

# Photonic disaggregated computer

New computer architecture  
for beyond 5G Era



# What is “Photonic disaggregated computer”?

- New computer architecture for beyond 5G Era realizes high power efficiency, low latency and rapid configuration.
- Fujitsu is developing Photonic disaggregated computer with NTT for realization of IOWN\* as next generation communications infrastructure for sustainable society.

\*IOWN = Innovative Optical and Wireless Network

## Requirements in Beyond 5G Era

Acceleration of data collection/utilization

High-definition video, 3D data, and IoT etc.

Solving environmental issues

SDGs, carbon neutrality etc.

DX/  
Various service

Various performance requirements depend on use cases  
e.g. Robotics, Rich UX/UI etc.

Traffic  
90x  
※1

DC power consumption  
13x  
※2

Delay  
< 10 ms

※1 from 2010 to 2025

※2 from 2018 to 2030



# Three features and value

## Features

### ① Flexible reconfiguration of devices

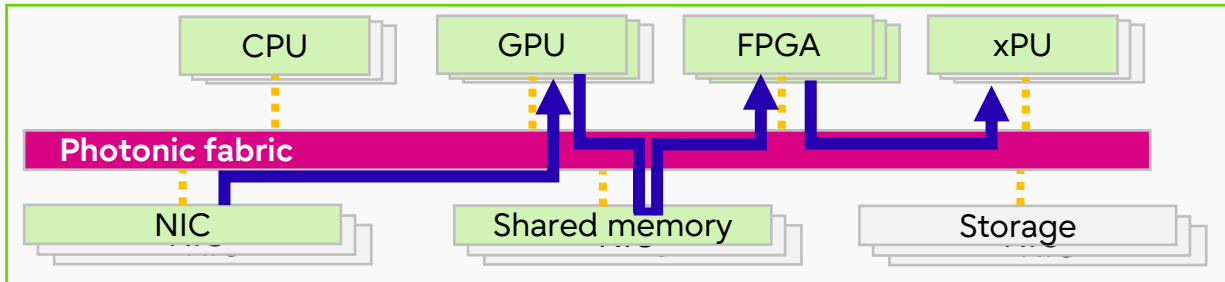
- ✓ Improve device utilization efficiency
- ✓ Rapid reconfiguration

### ② Device-to-device communication without CPU

- ✓ Reduce CPU load
- ✓ Reduce processing delay

### ③ Photonics connection

- ✓ Reduce power consumption
- ✓ Increase bandwidth/distance of device-to-device connections



## Value



**Reduce power consumption**



**Improve performance**  
**Fixed low latency**



**Improve cost-performance**



**Improve agility and maintenance/operation efficiency**

# ① Flexible reconfiguration of devices

- Realtime and dynamic reallocation of hardware that meet the performance requirements

