broadband forum

Shaping the Future of Broadband

WELCOME TO THE **BROADBAND FORUM**
QUARTERLY NEWSLETTER

Your quarterly resource for updates on recent activities and our most critical work and focus areas.

A welcome from our leadership

The sunny climate and steeped history of Porto was a fantastic location to successfully host our Q2 Meeting, pulling together the leading lights from across the broadband ecosystem.

We'd like to welcome and recognize our newly elected board members: John Blackford (CommScope), Francisco A. de Carvalho (Radisys), David Cluytens (Orange), Manuel Paul (Deutsche Telecom), and Mike Talbert (WNC).

Ken Ko, Managing Director

Craig Thomas, VP Strategic Marketing and Business Development

This week, our Broadband Forum members gathered both virtually and face-to-face, and were treated to five stellar Town Hall Innovation Sessions (THIS) presentations on the topical issues of broadband sustainability and energy efficiency. The growing momentum of the sessions was palpable, as a packed room and remote attendees tuned in to hear from an engaging line-up of speakers.

We were treated to presentations extolling the virtues of standards for remote energy fingerprinting, greater energy consumption of DBNGs, and how they can improve energy usage in the home network. The European Commission participated in the talks, calling for more involvement from Broadband Forum members on these topics, which will stimulate discussions in future projects. Stay tuned for the upcoming announcement of the focus of our Q4 sessions.

The Q2 Meeting also coincides with our annual meeting and report, which outlined the healthy position of the Forum which has experienced increased membership, solid financials, as well as a significant number of published Technical Reports, Marketing Reports, Test Plans, and Open Broadband projects.

Amongst a very busy agenda in Porto, our members struck the right balance of continuing significant progress for our existing projects with the introduction of several new NPIFs, and also dedicated time and effort to developing new strategies and focus areas. These more strategic forward-looking discussions will become a continued focus of future meetings and within work area sessions.Q3 will be a virtual meeting and we look forward to meeting face-to-face again in December in Bangkok, Thailand. Obrigado to all who participated and made Porto 2023 a productive, collaborative, and memorable event!

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Thank you to our meeting sponsors, Altice Labs and PICadvanced!

Altice Labs has been operating in offices, homes, industries, hotels, and stadiums for 73 years, the company's General Manager, Alcino Lavrador, told the meeting.

Over the last seven years, the company has evolved its technology portfolio. Its innovation ecosystem has seen Altice Labs continuously engage in collaborate research and development, and innovation projects with universities across Portugal.

Its Broadband E2E solution covers CPE, Central Office, Device management, and operational support systems aiming to unearth new opportunities, and improve the user experience. Mr Lavrador pointed out that Altice Labs was among the first vendors to achieve BBF.247 Certification for its GPON equipment and participated in the first joint CloudCO demonstration at Broadband World Forum in 2019.

Antonio Teixeira, CSTO and co-founder at PICadvanced said that the company was founded in 2014 and has expertise in access networks, photonics, and data centers. Its flagship product is the NG-PON2 ONU. With its technology mainly deployed in the United States, its legacy and disruptive technologies help connect the world.

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BASe hits five-year anniversary and continues to bring together broadband thought leaders

Bernd Hesse, BASe Chair and CMO to the Board of Directors

We have just reached our five-year anniversary of our Broadband Acceleration Seminar (BASe) series, with our industry education events providing the opportunity to learn valuable insights from across the broadband ecosystem. BASe is established and recognized by service providers, analysts, and vendors as the leading industry education series globally.

I remember our first BASe event back in Athens in 2018, which proved very successful with 300 plus attendees and highlighted the appetite for an industry education series. We have continued to move from strength and strength, and last year, we had 145 speakers across 11 BASe face-to-face workshops and 16 vBASe (virtual events and webinars). This drew on average 170 system vendors, operators, and analysts out of more than 50 countries per event.

Our series brings together a technical decision-making audience of service providers, thought leaders, and a very varied vendor representation from across the globe. BASe provides more technical discussion, testing and strategic technical planning, and valuable peer-to-peer networking.

In the last quarter, our BASe series has continued to gain momentum with four face-to-face events at OFC, Connected America, FTTH Council Europe Conference, and ANGA COM, as well as four virtual webinars. We also have a busy BASe calendar on the horizon with two vBASe webinars in June focused on metro edge computing and delivering a service provide app store, and four BASe workshops at FBA Fiber Connect in August, and the BASe Technical Summit (formerly UFBB) in September.

Interested in presenting a paper at the BASe Technical Summit? We are now receiving submissions for speakers, please reach out to us at **basechair@broadband-forum.org**

We would like to thank our speakers, attendees, and sponsors for all of your support in making the BASe series a great success. We look forward to the next five years.

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Our Q2 Town Hall Innovation Series (THIS) sessions

Sustainability and Energy Efficiency was the name of the game at the Q2 Town Hall Innovation Series!

Building on the first inaugural Town Hall Innovation Series (THIS) sessions at the Q1 Broadband Forum meeting in Dallas, sustainability and energy efficiency was the subject matter focus of this meeting's session.

Thank you to all of our speakers!

The THIS sessions take place at our face-to-face meetings, and we are inviting speakers. The strategic theme for the upcoming Q4 meeting will be announced this Summer.

The topics presented at the THIS sessions align with BBF's strategic vision and industry trends. These topics are expected to stimulate future work for the Forum and act as a catalyst for new projects.

Please contact THIS@broadband-forum.org if you would like to present on a subject matter or suggest a new topic for discussion.

Broadband energy consumption, how big it is and how to reduce it

The importance of broadband equipment complying with the EU Code of Conduct for Broadband Communication Equipment was outlined during an insightful presentation from **Paolo Bertoldi, Senior Expert at European Commission.**

Led by the European Commission Joint Research Centre, the European Union Broadband Code of Conduct is "a flexible mechanism to fill the policy vacuum till today." It creates an open and continuous dialogue on markets, technologies, efficiencies, and performance, so key issues and solutions to them can be identified. The ultimate goal is to raise awareness with decision makers and investors, develop a set of easy-to-understand set of metrics, and produce a common set of principles aligned with other international initiatives.

