Broadband Forum

2014
Annual Report

NFV MPLS Interoperability TR-069 M2M
Certification Vectoring G.fast G-PON FTTdp
VDSL2 IoT Vectoring G.9701
Broadband Forum IoT
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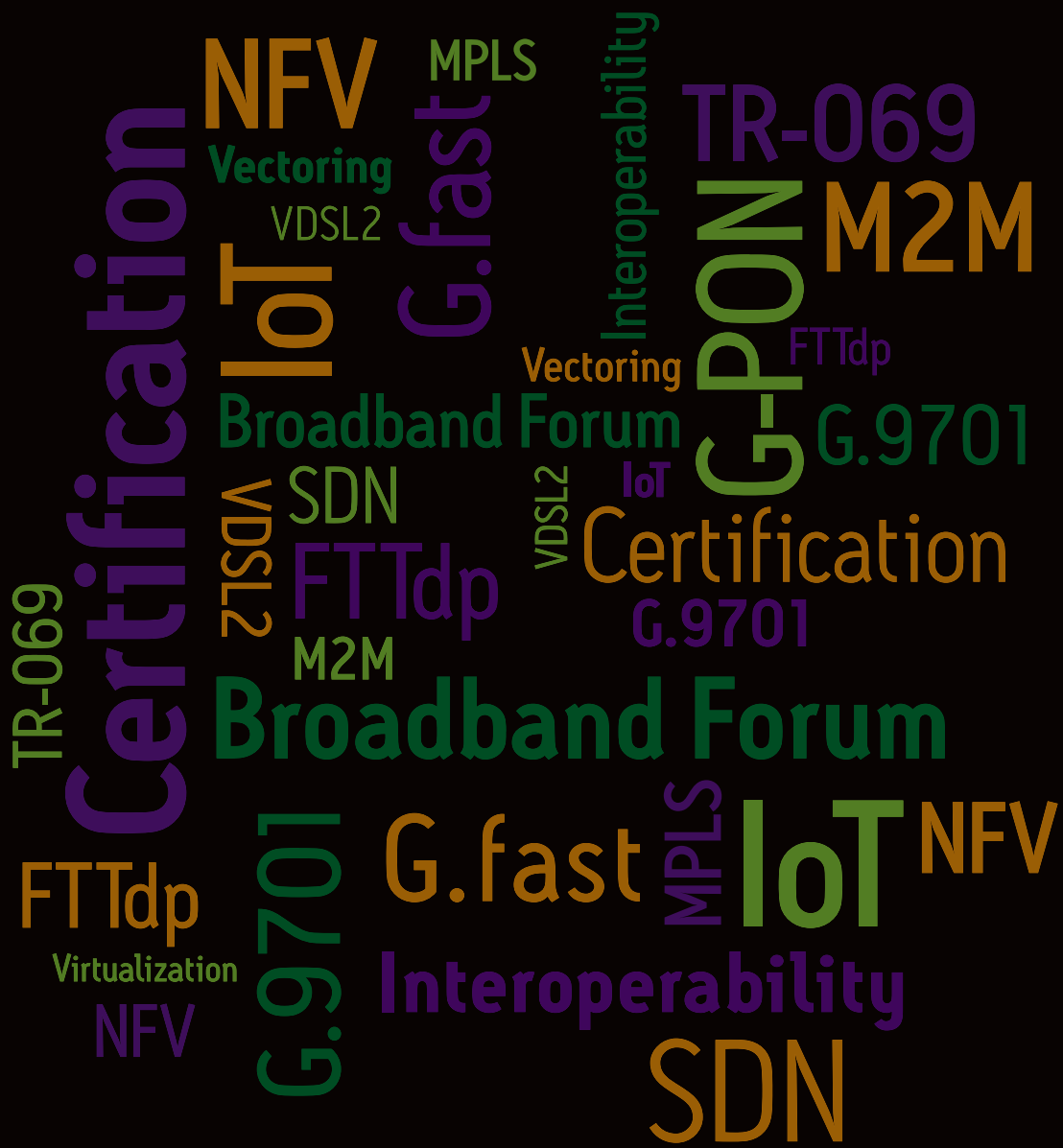
CHAIRMAN'S LETTER

Dear BBF colleagues,

It is a pivotal time for the broadband industry, as emphasis moves from volume expansion to radical new architectures in order to deliver ultra-fast speeds with improved operational efficiencies and flexibility throughout the entire broadband eco-system. New architectures to support fiber rollout to the periphery of the access network are taking shape and the Broadband Forum's key work on FTTdp is firmly embedded as a steel thread which runs through several of our working groups. The Forum's work on PON and xDSL interoperability is a key enabler for efficient and trouble free ultra-fast networks.

Network Functions Virtualization has become an important topic as operators seek to increase network efficiencies while orchestrating dynamic and responsive management and control of the network infrastructure to better improve customer experience, time-to-market and service agility. Broadband is changing, and the Forum has a key role in developing NFV and SDN synergistic techniques in integrated industry specifications, while working in close coordination with partner organizations such as the ETSI NFV ISG.

In the connected home area it is becoming less about managing boxes, and more about management and control of the explosion of new applications and services. With the increasing demand from more and more connected devices, the explosion in broadband TV and the opportunities opened up by huge increases in access speeds, our work on next generation home and business connectivity will become ever more critical.
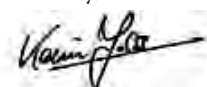
2014 was very productive for the Broadband Forum.

• There were two BroadbandSuite Releases underpinned by 25 technical specifications.

• TR-178 "Multi-service Broadband Network Architecture and Nodal Requirements" was finalized, laying the foundation enabling the next steps toward SDN/NFV infrastructure with a more modular MSBN approach.

• We witnessed incredible growth in the use of its flagship TR-069 protocol, expanding its use in cable, energy utilities, satellite and small cells.

• The BBF Certification program grew with a surge of BBF.247 certified products hitting the market, and new development begun on the G.fast Certification program (scheduled to release late 2015) to enable FTTdp.

