15 October, 2019

Amsterdam, The Netherlands

5G Broadband Acceleration Seminar

BASe

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Enabling Converged Connectivity by 5G

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ENABLING CONVERGED CONNECTIVITY BY 5G

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5G Broadband Acceleration Seminar (BASe) Workshop @ Broadband World Forum, 15th October 2019

LIFE IS FOR SHARING.

CONTENT

01 Key drivers

02 Long-term target picture

03 Standardization progress

04 Network transformation

05 Prototype implementations and trials

06 Success factors & challenges

ENABLING CONVERGED CONNECTIVITY BY 5G
KEY DRIVERS

Enhance customer experience

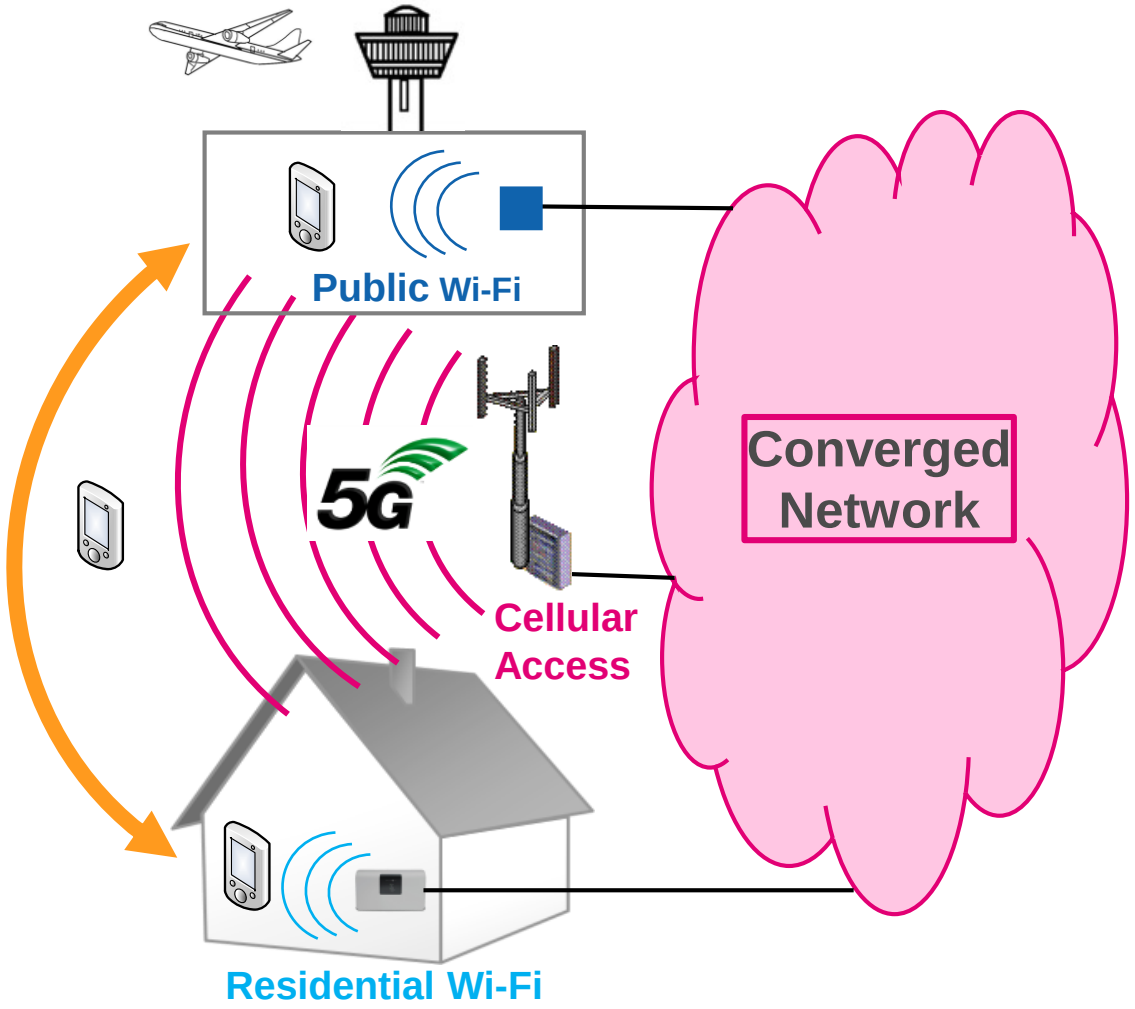
- Unified connectivity across different networks and devices – at home and on the move
- Seamless, demand- & context-driven service experience
  - Always best connected and best served
  - Sufficient network quality (speed, coverage, …)

