Edge Computing:
NTT Offerings in Japan and Use Cases

[BKNIX peering forum]

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Katsuhiro Ohki

Self Introduction

Katsuhiro Ohki
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Global IP Network (AS2914)
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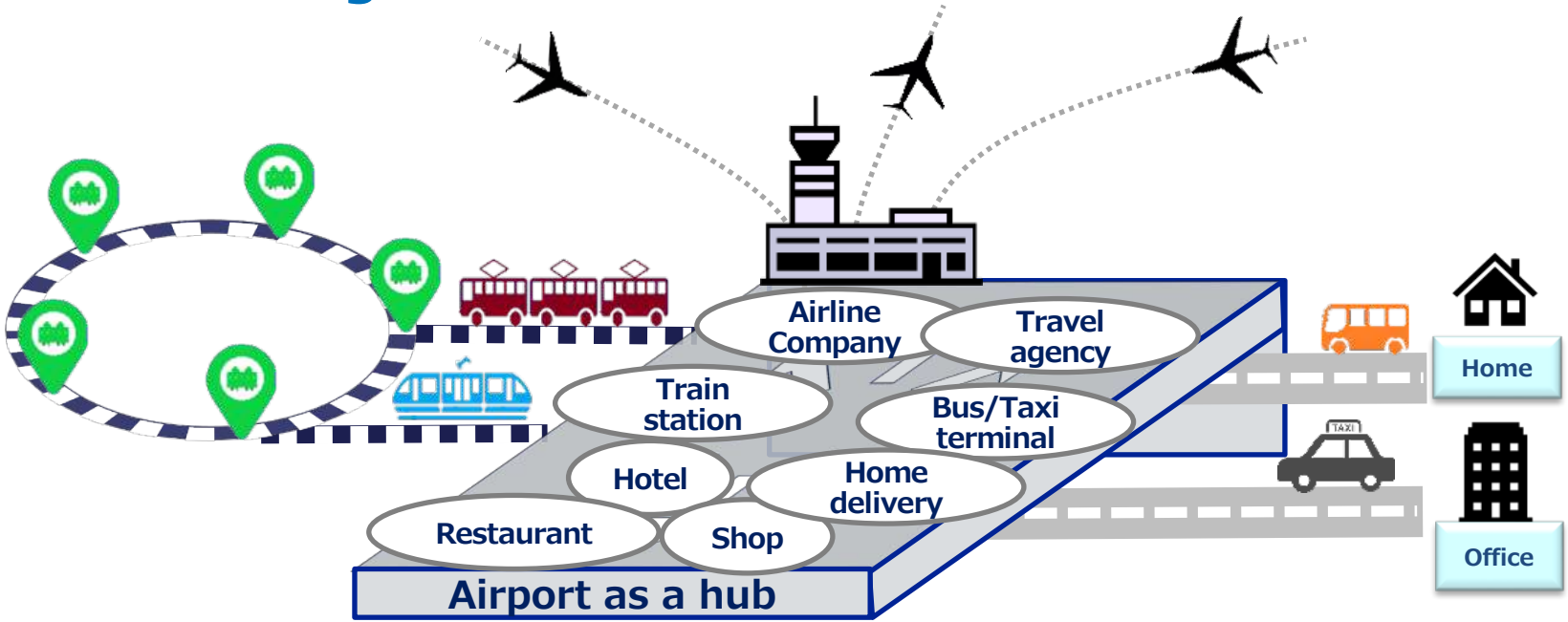
- Global IP Network (GIN, AS2914)
  2014-2015: Customer Engineer in JP
  2015-2016: Product Manager in HK
  2016-2017: Capacity Planning Engineer in JP
  2017-Today: Sales Engineer for ASEAN

We are “Airport Terminal”

& Global Managed IT Service Enabler

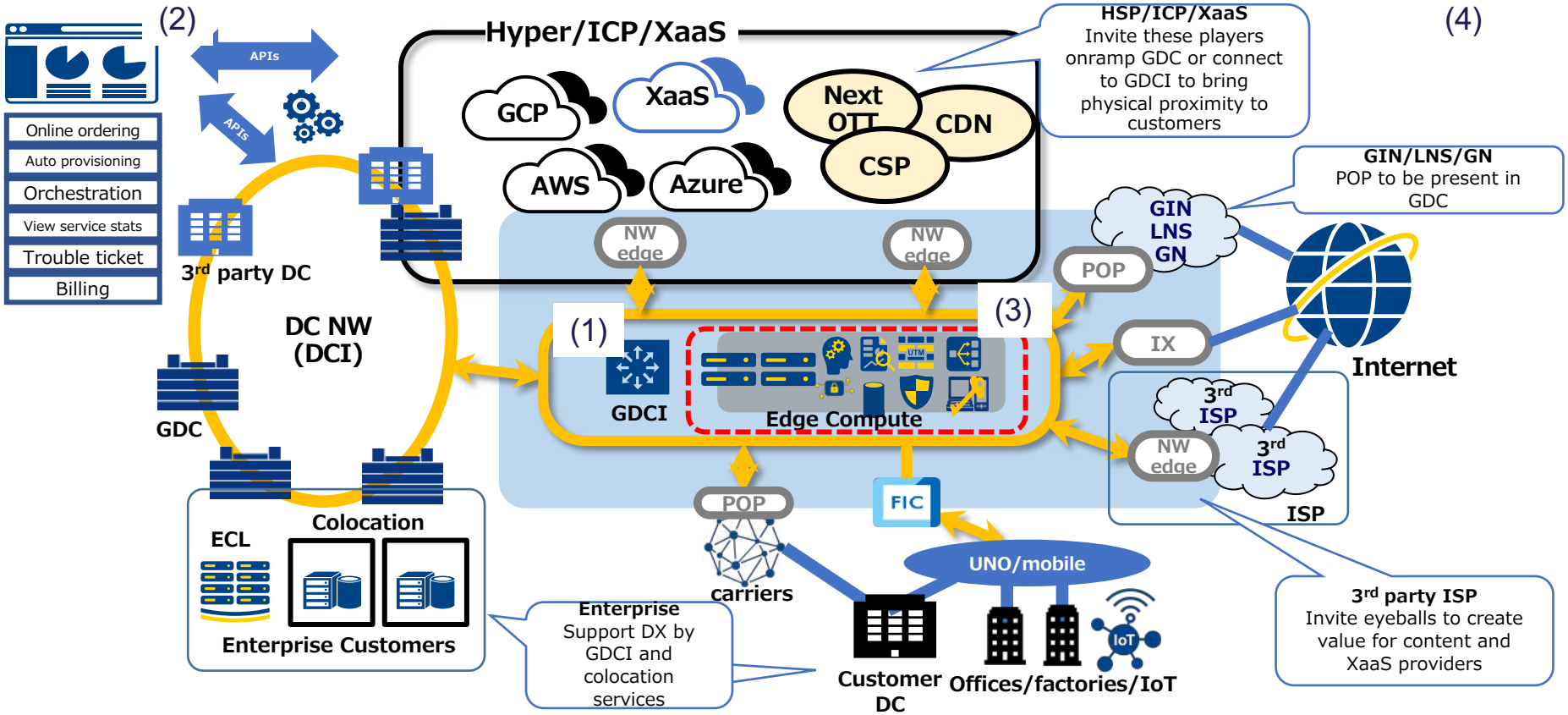
Online services
(Ticket/Hotel/Restaurant/Route searching..)



