

5G-Convergence

BBF Initiative and Related Cooperation Activities
Overview and Status Update

Greg Dalle (Juniper, 5G Project Stream Co-Lead)

Manuel Paul (Deutsche Telekom, 5G Project Stream Co-Lead)

David Allan (Ericsson, BBF Wireline Wireless Convergence Work Area Director)



5G-FMC @ BBF – Intro & Overview

- 5G Industry Vision goes beyond mobile, linked to SDN/NFV software transformation
- NGMN 5G Industry Effort, BBF 5G Initiative, Workshop with 3GPP (Feb2017, Dubrovnik)
 - Service providers want network convergence - not just functions hosted on a common infrastructure
 - Common infrastructure and processes on any access
- BBF tackles opportunity for 5G Convergence in Next-Gen Fixed and Mobile Cores
 - 5G minimizes dependencies between Access Network (AN) and Core Network (CN)
 - BBF analyzes gaps to integrate wireline access to a Common Core, make recommendation to 3GPP for adaptation to 5G System Architecture procedures and reference points
 - Study now & execute on normative work in a 5G Phase 2 timeframe (3GPP Release 16)
- Further opportunities and impacts around 5G @ BBF
 - Network Slicing
 - Multi-Access Edge Computing / Edge Optimization
 - Converged infrastructure “as a platform”
 - ...others to be explored



5G-FMC: A Service Provider driven initiative

- The SP community expressing interest in this initiative is a combination of those attending BBF with the addition of some carriers attending SG13
 - all of them are also attending 3GPP
- These are:
 - AT&T, British Telecom, China Mobile, Deutsche Telekom, KT, NTT, Orange, Telecom Italia, Telefonica, Telenor, Vodafone
- As all of these are both wireless and wireline operators who are focused on “converged operator” use cases
 - Follows NMGN 5G Vision and Requirements

Service Providers' Use Cases

- RG as NG UE connects to wireline and/or cellular
 - RG with wireline access
 - RG with wireless access (eg. 5G FWA)
 - RG with Hybrid Access
- NG UE connects to independent WLAN and/or cellular radio access network
 - Smartphone Wifi offload (UE connects to either WLAN or cellular radio)
 - Smartphone Dual homed to WLAN and cellular radio simultaneously
 - In both cases, when trusted, the RG acts as Wifi AN for the smartphone
- NG UE connects to WLAN and/or cellular radio access network that uses wireline access network as backhaul
 - NG UE connects to WLAN or cellular radio access that uses the wireline access network as backhaul

