5GXCrosshaul*

* formerly known as Xhaul

the integrated fronthaul/backhaul

Millimetre-wave in 5G-Crosshaul

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In a nutshell

- 5G-Crosshaul: the 5G Integrated fronthaul/backhaul
- EC Contribution: 7.942.521 €
- Duration: 30 Months
- Effort: 981 PMs
- Starting date: 01/07/2015
- 21 partners:
  - Coordinator: University Carlos III of Madrid
  - NEC Europe
  - Ericsson AB
  - Ericsson TI
  - ATOS
  - NOKIA
  - Interdigital Europe
  - Telefonica
  - Telecom Italia
  - Visiona
  - Eblink
  - Nextworks
  - CoreNet Dynamics
  - Telnet
  - FhG-HHI
  - CTTC
  - Create-Net
  - Politecnico di Torino
  - Lunds University
  - ITRI
  - Orange

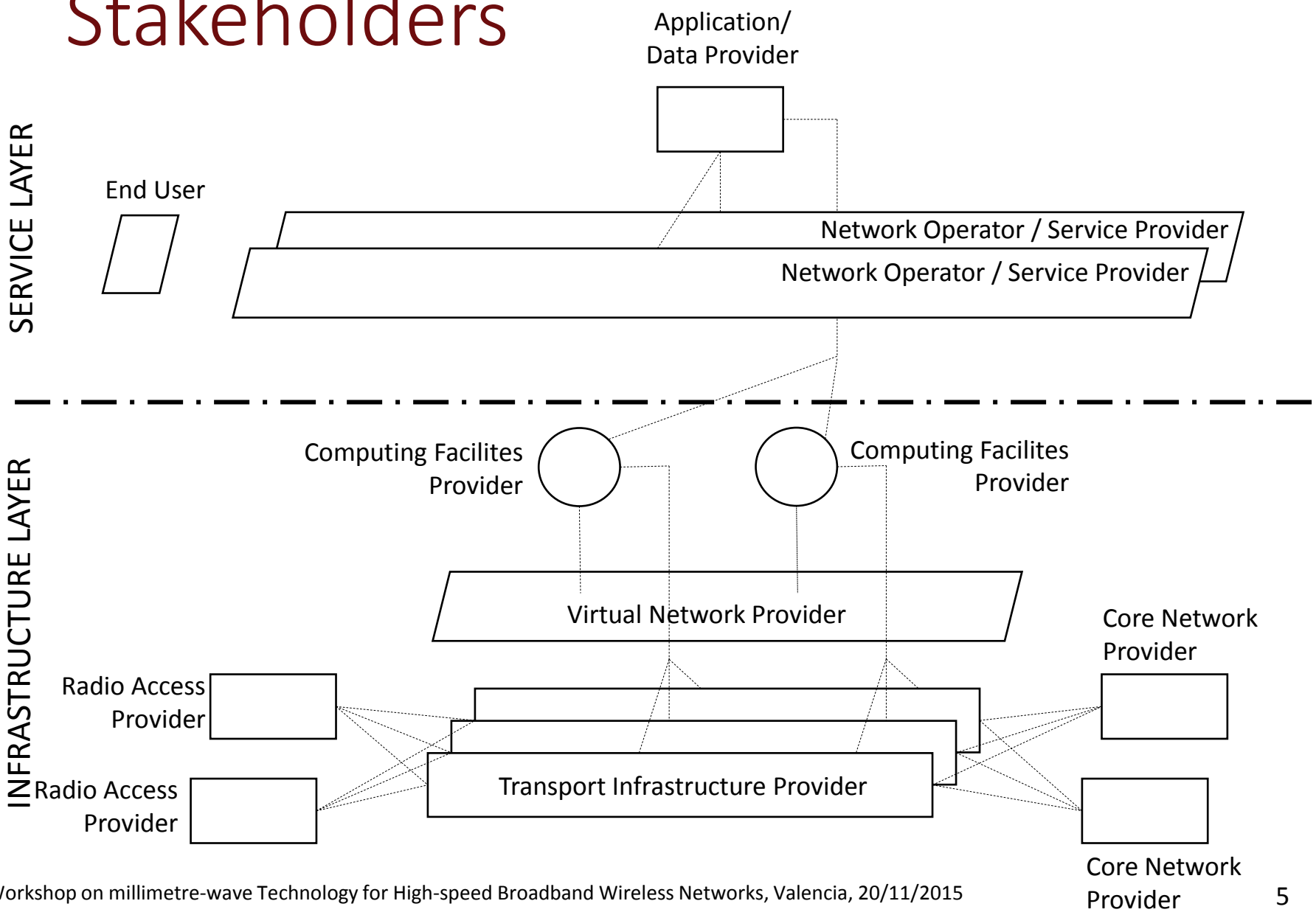
Motivation

- Operators looking for mechanisms to reduce CAPEX/OPEX in a scenario with reduced ARPU and increased needs in terms of infrastructure
- Two distinct and separated networks to manage (backhaul and fronthaul), increased OPEX
- Challenges of an integrated 5G-Crosshaul
  - Data plane: Diversity of requirements
  - Control plane: Control of heterogeneous multi-technology, multi-layer, multi-domain IT & network resources

Use cases

- Vehicle mobility
- Media distribution: CDN and Broadcast
- Dense urban society
- Multi-tenancy
- Mobile edge computing

