

Welcome to the Broadband Forum Quarterly Newsletter

Keeping you updated about our activities! Here we highlight our latest work and focus on areas which are most critical.



A Word from our CEO

In this exciting time of constant change and challenge for our industry, our approach to building holistic broadband services is already making a difference and I firmly believe that our projects will help drive the growth and success we are all striving for. This commitment will see the development of a set of inter-related deliverables which, in turn, will allow providers to offer differentiated services and lead to a truly open broadband era with multiple new, and innovative, revenue streams.

You, our members, are all playing an important part in this work and helping to shape broadband delivery into the world of 5G, cloud enhanced broadband and the Internet of Things (IoT), while also encompassing other developments such as Artificial Intelligence (AI).

As our Chairman Kevin Foster said during the annual awards evening, its people that make things work, not equipment and it is important we remember that it is our people that are at the heart of everything we do. The awards themselves are covered in more detail later in the newsletter but, I would like to take this opportunity to congratulate the recipients - especially Lincoln Lavoie, who was awarded the Distinguished Fellow Award following many years of outstanding contributions and commitment in the world of testing and Certification.

This week's meeting followed the latest of our BASE events which drew a record number of registrations - more than 300. BASE has proved to be a very successful innovation which we are looking to develop further. Our new Board member Bernd Hesse deserves to be congratulated for the way that he has turned this idea into such a popular and thought-provoking event.

On the core work front, we are about to tell the world about the arrival of the User Services Platform (USP). This is very much about helping operators implement, deploy and manage all aspects of IoT in the home. It will enable a vast number of devices from different suppliers to be integrated into service provider offerings, which will give them the chance to offer new revenue-generating services.

A powerful evolution of the popular TR-069 standard for which the Forum is well known, USP has the potential to substantially outgrow even the success of its predecessor and will make its mark in the IoT-focused markets to come.

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Broadband Forum forges ahead with holistic approach to broadband network development

A new conception of broadband is on target to be achieved as the industry experiences an era of unparalleled change and challenge, and networks transform to meet the opportunities of 5G, ‘cloudification,’ the IoT, gigabit access, open source solutions and the growing influence of AI.

That was the message delivered at our sell-out BASE Athens event which brought together more than 300 delegates from operators, service providers, system integrators, vendors, academia and industry bodies to discuss the entire broadband ecosystem and the technology developments needed to deliver future broadband networks.

“Like all the countries across Europe, my members are facing multiple challenges and opportunities as we look forward to 5G and IoT possibilities, allied to how they will interwork with new technologies such as Network Functions Virtualization (NFV) and even AI,” said George Stefanopoulos, General Manager of Greek Mobile Operators Association (EEKT). “Whatever the technologies, the choice is always going to be finding the right balance between investment capability, generating demand for services and supporting this with a friendly regulatory and licensing environment.”

“BASE gave Greece the chance to host this truly international gathering and share our thoughts, ideas and experiences with colleagues from across the entire ecosystem. I was delighted to give our views and listen to what others had to say - I’m sure we have all learnt a lot during the two days of the event,” added Stefanopoulos.

Stefanopoulos was joined on the stage by a host of operators and vendors, with subjects covered including virtualized broadband, cloud services, the managed home, 5G, wireless/wireline convergence, Wi-Fi performance and high-speed access, including NG-PON2, XGS-PON, MoCA and Gfast.

“This latest BASE event brought together a vast array of speakers, covering an unparalleled range of topics, from NG-PON2 and Gfast to virtualization and converged networks for 5G,” said Bernd Hesse, Chairman of BASE and the Broadband Forum’s NG-PON2 Council, and Sen. Director Technology Development at Calix. “This ongoing discussion and collaboration, looked holistically at the broadband access network and this is absolutely vital if we are to deliver the ubiquitous next-generation access for many consumers who are already seeing broadband as the fourth utility. We couldn’t have achieved such a successful event without our sponsors - Huawei, Intracom Telecom, Go Foton, Lightron, Hisense Broadband and Calix - thank you.”

Latest achievements on next-generation broadband networks honored as Broadband Forum holds annual awards and elections

Pioneering work around Gfast, Open Broadband, in-premises broadband technologies and Fixed Access Network Sharing (FANS) has been recognized by the Broadband Forum, with three top accolades presented during its quarterly meeting.