Service Providers' Aspirations

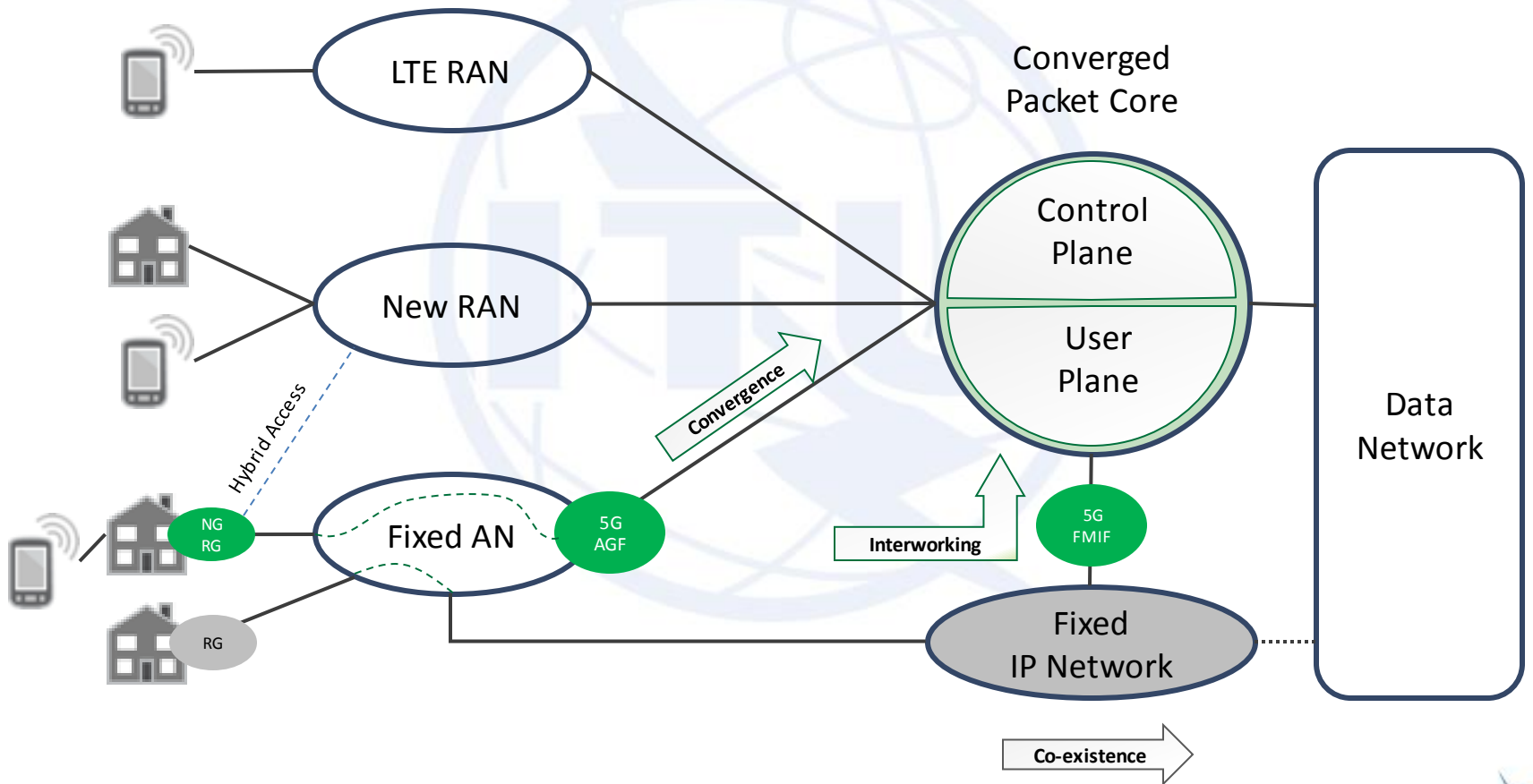
- Network functions convergence - not only about hosting them on a same infrastructure
 - Common credentials
 - Common user data management
 - Common policy
- Native interface between common core network and wireline AN, rather than interworking functions
 - Fixed Access Network would support interfaces toward Core Network Control Plane (N2) and User Plane (N3)
 - A UE (intended 5G RG) would support N1 (interface with AMF/ Core Network Control Plane) – could be limited/customized for wireline.
- Joint work on Convergence: study work in 3GPP Rel. 15, normative work in 3GPP Rel. 16.
Aligned timeframe in the BBF.

5G-Convergence: Where we are going?