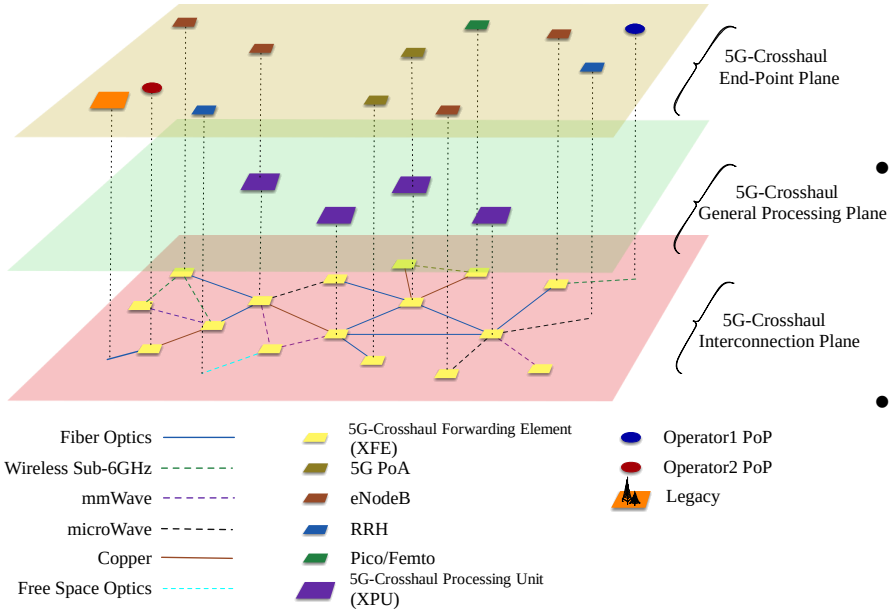
Stakeholders



In brief

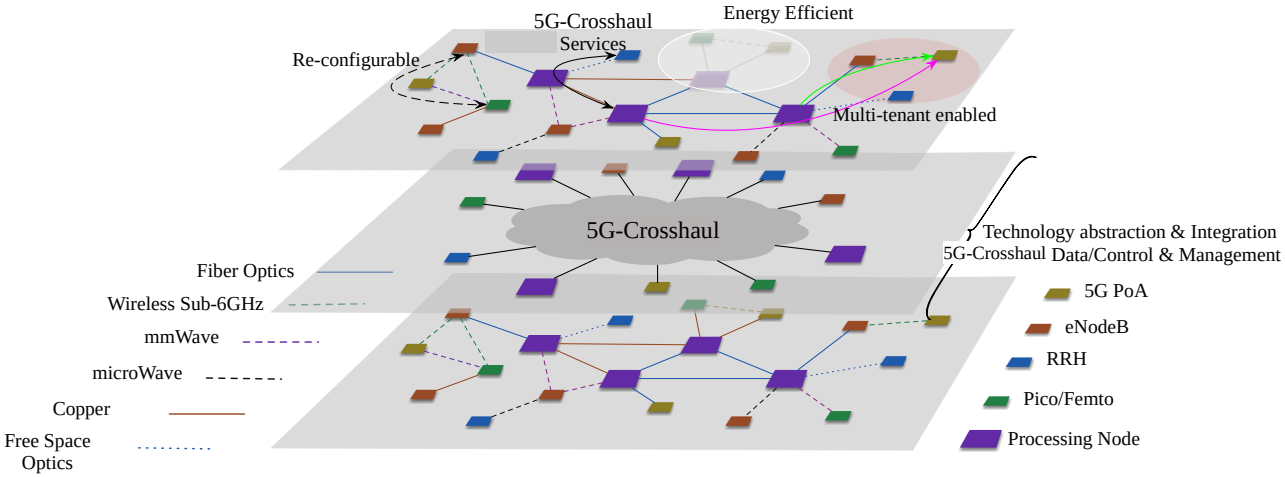
- 5G-Crosshaul aims at developing an adaptive, sharable, cost-efficient 5G transport network solution integrating the fronthaul and backhaul segments of the network.
- This transport network will flexibly interconnect distributed 5G radio access and core network functions, hosted on in-network cloud nodes, through the implementation of two novel building blocks:
  - a control infrastructure using a unified, abstract network model for control plane integration (5G-Crosshaul Control Infrastructure, XCI);
  - a unified data plane encompassing innovative high-capacity transmission technologies and novel deterministic-latency switch architectures (5G-Crosshaul Forwarding Element, XFE).
- 5G-Crosshaul will greatly simplify network operations despite growing technological diversity. It will hence enable system-wide optimisation of Quality of Service (QoS) and energy usage as well as network-aware application development.