• The Virtualization Project spun off a number of new projects, study documents and working texts focused on SDN, NFV, Service Chaining and Virtual Gateway solutions.

Service providers are now seeing many different use cases and benefits for their customers enabled through various forms of virtualization and software defined networking; both in the enterprise and consumer, underpinned by a strong business case as they move to a more dynamic network structure. To take advantage of the benefits, it is critical for the BBF to determine what the most common and valuable use cases are, where virtualization offers the most ROI, and how to manage during the migration from traditional networks to those with increased virtualization, agility and flexibility.

The Broadband Forum has a key role to play in enabling ultra-fast and flexible networks to support the needs of an industry which is seeing innovation develop at ever increasing pace. We are and will remain the global architects of the broadband network, developing specifications and best practices for network migration, including architecture, testing and management solutions that help providers leverage the benefits of rapidly changing new technology and software based solutions. Together, our members are driving specifications that define the ultra-fast future, and as virtualization takes root, they are addressing support of both legacy and new, as well as how to focus on continuously raising the bar on customer satisfaction and experience.

The BBF continues to be THE place companies focus their time, talents and resources to ensure global standards keep pace with emerging market requirements. There is much to do and we stand ready to facilitate the next phase of this exciting journey. I speak for the Broadband Forum when I say that we, as a collective leadership team, look forward to continuing to serve your needs, the needs of the broadband industry and all our customers.

Sincerely,

Kevin Foster
Chairman
The Broadband Forum

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COMMITTEE LEADERSHIP

The work of the Broadband Forum is performed under two main working committees, the Technical Committee and the Marketing Committee and includes a joint technical and marketing working group, Service Innovation and Market Requirements (SIMR), and a special advisory group, the Service Provider Action Council (SPAC).

Service Innovation & Market Requirements Leadership Team

SIMR Co-Chairs:	**SIMR Vice Chair:**
George Dobrowski, *Huawei Technologies*	Christele Bouchat, *Alcatel-Lucent*
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Technical Committee

Technical Committee Chair:	**Vice Chair:**
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IP/MPLS & Core Co-Chairs:	
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Metallic Transmission Chair:	**Metallic Transmission Vice Chairs:**
Les Brown, *Huawei Technologies*	Lincoln Lavoie, *UNH InterOperability Laboratory*
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Service Provider Action Council Leadership Team

SPAC Co-Chairs:
Mauro Tilocca, *Telecom Italia*
Charles A. Rexrode II, *Verizon*

TECHNICAL COMMITTEE ACHIEVEMENTS

In 2014, following the Board's strategic directive, each working group prioritized their workload to ensure that key architecture, testing and remote management work moved forward quickly. To expedite work and keep associated work better aligned, cross-working group projects were developed and tracked to keep the work on track to meet market requirements.

2014 Summary

• 1357 total contributions were made

• 42 working text were progressed

• 19 study documents were progressed

• 103 total incoming & outgoing liaisons to 21 different organizations.

• 37 new projects (NPIF) were proposed

• 30 new document numbers issued

Broadband Forum Releases for 2014

Two releases were published.

• BroadbandSuite 6.3: Vectoring testing and techniques

• BroadbandSuite 7.0: Multi-service Broadband Network Architecture related work

BroadbandSuite Release 6.3 (released June 2014) Vectoring Testing and Techniques		
Control R7.0	Network R7.0	User R7.0
	TR-249: Testing of G.993.2 Self-FEXT Cancellation (vectoring)	
	TR-320: Techniques to Mitigate Uncancelled Crosstalk on Vectored VDSL2 Lines	
	MR-257 Issue 2: White Paper: An Overview of G.993.5 Vectoring	

BroadbandSuite Release 7.0 (released December 2014) Multi-service Broadband Network Architecture		
Control R7.0	Network R7.0	User R7.0
TR-203: Interworking between Next Generation Fixed and 3GPP Wireless Networks	TR-178: Multi-service Broadband Network Architecture & Nodal Requirements	
TR-207: Layer 2 Control Mechanism For Broadband Mult-Service Architectures Part II	TR-224: Technical Specification for MPLS in Carrier Ethernet Networks	
TR-291: Nodal Requirements for Interworking between Next Generation Fixed and 3GPP Wireless Access		
TR-300: Policy Convergence for Next Generation Fixed and 3GPP Wireless Networks		

2014 Technical Reports

The Technical Committee was hard at work and focused on many work updates, new technical specifications, test plans, and a number of study documents on new areas of development as well as the launch of a new area of G.fast testing/certification.

Below is the full list of Technical Reports produced in 2014.

