Softwarization and Edge Computing Platform

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ONF board member

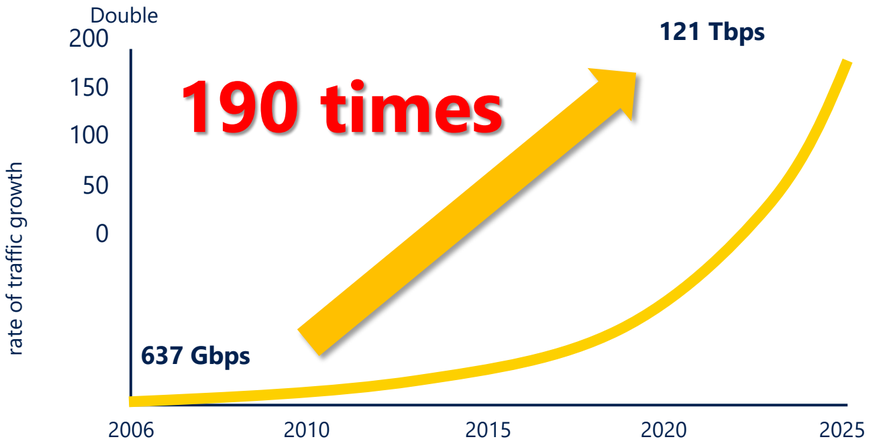
Agenda

- NTT's IOWN (Innovative Optical and Wireless Network) Concept
- Softwarization Challenges
- Edge Computing Platform

NTT's IOWN (Innovative Optical and Wireless Network) Concept

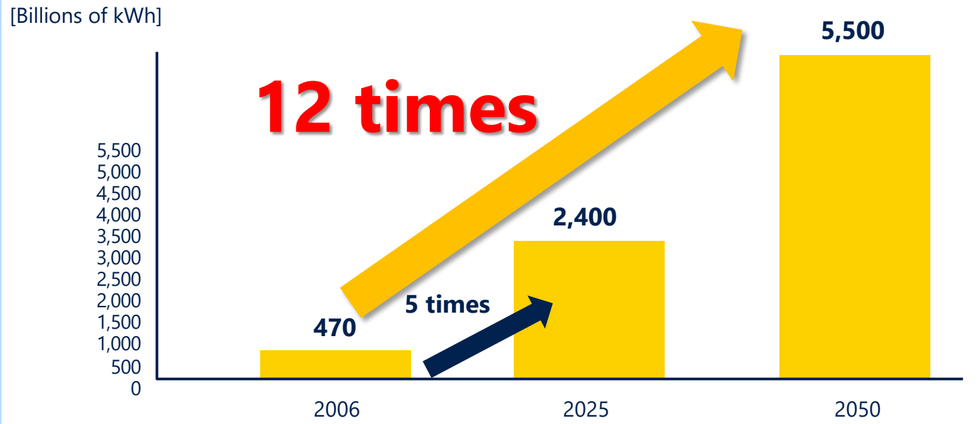
Challenges for Sustainable Growth

Estimating the amount of information distributed through the Internet



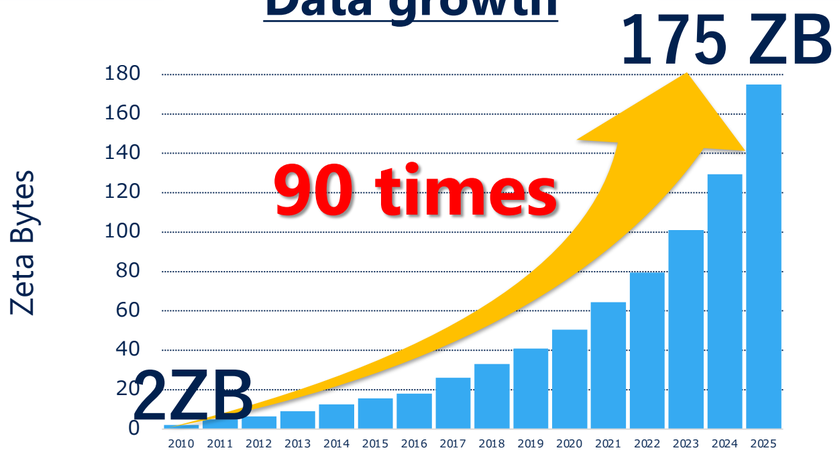
Source: "Green IT Initiative" (2007.12) by the Ministry of Economy, Trade and Industry

Estimation of IT equipment power consumption



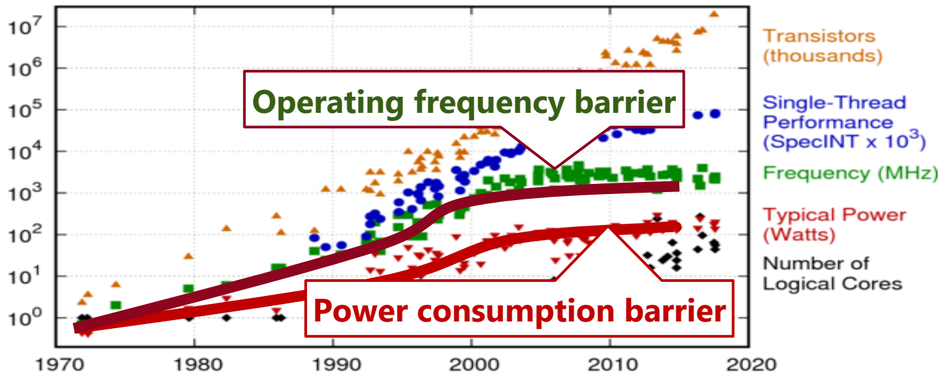
Source: "Green IT Initiative" (2007.12) by the Ministry of Economy, Trade and Industry

Data growth



Source: IDC "November 2018 The Digitization of the World Fro...

