



Metro-Haul: The Essential Infrastructure for an End-to-End Viable 5G Solution

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ITU Forum - Session 4: Implementation of 5G pilot Projects

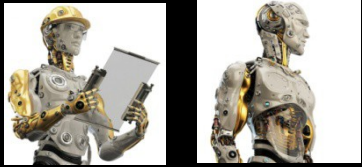


- ❑ Metro/Aggregation is indispensable
- ❑ Metro-Haul overview
- ❑ Key developments
- ❑ Testbeds



5G and society (1)

We witness an explosion of innovations

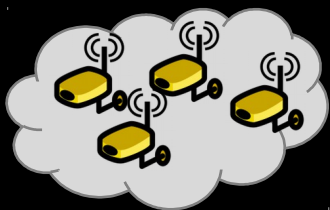


Robotic Farms

Smart City
Monitoring &
Control Center,



e-Presence



Public information/ Healthcare services



sensors

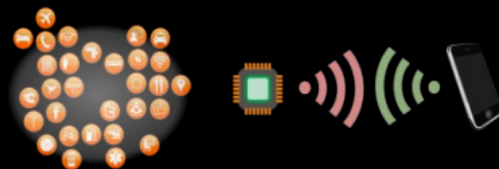
Precision/robotic agriculture



Smart Factories



sensors



IoT farms



Autonomous
Vehicles



Big-Data storage
& analytics

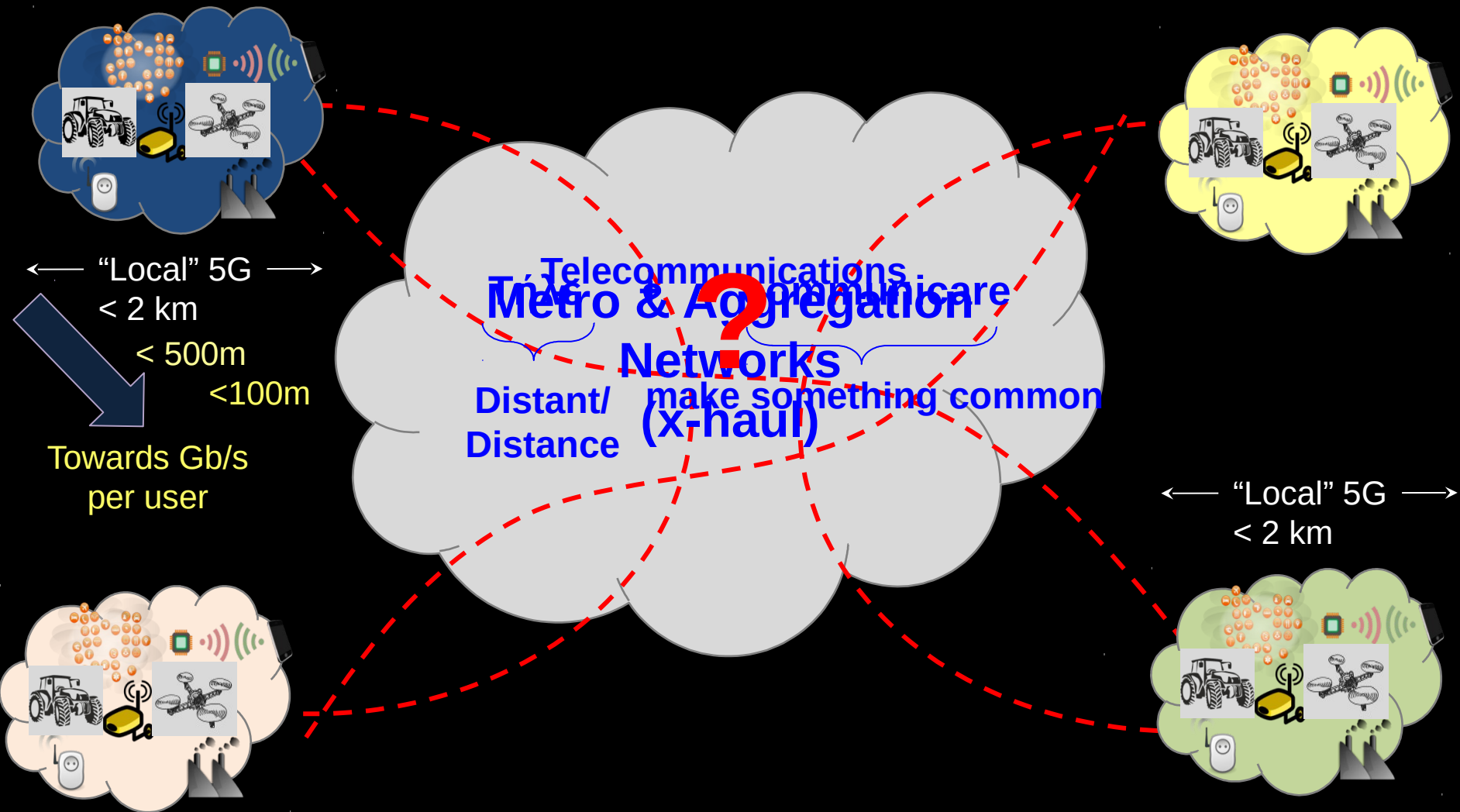


5G and society (3)

All these verticals are supported by a large number of heterogeneous access technologies



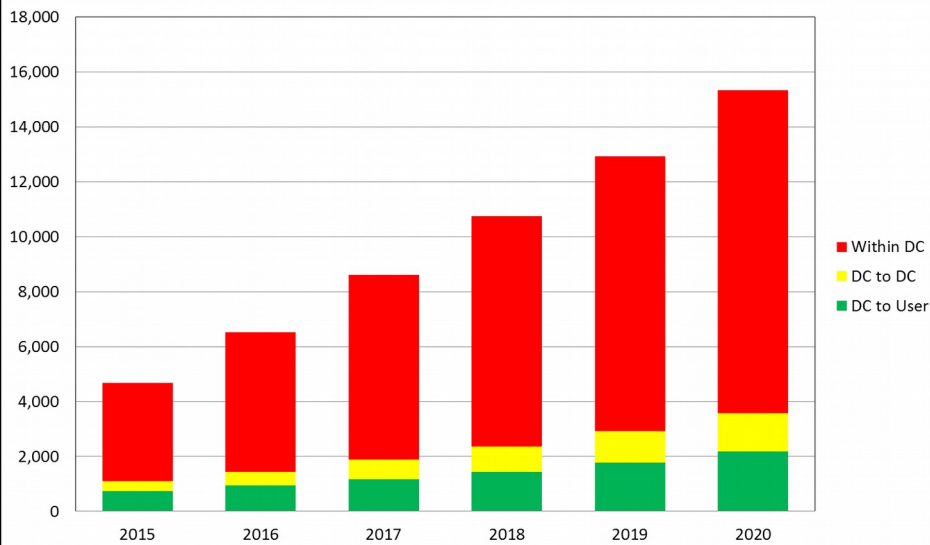
Metro-Haul makes end-to-end feasible ..



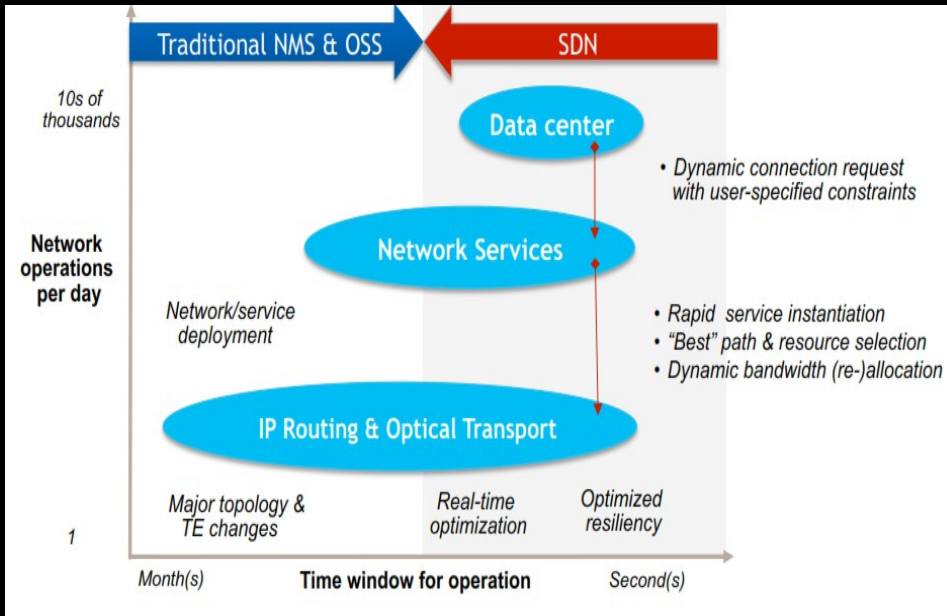


A new Metro is rising (1)