Lincoln Lavoie, senior engineer and industry lead for the executive steering body at the University of New Hampshire InterOperability Laboratory (UNH-IOL) received a Distinguished Fellow Award for his substantial contributions to a wide range of successful Broadband



Forum projects. These include the G-PON Certification Test Plan, the TR-069 Certification Testing Program, the Gfast Certification Testing Program, the formation of the Open Broadband Labs projects, and countless plugfest testing activities.

“As we develop broadband networks for future generations, these awards highlight some of the true innovation happening within the Forum and the personal achievements that go alongside,” said Kevin Foster, Chairman of the Broadband Forum. “Since we launched our Broadband 20/20 vision, the rate of progress has been incredible with the Gfast certification program and FANS specification among the significant developments. The dedication and commitment of our members is vital to our success. These latest achievements reinforce the importance of standardization in a rapidly evolving broadband ecosystem.”

Two Circle of Excellence awards were also presented. One went to Bruno Cornaglia, of Vodafone, who edited the groundbreaking TR-370 Fixed Access Network Sharing specification, which was completed last November, providing a revolutionary business model for the broadband industry. Cornaglia is currently editing the follow up WT-370 to add Software Defined Networking (SDN) capabilities.

The second Circle of Excellence accolade was presented to Marcos Martinez, of Maxlinear, in recognition of his work on the first industry test plan to apply across various in-premises broadband technologies (TR-208 - Performance Test Plan for In-premises Powerline Communications Systems). Martinez has also been integral to all projects around in-premises technologies, covering areas such as G.hn to MoCA and Wi-Fi.

There were also numerous recipients of the Outstanding Contributor award which is made to individuals who have gone above and beyond the call of duty to make valuable contributions within the Forum’s Work Areas. The full list of recipients was:

- Marco Spini, of Huawei, for work on a number of complex topics and providing an important liaison between the Forum and 3GPP.
- Ludwig Pauwels, of Nokia, and Nick Hancock, of ADTRAN, for their contributions to the Common YANG project.
- Yuanlong Jiang, of Huawei, for key contributions to Mobile Transport and Routing work.
- Georgios Karagiannis, of Huawei, for work on the Cloud-based Central Office Reference Architecture Framework, now known as TR-384 CloudCO.

The Athens meeting also saw the annual elections take place, with Bernd Hesse, of Calix, and John Blackford, of Arris, voted on to the board. David Sinicrope, of Ericsson, Frank Van der Putten, of Nokia, Kevin Foster, of BT, and Mauro Tilocca, of Telecom Italia, will also continue to hold their positions on the board after they were re-elected.

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Work Area Updates from Athens



Architecture and Migration Group continues to drive new testing initiative

New work within the Architecture and Migration group on the Generation of Application Test Traffic (WT-421) is picking up a fast pace. As a new concept within the Work Area, a tutorial on the subject was given at the quarterly meeting, which attracted a large audience and prompted a lot of interesting debate.

Work on three of the four deliverables has begun. The initial four projects include

architecture and requirements, definition of the associated models, an implementers' guide and a software reference implementation. This work has brought forward a need for more participants and a number of editorial opportunities. The ultimate goal of this project aims to specify the generation of test traffic at the application layer, to create an open source traffic generation tool that will allow networking equipment manufacturers to generate aggregated traffic patterns, in order to validate equipment performance under a variety of conditions, to improve scheduling algorithms.

The joint study with the Physical Transmission Layer Work Area on use cases for the repurposing of existing premises infrastructure - such as coax and twisted pair to distribute highspeed fiber access throughout a building - also made great progress and the initial collecting of use cases is nearly complete.

Discussion on a possible future edition of the Fiber to the Distribution Point (FTTdp) (Gfast) specification (WT-301) is also hotting up. This involves using multipair bonded Gfast itself as the backhaul for Gfast customer connections. Work on a second edition of a performance monitoring specification has also been given the green light.

Finally, work on efficient multicast delivery carried out in conjunction with DVB has also taken a significant step forward, following the availability and sharing of their architecture with the Forum.



Broadband User Services completes version 1.0 of USP

The Broadband User Services (BUS) group celebrated the completion of version 1.0 of the USP, the evolution of the Forum's flagship TR-069 protocol that opens new revenue streams for service providers providing Wi-Fi, IoT, and other services to both home and business subscribers. The work continues with writing best practices, finalizing the conformance test plan, and incorporating standardized IoT objects into the Device:2 data model, working with external organizations.

