

# All Photonic Network Technologies

Intelligent & Automated  
Next-Generation Transport



# Building new possibilities by connecting people, technology and ideas

## Our key technologies



### Computing

Super Computer  
HPC  
Quantum



### Network

Cloud Native Network  
Photonics  
Photoelectric conversion



### AI

Explainable AI  
Trusted AI  
Human Sensing



### Data & Security

Blockchain  
Data Trust  
Digital Identity



### Converging Technologies

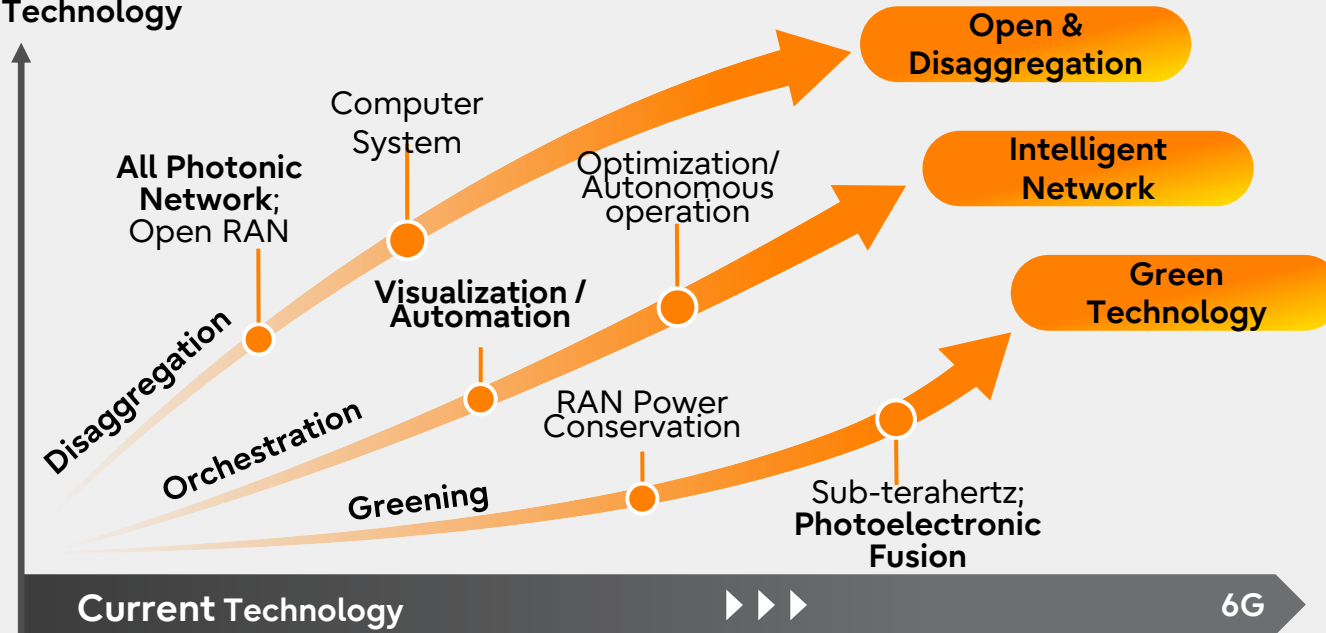
Leading-edge  
Digital Technology  
x  
Humanities and  
Social Sciences



# Network Technology Roadmap

Enable end-to-end fully virtualized cloud-native networks across the world

Evolution of Technology



**Open & Disaggregation**

All Photonic Network, Mobile Base Stations (Open RAN), Computer System

**Intelligent Network**

Network Visualization, Automation & Optimization, AI/Machine Learning

**Green Technology**

Sub-terahertz, Photoelectronic Fusion, liquid-cooling Technology

# Fujitsu All Photonic Network Vision

- Available the publication of a groundbreaking white paper on Fujitsu's vision of the All Photonic Network (APN)
- Please visit our Web page : **"Fujitsu's activities in IOWN GF"** [fujitsu.com/global/about/research/technology/iown](https://fujitsu.com/global/about/research/technology/iown)



## Fujitsu's activities in Open APN technical area

IOWN Global Forum creates Task Forces related to Open APN (All Photonic Network) and has been studying the next generation photonic network infrastructure.

