



ITU Kaleidoscope 2014

Living in a converged world - impossible without standards?

Towards Converged 5G Networks - Challenges and Current Trends

A. Zakrzewska, S. Ruepp, M.S. Berger

DTU Fotonik

Technical University of Denmark

azak@fotonik.dtu.dk

**Saint Petersburg,
Russian Federation**

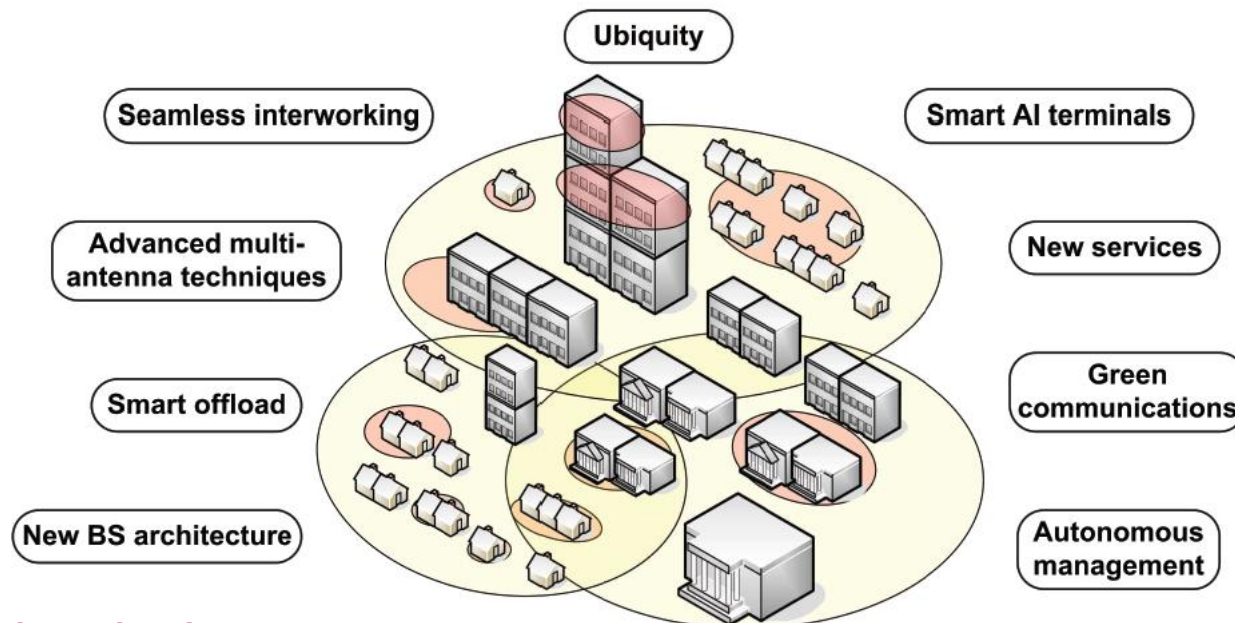


Introduction

Future Mobile Networks Expectations

- 10-100x peak data rate
- 1000x capacity
- 10x lower latency
- 10x energy efficiency

**Significantly
surpass
IMT-Advanced**



Outline

- Introduction
- Challenges and Development Directions
 - Machine to Machine Communication
 - Capacity Crunch
 - Enhanced Local Area Access
 - New Radio Access Architectures
 - Self-Organising Networks
 - Core Network Virtualisation
- Summary

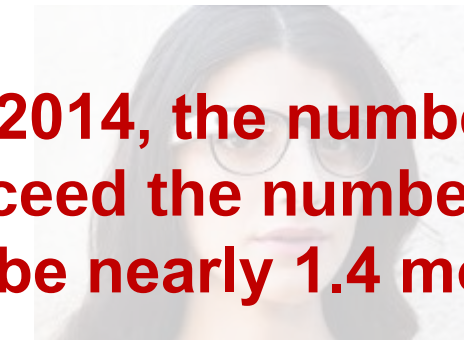
Machine to Machine Communication

- Network and device evolution (revolution?)

“By the end of 2014, the number of mobile-connected devices will exceed the number of people on earth and by 2018 there will be nearly 1.4 mobile devices per capita.”



