



AFFORDABLE 5G

5G KEY ENABLING TECHNOLOGIES

NKUA DISSEMINATION WORKSHOP

Evripos Campus, 20/10/2022

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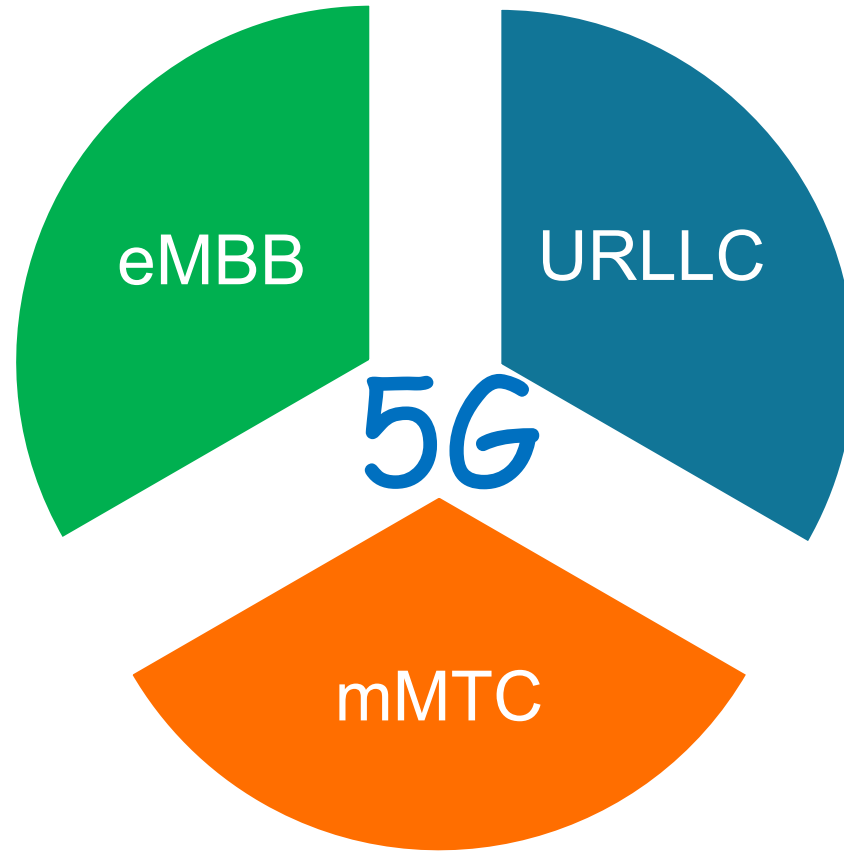
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Introduction

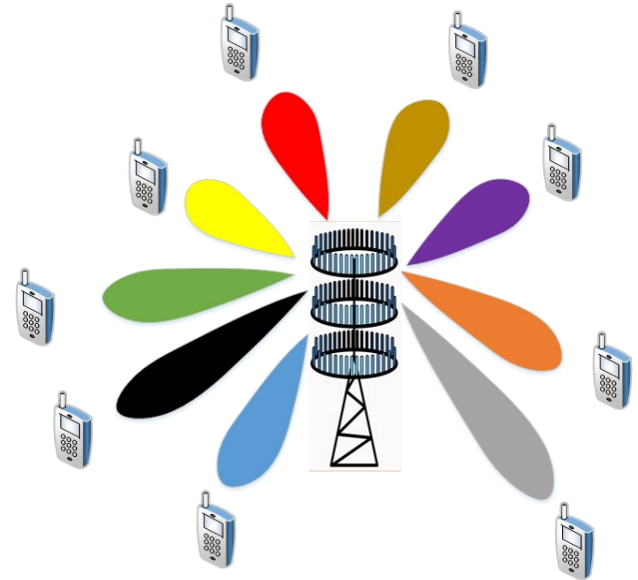


Milimeter Wave Transmission

- Transmission at higher frequency bands compared to 4G networks
- Frequency ranges between 30 and 300 GHz
- The propagation characteristics are significantly different from microwave frequency bands in terms of path loss, diffraction and blockage
- Fortunately, however, the small wavelengths of mmWave frequencies enable large numbers of antenna elements to be deployed

Massive MIMO^(1/2)

- Large number of antennas located at base stations either in a centralized or in a distributed way
- High data rate services can be supported via the generation of highly directional beams

