Innovative R&D by NTT

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IoT 2.0

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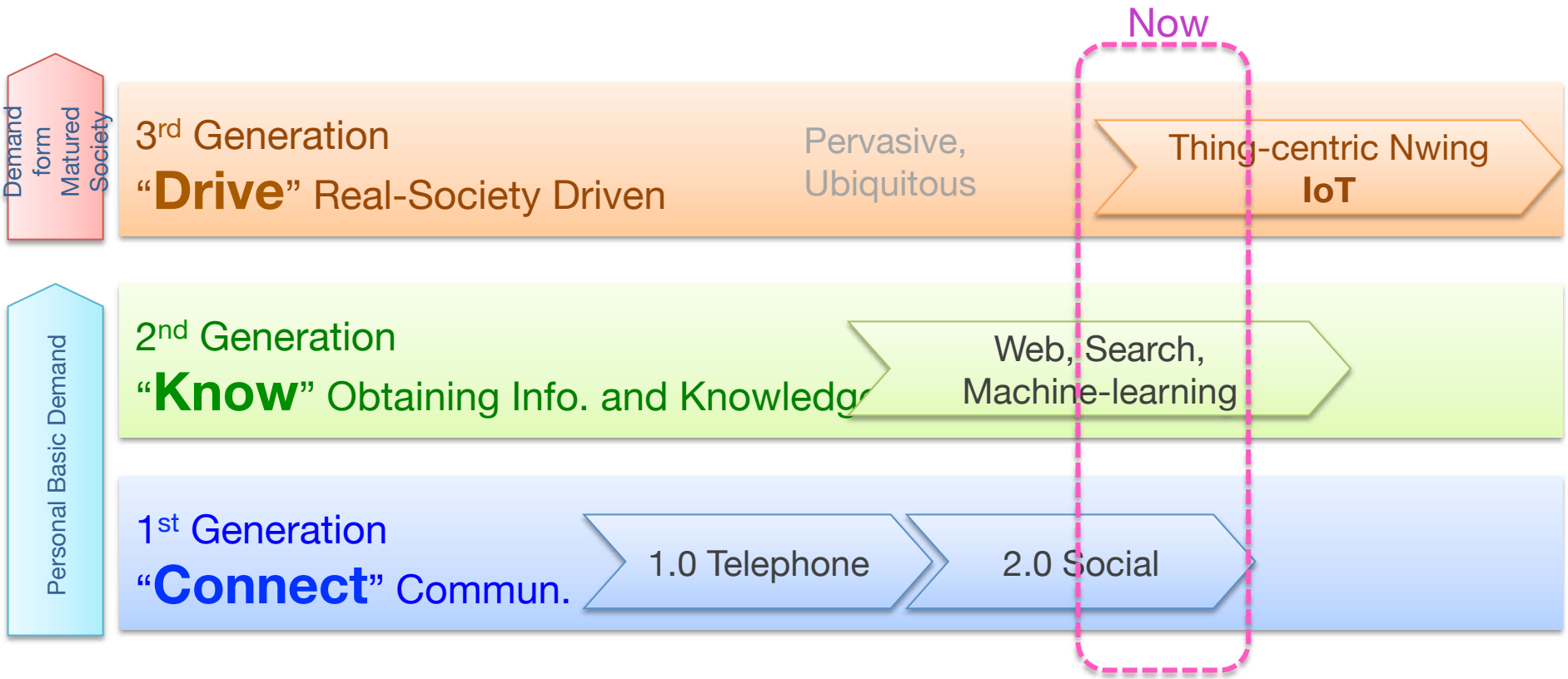
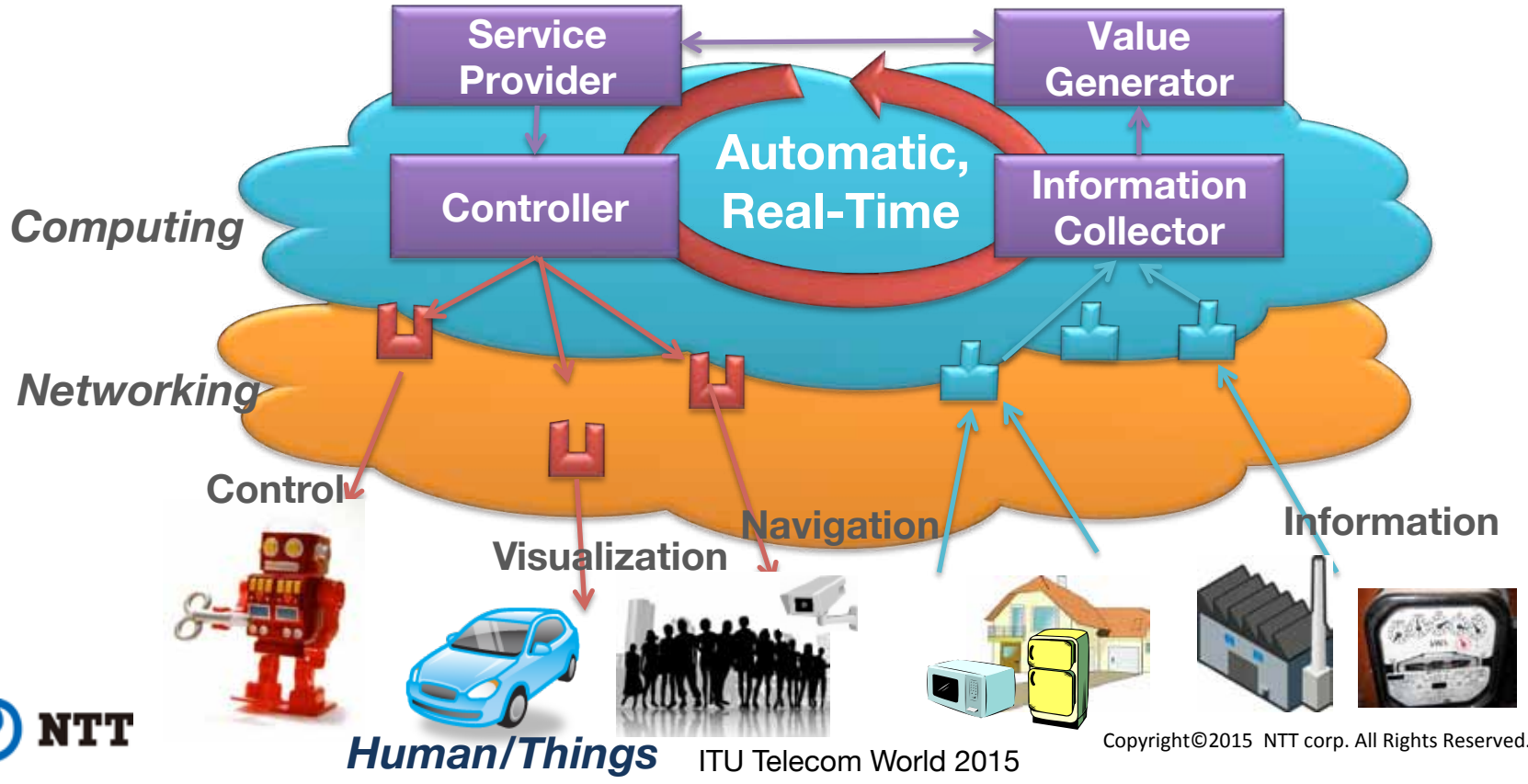
3rd Generation of ICT: "Real-Society Driven"