While it does not include STBs, TVs and computers, the Code of Conduct provides operators with power consumption information of their network equipment and end-users with broadband equipment that is energy efficient.

It is just one small aspect of Europe's sustainability efforts, which also include the EU Green Deal and the target to be climate neutral by 2050.

During his presentation, Bertoldi recognized the positive role that ICT and communication networks can play in reducing the environmental impact in other sectors, such as transport, and buildings. But, he said, more data is needed in the European Commission's studies to assess the energy consumption of broadband transmission networks and monitor network energy usage. So far, there is only some data readily available from studies in France, Belgium, and Finland.

Bertoldi asked Broadband Forum members to share any company studies or reports confidentiality to help the European Commission Joint Research Centre track and monitor the overall energy consumption as a limited number of studies currently provide estimates of consumption.

Bertoldi indicated that more telecommunications companies need to get involved and play their parts in achieving greater sustainability by committing to the Code of Conduct principles. To get involved, please reach out to paolo.bertoldi@ec.europa.eu.

Energy Fingerprinting through standards can deliver energy cost savings

Collecting energy consumption information at the same time as identifying devices in a home network could deliver significant environmental benefits for the planet, cost savings for homeowners, and new revenue opportunities for broadband operators, according to **Gavin Young, Vodafone Head of Fixed Access Center of Excellence.**

Currently, connected devices in the home can be identified in real-time using network data. This is known as 'device fingerprinting'. By extending simple data models in device identification to include energy consumption characteristics, energy consumption of connected devices can be measured, and we can build on the progress of device fingerprinting to capture an energy fingerprint.

By building on the concept of digital twins, telemetry can be leveraged to create an 'energy digital shadow' in the cloud of a customer's home. The likes of machine learning, analytics, and closed loop automation can help learn device usage patterns, which devices consume the most energy and propose energy reduction approaches without impacting the customer's normal activities.

Devices can be identified and modelled against set parameters, or measurements taken from a "virtual meter" from the Residential Gateway to the cloud. A dashboard can be constructed and provide information to customers, place devices in sleep mode, and advise what to turn off and when. The app can rank devices according to consumption, have a clear gauge of consumption readings (red, amber, green), and information on what time of day they are used, leading to dramatic cost savings.

Young was quick to point out that turning off devices or putting them in sleep mode would achieve savings that are a small percentage of the overall household energy bill (compared to heating, cooking etc.). However, if this approach is adopted by a million customers or more then the planet will benefit immensely.

Once the digital shadow of a household has been developed and stored in the cloud, its data could be offered to third parties (only with prior user consent). This could be a newfound revenue opportunity as energy companies could pay operators for such granular data insights and offer more customized tariffs (potentially helping them better load balance the electricity grid too).

Young recognized that standardization was essential to make the concept of energy fingerprinting a reality. There is an opportunity for broadband operators, namely through leveraging TR-369/USP plus associated TR-181 data models, to have an accurate and granular insight of the home as the number of devices grows. By forging strong liaisons with other SDOs, such as Matter, a unified vision of energy fingerprinting can bring innumerable benefits in the years ahead.

"The best network is the sustainable network"

Rita Tasnadi, Vice President Telco Energy Efficiency and Sustainability at Deutsche Telekom (DT) called for telcos to work with standards development organizations to deliver more sustainable networks.

During the session, Tasnadi identified the challenges the industry currently faces, such as limited renewable energy availability with companies all going green at the same time, price volatility, fluctuation of supply and demand, and rising data volumes. This is why DT, like all other companies and industries, has had to rethink its way of operation.

At its most recent Capital Market Day, DT advised that it was aiming to double its energy efficiency by 2024 and is committing to further retiring legacy equipment. With energy at the top of most companies' agendas, innovation is key, Tasnadi advised.

By creating a unified vision of future applied technology, the ecosystem would be well placed to adopt new energy efficient solutions to optimize mobile and fixed consumption and produce renewable energy for mobile sites. Using AI-based energy saving solutions, energy production and intelligent management is key for future energy markets and ICT measurement of fixed access.

"The best network must be a sustainable network. As an industry, we must act responsibility and create energy efficient networks operation, and a lot of measures are needed as we need to continuously work to develop new innovations and cooperate with SDOs to tackle this challenge," Tasnadi stated. "We are all trialling this out, but no one has a best practice yet so undertaking this journey together is the way forward."

Harnessing standards to improve the energy consumption of BNGs

Broadband Forum's work on disaggregation and Subscriber Session Steering can help enable a more energy efficient deployment for the BNG. This was the message delivered by **Jonathan Newton, Distinguished Technical Expert at Vodafone.**

Through BNG disaggregation, over-deployment will be avoided by simplifying the scaling of the system, greater resilience will be delivered, and different User Plane types can match the performance and efficiency requirements of certain services. Meanwhile, Subscriber Session Steering can enable a per subscriber choice of the User Plane, eliminate any 'on-path' resources constraints, and unlock on-demand scaling.

However, challenges for achieving greater energy efficiency in BNG deployments remain. These include the lack of value of headline power consumption, right-sizing deployments (as throughput, load, and subscribers continually change), the significant difference between average and peak loads, and quantifying the real benefit of new power saving techniques.