Fujitsu has been acting as a coordinator of OAW (Open APN Wavelength Availability) Task Force and promoting the shift from the existing converged system to the new disaggregated system. Fujitsu leading this industry and driving the open architecture.



## Related pages

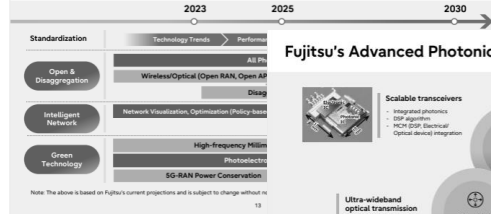
### Related pages

- > 1FINITY™ Optical Networking Platform
- > The Virtuora Network Control Solution
- > Fujitsu All Photonic Network Vision (PDF)
- > The 1FINITY Ultra Optical System (PDF)
- > Japanese joint research group achieves a world record of 1.2Tbps for optical signal transmission using 110nm silica transceiver in Fabry-Pérot

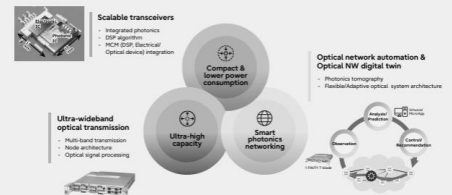
- > 1FINITY™ Optical Networking Platform
- > The Virtuora Network Control Solution
- > **Fujitsu All Photonic Network Vision (PDF)**
- > The 1FINITY Ultra Optical System (PDF)

## Connecting the borderless world with APN

Fujitsu is developing future network technologies to create seamless experiences and a sustainable future



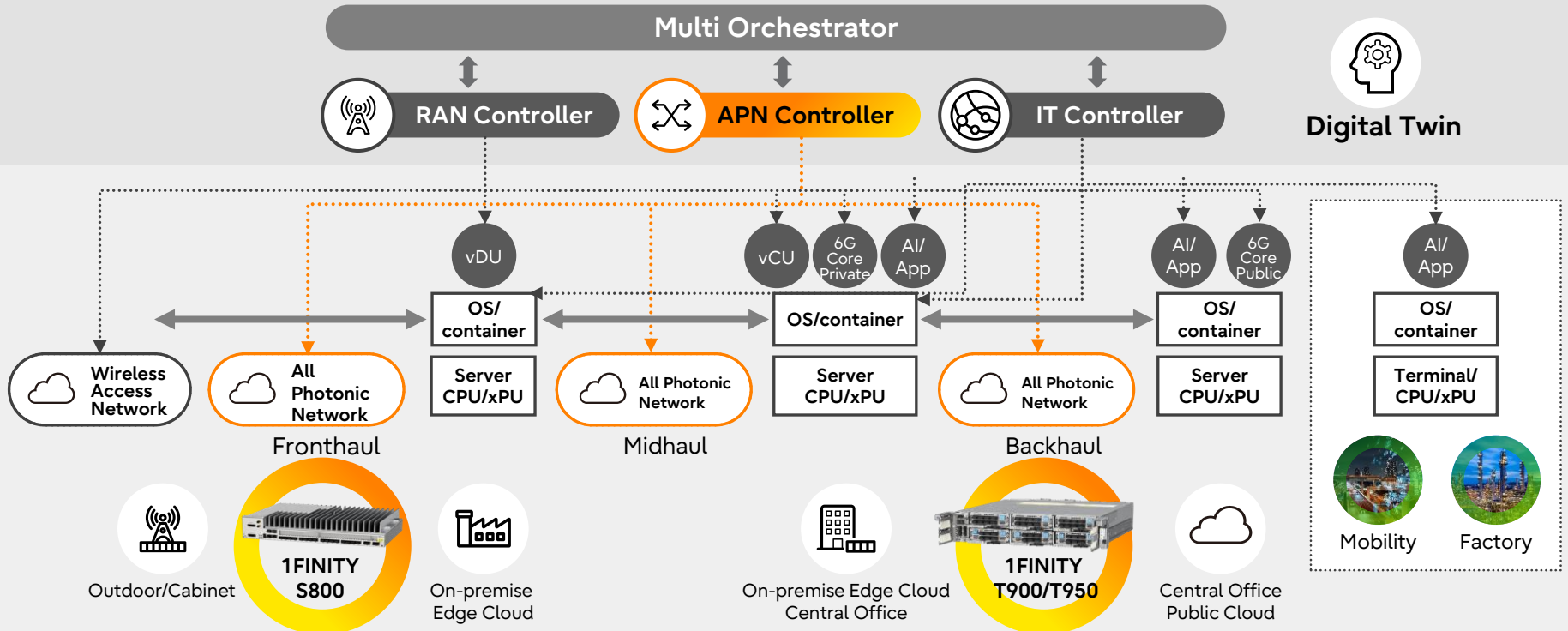
## Fujitsu's Advanced Photonics Research for APN



