

# **Toward the Future Society in the 6G Era**

February 2, 2024

**Toshikazu Yokai**

Chief Network Officer, Managing Executive Officer  
Deputy General Manager of Technology Sector  
KDDI CORPORATION

# Index

**1**

**KDDI's Vision**

**2**

**Area Deployment of 5G Network  
with a Focus on Quality**  
(Enhancing the Power to Connect)

**3**

**Activities toward the 6G Era**  
(Realization of Digital Twin)



**1**

**KDDI's Vision**

# KDDI VISION 2030

**The creation of a society in which anyone can make their dreams a reality, by enhancing the power to connect.**

Connecting and Protecting Lives



- ✓ Building a resilient infrastructure for communication and disaster measures
- ✓ Conserving the environment

Connecting Day-to-day Lives



- ✓ Sustainable development for cities and communities
- ✓ Developing human resources for the next generation

Connecting Hearts and Minds



- ✓ Creating a secure and productive society
- ✓ Fostering health and a purpose in life

# Social Issues

Environmental Problems



Labor Shortage



Aging population



**The creation of a society in which  
anyone can make their dreams a reality**

# **KDDI Digital Twin for All**

# Social Transformation through Digital Twin

Analysis, Prediction, Simulation

**Cyber Space**

Data Collection

Feedback

**Physical Space**

Accelerating Transformation with New Value Creation

⇒ It makes a society transform better

**2**

**Area Deployment of 5G Network  
with a Focus on Quality  
(Enhancing the Power to Connect)**



# Enhancing the Power to Connect

Expansion to a wide range of industries

Expansion of communication utilization technology

Game



TV broadcast



Building high quality and resilient communication infrastructure

**5G network**

Improving quality through additional 50 bil. yen investment in the mid-term

mmWave

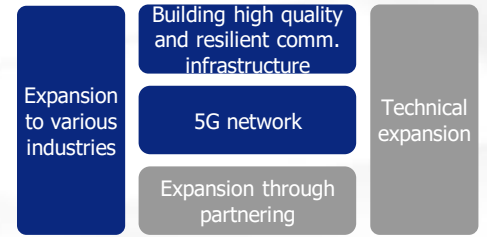


Starlink



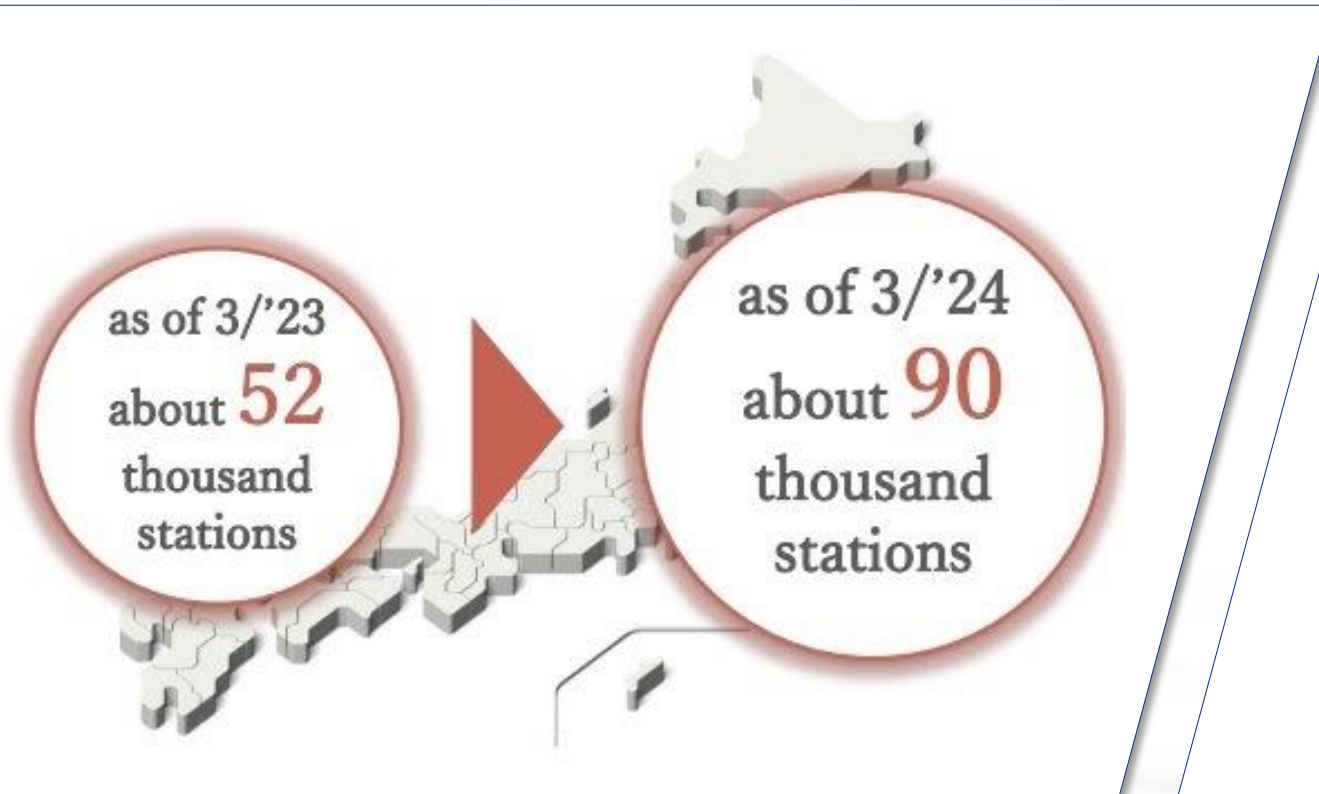
Expansion through partnering

# Deploying 5G Network



## Nationwide Coverage

## Connecting Where You Are Every Day



Railroads



Commercial districts



Last spurt towards installation of about 90 thousand stations

Expanding our 5G coverage area in line with our customers' daily life routes.

