

The New Edge for 6G

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New Trends Shaping Networks



AI revolution

Driving greater capacity and integration with compute/GPUs
6G: AI native?
E2E Networks for AI and AI for Networks



Sensing and communication

Both radio and optical
Sensing for 'situational awareness', reliability, physical security and management



Access-Metro Edge Convergence

Compute continuum: IoT-Edge-Core
Open Networking: O-RAN
Radio and Optical Confluence

AI is the Next Killer App for Networks

Agentic = Network AI

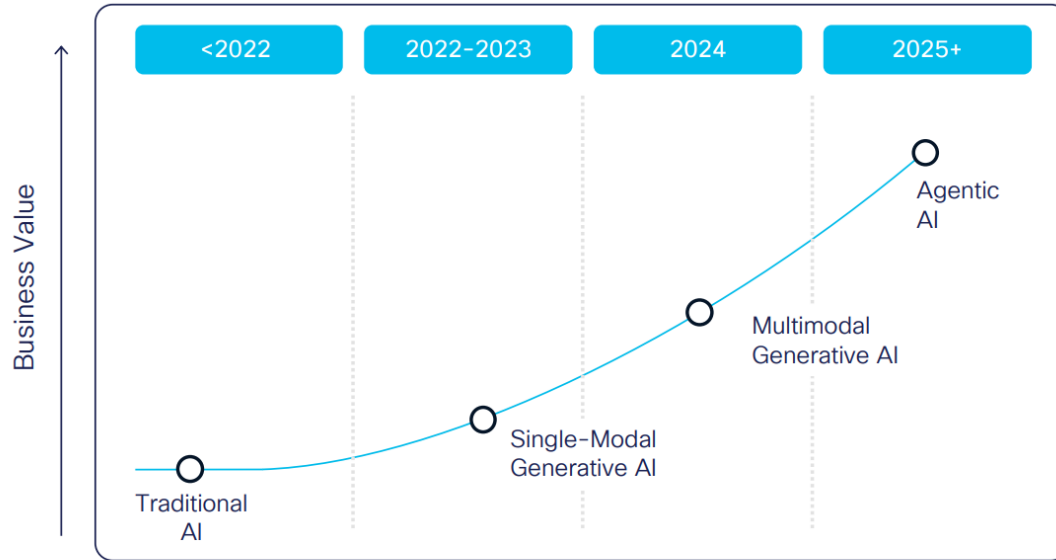


Figure 1. The evolution to agentic AI is driving greater business value

Zayo's Fiber Bet: Scaling Long-Haul and Metro Networks for AI Data Centers

AI-driven data center growth is reshaping US network infrastructure. Zayo is doubling down on long-haul and metro fiber, expanding routes between key AI data center hubs to meet the demands of hyperscalers and cloud providers.

David Chernicoff • March 20, 2025 • 7 min read

<https://www.datacenterfrontier.com/network/article/55274499/zayos-fiber-bet-scaling-long-haul-and-metro-networks-for-ai-data-centers>

Cisco White Paper "AI Infrastructure for the Agentic Era 2025"