# All Photonic Network (APN)

contributes eco-friendly AI infrastructure

In advanced data processing for AI application, there is a demand for low latency and high capacity in network resources, and less power consumption is necessary to reduce environmental impact.

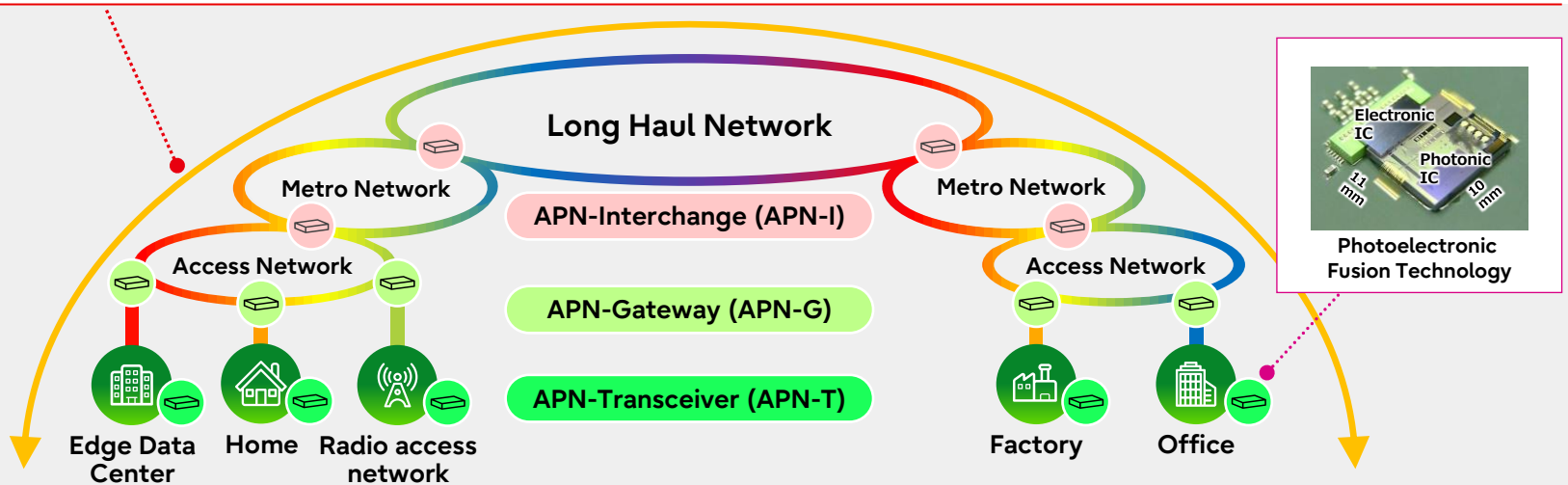


# All Photonic Network (APN) contributes eco-friendly AI infrastructure

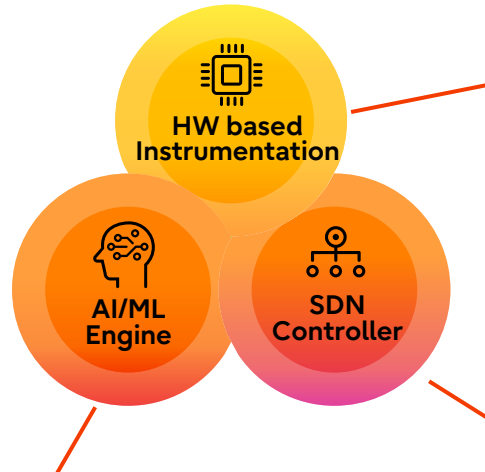
End-to-end direct optical path

- Less Power Consumption
- Higher Transmission Capacity
- Lower end-to-end Latency

End-to-end direct optical path connection for **less power consumption, higher Transmission capacity and lower end-to-end Latency** by APN nodes (APN-T/G/I) without intermediate electrical router and switch nodes



