Digital Twin Enabling Smarter IoT Network

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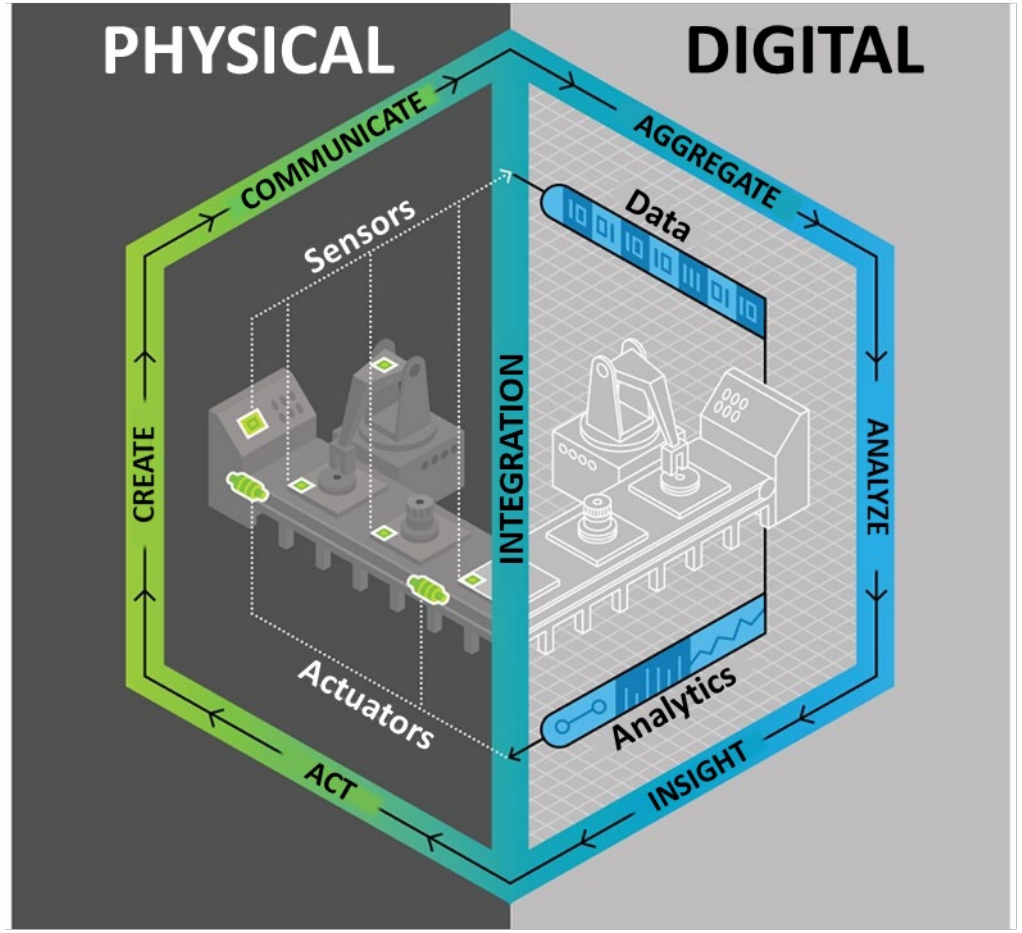
ITU