<http://theinstitute.ieee.org>



<http://www.google.com/glass>



<http://www.emro.who.int>

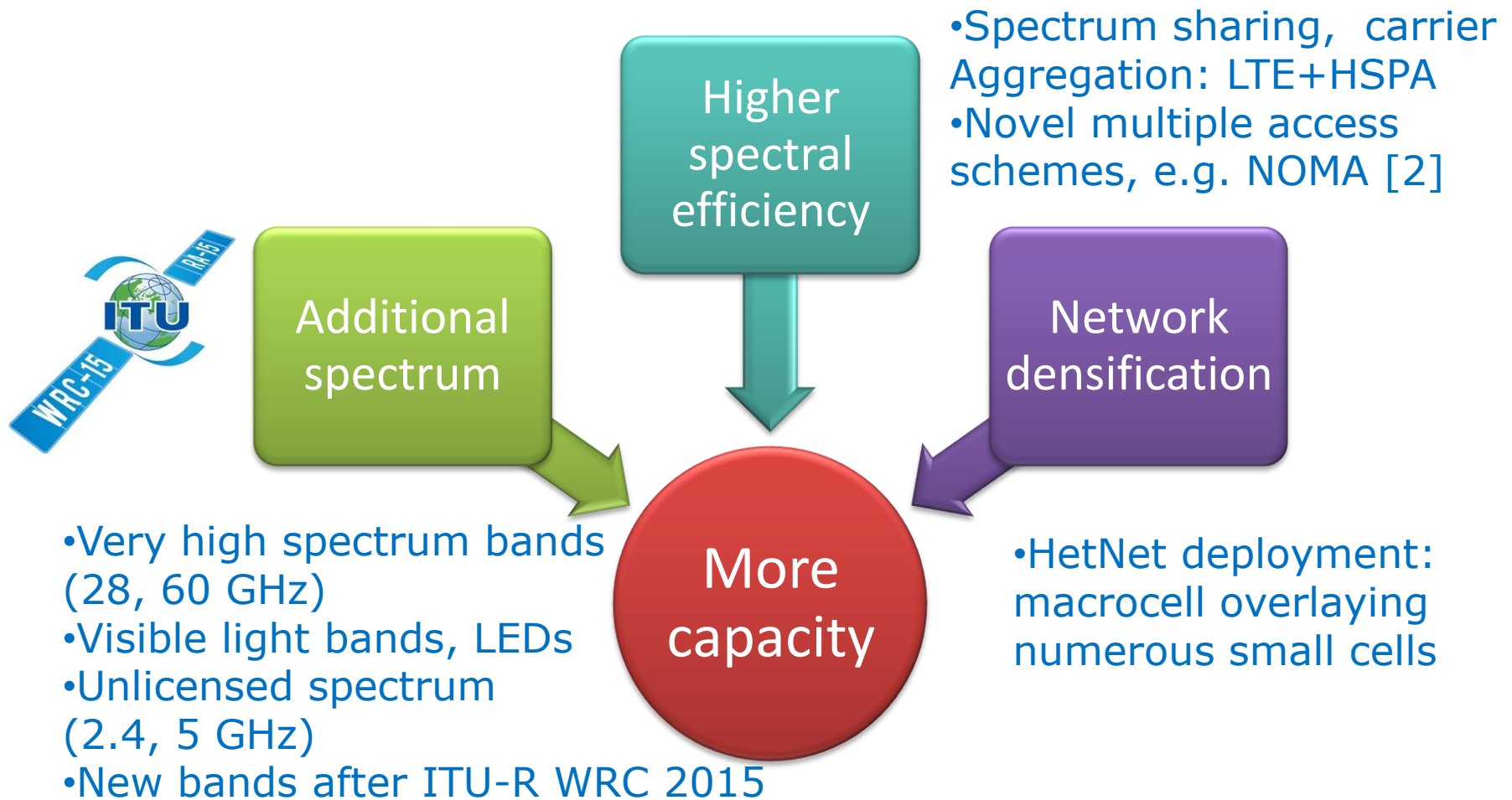


<http://www.ehi.eu/>

Cisco, Feb. 2014

- Challenges: enhanced security, radio access techniques, efficient resource management for diverse M2M traffic