Figure: Sales of optical transceivers and LPO/CPO for AI Clusters



Source: LightCounting

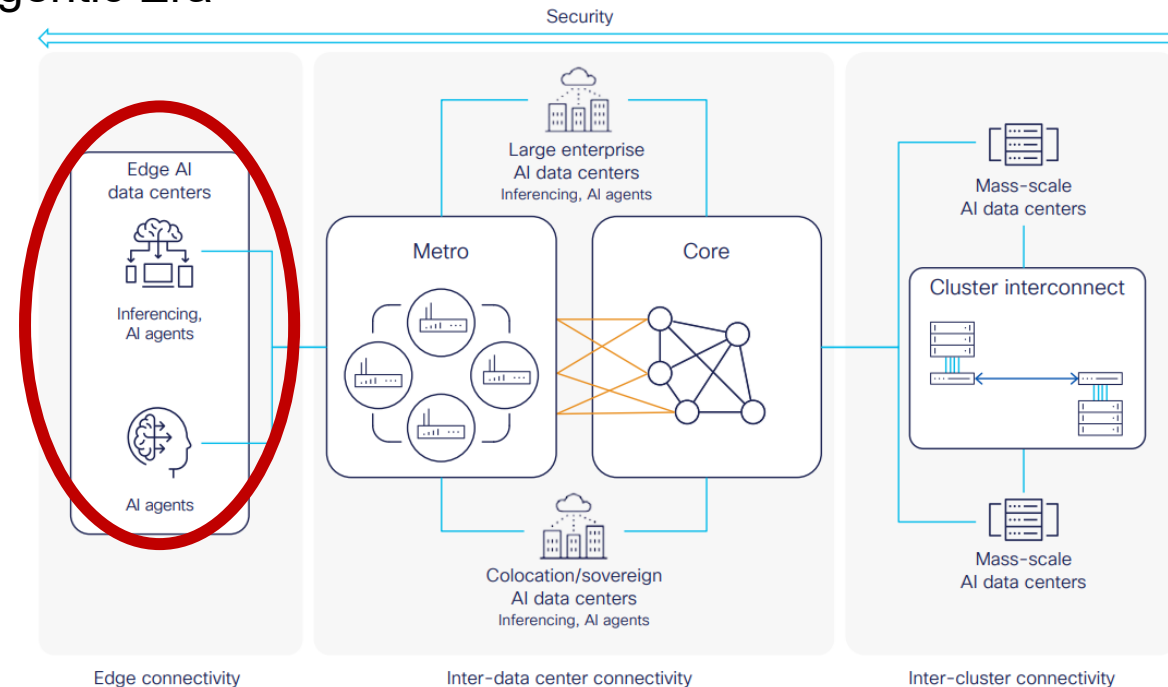


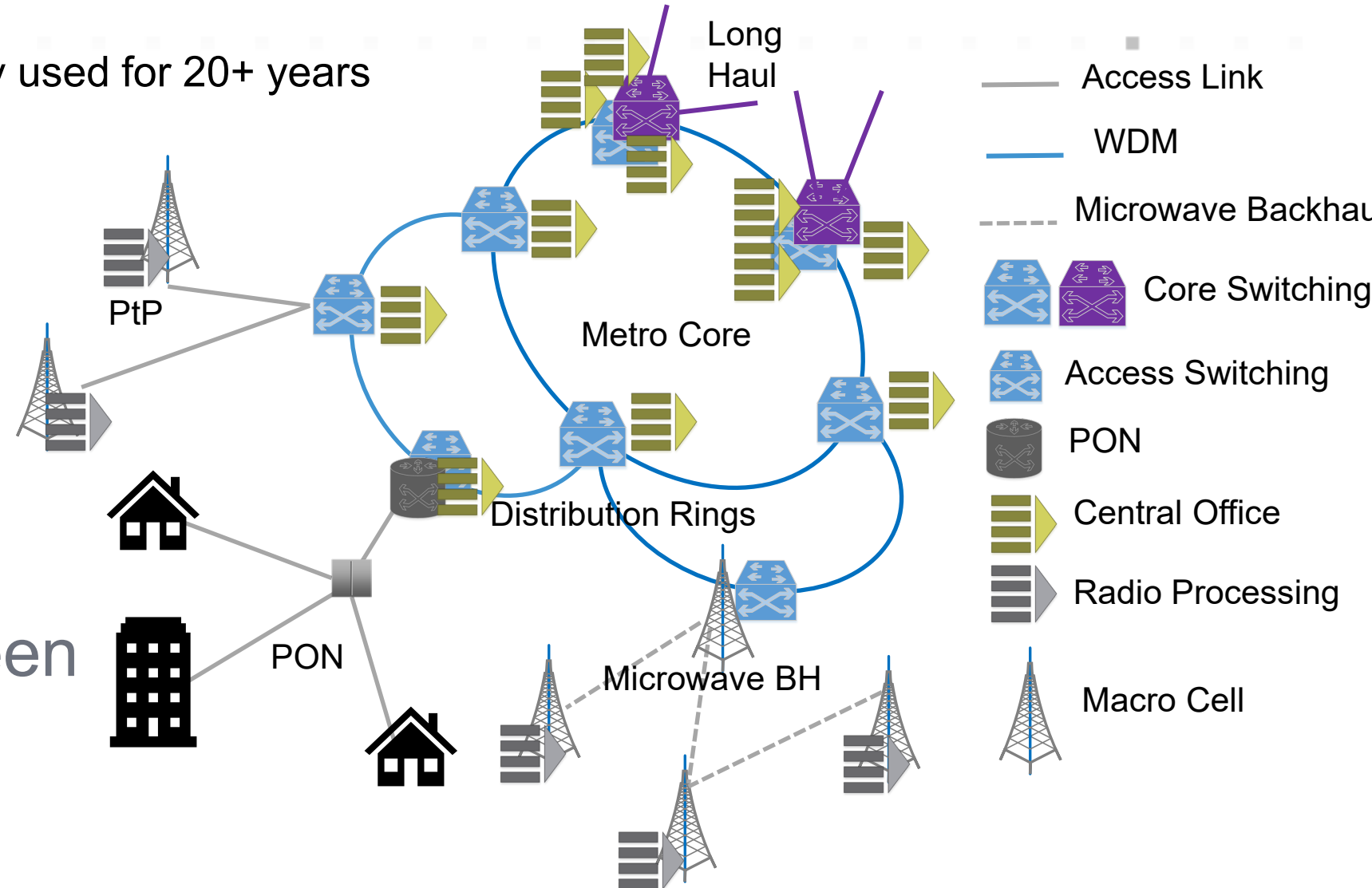
Figure 6. AI network connectivity across the cloud-to-edge continuum

