broadband forum

2015 ANNUAL REPORT

Chairman's Letter

Dear colleagues,

A year ago we previewed 2015 as a pivotal time for the industry and the Forum and so it turned out to be. The industry has been set the task of dealing with many inter-related transformational, technical and commercial challenges all at the same time. It would have been easy to have been distracted by the many potential courses of action. However, during the year the Forum put a laser-like focus on the business issues that challenge the membership and other stakeholders in the market. By leveraging new approaches and technologies such as SDN, NFV, FTTdp and IoT we arrived at a strategy to develop valuable new services that culminated in the launch the Forum's Broadband 20/20 Vision in September. Implementation of the vision has already begun, requiring thoughtful migration to a hybrid network that embraces virtualization and dynamically managed services working seamlessly with the existing deployed broadband infrastructure.

This new direction was not undertaken lightly. It required new initiatives such as the Software Advisory Group – formed early in the year to accommodate the trend to open-sourcing for prototyping, and a move to data models and faster implementation; inputs from the Service Provider Action Council and the membership; and giving the pervasive nature of SDN and NFV special attention. To align with the new work, in mid-year, we streamlined the organization into eight new working areas whose accomplishments and goals are explained in this report. This transition was managed smoothly by the Forum's Steering Committee led by our Technical Committee Chair. At the same time, a new Innovation Track was created as an incubator for new Broadband initiatives such as 5G and Broadband Assured IP Services. The result is a new and reinvigorated organization with a culture of rapid development, operating as a closely knit team.

This bodes well for an exciting future, but 2015 was in itself a stellar year in terms of technical work with 22 published technical reports. Thanks to exceptional member participation more than 1200 technical contributions were made, driving market innovation. Highlights included 5 completed SDN projects, broadband network virtualization, new smart home and IoT expansions for TR-069, G-PON Certification, plug-fests and large scale interoperability demonstrations. In addition, there were 17 member-driven study documents initiated plus numerous articles, marketing documents and an increased presence in key conferences. Throughout the year we continued to liaise closely with other SDOs including 3GPP, ATIS, DLNA, ETSI TM6 & NFV ISG, IETF, ITU-T study groups, NICC, ONF, OMA and Z-Wave Alliance.

The launch of Broadband 20/20 and the first large scale interoperability demo of G.fast were very well received paving the way for G.fast certification in 2016. We foresee the role of interoperability and certification becoming critical as network operators begin large scale deployment of ultrafast access.

Of all the activities, the market feedback to these innovations within Broadband 20/20 drew the most attention: Ultrafast Infrastructure services, Broadband Assured IP services, and the hybrid wireline/wireless project, with each having enormous potential. Also, with the Forum's flagship specification TR-069 for device management now exceeding 350 million installations, the migration to a User Services Platform that has the potential for automation and user access to a myriad of new business, entertainment and communications applications.

Once again, this is an exciting time to be a member of the Broadband community. We are especially looking forward to our 2016 interim meeting in Atlanta (May 18 - 20) where we are drawing together service provider innovators as they share their perspectives on network evolution in an interactive meeting with vendors and market analysts. It promises to be a unique event including demonstrations of the ONOS CORD project.

2015 was the year of the Forum's transformational Broadband 20/20 Vision, and 2016 is the start of its implementation. There has never been a better time to become an active participant and have your voice heard as these new markets are developed for the industry and your company. Your presence and active participation is requested and welcomed.

Sincerely,
Kevin Foster, CEng. FIET
Chairman, Broadband Forum

Broadband Forum Leadership

Kevin Foster
Chairman
BT

Tom Starr
President
AT&T

David Sinicrope
Vice President
Ericsson

Frank Van der Putten
Treasurer
Alcatel-Lucent

Lincoln Lavoie
Secretary
University of New Hampshire IOL

Robin Mersh
Chief Executive Officer

Marcin Drzymala
Vice President
Orange

Lowell Lamb
Board Member
Broadcom Corp.