Physical Infrastructure of 5G-Crosshaul



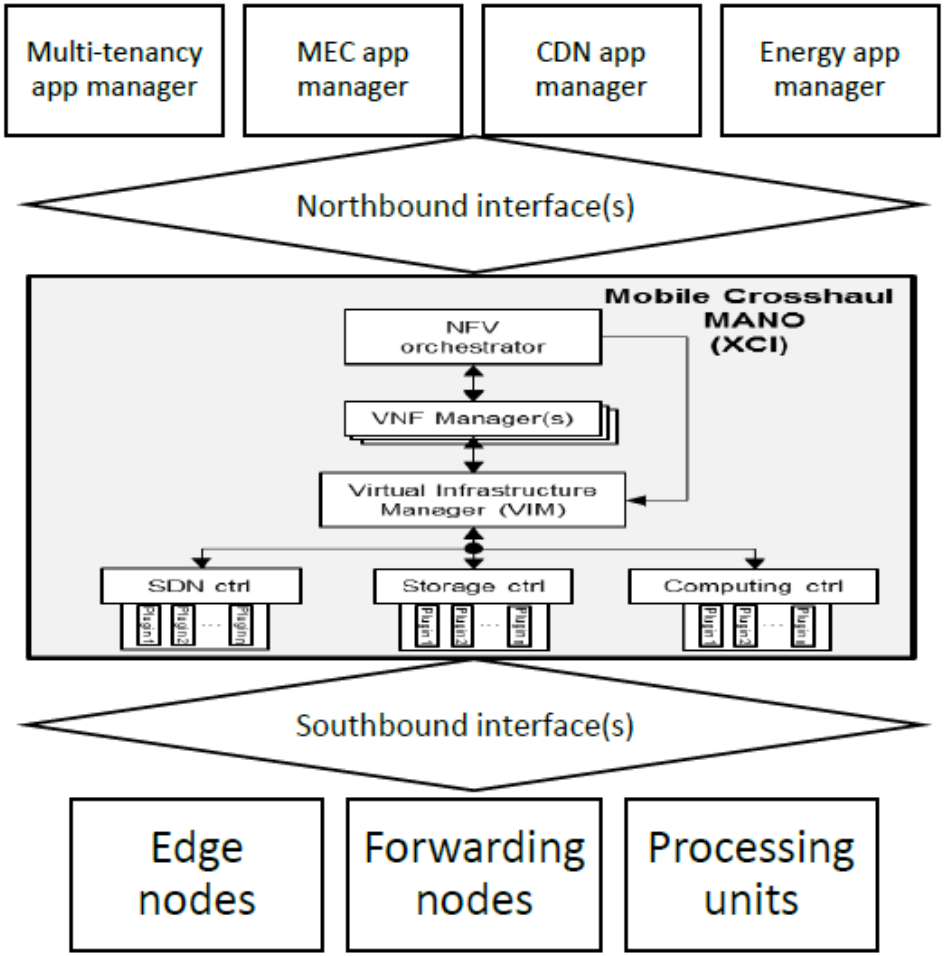
- The "Interconnection Plane" makes use of **5G-Crosshaul Forwarding Elements (XFE)** to **interconnect a broad set of novel technologies to create a packet-based network** that can meet the demands of 5G networks.
- The "5G-Crosshaul General Processing Plane" shows the different 5G-Crosshaul Processing Units (XPUs) that carry out the bulk of the operations in the 5G-Crosshaul.
- The different functional distributions between 5GPoA and XPU relation and the different services that can be hosted in the XPUs are represented by the different connection options between the uppermost ("End-Point Plane") and the middle layer.

Functional Architecture of 5G-Crosshaul

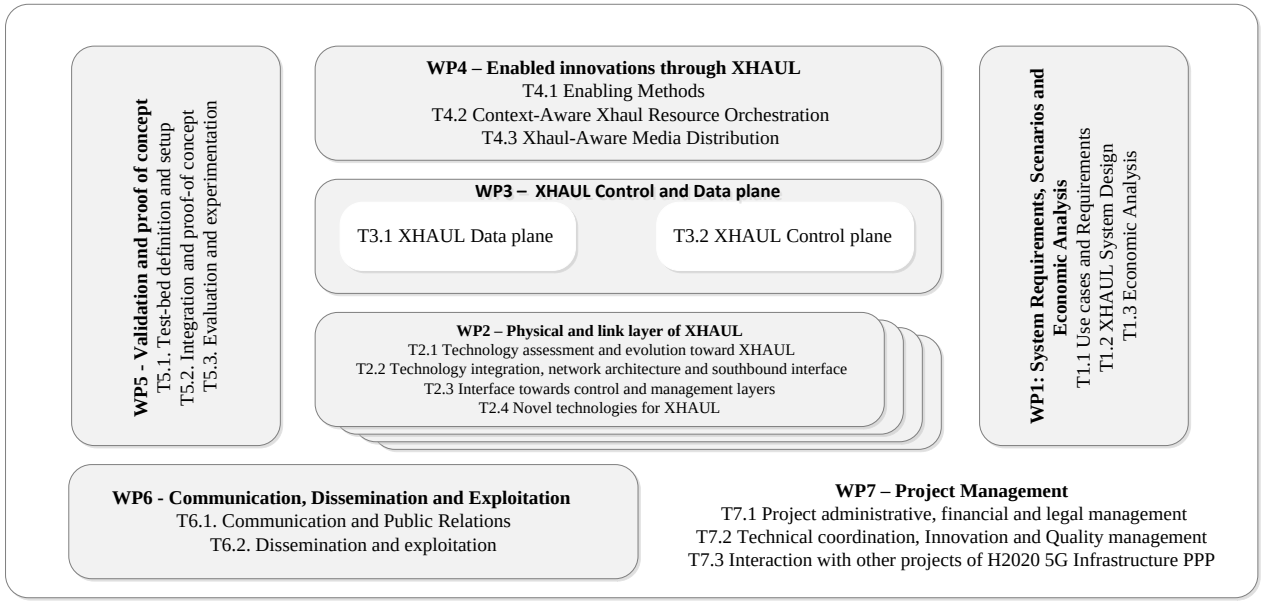


- The middle layer represents one of the key concepts associated to 5G-Crosshaul: the integration of the different technologies (including **fronthaul and backhaul**) in a common packet network based on **technology abstraction, unified framing and common data, control and management planes**.
- Finally, the upper layer presents a selection of the features offered by the 5G-Crosshaul infrastructure