# mmWave Initiatives

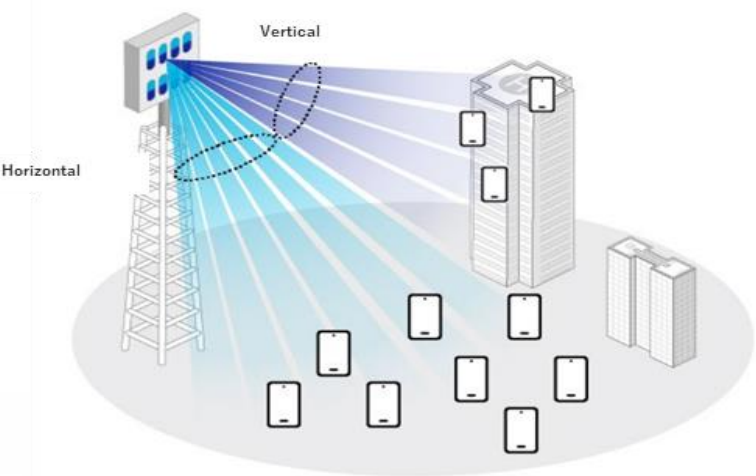
Expansion to various industries	Building high quality and resilient comm. infrastructure	Technical expansion
	5G network	
	Expansion through partnering	

In addition to the commercial deployment of 5G network, promoting R&D to utilize high frequencies for the 6G era

### Commercial

Realizing a stable communication environment

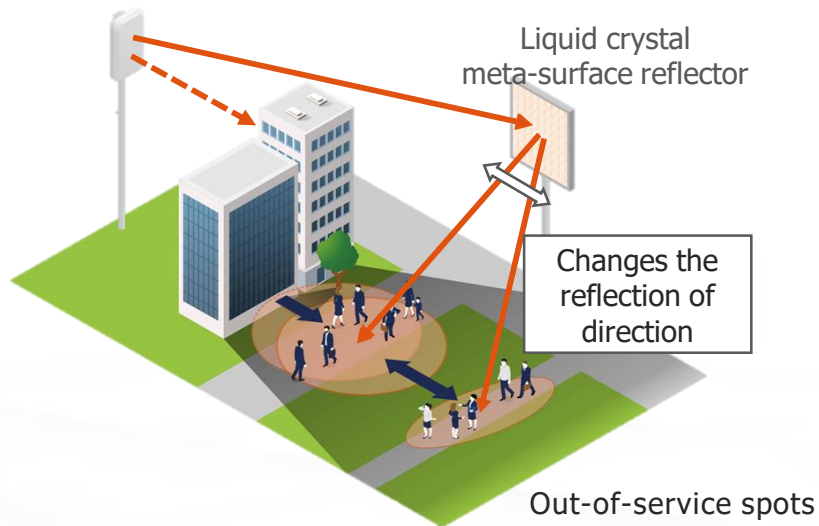
#### Massive MIMO



Utilize massive MIMO and beamforming to achieve a stable communication environment

### Under R&D

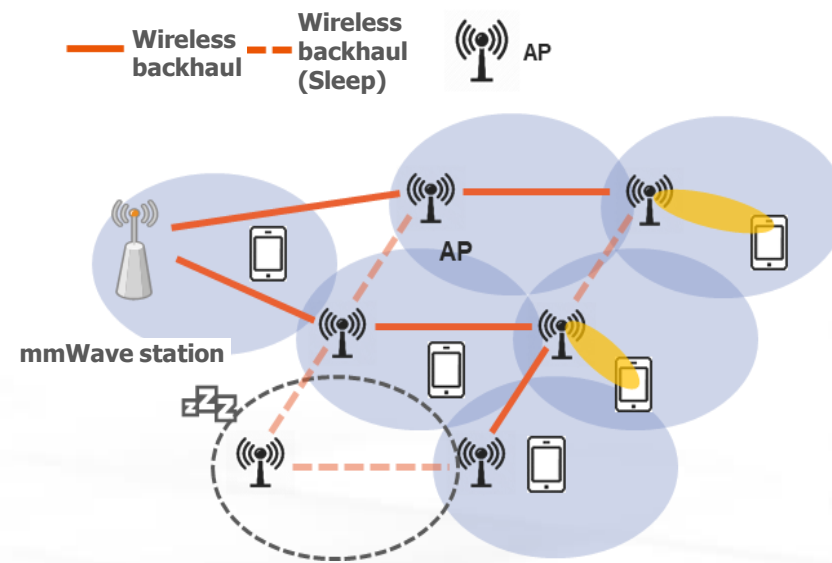
Liquid crystal Meta-Surface reflector



Reflects mmWave in any direction to realize flexible communication

### Under R&D

Equipment of mmWave relation



Utilize mmWave as backhaul for relay equipment to efficiently expand service spots

# Safety and Security



Communications integrate into society,  
Through various initiatives strengthen “tsunagu”(connecting) with partners

Strengthen Infrastructure

Secondary Line Service

Starlink Portable Base Stations



Virtualization core facilities and AI-based operations and congestion detection

Prepare for outages and disasters with other carriers

Vehicle-mounted, portable, shipboard base stations deploy about 200 units by end FY24-03



**Connecting  
the Unconnected.**  
*wherever you see the sky*

**Preparing for launch in 2024**

\* It does not guarantee actual service specifications since it is still under development.

\* The service is planned to be provided based on the establishment of radio-related laws and regulations in Japan.

# Network Recovery during Disasters

- Expansion to all industries
- High quality and resilient telecom infrastructure
- 5G network
- Expansion through partnering
- Technical expansion

During the Noto Peninsula Earthquake, We made every effort to work with our partners to restore communications.