Hierarchical Network

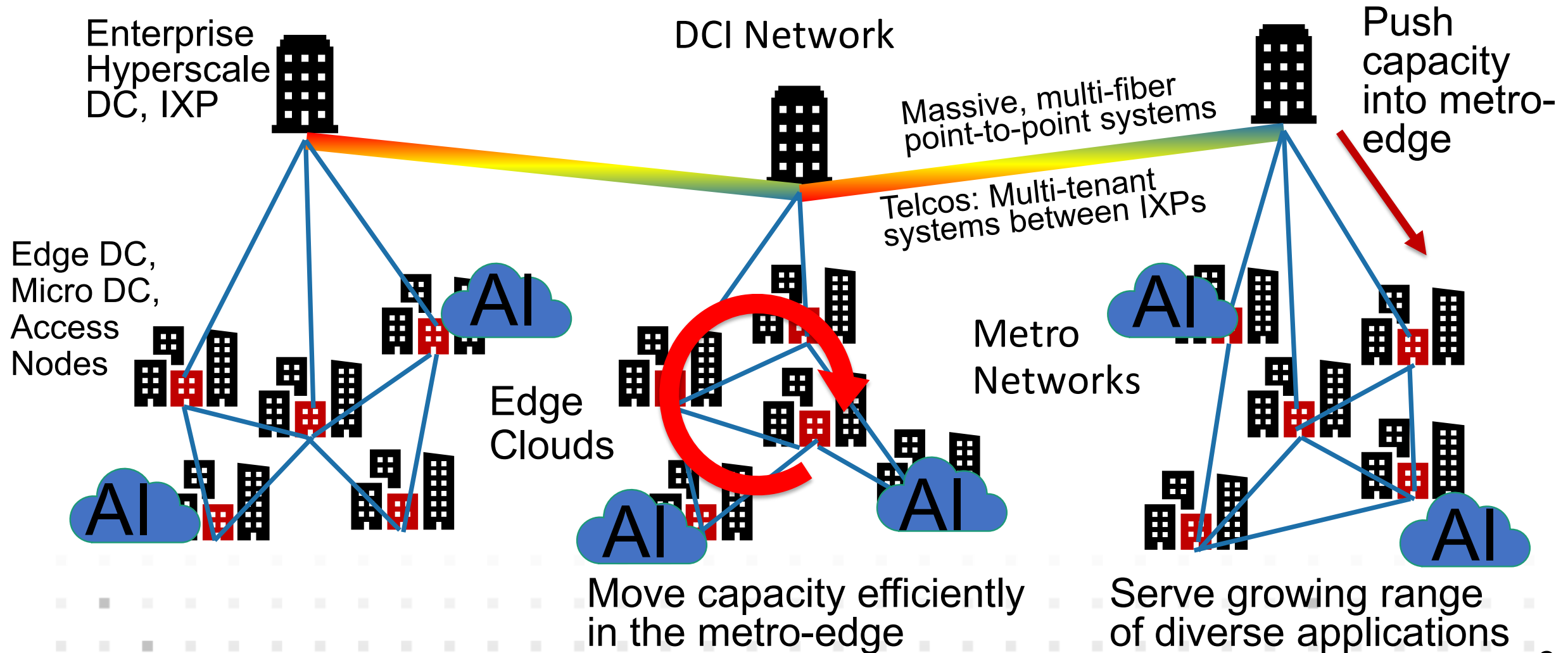


Widely used for 20+ years

- Access
- Metro/Regional
- Long-Haul
- Electronic switching between each network layer



From Internet to AI Backbone





7

Google's emissions climb nearly 50% in five years due to AI energy demand

Tech giant's goal of reducing climate footprint at risk as it grows increasingly reliant on energy-hungry data centres

www.theguardian.com/technology/article/2024/jul/02/google-ai-emissions

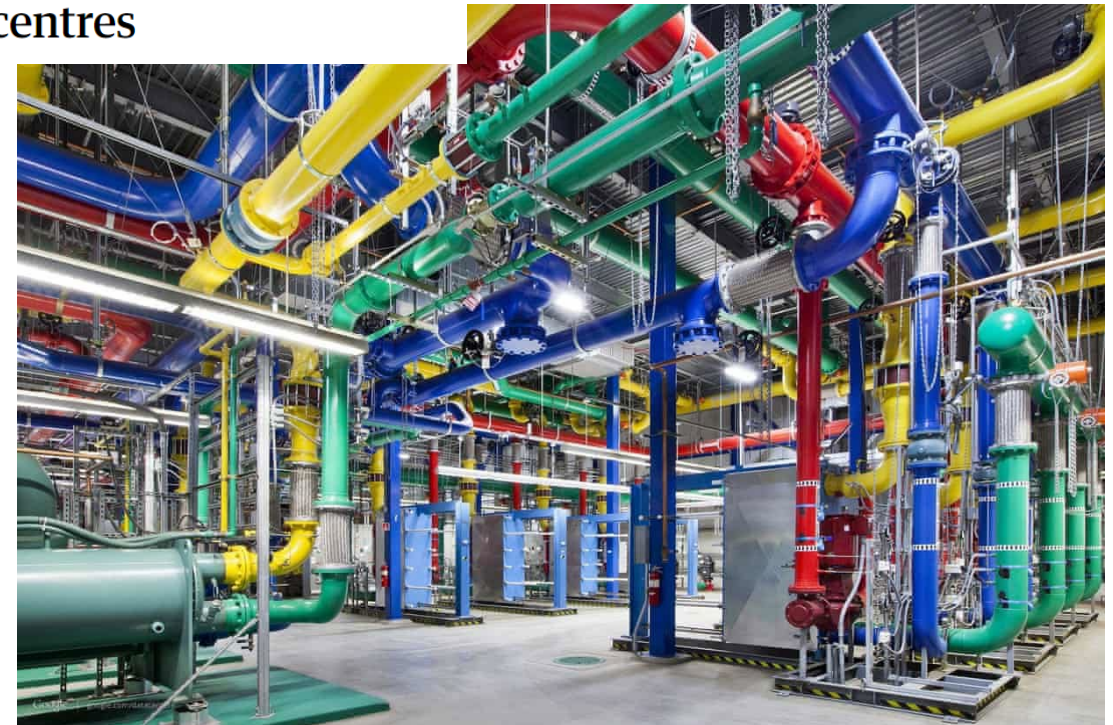
Google bets big on 'mini' nuclear reactors to feed its AI demands

Google says the agreement could 'unlock the full potential of AI for everyone.'