Stagnation in technological evolution



Source: https://www.karlrupp.net/2018/02/42-years-of-microprocessor-trend-data/

Challenges for Sustainable Growth

"Low power consumption", "Large capacity, High quality" and “Low latency" networks by utilizing photonics technologies (Electronics to Photonics)

- Quality guaranteed services by assigning wavelengths to each service
- Ultra-precise time information
- Fast computation of combinatorial optimization problems

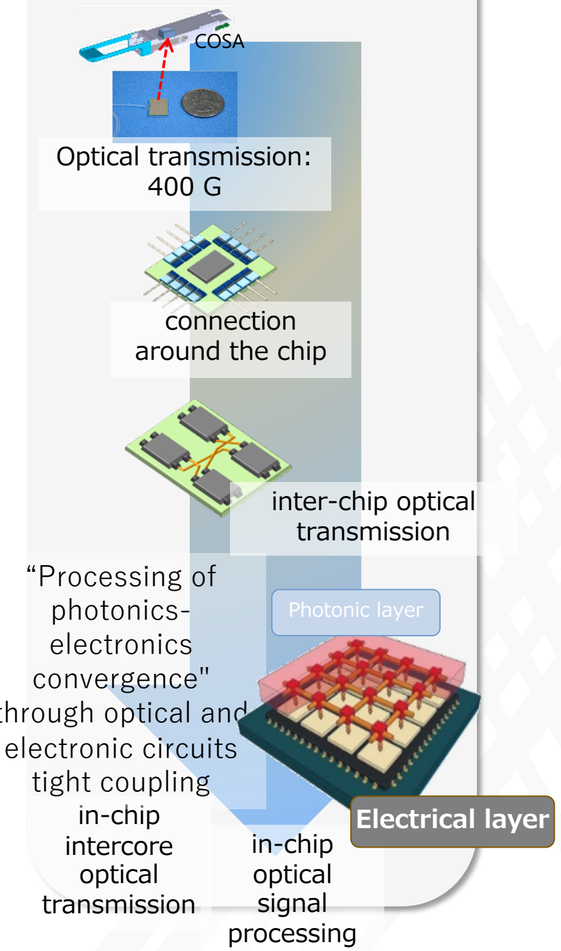
LASOLV

Optical Processor

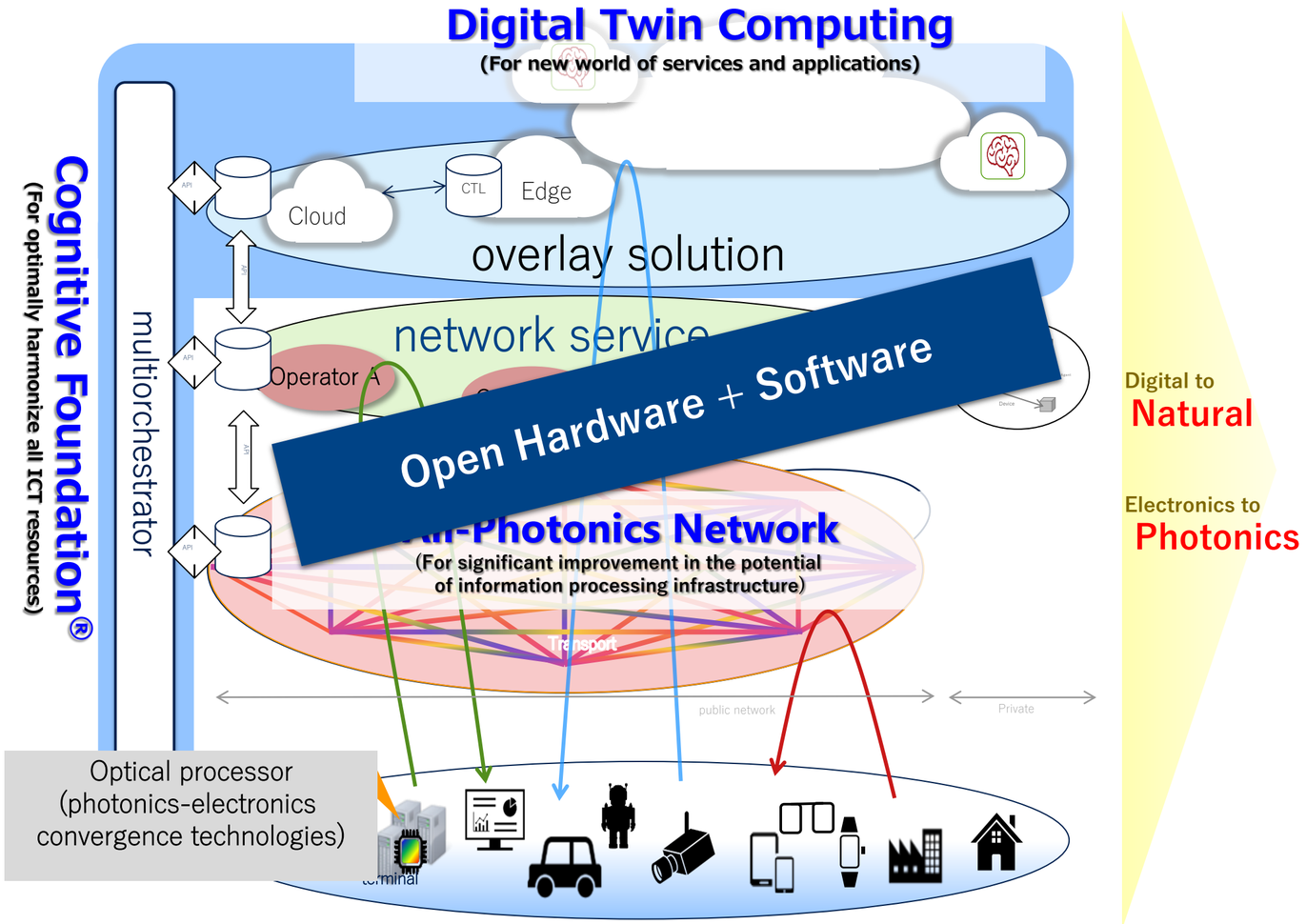
All-Photonics Network

Low power consumption	Large capacity, High quality	Low latency
Electrical efficiency 100 times	Transmission capacity 125 times	End-to-end latency 1/200