Work on WT-398, a set of performance metrics for Wi-Fi in different scenarios, will allow providers to benchmark Wi-Fi Customer Premises Equipment (CPE) to ensure it meets user expectations. The Wi-Fi in-premises project stream also started work on SD-410, defining performance requirements to meet the needs of video in the home.

The group also continued to expand the Device:2 data model, entertaining new objects for new Wi-Fi technologies and the ability to manage mesh networks and other whole-home Wi-Fi deployments.

Version 1.0 of USP is now live and can be found at <http://usp.technology>. For more information on the Forum's work on USP, visit: <https://www.broadband-forum.org/standards-and-software/major-projects/user-services-platform>.

YANG 1.1, YANG 1.2 and beyond



The Broadband Forum Common YANG Work Area maintained its fast working pace at the Athens meeting. The group completed the review of

the technical Straw Ballot comments on Amendment 1 of the Common YANG model defined in TR-383. Remaining non-technical comments will be addressed during an interim conference call. TR-383 Amendment 1 is scheduled for publication in June 2018. In addition, work on Amendment 2 is well under way, with several new accepted proposals covering alarm management, Internet Protocol Flow Information Export (IPFIX), Access Network Control Protocol (ANCP) and Multicast Router Discovery (MRD). The resulting YANG models enable the management of ultrafast broadband access networks based on copper and fiber technology.

The Work Area continues to closely interface with other standards organizations, notably the IETF, IEEE and ITU-T, addressing YANG modules for troubleshooting of Ethernet access/aggregation networks and alarm management, as well as sharing knowledge based on the expertise and experience within the Forum.

Several proposals were accepted in preparation of Amendment 1 of TR-355, enabling the improved management of FTTdp networks. This work is planned for publication by Q3 2018. Furthermore, the group will be completing Straw Ballot comment resolution for the new YANG model to manage G.hn home networks. This work is captured in WT-374 and is expected to be published in the next months.

Last but not least, focus remains on interop testing related to the NETCONF/YANG communication between the Persistent Management Agent (PMA) and the Distribution Point Unit (DPU). An additional testcase was brought forward and accepted for inclusion in OD-379, covering the interop test plan for the PMA-DPU interface. With this work, the goal is to target multi-vendor deployments that can fully leverage the key assets of NETCONF/YANG.



2018 is a big year in BBF Fiber Access

The Fiber Access Network group is excited to announce the publication of TR-331, which addresses the “Architecture and Technical Requirements for Passive Optical Network (PON) Based Mobile Backhaul Networks.” It focuses on PON specific access node requirements for Mobile Backhaul Networks fostering multi-vendor interoperability, leading to faster time to revenue and reduced capital costs for operators.

Responding quickly to the needs of operators, the Fiber Access Networks Work Area is expanding the BBF-247 certification program through the preparation of Amendment 2 of IR-247i3. This amendment defines the requirements and test specifications of a new Optical Networking Units (ONU) type, “TR-301 Model 2 Gfast DPU/ONU (TR-156 112 Backhaul).” The deployment of PON-based Gfast services continues to serve the Multi Dwelling Unit (MDU) market, now emerging as a major market for Gfast worldwide as operators look to service customer demand.

There will also be announcements on the BBF-247 certification programs for XGS-PON and NG-PON2. Later this year, the first beta certification test for next-generation ITU-T technologies is expected to be launched. These new technologies will be game changers for the service provider community because it will give them faster time to revenue, which in turn means the faster adoption of new services.

The third FSAN/BBF XGS-PON/NG-PON2 interoperability test session is anticipated to occur during the 2Q or 3Q 2018. The primary purpose of this event is to drive technology maturity through multi-vendor testing, reducing the operational and capital cost of residential and enterprise fiber access deployment for service providers. Vendors interested in staying involved should respond to a recent survey sent by the Work Area. We look forward to

another successful event.

The Project Stream for “PON Abstraction Interfaces for Time Critical Applications” continues to make excellent progress. This work is needed because operators are interested in providing additional value or differentiated services to meet the trend towards more diversified network requirements, particularly where the network is used as business infrastructure. These include dynamic bandwidth allocation, energy-efficient Optical Network Terminal (ONT) sleep mode, dynamic wavelength allocation and network protection. The WT-402 is expected to enter Straw Ballot over the next few months.



