	oneM2M- Application developer guide: Light control example using HTTP binding	2017-09
Y.oneM2M.DG.CoAP	Q3/20	oneM2M Developer Guide of CoAP binding and long polling for temperature monitoring	2017-09
Y.oneM2M.DG.DM	Q3/20	oneM2M- Developer guide of device management	2017-09
Y.oneM2M.UCC	Q3/20	oneM2M Use Case Collection	2017-09

## Q3/20 main activities

### Ongoing WIs

WI	Time	Process	Title
<a href="#">Y.AI-DECCS</a>	2022-Q4	AAP	Functional architecture of AI enabled device-edge-cloud collaborative services for IoT and smart city
<a href="#">Y.CDML-arc</a>	2022-Q4	AAP	Reference architecture of collaborative decentralized machine learning for intelligent IoT services
<a href="#">Y.cnce-IoT-arch</a>	2021-Q4	AAP	Functional architecture of cellular-radio network capability exposure for smart hospital based on Internet of things
<a href="#">Y.dec-IoT-arch</a>	2022-Q2	AAP	Decentralized IoT communication architecture based on information centric networking and blockchain
<a href="#">Y.IoT-AOS-prot</a>	2021-Q4	AAP	Protocols of supporting autonomic operations in the Internet of things
<a href="#">Y.IoT-BoT-peer</a>	2022-Q3	AAP	Capability and functional architecture of peer of blockchain of things
<a href="#">Y.IoT-DES-fr</a>	2022-Q4	AAP	Framework of decentralized service by using DLT and edge computing technologies for IoT devices
<a href="#">Y.IoT-DSE-arc</a>	2022-Q3	AAP	Reference architecture of service exposure for decentralized services for IoT applications
<a href="#">Y.IoT-rmc</a>	2022-Q2	AAP	Reference architecture of accessing IoT resources for management and control
<a href="#">Y.IoT-SCS</a>	2021-Q4	AAP	Requirements and functional architecture for smart construction site services
<a href="#">Y.IoT-SQMS</a>	2022-Q4	AAP	Requirements and functional architecture of IoT sensing quality management service