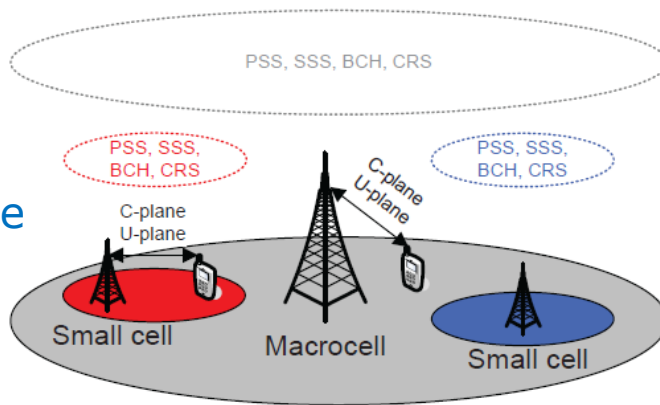
Capacity Crunch



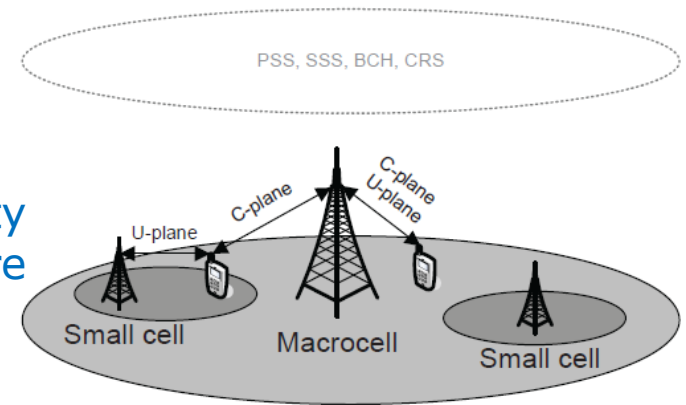
Enhanced Local Area Access

- HetNets boost the network capacity but pose numerous challenges related to mobility
- Dual connectivity: **C-and U-Plane Split**
 - Control-plane provided by the umbrella macrocell
 - User-plane by either the macrocell or the small cell
 - Main advantage: **Reduction of unnecessary handovers and handover failures**

Traditional architecture



Dual connectivity architecture



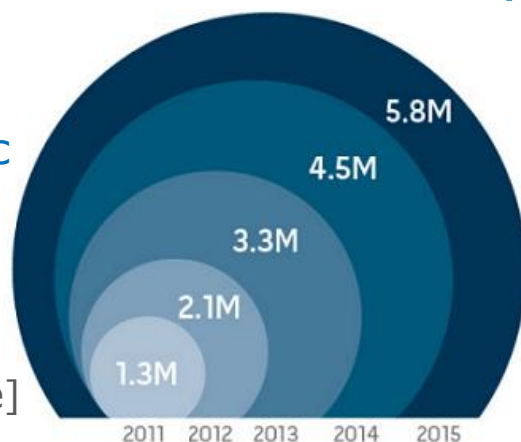
Enhanced Local Area Access (2)

Tighter interworking between cellular and WiFi

- **IEEE 802.11u**
 - Automatic authentication and handoff from cellular to WiFi networks
 - Offload of cellular data traffic in a seamless way
- **IEEE 802.11s**
 - Wireless Mesh Networks (WMNs) to extend public WiFi and offload
 - Self-Organizing Network (SON) properties
 - Easy and inexpensive deployment (open source firmware)