## ● AI / ML based Network Automation Requires:



### Hardware based Instrumentation Capabilities

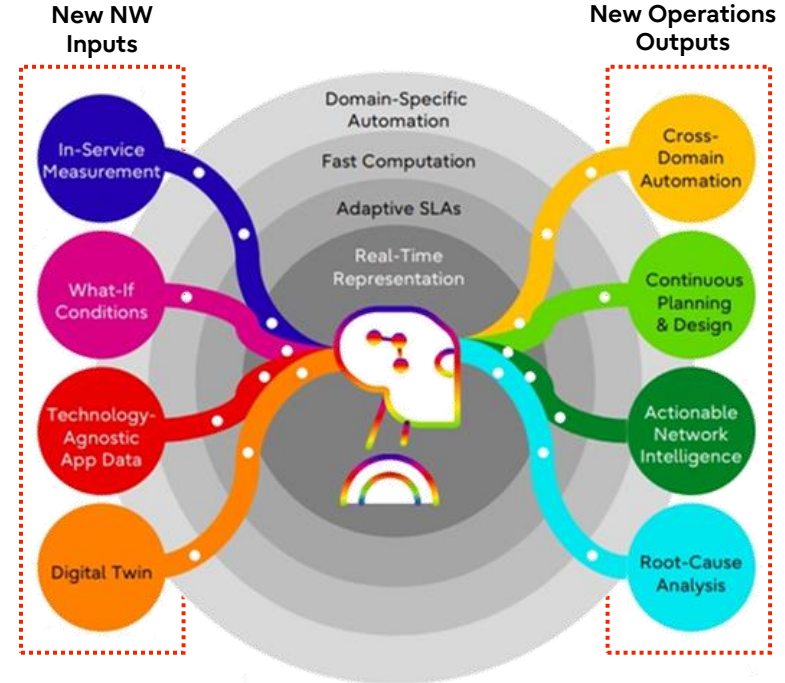
- 1FINITY T900 State of Polarization (SOP) detection
- 1FINITY L900 & T900 Optical Parameters measurement
- 1FINITY L900 Pseudowave Lightpath Characterization

### AI / ML engine to analyze, conclude, recommend and activate

- Based on Fujitsu's unique convergence of Computing, Network and AI expertise

### SDN Controller to collect and summarize the information

- Provides network level data collection & visibility
- Provide the automation execution



### Intelligent & Automated Operations



# 1FINITY Ultra Optical System

Hyper-reliable optical transport platform



## Extreme performance

- 1.2T now with upgrade to 1.6T
- 800G  $\lambda$ 's up to 2400 km
- 40% reach or capacity advantage using forward Raman



## Automated & optimized operations

- Up to 93% fiber cabling reduction
- Automated system turn-up
- Automated fiber health check & optical performance validation



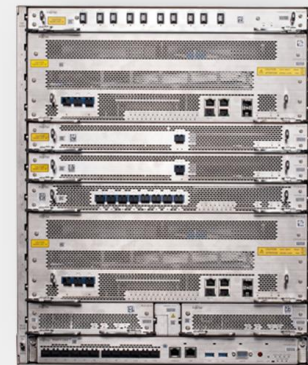
## Designed for sustainability & reliability

- 60% less power
- Liquid Cooling technology
- Error-free installation & turn-up
- Reduces fault localization time from days to seconds

## 1FINITY T900



## 1FINITY L900





# 1FINITY Ultra Optical System

## Hyper-reliable optical transport platform



- **New Optical Transport platform achieves top-level long-distance transmission capacity of 1.2Tbps**
- **Incorporate the latest technologies**
  - A digital signal processor (DSP) LSI using latest semiconductor processes
  - Liquid cooling delivers 2x the cooling capacity
  - C+L ROADM architecture able to handle multiple wavelength bands in one product
  - Forward Raman amplification
- **60% reduction in CO2 emissions**
- **Support for AI/ML automation to optimize performance**

More is less . . .