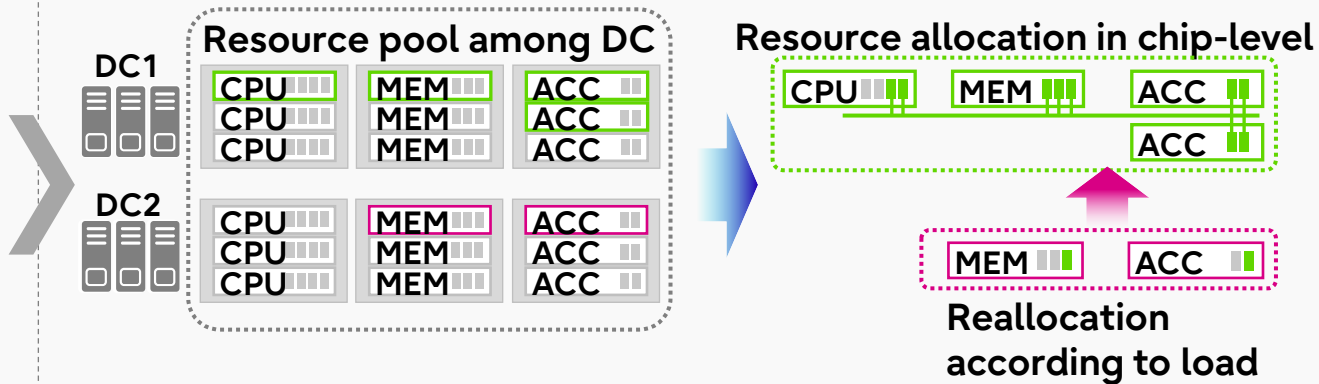
Before

Fixed server



After

Flexible allocation of resources

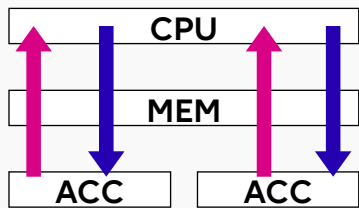


## ② Device-to-device communication without CPU

- Processing without CPU involvement
- Optimization of accelerators allocation in response to the type of processing

Before

**CPU-centric**

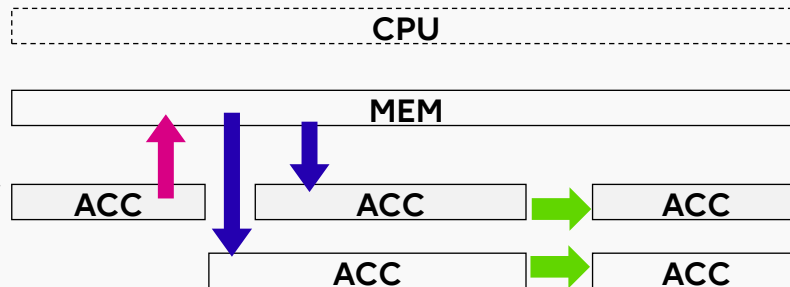


Function : →

Bottleneck for energy-performance  
Increases latency and its variability.

After

**Utilization of accelerator according to the data processed**



Processing by CPU is divided based on functions  
Function is offloaded to appropriate hardware

- Division and allocation of functions according to load and accelerator type
- Connection between accelerators without processing by CPU

# ③ Photonics connection

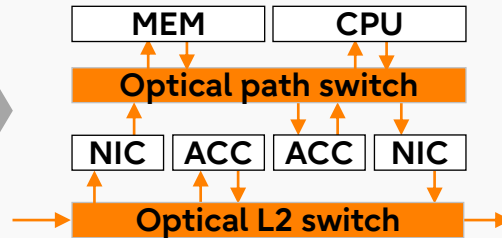
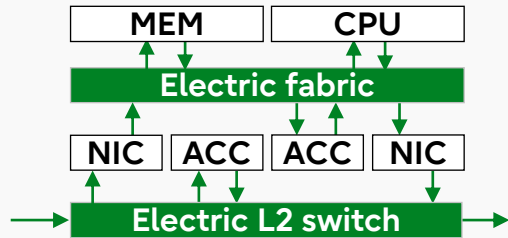
- Photonic technology for connection between devices

**Before**

**After**

**Electrical connection**

**Photonic technology with high energy efficiency**



- Optical connection between devices/chips without electric conversion
- Reduction of energy consumption and the deterioration of calculation speed

# Value provided by Photonic disaggregated computer

Photonic disaggregated computer as a solutions to several problems



**High-speed processing/  
Fixed low latency**



**Efficient use of  
accelerator**



**Efficient maintenance  
and operation**

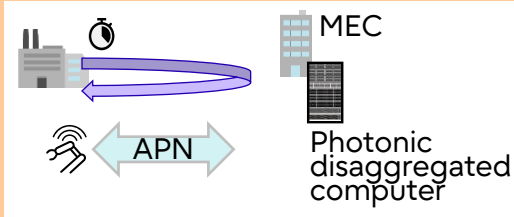
**Problem**

Systems with severe requirement for low latency



**Low latency with the reduction of CPU processing and utilization of APN\***

Reduction of latency of overall system is realized by reducing the fluctuation of latency with photonic disaggregated computer and enabling large-capacity and low latency transmission with APN