Manuel Paul
Board Member
Deutsche Telekom

Les Brown
Board Member
Huawei Technologies

Charles Andrew Rexrode II
Board Member
Verizon

Mauro Tilocca
Board Member
Telecom Italia

Michael Fargano
Technical Committee Chair
CenturyLink

2015 Report Contents

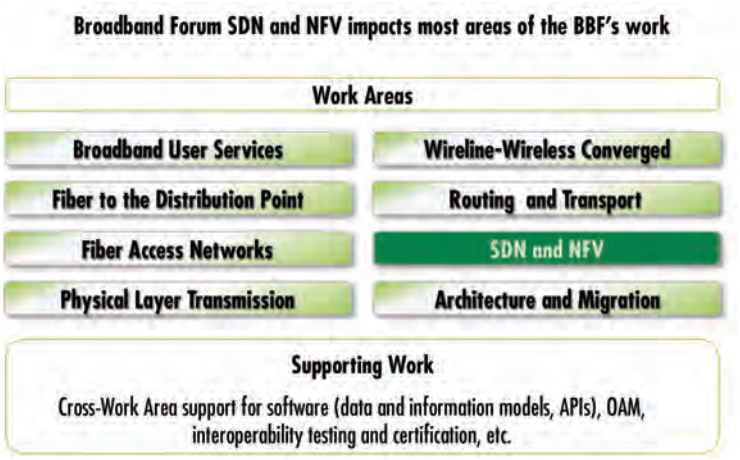
Technical Work of the Broadband Forum

As highlighted in the Chairman's letter, 2015 was full of excellent contributions. This section of the report lists technical work completed in 2015 and looks forward to projects in the coming year where member contributions will be critical.

Technical Work Published in 2015

TR-064 Corrigendum 1	LAN-Side DSL CPE Configuration
TR-064 Issue 2	LAN-Side CPE Configuration
TR-100 Issue 3 Amendment 1	ADSL2/ADSL2plus Performance Test Plan
TR-105 Issue 2 Amendment 2	ADSL2/ADSL2plus Functionality Test Plan
TR-131 Amendment 1	ACS Northbound Interface Requirements
TR-133 Corrigendum 1	TR-064 Extensions for Service Differentiation
TR-143 Amendment 1 Corrigendum 1	Enabling Network Throughput Performance Tests and Statistical Monitoring
TR-157 Amendment 10	Component Objects for CWMP
TR-181 Issue 2 Amendment 10	Device Data Model for TR-069
TR-208	Performance Test Plan for In-premises Powerline Communication Systems
TR-242 Issue 2	IPv6 Transition Mechanisms for Broadband Networks
TR-285	Broadband Copper Cable Models
TR-285 Corrigendum 1	Broadband Copper Cable Models
TR-292	Abstract Test Suite for MPLS OAM
TR-301	Architecture and Requirements for Fiber to the Distribution Point
TR-304	Broadband Access Service Attributes and Performance Metrics
TR-311	Fiber Infrastructure Management System: Architecture and Requirements
TR-319 Base	Achieving Packet Network Optimization using DWDM Interfaces
TR-319 Part A	Network Optimization using DWDM Interfaces – Physically Integrated Model
TR-321	Public Wi-Fi Access in Multi-Service Broadband Networks
TR-330	TR-069 UPnP DM Proxy Management Guidelines
TR-350	Ethernet Services using BGP MPLS Based Ethernet VPNs (EVPN)

To leverage the new technologies of Broadband 20/20 and to implement a culture of fast time to deployment, in mid-year the Technical Committee was organized into the following streamlined Work Areas:



The transition to this new work and ongoing technical development of each Work Area is via the oversight and guidance of the **Steering Committee** with the directors of each of the Work Areas managing the various projects. The following pages look at the work in the above areas and also the supporting testing and software initiatives. Given the focus on the execution of the Broadband 20/20 vision in 2016 this annual report covers all of the key initiatives that have begun in 2015 and will reach fruit in the near future. Projects with the designation "SD" and "WT" are available for BBF members only. See page 13 for membership information. For the latest list of work in progress visit www.broadband-forum.org.

Michael Fargano, CenturyLink – Technical Committee and Steering Committee Chair

Work Area Overview and Projects in Progress

Architecture and Migration

The Architecture and Migration Work Area creates the necessary foundation for all of the work of the Broadband Forum. It underpins all the new value-added services and application delivery for fixed and mobile access networks, home and business that can now be deployed at the pace of each market. Co-existence of physical and virtualized solutions and from static and dynamic services will create a hybrid broadband network mitigating the risks to existing revenue and enabling market-paced migration. The Architecture and Migration Work Area maintains the primary architectural models for the work of the Broadband Forum. The models are being augmented to subsume new industry directions such as SDN and NFV while carrying forward key aspects of broadband as currently deployed.

The following are the active project streams in the Work Area:

WT-317	Network Enhanced Residential Gateway
SD-332	Visualized Intelligent Platform
WT-359	A Framework for Virtualization
SD-364	Impact analysis and requirements for 4K (UHD) Video Support
SD-365	Definition of an SDN Reference Model
WT-349	DSL Data Sharing
WT-370	FANS Overall Architecture and Requirements
WT-345	Broadband Network Gateway and Network Function Virtualization

David Allan, Ericsson; David Thorne, BT – Work Area Directors

Broadband User Services

The Broadband User Services Work Area develops specifications and publications to create a new kind of Broadband experience for the end user and provides new means for service providers and application developers to monetize the broadband user's connection and open up large new markets. This ranges from on-demand business and entertainment services, IoT services related to energy, security, environment, etc. This encompasses management, zero-touch diagnostics and user control of what becomes a new residential/business compute/network/storage service model in a virtualized Broadband network.