Airport: Data Center
Road, Railway, Airway: Transport (NW)
Tenants: Clients

Edge to Cloud Fabric and Partner Ecosystem

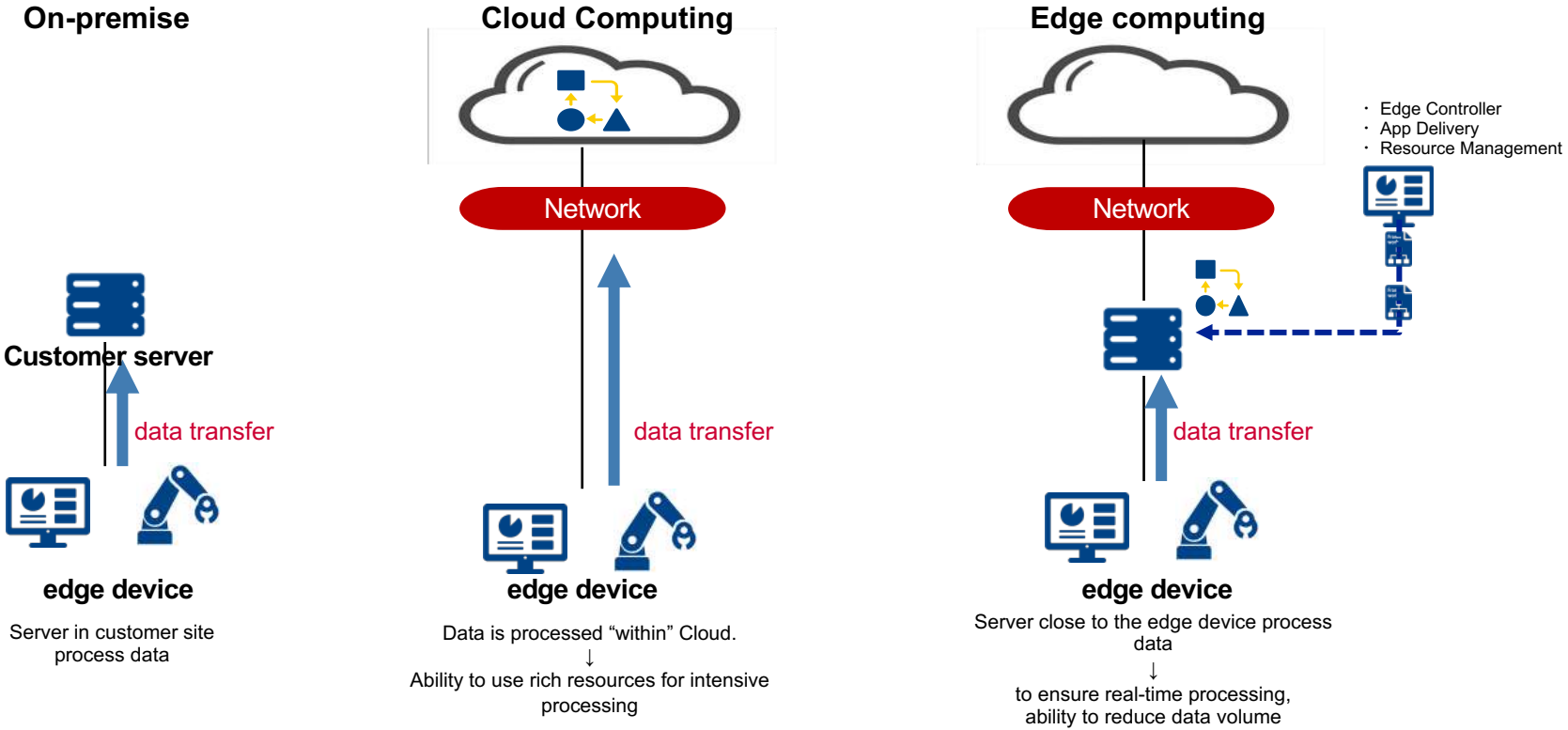
- Establish interconnection point (GDCI) inside NW data center to actively exchange traffic (1)
- Provide portal to automate all processes and transactions in fabric and ecosystem (2)
- Develop edge capabilities to provide value added features to meet customer requirements (3)
- Create ecosystem by inviting major service providers to hub NW data center for promoting customer digital transformation (4)



Environment surrounding edge computing

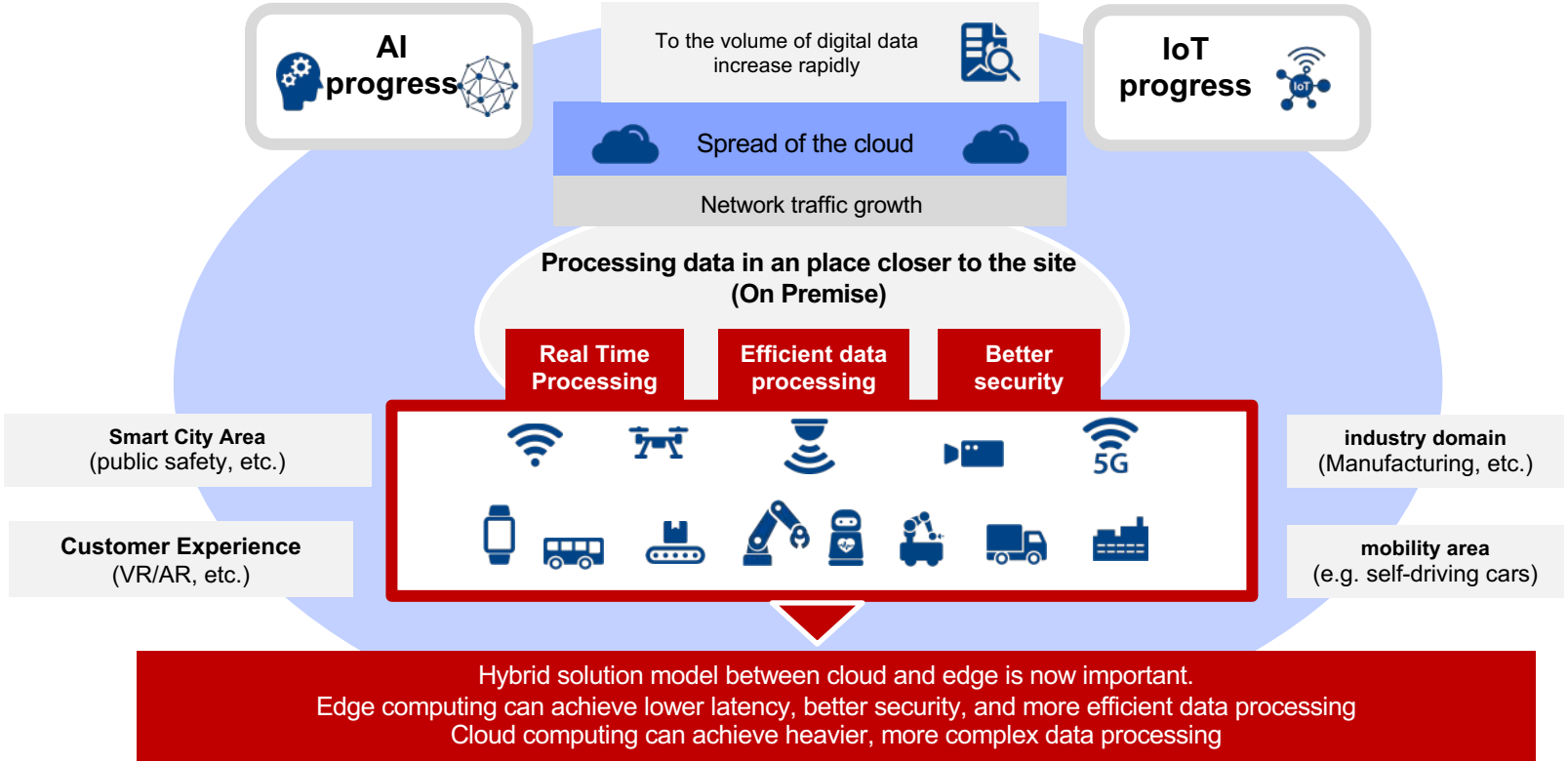
What is edge computing?

Edge computing is a distributed information technology (IT) architecture in which client data is processed at the “edge” of the network, as close to the originating source device as possible



Why edge computing is gathering attention

With development in AI and IoT technology, the volume of digital data is growing rapidly.



Overview of the Edge Market

The global edge market is expected to grow significantly in the future due to the growing volume of data, demand for real-time processing, and the impact of the social environment change caused by COVID-19.

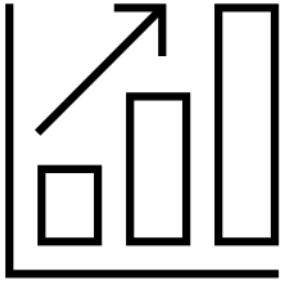
Overview of the Edge Market

27.2%

Global edge computing market expected to grow **27.2% annually** from 2020 to 2030

USD 32.8 billion

Global edge computing market expected to reach **$32.81 billion by 2030**



Background

Data volume

- Long latency issue is occurred because the amount of data stored in the cloud grows
- We need distributed IT architecture to avoid sending unnecessary data to the cloud

Real-time processing demand

- Increasing demand which require more immediacy such as automatic driving and abnormality detection
- Processing data in on-premise environment to achieve real-time processing

COVID-19 influence

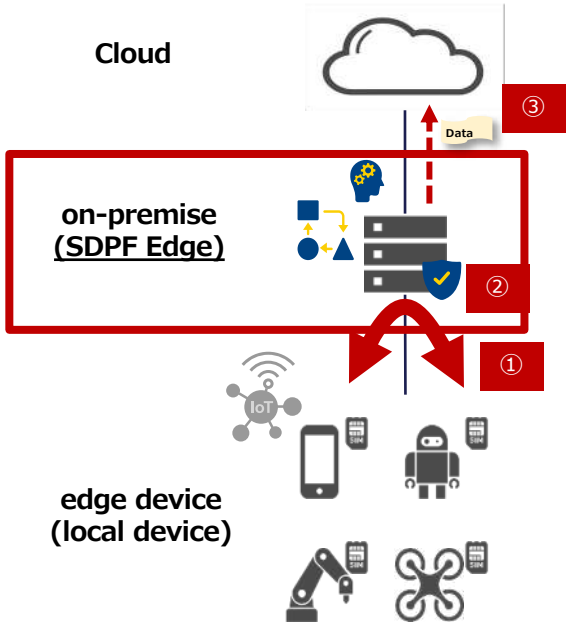
- Surging online demand, such as remote asset maintenance and monitoring and telemedicine
- Both secure environment and Real-time processing are required for these operations.