More wavelengths per fiber



More capacity or reach per wavelength



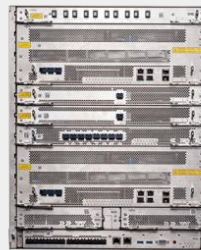
Less effort to install, operation, and maintain



Less power consumed per bit

The ideal balance of cost, capacity and reach – simplified

### 1FINITY L900 terabit-optimized OLS



- C+L band in one device ensures high reliability
- Using optical backboards to reduce cable connections during initial construction
- Forward Raman amplification increase maximum transmission
- Max transmission capacity 76.8Tbps, Max 16degree

### 1FINITY T900/T950 extreme-performance transponder



- High Baud Rate and Compensation Technology Realize High OSNR and Long-Distance transmission
- Space saving and low power consumption by liquid cooling technology
- Max transmission capacity 1.2Tbps/Lambda, 14.4Tbps/blade

# 1 FINITY T900/T950

sustainable network technology for eco-friendly AI infrastructure



Extends equipment life & maintenance intervals for substantial energy & cost savings

- Space saving and less power consumption by liquid cooling technology
- High Baud rate and High OSNR performance by unique compensation technology
- 5 nm CMOS technology and power-saving FEC to reduce power consumption
- Specification
  - Transmission capacity : Up to 14.4Tbps # per blade
  - Client : 100GbE, OTU4, 400GbE
  - Network : 400Gbps to 1.2Tbps
  - PIU Type : High Speed / Mixed speed

## Two versions

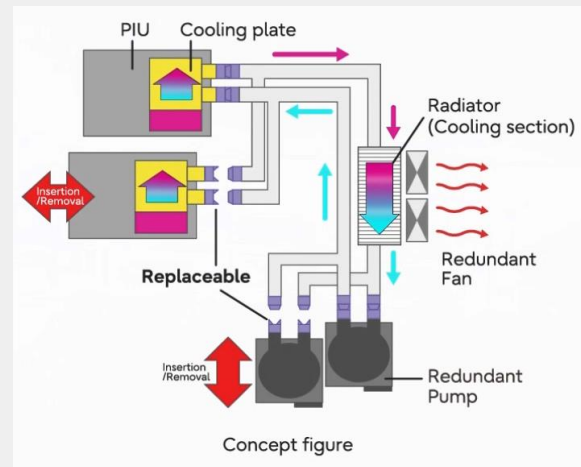
### 1 FINITY T900

- 2RU × 450 mm
- DC power

### 1 FINITY T950

- 2RU × 600 mm
- AC or DC power

Sustainable thermal management using liquid cooling



Higher channel capacity



Longer distances



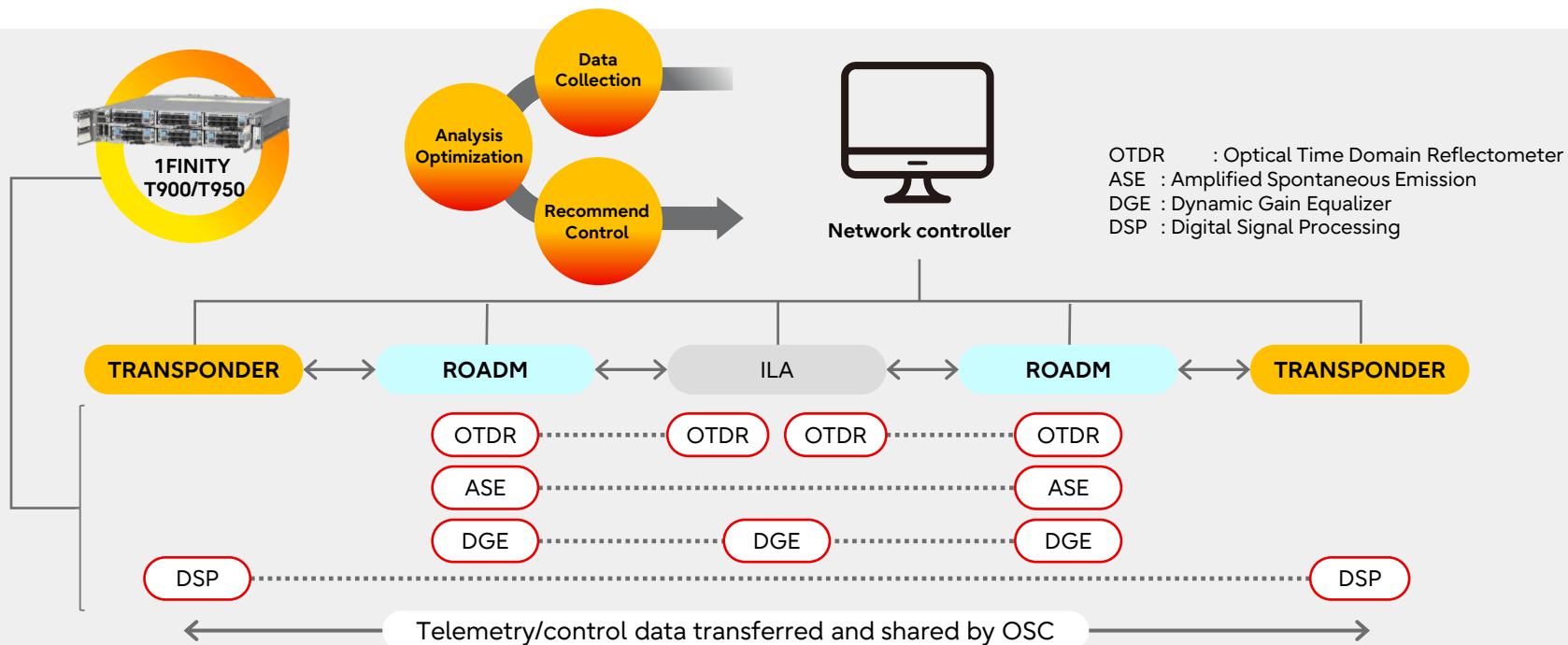
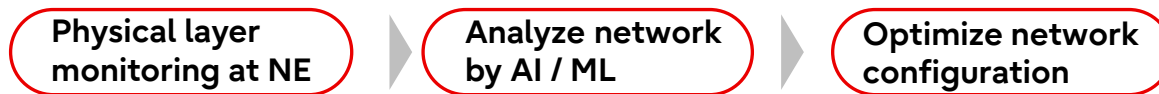
Less power consumed per bit