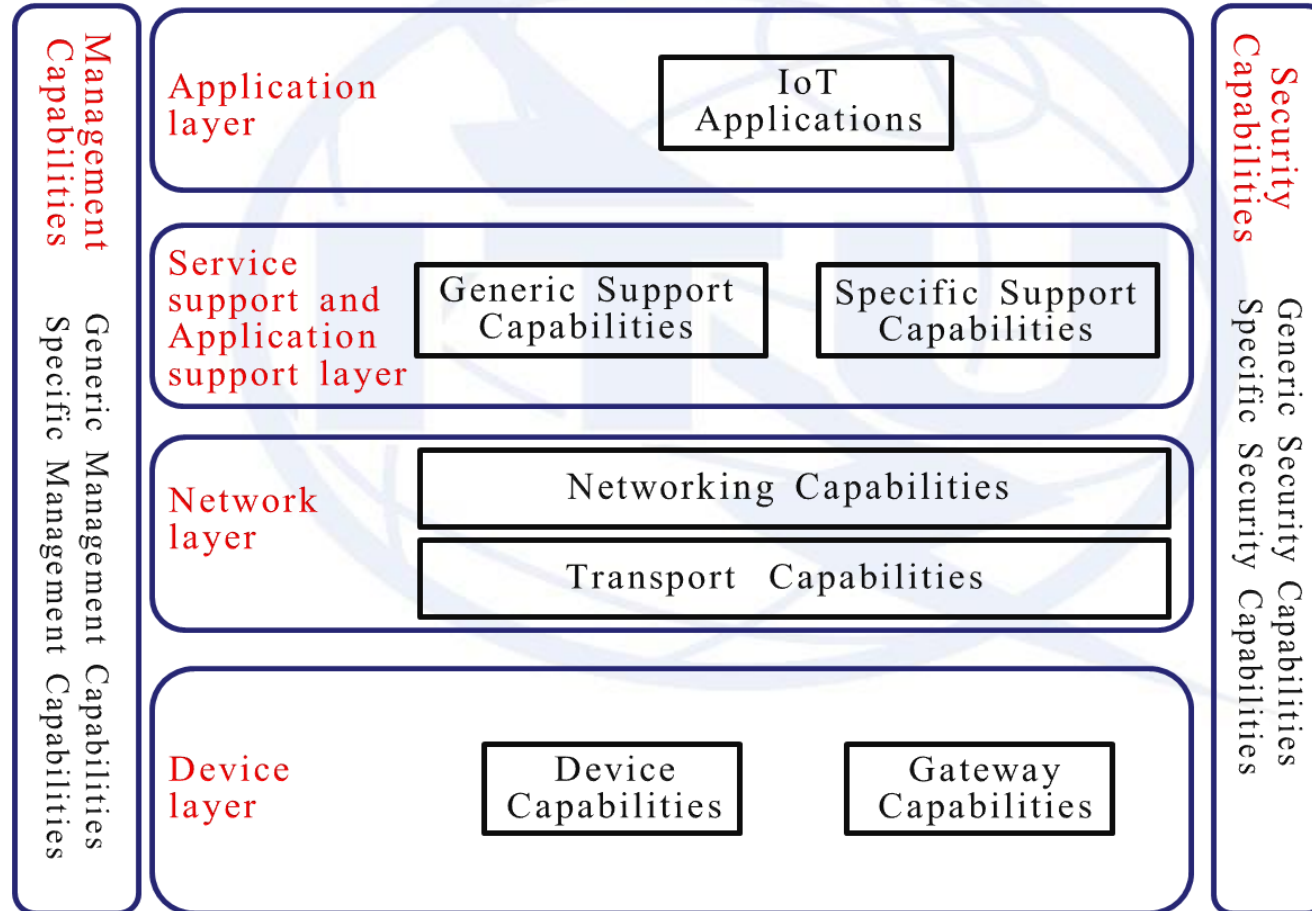


## Q3/20 main activities

### Ongoing WIs

WI	Time	Process	Title
<a href="#">Y.NCE.arch.EIoT</a>	2022-Q4	AAP	Functional architecture enhancement with network capability exposure to support flexible QoS/QoE requirements from enterprise IoT services and applications
<a href="#">Y.RA-FML</a>	2022-Q3	AAP	Requirements and reference architecture of IoT and smart city & community service based on federated machine learning
<a href="#">Y.RA-PHE</a>	2022-Q2	TAP	Requirements and reference architecture of smart service for public health emergency
<a href="#">Y.RA-SDL</a>	2022-Q2	AAP	Requirements and functional architecture of smart door lock service
<a href="#">Y.smart-education</a>	2021-Q4	AAP	Requirements and Reference Architecture of Smart Education
<a href="#">Y.smart-PBRS</a>	2021-Q4	AAP	Requirements and functional architecture of smart power bank rental service
<a href="#">Y.Smart-SBS</a>	2022-Q2	AAP	Requirements and functional architecture of smart sharing bicycle service
<a href="#">Y.TM.DM-API</a>	2021-Q4	AAP	IoT Device Management API REST Specification
<a href="#">Y.TM.SM-API</a>	2021-Q4	AAP	IoT Service Management API REST Specification
<a href="#">Y.UAV.arch</a>	2021-Q2	TAP	Functional architecture for unmanned aerial vehicles and unmanned aerial vehicle controllers using IMT-2020 networks

