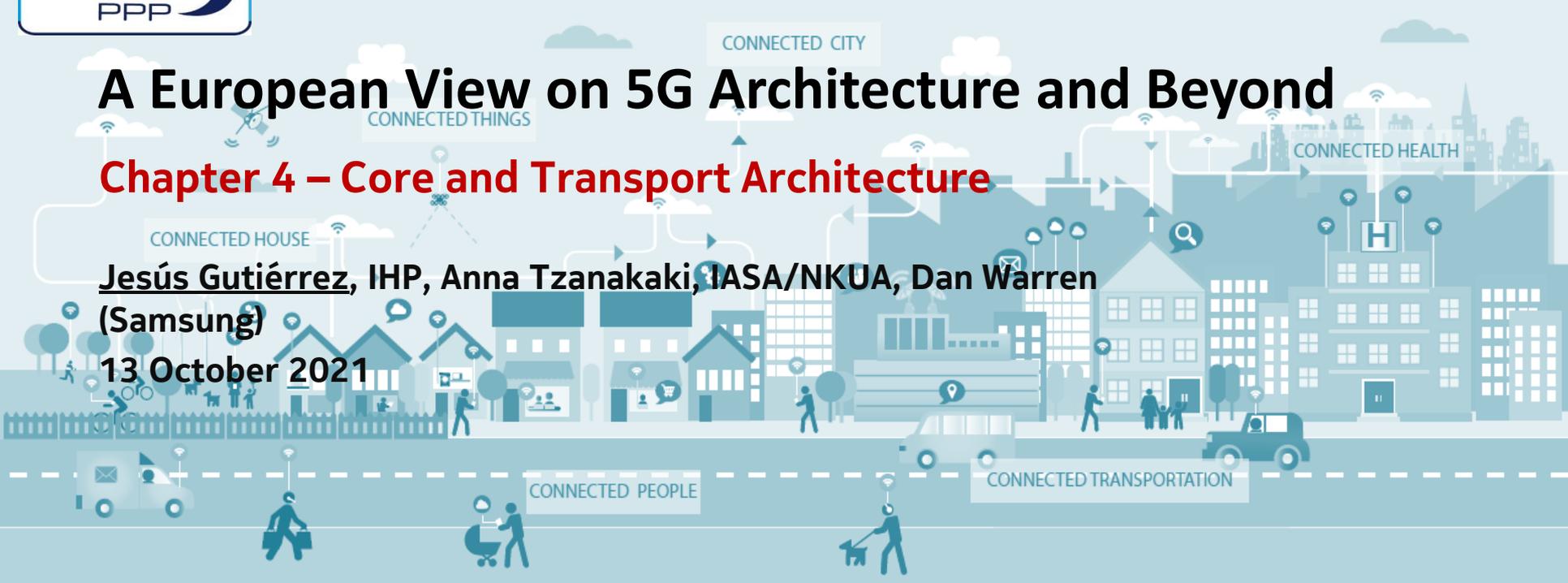


A European View on 5G Architecture and Beyond

Chapter 4 – Core and Transport Architecture

Jesús Gutiérrez, IHP, Anna Tzanakaki, IASA/NKUA, Dan Warren
(Samsung)

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Outline



- 5G System context
- 5G Core Network architecture
 - 5G Multicast
 - 5G Network data Analytics Services
- Transport Architecture
 - Transport network supporting user mobility
 - Transport network supporting user plane resilience
 - Integration of satellite backhaul in 5G
 - Integration of transport and radio management for THz fronthaul links



5G System context...

involving 5G Core and Transport Networks

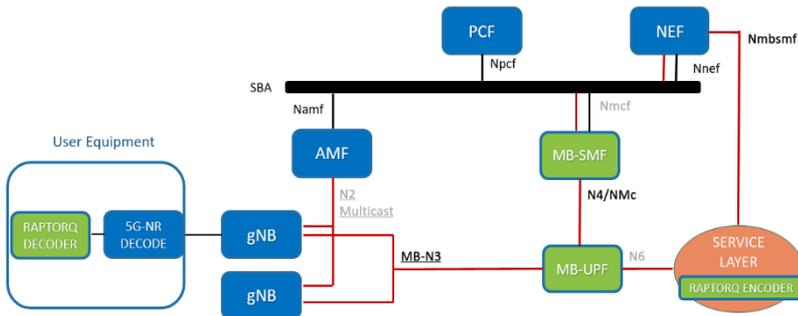
- **Service-Based Architecture (SBA)** provides a service-oriented architectural concept in mobile systems supporting more flexible designs and more flexible service instantiations
- **Cloud native** provides cost and operational efficiencies while offering the highest levels of flexibility, service velocity, scalability, programmability and automation – leverage CI, Container, Orch.
- The allocation of functions between the RU, DU and CU, i.e., the functional split, has a **major impact on the transport network** – optimal choice to relax the corresponding requirements regarding overall capacity, delay and synchronisation requirements. Handling of mobility is key!