Data Center IP Traffic 2015 to 2020
(Exabytes per year)



Datacentres penetrate Metro



Parity in the response times of Telco & DataCentre infrastructures



A new Metro is rising (2)

- The **migration of DataCenters in Metro** marks the first step of a longer –lasting decentralisation process that brings
 - Storage, processing, content and application execution progressively closer to the end-user.
 - Two traffic profiles: User-to-content (S-N) & Content-to-content (E-W)

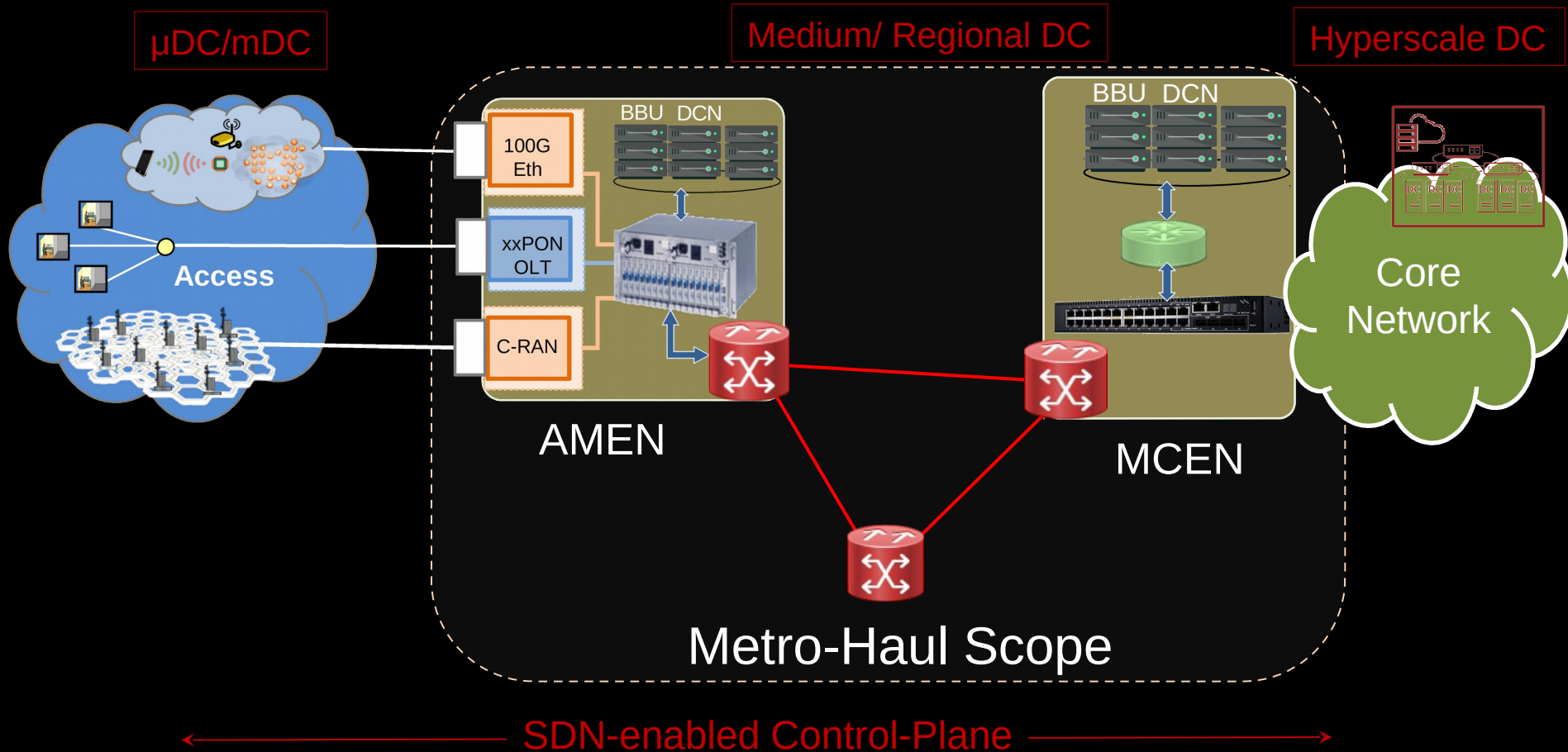
- A new Metro is rising:
 - Becomes more **dynamic** due to bursty traffic
 - Differentiated QoS handling per flow – **latency** is key
 - The connectivity between Metro nodes becomes meshed
 - Different transportation granularities 10G to 100G
 - 100 higher capacity and 10 times less energy consumption
 - Dissimilar operational systems
 - Interoperability between different system vendors is sought
 - Cost-effectiveness is key