- Information and communications technology is getting into the phase of "Real-Society Driven" by thing-centric networking



IoT 2.0

- IoT is world in which things and humans are connected and cooperate with each other
- Second generation of IoT ("IoT 2.0") drives real world "autonomously and at high-speed/real-time without mediation of human decisions."
- 3 Steps: (1)Understand current events, (2) Predict future, (3) Drive world



Motivation of IoT 2.0

– demands from mature society-

Expansion of Earth's Limitations

- Energy
- Population
- Global warming
- Food . . .

Addressing of Important Issues

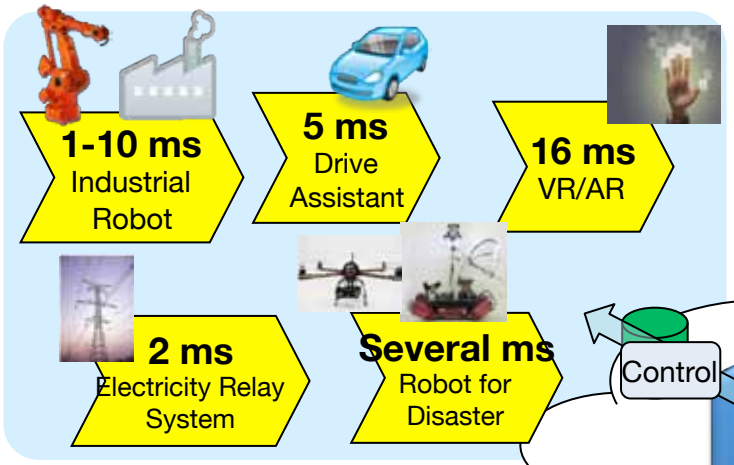
- Minimizing traffic accidents
- Elder-care, dementia
- Wealth gap . . .

Societal Demands

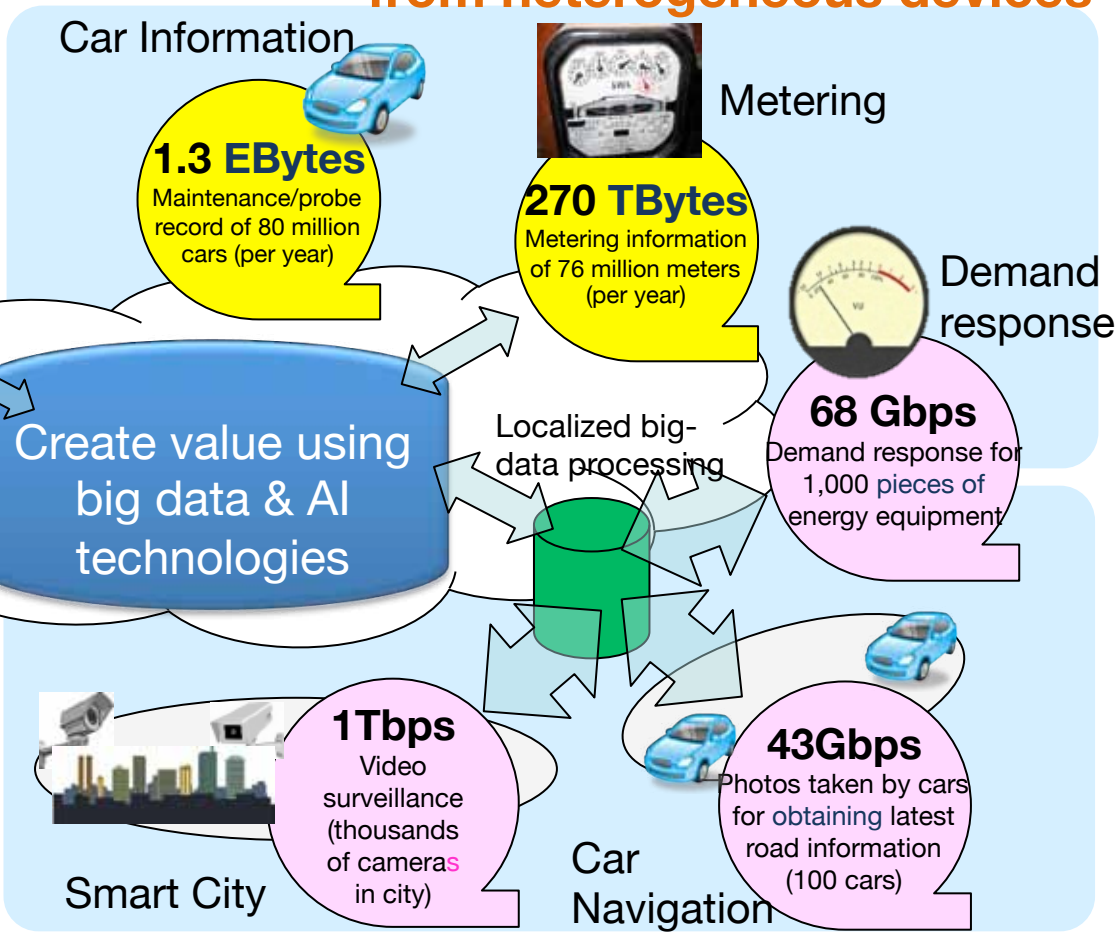
- Automation
- Productivity
- Improvement in comfortability
- Expansion of personal ability