Photonics-electronics convergence devices



IOWN (Innovative Optical and Wireless Network)



Digital to **Natural**

Electronics to **Photonics**

- Accurate prediction by simulation that takes into account human thoughts and emotions (ex. Future city planning etc.)
- Reproduction of realistic sensation beyond five senses such as skin sensation (High realistic live, expanded eSports, etc.)
- Work allocation, decision making, future forecasts, etc., using your own self in cyber space

Founding Members

IOWN GLOBAL FORUM

https://iowngf.org

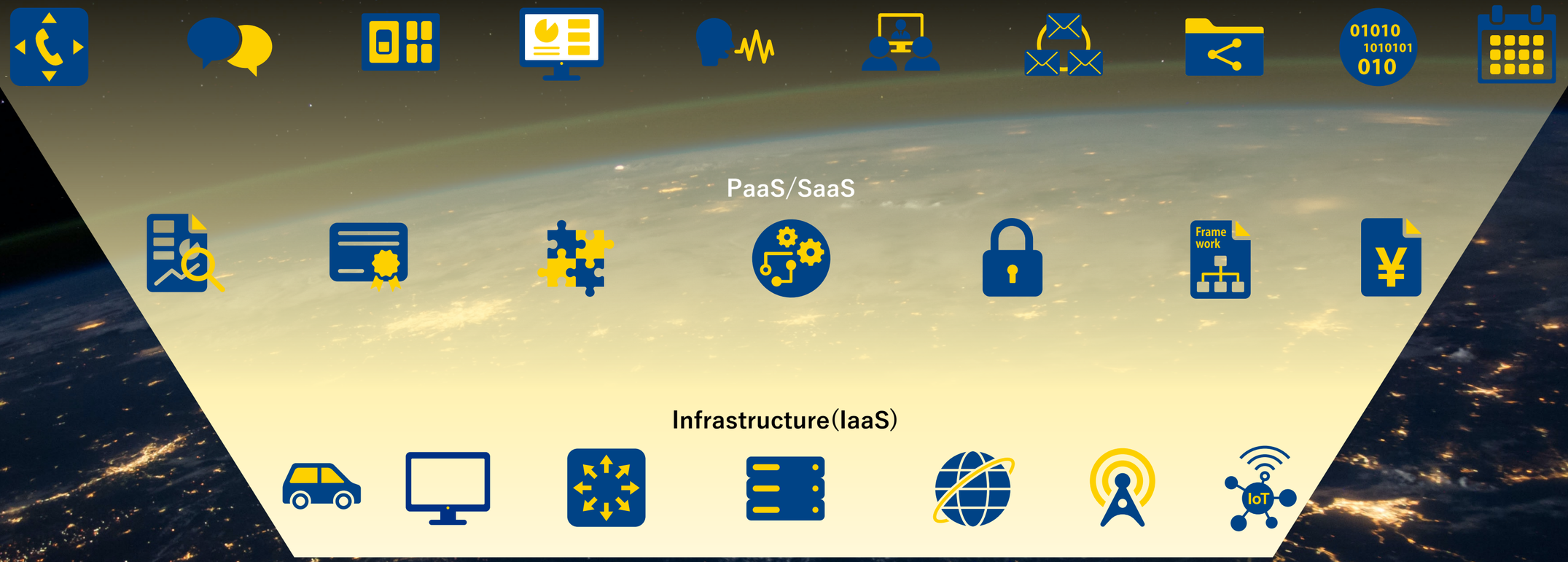
intel

NTT

SONY

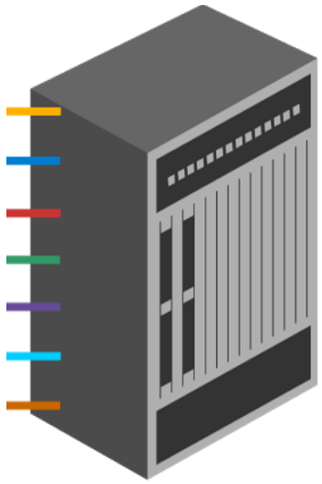
Softwarization Challenges

Softwarized Infrastructure in IT systems



Softwarized infrastructures are integrating into enterprises customers IT systems seamlessly...

Disaggregation/Virtualization



Disaggregation
Virtualizaion

Orchestrator

Controller

Value-added functions

Network OS

Network OS

Open hardware

- Operation automation
- Predictive detection, automatic recovery
- Easy upgrade
- Flexible configuration change
- Flexible scale up/down

Softwarization accelerates seamless integration with cloud-native ecosystems

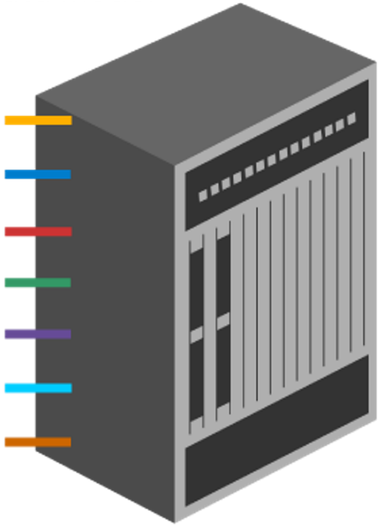
ODTN (Open Disaggregated Transport Networks)

NTT Communications
Go the Distance.

