

Building on the use of Spatial Multiplexing 5G Network Infrastructures and Showcasing Advanced Technology and Networking Capabilities

The BLUESPACE case

Christos Tsirakis, Dr. George Agapiou

Measurements and Wireless Technologies Research Laboratory

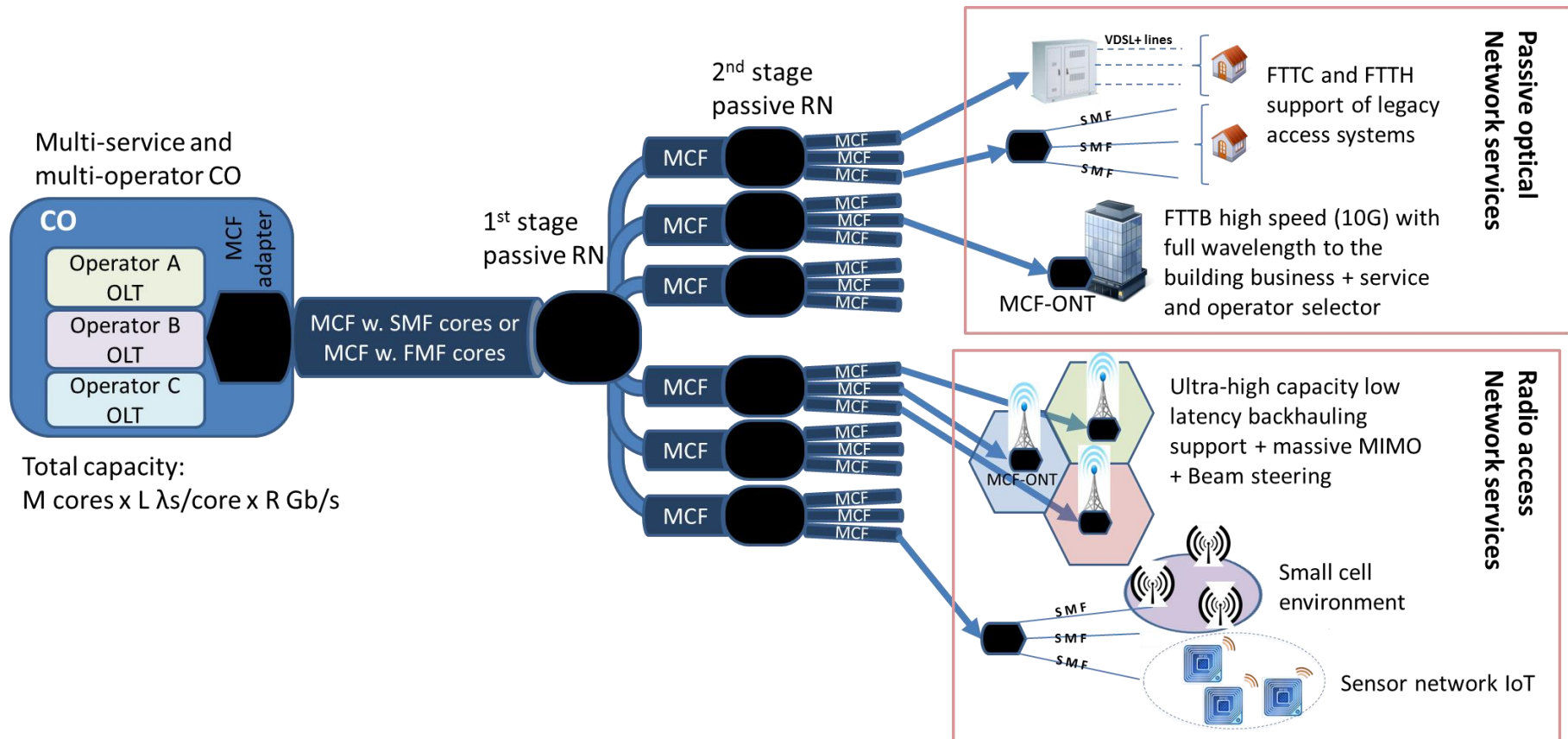
Labs and New Technologies Department, Fixed & Mobile

Ideas that led to BlueSpace

- 5G requires **x1000 increased capacity**, which corresponds to x10 or x100 increased user data rates.
- Large number of antenna elements at small coverage cells, require large BW at front-haul.
- Recent technologies are able to provide higher capacity at long-haul networks.
- Need for higher capacity at **front-haul networks**.
- The trend is the segment closest to the user to be supported by 5G wireless communications, while the segment connecting at the RAN and CO, will be supported by Fiber Optic.