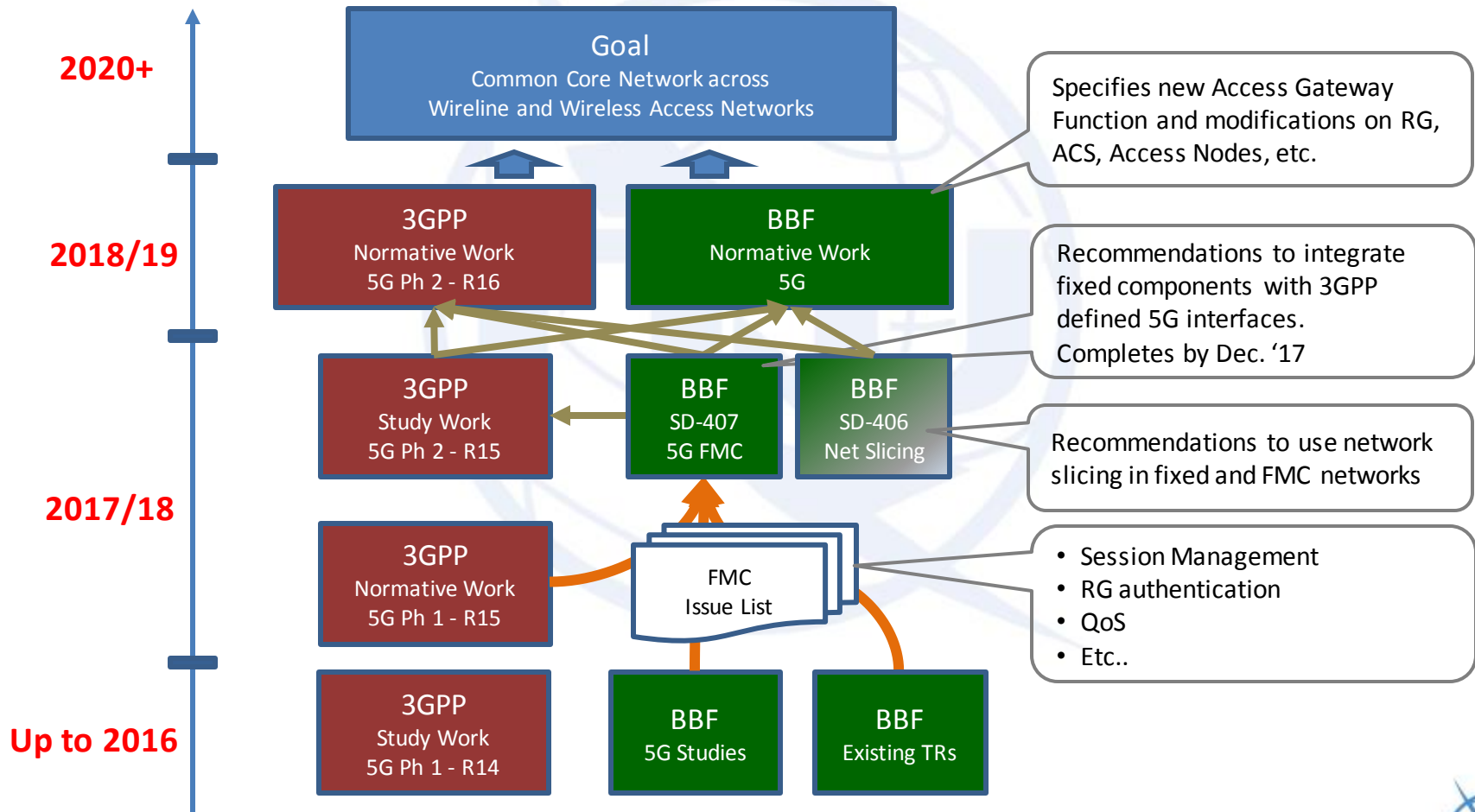
- The BBF strategy focuses on a migration path toward Convergence
- Three distinct aspects
 - Convergence
 - Co-Existence
 - Interworking
- The combination of the three permits a clean Future Mode of Operation to be deployed and operated side by side with Present Mode of Operation with substantially less CAPEX
 - We take forward “that which cannot be left behind”
- The BBF strategy brings the full Broadband home toolkit to the table
 - Many services currently supported or where support is under development are more unique to the fixed access environment, and not of interest to 3GPP