Communication restoration from space

Communication restoration from sea

Communication environment support for evacuation centers

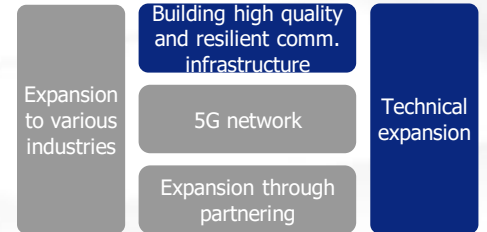


Leveraging SpaceX's Starlink in place of the severed fiber-optic cables to restore base stations

NTT Docomo and KDDI operate shipboard base stations

SpaceX and KDDI provide 350 Starlink units free to evacuation centers on the Noto Peninsula

# Toward Sustainability

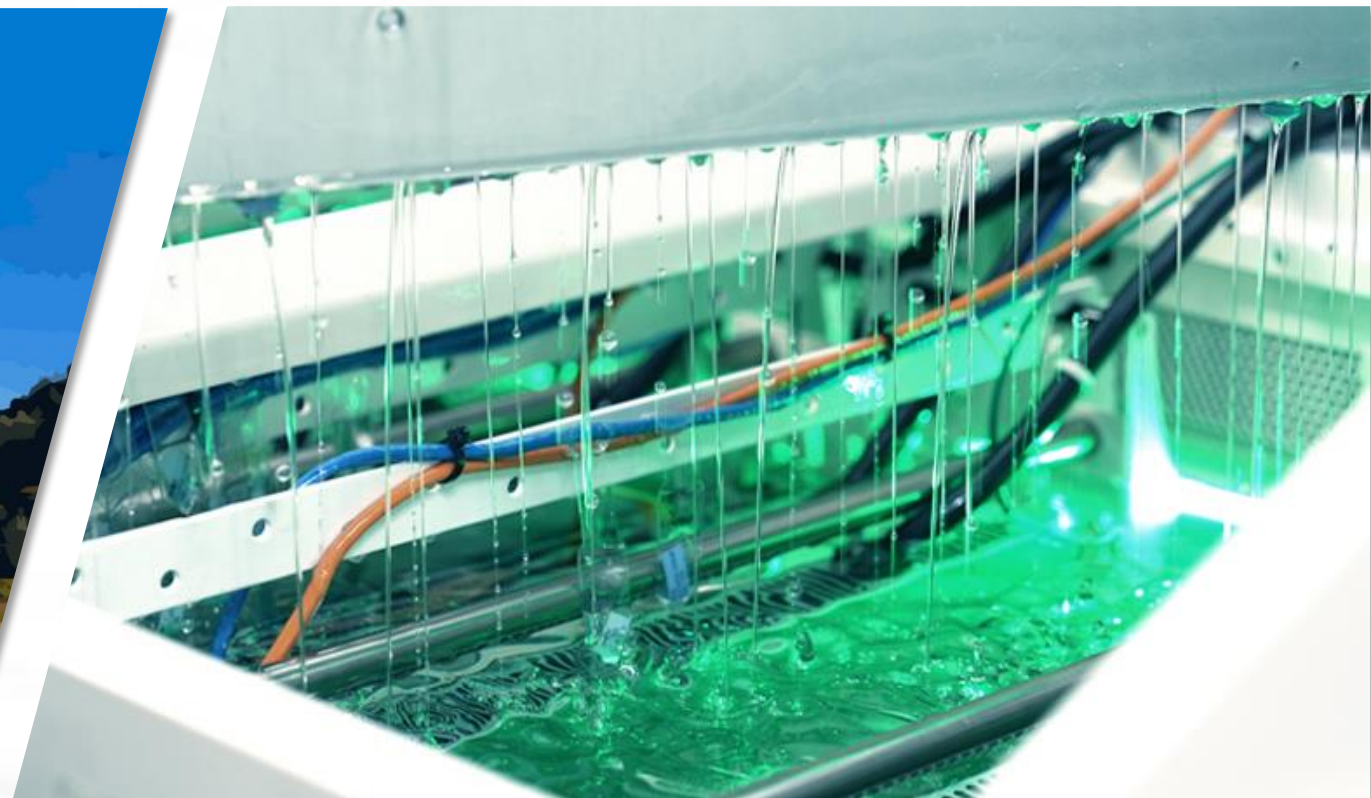


Sustainable base station



Base station that utilizes bendable solar cells called "perovskite"

Liquid cooling system in Data Centers



94% reduction in energy consumption to cool servers in data centers

# Providing new value with 5G SA Services

- Expansion to various industries
- Building high quality and resilient comm. infrastructure
- 5G network
- Expansion through partnering
- Technical expansion