Innovation Group hosts key presentations on CloudCO, 5G and IoT

The Innovation Group hosted a Birds of a Feather (BoF) session about orchestration in CloudCO, allowing views to be obtained from a number of angles, including vendor-specific products to an open source approach. The first part of this process took place in Athens, with speakers from ETSI Opensource MANO and RIFT.IO. Part two will take place in Osaka at the quarterly meeting, with a confirmed speaker from the Open Network Automation Platform (ONAP). The goal of these BOF sessions is to foster discussion on the next steps of the CloudCO work.

The Group also hosted two presentations in Athens - held jointly with other groups within the Forum - to provide the view of operators, including Deutsche Telekom who spoke about 5G service-based architecture. The second talk gave the perspective of CenturyLink on IoT.



Physical Layer Transmission continues Gfast progress

The group continued to work on issue 2 of ID-337 (Gfast certification), with the goal of going to Straw Ballot during an April conference call. Issue 2 addresses 212Mhz operation, Gfast over coax (106c/212c) and increases the performance requirements.

Issue 1 of the reverse power feed draft is now in Final Ballot (WT-338) and work has already started on issue 2. Issue 1 ensures that the Power Supply Equipment (PSE) complies with the necessary specification for the connected devices to operate safely.

At the Q1 meeting, progress was made on Long Reach VDSL2 (VDSL2-LR), including the WT-114i3a3 (Performance), WT-115i3a2 (Functionality) and WT-249i2 (Vectoring).

Joint collaboration with BUS continued on test set-ups and test cases for Wi-Fi performance (WT-398).

Work continued jointly with the Architecture and Migration group on SD-419, which addresses use cases for extending fiber access over existing in-premises infrastructure. Multiple use cases were addressed and added to the document.

Several documents have now passed Final Ballot. They include TR-400 (Gfast bonding) which is particularly important as it allows service providers to validate Gfast bonding performance to push higher speeds over longer distances. Others passed were TR-114i3a2 (35b performance) and TR-115i3a1 (35b functionality). Two other documents which will be sent to Final Ballot after the Q1 meeting are WT-114i3a4 (re-transmission performance) and WT-347 (CPE SELT Operation Guidelines).

Work was initiated on the “Infrastructure for testing mitigation of interference between Power Line Communications (PLC) and Digital Line Subscriber (DLS)”, also known as WT-425, at the meeting. Work on the SD-415 (MGfast) was also launched, with the addition of initial service provider requirements.

Gfast plugfest dates for the remainder of 2018 have now been set. They are located at the UNH-IOL laboratories in New Hampshire and are as follows:

- May 7th-11th
- August 20th-24th
- November 5th-9th



Wrapping up Cloud Interconnect and ramping up 5G Transport

Substantial progress was made on the Flex Ethernet / Multiprotocol Label Switching (MPLS) work, (SD.FlexEMPLS45G) in particular highlighting the market drivers and motivation not only for Flex Ethernet, but also for all deterministic transport technologies, including IEEE 802.1 Time Sensitive Networking (TSN) and IETF Deterministic Networking. The latter add enhancements to traditional packet switching technologies, including Ethernet and MPLS, to allow them to be used for applications that require predictable and consistent delay, delay variation and loss characteristics. These are mostly used for industrial applications and smart devices, which are enabled by the IoT and mobile networking. These will be essential in 5G networks.

In addition to deterministic networking, the Work Area made significant progress on its 5G Transport work (SD.5GTransport). There was substantial contribution to the architecture and scope, continuing the work from the Forum's established TR.221 architecture. The market drivers will be used to form a short white paper, which will be distributed at MPLS+SDN+NFV World Congress, in Paris, in April. A 5G tutorial will also be held at the conference.

WT-350i2 - the Ethernet Virtual Private Network (EVPN) architecture and requirements (TR-350) - Phase 2 Straw Ballot comment resolution continues. Many comments were resolved at the meeting and the remainder will be resolved in a post meeting conference call. Publication is anticipated for later this year.