Key issues of IoT

Real-time Control



Huge, varied, incomplete Data from heterogeneous devices



Impact of Cyber Attack

Area Dependency of Information

NTT

Requirements of IoT

Technical Requirements

Real-time
Real-time capability in milli-second order for information processing and transaction

Scalability
Capability to process huge, varied, incomplete data of several Ebytes per year

Security
Security systems for enormous number of low-end IoT devices

Value Creation
Generate distinctive value from big-data analysis

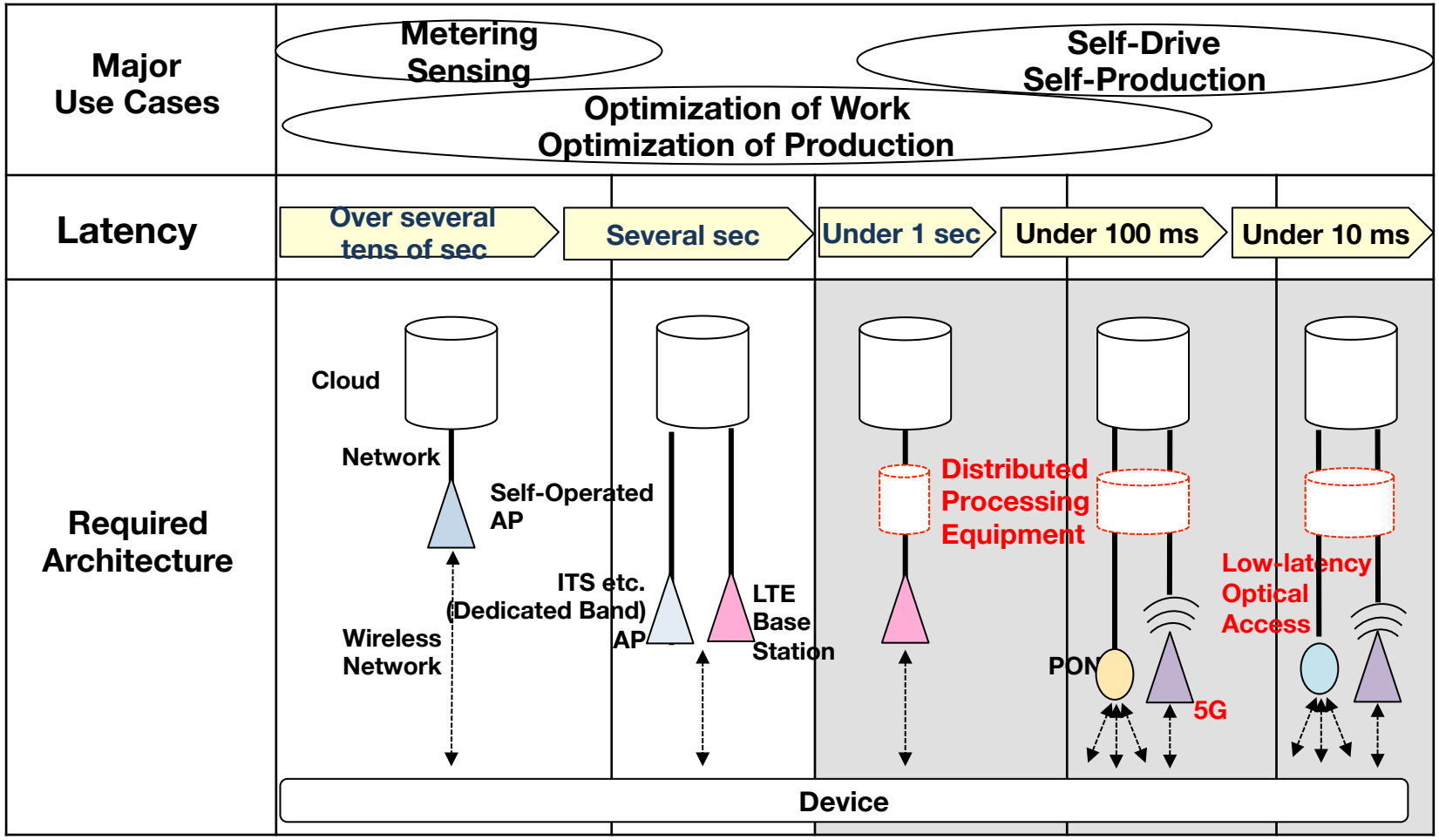
Non-Technical Requirements

Long-term Business Incubation
Incubate businesses such as social infrastructure, connected vehicles and home ICT for several decades