Reference: REPORT OCEAN
GLOBAL EDGE COMPUTING MARKET 2020-2030 BY COMPONENT (HARDWARE, SOFTWARE, SERVICES), TECHNOLOGY (FOG COMPUTING, MEC), DEPLOYMENT (ON-PREMISE, CLOUD), APPLICATION, INDUSTRY VERTICAL, ORGANIZATION SIZE, AND REGION: TREND FORECAST AND GROWTH OPPORTUNITY

Benefits of Edge computing

The edge computing is a new architecture that sends only the necessary data to the cloud while processing data at the edge in a fast and secure manner.

Solution Image

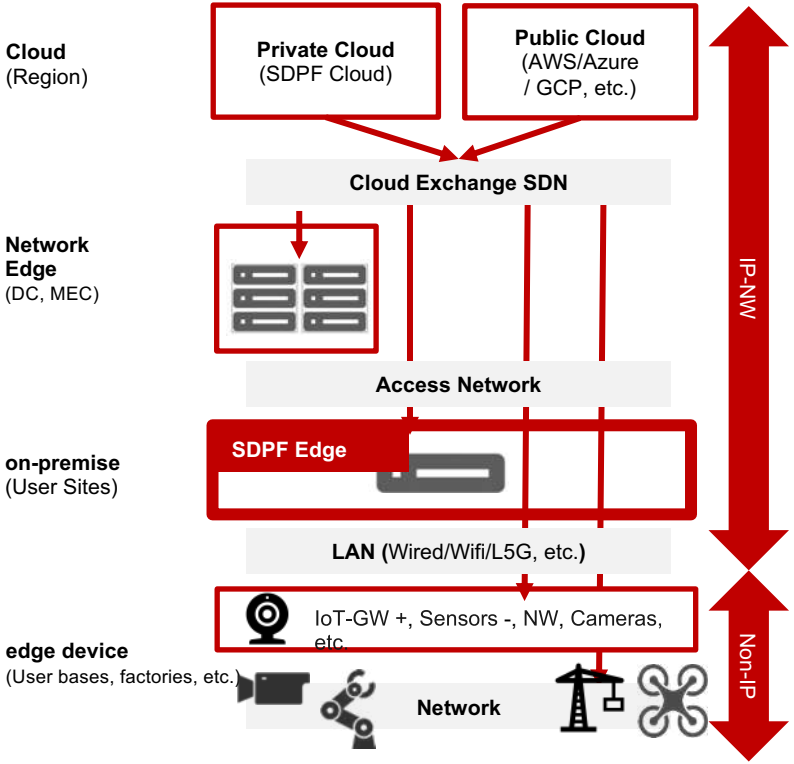


Effect of introducing edge

	Cloud only	Leveraging the Edge
Latency	• Processing data in the cloud can **cause latency** • When delays are not allowed (Ex, automatic driving), latency is critical issue.	① real-time processing • Collect and process data closer to the edge device to **reduce latency** • On-premise fast data feedback enables **real-time processing** on edge devices
Security Risk	• Sending and receiving data to the cloud via the Internet frequently increases the **risk of information leakage** increases.	② Security Risk Mitigation • On-Premise can **reduce the risk of data leakage** by processing data without going through an external network • Sensitive data can be **retained in the edge, not sent to the cloud**
Data growth	• The growth of the Internet of Things has enabled the acquisition of all kinds of data, resulting in **massive amounts of data.** • Data growth is **increases** data transmission and storage costs	③ Efficiency of data transmission • **Data can be collected and processed at the on-pemise** • Efficient data transmission by **sending only the data you need** from the on-premise edge devises to the cloud

Edge Computing System architecture

A distributed computing architecture that processes large amounts of data with low latency by distributing servers to IoT devices connected to the network or to a network which close to the edge devices.



Network Edge
- Equipment installed in boxes, base stations, small cells, and telephone switching facilities
- CDN Cache Servers (Edge Nodes)
- Edge microdata centers such as collocation
- Edge-related services provided by cloud service providers
- Mobile communication systems/services such as 5G, 4G and LTE

On-premise (User/customer site)
- Servers and other equipment in user locations such as factories, buildings, and offices

Edge device
- Smartphones, wearables devices, etc.
- Home appliances, smart speakers, surveillance cameras, sensors, etc.
- Machine tools, robots, drones, cars, etc.

Challenges of the edge computing

Challenges for the initial complicated settings, how to integrate operation management in various on-premise environments, and how to build support system that can trouble shoot such environment.

1 **Initial Deployment Configuration**

- Need design the entire solution between the on-premise edge devises and the devices collecting the data and the cloud to which the data is being sent
- Difficult for end-user to set up the hardware by themselves .

2 **Managing Multiple Edge Terminals**

- The edge terminals distributed in different locations, which complicates the environment and makes management troublesome during operations.
- How to effitiently manage various applications on many edge devices

3 **Troubleshoot**

- there are cases which support is weak, such as no emergency response, no phone support.
- Support system could be complecated. For example, edge devices's manufacturers support the hardware itself, and maintenance of applications equipped with hardware is out of their scope.

We can solve these challenges with SDPF Edge

Features of SDPF Edge

Sophisticated know-how and human resources in maintenance are not required as we also provids integrated operations from cloud to edge devices as end-to-end solution.

General Edges

SDPF Edge

A **Low latency data processing**

- On-premises, local data processing provides lower latency than via the cloud

B **Network Efficiency**

- Primary data processing at the edge enable optimizing network as cloud transmt only necessary data

C **Common HW/SW platform for services**

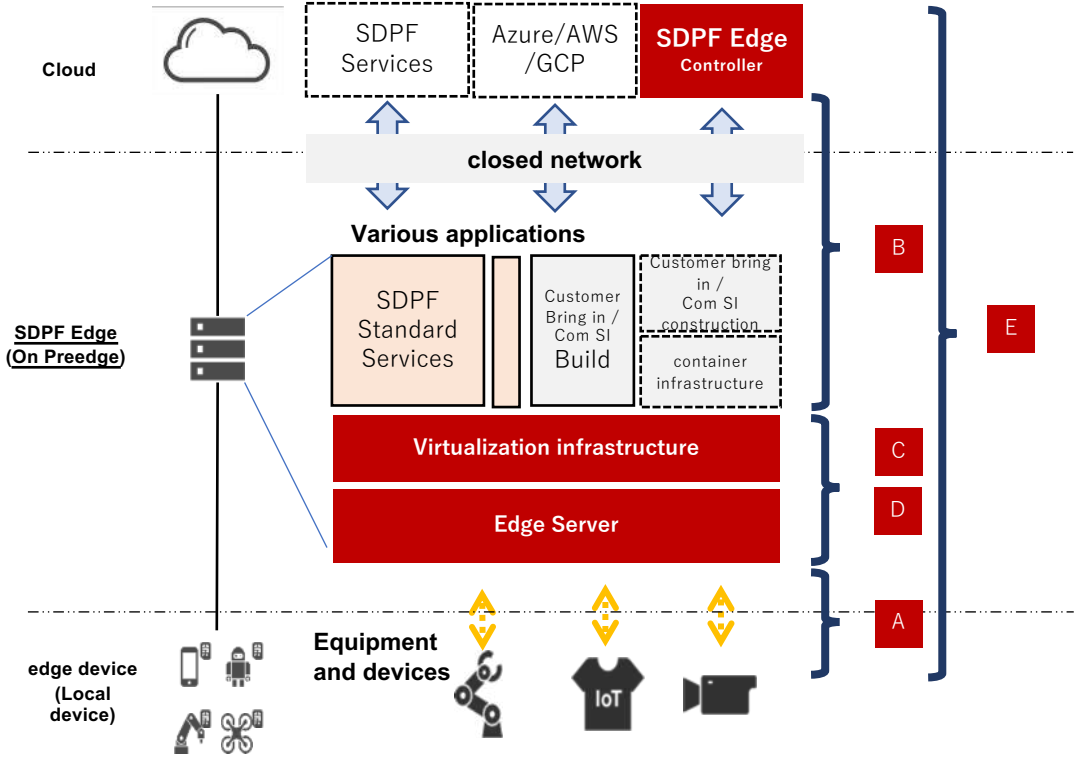
- SDPF Common hardware and software infrastructure for each service enables centralized application management, additional distribution, and version upgrade.