Developing the intelligent "**User Services Platform**" to allow service providers and applications developers to utilize the broadband user's network and devices as a platform for service and device management, and machine-to-machine/IoT use cases. Leveraging the vast popularity and ubiquity of the TR-069 CPE WAN Management Protocol. It's in this area where the industry looks to the Broadband Forum to bring new value to the Broadband Network. The project is covered in detail in the Broadband 20/20 section of the public web site
Ongoing TR-069 CPE WAN Management Protocol as installations exceed 350 million managed devices
New information and software data models to broaden the range of for which TR-069 and USP can be used (WT-140, WT-181). This includes investigating work on YANG, RESTCONF/NETCONF modelling
Developing requirements for broadband user devices and associated software
Alternate Management Path for Broadband to enable remote troubleshooting of fixed wireline services from mobile/wireless devices (WT-356)
Developing test plans and training programs for Work Area protocols and requirements

This active area has approximately 20 projects currently in progress:

For a full list of current projects visit www.broadband-forum.org

John Blackford, Arris; Jason Walls, QA Café – Work Area Directors

Fiber Access Networks

The Fiber Access Networks Area defines the requirements for deploying Broadband Forum network architectures in fiber access technologies so as to accelerate deployments and ensure interoperability. The Work Area focuses on both cost savings and acceleration of time to market. Standardized interoperability and certification create a trusted base of equipment and services without which significant investments in time and resources can cause years of delay and in-service failures that impact revenue and credibility. Interoperability provides invaluable intelligence as feedback to both developers and implementers of new products and services – especially with the move to virtualized devices with non-deterministic functions and performance.

Definition of new test suites used to verify the interoperability of the fiber access specific portions of the networks include:

Architecture & Technical Requirements for PON-based Mobile Backhaul networks (WT-331)
Multi-wavelength PON Inter-Channel-Termination Protocol Specification (WT-352)
Framework-for-multi-management-PON-devices (WT-372)
ITU-T PON (GPON in unbundled services) (WT-280)
Maintenance of existing Fiber Access Network specifications

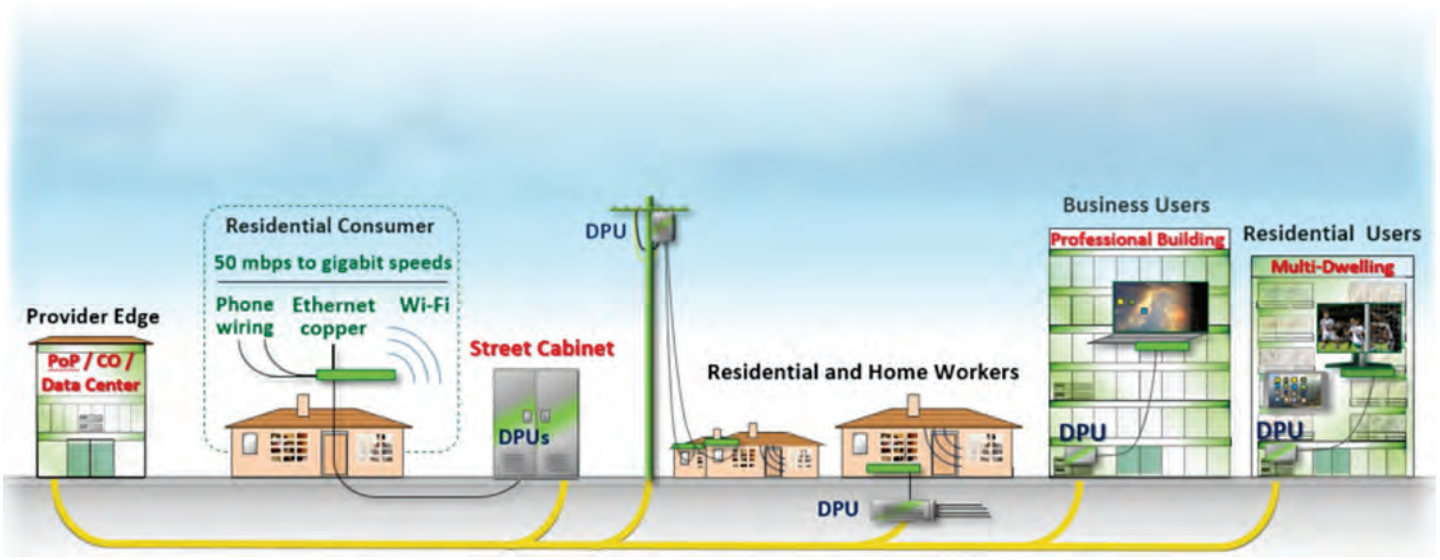
Wei Lin, Huawei Technologies; Michael Shaffer, Alcatel-Lucent – Work Area Directors

Fiber to the Distribution Point

The Fiber to the Distribution Point (FTTdp) network offers a number of new important benefits to operators and their customers. Firstly, it allows deployment of a FTTH ultra-fast broadband network without actually having to install fiber at the customer premises. This increases the service take-up rate and requires zero-touch provider provisioning with customer install, no in-house rewiring and no truck roll. Secondly, it offers the opportunity to lower OpEx through reverse powering and remote connectivity reconfiguration. It opens up new opportunities to service multi-tenant/dwelling business and residential locations with different requirements.