Consensus for data-use
Social agreement of using public/ private data for driver-less cars and smart cities

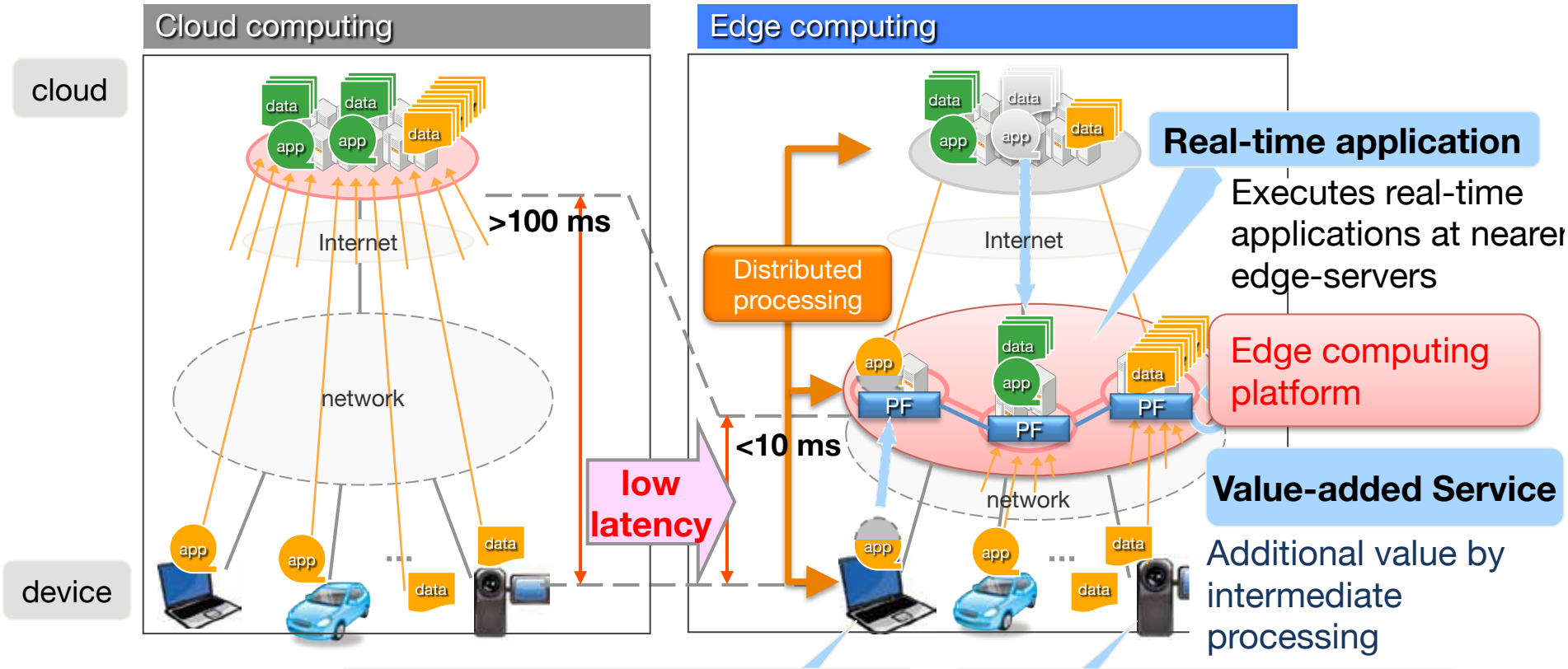
Requirements for distributed computing from perspective of real-time processing

- **“Low-latency network”** and **“Geographically distributed computing ”** are needed for satisfying demands of real time control.