Metro-Haul at a glance (1)

- The Metro-Haul consortium
 - EU-funded; 36 months /June 2017 – May 2020
 - The project led by BT
 - Collaboration between Industry and Academia
 - Three operators (BT, Telefonica, TelecomItalia) & Four vendors (Nokia, Coriant, ADVA, Ericsson)
 - Eight Universities & Research Centers
 - Five SMEs

Metro-Haul at a glance (2)



Access Metro Edge Node (AMEN) – multiple ubiquitous access technologies, cloud enabled (storage, compute)

Metro Core Edge Node (MCEN) – Larger cloud capabilities- Interconnection to Core

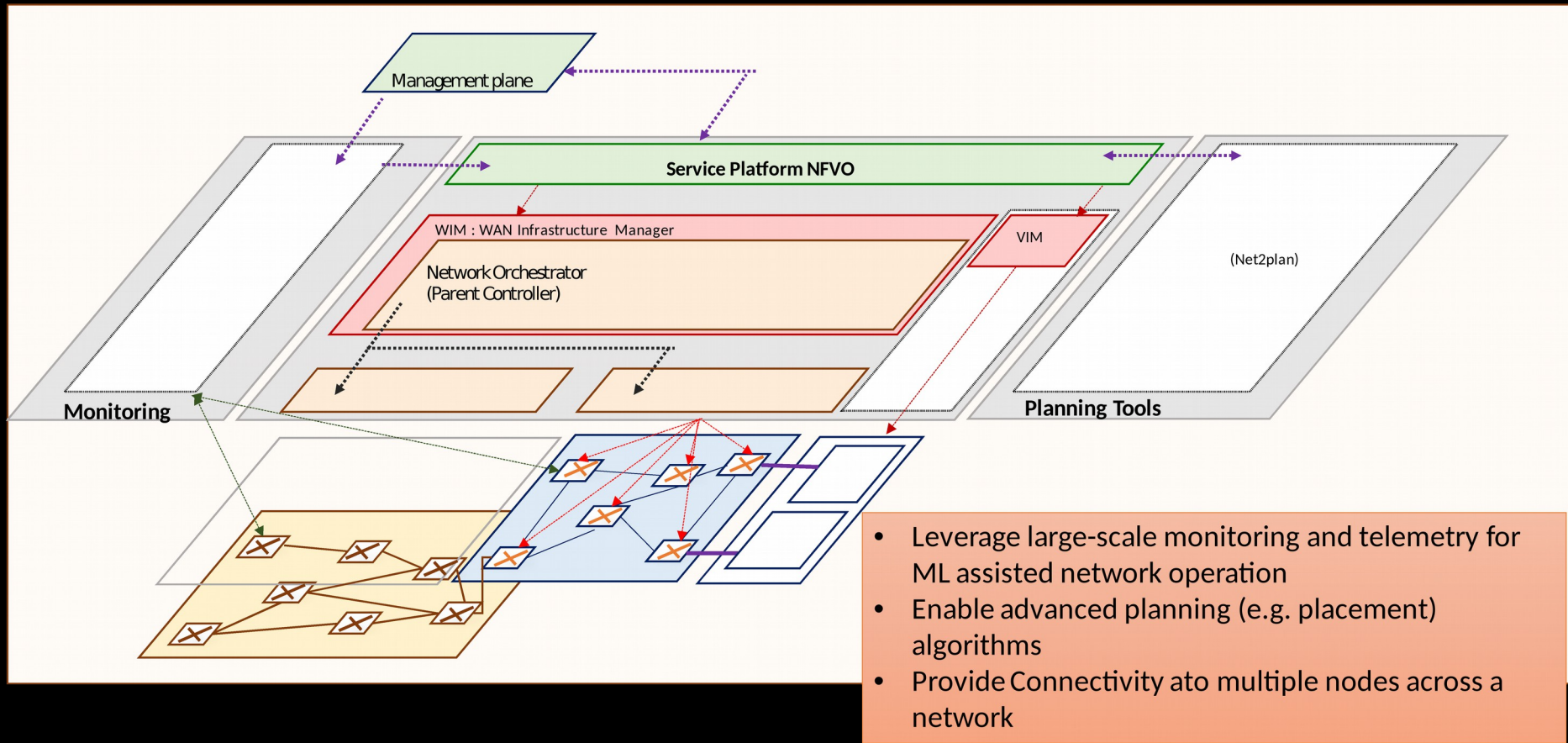


Metro-Haul: key innovations

- Metro is extensively studied in terms
 - Scalability in capacity, number of nodes & channels
 - AMEN and MCEN architectures
 - *Filtered and Filterless configurations are assessed*
 - Multi-granular transportation
 - *Coherent and DD modulations (NRZ, OFDM, 4-PAM)*
 - Techno-economic assessments