Architectural building blocks



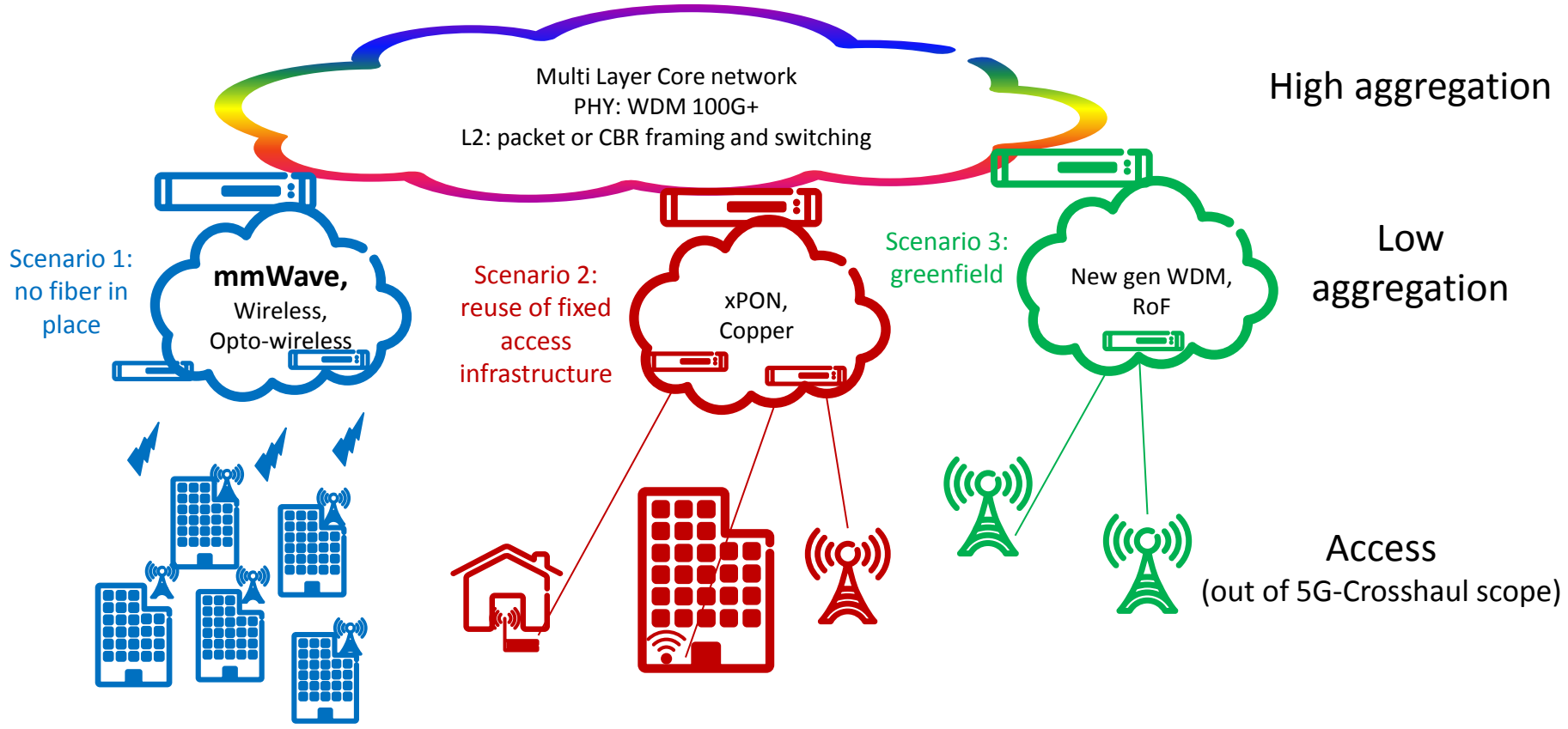
WP structure



- WP1: System Requirements, Scenarios and Economic Analysis (TI)
- WP2: Physical and link layer of 5G-Crosshaul (TEI)
- WP3: 5G-Crosshaul Control and Data Plane (NOK-N)
- WP4: Enabled Innovations through 5G-Crosshaul (NEC)
- WP5: Validation and Proof of Concept (FhG-HHI)
- WP6: Communication, Dissemination and Exploitation (IDCC)
- WP7: Project Management (UC3M)