ONF

Vendor Proprietary Network Controller

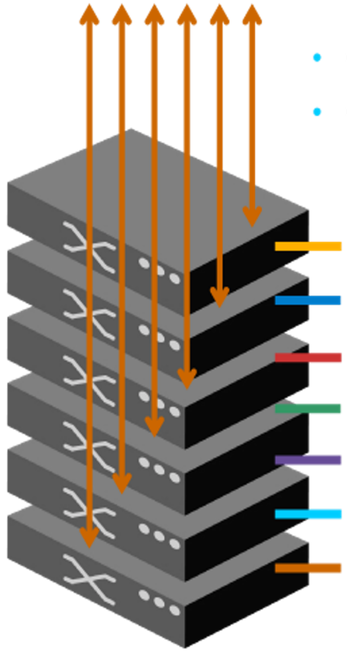
- Proprietary and closed API
- Vendor-specific data model



- Vertically integrated
- Single vendor

Open Source Network Controller

- Open and standard API
- Common data models



- Multi vendor
- Disaggregated

ADVA Optical Networking, ciena, Edgecore Networks, FUJITSU, infinera
ipinfusion, JUNIPER Networks, LUMENTUM, Metro Haul, NOKIA
NTT Communications Transform. Transcend., PALC networks, STL, Telefónica, TIM
TELECOM INFRA PROJECT, ZTE

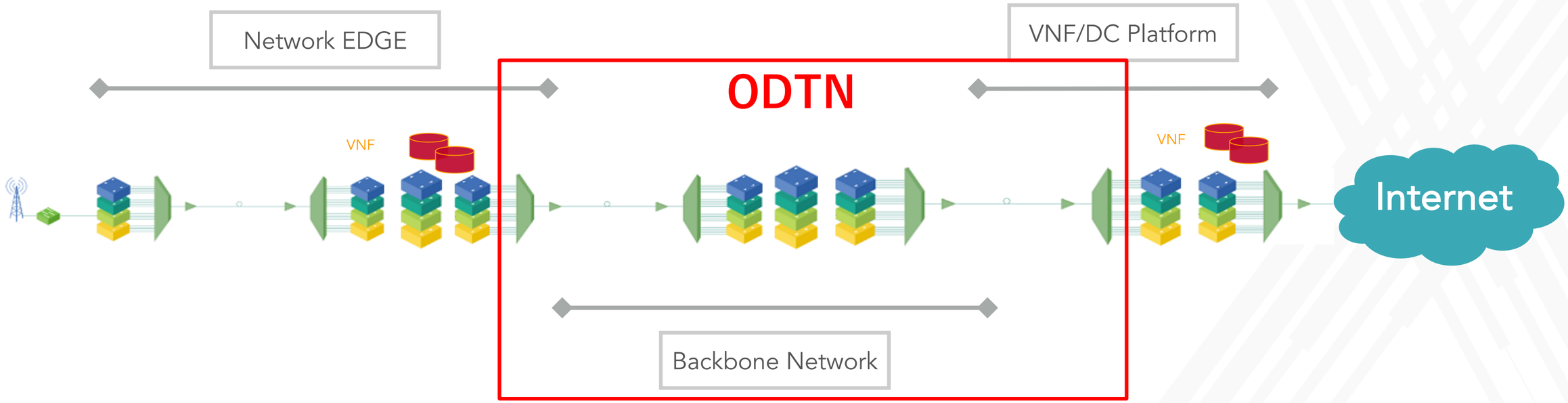
Collaboration with TIP

CONVERGED ARCHITECTURES FOR NETWORK DISAGGREGATION & INTEGRATION
NTT & Telefonica

PURPOSE

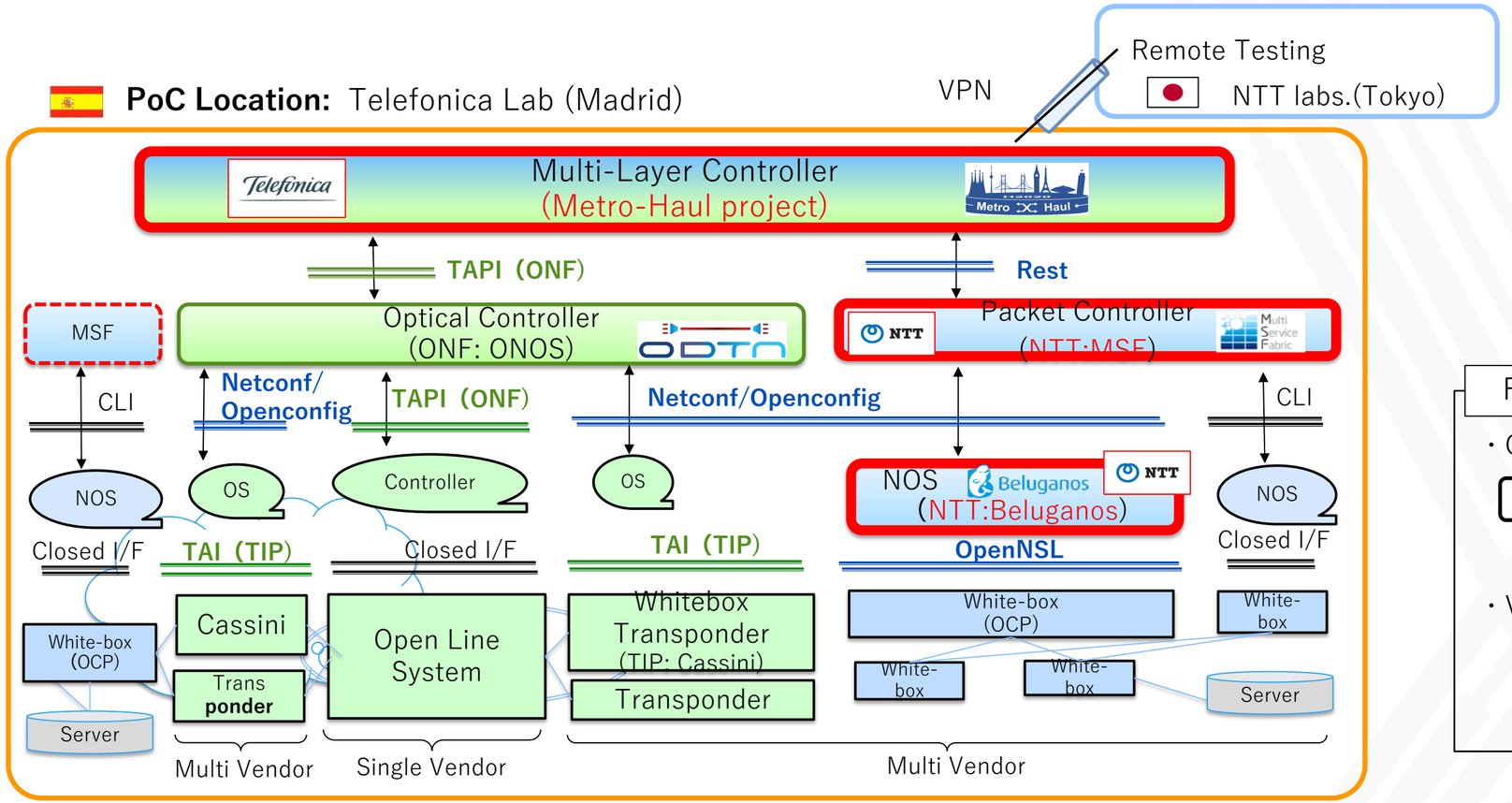
- Define **operator use cases** in open converged packet and optical networks.
- Prove that use cases can be met with **architectures based on open technologies**
- Leverage the opportunity provided by TIP to involve different players to **accelerate technical developments** and help operators in real-world scenarios.