5G Core Network

Multicast extensions

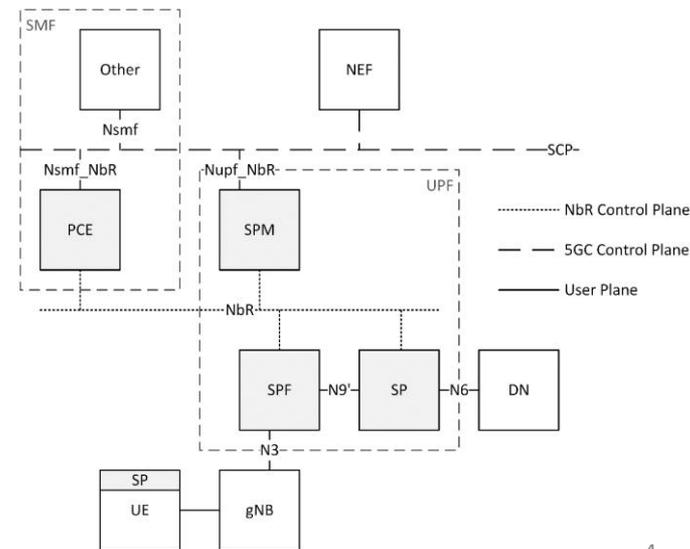
- 5G Multicast

- Use of Raptor codes for scalable and efficient data delivery



- Opportunistic Multicast

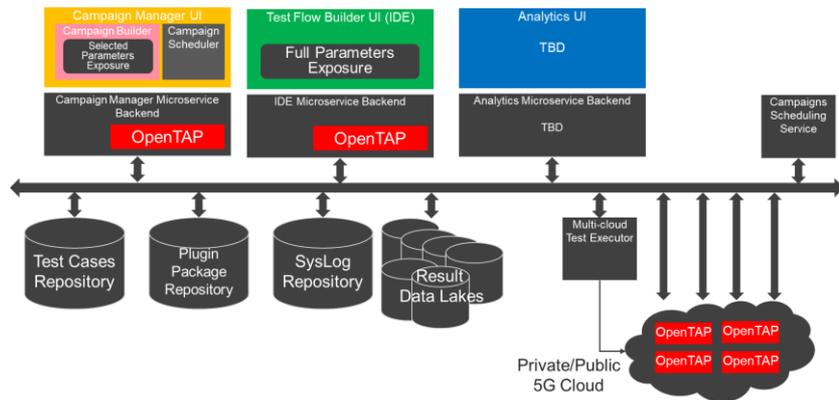
- No need of protocol changes at any IP endpoint
- Use of Name-based Routing (NbR)



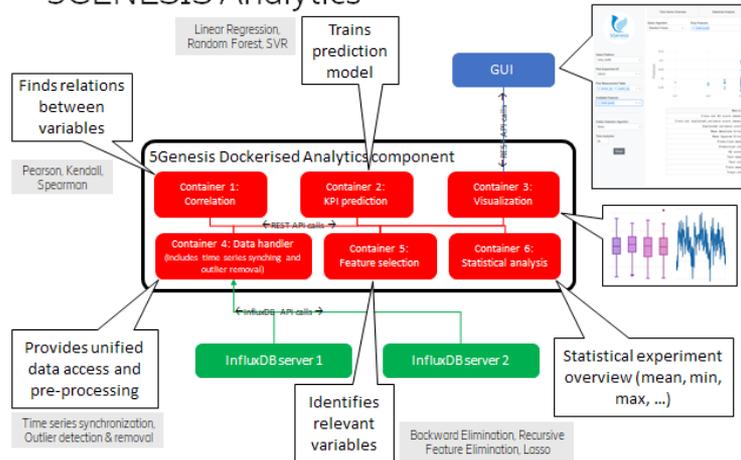
5G Core Network

5G Network data Analytics Services: Monitoring & Analytics

- M&A framework includes several Monitoring tools: Infra, performance, storage and analytics
- Fully dockerized, built around message buses
- Based on shared and independently scalable microservices
- Use of TAP/Open TAP