# Overview of IoT from architecture perspective: ITU-T Y.4000/Y.2060 (06/2012): Overview of the Internet of things

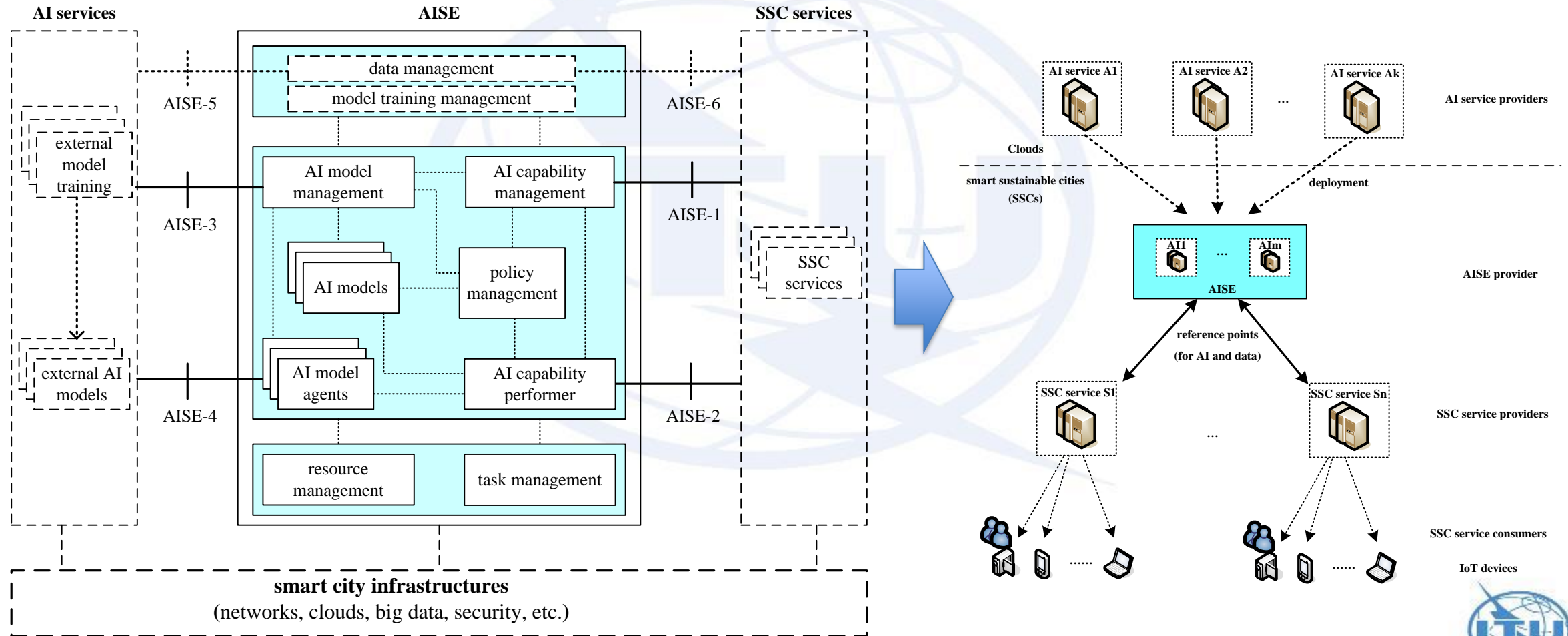


**IoT reference model**



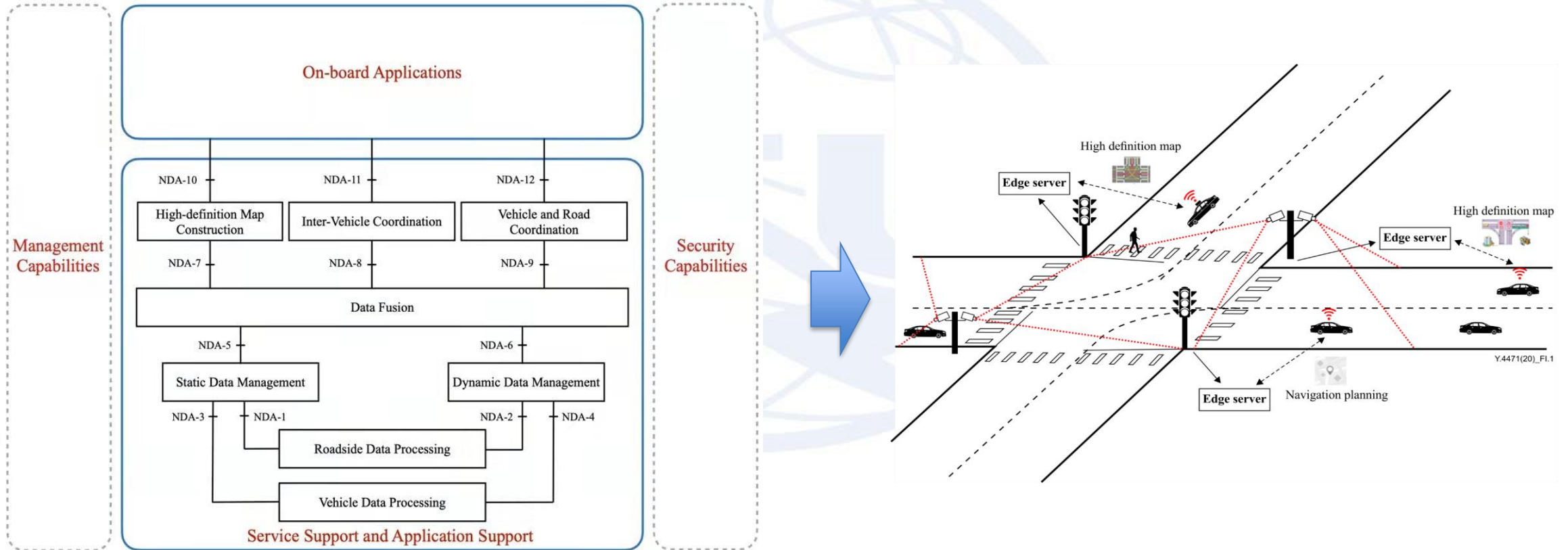
# Y.4470 (ex Y.SSC-AISE-arc)