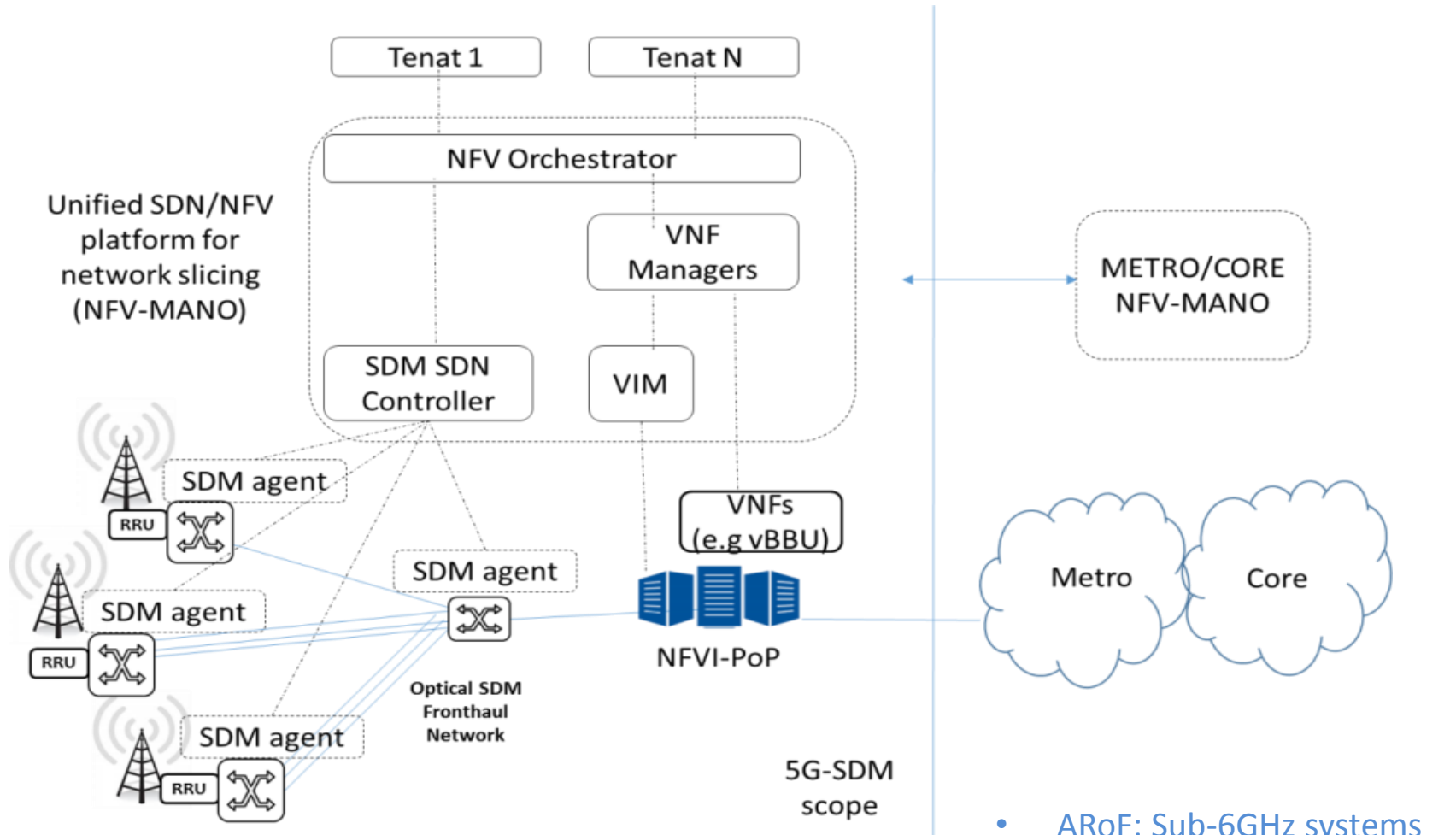
BLUESPACE Concept

- Respects the tradition methods of giving services via fiber optics.
- Applies perfect to the demands of different RANs requirements.
- e.g.: A **19-core MCF supports up to 8x8 MIMO**
(16 cores for BTS, 2 Upstream/Downstream & 1 Controlling Signal Delivery)