What is Digital Twin？

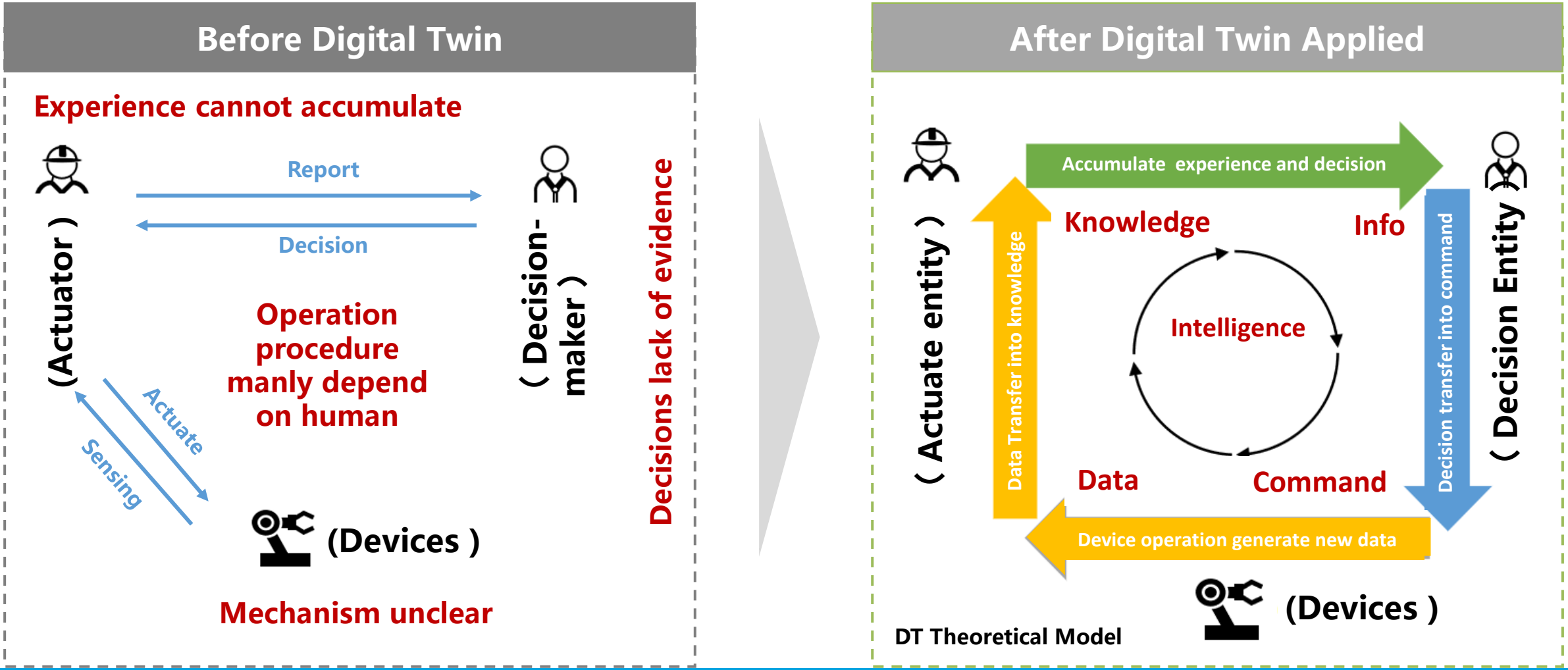


Low-cost
Trial & error

Intelligent
Decision

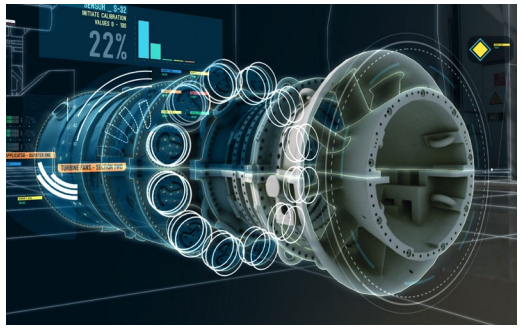
Efficient
Innovation

Digital Twin Paradigm Realize System Automation and Knowledge Inheritance

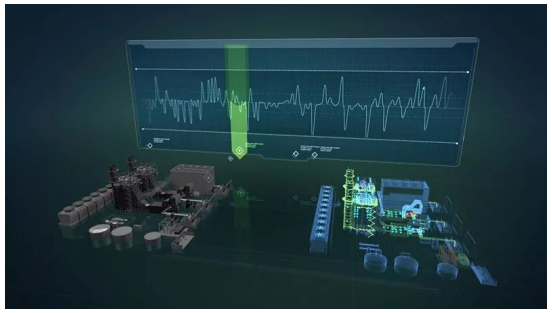


Utilization Of Digital Twin Can Enhance IoT Infrastructure And Verticals

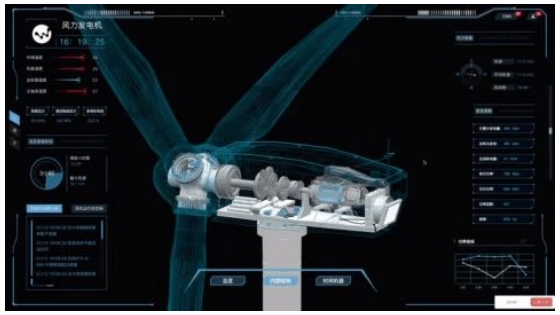
Aerospace



Manufacturing



Energy



Agriculture

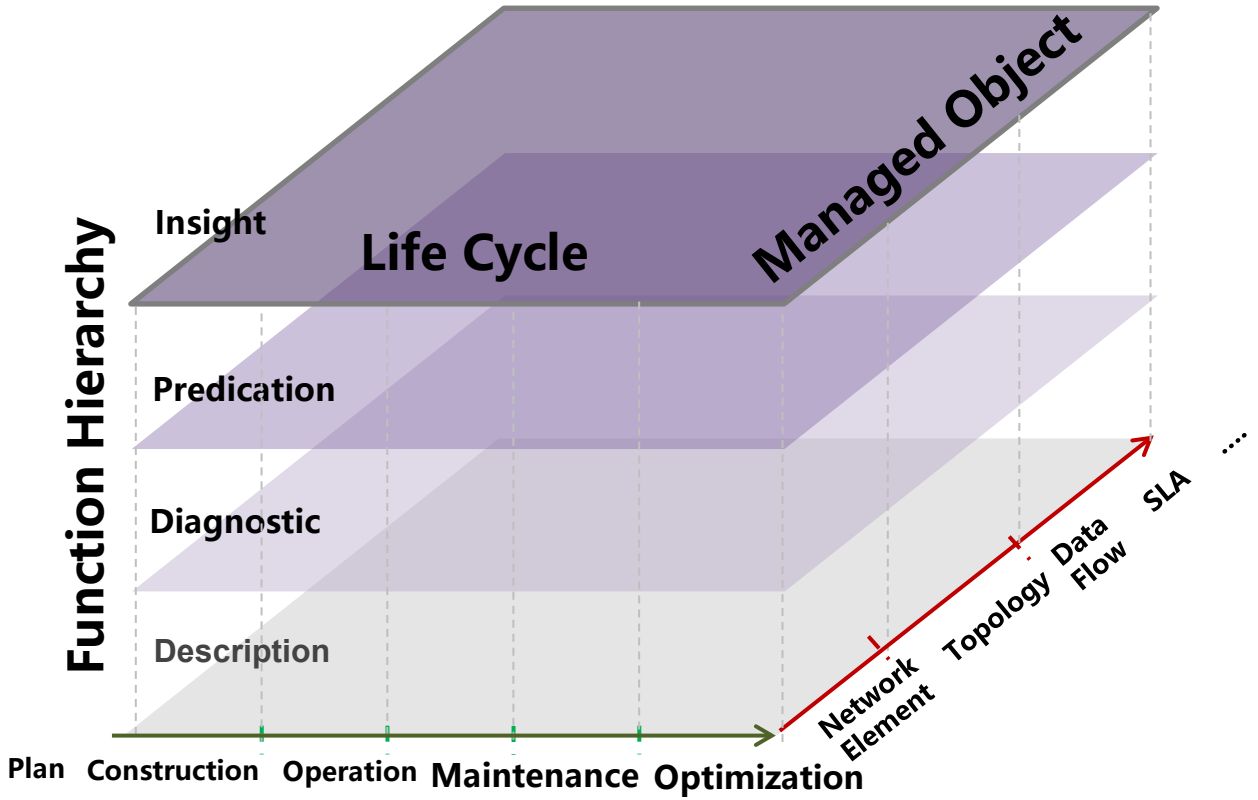
Transportation

Smart City

Wise Medical

Tourism

What Is Future IoT Network For Vertical Digitalization?



NMRM,Network Management Reference Model

Openness: *Enhance* ***interoperability*** *across objects, models and systems*

Flexibility: *Improve* ***expansibility*** *and* ***reusability*** *of digital resources*

Intelligent: *Support* ***data integration*** *across systems,*

What Digital Twin Could Do For IoT Network？

Digital Twin Network

Openness

- Realize digital visualization of all network element
- Enhance interoperability across objects, models and systems