Improve production efficiency

- Flexible combination of fixed & mobile network assets
- Leverage potentials of integrated connectivity-based offerings
- Simplification and automation of network production and operation

Converged connectivity propositions – enabled by network-based Fixed Mobile Convergence (FMC)

ENABLING CONVERGED CONNECTIVITY BY 5G
LONG-TERM TARGET PICTURE



- **Customer want to have an "always best connected" and "seamless connectivity" experience**
- **Selection of networks and steering of traffic shall be managed by the converged network**
- Basic requirements:

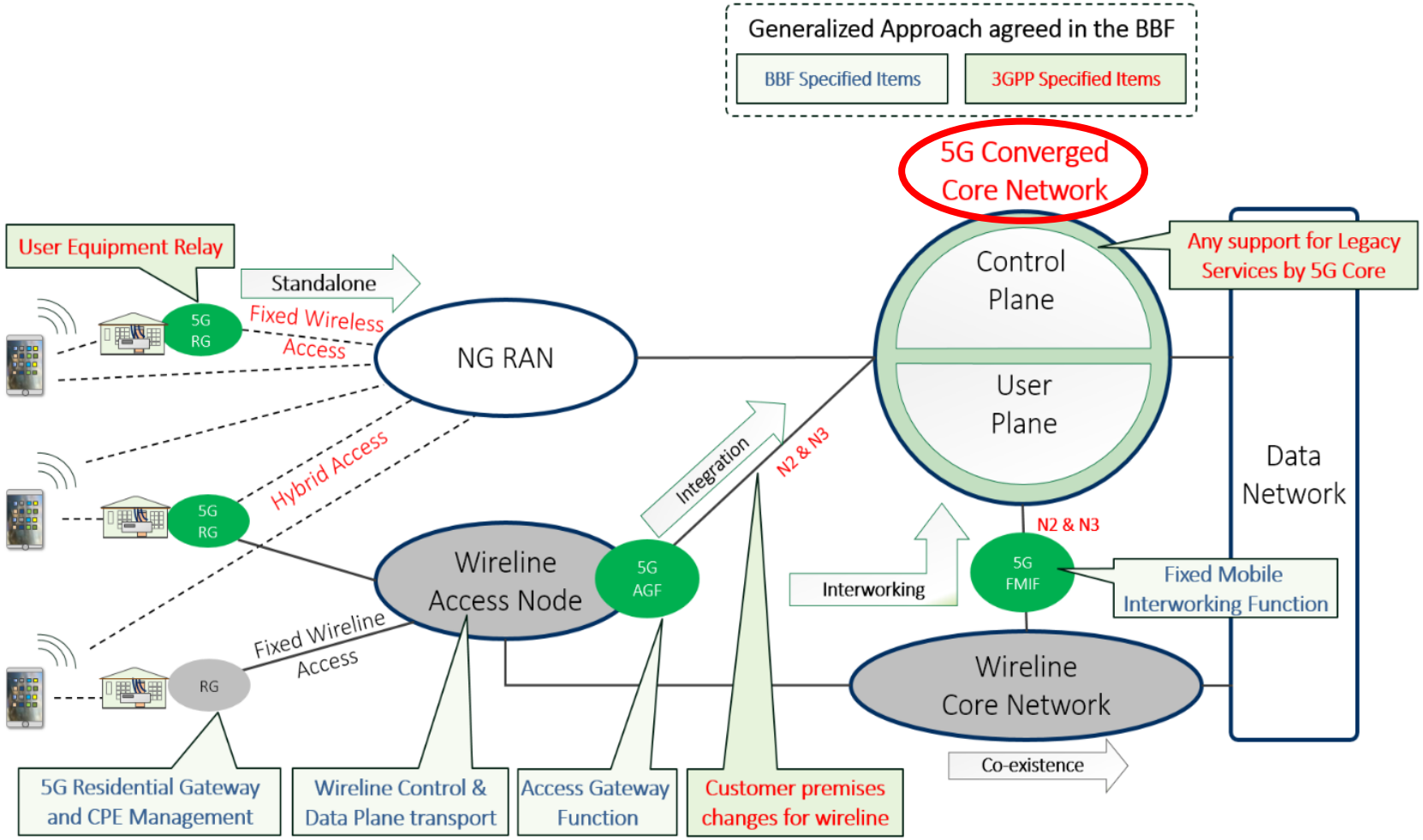
1. **Traffic Steering & Aggregation:**
   - Connection management: Intelligent selection of "best" access network(s)
   - Overarching, network-based traffic steering
   - Aggregation of multiple access links if required
2. **Converged network functions:**
   - Use as much as possible common "5G" functions, regardless of the access