## Reference architecture of artificial intelligence service exposure for smart sustainable cities



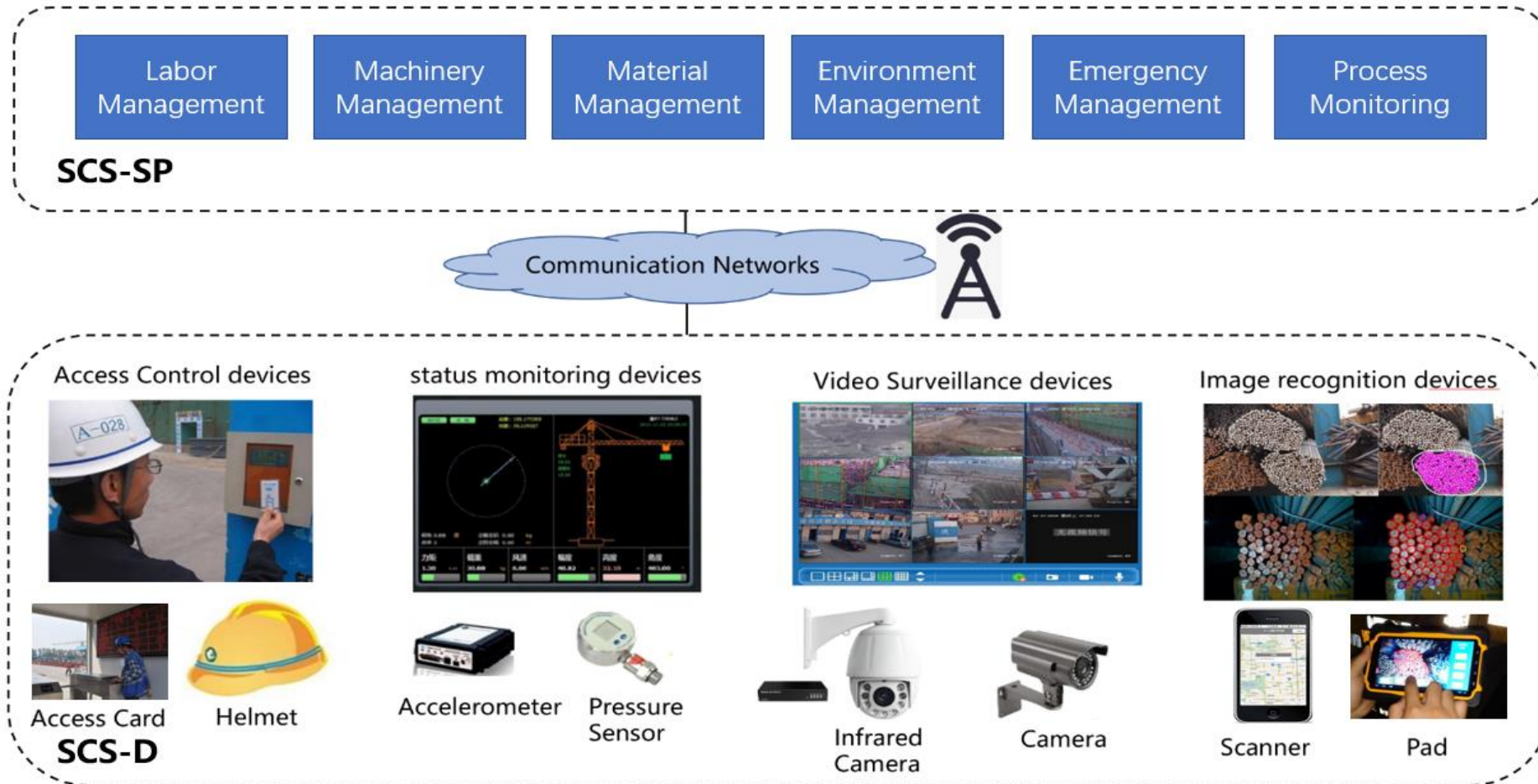
# Y.4471 (ex. Y.NDA-arch)