The group continues to work to transform transport and IP networks to efficiently support 5G and the innovative services brought about by 2020 mobile networks. These new services, through the development of applications that they enable, generate new revenues both for the provider and their customers. The network requirements of the anticipated services, are driving activity on use cases, architecture and technology enhancement. These include:

- Work on integration of Flexible Ethernet into IP/MPLS networks - This gives TDM-like characteristics to packet networks to deliver the performance and isolation needed for network slicing.
- Deterministic transport - based on IETF DetNet and IEEE TSN, provides packet networks with a predictable and stable performance that can be used to serve applications and services demanding ultra-low latency, high reliability and high scalability.
- Continued work with our partner organizations (3GPP, IETF, ITU-T, IEEE, MEF, and others) to coordinate activities.

Those interested in the details of the projects and progress are encouraged to contact the Area Director and/or Project Stream Leads for suggestions on how to get involved and contribute.

SDN and NFV Work Area publishes first CloudCO document as TR



In the area of CloudCO, the overriding framework document has passed Final Ballot, becoming TR-384. This is a major step for the SDN/NFV work area - being the keystone document which holds the ecosystem of CloudCO together.

The group reviewed and agreed several new application notes that will help drive WT-411 (Interfaces), providing new use cases to enable test cases and scripts to be generated, allowing end-to-end service assurance. This will enable the Forum's Open Broadband Labs to advance the testing of CloudCO infrastructure and services.

Joint sessions were held with the SDN/NFV group and other Work Areas, with presentations from newly created ETSI Industry Specification Groups (ISGs) which were soliciting the collaboration of the Forum to progress important new work on autonomic and intelligent network management. The intelligent "low touch" network management that was common to all of the presentations is at the heart of what a SDN/NFV network enables. These documents will be reviewed to formulate a proposal of how best to co-operate with the ETSI groups before the next face-to-face meeting.

At the Q1 meeting, a review of the OB-BAA (Open Broadband - Broadband Access Abstraction) project was provided to the group to encourage feedback on their progress. OB-BAA is closely interlinked with the CloudCO work, providing an Access Abstraction layer to enable the smooth migration of legacy network equipment into an SDN/NFV ecosystem. The OB-BAA group has started coding for the provided use cases and will have the first deliverable in July this year to provide the initial "Actuator" functionality. This is the first step in providing the translation from a common Northbound Interface (NBI) command to a vendor device specific one. New content integrating the OB-BAA system description into the WT-413 document was also added.

Work on the following documents not explicitly mentioned above continues, including the WT-408 (Migration), WT-412 (Testing) and the WT-386 (FANS interface), which was agreed to progress to Straw Ballot at the Q1 meeting.



Wireline-Wireless Convergence Work Area in significant 5G work

The Wireline-Wireless Convergence (WWC) Work Area addresses the needs of converged operators, which have both wireline and mobile networks deployed and are in a position to leverage all their assets with combined subscriber offerings.

Study work on 5G fixed access continued throughout the Q1 meeting, with an expanded focus, including the integration model, the interworking model - whereby existing fixed network residential gateways could be supported by the 5G core - and initial discussions on the ability to extend the 5G control plane to devices attached to the home network. This latter capability will be able to create new revenue opportunities for converged operators.

The study outputs will be used to assist both 3GPP and the Broadband Forum to develop normative specifications in the release 16 timeframe. The very co-operative relationship with 3GPP has been solidified with the initial exchange of liaisons, reflecting the work on Fixed Mobile Convergence (FMC) progressing in both organizations.

Study work on network slicing continues as the group develops a deeper appreciation of the impact of this 5G-centric topic on fixed and transport networks. This work is coordinated with the Innovation Group, the Routing and Transport Work Area and other standards organizations that are part of the larger 5G ecosystem.

Work on WT-378 nodal requirements for hybrid access is nearing completion, with the document now in Straw Ballot with an intention and drive to publish in the Q2 timeframe. Hybrid access offers converged carriers an opportunity to leverage both wireline and wireless assets to provide high bandwidth services, increased reliability and faster fulfillment. It also gives them additional options as to how they serve their customers in areas where fiber deployment would be extremely challenging.