Number of public hotspots worldwide

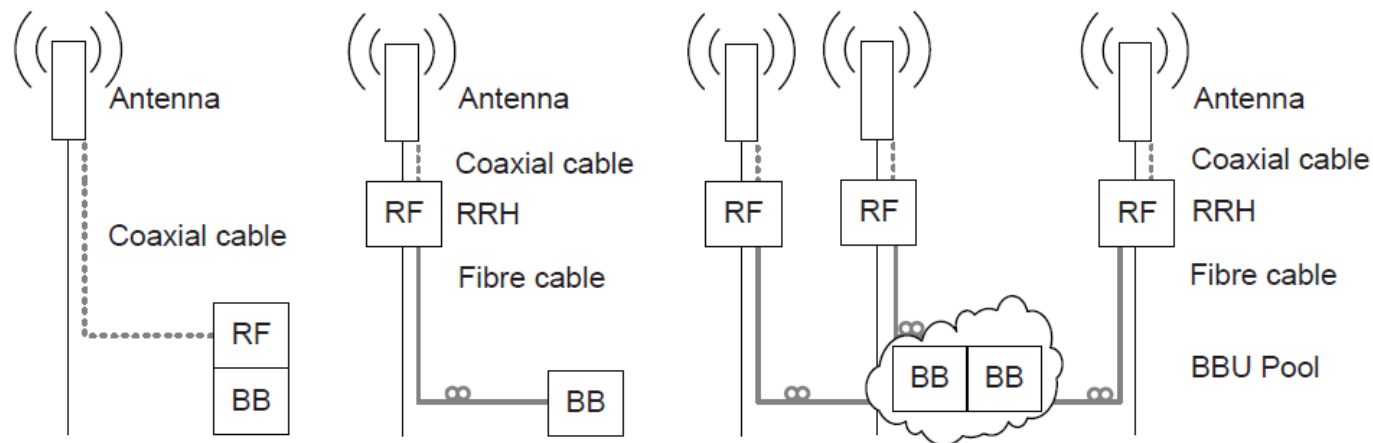
[Wireless Broadband Alliance]



New Radio Access Architectures

Cloud RAN

- Increasing cost of network deployment and maintenance: **Base station as the most expensive** part-site rental, cooling
 - New BS architectures - **separation of RF from BB**



Conventional

Distributed

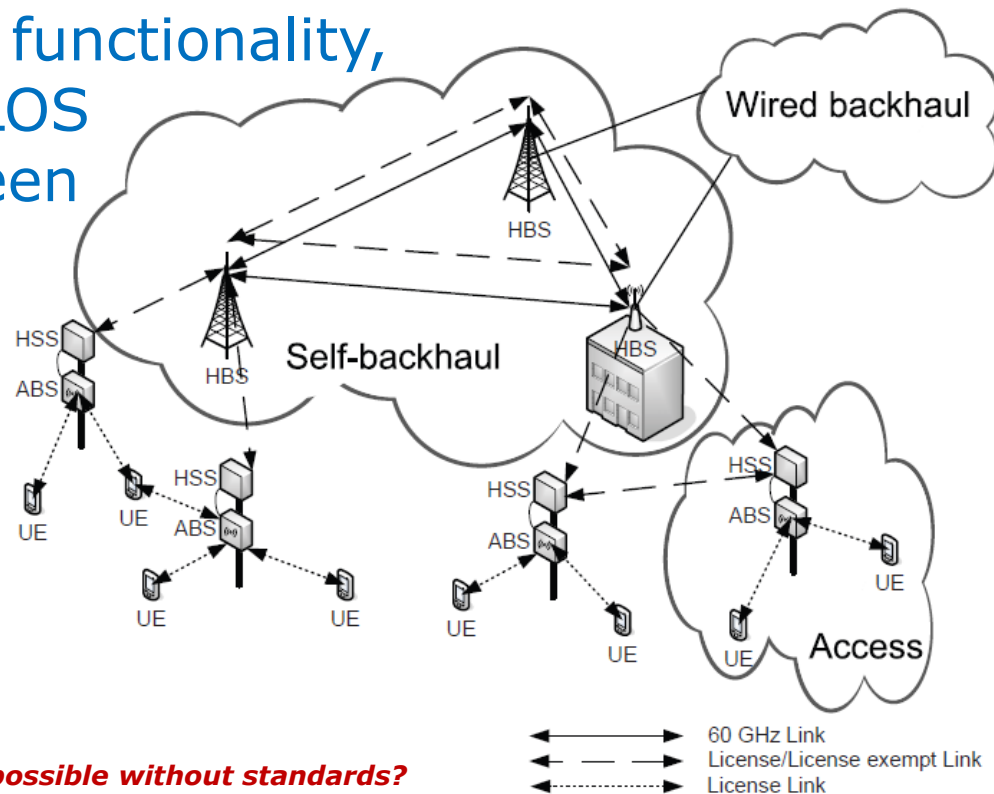
Cloud RAN

- Variety of architectures, BBU aggregation, reduction of BS sites, adaptability to non-uniform traffic