5G-FMC: BBF High Level Architecture

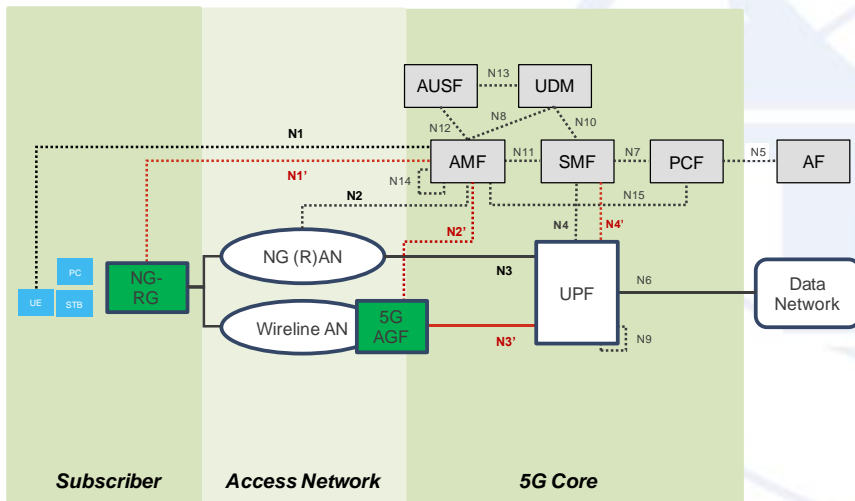


5G-FMC Standardization Timetable

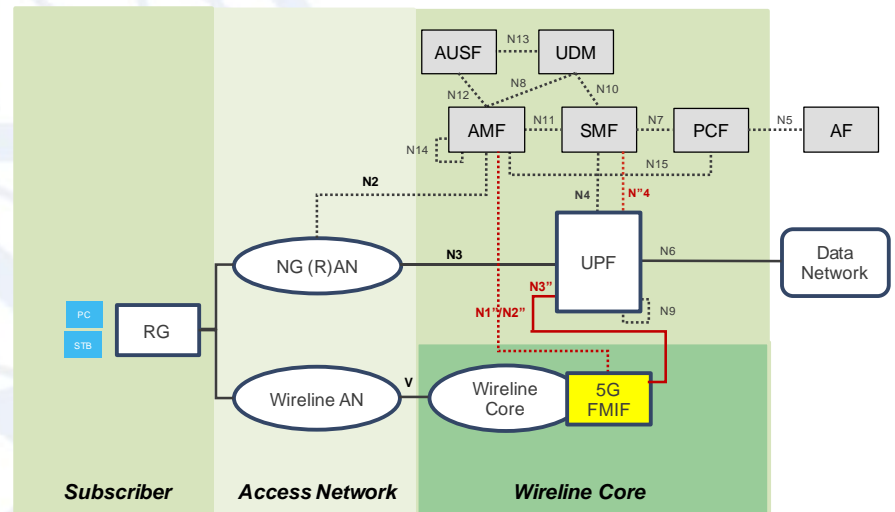


Key Models currently agreed into SD-407

- Convergence



- Interworking



- Incl. “Co-existence” path for Wireline Broadband: whether there is extra work needed in the study is tbd.

* SD-407 is BBF work currently in progress. N1', N2', N3': indicates N1, N2, N3 interface support being under study, naming is subject to change, accordingly.
 ** Note: The figures represent only the non-roaming scenario and the reference point representation of 5G Core Network.



5G-Convergence: What the BBF sees coming

- Seamless service experience to the customer, including as much as possible consistent features across multi-access networks, is a key requirement
- Multiple layers of convergence → service, platform, infrastructure
- Integration of fixed access into the network slicing ecosystem
- Flexibility through software-driven, virtualized function deployments
 - Machine Type Communication and IoT use cases drive “Fixed Friendly” changes to mobility management
 - Deployment of functionality closer to the User Equipment
 - Access agnostic
 - Extreme reliability → multi-attachment, multi-homing