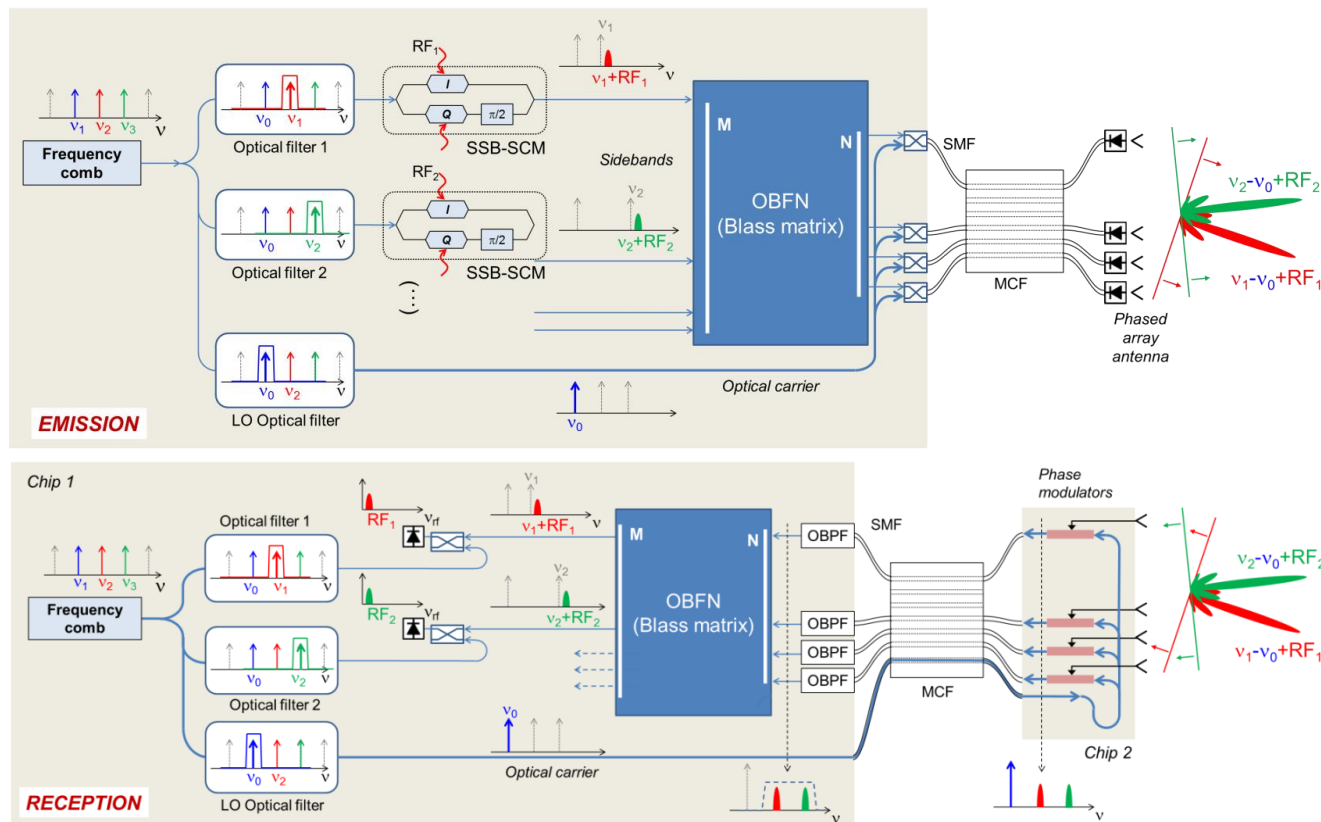
BLUESPACE: SDM, A&DRoF, and SDN

Integrating it all together



- ARoF: Sub-6GHz systems
- DRoF: 28-32GHz (Ka-Band)
- MIMO & DSP at BBUs

Beamforming and Steering



- Broadband Beamforming is achieved by using True Time Delay (TTD), either at the RF Domain, or at the Optical Domain.
- 64x16 Multibeam Demonstration (64: Emission/Reception & 16: Independent Beams)
- MCF is to transport from/to Phased Array Antenna.
- The frequency up/down conversion will be performed in the Optical Domain.

Challenges

- ❑ The adaptation of DRoF & ARoF techniques over SDM
- ❑ Cost efficient hardware solutions for ARoF transceivers, remote power distribution to RRUs over SDM network from the CO
- ❑ Spatial optical beam forming for ARoF transceivers at the RRU, and compact SDM splitter and MCF adapters enabling advanced SDM-based ODN designs
- ❑ Switching and interconnection hardware to enable SDM-compatible DCA, strict latency and CoMP for both DRoF and ARoF paradigms
- ❑ Interfaces between the SDM media and the radiating elements in the RRU/RRH sites for advanced massive MIMO and beam steering solutions for both DRoF and ARoF
- ❑ SDN control for SDM and NFV orchestration to deploy virtual base-band units (vBBUs) in the CO as well as slicing for multi-tenancy



GROUP OF COMPANIES

THANK YOU !!!