One approach to overcoming the challenges is to analyse and compare the performance of BNGs in a lab environment to validate peak performance and load. In the past, tests have highlighted how a BNG performs when maxed out, but that does not paint the full picture. Newton advised that it is more important to test how it operates over a full range across variation subscriber load, expected throughput, and latency. Limits can be applied such as maximum throughput, watts per subscriber, and latency and loss, allowing the efficient range of operation to be determined. These limits may vary by application such as added-value services, gaming, and enterprise services.
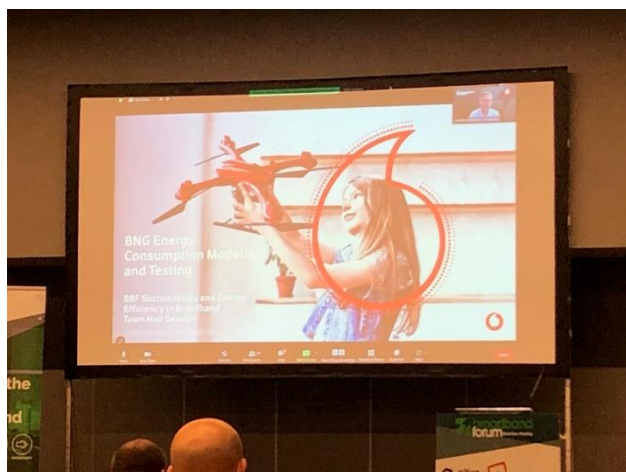
By characterizing and visualizing BNG performance, broadband operators can identify where it performs well and is most efficient.

Newton added: "As operators continue to seek better characterisation and comparison of the BNG before deployment, it is clear that disaggregation and Subscriber Session Steering will play a fundamental role."

Unlocking the Sustainable Home Network

A sustainable home network is a key opportunity for broadband operators to seize, according to **Christian Gacon, Vice President Orange Labs Network at Orange**. Today, operators directly account for 15% of the home network's CO_2 emissions.

Gacon advised that a sustainable home network can be unlocked by lowering the energy requirements per device, improving product lifecycles, and using future-proof technologies for longer shelf lives. Encouraging circular economies by recycling materials and refurbishing devices can also help operators better manage the home network's environmental impact.

The Home Gateway's idle time power consumption of 90% was pinpointed as a key area to target to reduce energy. Better sleep modes are an obvious solution to improve this situation, Gacon pointed out. Nonetheless, if operators want them to be used, they need to consider what each costumer expects from their Home Gateway. For example, if Wi-Fi is used to connect security devices, it should not be disabled when the customer is not at home. AI may help to activate sleep mode when possible.

Gacon warned that operators cannot do this alone. Chipset manufacturers need to improve their low energy features, optimize their manufacturing processes, and work with local manufacturers where possible. Improving CPE with features that lower consumption, helping subscribers reduce device numbers, and lowering the consumption of unnecessary devices (such as radio bands) are all additional tactics that operators can deploy.

In turn, Gacon said, improving the home network is not only beneficial for sustainability but can also encourage more people to take up remote working if there is traffic prioritization, such as video calls given precedence over gaming, improved cyber security, and enhanced Quality of Experience. An improved home network would also alleviate the load on the mobile network as customers would use Wi-Fi at home instead of their cellular radio network.

"If operators adopt equipment with sleep modes, migrate router functionality to the edge, educate consumers about digital sobriety, and cooperate with SDOs across the broadband ecosystem, the slice of the home network pie is there to be taken," he added.

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Want to become a Work Area Director?

Our Work Area Director nominations are now open - submit your candidacy!

The following work areas are seeking appointments of leaders:

- Common YANG
- Physical Layer Transmission
- SDN and NFV
- Wireless-Wireline Convergence.

The two-year appointment terms begin in January 2024, and the submission deadline is Friday, September 8, 2023.

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ONU authentication standard critical for virtualized networks

![broadband forum logo]

A new Broadband Forum project focused on Optical Network Unit (ONU) authentication will play a crucial role in making sure virtualized networks can enable OPEX savings and introduce new products and services faster to market.

ONU authentication identifies ONUs that are typically installed inside the home and convert optical signals to electrical signals. Historically, this process was carried out solely by the operator's equipment, also known as Optical Line Terminals (OLTs) that connect with ONUs. But as more network functions become disaggregated from physical equipment, it can also be carried out by functions on the network management plane.

"If the authentication process – and which part of the network is responsible for it – is not defined, it can result in inconsistent or even faulty network behavior," said Ken Ko, Managing Director at Broadband Forum. "TR-489 will benefit all Broadband Forum Work Areas concerned with ONU authentication and management selection and continue to help the industry transition to open, virtualized networks."

Read the full press release here.

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Flexibility, agility, and host of new network features delivered by latest Broadband Forum specification

More stable networks, greater interoperability, and cost savings for operators will become possible thanks to the latest technical report published today by Broadband Forum. The second issue of Technical Report-459 will enable improved resiliency, scalability, and faster deployment times, which will give end-users a more reliable and more consistent service.

"TR-459 Issue 2 includes an additional layer of flexibility to manage subscriber resiliency, simplifying operations and streamlining provisioning and maintenance," said Jonathan Newton, Co-Director of the Access and Transport Architecture Work Area at Broadband Forum from Vodafone.

"These characteristics are all the more critical in a post-COVID world in which more people are using their home broadband access services to manage their lives, including working and shopping online," added Mr Newton.

Any faults that can cause network outages can be navigated around as the new specification enables the brain of the network (known as the Control Plane, responsible for managing interactions with the customer home router) to intelligently determine whether a switchover to a new User Plane is needed. The User Plane carries network traffic and enforces policies such as Quality of Service (QoS).

Read the full story here.