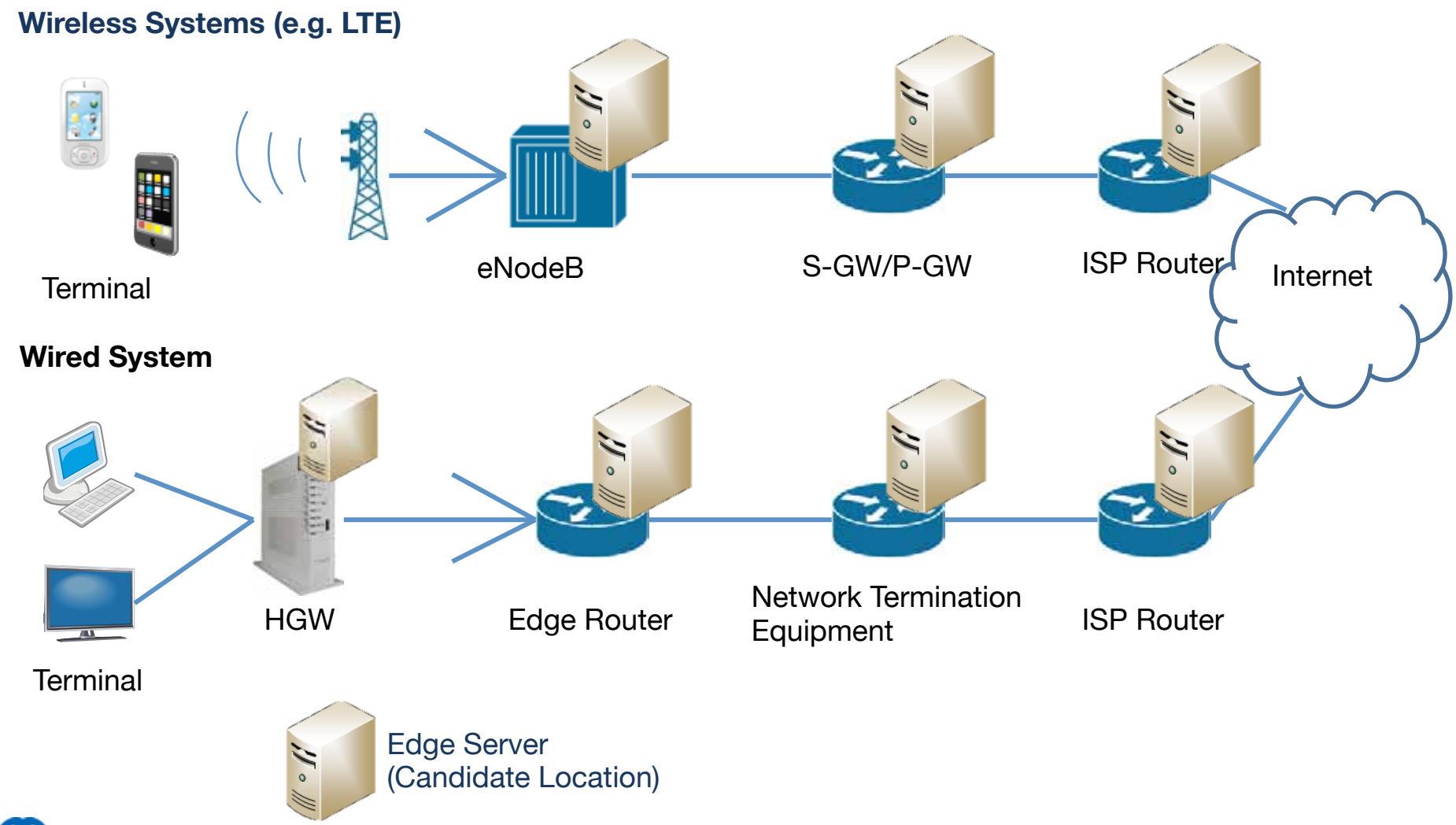


Edge computing

- **Rapid response: more interactive applications**
- **Enables wide-area/vertical distribution: enables more efficient processing assignment**



Candidate of location for edge Servers in current NWs



International Standardization: ETSI ISG MEC

- **ETSI ISG MEC (Mobile Edge Computing) started on Dec. 2014.**
- **Base station (eNodeB) and other mobile nodes are candidates of the "Edge Node".**