ENABLING CONVERGED CONNECTIVITY BY 5G
NEW STANDARDS WILL PROVIDE FOUNDATION FOR “5G FMC”

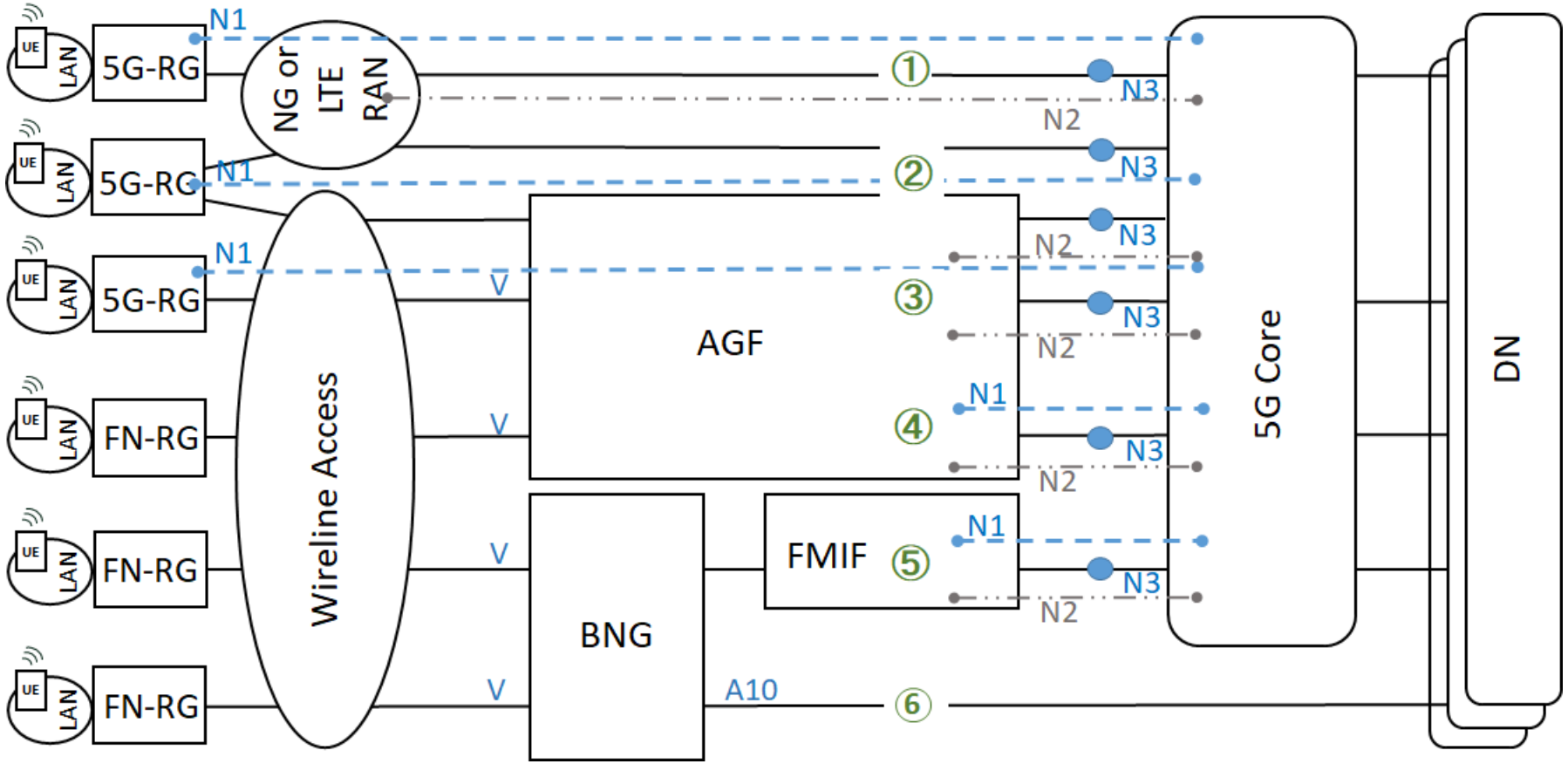
- 3GPP Rel. 16
  - **ATSSS** (Access Traffic Steering, Switching and Splitting)
    - Extend the 5G System in order to support flexible traffic management and traffic aggregation between 3GPP and non-3GPP access networks
  - **5WWC** (5G Wireless and Wireline Convergence)
    - Enhance the common 5G (Phase I) core network in order to support wireline access networks and Trusted Non-3GPP access
- Broadband Forum (BBF)
  - **Wireline Wireless Convergence**
    - Extend broadband access to support converged wireline-wireless networks that use the 5G Core, in close cooperation with 3GPP, aligned with R16 timeline
- IETF
  - Existing IETF standards selected or considered as protocols for Rel. 16
    - Example: MP-TCP selected for ATSSS
  - New standards (e.g. “MP-UDP”) can be enabler for eATSSS in Rel. 17