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Multicast steaming, Common YANG, UDP Speed Test, latency, and the connected home among the latest topics this quarter
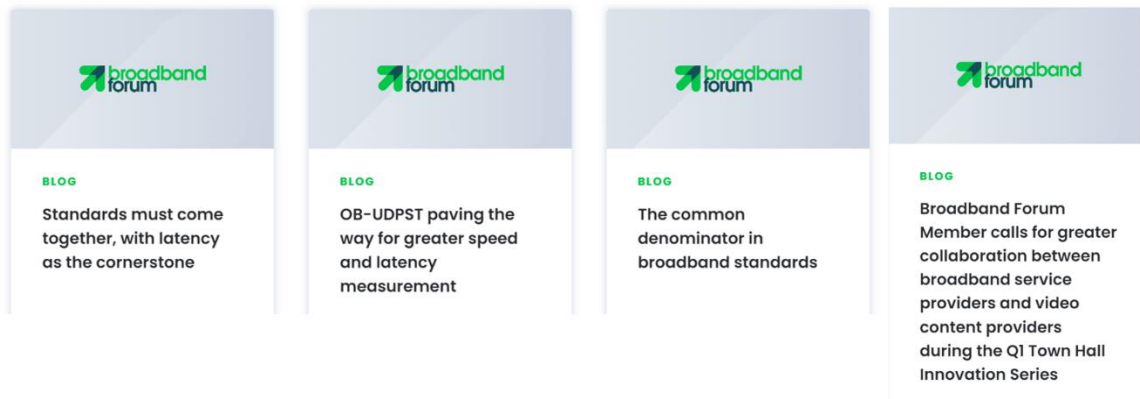
Fabrizio Guidotti, OutSys and Broadband Forum member, called for **greater collaboration between broadband operators and video content providers** for multicast streaming. Guidotti stated that the Broadband Forum is the right place, with the right culture, for all stakeholders to start the conversation.

Meanwhile, **Joey Boyd and Sven Ooghe, Co-Directors of the Common YANG Work Area at Broadband Forum**, penned a blog post on how **Common YANG acts as the cement that combines and connects the bricks of work and projects** that take place within the Broadband Forum. The duo described how Common YANG provides assistance to other Work Areas when defining YANG data models for specific applications.

There has been a continued push for a common understanding and approach on how industry players can measure performance more accurately, with speed no longer being the sole consideration. **Al Morton, OB-UDPST Project Co-leader at Broadband Forum** discusses how a **simple, standardized, and open-sourced User Datagram Protocol-based Speed Test (UDPST) can deliver on this promise**.

"Standards must come together, with latency as the cornerstone," was the messaged expressed by **Craig Thomas, Vice President Strategic Marketing and Business Development at Broadband Forum, and Greg Mirsky, PEAT Project Stream Lead in the ATA Work Area at Broadband Forum from Ericsson.** The pair expressed in their blog that it is paramount that the industry has an agreed global standard for latency, and a consensus is agreed upon between multiple SDOs to create a clearer path for market deployments and universal adoption.

The topic of **unlocking greater value from the connected home** was published by **Connected Home Chair and BUS Work Area Director Jason Walls in The Fast Mode**. Walls advised that service providers deploying an open, standardized solution that provides a clear path towards new value and reduced costs is an opportunity that they must take now.

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Work Area Updates

ATA - Brainstorming and marketing to follow!

Target: The Access & Transport Architecture work area maintains the primary architectural work of the Broadband Forum. This work reflects the control, management and data plane aspects of the Broadband Forum's defined and new architectures. These architectures are augmented to leverage new industry practices, while protecting the investment in broadband networks already deployed.

Outcomes:

- Access Architecture Project Stream - TR-459i2 Multi-Service DBNG was published.

- Access Architecture Project Stream - MR-459.4 CUPS for a Disaggregated BNG: Objectives and Scope was published.

- Performance, Experience, Application Testing Project Stream - TR-452.5 Quality Attenuation Measurements Using L2 PM OAM starting Final Ballot.

- Performance, Experience, Application Testing Project Stream - WT-452.6 Applicability of IOAM in Supporting QED Measurement started.

- Performance, Experience, Application Testing Project Stream -WT-471i4 IP Capacity Metrics and Measurement sent to Straw Ballot.

Progress:

- Access Architecture Project Stream - WT-459.2i2 Multi-Service Disaggregated BNG with CUPS: Integrated Carrier Grade NAT function. Reference Architecture, Deployment Models, Interface, and Protocol Specifications revision started.

- Access Architecture Project Stream - WT-474 Subscriber Session Steering project continuing YANG data modeling project (YMSSS) for the entities and relationships defined in the document. Work has been completed offline via BitBucket.

- Access Architecture Project Stream - WT-487 DBNG for Wired Access is under development. The protocol debates continue.

- Access Architecture Project Stream - WT-497 WiFi Authentication is under development.

- Performance, Experience, Application Testing Project Stream - WT-452.4 QED Measurement Formats progressing via BitBucket and markdown.

- Performance, Experience, Application Testing Project Stream - WT-452.3 Quality Attenuation Conformance Testing is in progress.

- Performance, Experience, Application Testing Project Stream - WT-499 Service Metrics contribution in progress.

- ATA Marketing Group – See Join or Leave BBF Groups and Email Lists to subscribe.

We had a great meeting with good progress made across our projects!

New ideas: We had our first brainstorming session in quite a while which resulted in a good start

of listing potential new work items and activities - please keep it going! We compiled the list of ideas on the [new idea wiki page](#) and each idea will eventually be broken out into its own wiki page for further development, if you have more ideas to add, please do so! If you are interested in participating in work related to one of the ideas, please feel free to reach out to the listed contact and get involved.

ATA Marketing: One key point raised during the brainstorm was the enthusiastic re-commitment to marketing of ATA work, the work that can potentially be done in ATA, and work that can potentially be done in the Forum. As we said in the meeting, we are doing great work, but if we don't tell anyone, it will just sit on a shelf and collect dust. Jon and I will be working with Craig Thomas offline to set up what we need to kick off productive activities and deliverables immediately following the meeting. Stay tuned on the ATA marketing email list for more on this important topic and please reach out to marketing counterparts in your respective companies to help out.