Document	Title	Approval Date	Working Group
TR-104 Issue 2	Provisioning Parameters for VoIP CPE	14-Mar	BroadbandHome
TR-115 Issue 2 Corrigendum 1	VDSL2 Functionality Test Plan	14-Mar	Metallic Transmission
TR-249	Testing of G.993.2 Self-FEXT Cancellation (vectoring)	14-Mar	Metallic Transmission
TR-286 Amendment 1	Testing of Metallic Line Testing (MELT) functionality on xDSL Ports	14-Mar	Metallic Transmission
TR-291	Nodal Requirements for Interworking between Next Generation Fixed and 3GPP Wireless Access	14-Mar	End to End Architecture
TR-320	Techniques to Mitigate Uncancelled Crosstalk on Vectored VDSL2 Lines	14-Mar	Metallic Transmission
ATP-247 Issue 3	GPON & XG-PON1 ONU Conformance Abstract Test Plan	14-May	Fiber Access Network
IR-247 Issue 3	GPON & XG-PON1 ONU Conformance Test Plan	14-May	Fiber Access Network
TR-115 Issue 2 Corrigendum 2	VDSL2 Functionality Test Plan	14-Jun	Metallic Transmission
TR-287	PON Optical-Layer Management	14-Jun	Fiber Access Network
TR-100 Issue 3	ADSL2/ADSL2plus Performance Test Plan	14-Sep	Metallic Transmission
TR-124 Issue 4	Functional Requirements for Broadband Residential Gateway Devices	14-Sep	BroadbandHome
TR-138 Amendment 1	Accuracy Tests for Test Parameters	14-Sep	Metallic Transmission
TR-157 Amendment 9	Component Objects for CWMP	14-Sep	BroadbandHome
TR-178	Multi-service Broadband Network Architecture and Nodal Requirements	14-Sep	End to End Architecture
TR-181 Issue 2 Amendment 8	Device Data Model for TR-069	14-Sep	BroadbandHome
TR-221 Corrigendum 1	Technical Specifications for MPLS in Mobile Backhaul Networks	14-Sep	IPMPLS & Core
TR-224	Technical Specification for MPLS in Carrier Ethernet Networks	14-Sep	IPMPLS & Core
TR-249 Amendment 1	Testing of G.993.2 Self-FEXT Cancellation (vectoring)	14-Sep	Metallic Transmission
TR-273 Corrigendum 1	Testing of Bonded, Multi-Pair xDSL Systems	14-Sep	Metallic Transmission
TR-293	Energy Efficient Mobile Backhaul	14-Sep	IPMPLS & Core
TR-300	Policy Convergence for Next Generation Fixed and 3GPP Wireless Networks	14-Sep	End to End Architecture
TR-098 Amendment 2 Corrigendum 1	Internet Gateway Device Data Model for TR-069	14-Dec	BroadbandHome
TR-143 Amendment 1	Enabling Network Throughput Performance Tests and Statistical Monitoring	14-Dec	BroadbandHome
TR-181 Issue 2 Amendment 9	Device Data Model for TR-069	14-Dec	BroadbandHome
TR-197 Issue 2	DQS: DSL Quality Management Techniques and Nomenclature	14-Dec	Operations & Network Management

Technical Working Group Progress

End-to-End Architecture

Activity in End-to-End Architecture was focused largely around virtualization, FTTdp and new work on hybrid access. This included the completion of TR-178 "Multi-service Broadband Network Architecture and Nodal Requirements," work on WT-345 "Migrating to NFV in the context of TR-178" and WT-304 "Broadband Access Service Attributes and Performance Metrics."

There were two NFV BoF (Birds of a Feather) sessions which fed into work either under way or under consideration in both this working group and in the Service Innovation and Market Requirements Working Group. The NFV debate directly related to the End-to-End group's work in WT-345 and how migration from a 'traditional' multi-service network architecture to the software based hybrid network of the future can be achieved.

Additional progress was made on WT-317 "Network Enhanced Residential Gateway" and WT-328 "Virtual Business Gateway." In addition there was a lot of discussion around the next steps on SDN and NFV that would build on the work currently in progress.

Further progress was also achieved around WT-304, where a meeting with the IETF LMAP group clarified issues around the LMAP registry approach and may lead to an interoperability system being developed. The group also had an interim meeting, held at BT in Ipswich, in relation to WT-301 "Fiber to the Distribution Point." Much progress was made around the adoption of the Netconf Yang for management modeling and the agreement that level 3 management would be the required level for DPU control.

The set of tools to facilitate the Internet to migrate to IPv6 was enhanced with the completion of WT-242i2, which augmented the 2012 specification to include the IETF.

WT-304 "Broadband Access Service Attributes and Performance Metrics" was also completed. Both WT-242i2 and WT-304 now will start the journey towards formal publication as TRs.

Finally work on Service Control and Convergence proceeded with WT-321 on "Public Wi-Fi access" and WT-348 on "Hybrid Access," which can combine both wireline and 3GPP access networks to drive faster service fulfillment and reliability.

Fiber Access Network (FAN)

FAN completed one new document TR-287 "PON Optical Layer Management" and updated ATP-247 Issue 3 "GPON & XG-PON1 ONU Conformance Abstract Test Plan."

With multiple interim meetings, the FAN group made steady progress on the "Fiber to the Distribution Point" project (WT-301). It is expected that this work will go to straw ballot in first quarter 2015.

FAN worked with Operations & Network Management on WT-311 "Fiber Infrastructure Management System: Architecture and Requirements." The FAN Working Group also reviewed an important new project proposal concerning creating a protocol between OLTs. This will see the development of a channel to co-ordinate wavelengths on shared ODMs, primarily for use with ITU-T and NGPON2 work.

IP/MPLS & Core

Two major documents became TRs during the IP/MPLS and Core sessions – TR-293 "Energy Efficient Mobile Backhaul" and TR-224 "Technical Specifications for MPLS in Carrier Ethernet Networks" – while work progressed on WT-319 "Achieving Packet Network Optimization using DWDM Interfaces."

TR-293 provides considerable energy savings on Ethernet links, especially in the Small Cell environment where such cells are so numerous, while TR-224 takes the operator beyond the MEF Ethernet network architecture with MPLS into explaining the features needed to actually build the network. For carriers, TR-224 guides them to a multi-vendor set of features – allowing them to play to each vendor's strengths while ensuring compatibility. This allows vendors to focus on feature development, building distinctive differentiation into their products and also reduce time to market.

The group initiated the approval process on WT-319 following the Taipei meeting with the aim of publishing in early 2015. This work is important because it integrates IP and optical networks, achieving multi-layer network optimization, which can result in dramatic cost savings.

A new project, Ethernet Virtual Private Networks (EVPN), was also progressed in the areas of OAM, QoS and Service description. The EVPN will have a direct impact particularly on Data Center Interconnection (DCI) and LTE Advanced networks, as well as be used for backhaul applications. When this work is completed, network operator benefits will include greater resilience, fewer overheads, and a more manageable system and lower OPEX. It will also support MEF Carrier Ethernet 2.0. This work is on an accelerated schedule to meet widespread industry demand.

The Group started an amendment to its MPLS in Mobile Backhaul Initiative (MMBI). Among the advancements slated for the amendment are time and synchronization technology from ITU-T, enhanced resiliency (Loop Free Alternates, LFA) and advanced fault handling capability. These are all critical enhancements for supporting small cell mobile backhaul and mid-haul (i.e., traffic between small and macro cells) and enable today's advanced Internet based services.