Game streaming in crowded conditions with 5G SA

Live TV broadcast of Tokyo Marathon 2023 with 5G SA



Demonstration experiment starting in 2021



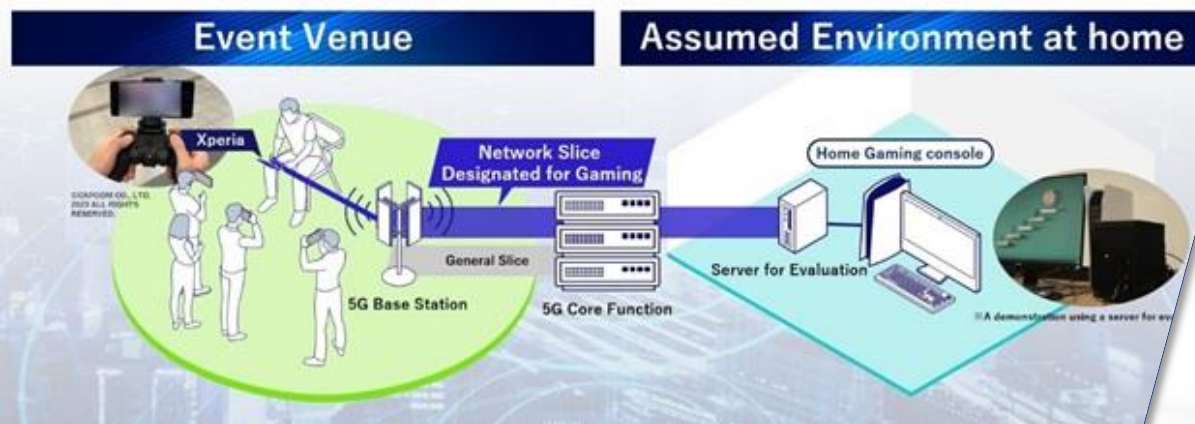
Image of this demonstration



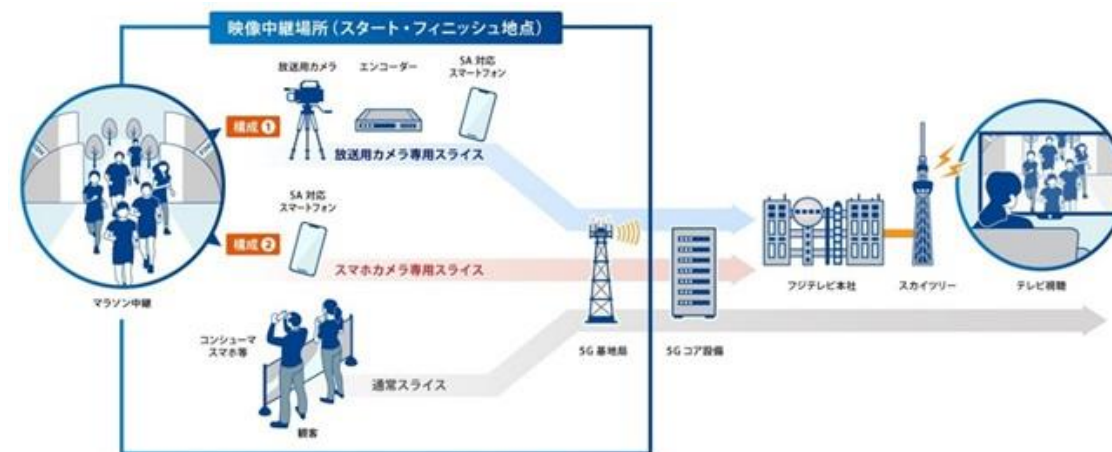
State of the relay site



Actual broadcast screen



Co-creating a mobile communication environment with Sony that allows for comfortable game play



Utilizing SLA-guaranteed slicing for terrestrial TV broadcasting with Fuji Television

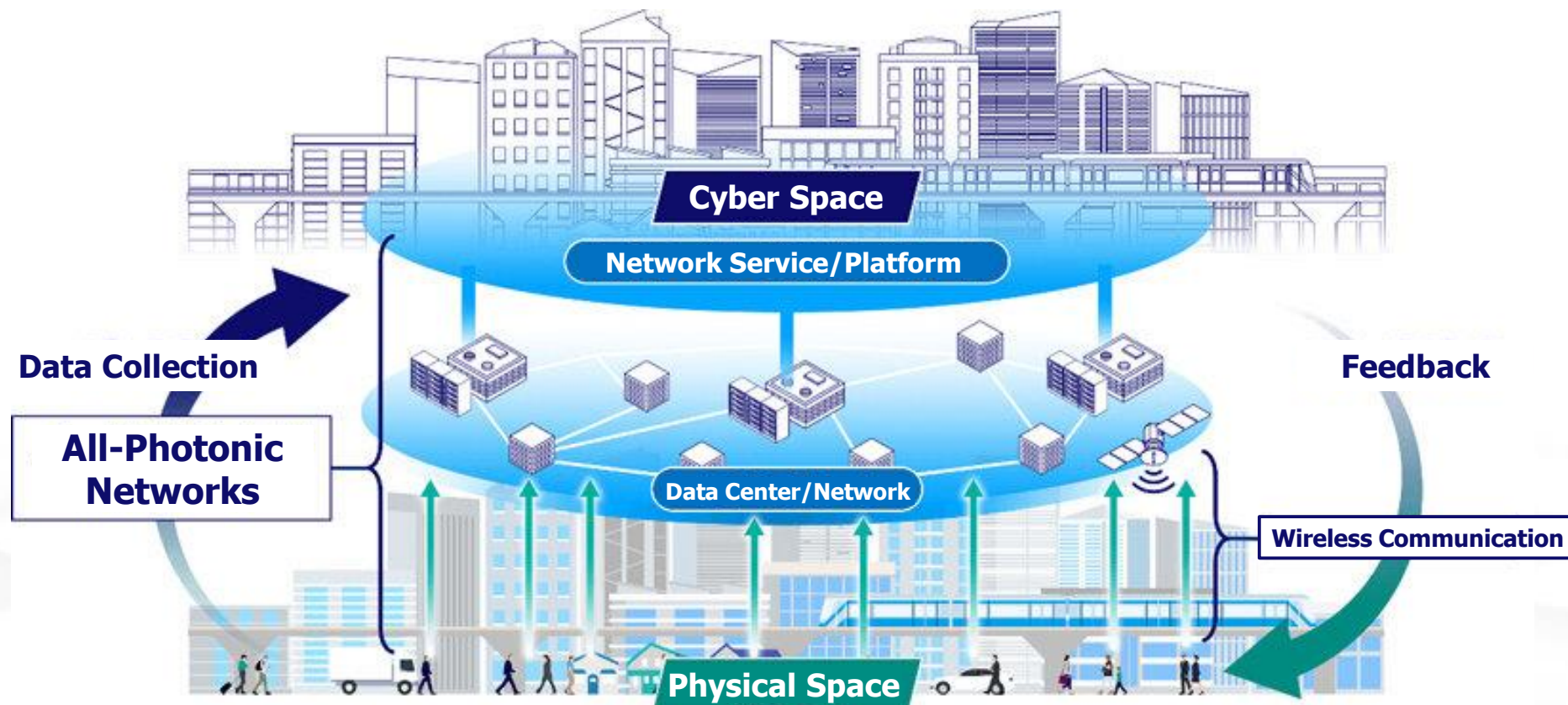


**3**

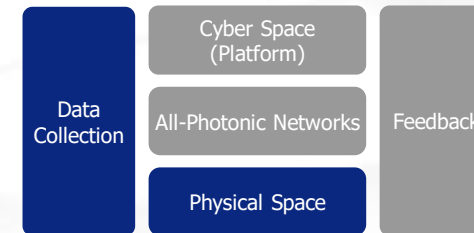
**Activities toward the 6G Era  
(Realization of Digital Twin)**