Sustainable thermal management

# Photonics tomography

## AI technology for smart optical network monitoring



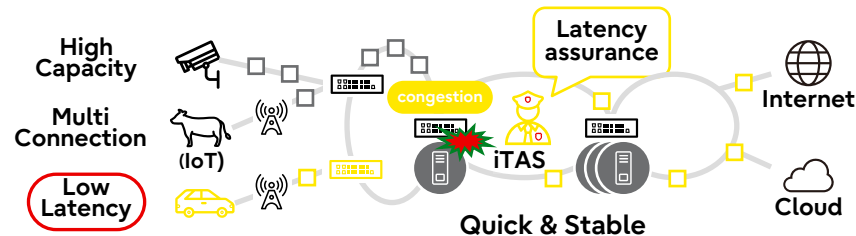
# 1FINITY S800

intelligent ultra-low latency network for edge AI infrastructure



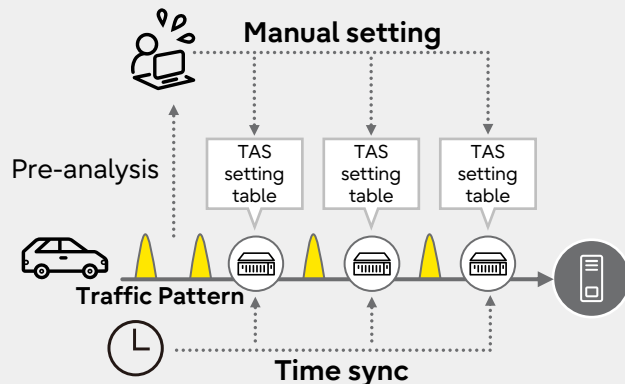
## iTAS technology powered by AI

- In access networks where various traffic coexists, S800 provides ultra-low latency and stable network, contributing to comfortable services
- Ultra-low Latency less than 50% compared to conventional



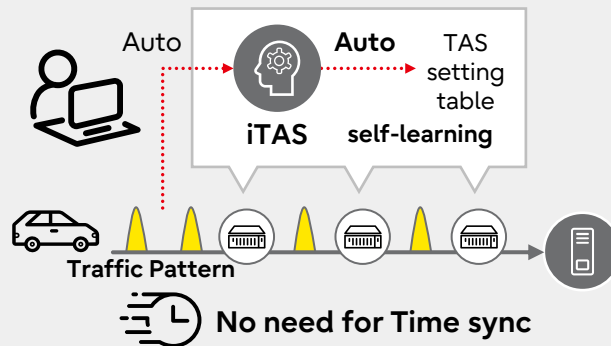
### conventional TAS

Manual table setting and need for time sync of each device



### intelligent TAS (iTAS)

Automatic table optimization by getting self-learning intervals from traffic patterns automatically