Will be completed in Q1/2020

ENABLING CONVERGED CONNECTIVITY BY 5G
HIGH LEVEL VIEW FOR A CONVERGED ARCHITECTURE



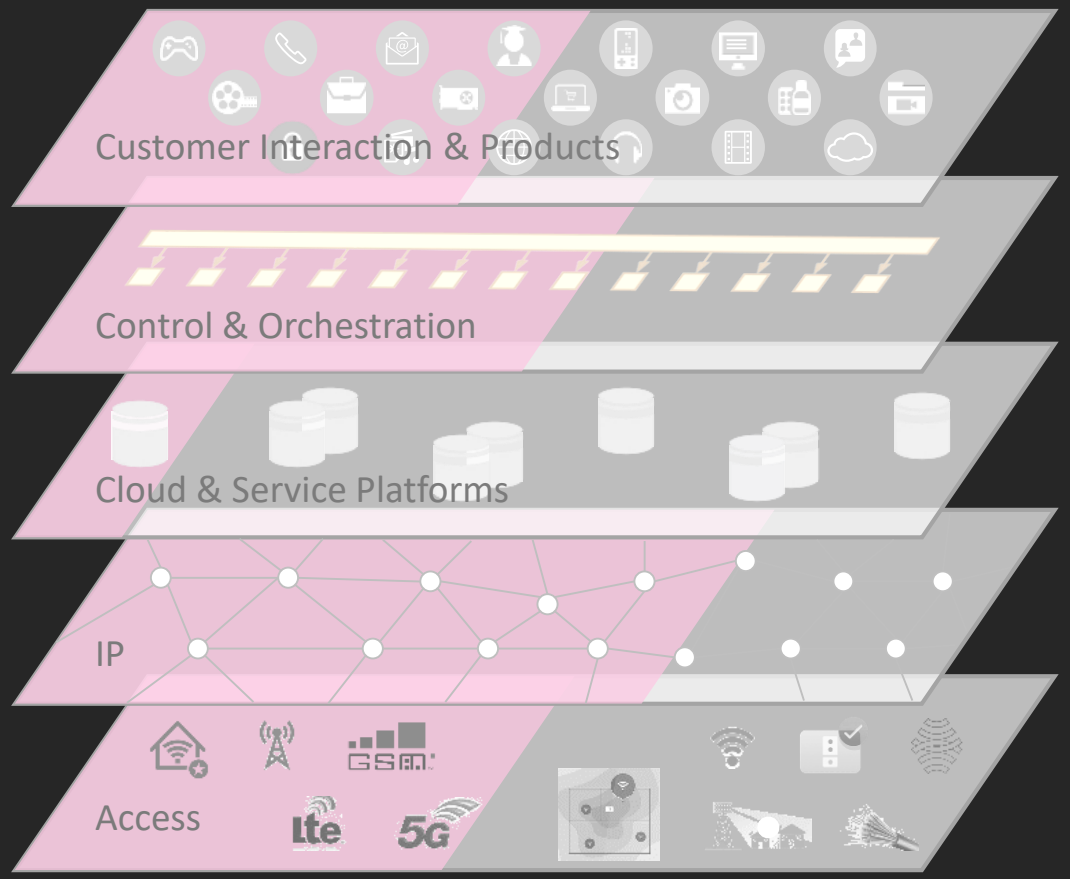
ENABLING CONVERGED CONNECTIVITY BY 5G
POTENTIAL 5G FMC DEPLOYMENT SCENARIOS



(1) Fixed Wireless Access (5G-RG)
(2) Multi-access (5G-RG)
(3) Integration in Direct Mode (5G-RG)
(4) Integration in Adaptive Mode (FN-RG)
(5) Interworking (FN-RG)
(6) Coexistence (FN-RG)

RG = Residential Gateway
BNG = Broadband Network Gateway
AGF = Access Gateway Function
FMIF = Fixed-Mobile Interworking Function