# Towards the New Era with Digital Twin

For realization of Digital Twin,  
All-photonic networks are essential, that can transmit large data with low power



# User-Centric RAN



## From Cellular to Cell-Free

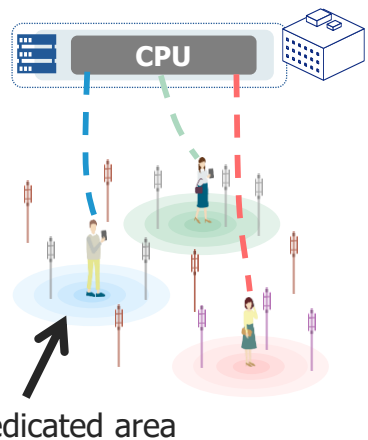
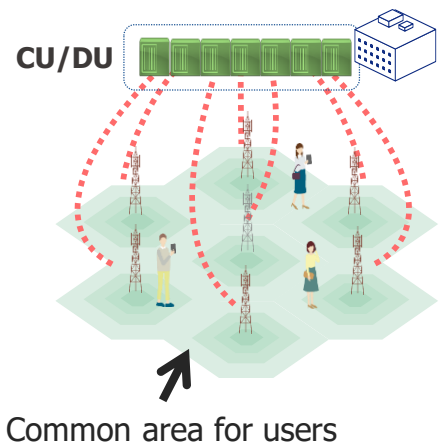
## User-Centric RAN Architecture

### Cellular

### Cell-Free

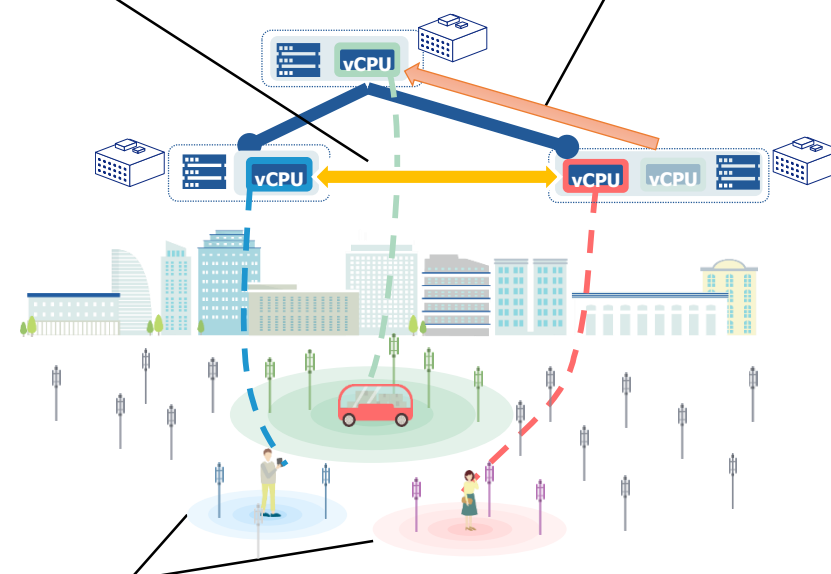
Forms a fixed area around the base station

A user-dedicated area is created through cooperation among base stations



### (b) Cooperation between CPUs

### (c) Hierarchical deployment of vCPUs

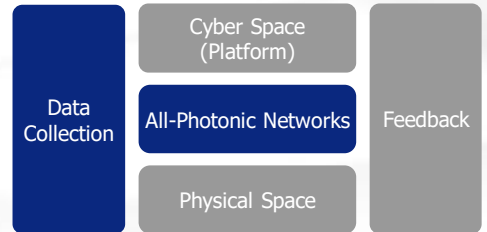


### (a) AP clustering

Providing the optimized communication environment for each person anytime, anywhere

Achieving large-scale Cell-Free services using AP clustering technology and Cooperation between CPUs technology

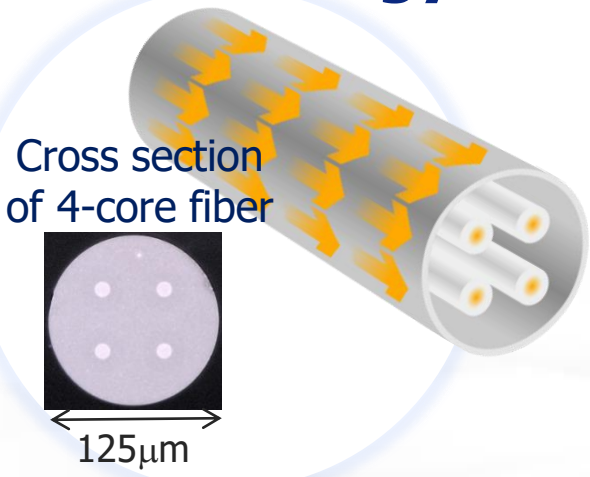
# Research Activities for All-Photonic Networks



Promoting international standardization from Japan using various technologies cultivated over 50 years in optical submarine cables

Large Capacity
 Long Distance

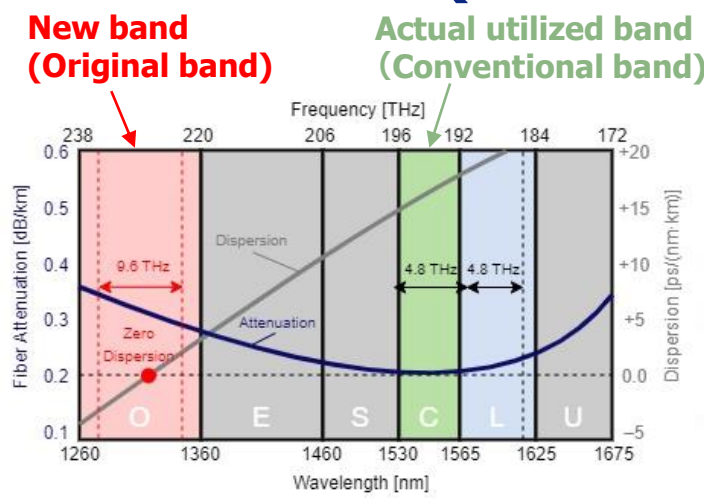
## Multi-Core Optical Fiber Technology



It is possible to expand the transmission capacity by a multiple of the number of fiber cores without changing the diameter of them