# 1 FINITY S800

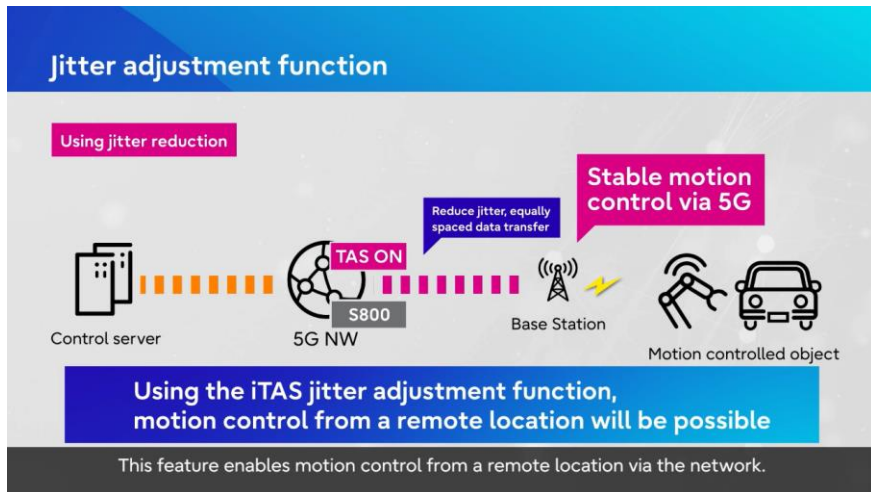
intelligent ultra-low latency network for edge AI infrastructure



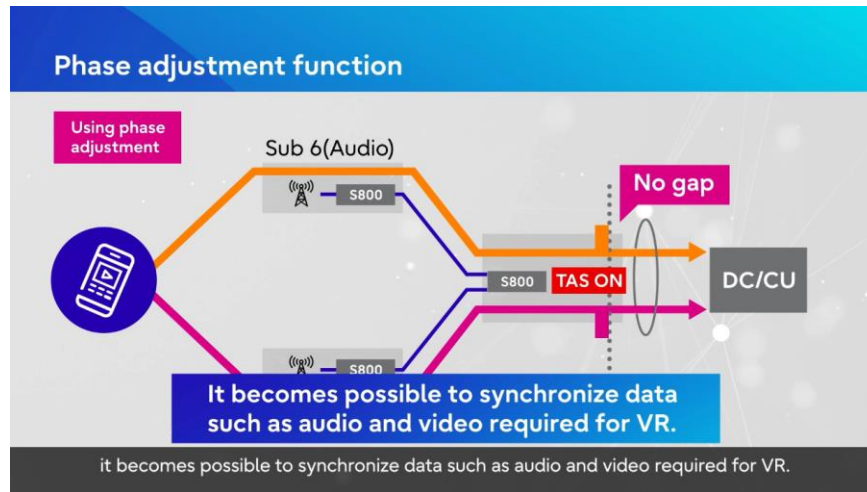
iTAS technology  
Use case

Fujitsu's proprietary intelligent TAS (iTAS) technology enables **jitter adjustment** and **phase alignment**

### Reduce the jitter generated within the network



### Synchronize data transfer timing for different traffic



# Virtuora Cloud Platform

## AI / ML Enabled SDN Controller



### AI/ML central to Fujitsu's data-driven, closed loop digital transformation capabilities

- Integrated into our 5G software platform and solutions



### "Open" is central to our software strategy and solutions

- Open API-based
- Open source-based orchestration and control
- Active contributor to multiple open network software initiatives