New Radio Access Architectures

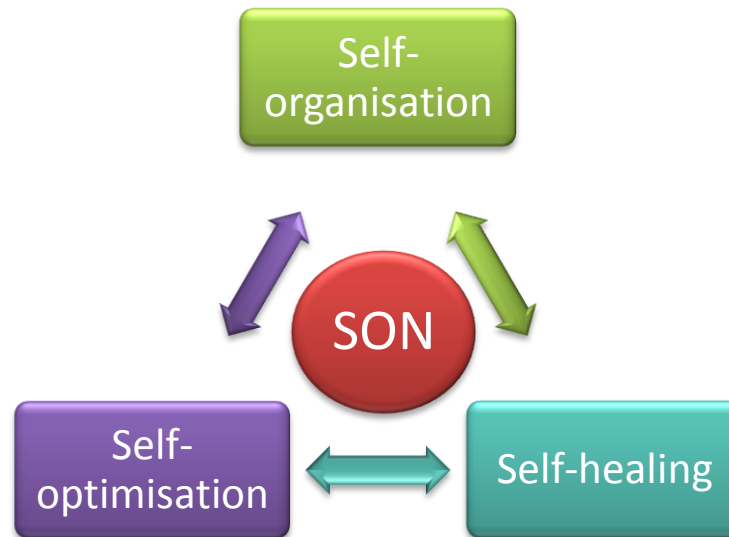
BuNGee

- Beyond Next Generation Mobile Networks (BuNGee): Capacity density up to **1 Gbps/km²**
- Contribution to ETSI standardisation
 - **Hub BS** (HBS): core functionality, local centralisation, LOS links at 60GHz between
 - **Access BS** (ABS) provide the service over licensed links
 - Low cost significant increase of network capacity



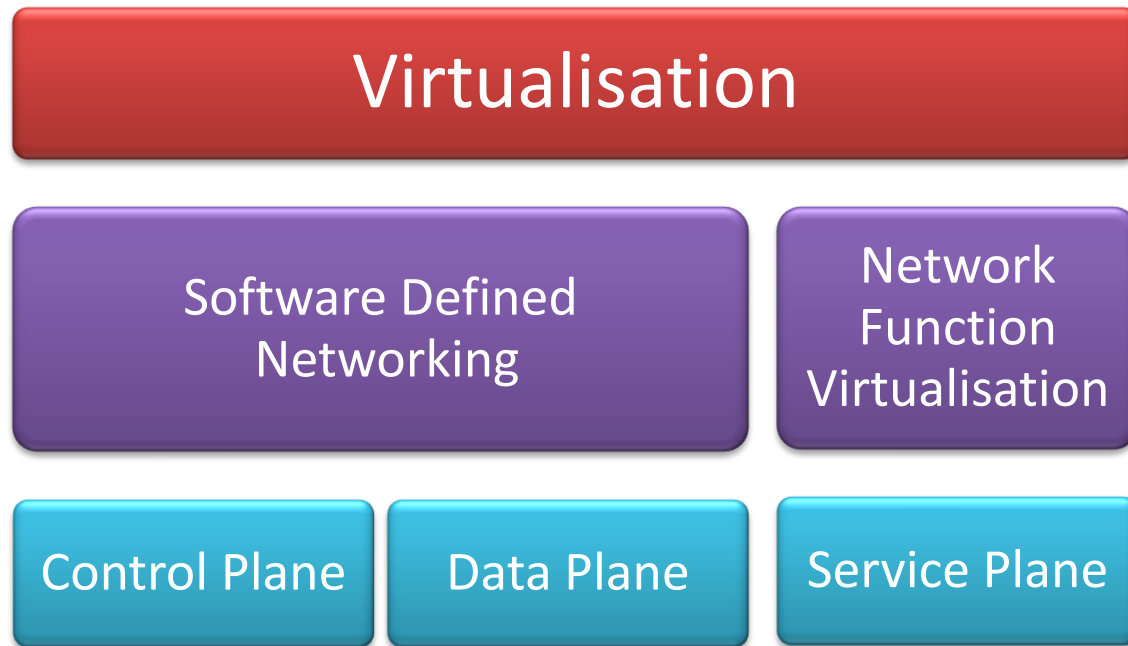
Self-Organising Networks

- Increasing network complexity
 - New **architectures**: multi-RAT, multi-tier, C-RAN
 - New **functionalities**, e.g., Carrier Aggregation (CA)
 - **Resource diversity**: spectral, optical, computational
- Management automation