Current Members

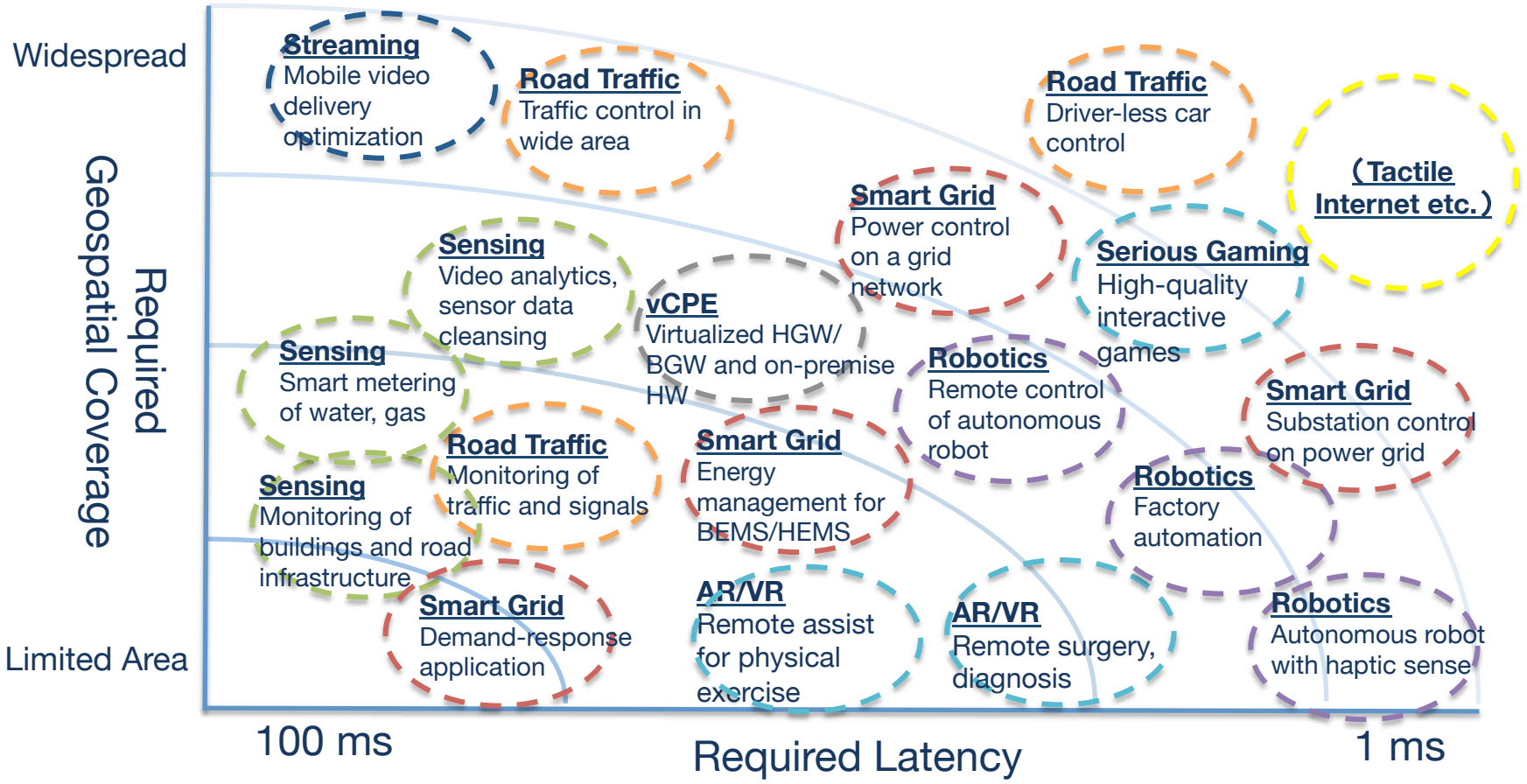
- IBM, Akamai (Cloud Provider)
- Vodafone, **NTT, NTT DOCOMO**, Orange, Telefonica, Telecom Italia, SK Telecom (Telecom Carrier)
- Intel, Nokia Solutions and Networks, Huawei, HP, NEC, Fujitsu, Samsung, SONY, Saguna, Ceragon, InterDigital, SpiderCloud, ZTE (Network Hardware/ Software Vendor)

Activities

- Standardization of system architecture and technical method (management method, API, etc.)
- Discussion about use cases, expected services, and business models
- Promotion of liaison with other standardization organizations.

Real-time applications run on edge

◆ **Various types of applications possible by super-low latency and wide-spread distributed platform for IoT applications**



World of IoT 2.0 using edge computing