Lastly, as noted in our Q4 2022 and Q1 2023 meetings, we agreed to hold an ATA interim meeting later in 2023. The particulars will be posted on the ATA email list and the wiki. Many have expressed their recognition of the critical nature of meeting in-person, in particular to work out difficult issues, and formulate approaches to progress and establish new work. The interim meeting allows an additional opportunity to do such, as well as generally foster a productive team working environment. While we will continue to allow remote participation, we strongly encourage attendance in-person to leverage these opportunities, especially at the quarterly meetings.

See the [Closing Plenary slides](#) for details but above are some highlights.

For more information on ATA Work Area's ongoing work, visit: shttps://wiki.broadband-forum.org/display/BBF/Access+and+Transport+Architecture.

USP version 1.3 and TR-181 Device:2.16 published, next up is the operator-grade smart home

Target: Explore the necessary work for delivering an operator-grade smart home

Outcome: Detailed contributions in the new Smart Home Project Stream

Building on the successful publication of USP version 1.3 and TR-181 Device:2.16 – both of which form the basis for application-enabled services using broadband CPE – the Broadband User Services (BUS) work area set its sights on its latest endeavor: delivering an operator-grade smart home ecosystem.

The Smart Home project stream is designed to provide the tools to empower operators to assist in the deployment, management, and interoperability of the smart home. This will be achieved by using USP (TR-369)/TR-181, as well as introducing requirements and test plans for the network and security capabilities of the smart home devices deployed in subscriber networks. Contact the project stream leads, Jason Walls and Tim Spets, to get involved.

The group is also finalizing the most recent performance metrics for the widely used TR-398 Wi-Fi performance test plan. Once these proposed metrics have been thoroughly tested and approved, the third issue of the specification will promptly follow.

BUS is happy to announce the first USP Summit is coming this September, with training

sessions, an in-person plugfest, and service provider roundtable discussion. Look for more news soon!

Take a look at the BUS Work Area's latest work: https://wiki.broadband-forum.org/display/BBF/Broadband+User+Services.

WT-477 has YANG; TR-383 Amendment 7 is here to help!

- **Target:** Specify YANG modules that are applicable to multiple work areas, provide support to those same work areas for their specific YANG projects, and maintain YANG Best Current Practices, processes, procedures, and tools.
- **Progress:** Supporting role for the SDN/NFV and FAN Work Areas, working on YANG models in a series of ongoing projects. We continued to review new functionalities targeting future amendments of TR-383.
- **Outcomes:** Agreed on the scope of Amendment 7 of TR-383 to cover required enhancements to support WT-477 with a target publication by end of 2023; agreed on a best practice on deprecating and obsoleting data nodes in OD-360; progressed on the description of deployment use cases of Multimedia over Coax Alliance (MoCA) access nodes.

The scope of Amendment 7 of the group's flagship project TR-383 'Common YANG Modules for Access Networks' has been agreed upon. This next amendment includes enhancements to support WT-477 'Disaggregated OLT', adds several new features and reworks/refactors some existing functionality. The group also agreed that the work on Internet Protocol Flow Information Export (IPFIX) would be addressed in amendment 8.

For the long-term maintenance of YANG models, a proposal was agreed for inclusion in OD-360 'BBF YANG Best Current Practices', defining the methodology for deprecating and obsoleting data nodes. The proposed guideline is undergoing a two-week review.

The group discussed different deployment use cases of Multimedia over Coax Alliance (MoCA) access nodes, as part of WT-496 'YANG Modules for MoCA Access 2.5 Interface'. Updates to the working text were discussed, adding further clarifications on operational aspects. Updated contributions will be reviewed for inclusion in the working text during an interim call.

The work area has a key supportive role towards other work areas aiming to develop and publish YANG models. To that end, sessions were held with the SDN/NFV and FAN work areas, reviewing items of common interest, including WT-386i2 'Fixed Access Network Sharing - Access Network Sharing Interfaces', WT-413i2 'SDN Management and Control Interfaces for CloudCO Network Functions', WT-411i2 'Definition of interfaces between CloudCO Functional Modules', WT-454i2 'YANG Modules for Network Map & Equipment Inventory', WT-505 'YANG Modules for ONU Management at Scale' and WT-385 'ITU-T PON YANG Modules'.

Moving forward, the group will continue the formal review of the specification of YANG modules for VoIP; this topic will be covered during an interim conference call. This work is intended to be covered in a future amendment of TR-383.

For an overview of the Common YANG Work Area's current activities, please visit: https://wiki.broadband-forum.org/display/BBF/Common+YANG+Work+Area.

FAN sends two documents to Final Ballot review

Target: The Fiber Access Networks (FAN) Work Area specifies and maintains PON architecture and nodal requirements, PON abstraction and mobile backhaul requirements. It is also responsible for PON test suites related to ITU-T PON conformance and interoperability, and compliance test plans related to XGS-PON, NG-PON2 and Physical Medium Dependent (PMD)/Transmission Convergence (TC) Layer. Lastly, it is responsible for ITU PON YANG data model specifications.

In Progress: During the Q2 meeting, the following updates occurred in each project stream:

The Unassigned Project Stream reviewed contributions for updating the following architectural documents to include higher speed PON/25GS PON:

- WT-331 Issue 2 'Architecture and Technical Requirement for PON-Based Mobile Backhaul Networks'
- WT-167 Issue 4 'PON-fed TR-101 Ethernet Access Nodes'.

In the Interoperability/25GS-PON/G.HSP 50G-PON project streams, contributions were reviewed for:

- WT-309 Issue 3 'TC Layer Interoperability Test Plan'
- DTP-255 Issue 2 'GPON Interoperability Test Plan'.

FAN initiated discussions around future test plan work. The team will collaborate on the following topics:

- VOLTHA Open OMCI: Agree to analyze it to determine how much of it can be tied to broadband PON test plans and requirements. How to act with respect to the differences is to be determined at a later date
- EPON: Continue discussions on whether EPON should be covered by Broadband Forum test plans
- Interoperability certification: Continue discussions on 'System Under Test' interoperability certification
- Energy and power saving test cases for future versions of DTP-255 and DTP-247
- Use of DTP-255 stimulus for multi-vendor DOLT to ONT testing.