BY MACK DEGEURIN | PUBLISHED OCT 15, 2024 11:38 AM EDT



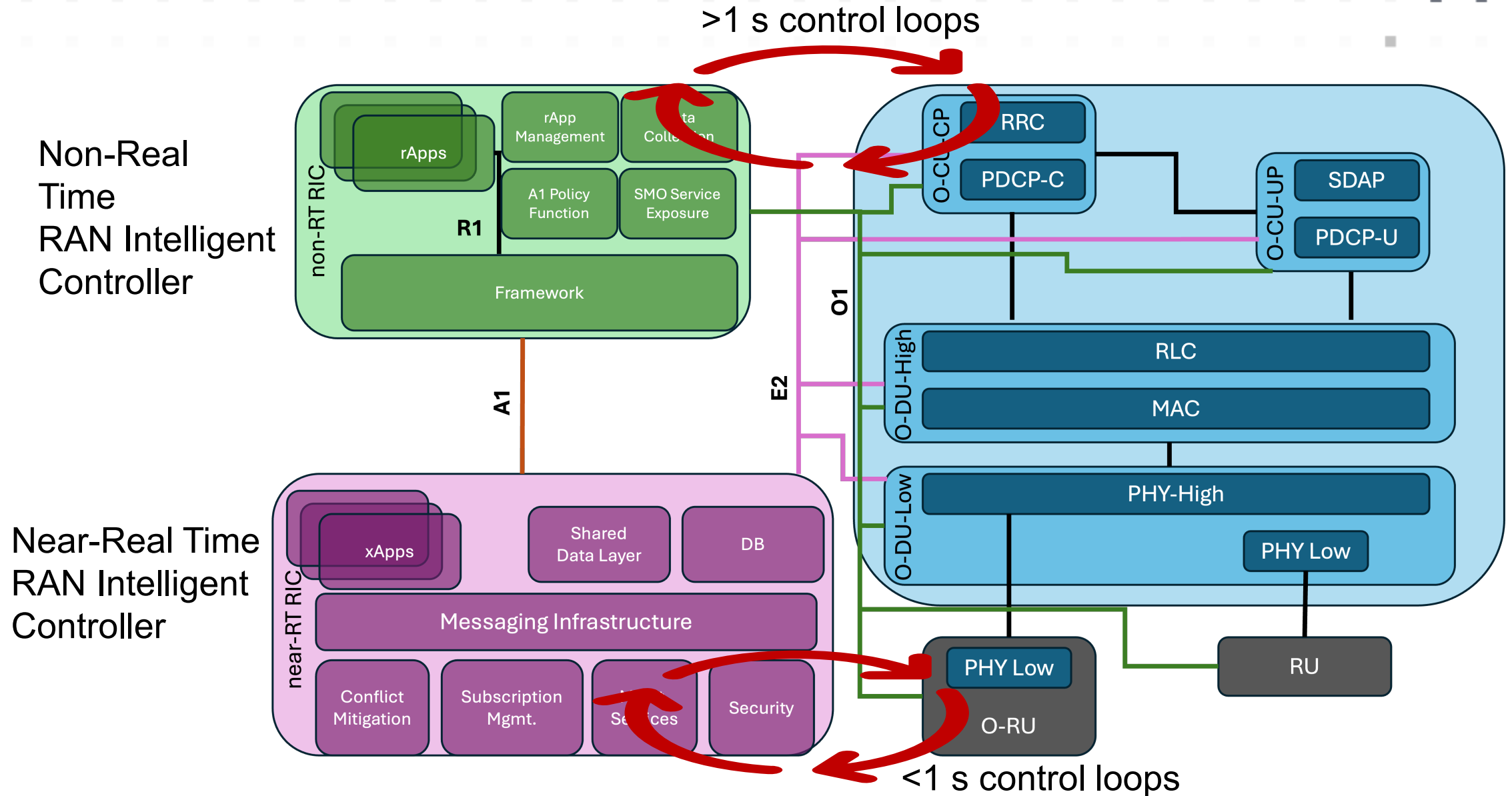
An architect's rendering of what Kairos' first demonstration mini nuclear reactor will look like when it's completed. Credit: Kairos Power



Popular Science, Oct 2024

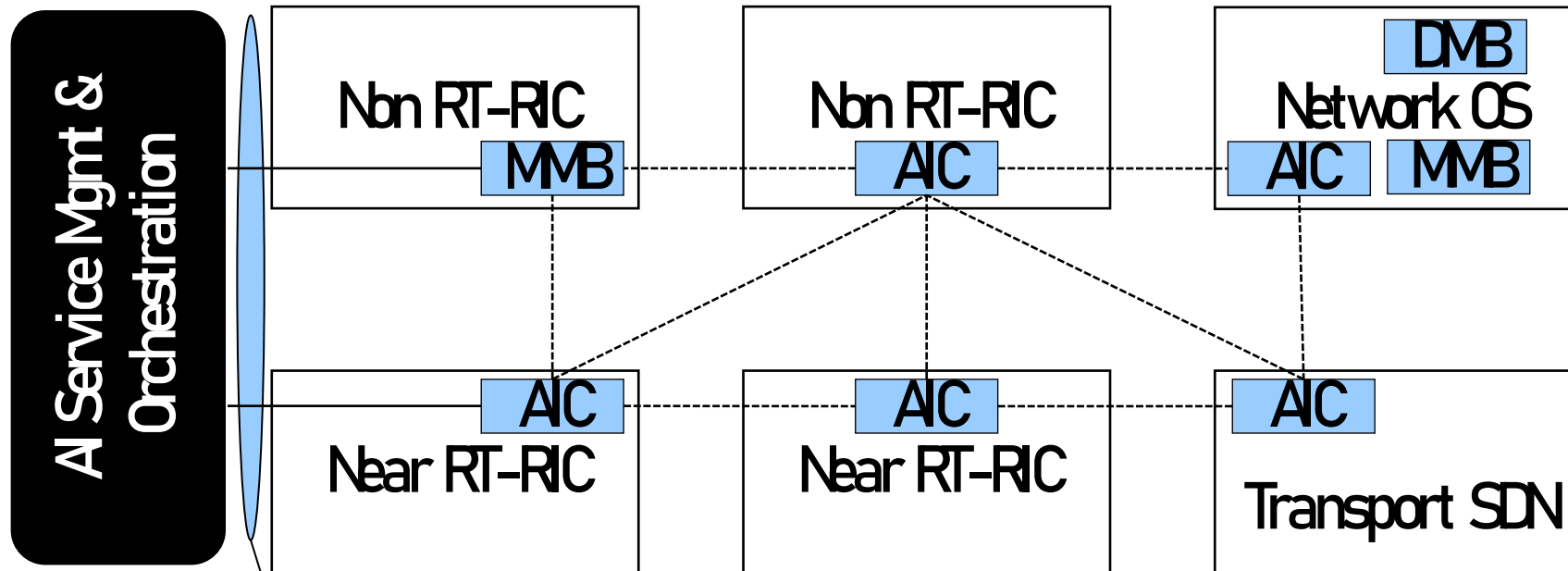
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O-RAN Architecture