D **Fixed monthly fee for hardware maintenance**

- Fixed monthly fee includes HW install, seting up, and maintenance on customer premises

E **Full stack proposal from edge to cloud**

- NTT provides SDPF services from on-premise edge to network and also to cloud services



SDPF Edge Use Case

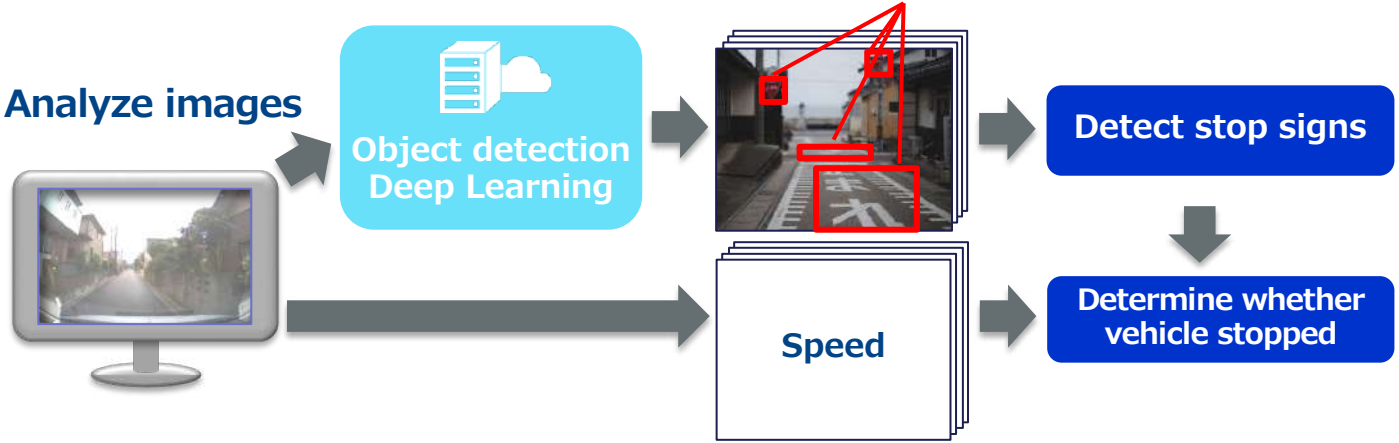
Abnormality detection of automatic driving

- Able to detect incidents where a driver ignored stop signs, with 96% accuracy in the 2000 samples.

Sort images manually (time consuming)

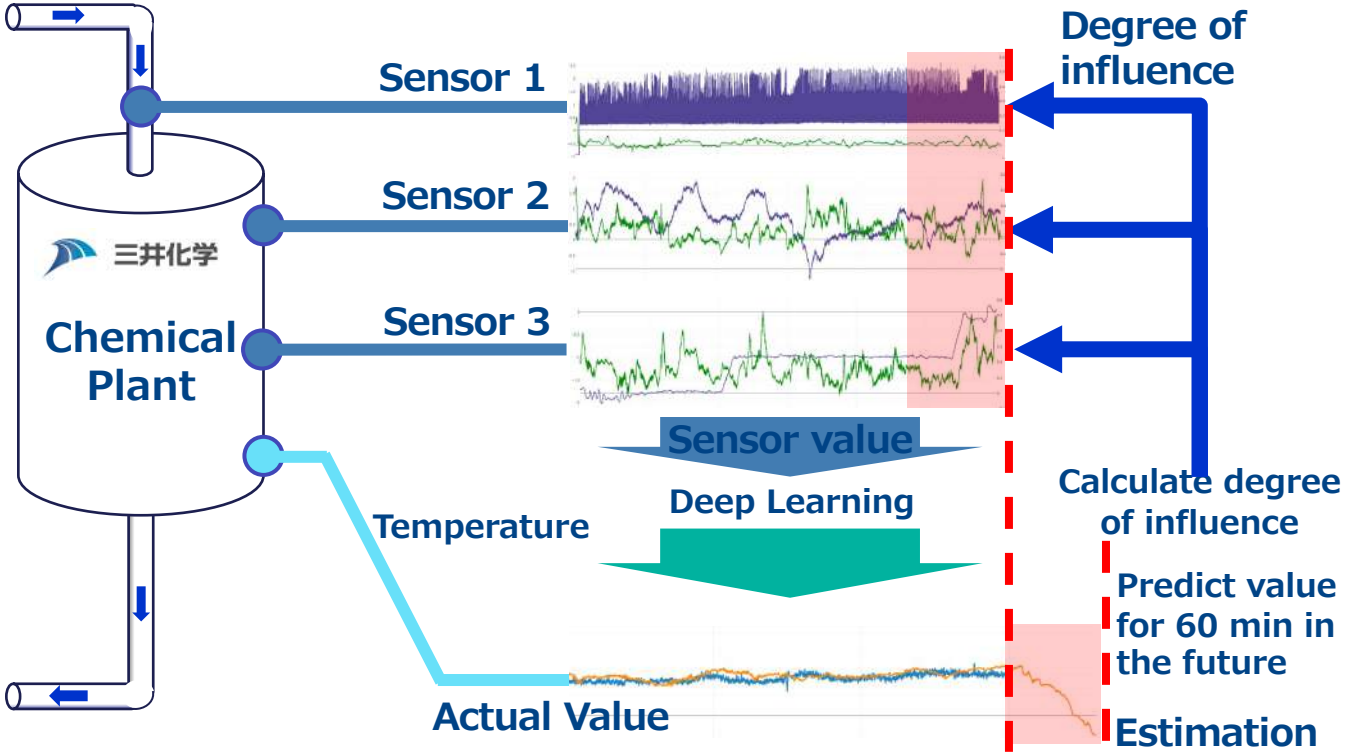
Detect stop signs

Analyze images



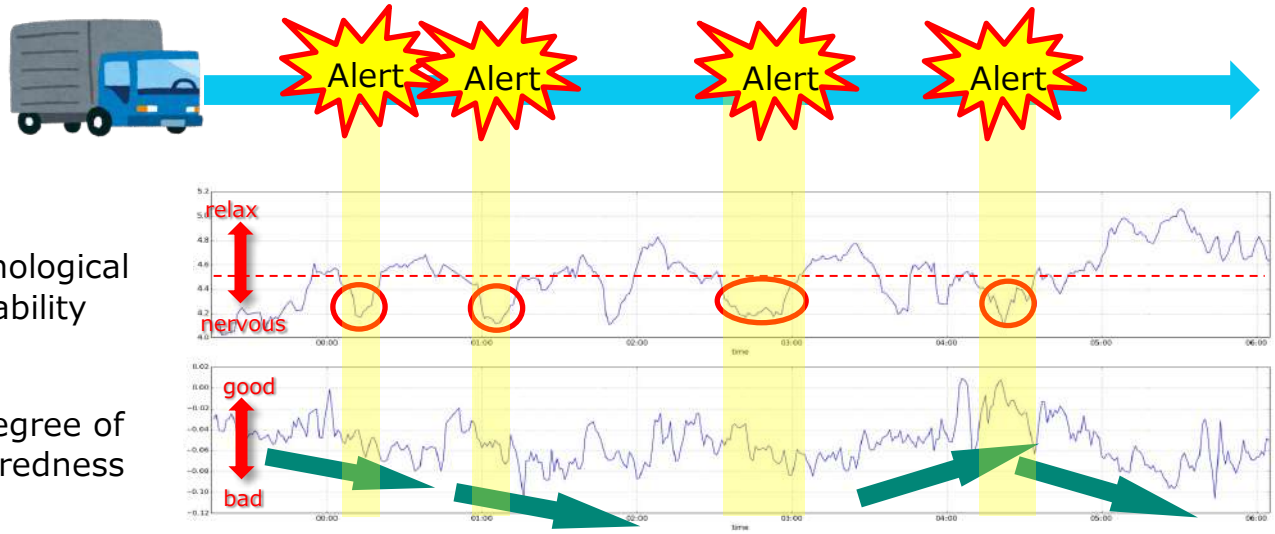
Abnormality detection of Chemical Plant

- Visualize degree of influences on each sensors
- Identify sensors that affect temperature and support operation