The target areas expand from the edge of the network up to the VNF or Datacenter platform going through the backbone network



CANDI First PoC and White paper

- Achieved in Madrid in Oc. and published white paper by 5 operators and ONF in Jan.



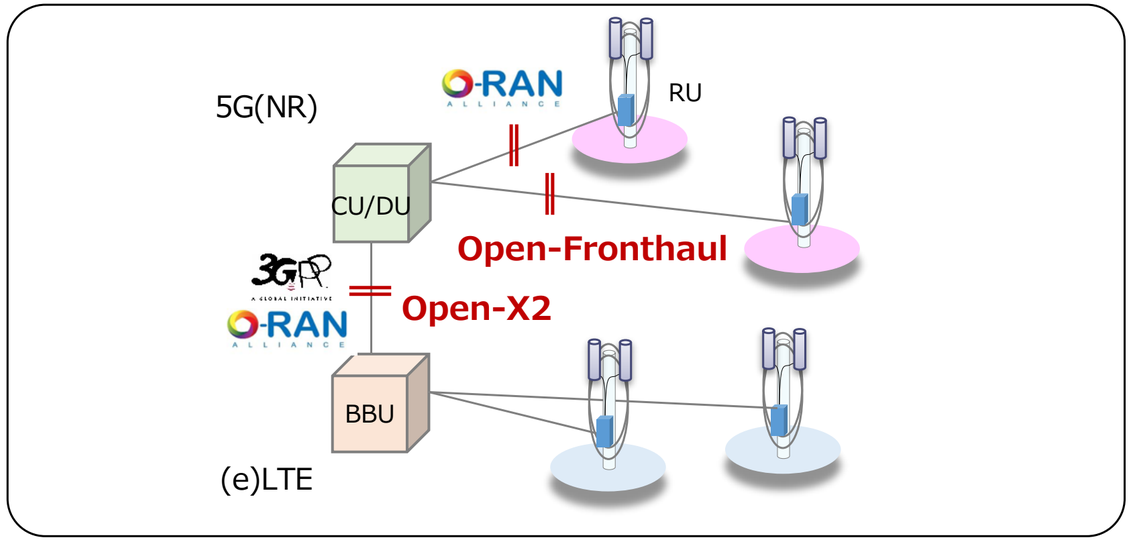
[White paper on OOPT site] https://cdn.brandfolder.io/D8DI15S7/as/q43vmp-30aaqg-3sbb3u/CANDI_-1st_experimental_demonstration-_Telecom_Infra_Project.pdf

Open RAN Strategy

First Step

Open Interface between RAN equipment (i.e. decouple CU/DU from RU and 4G BBU)

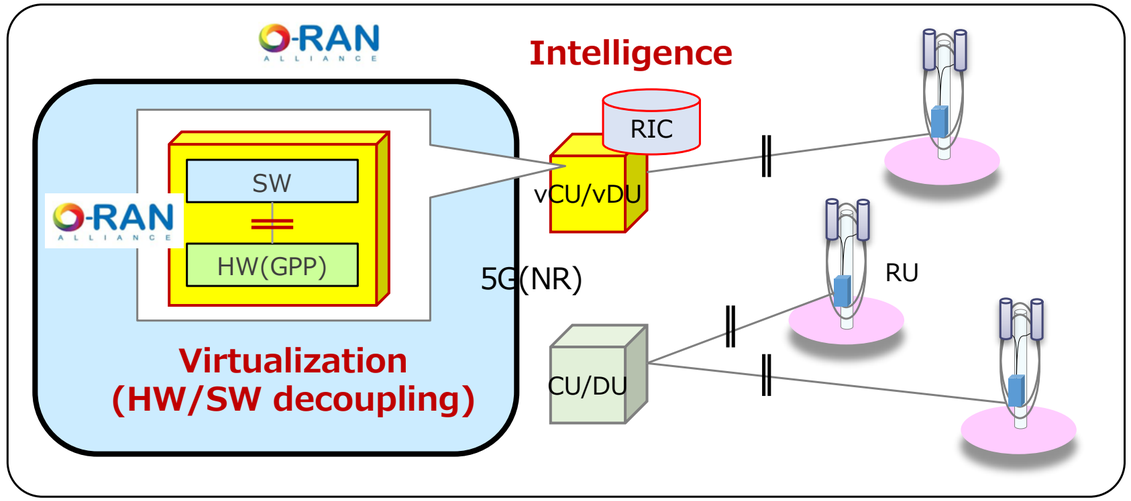
NTT DOCOMO has achieved multi-vendor interoperability of 4G and 5G base station equipment compatible with the O-RAN Alliance specifications.