Decentralised AI in Networks

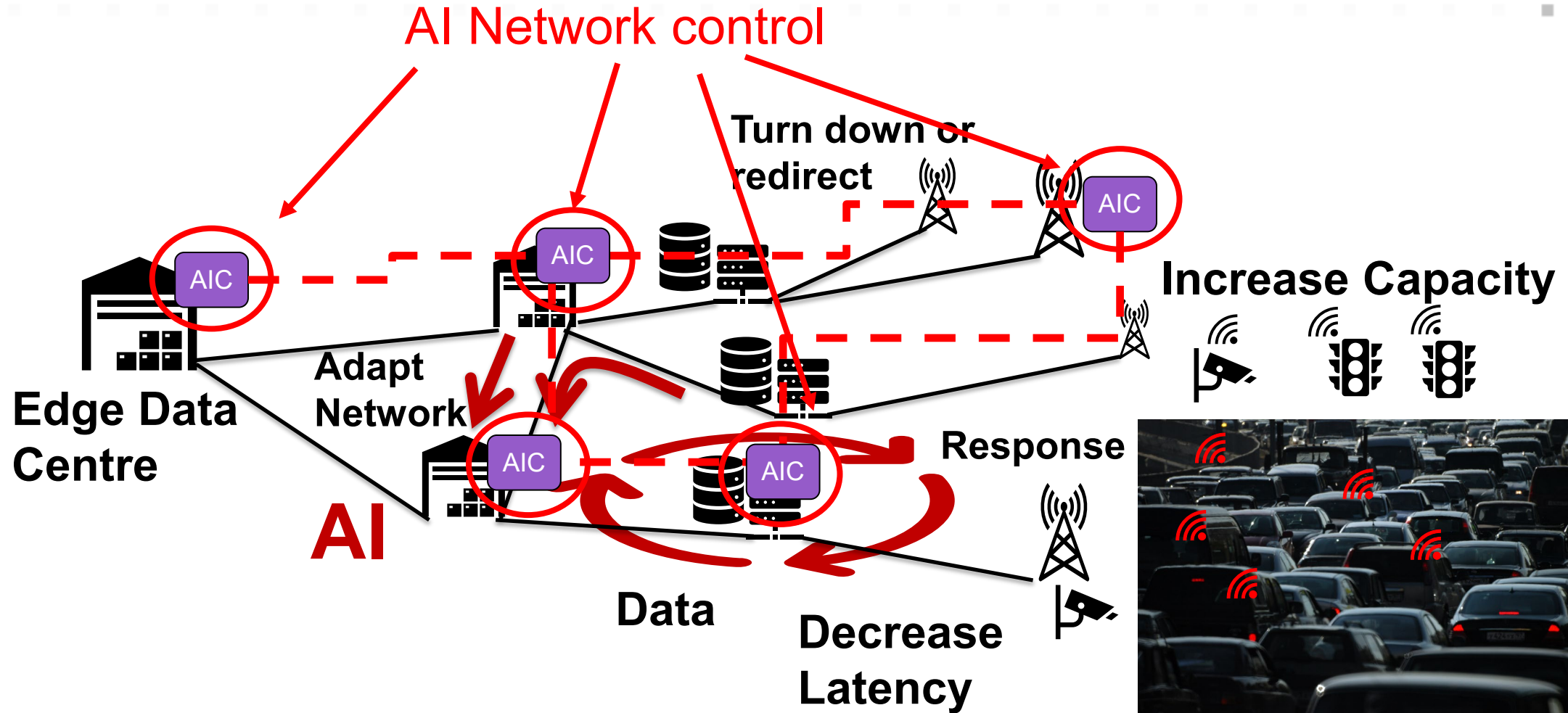
Explore common AI control elements (AIC) and model (MMB) and data (DMB) management tools to work across technologies and domains



- TMF633 Service Catalog
- TMF638 Service Inventory
- TMF915 AI Management

Use TM Forum Open APIs to interface with AI orchestrators

AI Control in the Network



Multi-Modal Data:
Sensing, Video, CSI,...

Mesh Networks at the Edge

Adaptive Split-PHY &
coding for Analog &
Digital RoF

OSaaS +
Fibre Sensing

Wireless-wireline
mesh networks in
the metro/edge

BBU-MEC Proc.

L1/L2 Switching

Sub-THz

FSO

FSO+ Sub-THz

Sub-THz

OSaaS

MEC+Split-PHY

Flex-WDM

Cell-free
d-MIMO

Wireless
short-cut

Radio-Optical-
Radio paths

In-Network
Decentralised AI

From Convergent to Confluent Networks



Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)

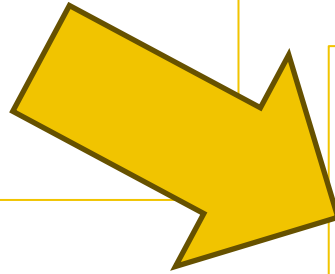


convergent

/kənˈvəːdʒ(ə)nt/

adjective

1. coming closer together; converging.
"a convergent boundary"



Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)



confluent

/ˈkɒnflʊənt/

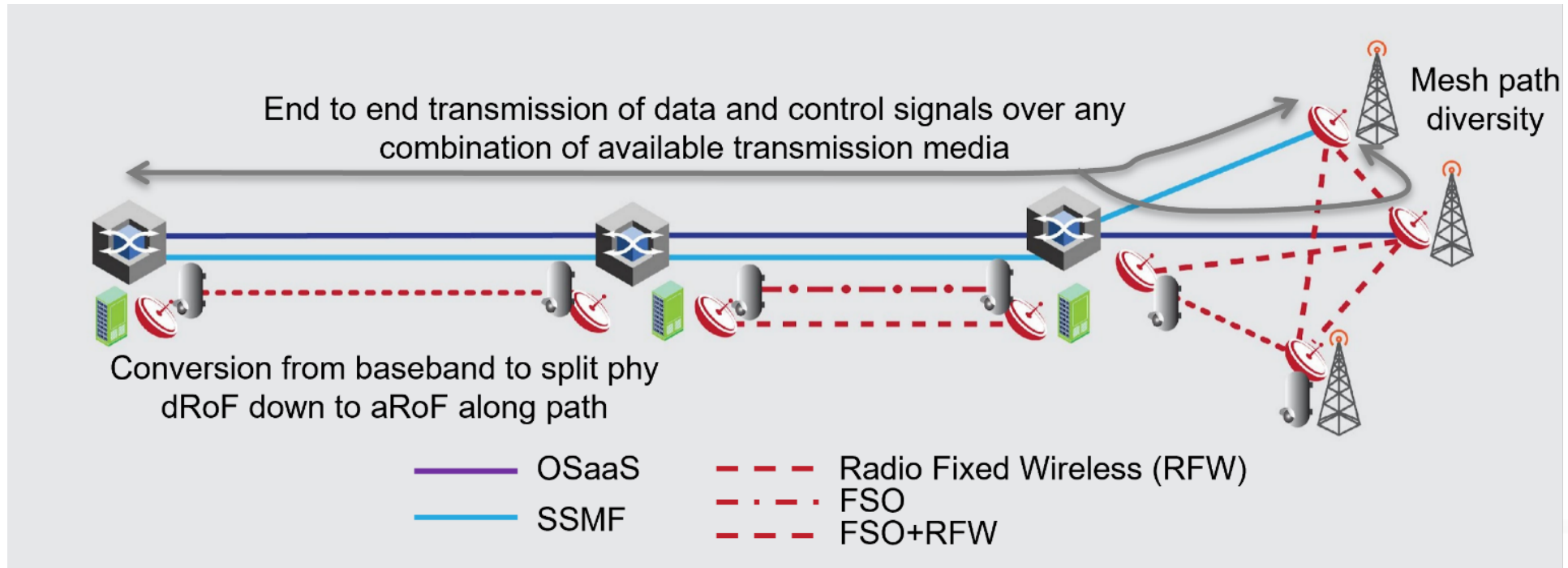
adjective

flowing together or merging.
"these confluent tones helped to fuse and unite his landscapes"

Confluent Systems



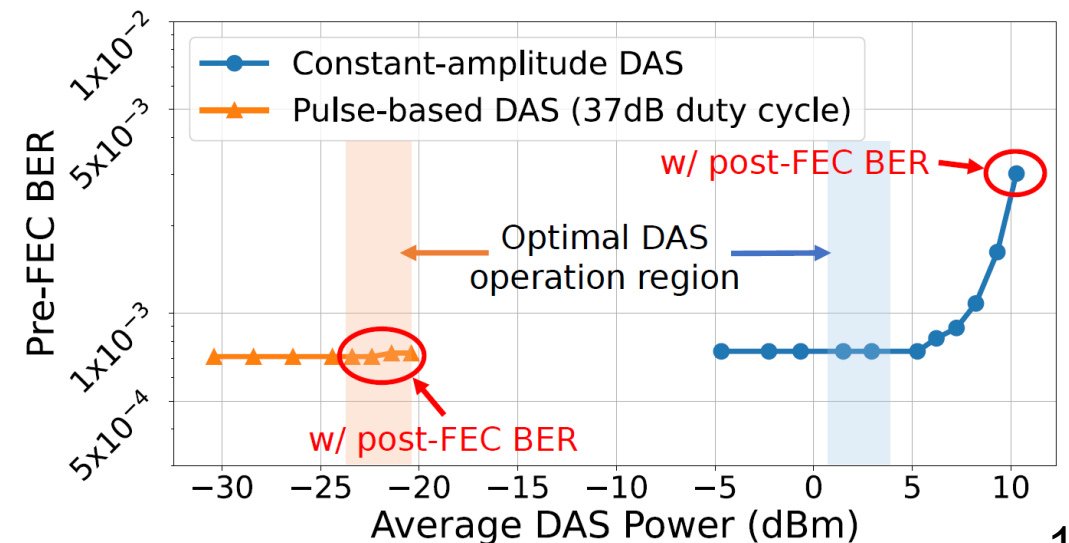
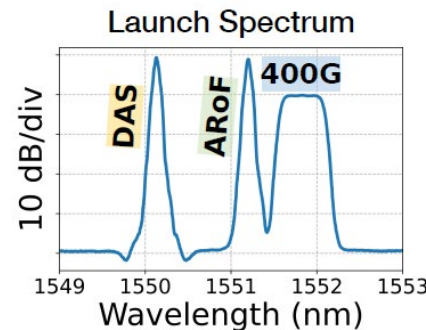
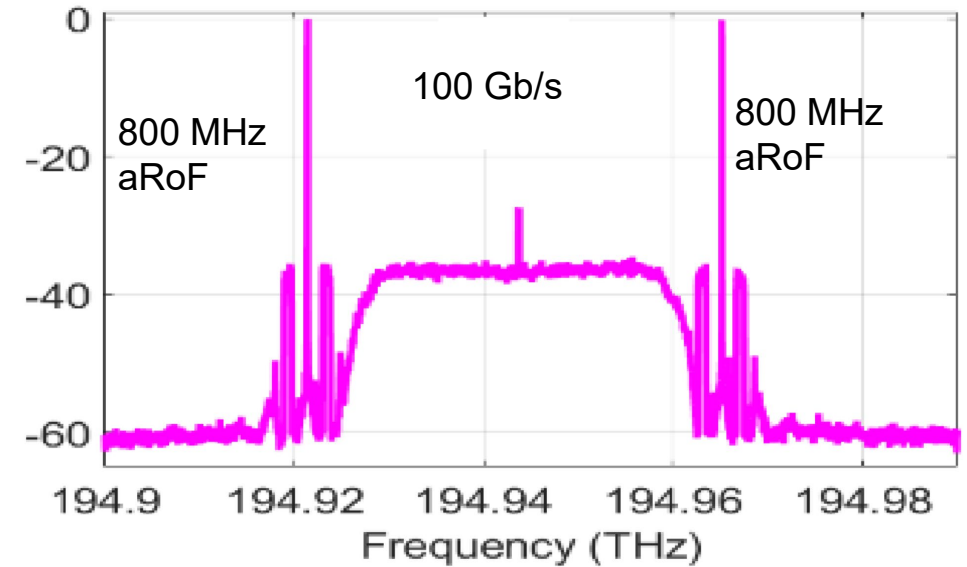
- **Confluent transmission** refers to a system that natively supports multiple transmission media and their signals as opposed to just a convergence of the enabling technologies.