NETWORK TRANSFORMATION TOWARDS NEW PRODUCTION MODELS

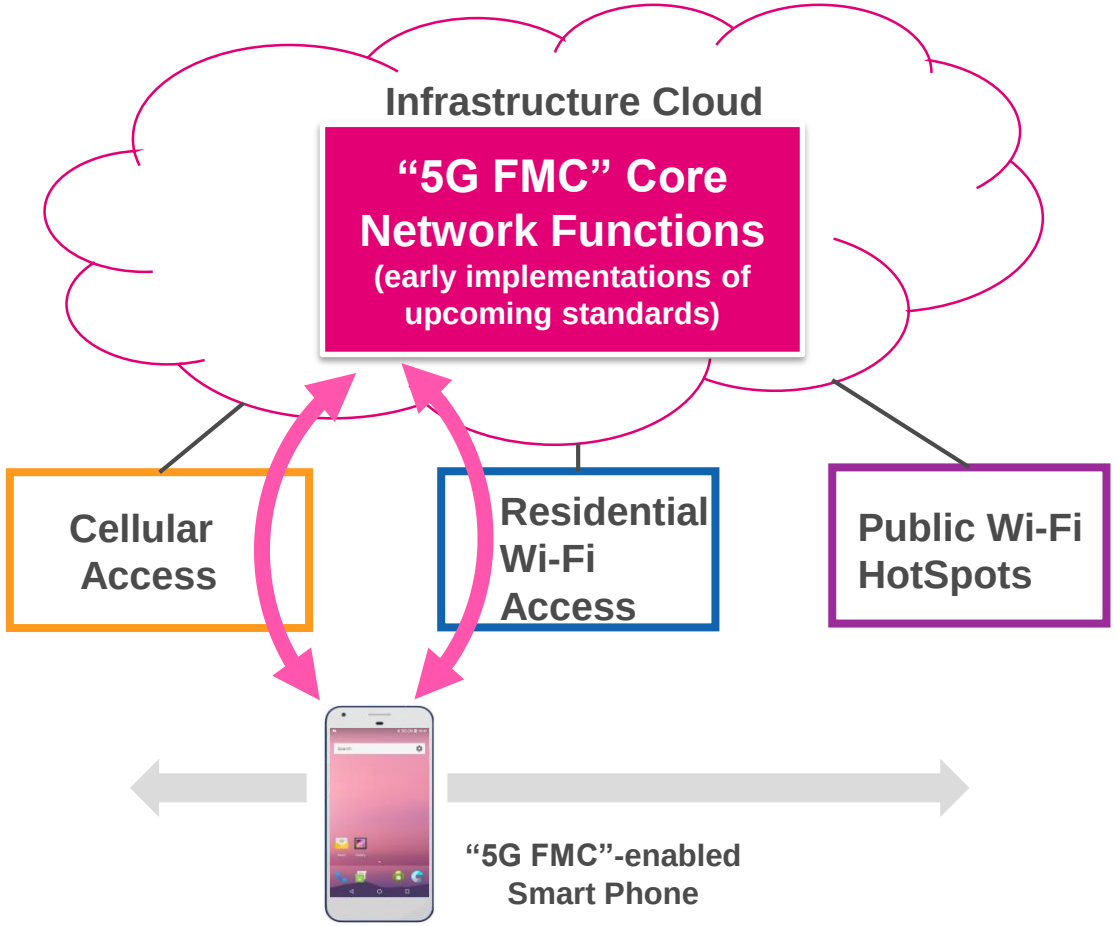


Disaggregation & Softwarization
to drive flexibility & scalability (e.g. Access 4.0, 5G Core, CUPS,..)

Orchestration
across domains and lifecycles to drive speed & quality by DevOps and cope with complexity of network

Open APIs & Ecosystem
optimize TCO, enable global reach & connectivity and network monetization (e.g. Edge Computing)

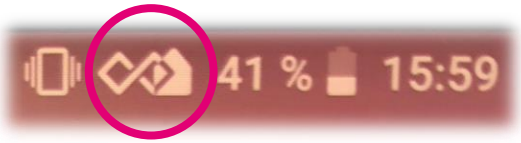
ENABLING CONVERGED CONNECTIVITY BY 5G
EARLY FIELD TRIALS HAVE PROVEN THE BENEFITS



Corner stones of "Zero Touch" field trial:

- Software-based solution for "converged connectivity" functions in the device and in the network
- Implementation of functions in device OS (Anroid kernel) – no App required
- Traffic aggregation based on MP-TCP (part of ATSSS) – "MP-UDP" implementation available as prototype

- "Auto Login" functionality for Wi-Fi networks
- "Auto Connect" feature with neutral connectivity symbol shown to the customer



→See presentation on „Zero Touch Connectivity" by Thomas Henze (DT) in Wednesday afternoon „Intelligent Network" session