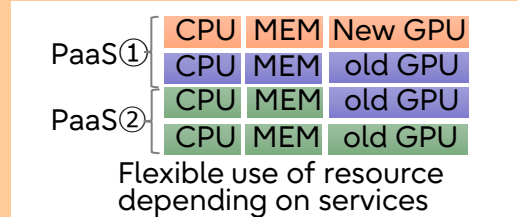
**Problem**

High-cost and short lifecycle of GPU



**Highly efficient use of expensive devices with flexible configuration**

ICT infrastructure for SaaS/PaaS which realizes efficient use of expensive and fast obsolesced of GPU



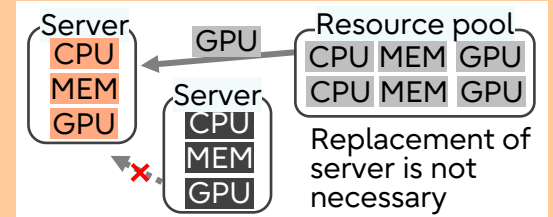
**Problem**

Management and failure handling of large number of servers



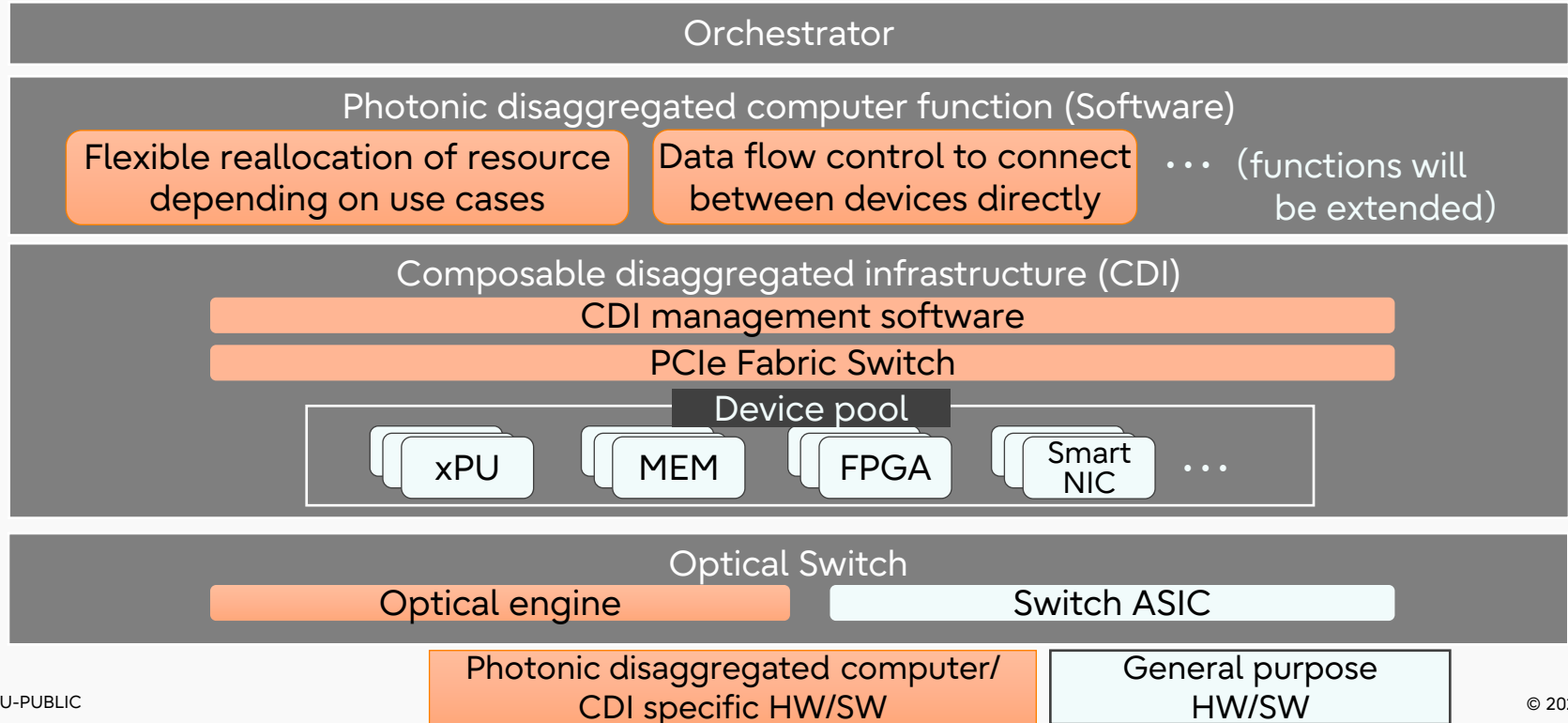
**Automated reallocation of devices in the case of failure**