Wearable device solution (hitoe)

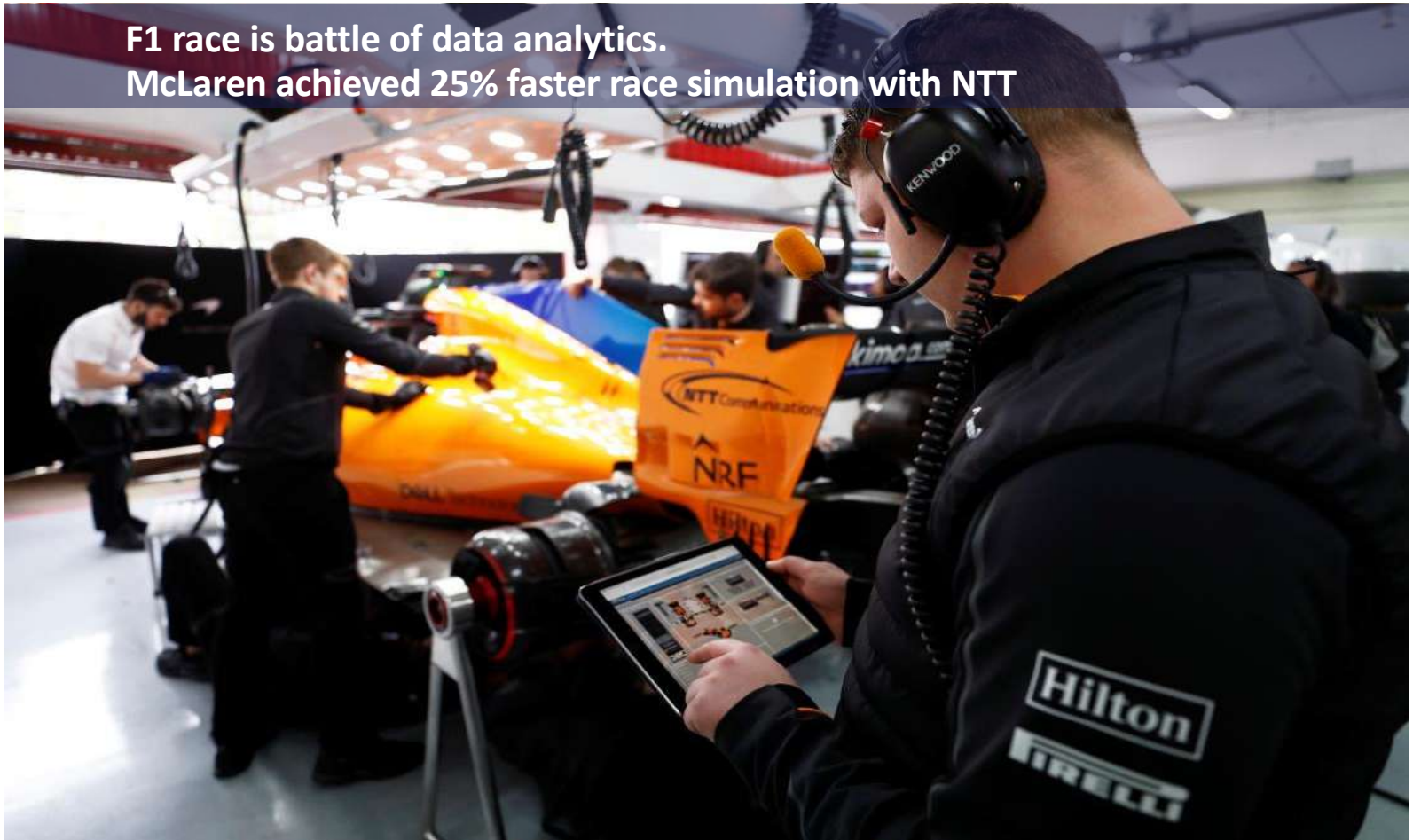
Utilizing hitoe and estimate degree of fatigue,
- Notice to take a break-time
- Manage the driver's condition from remote area



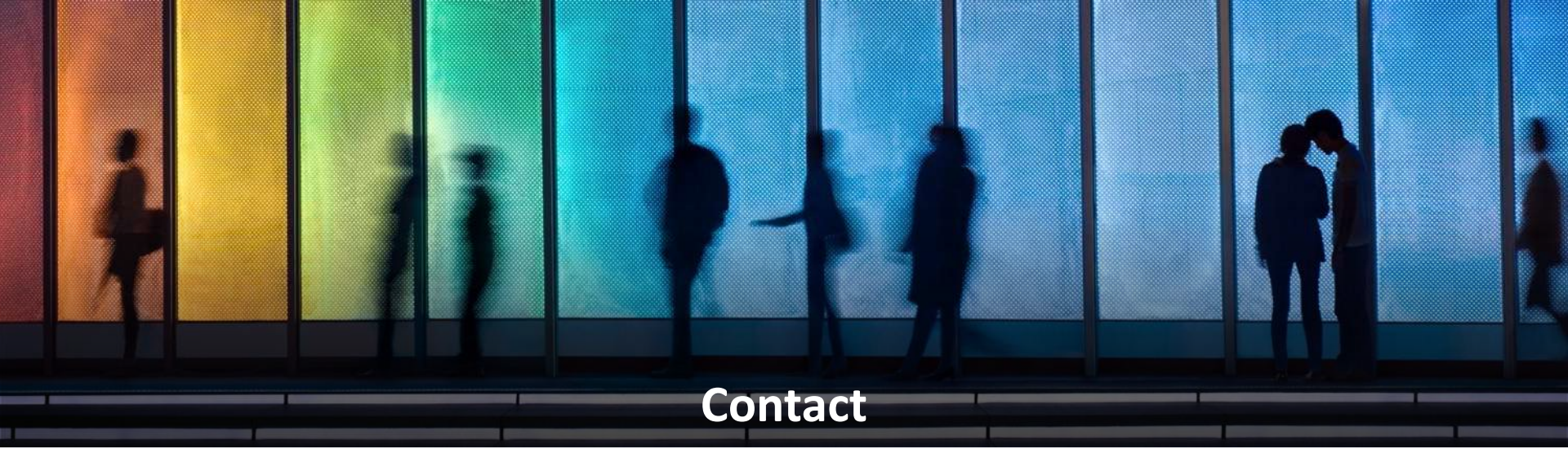
Wearable device solution (hitoe)

-Feel nervous when the start of driving

Adopt NTT Com's Technology to Formula 1 GP



Adopt NTT Com's Technology to Formula 1 GP



Contact

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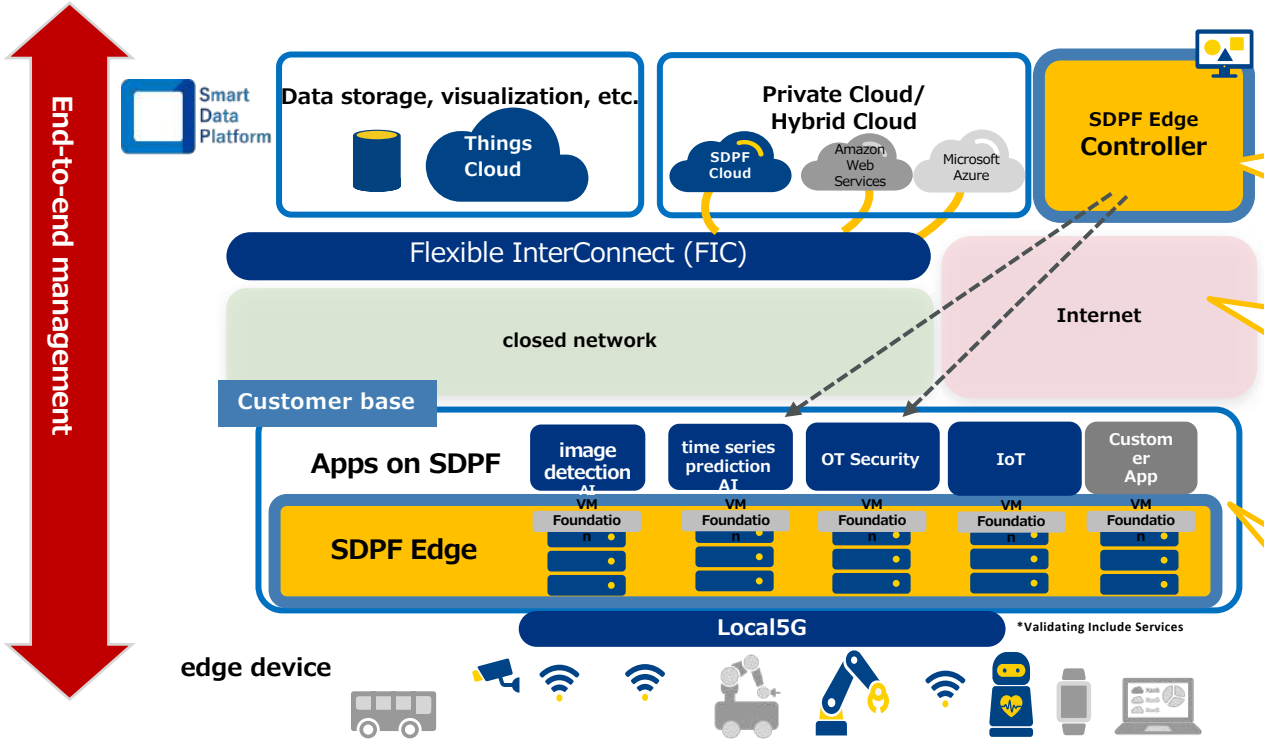
SDPF Edge Service Overview

NTT provides comprehensive services to enable customers to access to the app on remote-environment, and also achieve end-to-end management with "SDPF edge controller", "FIC", "Apps on SDPF" and "SDPF edge".