The ultra-fast broadband network opens up a new market for the provisioning of high-value performance-assured applications and services. The work includes developing FTTdp access architecture, encompassing architectural, nodal functional and network management requirements for FTTdp access architectures, in order to drive interoperability and best practice. This also includes the specification of YANG management models for the Distribution Point Units (DPUs).

An important change is that existing phone wiring now stands alongside Ethernet & Wi-Fi as an equal but unobtrusive player in the gigabit home.



Christopher Croot, BT; Sven Ooghe, Alcatel-Lucent – Work Area Directors

Physical Layer Transmission

The Physical Layer Transmission Work Area provides test plans, technical documentation, and educational papers to enable multi-vendor interoperability in deployments for both access and in-premises networks, with focus on accelerating time to market. Standardized interoperability and certification creates a trusted base of equipment and services avoiding delays, repeated customized one-off and NxN testing that impact revenue and credibility. Interoperability provides invaluable intelligence as feedback to both developers and implementers of new products and services.

Work in progress includes:

Definition of test plans for access network physical layer transmission technologies (such as VDSL2 and G.fast) and reverse power feeding technologies
Test plans for in-premises network physical layer transmission technologies such as power line communications
Creation of best practices for advanced features, such as upstream power back-off, self-install, and vectoring
Testing of Bonded, Multi-Pair xDSL Systems (WT-273)
CPE SELT Equipment Testing and Operation Guidelines (WT-347)

Les Brown, Huawei Technologies; Massimo Sorbara, Qualcomm Incorporated – Work Area Directors

Routing and Transport

This Work Area produces specifications for the routing and transport network infrastructure for applications such as mobile backhaul/transport infrastructure, data center inter-connect, video distribution etc. This work accelerates industry adoption of new technology and deployment of new services and infrastructure. The work includes the introduction of and migration to SDN and virtualization of the network infrastructure where commercially viable.

Control, management and data plane for the IP layer down to the physical layers, including time and synchronization, OAM, routing, resiliency, scalability, security, virtualization of the transport infrastructure, and enablement of software driven networking. Current project work includes:

Ethernet Services using MPLS Based Ethernet VPNs (WT-350) amendment and new work on cloud/data center interconnect. A complete tutorial covering a number of uses cases and a new white paper is scheduled for availability by the time this report is published
Optical Packet Evolution – Network optimization using DWDM interfaces (WT-319)
Mobile Transport and Routing – MPLS in mobile backhaul networks (WT-221)

David Sinicrope, Ericsson; Charles Andrew Rexrode II, Verizon – Work Area Directors

SDN and NFV

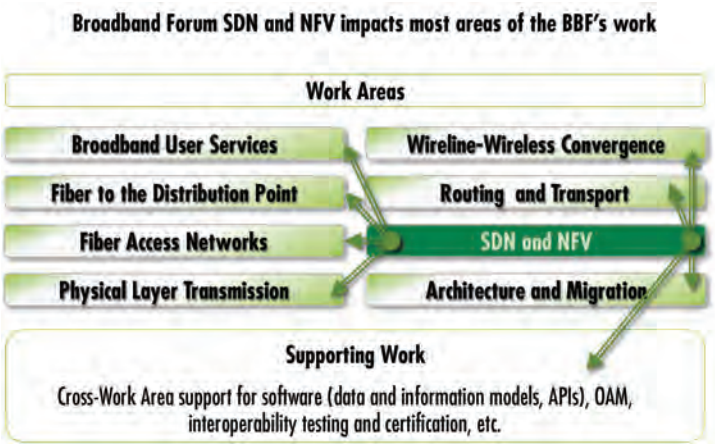
This Work Area focuses on the introduction of Software Defined Networking (SDN) and Network Functions Virtualization (NFV), including migration and coexistence of physical and virtual elements, into the broadband network.

The Forum's Broadband 20/20 vision is focused on new use cases and business opportunities that are enabled by the synergistic technologies of NFV and SDN. These touch almost every Broadband Forum project from ultra-fast technologies to new software, hardware and M2M management in the home and business. Integral to all is seamless migration and harmonizing of NFV/SDN implementations with existing deployments to mitigate business risk while new revenue streams grow at the pace of the market.