In the PON Project Stream, contributions were reviewed for:

- WT-385 Issue 3 'ITU-T PON YANG Modules'
- WT-505 Issue 1 'ONU Management at Scale'

Two documents are proceeding to Final Ballot review:

- WT-385 Issue 2 Amendment 1
- WT-489 Issue 1 'Authentication of an ONU and selection of eOMCI or vOMCI'

For more on the FAN Work Area's ongoing work, please see: https://wiki.broadbandforum.org/display/BBF/Fiber+Access+Networks.

PHYtx Work Area develops MoCA Access™ Performance Test Plan

Target: To help service providers deploy equipment that will provide better Quality of Experience (QoE) for their end-users.
Progress: The team started work on the WT-500 "MoCA Access Performance Test Plan. The next issue of WT-301 "Architecture and Requirements for Fiber to the Distribution Point" is also in preparation.

At this meeting, the PHYtx Work Area began to develop the WT-500: "MoCA Access Performance Test Plan". MoCA Access is one of the technologies that can be used in the scope of Fiber-to-the-extension point (FTTep) deployments as described in TR-419i2. The performance test plan is focused on the physical layer and traffic testing, similar to how TR-380i2 and TR-476 are defined.

WT-500 will include test setup information, equipment configuration requirements, test procedures, and performance requirements for each test case. Traffic tests will show the throughput and delay for various packet sizes and mixes for the various use cases. The technical report, once published, will be beneficial to the industry, providing guidance of the expected performance and Quality of Service for operators in an FTTep environment.

A new issue of TR-301 "Architecture and Requirements for Fiber to the Distribution Point" is in preparation. WT-301i2a2 will add support of recently developed uplink technologies such as XGS-PON, NG-PON2, HSP, and 25GS-PON to the DPU. The introduction of bulk data collection using IPFIX will be studied in close alignment with other work areas due to the dependencies on TR-413 (SDN/NFV), TR-383 (Common YANG), and IETF.

For further insight into the current work of the Physical Layer Transmission Work Area, visit: https://wiki.broadband-forum.org/display/BBF/Physical+Layer+Transmission.

SDN/NFV collaborates with Common YANG Work Areas to drive forward multiple documents

• **Target:** Define the Cloud-based Central Office (CloudCO) architecture using SDN, NFV, and cloud technologies to support network functions fundamentally redefining the architecture of access and aggregation networks. Support the migration of SDN and NFV into all aspects of broadband networks, facilitating the agile deployment of new distributed broadband services and applications for operators with greater operational efficiency and lower cost.

• **Progress:** The SDN/NFV Work Area continues to progress the CloudCO project for virtualized network functions, SDN management and control and domain orchestration capabilities in a broadband network. The main activities currently ongoing are related to the disaggregation of the Access Node and defining the related interfaces. The "Cloud Component" Project Stream is continuing work on Automated Intelligence Management (AIM), Smart SD-WAN and virtual OMCI.

SDN/NFV worked alongside Common YANG on progressing WT-413 Issue 2, WT-386 Issue 2, WT-411 Issue 2, and WT-454 Issue 2.

• **Outcomes:**

WT-477 on Access Node disaggregation is in Straw Ballot (SB) comment resolution. The related data models to be included in WT-383a7 will enter SB before the Q3/23 meeting. In the meantime, the working area discussed possible virtualized functions that could be added to WT-477 issue 2. The current proposal includes traffic steering and L3 functions. Further inputs are expected before identifying and developing detailed call flows and data models.

WT-413 Issue 2 on 'SDN Management and Control Interfaces for CloudCO Network Functions' is progressing. Previously, the SDN/NFV and Common YANG Work Areas reviewed the approach and agreed to report a detailed list of data models, so that vendors can rapidly discover the data models to be implemented for each access network function. In the current meeting a contribution covered the interoperability requirements for the NETCONF/YANG protocol. The document is expected to enter SB review before the Q3 meeting.

On the Artificial Intelligence and automation fronts, WT-486, which specifies the interfaces for the AIM Framework specified in TR-436, is in SB review and the group is reviewing comments. A joint leadership call with TMForum took place to establish a collaboration for defining closed loop automation at all levels, including intent based configuration framework. An AIM Tiger Team has also been established for reviewing the AIM architectural framework defined in TR-436 to include new use cases. The Tiger Team is also continuing the discussion on AIM use cases, and analyzing the impact on AIM interfaces.

Regarding WT-386i2 on Fixed Access Network Sharing, YANG data models have been reviewed and last comment has been resolved. Now revision of the baseline text can be done and it is expected for Q3/23 meeting.

A Tiger Team has been established to review the document on CloudCO interfaces (WT-411i2/WT-454) to include the Access SDN Management and Control northbound interface intent-based interactions addressing access network topology and abstraction, including inventory.

Some contributions were focused on making improvements to the vOMCI-OLT interface and related error messages regarding virtual OMCI (WT-451a1). Revision of Annex A and the new Appendix on example deployment is still ongoing and will continue during weekly calls.

A liaison from IETF has been received where BBF has been informed to use new Compute-Aware Traffic-Steering (CATS) protocol for Metro Compute Networking (MCN). A call for contribution has been issued to cover the architectural framework.

The group is developing a CloudCO webinar on CloudCO for SDN enabled Access Nodes, and discussions continued on the CloudCO Demo for Network X in October.

More information about the SDN/NFV Work Area can be found at: https://wiki.broadband-forum.org/display/BBF/SDN+and+NFV.

WWC has completed key Phase 3 documents, progresses marketing plans

- **Target**: Address the needs of operators which have wireline or mobile networks deployed so they can leverage their assets with combined subscriber offerings with a converged core.