Operations & Network Management

Management requirements for Fiber to the Distribution Point (FTTdp) dominated the debate in Operation and Network Management as the Working Group moved to make further progress on WT-318 "Management Architecture and Requirements for FTTdp." A framework of the required Management Model is being built, although final completion of the project will somewhat be determined on the work of other outside bodies in areas such as G.fast.

TR-197 Issue 2 "DQS: DSL Quality Management Techniques & Nomenclature" was worked on and joint sessions were held with FAN about WT-311 "Fiber Infrastructure Management System: Architecture and Requirements," End to End Architecture about WT-304 "Broadband Access Service Attributes and Performance Metrics" and Metallic Transmission about FTTdp.

Work also started on a new WT-355 "YANG Data Models for G.fast & VDSL" to define the Netconf/YANG models for VDSL and G.fast for the management channel between a Persistent Management Agent (PMA0 and Distribution Point Unit (DPU).

Taiwan marked the final meeting appearance of Peter Adams, who is retiring as co-chair of the Working Group after 17 years of service with the Forum. Peter, who estimates that he has spent 1.5 years of his career at Forum meetings around the world, will continue to work in the background for several months.

BroadbandHome

Significant advancements were made for TR-069, the "CPE WAN Management Protocol" including new features to manage more devices in the home, and expanding the data model to enable even more services. Five documents were updated and released during the year:

- TR-104 Issue 2 "Provisioning Parameters for VoIP CPE." paving the way for broadband providers who offer business VoIP service to manage their networks with TR-069.
- TR-124 Issue 4 "Functional Requirements for Broadband Residential Gateway Devices"
- TR-181 Issue 2 Amendments 8 and 9 "Device Data Model for TR-069." adding support for HTIP, LLDP, tunneling, and IEEE P1905.1a to the CWMP device data model.
- TR-098 Amendment 2, Corrigendum 1 "Internet Gateway Device Data Model for TR-069." officially deprecating the InternetGatewayDevice data model in favor of the more advanced and expandable Device:2 data model.
- TR-143 Amendment 1, "Enabling Network Throughput Performance Tests and Statistical Monitoring," which expands the CWMP data model for diagnostic tests.

The BroadbandHome Working Group took steps towards the creation of a new report tool for CWMP data models, laying the groundwork for Broadband Forum software projects in the future. The requirements for the tool are being outlined in SD-354 "New BBF CWMP Report Tool." Work continued on WT-330 "TR-069 UPnP-DM Proxy Management Guidelines" in order to provide best practices for UPnP to TR-069 proxy gateways.

Early in 2014, the Broadband Forum was approached by IEEE1905.1a, the Converged Digital Home Network Working Group at IEEE, to help define a common layer for all home networking technologies to communicate. The BroadbandHome Working Group took the lead in fast tracking this work to ensure that external organizations looking to develop official TR-069 data models experience a seamless process.

The group developed the first drafts of two new marketing documents, MD-353, "Best Practices for Deploying TR-069." which will focus on interoperability, security, and scalability of CWMP deployments, and MD-278, "Managing Machine-to-Machine Systems with CWMP." outlining the ways that CWMP can be used to enable M2M deployments.

Lastly, the group made significant strides in its M2M work and the future of the next version of TR-069, synthesizing concepts from the exploratory SD-069 document and the ideas presented in SD-282, "Control Signaling Device Abstraction layer." outlining a unified protocol for bootstrapping, managing, controlling and enabling broadband and M2M services.

Metallic Transmission

In Metallic Transmission, exciting developments took place with ID-337 "FAST Certification Test Plan." as the Group aims to release this test plan for the BBF G.fast Certification Program in either Q2 or Q3 of 2015 with beta trials beginning shortly thereafter. In support of this, the Group worked on WT-285 "Broadband Copper Cable Models." characterizing copper cables above 30 MHz for physical layer testing of G.fast. The group confirmed its first ever plugfest for G.fast will take place in January 2015, with additional events planned for March, April, and June.

Metallic Transmission drove forward numerous other test plans.

- WT-208 "Performance Test Plan for In-premises Powerline Communications Systems." a universal and common PLC test methodology that can be used to compare solutions was sent to straw ballot out of the fourth quarter meeting.
- WT-249 Issue 2 "Testing of G.993.2 Self-FEXT Cancellation (Vectoring)." Building on the success of its predecessor, Issue 2 is more advanced and sophisticated than before as it vets new issues of software. This includes creating test cases for impulsive noise and network stability, amongst a host of other areas.
- WT-347 "CPE SELT Equipment Testing and Operation Guidelines" started. The objective of this specification is to increase the performance and accuracy of SELT, focusing on single ended loop testing, which helps operators to use CPE to diagnose faults. Metallic Transmission has collaborated closely with the ITU-T on this project, as well as a number of other liaisons.

Service Innovation and Market Requirements (SIMR)

SIMR was definitely on the boil throughout the year, as Virtualization took center stage to most discussions. With more contributions than ever, the Group made huge steps forward completing SD-313 "High Level Requirements and Framework for SDN in Telecommunication Broadband Networks" and progressing SD-326 "Flexible Service Chaining" which will complete 2Q2015.

Lots of discussion took place around NFV, as work nears completion for SD-340 "Stage 1 for introduction of Network Function Virtualization in MSBN." The Group focused on projects to start filling the gaps enabling migration of the MSBN. The next steps to complete SD-340 is to insert the Use Case prioritization to be finalized by SPAC for 1Q2015, and inclusion of a BBF virtualization work plan proposal by Virtualization Project Planning Task Force (VPPTF) by the end of 1Q2015 addressing how to apply SDN and virtualization techniques to the MSBN in a way that allows co-existence and a smooth migration of existing embedded broadband network infrastructure.