Analog, Digital, and Sensing

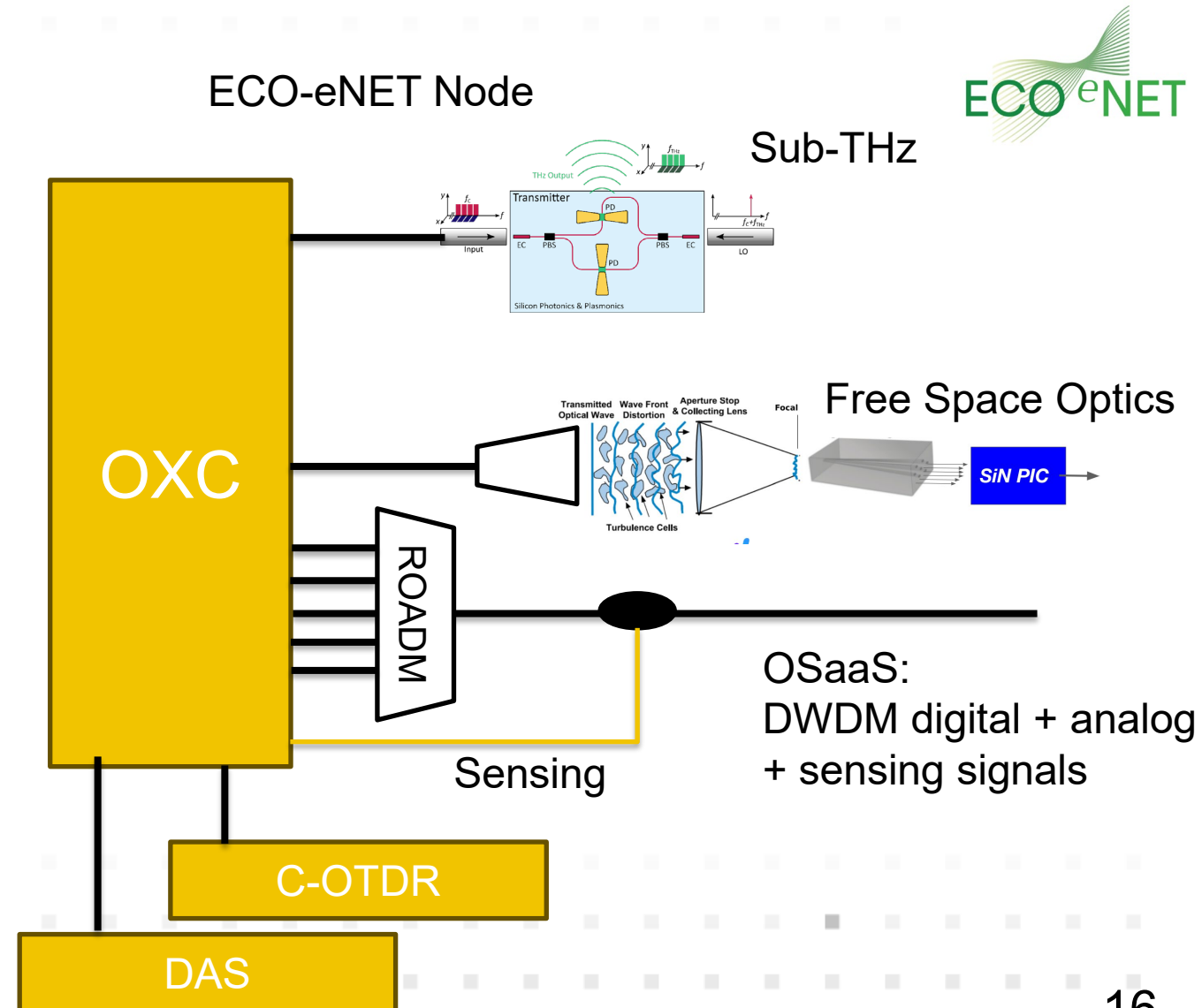


- Analog and digital communication signals:
 - (A. Delmade, et. al., "Metro access network with convergence of coherent and analog RoF data services," ECOC 2023)
- Sensing and communication signals:
 - (Z. Wang, et. al. OFC 2023 and JLT 2024)