Distinctions between fixed and mobile rendered irrelevant



5G Transport

David Sinicrope

BBF Routing & Transport Area Director

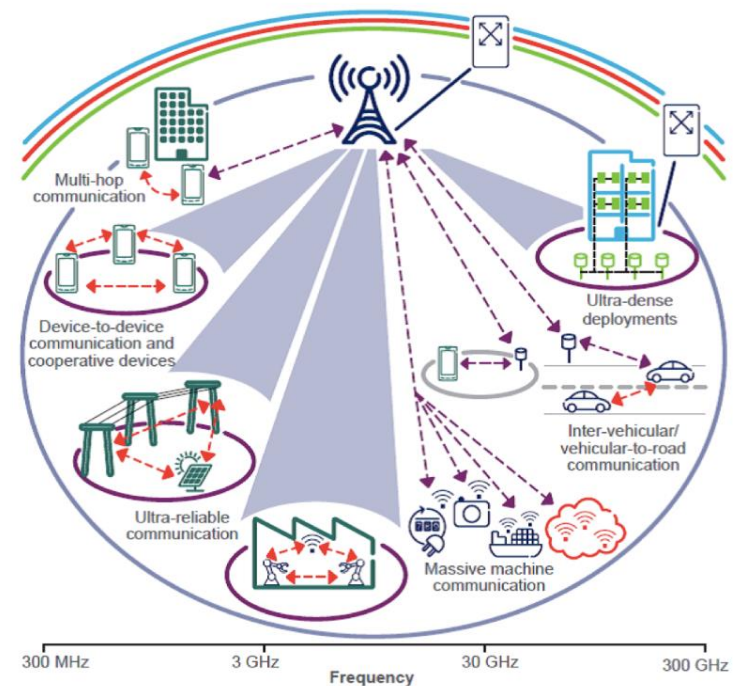
Yuanlong Jiang

BBF Mobile Transport and Routing Project Lead



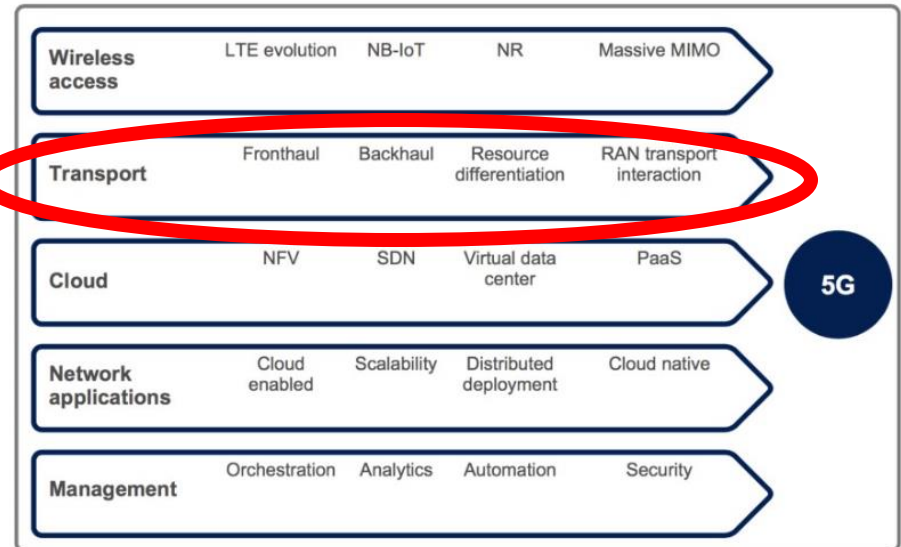
Routing & Transport for 5G

- Provides a huge number of wireless connectivity for new applications
 - wearables, smart homes, traffic safety/control, critical infrastructure, industry processes and very-high-speed media delivery
- Capabilities of 5G extend far beyond previous generations
 - very high data rates, very low latency, ultra-high reliability, energy efficiency and extreme device densities
- Network architecture is different from previous generations, more dynamic, more scalable
- The transport network must support various deployment scenarios and characteristics
- Network slicing - services isolated into different “slices” of the network
 - Slicing for services may map onto different slice schemes at the transport level.