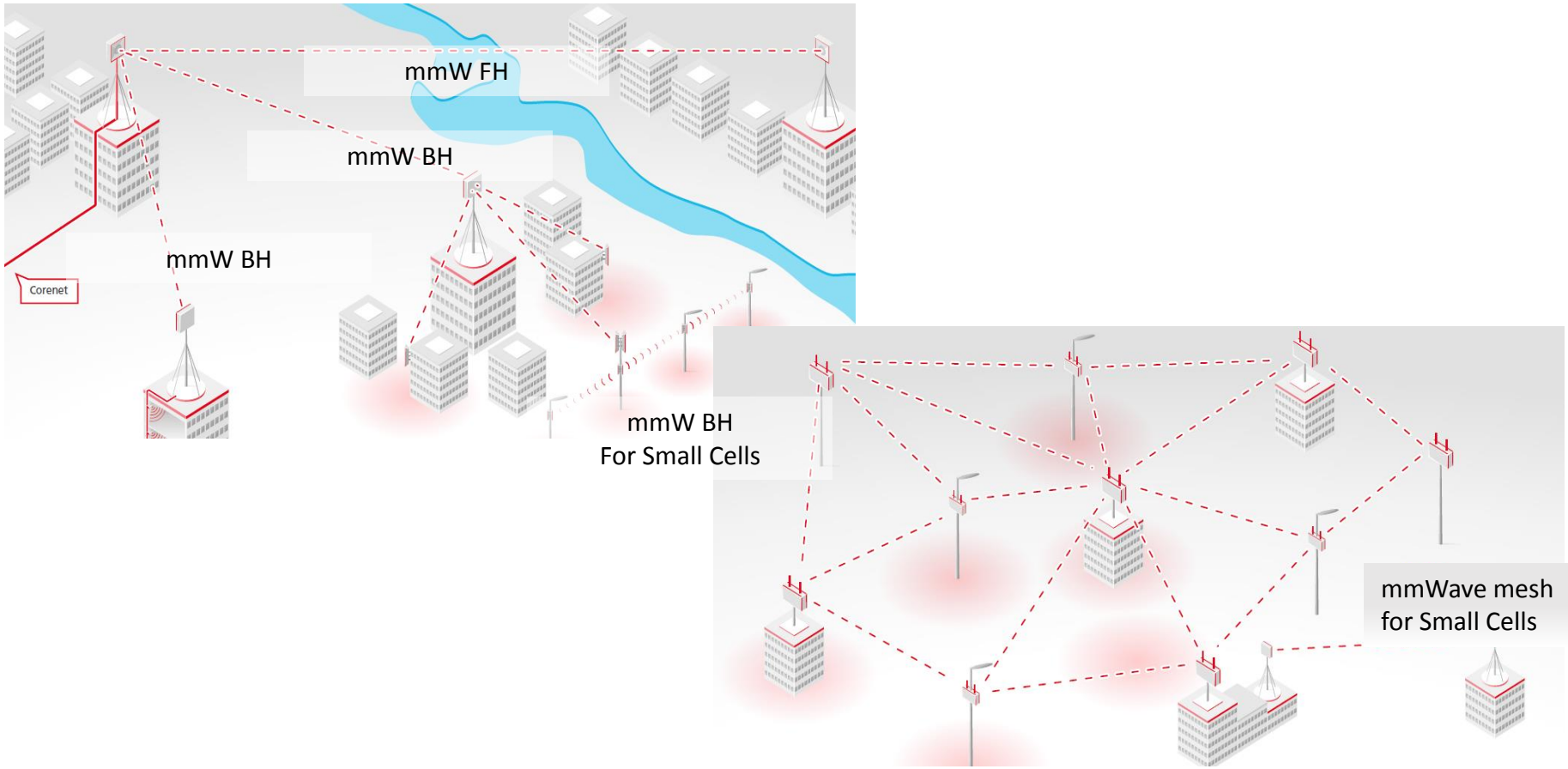
mmWave role in 5G-Crosshaul

A complementary technology to optical and copper in the fronthaul and backhaul, with **fibre-like capacity** provisioning

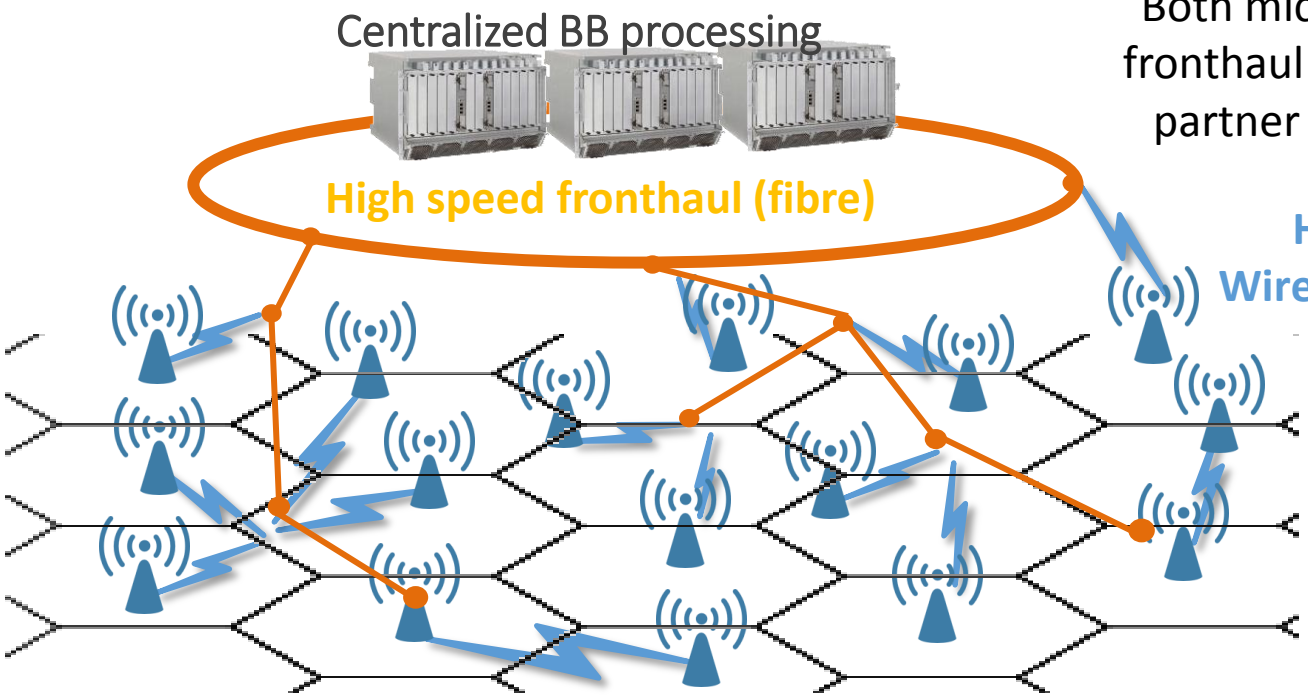


mmWave Hierarchy/Mesh

Spectrum-wise, the focus is on the 50-90 GHz bands for fronthaul and backhaul (in line with ETSI mWT)



mmWave fronthaul



Both microwave and mmWave fronthaul CPRI links from EBLINK partner will be demonstrated