Confluent Transmission Technologies

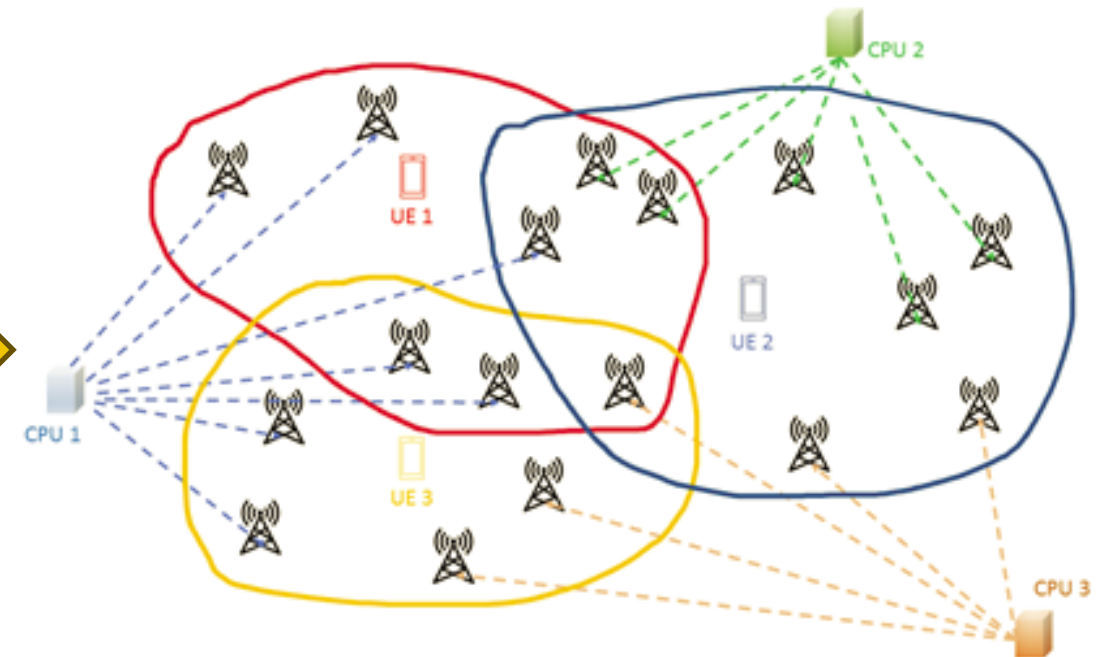
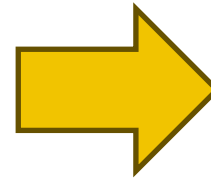
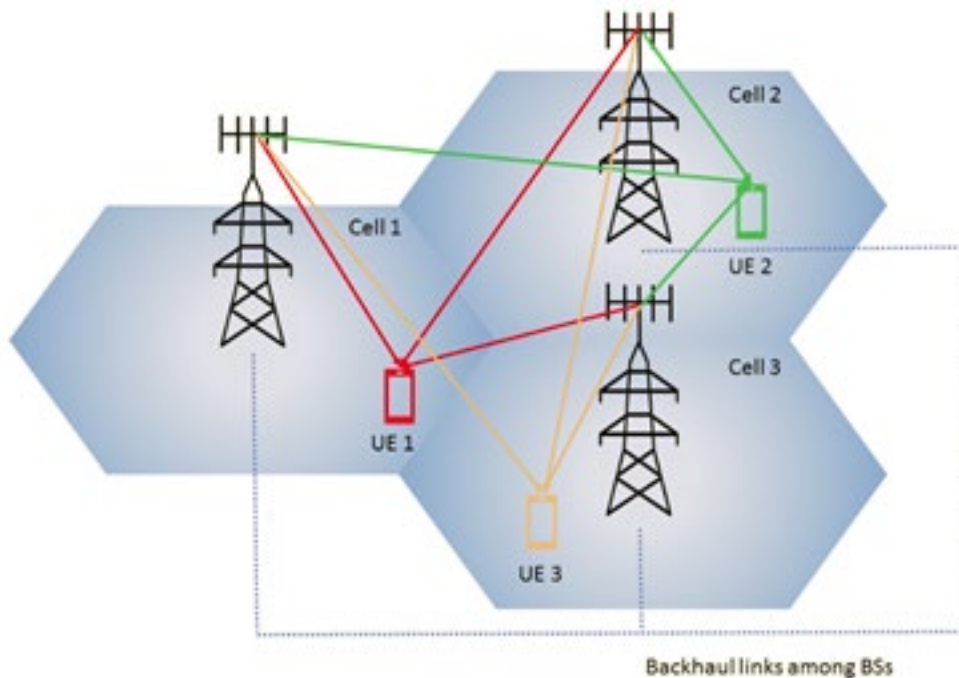
- Fibre Spectrum Services (OSaaS)
- Plasmonic Sub-THz link
 - 1 Tb/s @ 1 km, 190-350 GHz
- FSO fixed wireless
 - 1 Tb/s @ 1 km, WDM
- Hybrid sub-THz/FSO
 - Compensating atmospheric effects
- DWDM Optical X-Haul
 - Control & management
- Coherent OTDR based fibre sensing
- Distributed Acoustic Sensing



Move to Cell-Free Radio



- From Joint-CoMP and Massive MIMO to Cell Free



Mesh, Multi-Technology Edge for 6G

- Enhancing connectivity to AI compute in edge data centres
 - Increased bisection bandwidth between edge data centres for advanced and agentic AI
- Connecting users to AI applications
 - Lower latency, higher capacity, and greater resilience through route diversity
- Scalable cell-free dMIMO architectures
- Integrated sensing and communications
- Adaptive for sustainability—support renewable energy sources



<https://www.eco-enet.eu/>



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