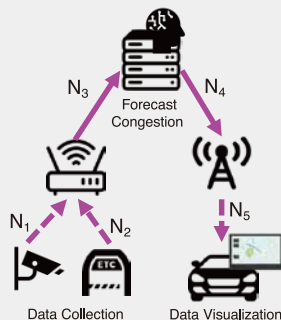# Cloud-Edge Continuum Computing Platform : An Application Platform in Post-5G Era

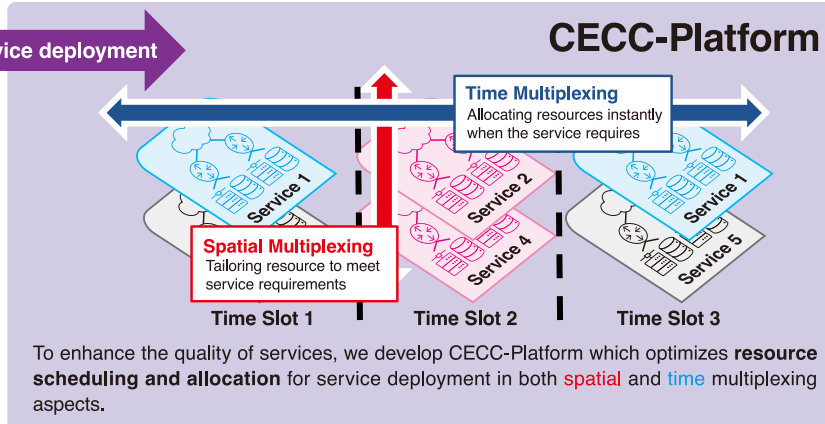## Cloud-Edge Continuum Computing Platform (CECC-Platform)

As technology rapidly advances in the post-5G era, particularly in network resources that enable low latency and high concurrent connectivity, there is a growing capability to deliver **time-sensitive services.**
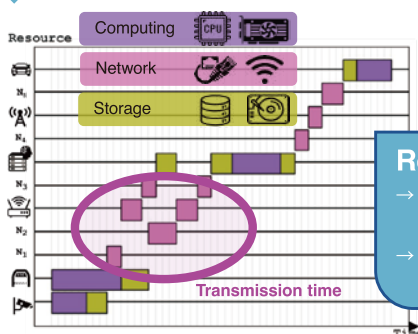
### Time-Sensitive Services
Ex: Congestion Forecast Service

N_3 N_4 — Forecast Congestion
N_1 N_2 N_5
Data Collection Data Visualization

Service deployment

CECC-Platform

Time Multiplexing
Allocating resources instantly when the service requires

Spatial Multiplexing
Tailoring resource to meet service requirements

Service 1 | Service 2 | Service 4 | Service 1 | Service 5

Time Slot 1 | Time Slot 2 | Time Slot 3

To enhance the quality of services, we develop CECC-Platform which optimizes **resource scheduling and allocation** for service deployment in both spatial and time multiplexing aspects.

Scheduling Fine-Grained Resources for Time-Sensitive Services

Resource: Computing, Network, Storage — Transmission time

Scheduling with fine granularity across heterogeneous resources is an essential mechanism within the platform **to achieve spatial-time multiplexing** in service deployment.
Job shop scheduling problem involves allocating resources for time-sensitive services, where each operation must adhere to a **predefined sequence** and be assigned to **specific resources.**
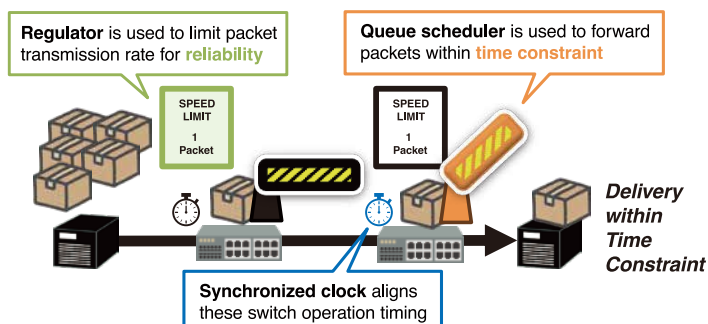
Research directions
→ To enhance scheduling time for time-sensitive services
→ To develop scheduler for large and diverse services and resources

Job 1 | Job 2 | Job 3 — Scheduler
Worse scheduling
Makespan reduction
Best scheduling
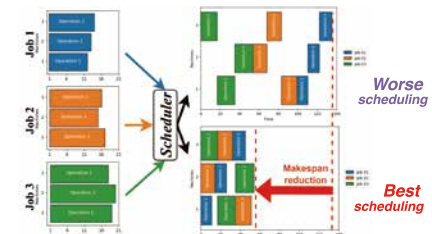
An efficient scheduler enables the platform to provide **cost-effective, tailored, and instant resources.** However, it is still challenging to **control transmission time** due to network conditions

Ensuring Communication Latency in Wide-Area Network through DetNet

Deterministic Networking (DetNet) is **a network protocol suite that guarantees communication latency** and under development.
When implemented within the platform, DetNet simplifies the process of achieving **precise control over data transmission times.**

Regulator is used to limit packet transmission rate for **reliability**

Queue scheduler is used to forward packets within **time constraint**

SPEED LIMIT 1 Packet

Delivery within Time Constraint

Synchronized clock aligns these switch operation timing

DetNet guarantees the latency using switches equipped with these elements. However, to implement DetNet effectively on the platform, it is **essential to enhance its scalability** for real-world applicability.

Research directions
→ To ensure robustness of DetNet against time synchronization errors
→ To develop scalable optimizations for switch settings in large-scale deployments

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