Wireless Fronthaul benefits

- ✓ Complementary to fiber for the very last miles
- ✓ Faster and easier deployment
- ✓ Greater flexibility
- ✓ Lower TCO

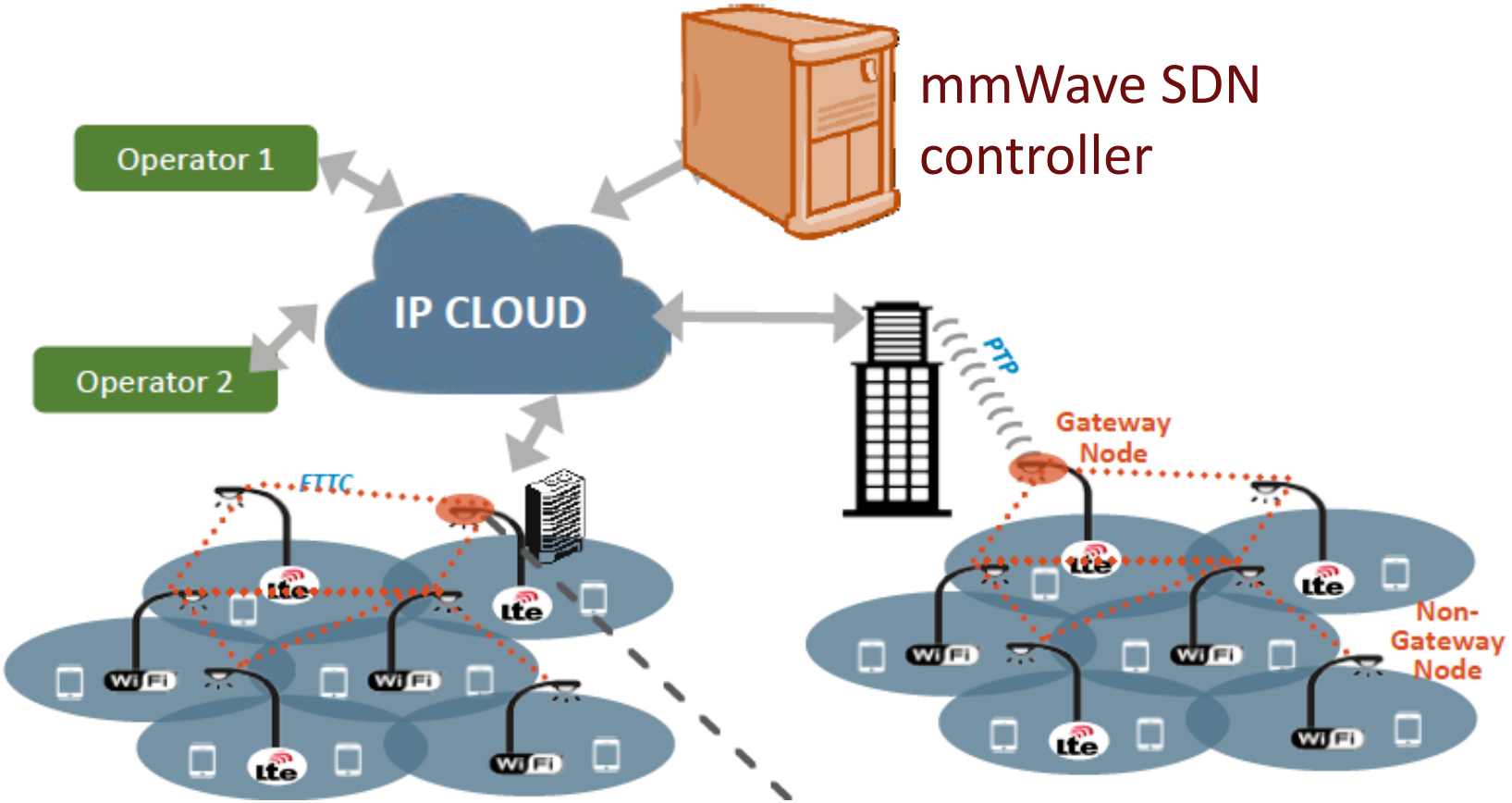
C-RAN benefits

- ✓ Improvement of DL CoMP, latency, CA, eICIC, O&M, etc.
- ✓ Lower OPEX/CAPEX
- ✓ Energy saving
- ✓ Simplify Upgrade and maintenance