- **Progress**: The WWC Work Area is progressing work on the third phase of specification development. It currently has two active project streams, the 5G Project Stream and IMS for 5G-RG Project Stream. With this work, the group continues to subsume more of the capabilities of the 5G architecture.

- **Outcomes**: Work continues on a new set of capabilities and enhancements with the latest specifications in progress for subsequent publication.

Ongoing work in the WWC Work Area focuses on bringing more value to 5G for wireline and provide operators with increased flexibility, revenue potential and deployment options. The goal is to increase the service capabilities of the network to allow operators to fully leverage convergence of their networks while at the same time giving them more paths to transition their networks to a single 5G Core.

The group continues to incorporate capabilities from the 5G Toolkit into our specifications to realize a variety of use cases. These range across a broad spectrum and include topics such as hybrid access, enhanced work from home, access sharing scenarios and convergence of voice with the mobile system. This work will allow converged operators to provide a uniform experience to their customers irrespective of the access or appliance they are using, supported by a common and streamlined back office and control plane.

The 5G Project Stream has completed the technical work for its Phase 3 specifications. TR-457 (FMIF Functional Requirements) has already been published and WT-458 (CUPS for 5G Wireless Wireline Convergence) has successfully completed Straw Ballot. Both of these documents expand the deployment options for 5G WWC. A corrigendum for TR-456 Issue 2 has been completed and will go to Final Ballot.

The IMS for 5G-RG Project Stream addresses 5G-RG IMS Voice support, with work on the architecture and a profile for residential voice. Work has moved forward on WT-493 (IMS for 5G-RG Architecture) and WT-494 (IMS for 5G-RG Residential Voice Requirements) and is planned to enter Straw Ballot before the Q3 Meeting. This key piece of work will converge legacy voice services onto the 5G system.

Phase 1 of the 5G Fixed Wireless Access for multi-tenant fixed broadband (FWA Extensions) has progressed. Potential scenarios have been identified and solutions discussed. The next step is to assess the proposed scenarios, determine any potential gaps that would need to be addressed, potentially leading to new guidelines for the industry.

The WWC Work Area has confirmed the plan to do a multi-vendor WWC demonstration with FN-RG and 5G-RGs at Network X, for which the group is moving into the detailed planning stage.

Further in our marketing efforts, the work area has initiated two new marketing whitepapers - (MD-470 The Value of WWC) and (MD-506 5G Hybrid Access). Furthermore, as part of the completion of WWC Phase 3, the group is starting to develop new marketing content. We call on active contributions from all members including their marketing teams in addition to their technical delegates to join and contribute to this important opportunity.

Broadband Forum is taking an important role in developing 5G, continuing the productive cooperation with 3GPP, and making recommendations for the connection points between the fixed and 5G mobile core networks in order to drive core convergence.

For more on the WWC Work Area, please see: https://wiki.broadband-forum.org/display/BBF/Wireless-Wireline+Convergence.

OB-BAA to support vOMCI Plugfest and CloudCO Demo

The Open Broadband – Broadband Access Abstraction (OB-BAA) project team is close to completing all software code for Release 6.0.

Two examples of the work are the alignment with the updated YANG models as outlined in the soon-to-be-released specifications WT -451 Amendment 1 (vOMCI) and WT -477 (D-OLT).

Starting in June, the OB-BAA team will support the vOMCI Plugfest at the University of New Hampshire InterOperability Laboratory (UNH-IOL) in the July-August timeframe. The OB-BAA SW layer will be used, and host one or multiple vOMCI software functions. In addition, the OB-BAA team will also support OLT and vOMCI vendors where needed in the end-to-end integration testing for the planned Broadband Forum Network X CloudCO Demo in October 2023. In June, a discussion is also planned to identify potential new features and outline the direction of future OB-BAA work.

For more information about the OB-BAA project, see: https://wiki.broadband-forum.org/display/OBBAA/Open+Broadband-Broadband+Access+Abstraction+Project+Home.

OB-MAP collaborates with BUS and prpl to advance Wi-Fi data modelling

The Open Broadband – Multi Access Point (OB-MAP) project and the prpl Foundation's prplMesh project are establishing a baseline vision of how data and control commands will be represented in TR-181. This will influence the design of the APIs presented by prplMesh.

The data model (and prplMesh APIs) is meeting the diagnostics and management needs of service providers that use multiple physical layer networking technologies to deliver ever-increasing broadband bandwidth and innovative services through increasingly complex home networks to end-user devices. This has impacted progress on prplMesh's Northbound API (NAPI).

There were many recent discussions within OB-MAP and this has led to the creation of a potential new project in the BUS Work Area. This project will extend topology modelling in TR-181, as well as potentially define new IEEE 1905 messages to carry topology data across a premises network.

The OB-MAP project team will continue to collaborate with the BUS Work Area and the prpl Foundation on requirements and feature prioritization, and data modelling of multiple devices and services in a mesh network.

To learn more about the OB-MAP project's ongoing work, please see: https://wiki.broadband-forum.org/display/OBMAP/OBMAP+Home.

OB-USP-Agent swoops in with Heron release

The OB-USP-Agent group is working on Release 8 (Heron), which is focused on implementing some of the features that will be released in the TR-181 Device:2.16 and USP

version 1.3 specifications.

Specifically, the Heron release will implement features that pertain to enabling software modularization, USP-enabled applications, and the following related concepts:

- The UNIX Domain Socket (UDS) Message Transfer Protocol for communications between processes within the device.
- The Register and Deregister USP Messages that allow a USP Agent to publish its data model paths.
- The USP Broker concepts that form a centralized communications hub for USP Endpoints that reside both inside and outside the device.

These new features will ensure OB-USP-Agent is a key component in open-source middleware solutions (e.g. prplOS and RDK) as it enables the decentralization of a device's data model into USP-enabled containerized applications.

Due to the nature of these changes, the usual release cadence will undoubtedly be stretched somewhat, but the group is hoping to get the release out before the end of the year.