Routing & Transport for 5G

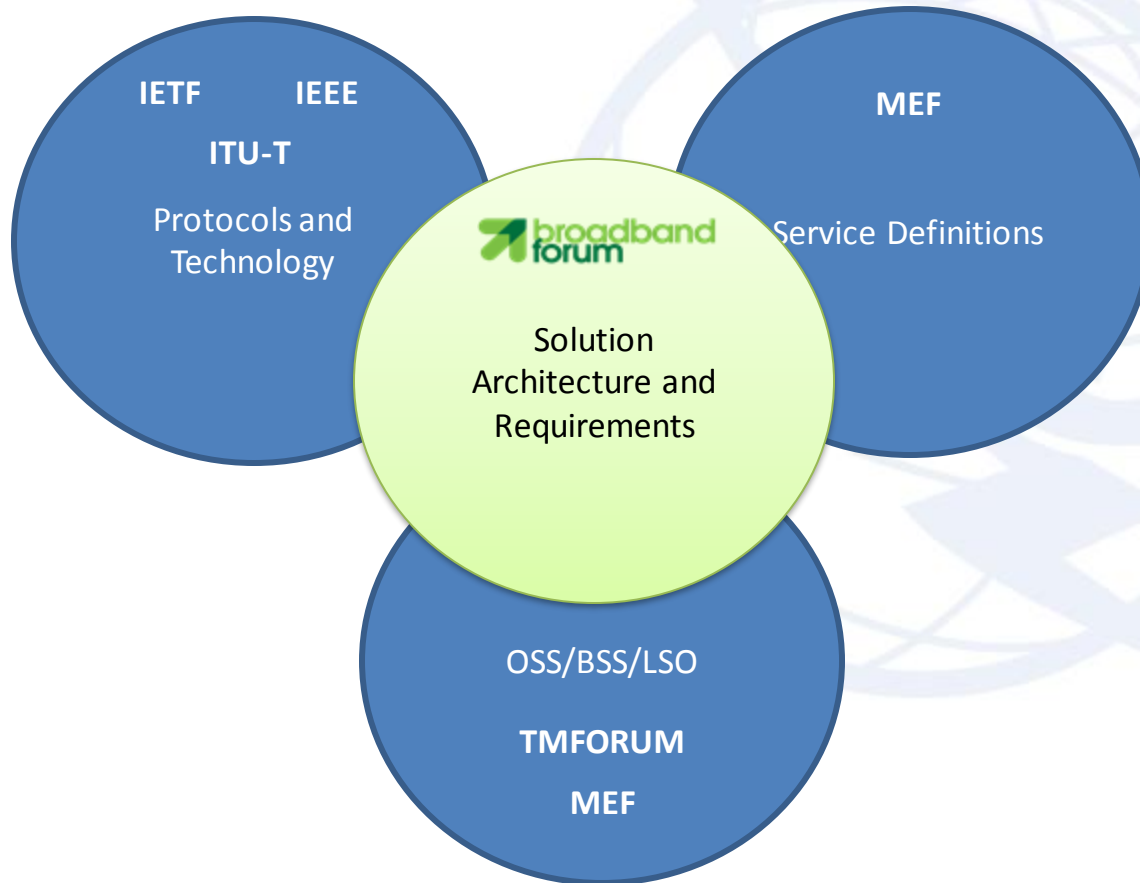
- Backhaul
- What is needed?
 - Diverse services: Higher speeds, Lower latency etc
 - High scalability, more convergence and aggregation
 - Fewer layers, support slicing in node level and network wide
 - More dynamic and automated
 - More secure
- Fronthaul
- Between the antenna and baseband units
- What is needed?
 - Media - New media and transmission layers
 - Speed - New and higher speeds
 - Jitter – more sensitive timing
 - Latency - New classes for tighter latency requirements
 - Synchronization - more accurate synchronization options
 - Performance Monitoring – KPI, proactive feedback to network control
 - Security - security framework and characteristic description



Evolution to Transport for 5G Mobile Networks

- Project started 2016
- [Video](#) summary

Routing & Transport for 5G – Why BBF and the fixed community?