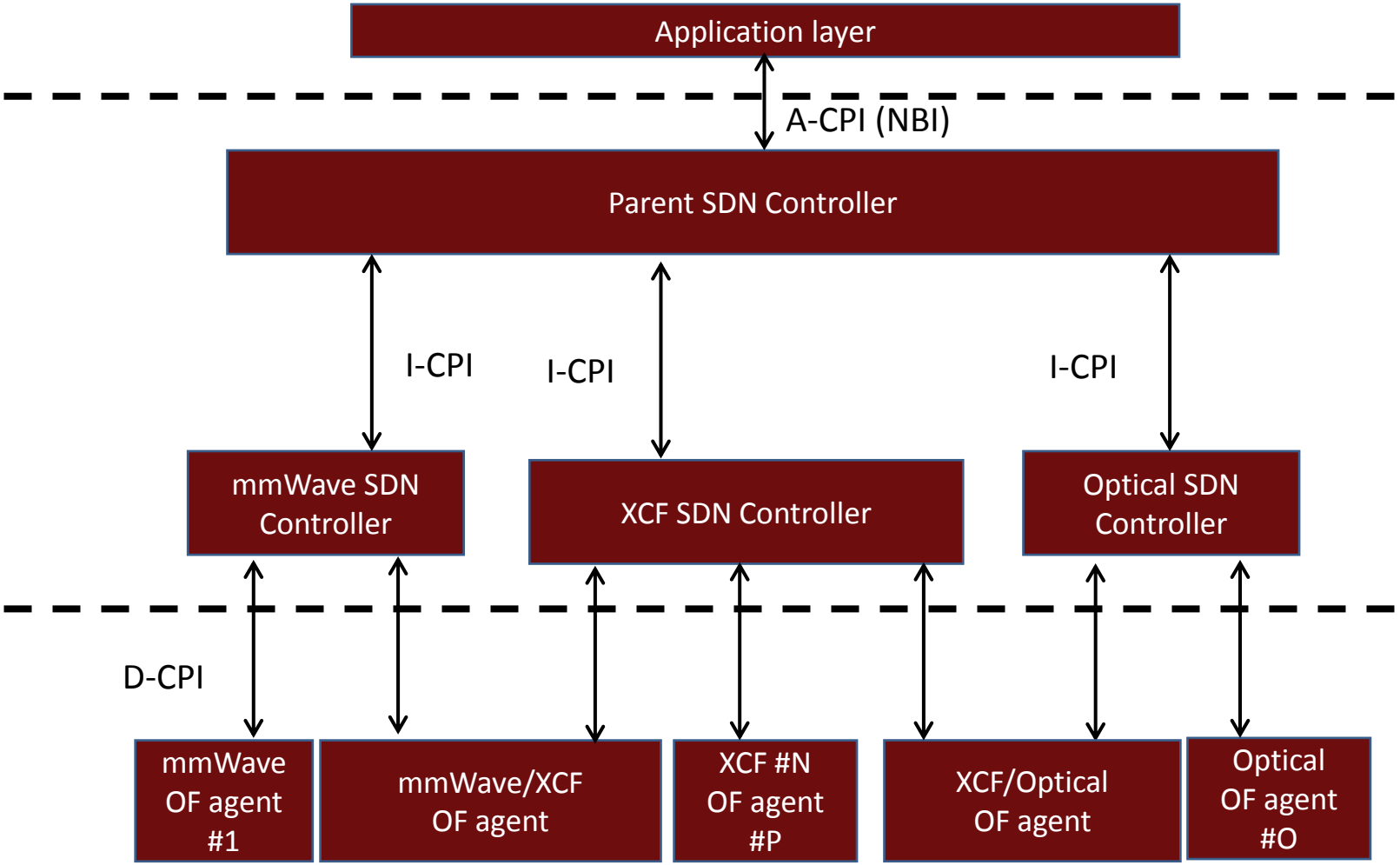
mmWave backhaul

Focus on small cells backhaul using mmWave links under the control of an SDN-based mesh controller

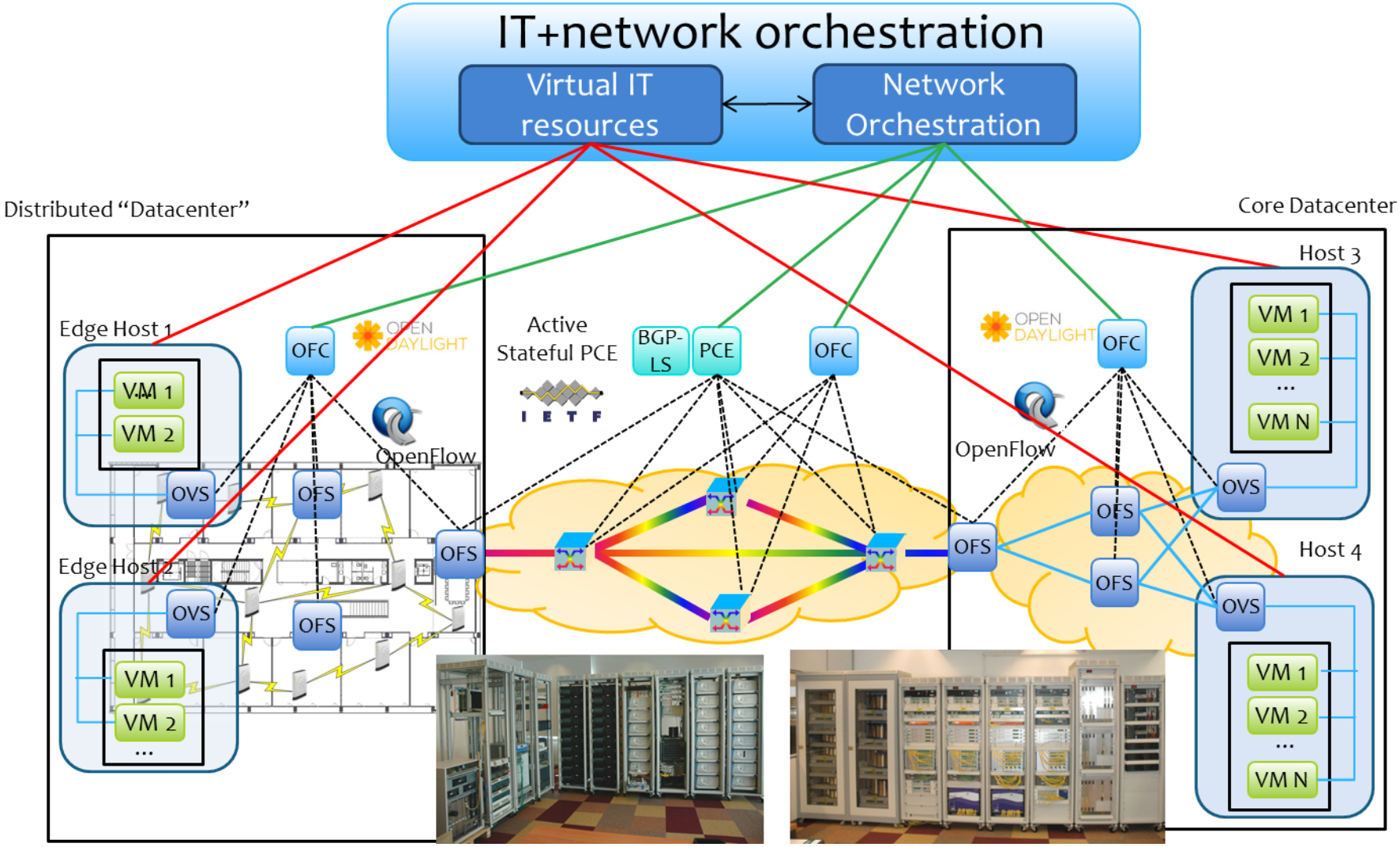
InterDigital EdgeHaul and CTTC mmWave domains will be integrated and demonstrated under 5G-Crosshaul common framework