For more on the OB-USP-Agent project's ongoing work, please see: https://wiki.broadband-forum.org/display/OBUSPA/OB-USP-Agent+Home.

Tenth Release of OB-UDPST: Clients can test with multiple UDP flows to multiple/diverse servers

Current Progress: March 2023 saw a major release of UDPST, version 8.0.0. The primary new feature in this release was support for multiple test connections (UDP flows) between the client and one or more server instances (i.e., distributed servers). This feature provides server redundancy and resiliency to busy or unavailable servers.

The OB-UDPST project team has begun work on Issue 4 of TR-471 to include the new multi-flow capabilities in the information model. Work to add new parameters to the TR-181 Data Model to support Issue 4 of TR-471 has also started.

The project team decided the feature list for the next release in August.

The following additional features are present in this release:

- the starting send rate adds support for randomized packet sizes in a QED-compliant stream
- mitigating attacks that prevent graceful test shutdown by manipulating STOP bits in Load Protocol Data Units (PDUs)
- adding an optional flag to the command-line to have the server cleanly exit after a single test
- randomizing the start time of load PDU generation, and enhancing socket receive processing to provide load balancing of events (to better support multiple flows).

With these changes, new fields were required in the Test Setup PDUs and Load PDUs. As a result, both the current and minimum protocol version are now (the new) version 10.

For more information on the OB-UDPST project team's ongoing progress, please visit: https://wiki.broadband-forum.org/display/OBUDPST/OB+UDP+Speed+Test+Home.

OB-5WWC project team continues alignment and integration of RDK-B architecture

Open Broadband-5WWC (OB-5WWC) is an Open Source project focused on bringing the full benefits of the 5G ecosystem to fixed-line services and offering a full end-to-end solution to operators. The aim is to create a reference implementation of the Broadband Forum specified Wireless-Wireline Convergence solution for 5G capable Residential Gateways (5G-RGs). There are already key Broadband Forum and 3GPP specifications available to help fulfill the need for 5G and convergence, and a 5G-RG reference implementation will be of great benefit to operators, providing shorter time-to-market for products and reduced development times and cycles.

OB-5WWC also seeks to provide a production grade 5G solution stack capable of integration with OpenWRT/RDK-B frameworks and to provide a reference for testing Access Gateway Function (AGF) and RG test tool development.

Current Progress: The group continues its progress with the architecture, design, and alignment with OpenWRT and RDK-B and gaining clarification of RG deployment scenarios. The team has documented RG deployment, architecture, and modelling aspects.

The low-level design including WWCd as a key component and the continued alignment on RDK-B architecture and integration has progressed.

A new development environment has been established and Continuous Integration (CI) operationalized, with exploration taking place of the components for the end-to-end test environment, including AGF and 5G Core. The development includes the solution design of the Control and User Plane transport including the Stubbed AGF test tool, and 5G Wireless Wireline Convergence User Plane Encapsulation (5WE), and the 5G controller (WWCd) providing registration and session management.

Next steps: The project team's next steps will be to start the MVP implementation of WWCd as a key module, and further improve the test environment. The group intends to begin code development in the near future.

Members of the project team aim to support and align mutual members' activities to improve data models for cellular interface management to the BUS Work Area to establish an RG architecture technical report.

An important next step is the design of a common approach to access SIM-based credentials to develop a Broadband Forum compliant solution covering wired-only 5G-RG, and the group is calling on device manufacturers to support this activity.

There is now an opportunity for interested parties to offer contributions as we enter this key phase of implementation. The project continues to welcome interested parties, including

candidates with software development experience in the C programming language, and radio module and mobile experience.

For any interested parties (including non-Broadband Forum members) that wish to be part of the project, please sign the project participation agreement online here.

For more on the OB-5WWC project's current work, please see: https://wiki.broadband-forum.org/display/OB5WWC/OB-5WWC+Home.

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Welcome to our new and returning members!

We welcomed a mix of new members and guest companies during the Q2 Meeting. We had 157 registrations, with 11 first-time attendees.

At Q2, we welcomed our new members: Blu-Castle, DKT, NAGRA, Invigo, ReadyLinks, and SDMC and our 2023 upgraded members: DISH and Zyxel Communications. Our six Q2 guest companies included: Altitude Infra Exploitation, Americanet, Cyient, Turk Telekom, Umniah Mobile, and Vector Technologies.

Are you interested in becoming the next member of the industry's leading standards body in defining broadband networks? Broadband Forum membership will not only accelerate your company's progress but enable you to become a key influencer in developing 5G, the Cloud, the connected home and access networks.

We have a range of membership options for companies of all sizes, from startup companies to large corporations and not-for-profit organizations. Our new regional Operator Membership category has further opened participation; take a look for further details of the access level privileges, benefits and requirements.

To learn more about the benefits of membership, watch the video interview with Rhonda Heier, Director of Membership Development, as Rhonda discusses the value of the Broadband Forum membership here or email rheier@broadband-forum.org for more information.

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Save the dates! Broadband Forum Meetings and BASe Events

- September 5-8, 2023, Broadband Forum Q3 Meeting, Virtual
- December 4-7, 2023, Broadband Forum Q4 Meeting, Asia

Take a look at our latest calendar of events here: https://www.broadband-forum.org/events.

Sponsorship opportunities are available for Broadband Forum's quarterly meetings and BASe events. Sponsoring Broadband Forum events is a great way to highlight your company and exhibit your company's innovation in the broadband industry – including demonstrations or prototypes – while showing your support of Broadband Forum. Opportunities vary and can be customized to accommodate a variety of budgets.

Please view the list of our standard sponsorship packages and benefits at: https://wiki.broadband-forum.org/display/BBF/Sponsorship+Opportunities.

If you are interested in sponsoring a meeting, please contact Rhonda Heier at rheier@broadband-forum.org.

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Contact information

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