The ability to dynamically manage services (e.g., with TR-069) rather than static configuration has been available for some time. Recent work now enables dynamic control of services via SDN and NFV with 5 completed and 9 in progress specifications. The Forum's expertise in understanding the functionality, service attributes and interoperability issues of the broadband and premises infrastructure that has made it the natural place for these developments. Other SDOs such as ETSI-ISG look to the Broadband Forum to fulfill the promise of ubiquity of SDN managed NFV devices.

Application of SDN and Virtualization:

Residential: Network Enhanced Residential Gateway (WT-317)
Business: Virtual Business Gateway (WT-328)
Access: SDN in the Access Network (WT-358)
Framework for Virtualization: for SDN & NFV specifications (WT-359)
Defining an SDN reference model (SD-365)
Migration: Introducing NFV into the Business Gateway Edge (WT-345)



Recently completed technical enablers:

Cloud Intelligent Broadband Network (SD-302)
SDN in Broadband Networks (SD-313)
Flexible Service Chaining (SD-326)
NFV introduction in the Broadband Network (SD-340)
Access: Fixed Access Network Sharing – Virtual Operator (SD-351)

George Dobrowski, Huawei Technologies; Ken Ko, ADTRAN – Work Area Directors

Wireline-Wireless Convergence

This Work Area addresses the increasing synergy between wireless access technologies and wired access technologies, as well as that of wireless networking and wireline networking functions. Activities examine scenarios where wireless access technologies play a role or mobile networking is involved in the wireline network. The principle impact on the market addresses the ability to create seamless connectivity to either wireline or wireless access connectivity from single or multi-tenant business and residential locations that will radically alter users' network experience. This is the next step in the evolution from the automatic connectivity to available Wi-Fi networks and will become the norm with the advent of 5G.

Topics in this area within scope are Wi-Fi as last mile for broadband access, small cells, hybrid (dual access) access, functions between wired and wireless networks that may be instantiated as a common element, wireline and wireless network interworking and convergence at the service and subscriber level. The virtualization aspect of identified common functions enables future study in the area of VNFs and NFVI destined for mobile and fixed networks and next phase of FMC evolution. Key projects in the Work Area are:

5G Requirements and enablers
Consolidation of existing work on authentication, authorization and accounting functions within a BBF network (WT-341)
Hybrid Access: Integration of fixed broadband access and 3GPP access networks (WT-348)

The last of these will pave the way for exciting possibilities for fixed and 5G mobile integration.

David Allan, Ericsson – Work Area Director

Supporting Work

Two important supporting areas were very evident in 2015 and will both play an increasing important role in 2016.

Test and Certification

Certification of products conforming to Broadband Forum specifications continued in 2015, with BFF.247, under the supervision of our test partner L.A.N., making solid progress.. The latest information on certified companies and their products may be found on the Broadband Forum public web site.

Driven by market estimates indicating 10x as many fiber distribution point units v DSLAMs, G.fast testing and interoperability was top of mind in 2015. Interoperability provides an invaluable accelerator to product, service introduction. Seven G.fast Interoperability plug-fests and a large scale public interoperability demonstration took place in 2015 supervised by University of New Hampshire Interoperability Test lab (UNH-IOL), the Forum's longstanding test and certification partner. The G.fast Certification Program development and testing is under way, with the full program launch anticipated in 2016. It is designed to certify compliance to ITU-T & BBF standards. It establishes a trusted industry standard for implementation. Several G.fast related specifications were completed in record time. There are several new test and certifications underway via the various Work Areas as indicated below. These include:

TR-069 Conformance Test Plan (Broadband User Services)
CWMP Data Model Verification Test Plan (Broadband User Services)
CWMP Interoperability and Functionality Test Plan (Broadband User Services)
CWMP Certification Program Guidelines (Broadband User Services)
Test Plan for FTTdp PMA/DPU Management Interface (Fiber to the Distribution Point)
Testing of Bonded, Multi-Pair xDSL Systems (Physical Layer Transmission)
CPE SELT Equipment Testing and Operation Guidelines (Physical Layer Transmission)
Reverse Power Feed (RPF) Test Plan (Fiber to the Distribution Point)
Performance Test Plan for In-premises Powerline Communication Systems (Physical Layer Transmission)

It is anticipated that the role of interoperability and certification will greatly increase in importance as open-sourcing leads to a plethora of non-standard and ad-hoc implementations, which have the potential to reduce time to market but greatly increase the cost for service providers to evaluate, deploy, test, integrate and provision new services.

Software

A critical area of all of the work is the development of software models, specifically, the development of both data and information models that accelerate the implementation of agile services. 2015 saw the appointment of Software Architect William Lupton who also leads the newly formed Software Advisory Group described on the next page.