Cross fertilization between Operator Use Cases and the development of broadband network technical specification enablers progressed. SD-340 started mid-year and completed within six months, showing progress that was a sign of the fast action approach of SIMR towards getting results quickly. In fact, one of the use cases from SD-340 has already resulted in initiation of a new project and baseline document SD-351 "Stage 1 Analysis of Fixed Access Network Sharing." This new area of work, SD-351, applies virtualization to the fixed access network enabling the concept of a Virtual Network Operator (VNO) to be analyzed for both greenfield and brownfield use cases.

BROADBAND FORUM TESTING & CERTIFICATION PROGRAMS

Testing was a hot topic in 2014 as we hosted multiple DSL and fiber related plugfests, updated the ONU test suite, continued TR-069 compliance and interoperability efforts, expanded the VDSL2 Vectoring testing and announced the intent to launch a G.fast Certification test plan in 2015.

2014 Plugfests
- VDSL2 G.vector Chipset Plugfest - February 17 - 21, 2014
- VDSL2 G.vector System Integrator Plugfest - April 14 - 18, 2014
- G.vector Chipset Interoperability Plugfest - September 8-12, 2014
- G.vector System Integrator Plugfest - October 13-17, 2014
- FSAN-BBF XG-PON1 Interoperability Test Event – October 27 – 31, 2014

Broadband Forum Approved Test Laboratories

In 2014 we expanded the Broadband Forum Approved Test Laboratory (ATL) program by announcing the pending launch of the G.fast Certification Program and the approved testing lab as UNH-IOL.

Broadband Forum Approved Test Laboratories

Laboratory	Approved Testing
LAN	PON
UNH-IOL	DSL, PON, TR-069, IPv6 and G.fast
Telebyte	VDSL2 Vectoring

BBF.069 CPE Certification

The BBF.069 CPE Certification program also grew in 2014. The program provides the broadband industry with a baseline for the CWMP functionality present in CPE devices. Test documents are in development for ACS/device interoperability testing and the associated plugfests are continuing at UNH-IOL, the Approved Test Lab for this certification program.

BBF.069
Managing the Connected Home

Below is the list of all publicly announced BBF.069 certified products.

Company	Device Type	Model	Software Version	TR-069 Amendment Supported	Optional Features
Broadcom	Internet Gateway Device	96328AVNG	4.12L.07_RC_9	TR-069a2	TLS1.0, Upload, FactoryReset, ACS URL change on DUT by 3rd party means, ScheduleInform
Cisco Systems	Internet Gateway Device	Linksys E4200	1.5.20	TR-069a1	Factory Reset, ACS URL change on the DUT by 3rd party means EnableCWMP set to False, DefaultActiveNotificationThrottle Throttles Active Notification
Lantiq Deutschland GmbH	Internet Gateway Device	EASY80920 XWAY VRX288	UGW-5.2-2204-18 Sept12	TR-069a2	SSL3.0, Upload, Factory Reset, ACS URL change on DUT by 3rd party means, ScheduleInform, EnableCWMP set to False
Huawei Technologies	Internet Gateway Device	Speedport W 724V Typ A	02011701.00.312	TR-069a4	TLS1.0, Upload, Factory Reset, ACS URL change on DUT via 3rd party means, ScheduleInform, EnableCWMP set to False, DefaultActiveNotificationThrottle Throttles Active Notification
D-Link	Internet Gateway Device	DIR-835	1.01NEb23	TR-069a1	DHCPv4 Options, DHCPv6 Options, SSL3.0, TLS1.0 Upload, Factory Reset, ACS URL change on DUT by 3rd party means CancelTransfer, ScheduleInform, GetAllQueuedTransfer, EnableCWMP set to False
Actiontec	Internet Gateway Device	C1000A	CAC002-31.30L. 17cUNH	TR-069a1	DHCPv4, TLS1.0, Managing Objects, Upload, Factory Reset, 3rd Party URL Change, ScheduleInform, EnableCWMP set to False
ZTE Corporation	Internet Gateway Device	ZXHN H368N	V1.00.00T12e	TR-069a3	DHCPv4, TLS1.0, Factory Reset, Upload, ScheduleInform

BBF.247 GPON ONU Certification

In 2014 the BBF.247 test plan was updated to include more ONU profile types, and functional testing. Companies now bring their ONUs in to be tested against specific profiles appropriate to their application. With the addition of TR-255, the OLT/ONU interoperability test plan, companies can test their certified ONUs against OLTs in the industry. Below is the list of publically listed BBF.247 certified ONUs.

BBF.247 G-PON ONU Certified Products

Product			Product Type[1]		VLAN Profiles[2] 1:1, N:1, VBES	Service Features
Company	Product Name	Version (HW & SW)	Single User Port ONU	Multiple User Port ONU		Multicast
Askey	RTF7000	HW: R1 SW: RTF7000V1216	✓		✓	✓
Askey	RTF7010	HW: R0 SW: RTF7010V1217	✓		✓	✓
Alcatel-Lucent	I-010G-P	HW: CP88 94V-0 E243951 SW: R4.2 48G	✓		✓	✓
BLU-CASTLE	RT01FV	HW: 135-00002-21 SW: BCF0000000T10	✓		✓	✓
Calix	T073G	HW: P1A SW: R4.1.1.126.Eric1v		✓	✓	✓
Cambridge Industries Group Ltd.	G-93E3	R4.1		✓	✓	✓
FiberHome	AN5506-04	HW: WKE2.134.285 SW: RP2512		✓	✓	✓
Finisar	FTGN2117P2TUN (SFP)	HW: 0A SW: V0.7.2_G277_fc	✓		✓	✓
Genexis	Element-G1030	HW: 1 SW: 1.0.0-T5	✓		✓	✓
Huawei Technologies Co., Ltd.	EchoLife HG8240H GPON Terminal	HW: 474.B SW: V300R013		✓	✓	✓
Huawei Technologies Co., Ltd.	HG8010	V100R003C00	✓		✓	✓
Lantiq	FALCTM ON Reference Board	HW: V1.7 SW: 4.5		✓	✓	✓
PT Inovação S.A.	ONT7-SFU	HW: ONT7-SDU-D1 SW: ONT4GE2FXSSW20	✓		✓	✓
Sagemcom	F@ST5601	HW: F5601 v1.0 SW: 9.14	✓		✓	✓
Sagemcom	F@ST5655	HW: 253604972 SW: 9.07.9		✓	✓	✓
Sercomm	RV6699	HW: v2 SW: sc2.0.27		✓	✓	✓
Tecom Co. Ltd.	OB1004 GPON Indoor Mini ONT	SW: 1.5.3.12	✓		✓	✓
Xavi	XO390/XO3901 (SFP)	HW: v0.4 SW: XO390SWVER315	✓		✓	✓
ZTE Corporation	F601	HW: v2 SW: v2.0.0 P4T19	✓		✓	✓

Notes:

[1] Product Types as defined in IR-247: ONU/L2 with Single or Multiple U interfaces, or ONU/RG with single or multiple VEIP (Virtual Ethernet Interface Point).