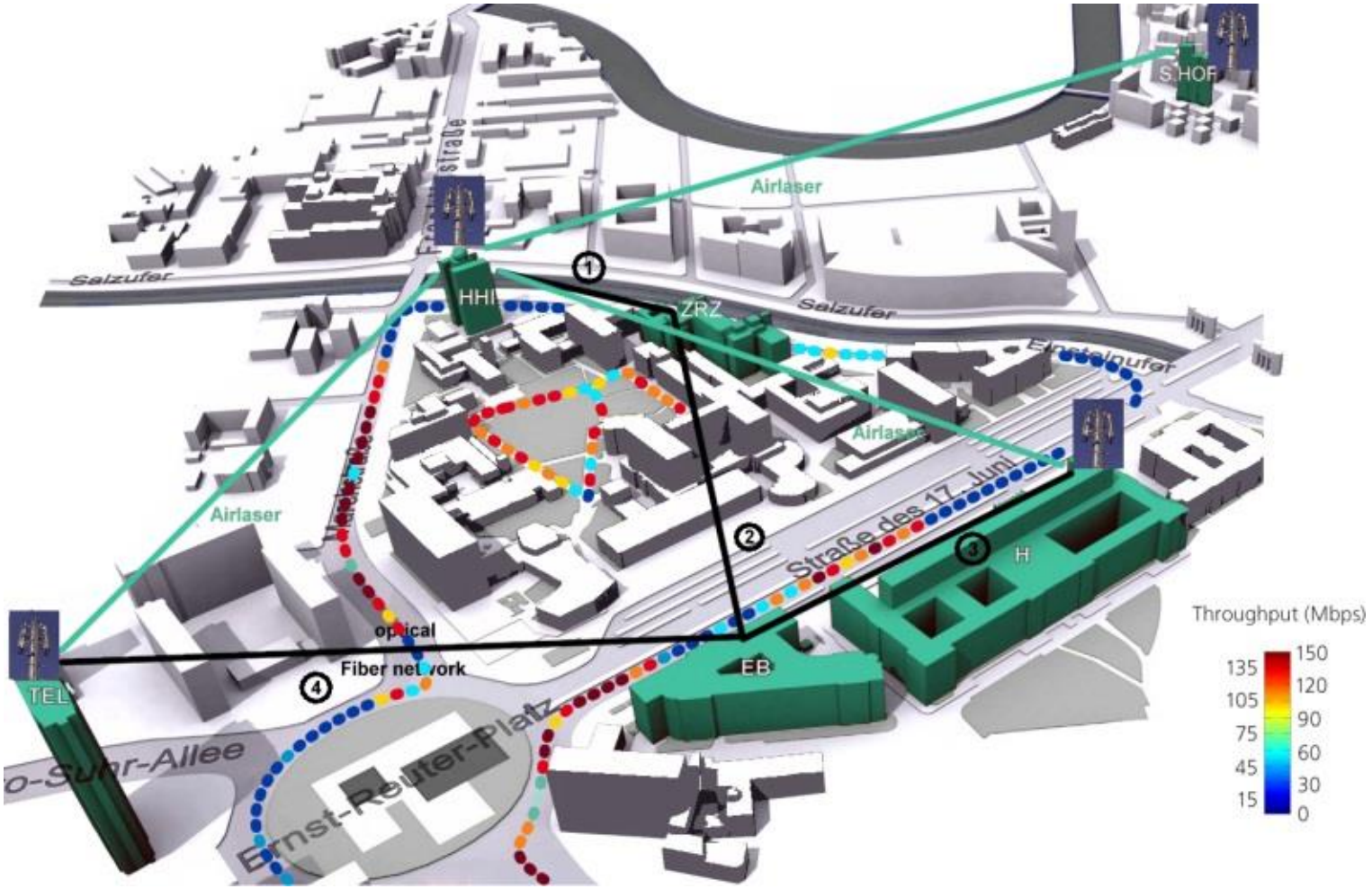
5G-Crosshaul (network) architecture Potential instantiation



IT & network orchestration



5G-Crosshaul demonstration



Thank you!

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