Analysis of NETCONF/RESTCONF management protocols (Broadband User Services)
Best Current Practices for developing YANG models (Broadband User Services)
CWMP Data Model/YANG Translation Rules and Tools – SD-376 (Broadband User Services)
CWMP Report Tool SD-354 (Broadband User Services)
TR-069 Data Models for devices and storage – WT-140, WT-181 (Broadband User Services)
YANG Models for access nodes in SDN – WT-368 (SDN& NFV)
YANG Modules for FTTdp Management – WT-355 (Fiber to the Distribution Point)
YANG Models for Management of G.hn Systems – WT 374 (Fiber to the Distribution Point)

The emergence of SDN and NFV is clearly important in almost every aspect of the above work.

Software Advisory Group

The SAG (Software Advisory Group), comprised of contributing Forum member companies, met for the first time in mid-year. It provides a center of software expertise acting as a "think tank" within the Forum, as well as advising on engagements with external SDOs and Open Source (OS) organizations. It will also be looking at the processes needed to enable the Broadband Forum to work successfully as a software-focused organization – for example, using tools such as GitHub to allow agile creation, review, publication and updating of software deliverables.

The group began addressing the challenges of IPR in open-sourcing software developments – RAND (reasonable fair and non-discriminatory) basis and RAND-Z (zero) licensing. A key issue is balancing the Forum's role on the definition of requirements and service attributes with the implementation of code and prototyping.

William Lupton, BBF – SAG Chair

Service Provider Action Council

The SPAC (Service Provider Action Council) is a key influential standing committee that keeps the Forum connected to user requirements, the key financial realities of the market. Open exclusively to the service provider membership it provided valuable inputs and confirmation of the value and importance of G.fast. It is expected to play an important role in testing the value of other Broadband 20/20 services in 2016.

Mauro Tilocca, Telecom Italia; Charles Andrew Rexrode II, Verizon – SPAC Co-Chairs

Steering Committee

The Steering Committee sets the strategic direction for the Technical Committee. It played a key role in 2015 in the re-engineering of the Broadband Forum, and meets the ongoing technical and marketing work of the Forum and streamlining the instigation of development of new projects.

Michael Fargano, CenturyLink – Technical Committee and Steering Committee Chair

Innovation

The Innovation track was formed as the incubator for new projects such as the developments in 5G. As envisaged in the Broadband 20/20 vision document, the Innovation track began work on Broadband Assured IP Services. The Forum has long recognized the need for performance-assured services that are secure, standardized, on-demand and user-initiated and is leveraging several new technologies (SDN, NFV, G.fast, etc.), its IP expertise and experience with more than 350 million TR-069 installations.

There are many use cases for Broadband Assured Service (BAS) but the most pressing is for cloud service delivery. The Forum's priority is to define and deploy connectionless user selectable services that enhance the performance (QoS) of Internet services and without the inherent uncertainties of insecure basic Internet Access connectivity.

The Innovation track also works with various member groups to host "Birds of a Feather" events such as the one on 5G held in 2015. 5G will push the envelope of performance to provide for example much greater throughput, much lower latency, ultra-high reliability, much higher connectivity density, and higher mobility range.

Christele Bouchat, Alcatel-Lucent; Mauro Tilocca, Telecom Italia – Innovation Co-Chairs

Industry Initiatives

Broadband 20/20 Vision

The Forum's new Broadband 20/20 vision launched in 2015 is about unlocking the potential new markets and profitable revenue growth by leveraging new technologies in the home, small business and multi-user infrastructure of the broadband network. The innovative use of NFV, SDN, Ultra-Fast access and IoT (Internet of Things) and, when formally defined, 5G, enables the delivery of exciting ultra-fast broadband services, with distributed compute and storage to anywhere and any device in the home and business locations.

Service providers have always been focused on profitable revenue generating services but this is the first time this or any forum has come together as a community to take a holistic approach to new technologies and have them deliver real value, to all stakeholders that address the fundamental issues of revenue per user that fuel healthy network growth.

The top 5 new market opportunities; new broadband services, software deliverables, the hybrid nature of the new broadband, the Forum's new structure and culture of fast time to deployment are important elements of Broadband 20/20 and the project deliverables.

Liaison Program

As mentioned in the Chairman's introductory letter, there have been many official liaisons with other SDOs including 3GPP, ATIS, DLNA, ETSI TM6 & NFV ISG, IETF, ITU-T study groups, NICC, ONF, and Z-Wave Alliance. In additional there has been interactions with many of the open source organizations. Much of those discussions have been in the area of intellectual property, proprietary solutions and interoperability solutions, which will have continued discussions in the coming year.