[2] VLAN profiles as defined in TR-156: 1:1, N:1 or VBES (VLAN Business Ethernet Service).

Liaison Program

Cooperation is a central theme for the Broadband Forum as we continue to focus on innovative and disruptive technologies. It is encouraging to see the whole broadband industry coming together on Network Functions Virtualization (NFV), which has been highlighted by our collaboration with the European Telecommunications Standards Institute's (ETSI) Industry Specification Group for Network Functions Virtualization (NFV ISG). The collaboration aims to achieve a consistent approach and common architecture for the infrastructure needed to support virtualized network functions, and will help the industry channel its efforts towards achieving a rapid roll-out of NFV solutions.

At our Q3 2014 meeting in Dublin, we hosted a dedicated workshop, held jointly with the IETF - LMAP (Internet Engineering Task Force – Large scale Measurement of Access network Performance), which explored broadband access service attributes and performance with the objective of providing a common language that can be used to define measurements and measurement results. We also participated in a joint workshop with IEEE SIEPON on PON management in Denver and co-located some meetings with ITU-T Q2/15.

2015 is going to be a very busy year for collaborations as the need to coordinate and draw in diverse expertise into some large projects is needed, particularly in the NFV space, but also in M2M and other key topics.

We received 57 incoming liaisons and sent out 46 liaisons to 21 different groups in the last year, as well as holding workshops with key partners FSAN, IETF LMAP and III.

Partner Organization	Type of Partnership	BBF Liaison Officer
3GPP	Collaboration	Filipe Leitao, Ericsson
3GPP2	Liaison	Doug Knisely, Qualcomm Incorporated
Alliance for Telecommunications Industry Solutions (ATIS)	Liaison	Tom Starr, AT&T
Digital Living Network Alliance (DLNA)	Liaison	Barbara Stark, AT&T
Digital Video Broadcasting project (DVB)	Liaison	William Lupton
European Commission Joint Research Center (EU JRC)	Liaison	Frank Van der Putten, Alcatel-Lucent
European Telecommunications Standards Institute (ETSI)	Cooperation	Robin Mersh, BBF; Olivier Van De Wiel, Broadcom Corporation; Parviz Yegani, Juniper Networks(NSV ISG)
Full Service Access Network (FSAN)		Michael Shaffer, Alcatel-Lucent
Groupe Speciale Mobile Association (GSMA)	Liaison	Robin Mersh, BBF
HomeGrid Forum (HGF)	Collaboration	Robin Mersh, BBF
Home Gateway Initiative (HGI)	Collaboration	Robin Mersh, BBF
IEEE P1904.1 SIEPON	Liaison	Lowell Lamb, Broadcom
Internet Engineering Task Force (IETF)	Liaison	David Sinicrope, Ericsson
International Telecommunication Union (ITU-T)	Collaboration	Tom Starr, AT&T (WP 1/15); David Sinicrope, Ericsson; Frank Van der Putten, Alcatel-Lucent
ISO IEC/JTC 1	Liaison	Robin Mersh, BBF
IPv6 Forum	Liaison	Lincoln Lavoie, UNH InterOperability Lab
Metro Ethernet Forum (MEF)	Liaison	Scott Mansfield, Ericsson
MoCA	Liaison	Robin Mersh, BBF
NICC	Cooperation	Robin Mersh, BBF
oneM2M	Liaison	Robin Mersh, BBF
Open IPTV Forum	Liaison	Robin Mersh, BBF
Open Mobile Alliance (OMA)	Cooperation	Jason Walls, QA Café
OSGi	Liaison	Robin Mersh, BBF
Small Cell Forum	Cooperation	Robin Mersh, BBF
Telemanagement Forum (TMF)	Cooperation	Robin Mersh, BBF
Universal Plug And Play Forum (UPnP)	Liaison	Barbara Stark, AT&T; William Lupton
Wi-Fi Alliance	Liaison	Robin Mersh, BBF
WIMAX FORUM	Collaboration	Robin Mersh, BBF
Zigbee Alliance	Liaison	Jason Walls, QA Café

MARKETING COMMITTEE ACHIEVEMENTS

The Marketing Committee focused on developing white papers and tutorials to better promote a number of new technical areas of work in the BBF. The team worked in tangent with the Working Groups most closely associated with each paper or tutorial.

White Papers

- MR-316, Multi-Service Broadband Network Architecture Evolution – January 2014
- MR-257 Issue 2, An Overview of G.993.5 Vectoring – March 2014

Tutorials

- MPLS Mobile Backhaul Evolution – 4G and Beyond (2014 Update- March 2014)
- Enhancing IP/MPLS based Carrier Services to address the Data Center Interconnection Market (March 2014)
- Broadband Architecture Moving to FMC (January 2014)

Still in development, the team continues to work on these items:

MD#	TITLE
MD-322	Service Provider Managed Enterprise Services
MD-343	Packet Optical (DWDM) Integration
MD-278	Managing Machine-to-Machine systems with CWMP
MD-353	Best Practices for Deploying TR-069
MD-325	Seamless MPLS for efficient broadband services delivery
MD-342	Energy Efficient Mobile Backhaul
MD-303	BBF positioning on M2M standardization

Interoperability Pavilion

Following on the success of 2013, the Broadband Forum partnered with the Broadband World Forum once again to create a pavilion that allowed its members to showcase a range of interoperable products and engage with a massive service provider community. The Pavilion included live multi-vendor VDSL2 Vectoring demos, G-PON testing & certification demonstrations and an educational section on G.fast.