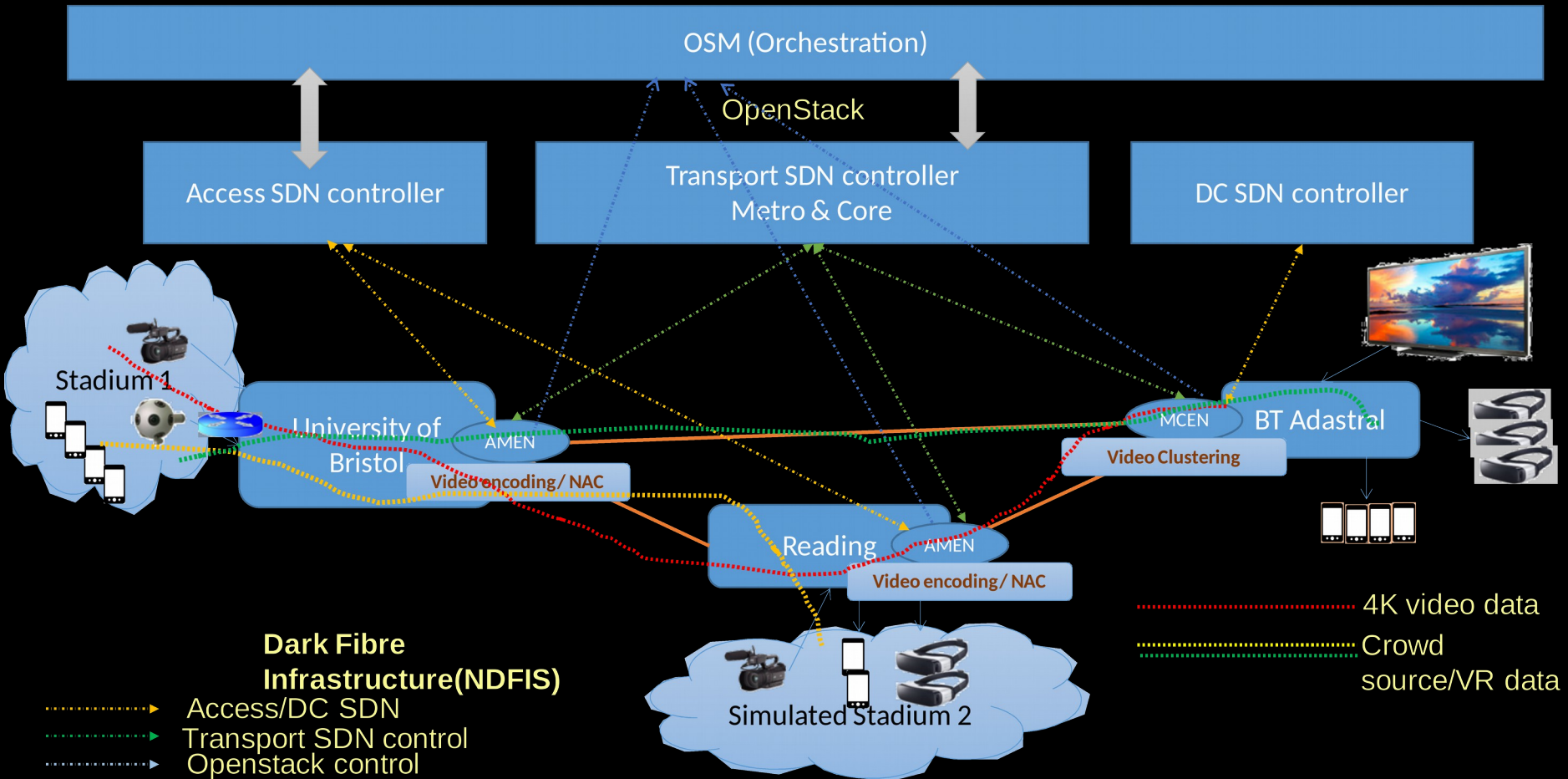
- Key building blocks are developed
 - Various low-cost ROAD configurations
 - Control-plane modules for “green-field” open-ROADMs and “brown-field” deployments for AMEN
 - Sliceable platforms
 - Dynamic Metro end-to-end platforms extending PON technologies
 - Universal traffic Framing prototypes