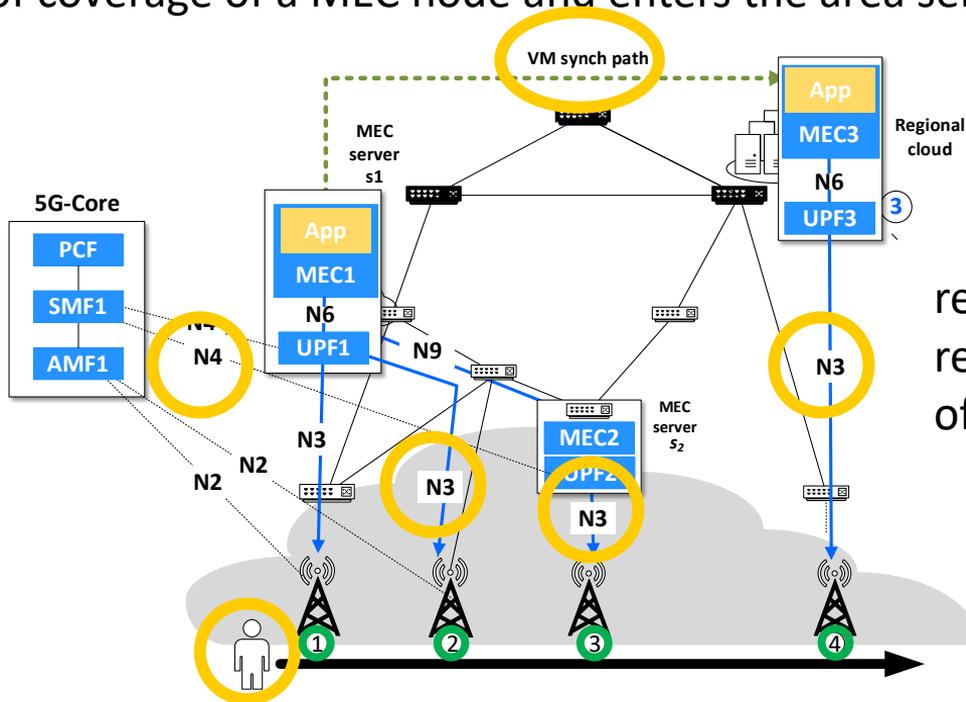
5GENESIS Analytics



Transport architecture

Support for UE mobility

How network and compute resources are allocated when a user leaves the area of coverage of a MEC node and enters the area served by another MEC node?



reservation of sufficient resources across all elements of the 5G system

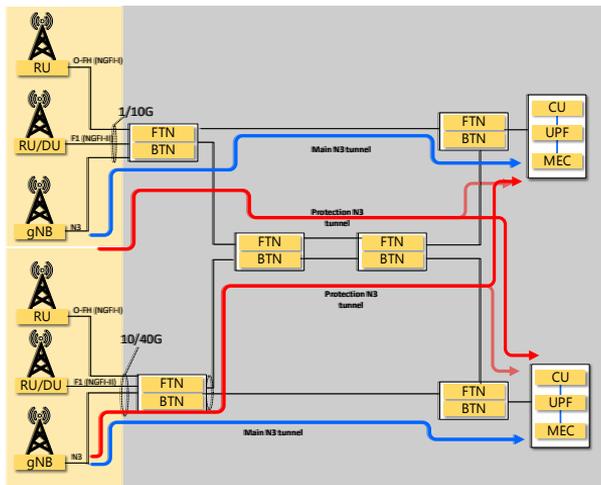
A. Tzanakaki, M. Anastasopoulos, A. Manolopoulos and D. Simeonidou, "Mobility aware Dynamic Resource management in 5G Systems and Beyond", ONDM2021, invited paper

Transport architecture

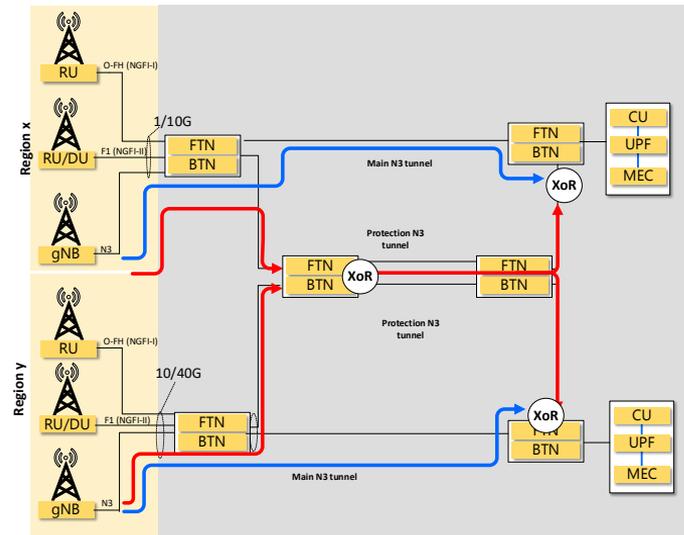
Support for user plane resilience

- Addressing of high reliability requirements of uRLLC services
- ETSI proposes that each UE configures two redundant PDU sessions
- Duplication of 5G-RAN and 5GC components → increased requirements in the transport network

- Use of **Network Coding (NC)** to offer redundancy by multiplexing flows traversing FH and BH transport nodes