Interoperability Events

The Forum hosted the first G.fast Interoperability Demonstration in October 2015 at the annual Broadband World Forum event in London. It featured the following participants:

ARRIS, ADTRAN, axiros Lasting Advantage, Calix, Digital Lightwave, HomeGrid Forum, HUAWEI, LAN Your digital lab, PIVA Software, SMART/RG forward thinking, Telebyte, iol

Events

The Forum's 2015 members' meetings were held in Shenzhen, China; New Hampshire, USA; Porto, Portugal and Puerto Vallarta Mexico. 2016 quarterly members' meetings are scheduled as follows: February 1 - 5, Hong Kong; April 18 - 22, Prague; July 25 - 29, Berlin and October 24 - 28 – Kansas City. Participation guidance is provided on the Membership levels page.

There will also be a special interim meeting May 18 - 20, 2016, in Atlanta, Georgia. This meeting will feature key service provider members presenting their vision of the future of broadband networks plus a demonstration of the ONUS CORD project.

The Broadband Forum continues to have a strong, worldwide presence at key industry conferences events related to broadband intelligent home etc. Details are to be found on the public website.

Member Recognition

In 2015 many of our members were recognized for their valuable contributions to the industry and specifically to the Broadband Forum. Below are the lists of awards and recipients. We thank each person and each company for their outstanding support.

Distinguished Fellow

The Distinguished Fellow title is bestowed by the Broadband Forum to exceptional individuals who have over time provided a major influence on the direction and success of broadband development. These are the key individuals who help the Forum chart new technology solutions, drive best practices to overcome deployment obstacles, and whose vision continues to inspire our industry's growth.

2015 Recipient:
Les Brown, Huawei Technologies

Leadership Award

This award is given to outgoing leaders. These individuals, who have dedicated their time and leadership ability to establishing our success, have gone above and beyond the call of duty within the Broadband Forum and we thank them for their service.

2015 Recipient:
Christophe Alter, Orange

Circle of Excellence

The Broadband Forum recognizes the exceptional contributions of its members through the "Circle of Excellence" award, which is awarded at our quarterly meetings. The recipients inducted into the Circle of Excellence are determined by membership nomination with selection based on leadership, diligence, or having provided a contribution that was foremost in advancing the Forum's mission.

2015 Recipients:
Martin Casey, Calix Networks
Hongyu Li, Huawei Technologies
Scott Mansfield, Ericsson
Diane Patton, Cisco Systems

Outstanding Contributor Award

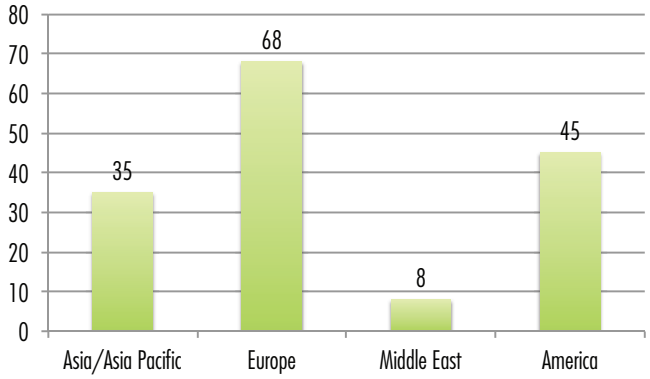
Once a year, at the annual meeting, the Top Contributor awards are given to individuals who, during the previous year, went above and beyond the call of duty within the Forum Work Areas by making many valuable contributions throughout the year as well as effectively moving the consensus process forward. Both the quantity and quality of the contributions are taken in to consideration.

2015 Recipients:
Martin Casey, Calix Networks
Ken Kerpez, ASSIA
Ken Ko, ADTRAN
Diane Patton, Cisco Systems
David Thorne, BT
Jinwei Xia, Huawei Technologies

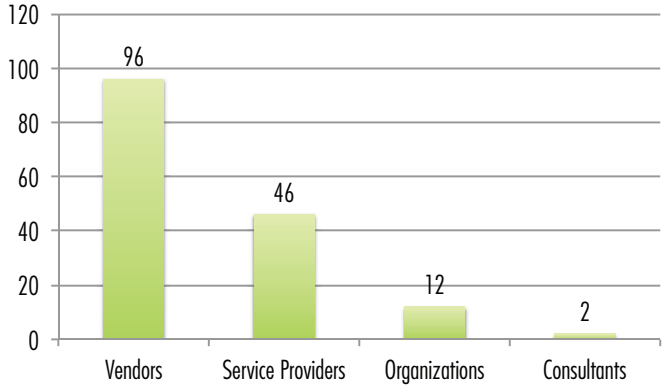
Broadband Forum Membership

Strong membership support and high levels of technical participation were evident in 2015 with the new initiatives of Broadband 20/20 raising expectation of high levels of interest in 2016.