### Full portfolio of modular software components and platforms for network orchestration and control

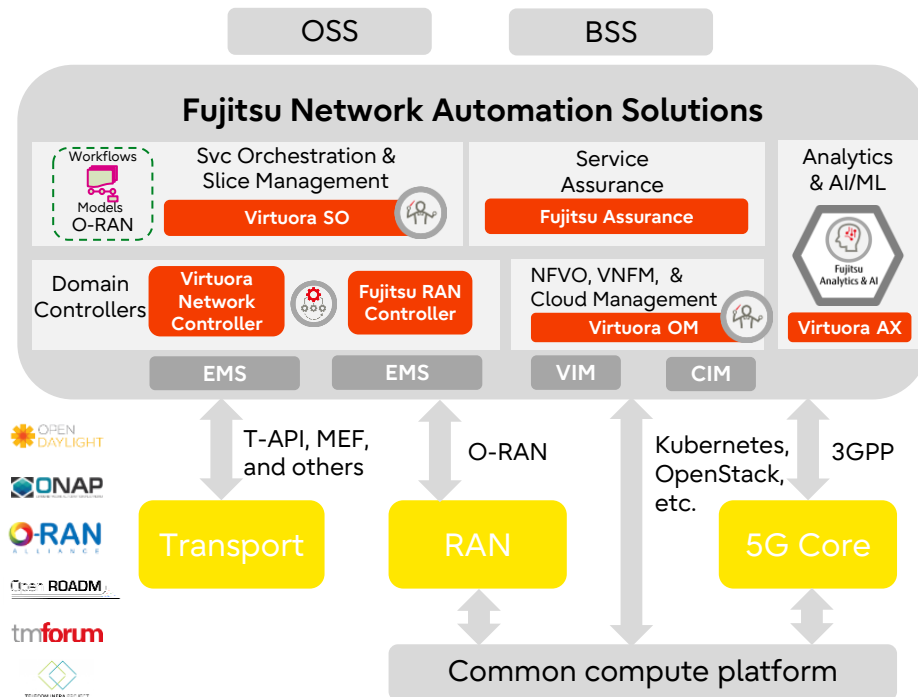
- Multi-domain – transport, vRAN, 5G Core
- Multi-vendor and extendable with SDK
- Model-driven interactions



### Containerized, applications

- Flexibly integrate systems and MicroApps
- DevOps development & integration model
- Scalable, secure, open platform

Open | Scalable | Modular | Flexible | Carrier Proven Capability

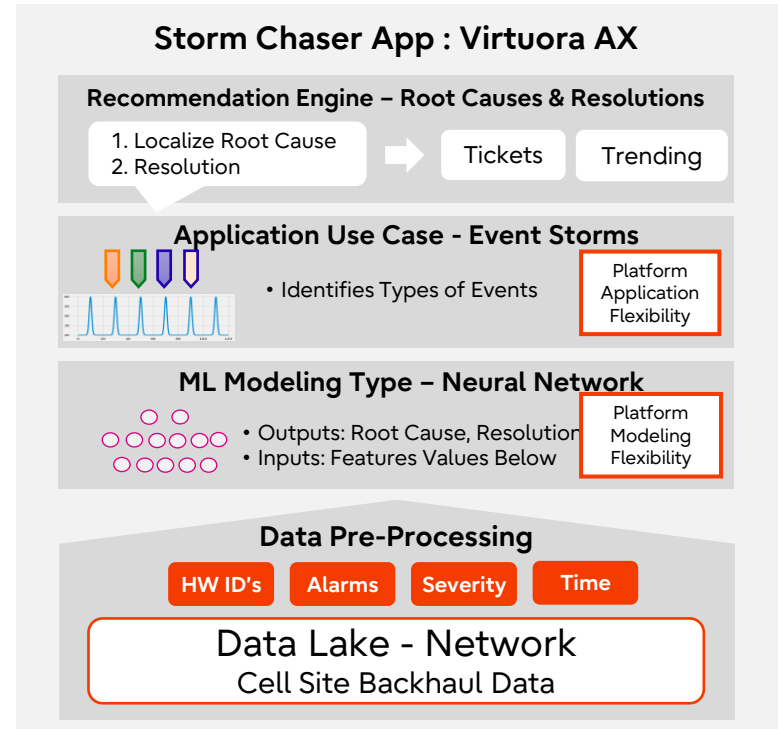


**Fujitsu plays a lead role in digital transformations of the world's largest service providers**

# Root Cause Analysis (RCA) in seconds

## Virtuora AX Storm Chaser microapp

- Identify and analyze the root cause of network alarm storms
- Use predictive modeling & adaptive control
- Update and train models with real-time network information



AI/ML delivers RCA on millions of alarm storms in seconds



**Thank you**