Next Step

vCU/vDU introduction where it fits based on requirements (with RIC) (i.e. decouple HW and SW)

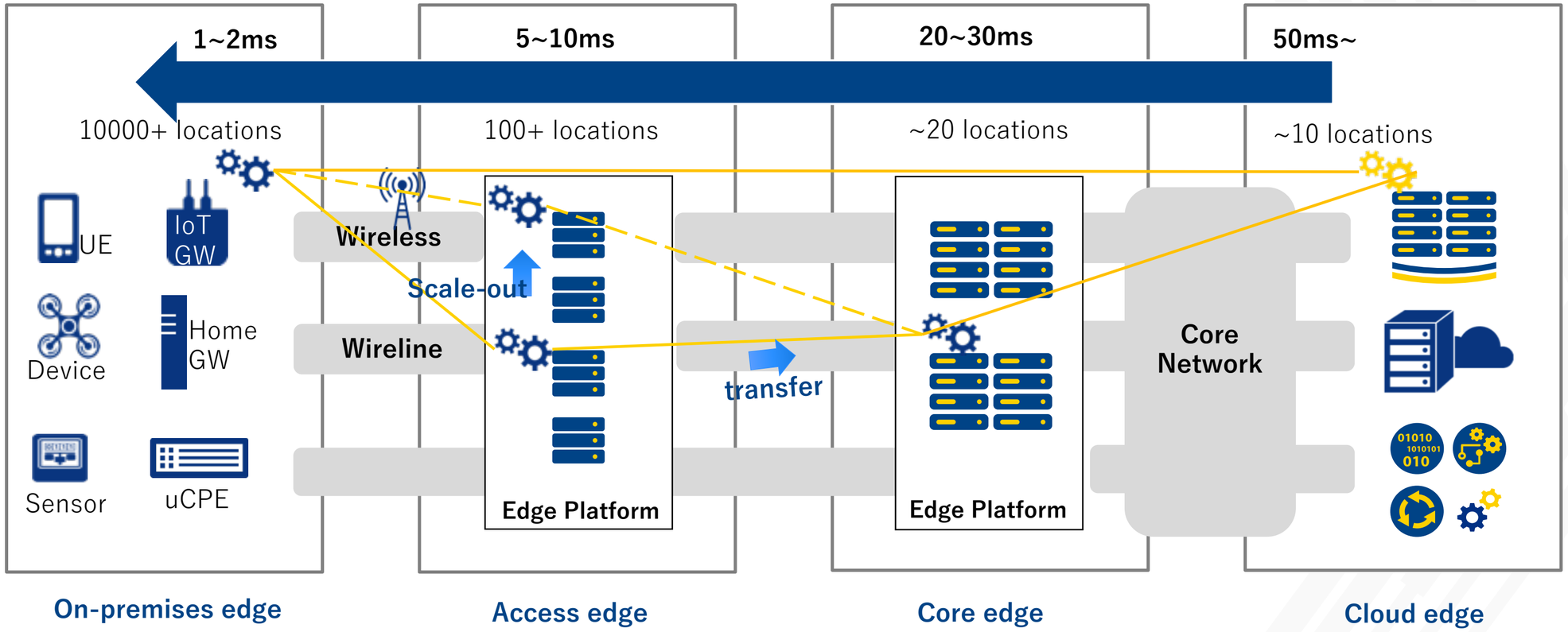
Nationwide deployment of vRAN is not necessarily efficient in terms of TCO today. NTT DOCOMO plans to deploy vRAN on the basis of requirements.