- Expertise with technologies involved both legacy and emerging
- Expertise with architecting end to end solutions
- Expertise with specifying requirements
- Cooperative Relationships with relevant partners (fixed and wireless, SDO and open source)
- Critical mass of key stakeholders (operators, vendors, component)
- Agile processes and tools
- Relationships to provide guidance and education
- Broadband is at the heart of the Converged network



Fiber Access Networks Work Area

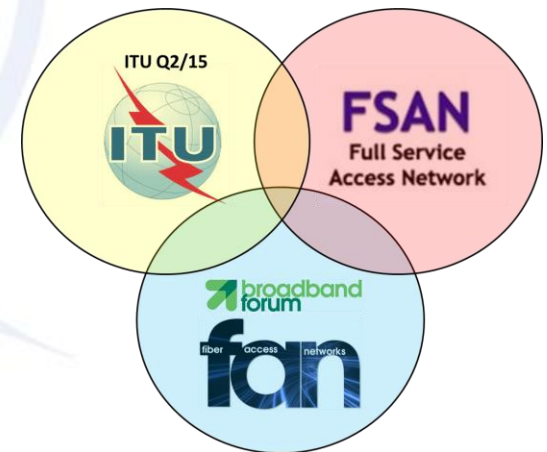


Greg Bathrick and Lin Wei
Director of Fiber Access Networks Work Area



BBF Fiber Access Networks Work Area - Overview

- Mission
 - To define the requirements for deploying Broadband Forum network architectures in fiber access technologies so as to accelerate deployments and ensure interoperability.
- Primary Work Areas
 - PON Interop and Certification (BBF.247)
 - PON Management (WT-385)
 - PON Applications
 - Wavelength Management (TR-352)
 - Mobile Backhaul (WT-331)
- 10 years collaboration with ITU-T/FSAN



PON-based Mobile Backhaul

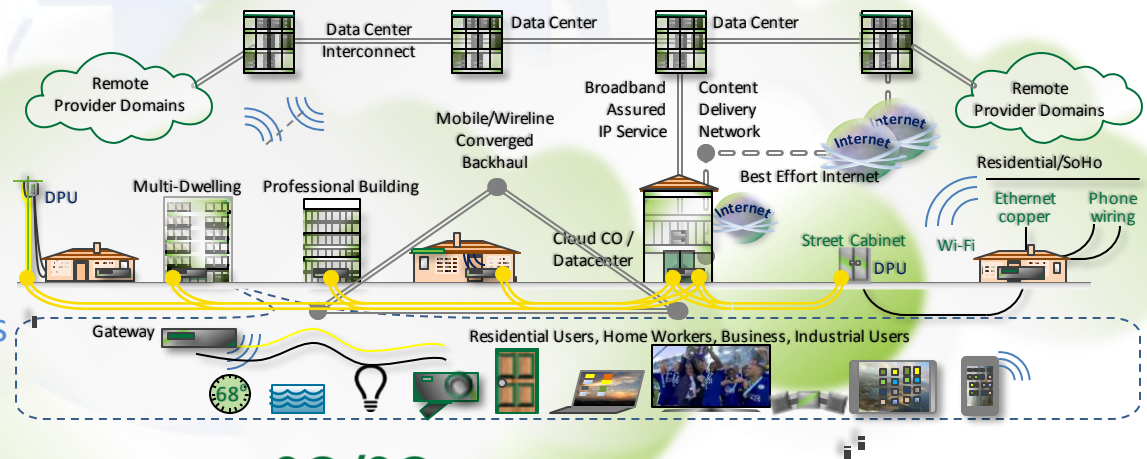
- WT-331 “Architecture & Technical Requirements for PON-based Mobile Backhaul Networks” extends the architecture and technical requirements to providing enhanced mobile backhaul functionality.
- These requirements cover system architecture, use cases, technical requirements as well as some implementation guideline, so as to foster multi-vendor interoperability.
- The specifications in this document apply to both ITU-T and IEEE PON systems and focus on LTE and LTE advanced.