Core Network Virtualisation

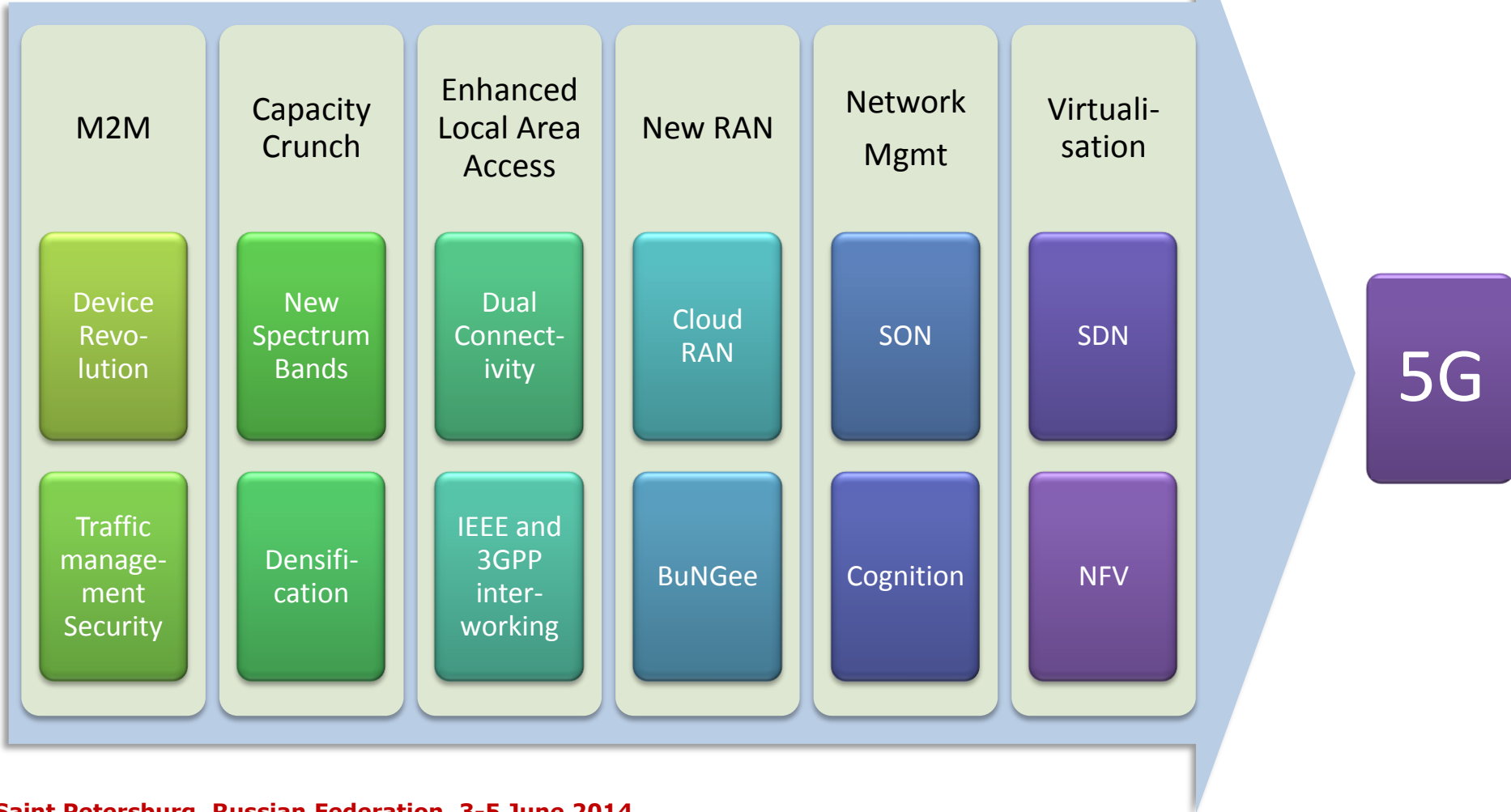
- Hardware and software decoupling



- Scalability, adaptability, faster deployment of new innovative features

Summary

Unified agnostic solution as a result of standards convergence



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