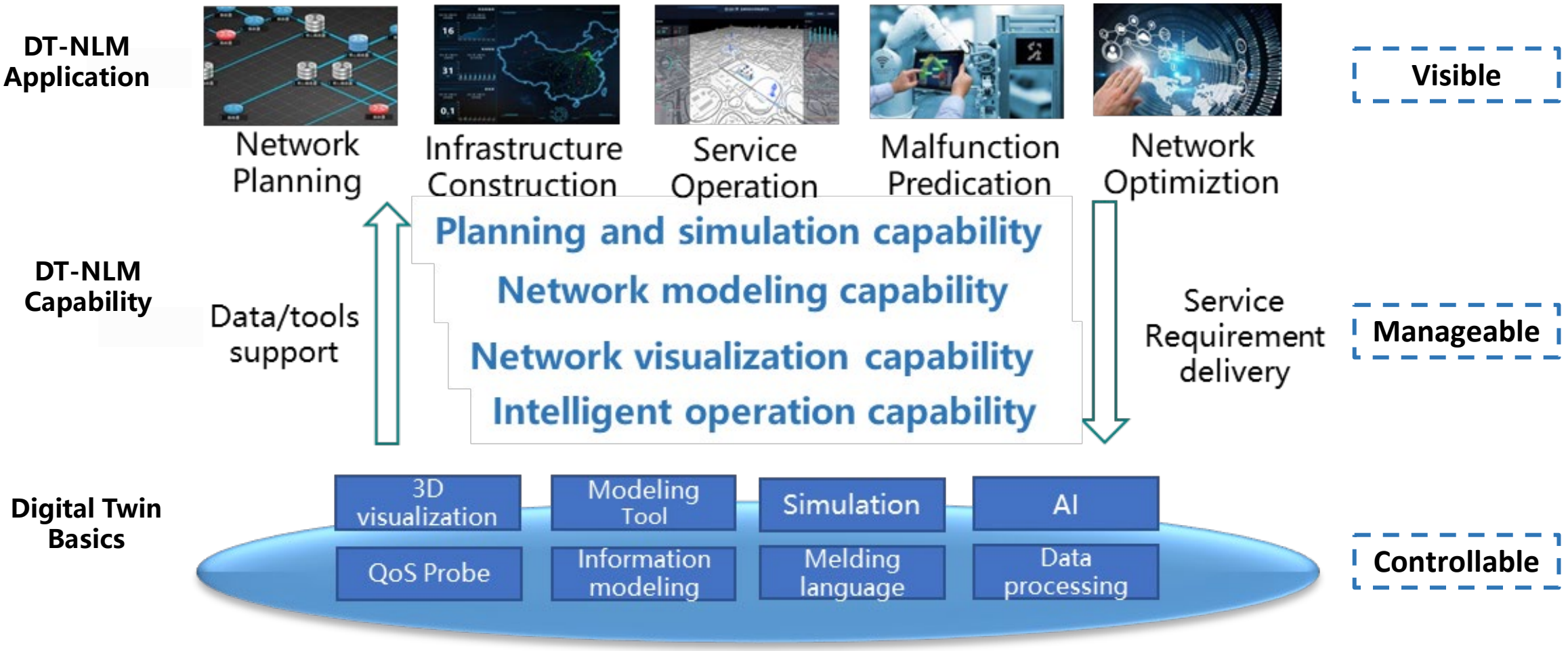
Flexibility

- Provide flexible invocation through object-oriented modeling,
- Improve expansibility and reusability of digital resources

Intelligent

- Support data integration across objects and systems.
- Construct foundation for intelligent operation , network autonomation and self-optimization

CMCC Practice: Digital twin based network lifecycle management



Digital Twin based network lifecycle management

Improve IoT Network Service Based On DT-NLM

The interface that enhance communication with users.

The simulation tool and reference that improve network construction

The intelligent engine that enable autonomous optimization

Planning and design

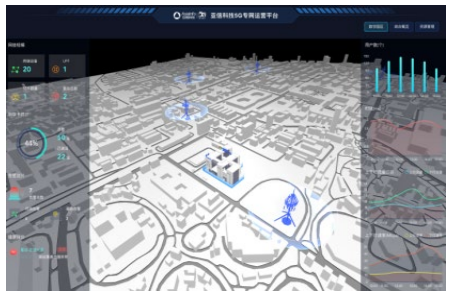
1. Network virtual planning and design
2. Network scheme visualization

Implementation

1. Network topography visualization
2. Construction plan dynamic optimization
3. Network performance simulation

Operation

1. GIS visualization
2. Holistic view of network
3. NE positioning
4. Dynamic and static information display (data flow, SLA, and network traffic)
5. Intelligent analysis and optimization