## Functional architecture of network-based driving assistance for autonomous vehicles



# New WI (Under AAP) Y.IoT-SCS

## Requirements and functional architecture for smart construction site services



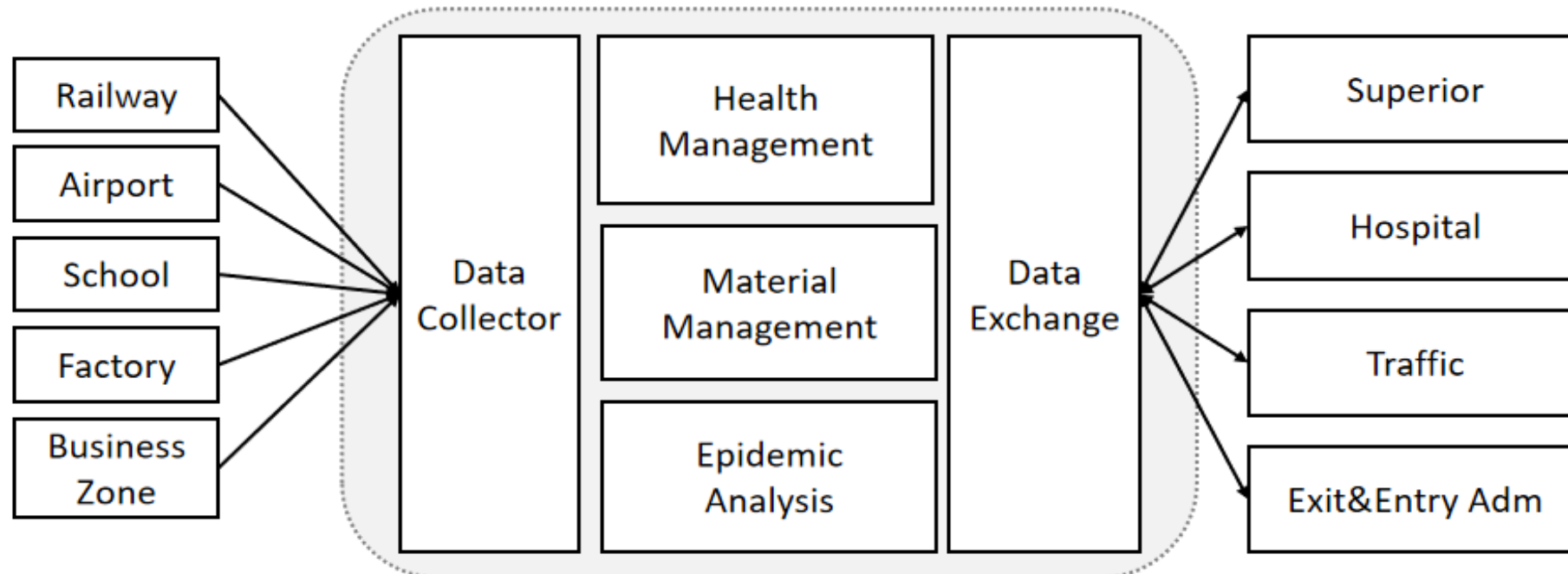
# New WI (Under TAP) Y.RA-PHE

## Requirements and reference architecture of smart service for public health emergency

data collection zone

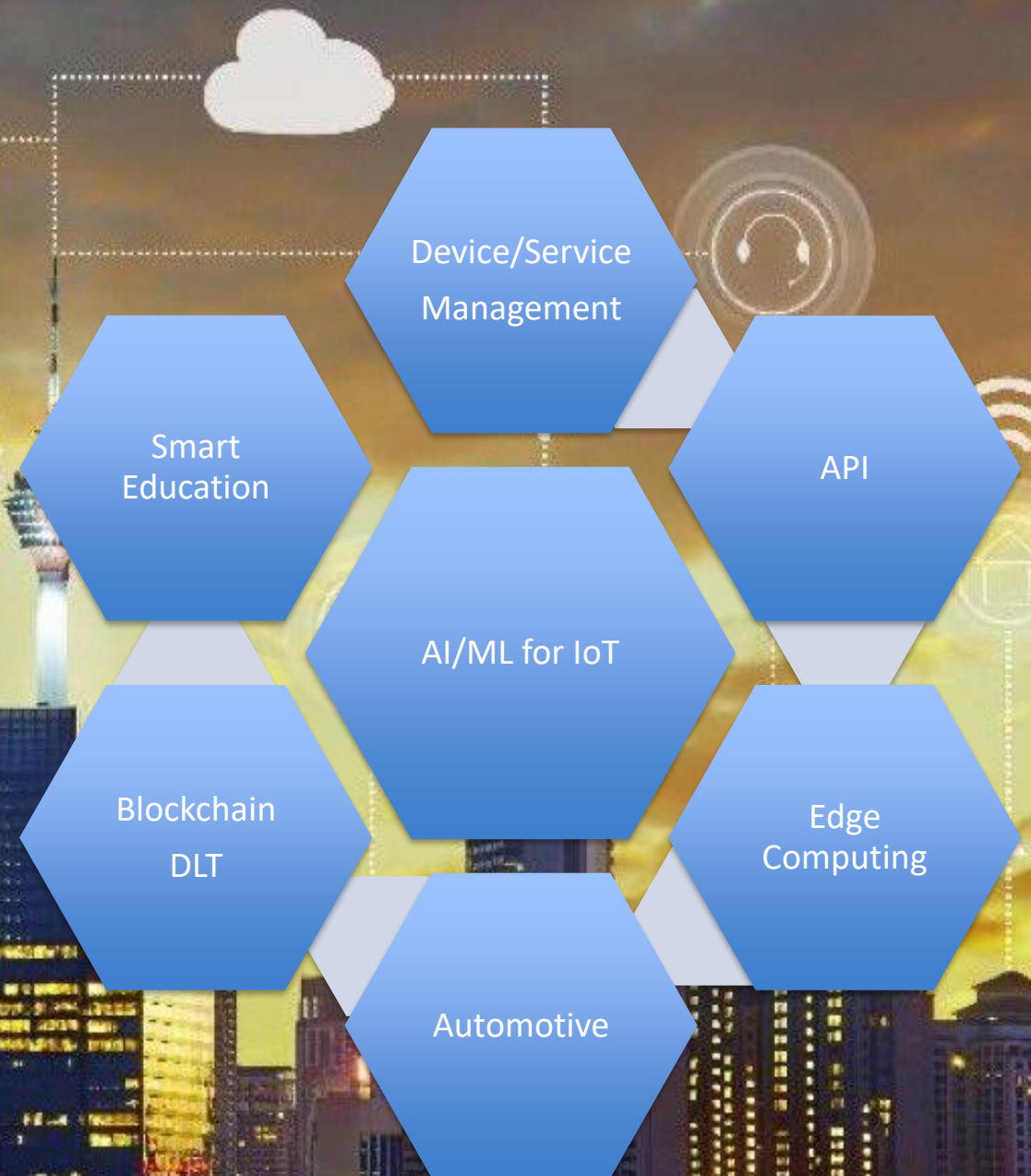
Smart service for public health emergency

Scene



# Key topics in Q3/20

Architecture, protocol,  
QoS/QoE, management,  
connectivities, etc. of:



# Strengthening Regional & International Collaboration

## Regional Groups

- SG20RG-LATAM
- SG20RG-ARB
- SG20RG-AFR
- SG20RG-EECAT

## JCA-IoT and SC&C

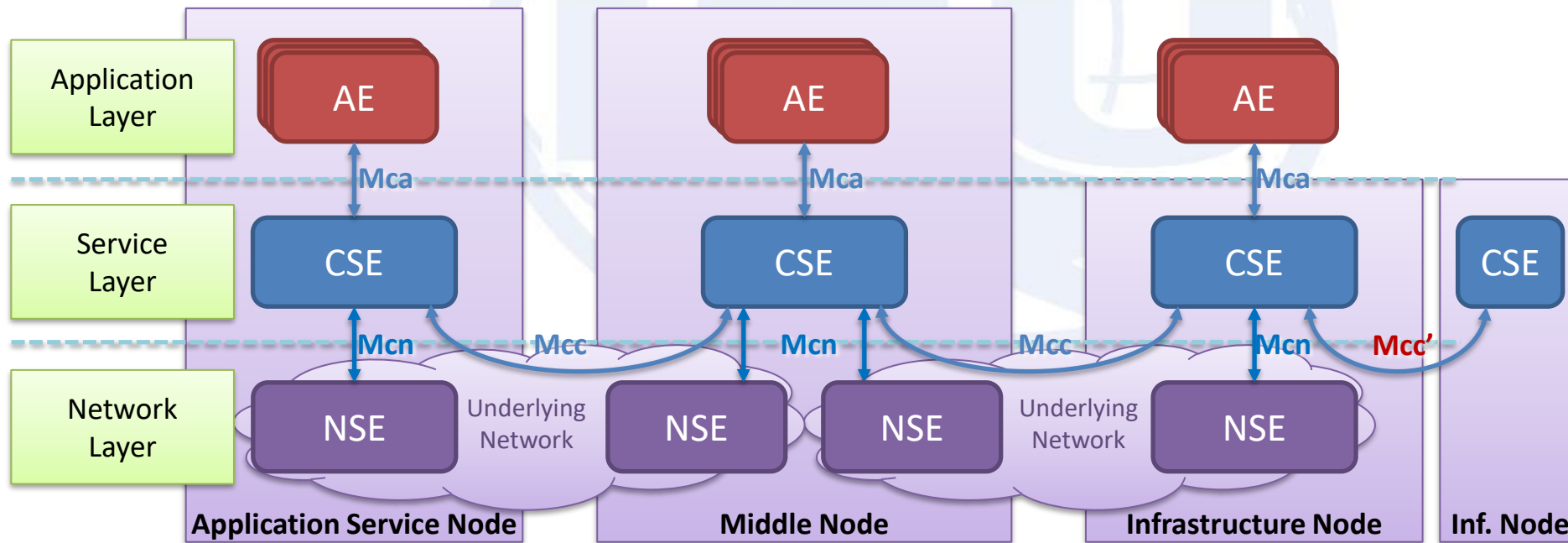
- Collaboration and coordination with other SDOs on topics on IoT and SC&C
- IoT and SC&C online standards roadmap

## SDOs & Alliances



# ITU-T Recommendation Y.4500.1: oneM2M Functional Architecture

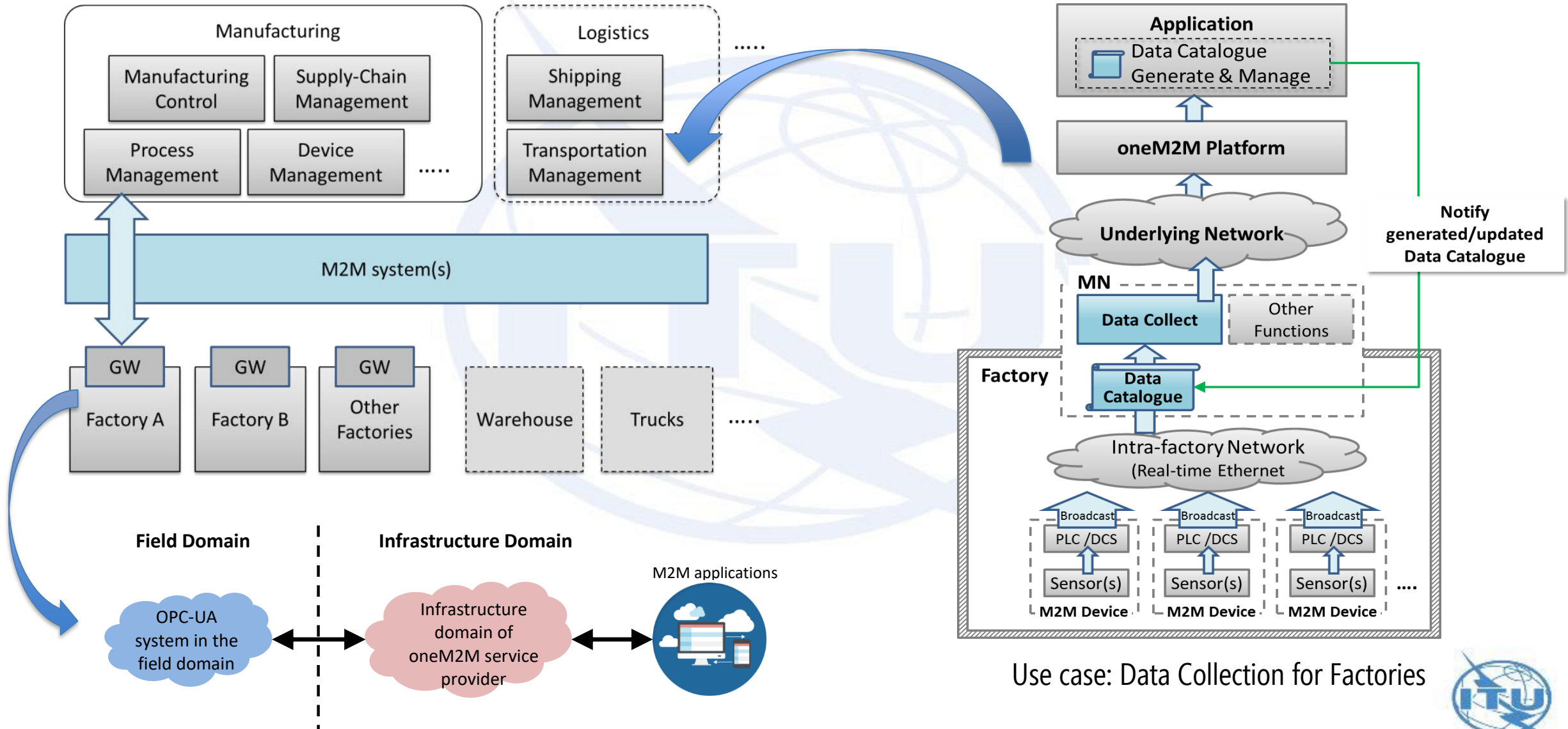
- Reference Point** One or more interfaces - Mca, Mcn, Mcc and Mcc' (between 2 service providers)
- Common Services Entity** Provides the set of "service functions" that are common to the M2M environments
- Application Entity** Provides application logic for the end-to-end M2M solutions
- Network Services Entity** Provides services to the CSEs besides the pure data transport
- Node** Logical equivalent of a physical (or possibly virtualized, especially on the server side) device