With 17 companies in the pavilion, there was a tremendous amount to see at all times, and an evening reception for Service Providers made it easy for vendors to get some one-on-one time with key attendees.

Thank You to the Interoperability Pavilion Participants

Actelis Networks • ADTRAN • ADB • Alcatel·Lucent • EXFO • ikanos • JDSU • JUNIPER NETWORKS • HUAWEI • KEYMILE • Lantiq • LHAN Your digital lab • Sagemcom • SCKIPIO • Telebyte • iol

International Development

One of the key goals of the Forum marketing team is to empower growth markets with as much information, best practices and tools available to help them expedite and build their networks on a strong standards platform. In 2014, the key markets that the team focused on were Brazil and Taiwan. To address the Brazilian market, the BBF had a presence and provided collateral at two major events; Broadband Latin America and FutureCom. We also met with CPqD to discuss partnership opportunities to stimulate more fiber development and deployment in the region.

To address and grow our presence in the Taiwan market, we held our fourth quarter meeting in Taiwan, and hosted (with our partner III in Taiwan) a very successful special Executive Invitational one day before the meeting. We exceeded our goal, and had 74 regional representatives from 21 companies spend the day with our lead team. It was a very interactive session discussing broadband standards strategy. Two of these new companies committed to participation in the BBF Certification Program.
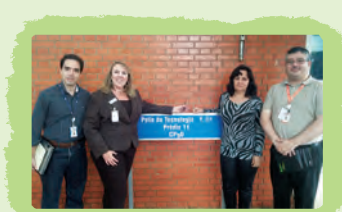
Ambassadors

The Ambassador committee continued to educate the marketplace about new technical solutions and inform them about the work of the Broadband Forum. The Ambassadors, who are Broadband Forum subject matter experts, participated in various speaking opportunities that showcased the Forum's work and new specifications. We hosted three Tutorials at major events around the world, highlighting work around the MPLS and Multi-service Architecture work we are doing and were featured on a webinar focused on Multi-service Architecture as well.

With 2 new Ambassadors added in 2014, the education efforts were truly global, and in 2014 there were 11 presentations made throughout the world.

Americas	**2**	**Asia**	**3**
Europe	**5**	**Middle East**	**1**

Special thanks to our 2014 active Ambassadors who spoke at the following events:

- Dave Sinicrope, BBF Vice President & Santiago Alvarez and Yves Hertoghs, BBF Ambassadors at MPLS SDN World Congress – March 2014

- Robin Mersh, BBF CEO & Tom Starr, BBF President at Fixed Access Networks Summit – April 2014

- Robin Mersh, BBF CEO at Optinet China – May 2014

- Tom Starr, BBF President & Frank Van deer Putten, BBF Board Member at the G.fast Summit – May 2014

- Laurie Adams de Sa, BBF Membership & Marcom Director at CommunicAsia – June 2014

- Robin Mersh, BBF CEO and Kevin Foster, BBF Chairman at TNO – DSL Access without Barriers – June 2014

- Laurie Adams de Sa, BBF Membership & Marcom Director at Broadband TV Connect Latin America – June 2014

- Hongyu Li, BBF Ambassador at the SDN & OpenFlow APAC Conference – June 2014

- Laurie Adams de Sa, BBF Membership & Marcom Director at FutureCom – October 2014

- Robin Mersh, BBF CEO and Christele Bouchat, BBF Ambassador SDN & OpenFlow World Conference – October 2014

- Robin Mersh, BBF CEO at the GiTEX Conference – October 2014

Marketing Communications

The MarCom team continued their solid outreach and added social media into the mix. As more people turn to YouTube, Linked In, Facebook and Twitter for their bite size industry news, the team made it a priority to do more video filming, including onsite interviews of members and TR editors, as well as posts weekly to Twitter, Facebook and LinkedIn. Social media drives more visibility beyond our normal attendees and website visitors, and is creating a more immediate dialog with the industry.

Below shows the strong results of the marketing team over the last five years:

	2010	2011	2012	2013	2014
Overall coverage tracked	1292	3732	5289	4739	4654
Coverage – BBF press release driven	1051	3404	3331	2821	2531
Coverage - General industry mentions	125	262	491	920	1060
Coverage - Member reference	65	66	1467	991	1057
News releases issued	9	17	12	10	14
Media interviews	34	104	78	8	15
Analyst briefings	5	7	10	4	9
Video/broadcast interviews	4	14	9	26	24
BBF bylined Articles / Features	13	13	13	7	15
Press conferences	3	6	3	1	0
White Paper placements	6	5	13	0	2
Blogs			1	1202	5
Newsletters			4	135	4
Linked In group members			1007	1202	1482 (521 senior managers)
Twitter followers				135	386 (22% press/analysts)
Facebook followers					123
YouTube followers					1161

Below are the key headlines from 2014:

- The Era of the Software Defined Operator is here, says Deutsche Telekom (March 13, 2014)

- Small Cell Backhaul Helps Solve Service Provider Issues (March 13, 2014)

- G.fast to be Major Factor in European Union 2020 Vision for Broadband Penetration, Says Broadband Forum (April 8, 2014)

- 40 Million New Broadband Subscribers and 14.1% Growth in IPTV Mark a Year of Steady Growth (April 9, 2014)

- Brazil Broadband Faces Its Biggest Challenge (June 3, 2014)

- Vectoring Advances Need Best Practice Processes, Says Broadband Forum (June 17, 2014)

- TR-069 Gears Up for Ten More Years as Device Management Evolves to Services Management (June 25, 2014)

- Broadband Forum TR-069 Statement (August 20, 2014)

- Broadband Forum and NFV ISG (ETSI) Up the Ante for NFV (September 15, 2014)

- Broadband Forum's Q3 Meeting Goes Beyond Broadband (September 18, 2014)

- New Technologies for Innovative New Services at the Broadband Forum's Interoperability Pavilion (October 21, 2014)

- G.fast Solves Ultra HDTV Bandwidth Bottleneck (December 8, 2014)

- Taipei Hosts Broadband Forum as Taiwan Broadband Penetration Marches On (December 11, 2014)

SERVICE PROVIDER ACTION COUNCIL (SPAC)

The Service Provider Action Council (SPAC) brings the service provider community together to guarantee the Broadband Forum has continuous guidance on service requirements and technical evolution. This engagement of Service Providers guarantees market relevance and timely specification delivery. At each meeting in 2014, the SPAC attendance averaged 30 attendees from 15 service provider companies.