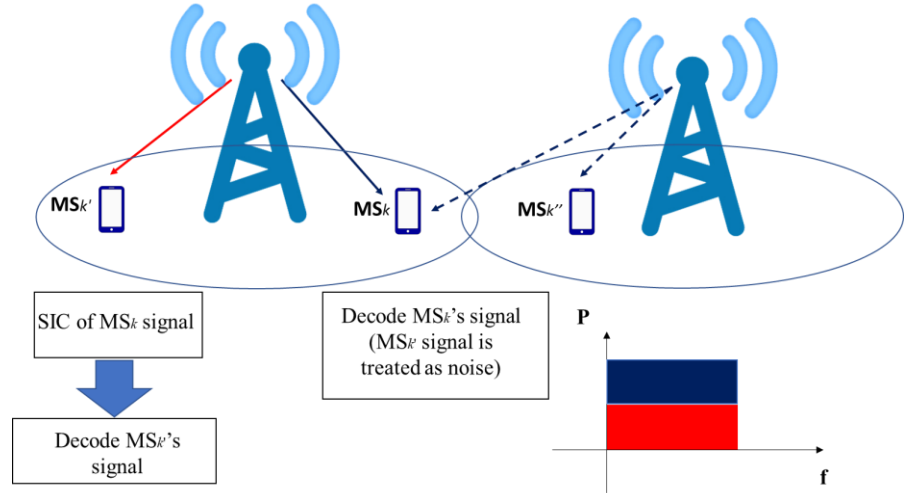


Massive MIMO^(2/2)

- **Typical MIMO systems**
 - ✓ Each antenna is connected to a separate RF chain (Fully Digital precoding)
 - ✓ However, in a massive MIMO configuration this would significantly increase hardware and algorithmic complexity at base stations
- **Massive MIMO systems**
 - ✓ Hybrid Beamforming Digital precoder at baseband and the analog precoder in the RF domain
 - ✓ Fewer RF chains are required for implementation

Non-Orthogonal Multiple Access (NOMA)

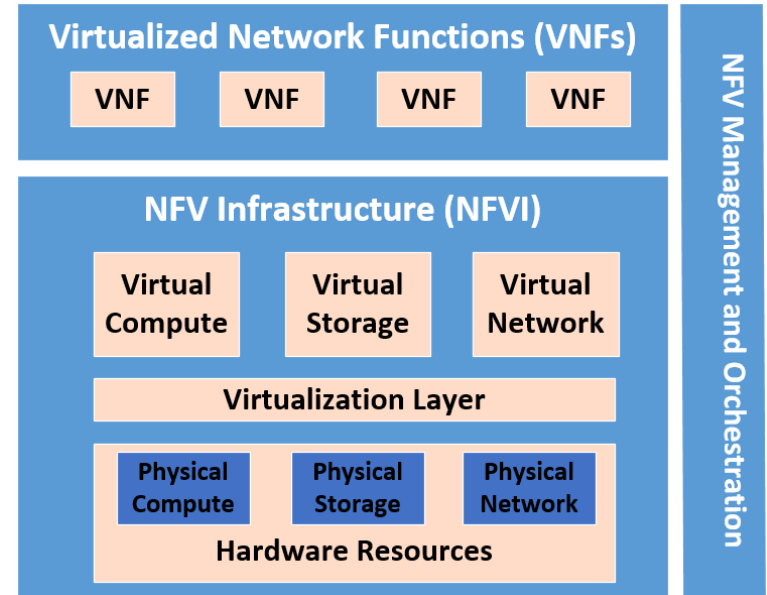
- The same resource block can be reused among different mobile users
- Hence, spectral efficiency can be improved
- However, advanced signal reception techniques are required to mitigate intra-cell interference



Network Function Virtualization

(1/2)

- Network function virtualization (NFV) is a network architecture concept that leverages the IT virtualization technologies to virtualize entire classes of network node functions into building blocks that may connect, or chain together, to create and deliver communication services



Network Function Virtualization^(2/2)

- New services are allowed to be deployed on demand
- Service providers deliver services faster and cost-effectively
- Automation is leveraged
- Dedicated hardware platforms support a single service
- 5G networks have been designed and implemented using NFV and cloud principles

Software Defined Networking

- Software-Defined Networking (SDN) is an approach to networking that uses software-based controllers or application programming interfaces (APIs) to communicate with underlying hardware infrastructure and direct traffic on a network
- This model differs from that of traditional networks, which use dedicated hardware devices (i.e., routers and switches) to control network traffic
- SDN can create and control a virtual network – or control a traditional hardware – via software.

Challenges towards 6G Networks

- The necessary 5G equipment should be adapted to high frequency devices for multi-gigabit-per-second data speed applications to be supported
- Small size of mmWave antenna configurations → flexible base station deployments
- Effective management of heterogeneous IoT networks
- Security and privacy concerns especially for small size physical devices

Partners



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*Affordable5G project is funded by the EU's Horizon2020
programme under Grant Agreement number 957317.*



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THANKS FOR YOUR ATTENTION