DRIVING ADOPTION THROUGH OPEN SOURCE IMPLEMENTATIONS

ONF POC FOR OPTIMIZED USER-PLANE HANDLING VIA SDN & EMBEDDED VNFS

Realization of User Plane Convergence for Fixed and Mobile Network Functions

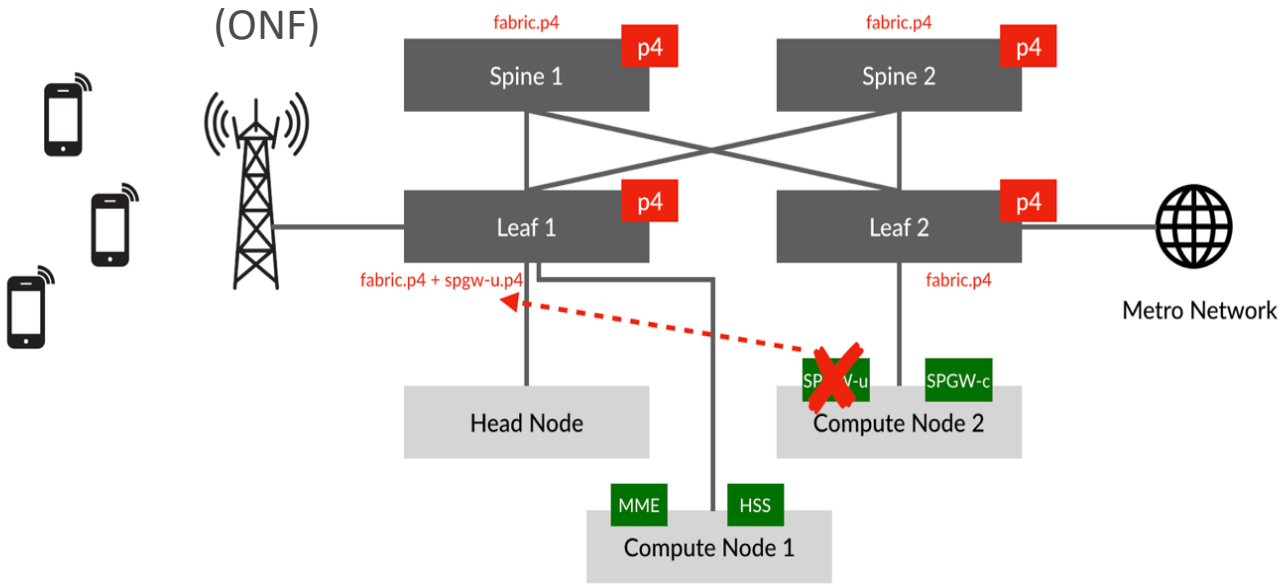
- Embedded VNFs handle the "packet pushing", i.e. Network Functions that process and forward user traffic are realized on high-performance switching hardware
- Control plane and other network functions run on compute servers
- Leveraging Control-User-Plane-Separation (CUPS)
- Support leveraging programmable switching hardware

Phases: 1) S/P-GW 2) BNG 3) S/P-GW and BNG

Addressed by and realized within ONF COMAC and SEBA Reference Designs and Open Source implementations

- Future phases to potentially include disaggregated RAN components

➢ Proof-of-Concept open source implementations for SPGW functions realized on a P4-programmable leaf-spine fabric, publicly demonstrated by Open Networking Foundation (ONF)



P4	Programming Protocol-Independent Packet Processors
SE	Service Edge (session handling function of a BNG)
S/P-GW	Service/Packet Gateway
VNF	Virtual Network Function

Source of figure: ONF/Use Case „SDN'ization and Convergence of the 3GPP and BBF User Plane with Programmable Switching Fabric"

ENABLING CONVERGED CONNECTIVITY BY 5G SUCCESS FACTORS AND CHALLENGES

- **Device support**
  - Mobile Devices & Device Operating Systems (OS) – e.g. for ATSSS
  - Home Gateways – e.g. for „5G RG“ (5G Residential Gateway)

- **Cost efficient implementation, deployments and operations**
  - „Softwarization“ - role of Open Source?
  - Universal or specialized compute hardware?
  - Centralized or decentralized deployment topologies?

- **Migration strategies**
  - Coexistence with legacy infrastructure
  - Penetration of devices with new functionality
  - Regulatory constraints

LET‘S WORK TOGETHER AND MAKE FMC HAPPEN

THANK YOU!

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June 2-4, 2020

Den Haag, The Netherlands

THE DATE HAS BEEN SET!

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Thank you

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rheier@broadband-forum.org

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