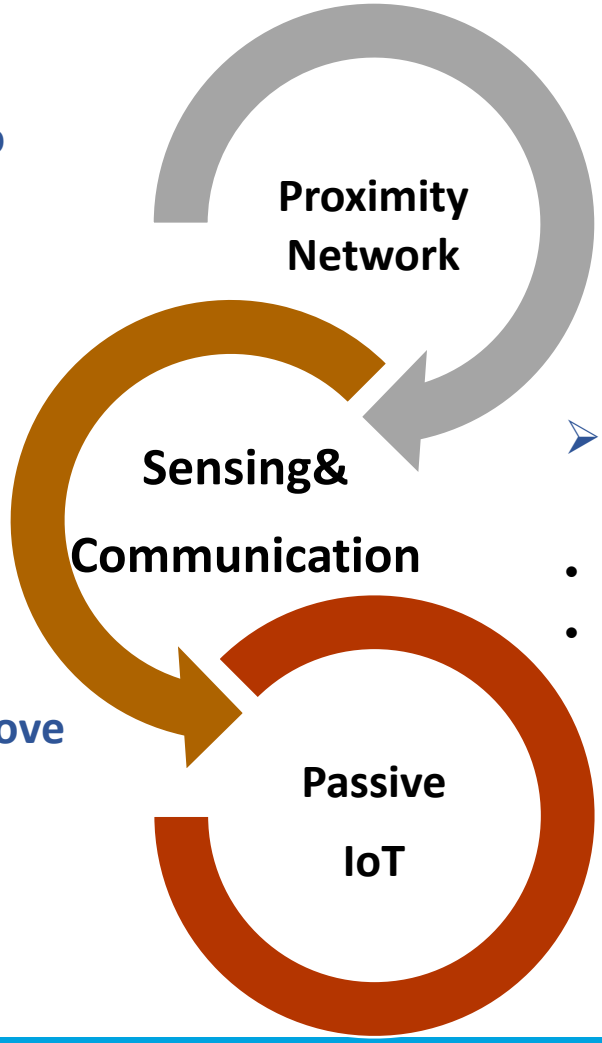


Standardization works on “Digital Twin” in ITU-T

- ITU-T SG20 is working to address the standardization requirements of Internet of Things (IoT)
- Recommendations related to Digital Twin developed/under development by SG20
  - **ITU-T Y.DT-interop**：“Interoperability framework of DT systems in smart cities and communities” is under development by Q2/20, it will provide a architecture framework for cities and communities DT system from three aspects: data interoperability, data processing and infrastructure.
  - **ITU-T Y.SCDT-rqts**：“Requirements and capabilities of a DT system for smart cities” ” is under development by Q2/20, it will identify requirements and capabilities of smart city digital twin system which may be used to analyze use cases and case studies, develop strategies and identify optimal parameters to achieve a specific goal of city by conducting simulations on a digital replica of the city (virtual cities).
  - **ITU-T Y. DT-firefighting**： “Requirements and capability framework of DT for smart firefighting” is under development by Q2/20, it will specify requirements and capabilities of smart firefighting digital twin system, which can utilize real-time interaction between digital and physical world to develop and optimize rescue strategies.
  - **ITU-T Y. DT-ITS**: “Requirements and capability framework of DT for intelligent transport system” is under development by Q2/20, it will specifies the requirements and capability framework of digital twin for intelligent transport system in order to support intelligent transportation applications such as transportation planning and traffic optimization.
  - **ITU-T Y.supp.DTw-concept-usecase**: “Concept and use cases of a digital twin in smart sustainable cities” is under development by Q2/20, Tit defines the concept, common vocabularies and describes use cases of digital twins in smart sustainable cities from a maturity perspective. It will also identify challenges and opportunities for digital twins in smart sustainable cities.

Look Into Future

- **The network below gateway is the key to solve “last 100 meters” connectivity**
  - Industrial field bus, TSN, OPCUA
  - RFID, Zigbee, LoRa
  - Smart sensor network



- **Sensing and Communication Integration is the future of IoT networks**
  - Wi-Fi sensing
  - 5G sensing

- **Passive communication and sensing remove the limitation of power consumption**
  - New RFID
  - Passive sensing
  - Self-energizing by electromagnetic wave

THANK YOU