Controller: Allows edge apps to be cataloged, versioned, distributed to each SDPF Edge (**Zero Touch Provisioning**) and monitored

+

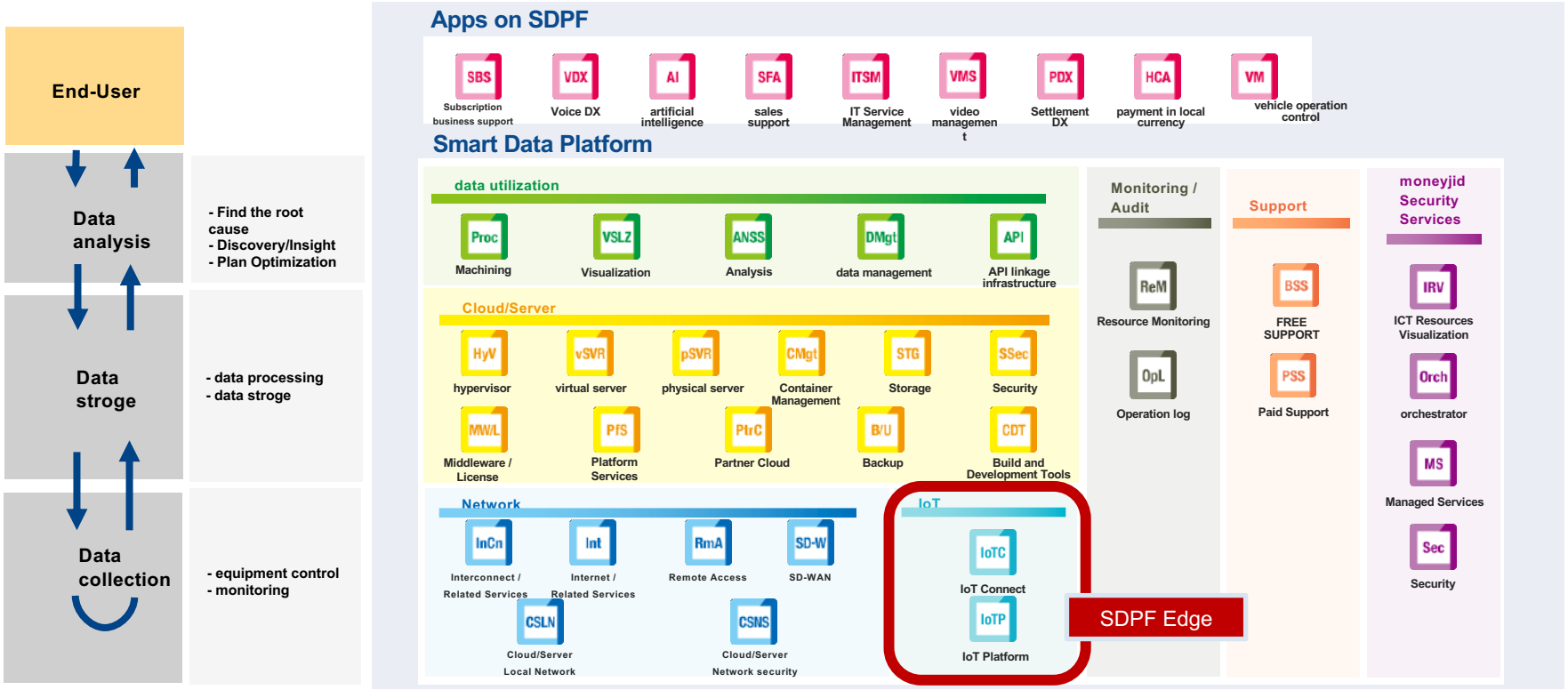
Data collected from various sensors is subjected to primary processing by edge computing, enabling **data traffic optimization**

+

Enables **real-time processing** with no delay by running various applications, including SDPF services, in on-premises environment

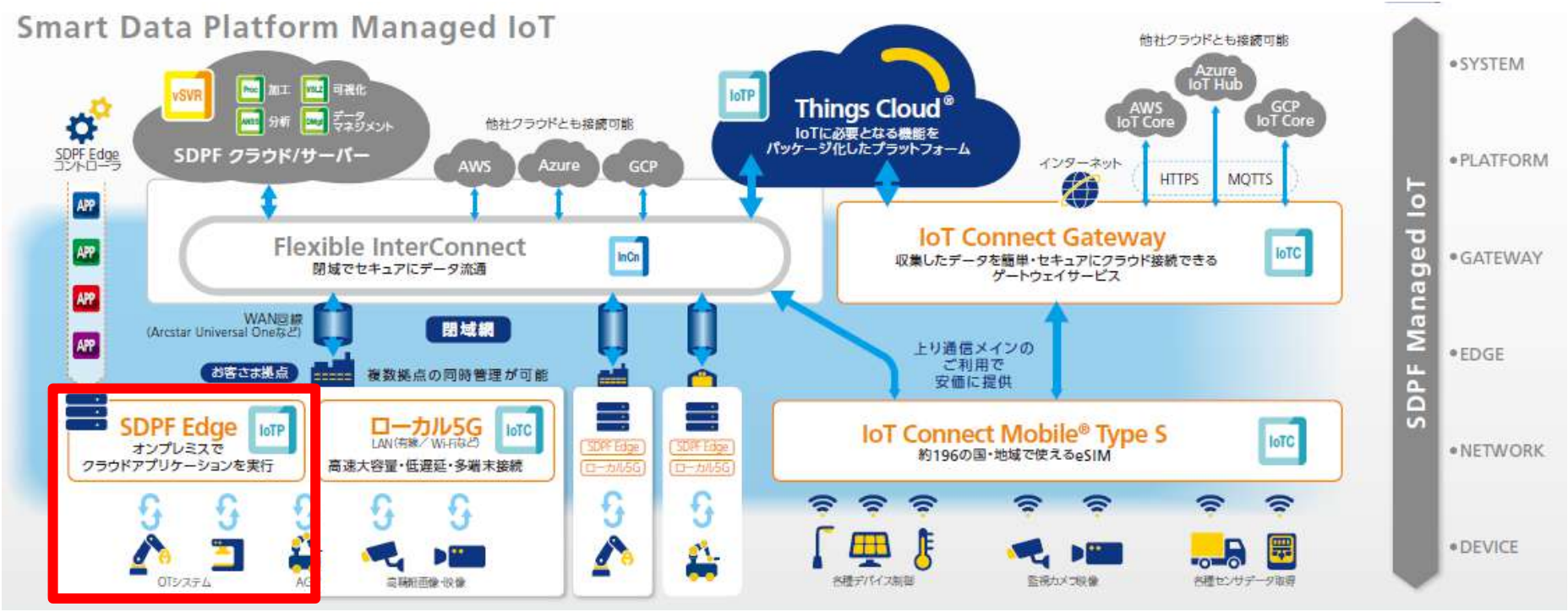
Smart Data Platform(SDPF)

SDPF is an integrated platform that enables seamless data utilization
Data collectionand control has traditionally been done over the WAN from sensors, cameras and other devices.
However, SDPF Edge enabled to collect and control data in on-premise plathome services.



NTT Communications IoT Solutions

Smart Data Platform's portfolio of products that connect data and value
are combined according to the customer's request and provided in a secure and managed manner.



SDPF Edge Menu (pricebook)

3 plans are available.