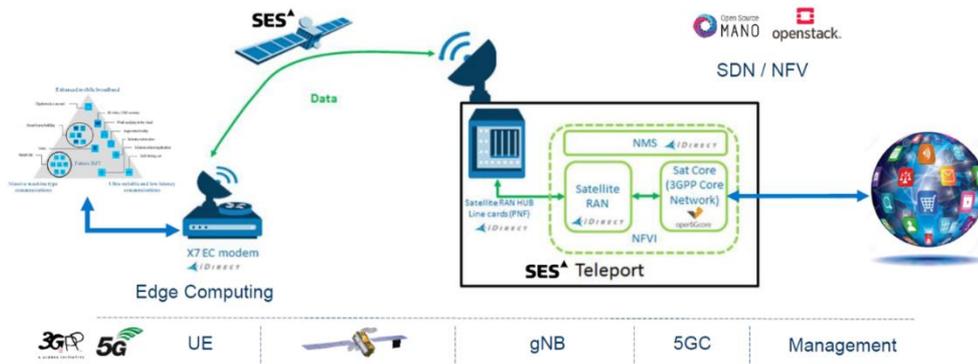
redundancy of RAN functions



Transport architecture

Integration of satellite backhaul in 5G

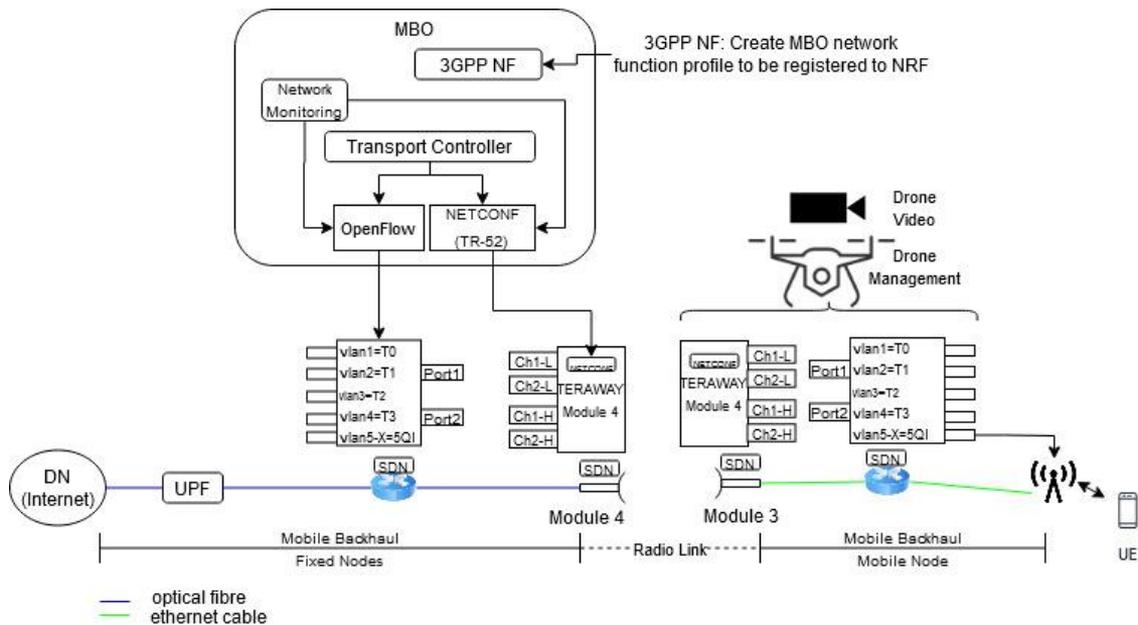
- Edge node and a central node connected using a satellite backhaul link.
- The UEs connect to the edge node which connects to the central node through a GEO/MEO backhaul link
- The backhaul is seen as a transport layer for the messages between the edge and the central node (transparent backhaul)
- Backhaul assures a guaranteed communication quality. This can be configured statically or dynamically through the specific management interfaces.



Transport architecture

Integration of transport and radio management for THz fronthaul links

- Ultra-wideband X-Haul network based on THz radio links
- Flexibility to implement distributed approaches via radio transport



Conclusion and Outlook

- Innovations in:
 - Migration to Cloud Native
 - Multicast extensions to the SBA
 - Analytics for KPI validation (@ Infra and Vertical level)
 - Migration to Non-GSO satellite systems and integration with the 5G system
 - Ensure service continuity and user plane resilience in 5G Networks accounting on user mobility
 - THz transport links to adopt common practices in M&O for resource optimization



The 5G Infrastructure Public-Private Partnership



<https://5g-ppp.eu/white-papers/>

<https://5g-ppp.eu/wp-content/uploads/2021/11/Architecture-WP-V4.0-final.pdf>