Multiple protocol bindings (HTTP, CoAP, MQTT, or WebSocket) over Mca, Mcc, Mcc'

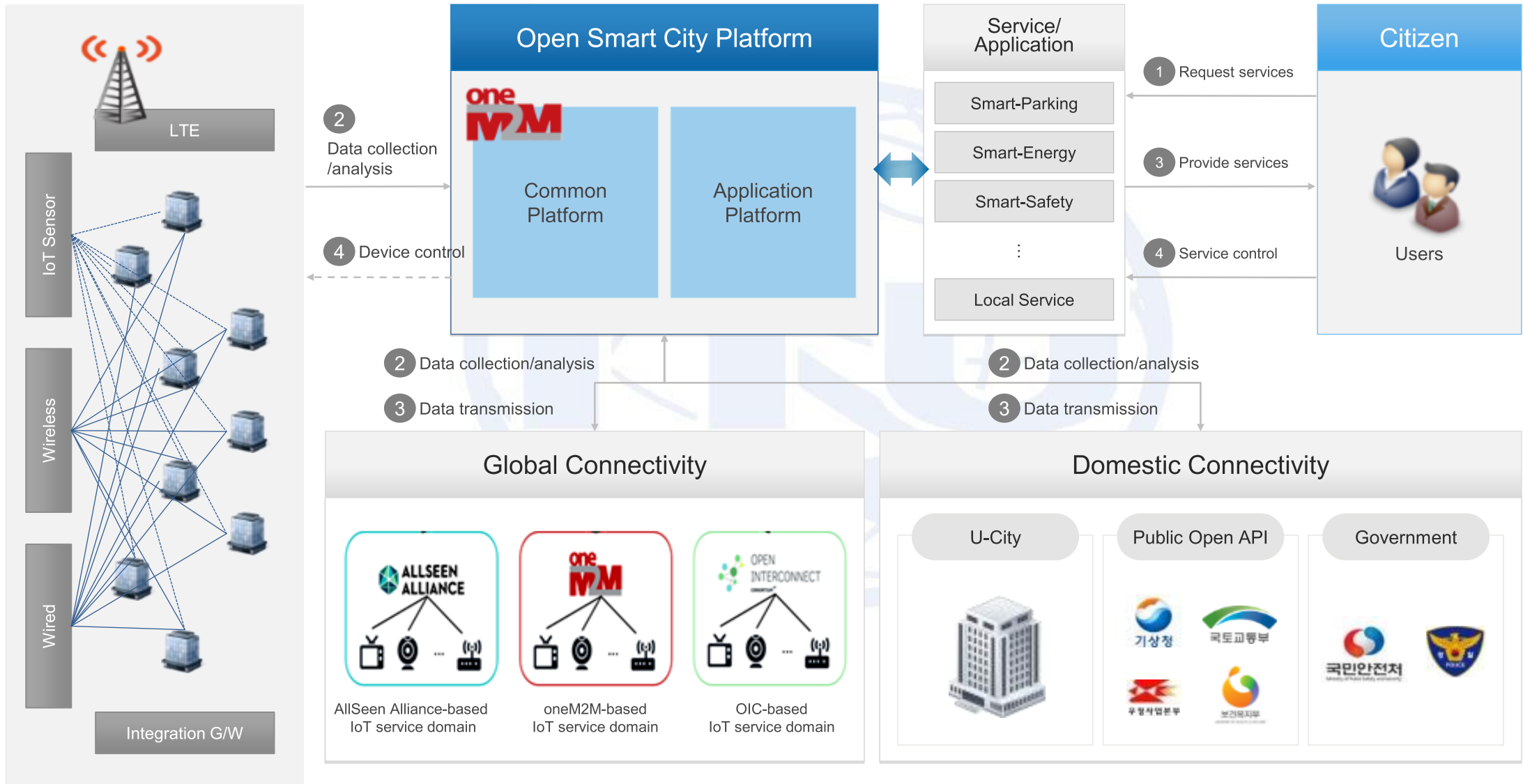


# Technical Report: oneM2M Industrial Domain Enablement

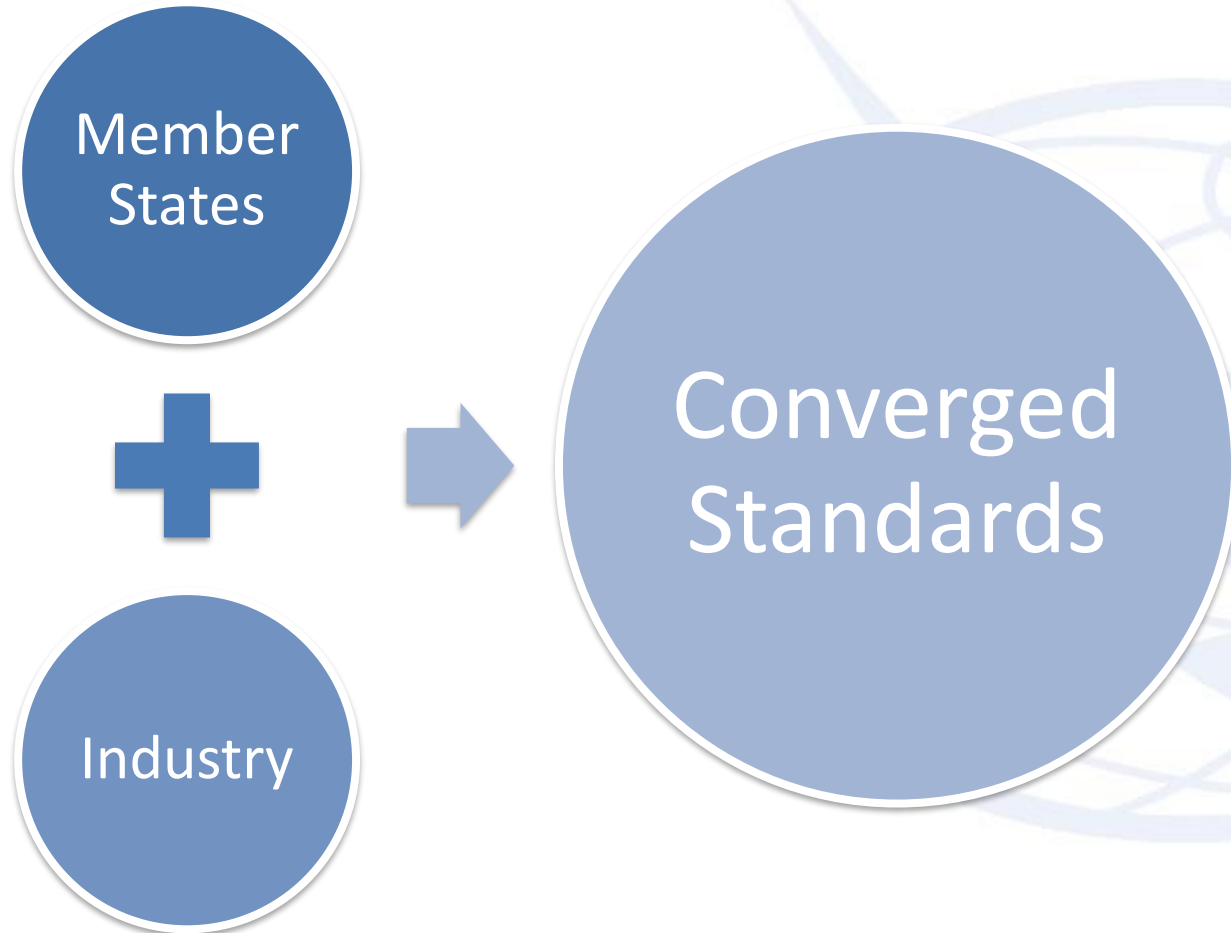




# oneM2M based smart city deployment example - Busan



# International Collaboration



## Benefit:

- ✓ Membership of both organizations have been calling for convergence of IoT standards and alignment of work.
- ✓ The work done in both organizations is complementary.
- ✓ One of the ITU-T strategic objectives is cooperation and collaboration.
- ✓ Industry and Member States benefit from converged and aligned standards

## Progress:

- ✓ 17 oneM2M Technical specifications approved as ITU-T Recommendations (Y.4500 series)
- ✓ 6 oneM2M Technical reports approved as ITU-T technical reports
- ✓ Discussion is going on for next step collaboration



Thank you

ITU-T, IoT and smart  
cities & communities

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