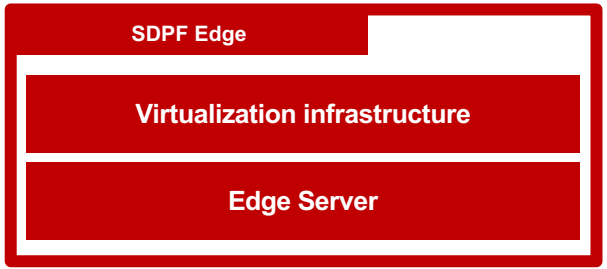
	Plan 1	Plan 2	Plan 3
use	Video analysis... High-quority & real-time processing	image analysis data analysis	primary data processing
Form factor	Rack	Rack	Box
CPU	32Core	16Core	8Core
Memory	128GB	64GB	32GB
Storage	3.84TB(SSD)	0.96TB(SSD)	1TB(HDD)
Pricebook (units/month) *tax exemption	From 123,600 yen	From 85,100 yen	From 47,700 yen

*This is a standard pricebook price. This is an individual estimate based on your requirements.
*You can customize the CPU, memory, and storage specifications.
*The minimum period of use is 36 months.

Notes) SDPF Edge Service Pricing Specifications

The SDPF Edge service is intended to be used with each SDPF application service.
The total cost monthly fixed SDPF Edge + additional cost which will be subject to individual requirements

SDPF Edge (Hardware)



Monthly fixed fee
- including hardware maintenance

Application

Monthly fee
- By each service

Various applications Maintenance

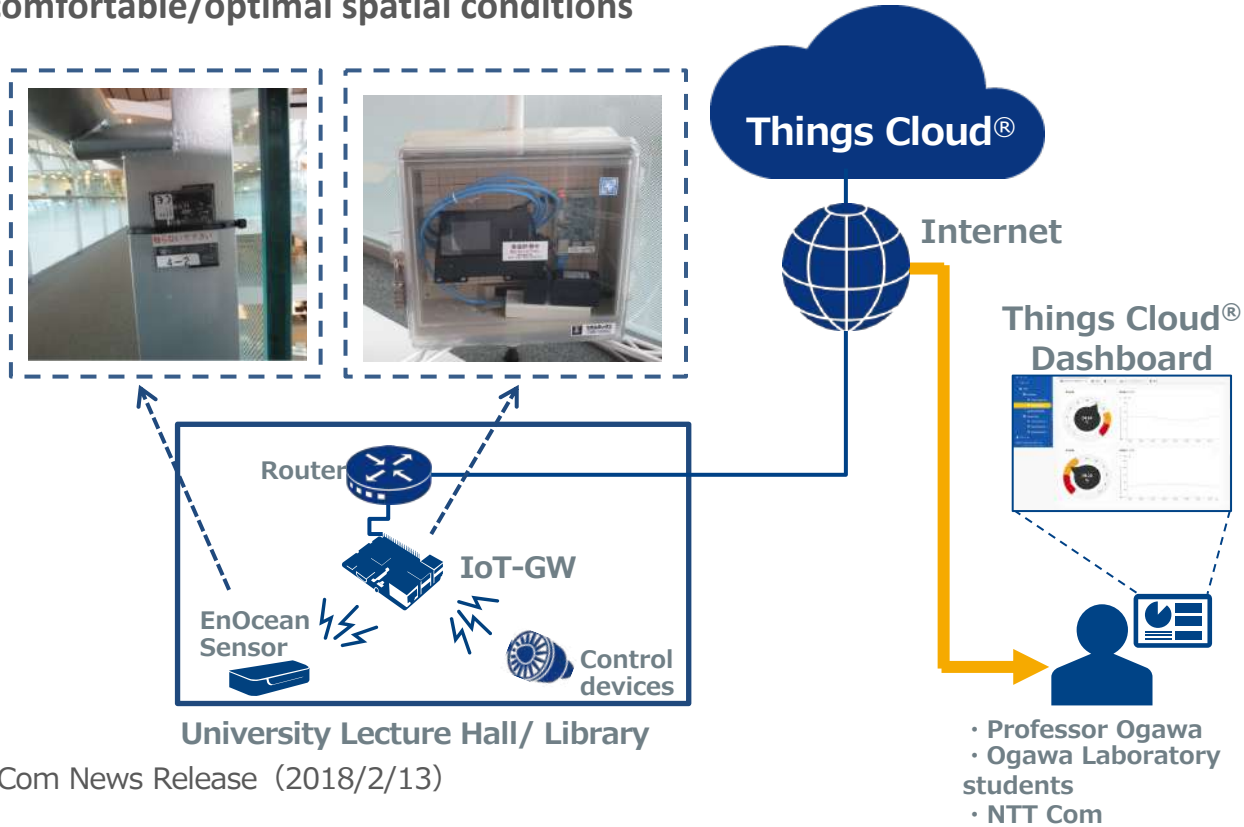
Monthly fee
- By each service

Reference: SDPF Managed IoT Service Overview

IoT Platform	Things Cloud®	**IoT platform service** that packages functions for IoT, such as data collection, visualization, and analysis
	SDPF Edge	Enable real-time and secure IoT utilization **Customer Edge Computing Service** Full support for providing, building, maintaining, and operating controllers for edge application distribution and centralized management
IoT Connect	Local 5G	**One-stop services ranging from local 5G implementation consulting to operation** providing agency services for license acquisition, construction, monitoring, maintenance, and operation necessary for local 5G
	IoT Connect Mobile ® Type S	**Mobile Data Services for IoT** to Enable Global IoT Business
	IoT Connect Gateway	**Simple and secure connection based on cloud-side interface specifications** without worrying about the processing load or data volume of IoT devices

Maximize Spatial Value of University Campus

- Combine temperature, humidity, and CO2 concentration data collected through EnOcean sensors with the sensory evaluation result to derive the comfortable/optimal spatial conditions



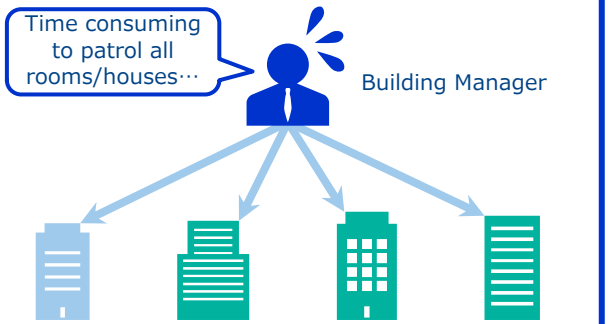
NTTCom News Release（2018/2/13）

Things Cloud® Use Case ~Theft prevention in Condos~

- Remotely monitor any anomalies in real-time, of all vacant rooms and reduce workload/ cost for patrol.

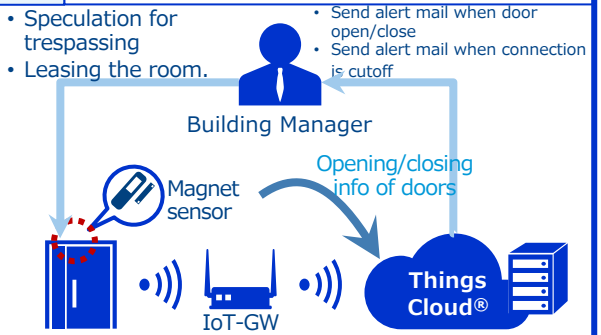
Before

Pain point	• Patrol all vacant rooms to prevent theft. • Increase in vacancy due to population decrease has accelerated workload in patrolling
Result	• Heavy Cost and workload for patrolling vacant houses



After

Utilization	• Detect any opening-closing of the vacant room in real-time.
Result	• Reduce workload/cost for regular patrol.