Large Capacity
 Long Distance

## Technology that utilizes the new band (O-band)

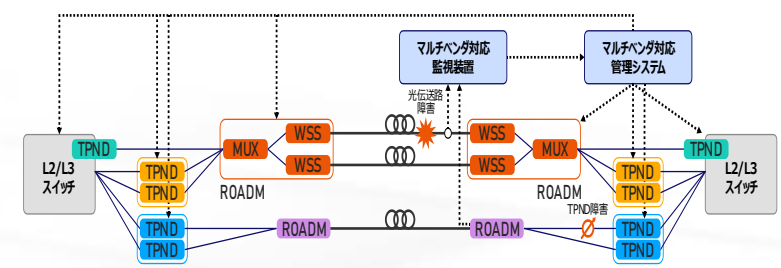


Achieving large capacity and power saving by utilizing O-band

High reliability

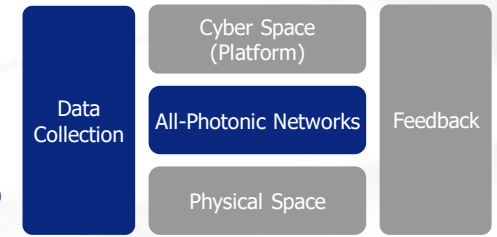
## Monitoring/Management Control Technology

**Developed control platform**
**Demonstrated feasibility of automatic failure recovery**



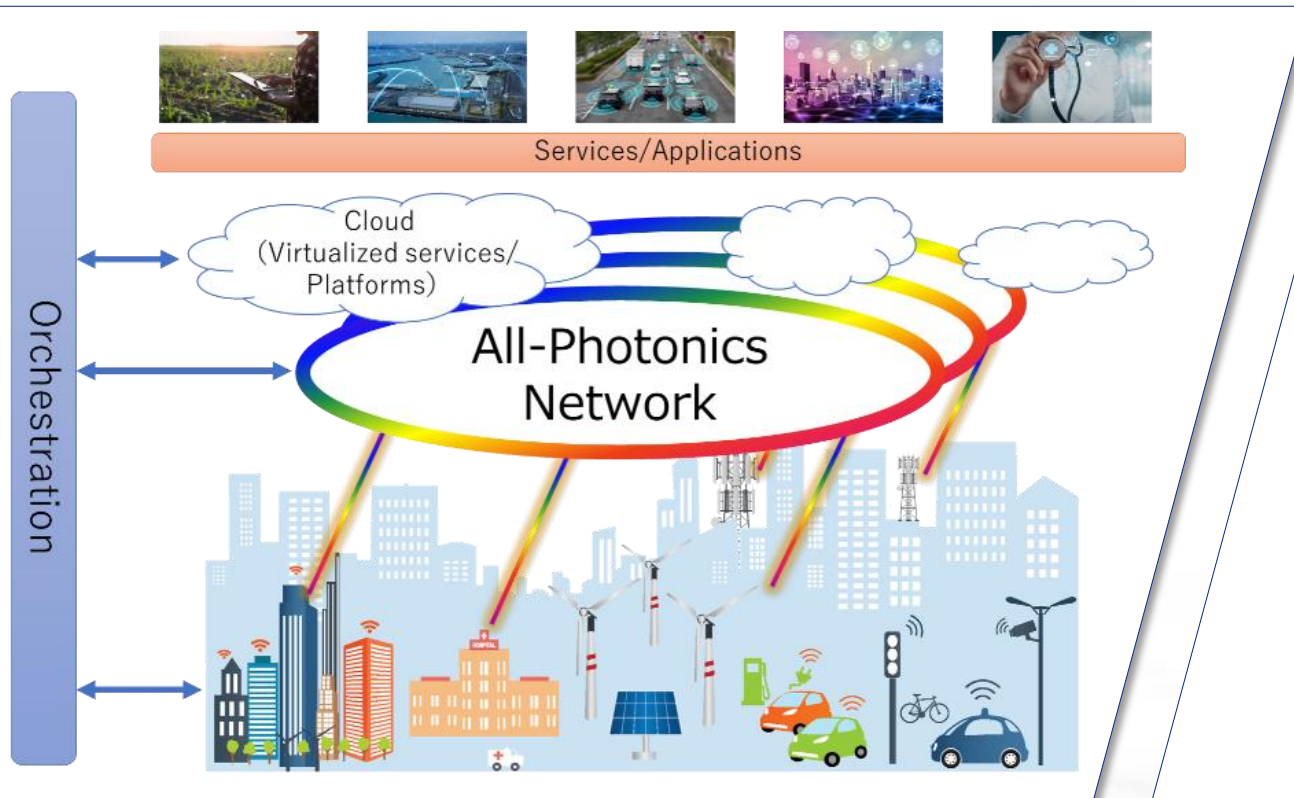
Dynamically configure optical paths and maintain service even in disasters

# Standardization for All-Photonic Networks



Participation in IOWN Global Forum

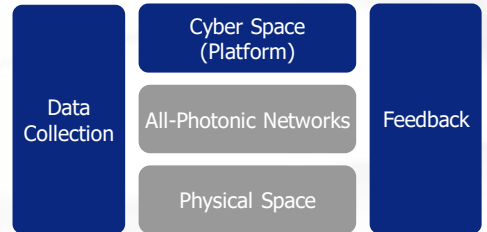
Collaboration with standardization organizations