Regional Membership



Industry Segment Breakdown



Member-driven market growth

Actively participating in the work as a Broadband Forum member creates an invaluable advantage for members, especially as the exciting initiatives and exploitation of new technologies described in this report promise to rejuvenate the broadband market. It's the expertise and contribution of the membership that have created the vast number of installations and generated significant revenue. What better moment to get involved and join the Broadband Forum!

Four membership levels

To match your needs and your available resources there are four membership levels with these benefits:

Standard Membership Benefits (all levels)

- Access advanced information on the Forum's work and the Broadband industry's direction ahead of the market to develop your own winning strategy, and implementation plans
- Track innovative technical ideas from the world's leading companies as new revenue-generating markets are developed
- Access a large library of technical work-in-progress contributions, meeting minutes, discussions and tutorials, member contacts on the BBF Members-only site
- Attendance at summit and plenary sessions of annual and general Forum meetings
- Networking with experts and leaders in many of the top industry companies
- Use of the BBF logo to aid in promoting your company's adherence to global standards
- Members' newsletter communications and updates on new work

Each membership level has additional specific advantages:	Principal Member		Auditing Member	Associate Member Not-for-profit & Educational
• **Shape and influence the entire industry** by submitting contributions to create new standards, software and best practices as work of the Forum • Unlimited opportunities to collaborate with your peers • Opportunity to represent the Broadband Forum as an industry authority • One vote each on all Forum issues, technical, and marketing reports • Eligibility to run for Board of Director and Committee officer positions	✓	Small Company Principal Member (< $20m revenue) ✓		
• Participate in **BBF Certification Programs** to meet frequently mandated RFP product compliance, increase recognition and perceived value	✓	✓	✓	
• Attend all sessions of annual & general meetings, frequent conference calls (no limits to the number of participating eligible employees) • Eligible for committee Work Area chair positions	✓	✓		✓
Annual Subscription ($US)	$13,500	$5,800	$4,800	$1,275

Choosing the right membership level

Principal Membership: Simply put, anyone serious about leadership at this innovative time in the Broadband community should be a principal member to help steer the industry and accelerate their own commercial plans. For service providers it affords the opportunity to keep the market focused on practical solutions that will drive end-customer and wholesale revenues. Principal membership offers the most value and avoids the risk of missing out on new initiatives that can change the market. The question you should ask is not "Why should we join?" but "Why have we NOT joined?"

Small Company Principal Membership represents the best value in the industry for such an influential role. This level of membership is geared for startups or companies that focus on smaller niche markets.

Auditing Membership is a great option for (i) growing companies seeking recognition for new products, (ii) Local and regional Internet service providers wanting to use the Broadband Forum work to enable new growth opportunities but have limited resources to make contributions (iii) consumer electronics companies, OTT providers, etc., who wish to track adjacent technology and business areas but do not have the available resources to actively contribute.

Visit www.broadband-forum.org for application details.

FINANCIAL REPORT

Auditors John Waddell & Co, Certified Public Accountants, have audited the financial statements of the Broadband Forum.

The following gives an overview over the key financial figures and indicators of the Broadband Forum.

STATEMENT OF FINANCIAL POSITION:

December 31, 2015 and 2014

	2015	2014
Assets		
Cash	$680,402	$804,529
Certificates of deposit	292,000	442,000
Accounts receivable	—	325
Accrued interest receivable	4,976	5,324
Prepaid expenses	109,171	58,236
Investments in marketable securities	1,362,337	1,360,455
Total Assets	**$2,448,886**	**$2,670,869**
Liabilities		
Accounts payable	$75,371	$224,768
Deferred membership dues and sponsorships	502,310	453,431
Total Liabilities	577,681	678,199
Net assets – unrestricted	**1,871,205**	**1,992,670**
Total Liabilities and Net Assets	**$2,448,886**	**$2,670,869**

STATEMENT OF ACTIVITIES FOR THE YEARS ENDED:
December 31:

Revenue		
Membership dues	$1,349,665	$1,306,675
Meeting fees	236,765	266,365
Sponsorships	50,000	111,000
Interest and Investment income (loss)	(18,779)	67,801
Other income	3,250	2,980
Total Revenue	**$1,620,901**	**$1,754,821**
Expenses		
Meetings	438,438	566,229
Trade shows	42,848	27,337
Management fees	650,520	583,600
Marketing and public relations	235,171	300,045
General and administration	116,692	80,379
Strategic initiatives	257,042	78,754
Miscellaneous/contingency	1,655	9,616
Total Expenses	**$1,742,366**	**$1,645,960**
Change in Net Assets	(121,465)	108,861
Net Assets – unrestricted		
Beginning of year	1,992,670	1,883,809
End of year	$1,871,205	$1,992,670

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An electronic copy of this report can be downloaded from:
http://www.broadband-forum.org/news/annualreports.php