Documents approved include:

- TR-069s6 CPE WAN Management Protocol
Editors: Klaus Wich, of Huawei, and John Blackford, of Arris
- TR-106a8 Data Model Template for CWMP-Enabled Devices and USP Agents
Editors: William Lupton, of Broadband Forum, and Jean-Didier Ott, of Orange
- TR-114i3a2VDSL2 Performance Test Plan
Editor: Aleksandra Kozarev
- TR-115i3a1 VDSL2 Functionality Test Plan
Editor: Aleksandra Kozarev
- TR-181i2a12 Device Data Model for TR-069
Editor: Steve Nicolai
- TR-331 Architecture and Technical Requirements for PON-Based Mobile Backhaul Networks
Editors: Chengbin Shen, of China Telecom, Jin Jialiang, of China Telecom, Wei Lin, of Huawei, Robin Grindley, of Broadcom, and Duane Remein, of Huawei
- TR-369 User Services Platform
Editor: Barbara Stark, of AT&T
- WT-400 Testing of Bonded, Multi-Pair Gfast Systems
Editors: Martin Casey, of Calix, and Fred Chu, of ADTRAN

These documents will be published in the coming days. For a full list of all work in progress, [click here](#). Please feel free to share this information with your colleagues, so they are engaged and aware of the developments of this work.

Welcome to new and returning members!

We are pleased to welcome new and returning members to the Q1 meeting, including Aeponyx, Corning, DUAL BEAM MERGER INGENIEROS, InCoax Networks, Octoscope, OutSys, Samsung Electronics and Wistron Ne Web.

Broadband Forum in the news

Since the Q4 meeting, the Broadband Forum has received media interest from a variety of top tier publications. Following the Q4 announcement, Robin Mersh was interviewed by [Light Reading](#) and [SDx Central](#), resulting in two top-tier pieces of coverage, which can be viewed at: [“PON, 5G & the Case for Convergence”](#) and [“Broadband Forum’s PON Project Targets 5G Fronthaul”](#).

Gfast also remains in the spotlight, with [Broadband World News](#) publishing an interview with Tom Starr, of AT&T, and Lincoln Lavoie, of UNH-IOL.

The Forum’s vision on Fixed and Mobile Convergence to support 5G has also caused a stir, both in the press and on social media. [Telecom TV](#), [Fierce Telecom](#), [Vanilla Plus](#) and [CommsBusiness](#) all covered the news.

As the Forum continues to drive a holistic approach to broadband development with its BASE events, its work is continuing to attract attention from the media, including [Advanced Television](#), [IoT Now](#), [ITWire](#) and [Communications Today](#).

Word on the Tweet

With a focus on next-generation technologies and action to engage new members, the Forum’s social media presence continues to grow, with an increased level of tweeting and a renewed focus on LinkedIn company page.

As part of an active initiative to promote and increase industry awareness of BASE, posts were distributed daily in the run up to the event, including the use of relevant hashtags around the next-generation technologies being discussed at the event, details on speakers’ abstracts and videos filmed at BASE 2017 to incorporate thought leadership.

Across the two-day BASE Athens event, a total of 107 live tweets were distributed, which gained a record number of 11,610 impressions - 10,000 impressions more than the usual activity level of 1,500. These posts also triggered engagement with the Forum’s online audience, resulting in 64 likes and 43 tweets.

Help get the word out: Please connect with the Broadband Forum on [Twitter](#) (@Broadband_Forum), [LinkedIn](#), [Facebook](#) and [YouTube](#).

Events Calendar

2018 Broadband Forum Meetings

Keep the below dates free for this year’s upcoming quarterly meetings.

2018 Q2 Meeting: June 11-14 (Osaka, Japan)

2018 Q3 Meeting: September 10-13 (Montreal, Canada)

2018 Q4 Meeting: December 10-13 (Europe)

Sponsoring a BBF meeting can be a great way to get some company recognition! If you are interested in sponsoring a meeting, please [click here](#) for more information or contact Christine Corby at ccorby@broadband-forum.org.

Forthcoming Industry Events

- Gigabit Access 2018: April 10-11, Brussels, Belgium
- Internet of Things Summit: April 19-20, San Francisco, US

- Telco Cloud World Forum: April 17-18, London, UK
 - ONUG Spring Meeting: April 18, San Francisco, US
 - China SDN/ NFV Conference 2018: April 17-18, Beijing, China
 - 5G India Congress 2018: April 20, New Delhi, India
 - TNO's Ultra-fast Broadband Seminar: June 19-21, The Hague, The Netherlands
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Contact information

Questions or ideas? Contact the Broadband Forum +1 510.492.4020 or email info@broadband-forum.org