NTT and KDDI agreed to cooperate in three areas

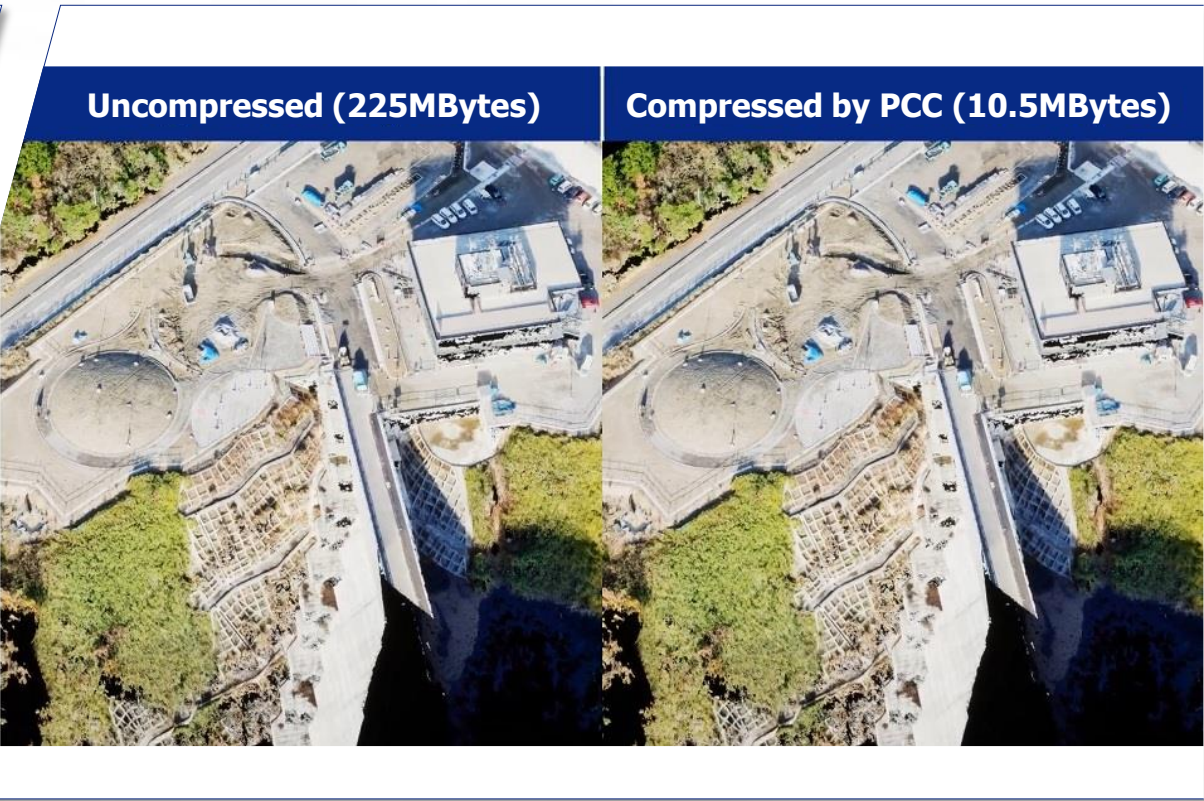
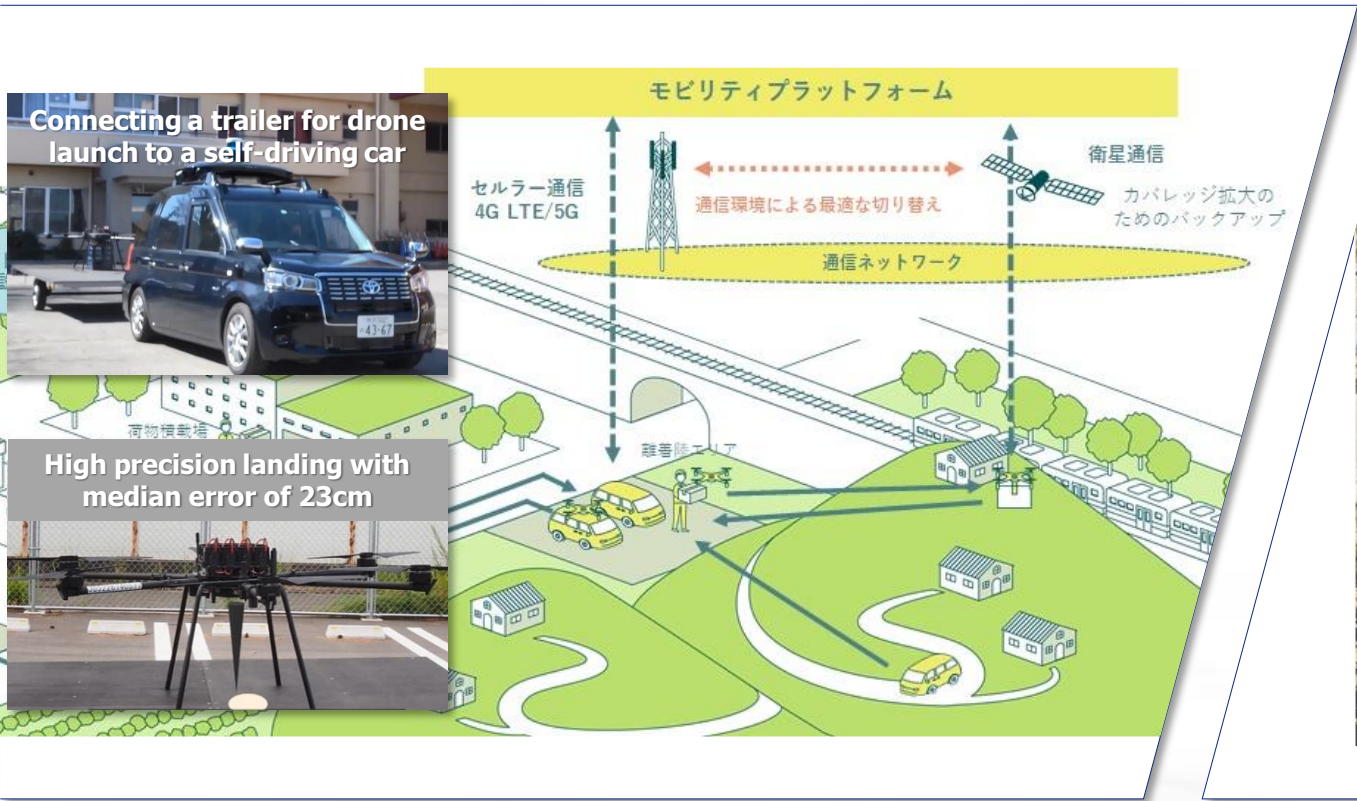
Standardizing technology developed in Japan to numerous organizations