Edge Computing Platform

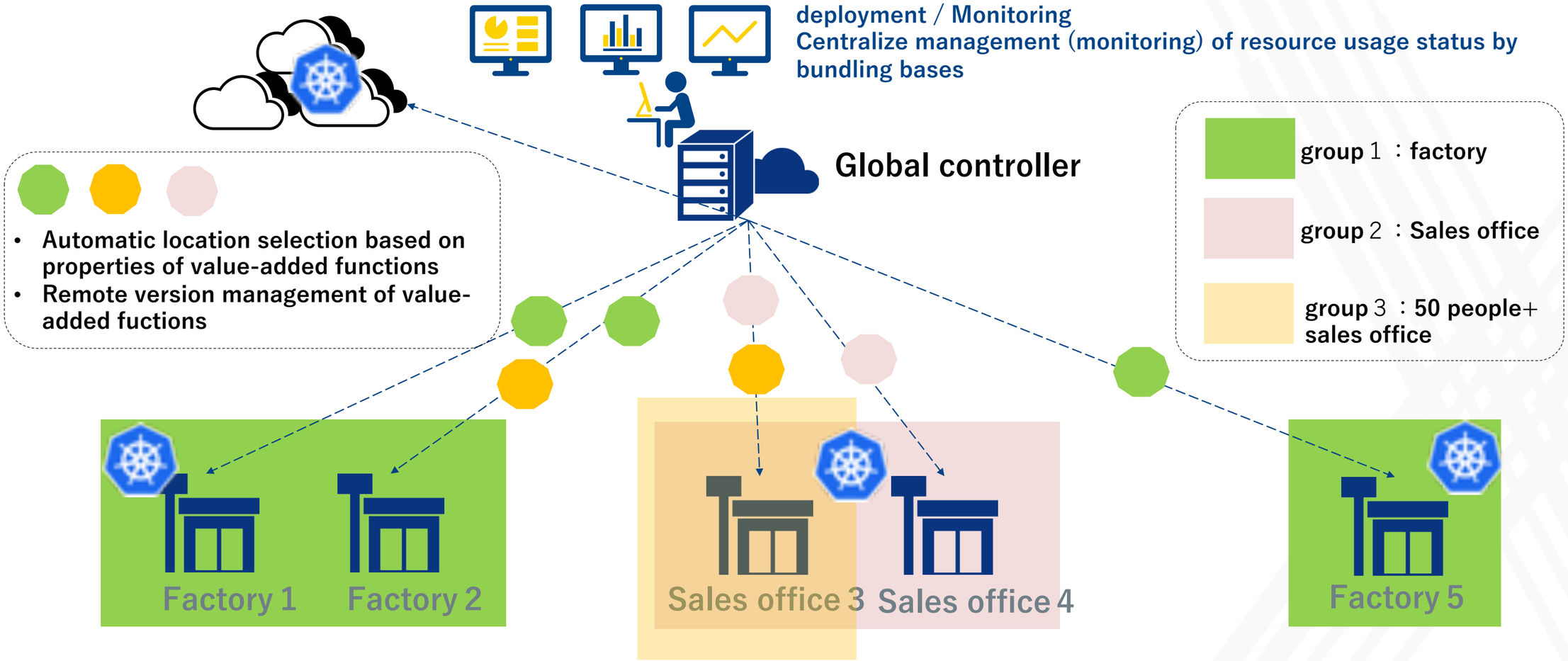
Multi-level Edge Computing Environments

- Distributed processing platform to run value-added functions with optimal routes and environments dynamically, in cooperation with high-speed and low-latency underlay networks.
- Build service meshes of value-added functions running on distributed multi-level edge environments
- Support scale-in and scale-out of value-added functions and transfer them to other environments aligned with the running policies.



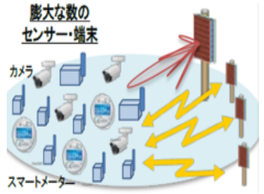
Centralized management

- Centrally manage distributed edge platforms and remotely distribute value-added functions to specific edge platforms
- Based on “Run Edge-Computing Everywhere” idea, from the Cloud edge to the On-premise edge, you can easily build an edge platform by using a global controller

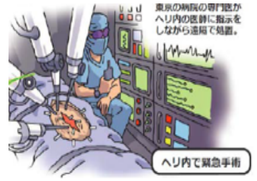


Network Slicing

massive
Machine
Type
Communication



Ultra-Reliable and
Low
Latency
Communications



enhanced
Mobile
Broadband

Off-loading

mMTC slice

Return by an edge

uLLC slice

Low-delay path
selection

eMB slice

Wide-band path
selection

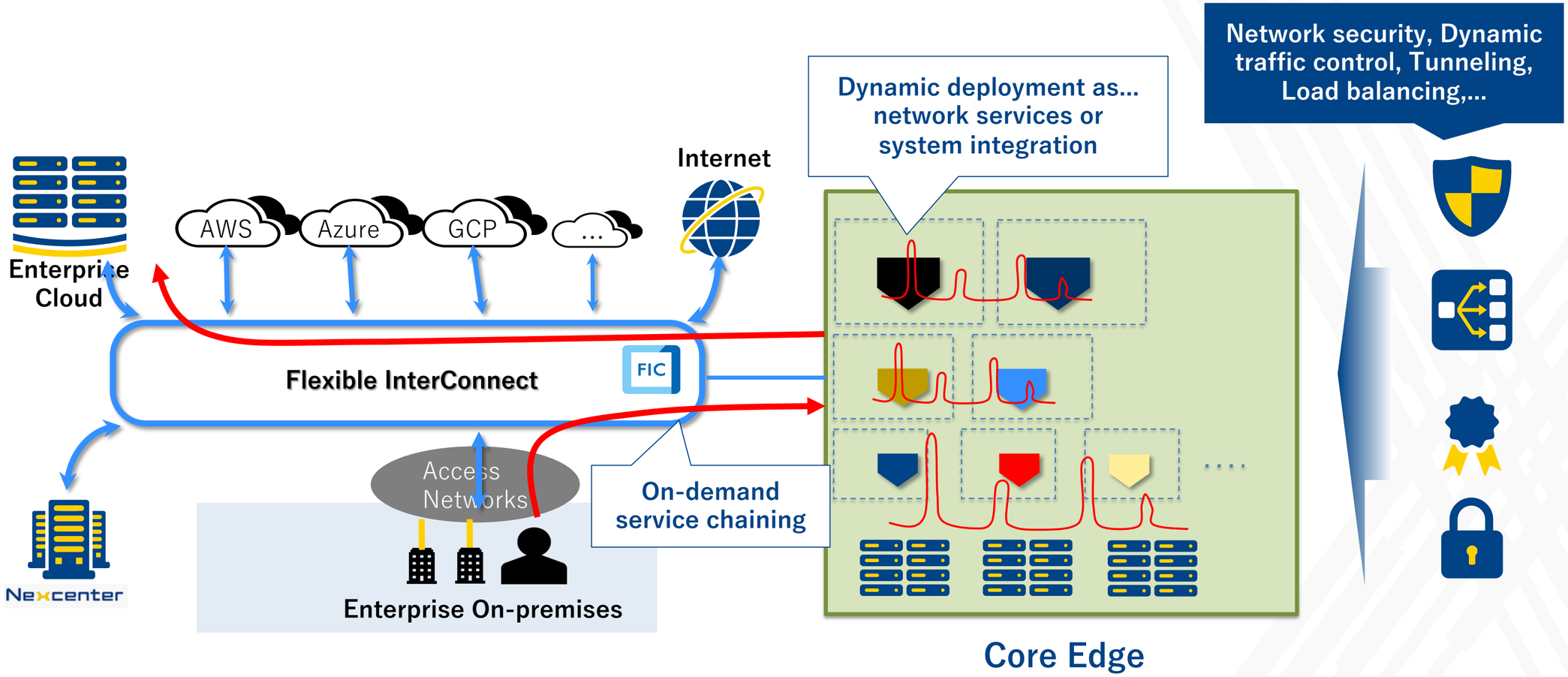
Cloud

Data Center

CDN

Use Case of Utilizing Core edges: NFV

- Provision of value-added functions such as network security, dynamic traffic control, tunneling, etc.. at the core edges
- Open platform for our partners to enhance open collaboration