Broadband Forum in 2017

- Industry's defining body for LAN/WAN implementation, management and architecture
- Strong membership > 25 years | Global | 150+ providers, equipment and component vendors | 200+ standards adopted globally | over 1200 tech contributions last year | 400 million TR-069 installations | successfully combining agile software delivery and traditional specifications |

BBF Projects

- New Services
- Driving the Generic Platform
- Migration Strategies
- On-boarding and Enabling Innovators
- Enabling Operator Cooperation and the new market



20/20
broadband
Hyper-Connected • Agile • Valuable



A large, light blue watermark of the ITU logo is centered on the page. It features a globe with a lightning bolt and the letters 'ITU' overlaid.

Thank you

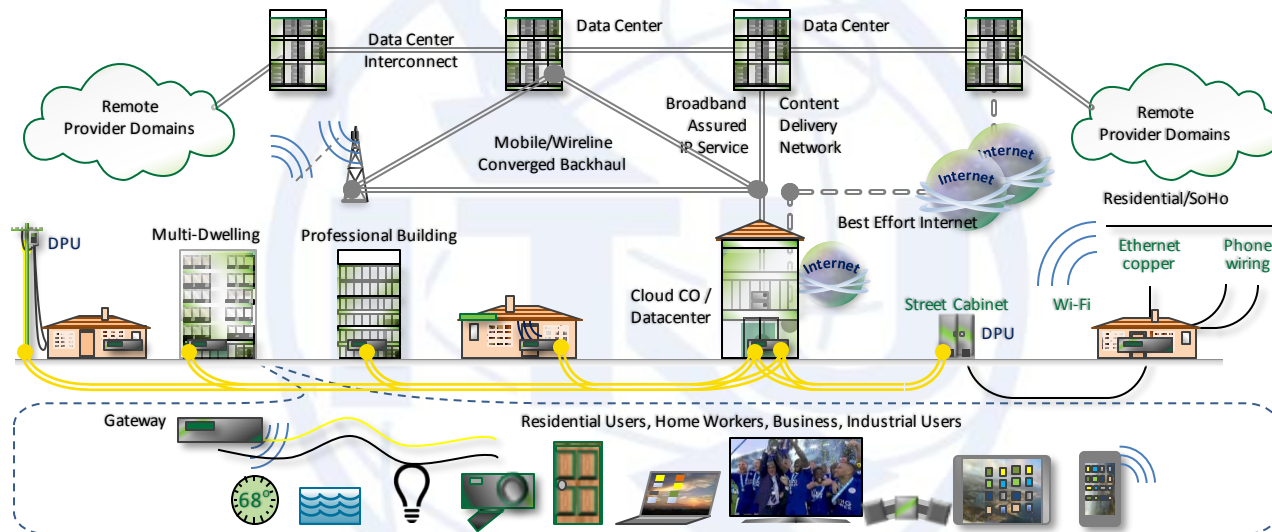


BACKUP / Supporting Material



BBF Projects in 2017

Broadband - the big picture



Broadband - the big projects

TR-069, Broadband User Services

Broadband 20/20

Ultra-fast, FTTP, NGPON2, GPON

Distributed Compute/ Cloud CO

User Services Platform

Wireless-Wireline Convergence

Network Programming /SDN

Interop Testing & Certification

Fiber Access Networks

4G/5G Hybrid Networking

Network Virtualization/NFV

Open Broadband

Physical Layer Transmission

Architecture & Migration

DevOps for Virtualized Networks

Broadband Innovation

Software, Data Models, APIs

Internet of Things

Performance Aware Services

Wi-Fi Performance and Fault Isolation

5G-Convergence: References and further BBF resources

- Wiki (need BBF wiki login)
 - [Wireless-Wireline Convergence](#)
 - [5G Project Stream](#)
 - [5G Study Areas Workspace](#)
 - [SD-406 End-to-End Network Slicing](#)
 - [SD-407 5G Fixed Mobile Convergence Study](#)
- Mailing List (subscribe on BBF ARO)
 - wwc-5g
- Conference calls
 - Biweekly, Thursdays from 10am to 11:30am EST