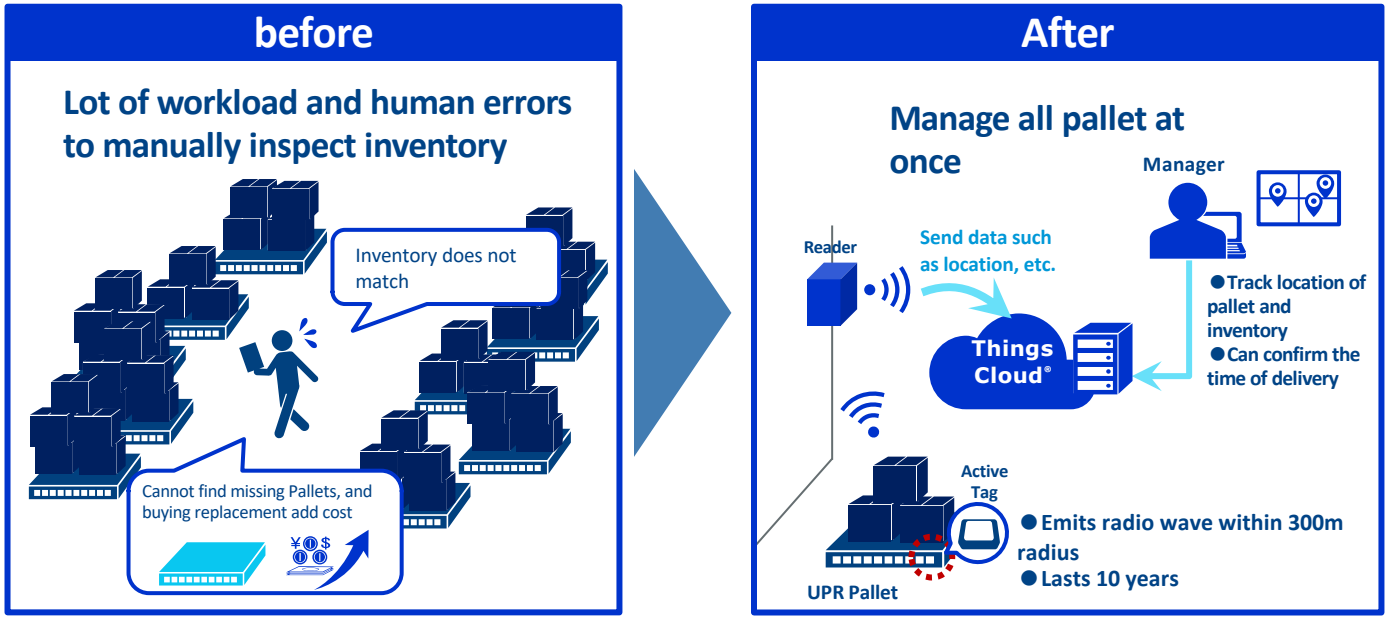


NTT com Offering	• Provided Things Cloud®/ Internet Connection and customized display • Selected EnOcean sensor/IoT-GW, and tested connection with Things Cloud® • Field inspection (EnOcean radio-wave, sensor/IoT-GW installation environment etc.) • Establish a dedicated Customer Service Support Line
Future Prospects	• Review Customer Operation Flow under the commercial environment.

Things Cloud® × Asset Management

～Prevent Loss of Pallet(asset)～

- Prevent Loss and reduce cost by tracking pallet location in real-time.



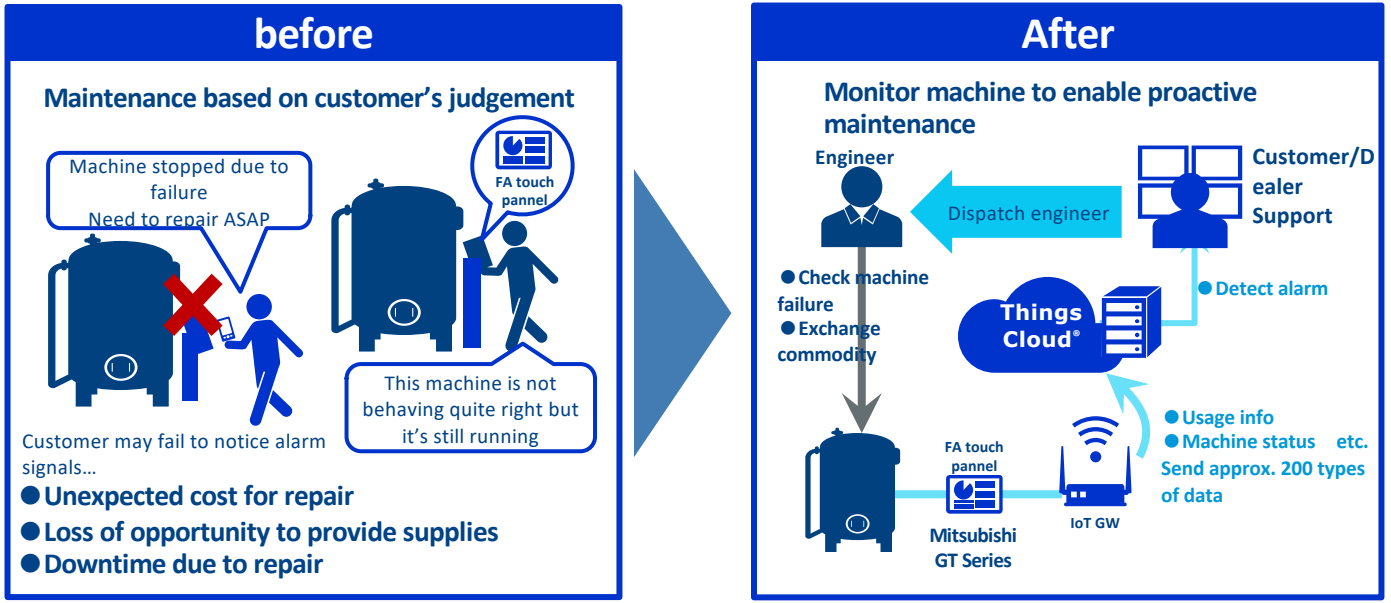
NTT Communication's Offering

- Things Cloud/OCN mobile ONE for Business
- Active RFID Tag, provide support in connecting existing customer application to Things Cloud
- Provide training in operating Things Cloud

Things Cloud® × Machine monitoring (remote monitoring)

～Advanced maintenance for water treatment equipment～

- Providing advanced maintenance by monitoring devices in real time.

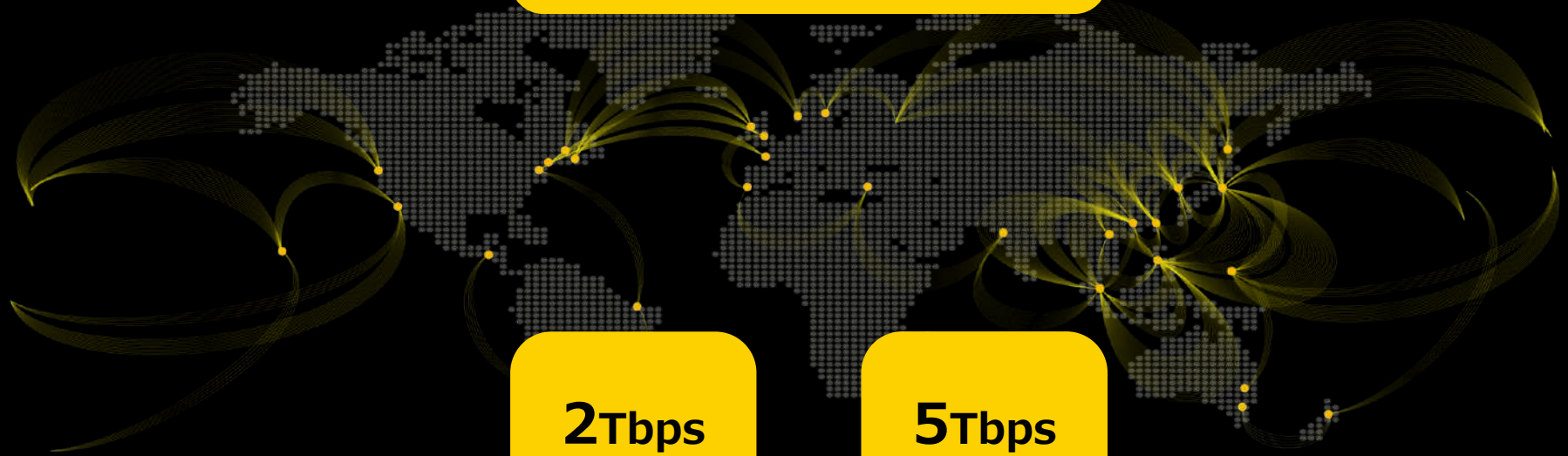


NTT Communication's Offering

- Things Cloud/UNO mobile/ Internet connection options
- Support customer requirement, provide customer device (FA touch panel), and provide support in connecting to Things Cloud
- Design and create display on Things Cloud
- Provide training in operating Things Cloud
- Assisted in creating the Report form for end users.
- Outage detection/ machine parts replacement prediction using AI (Future Plan)

Global Cable Capacity

8.8Tbps



2Tbps
Japan - USA

5Tbps
Japan - Asia

As of Sept. 2017

Global Coverage ～Arcstar Universal One～

As of Nov. 2017(Including plans)

Feature as an IoT Platform

- We began initiatives to use IoT in improving comfort at our Otemachi Office W.C.

Results

Office User

- ✓ Prevent long term confinement
- ✓ Reduce waiting time

Office Manager

- ✓ Improve efficiency in cleaning/repair
- ✓ Ascertain Safety environment