# Towards the realization of Digital Twin (R&D)



**New** Fully automated delivery using self-driving cars and drones

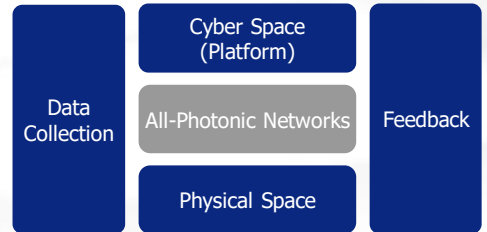
**Update** Real-Time Point-Cloud-Compression Technology



Successful logistics demonstration in which a drone takes off and lands from a self-driving car

Reduce data amount to approximately 1/20 while keeping quality

# Towards the realization of Digital Twin (Social Implementation)



**New** Drones to solve social issues

**Update** Smart city



Achieving advanced drone utilization through business partnership with Japan Airlines



Disaster prevention simulation      Moss panel art      NFT art

Co-created "TAKANAWA GATEWAY CITY" with JR East

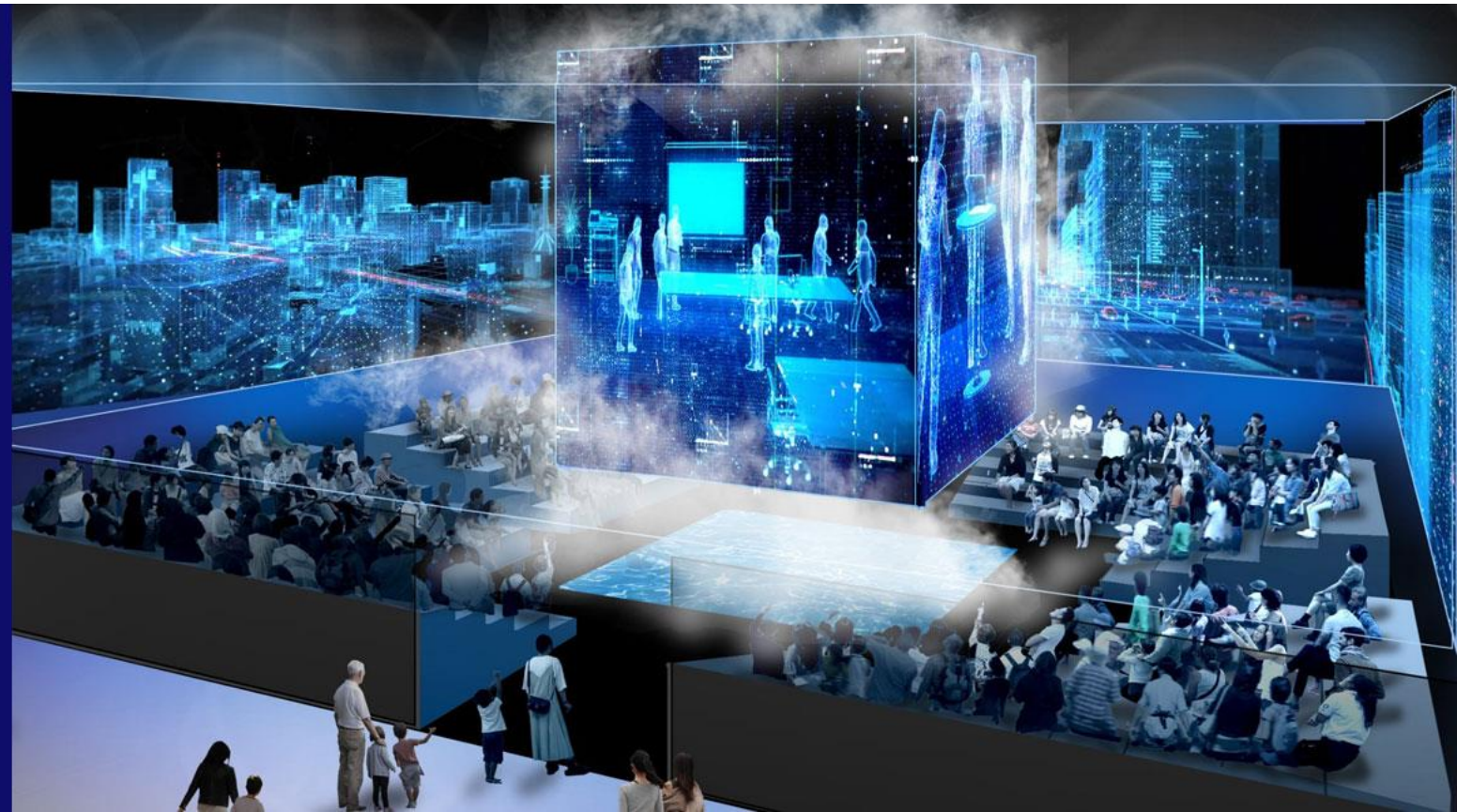
# “Future City” realized by Digital Twin

As a platinum partner of the “Future Life Expo: Future City” Project, KDDI will jointly exhibit with Hitachi under the theme of “Society 5.0 and Future City”



Expo 2025 Osaka, Kansai, Japan  
Future Society Showcase Project Exhibition  
“Future Life Expo: Future City” Project

“Future City”  
Realized with Digital Twin





# Summary

## **KDDI's Vision**

Solving social issues by enhancing the power to connect and Digital Twin through our business

## **Area Deployment of 5G Network with a Focus on Quality (Enhancing the Power to Connect)**

Enhancing the power to connect through various activities

## **Activities toward the 6G Era (Realization of Digital Twin)**

We will create a future society by Digital Twin with our partners

**The creation of a society in which  
anyone can make their dreams a reality,  
by enhancing the power to connect.**

# **KDDI VISION 2030**