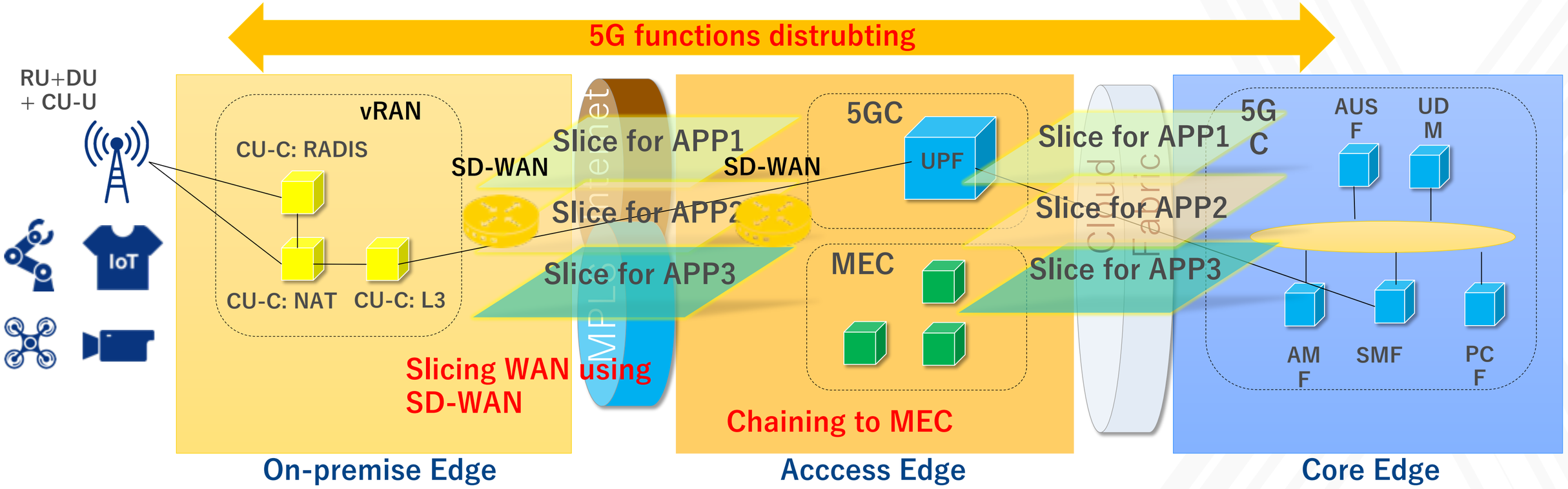
Use Case of Utilizing On-premise/ Access/ Cloud Edges : IoT w/ Local 5G

Distributing 5G functions according to characteristics

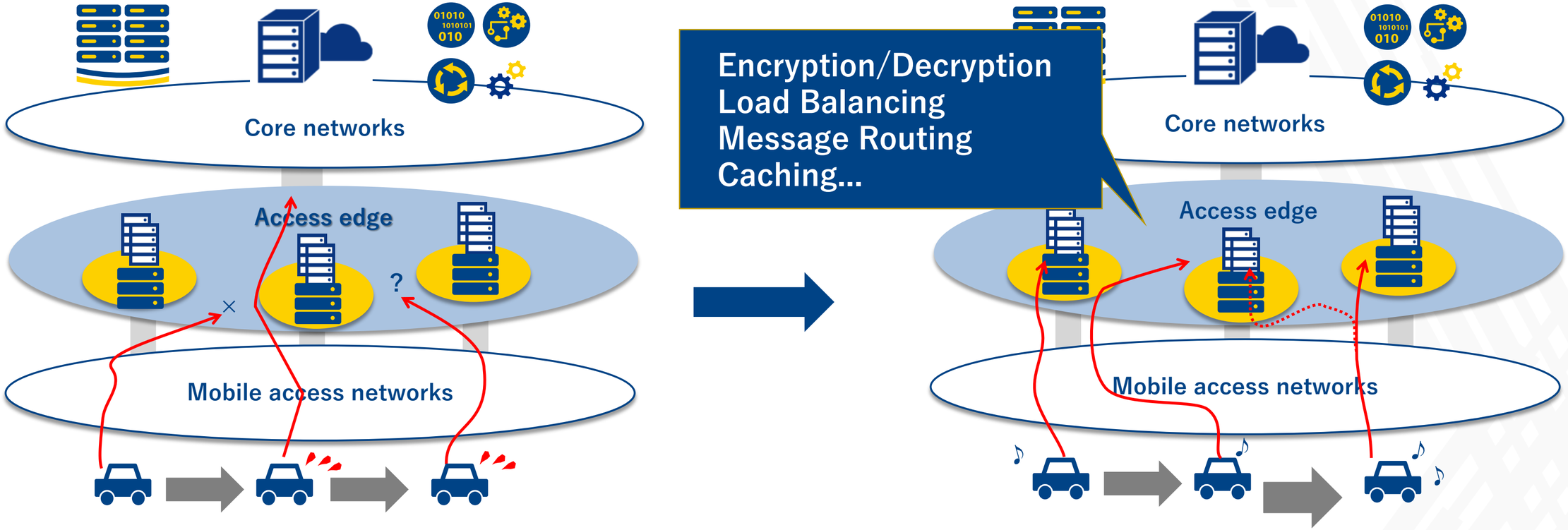
- vRAN on on-premise edge -> UPF on Access edge -> 5GC on Cloud edge
- A low delay is achieved by arranging the U plane processing unit at the edge

Slicing WAN using SD-WAN

Local breakout of traffic at the access edges and chaining to MEC



Use Case of Utilizing Access Edges and Cloud Edges: Connected Car



- ✓ Low latency communication
- ✓ Effective infrastructure resources utilization
- ✓ Dynamic and optimized route communications aligned with cars drive

Thank you!

Reference slides

Software technologies leads IT innovation and DX...

	IT before DX-era ～IT supports human works～	IT after DX-era ～IT/human works together～
Priority	Cost, Performance	Speed, Scale
Operations	Fixed, Long-term, Stable	Flexible, Agile, Continuous Delivery
Functions	Process, Record	Predict, Optimize
IP/ Know-how	Patent, License, IP, Security Control	Open Collaboration / Integration

Software speeds up innovation drastically and leads DX, integrating hardware evolution

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