COM: Metro-Haul Service Platform (Integrated)

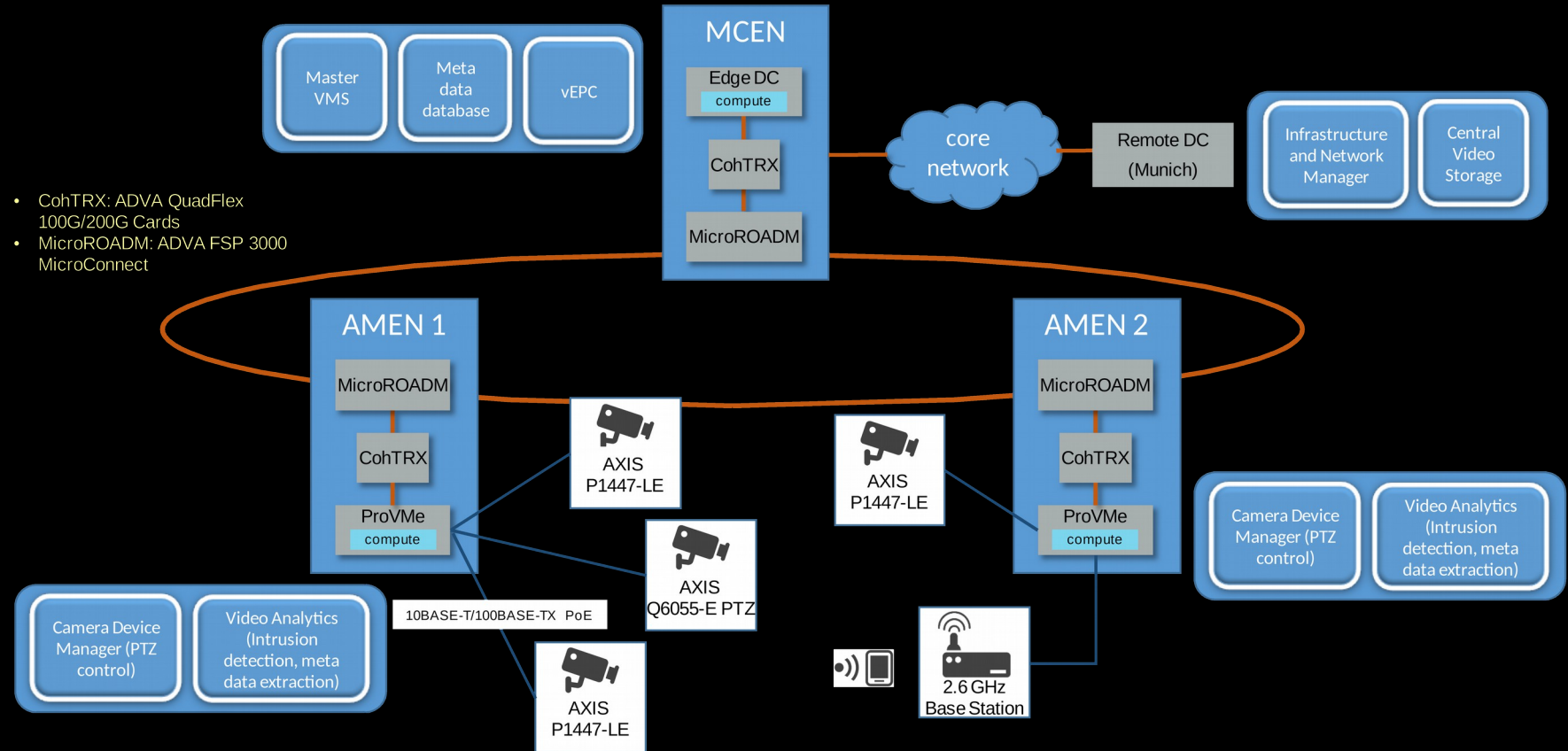


COM: Control, Operation & Management

Metro Haul Demo #1



Metro-Haul Demo #2: Real-Time Object Tracking - Hardware Setup (Semi-Filterless Network)



- CohTRX: ADVA QuadFlex 100G/200G Cards
- MicroROADM: ADVA FSP 3000 MicroConnect