Replacement of server is not necessary even when the failure occurs. New device can be allocated automatically in place of failure device



# Basic architecture of Photonic disaggregated computer

Efficient use of composable disaggregated infrastructure(CDI) and optical switch by photonic disaggregated computer function(software)





# Use case which Photonic disaggregated computer is effective

Volume of data  
processing

Use of various  
accelerators to archive  
higher performance and  
low power consumption

Large dynamic range  
of processing load

Low processing delay,  
deterministic delay

## Smart Security



- ✓ Suspicious person detection
- ✓ Crime detection

## Smart City Management



- ✓ City operation
- City data collection and analysis

## Smart Factory



- ✓ AR Navigation
- ✓ Remote control

## Smart Mobility



- ✓ Mobility control
- ✓ Individual vehicle control

## Smart Store



- ✓ Digital store
- ✓ Live commerce

## Smart Energy & Smart Building



- ✓ Energy management

## Smart Media



- ✓ Cloud Gaming
- ✓ Video Editing

AI(Image analysis, etc...), real-time processing(rendering, DB), etc.

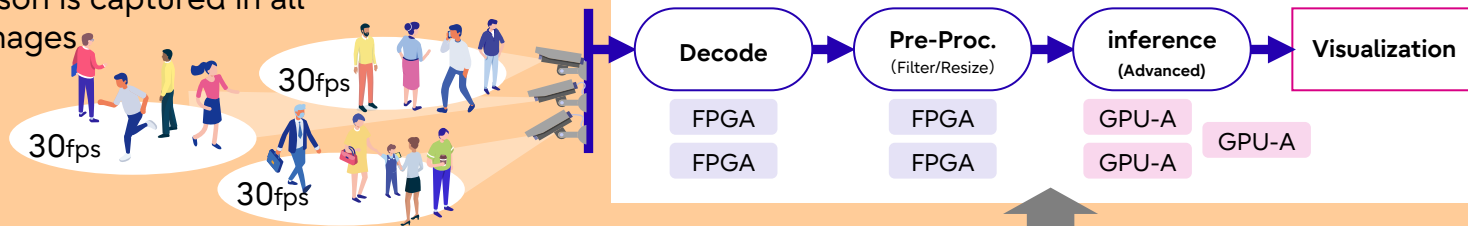
# Use case: Smart Security

## Security infrastructure for smart cities

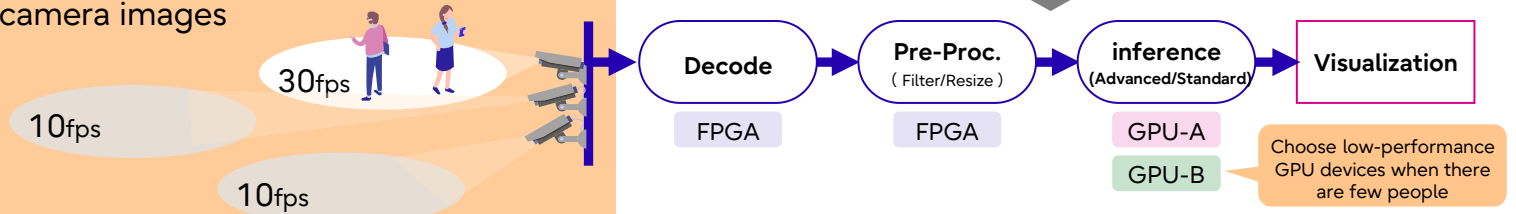
Smart security detects suspicious individuals by collecting large amounts of camera image data and AI analysis, and it protects safety of city. Photonic disaggregated computer makes smart security infrastructure Economical and Sustainable

### Leverage existing urban cameras for enhanced public security

When person is captured in all camera images



Lower frame rate if there are no people in camera images



**Thank you**