Topics in 2014 included:

- Testing and certification of copper PHY for the FTTdP architecture:
  - Project Plan on copper PHY for the FTTdP architecture
  - Assessment of a Certification Program
  - Operators Survey about a Certification Program

- Follow up discussion about FTTdP copper PHY Certification

- Network Functions Virtualization (NFV) Work Status in BBF

- Fixed Access Network Virtualization

- FTTdp certification survey results and review of TCOC recommendations

- Impact on fault rate of wetting current on Naked DSL services

- Input on the SDN SD-13 Prioritization

- OTT Webinar Presentation

- SIMR NFV update

- G.fast certification: update of Program build-up

MEMBER RECOGNITION

In 2014 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.

• George Dobrowski, Huawei Technologies

Leadership Award

The Leadership award is given to outgoing, commendable working group chairs or Board members. 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.

• Alessandro Capurso, Telecom Italia
• Dave Christophe, Alcatel-Lucent
• Andrew Malis, Verizon
• Moti Morgenstern, ECI Telecom

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.

• Jaume Rius i Riu, Ericsson
• Timothy Carey, Alcatel-Lucent
• Roberto Carnero Ros, Ericsson
• Ken Kerpez, ASSIA Inc.
• Balazs Varga, Ericsson

Outstanding Contributor Award

Once a year, at the annual meeting, the Outstanding Contributor awards are given to individuals who, during the previous year, went above and beyond the call of duty within the Forum working groups 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.
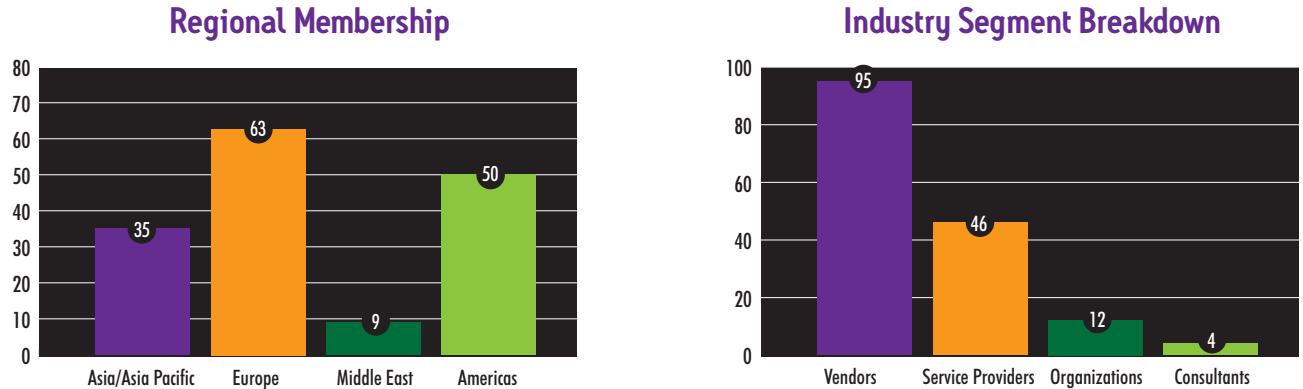
• Stefano Galli, ASSIA
• Yves Hertoghs, Cisco
• William Lupton, Cisco
• Diane Patton, Cisco
• Dean Cheng, Huawei Technologies
• Frederic Klamm, Orange

BROADBAND FORUM MEMBERSHIP AND OPERATIONS

The Broadband Forum has been at the forefront of many of the improvements happening in the broadband industry. Despite the economic climate remaining challenging, our membership was again stable in 2014, and we added new service providers, many new fiber and virtualization solution providers with our new efforts.

The graphs below show the diverse regional and industry segment breakdown.

Regional Membership

Industry Segment Breakdown

Date	Location	Number attending	Sponsor
March 10 - 14, 2014	St. Julians, Malta	139	
June 23 - 27, 2014	Denver, Colorado USA	174	Actiontec CenturyLink
September 15 - 19, 2014	Dublin, Ireland	151	Axiros
December 8-12, 2014	Taipei, Taiwan	171	Accton Technology Arcadyan Technology Corp. Askey Computer Chunghwa Telecom Labs ECONET Gemtek Technology Co. Institute for Information Industry Industrial Technology Research Institute (ITRI) Metanoia Communications Realtek Semiconductors Zyxel Communications

As it is every year our focus in 2014 for Forum operations was to ensure continued member satisfaction, and that services were delivered efficiently and cost effectively. 2014 has seen continued success with key objectives met and best practices maintained.

The website experienced a facelift in 2014, updating ARO features and adding a variety of new content throughout. It continues to be enhanced with new online member tools and increased support for volunteer editors. We also added a BBF Facebook page to stimulate more interaction among members and the industry.

In challenging economic times the Forum continues to strive for the utmost value for the investment our members make in standards. The Forum wants its members to continue to consider Forum membership the best value for money in the industry and will continue to maintain a lean and efficient structure.

Membership List

157 Total Members as of December 31, 2014
New members noted with an * below:

Principal Members (78)

A1 Telekom Austria AG	Juniper Networks
Actiontec Electronics	KAONMEDIA Co., Ltd.*
ADTRAN	Keymile
ADVA Optical Networking Ltd	KPN
Advanced Digital Broadcast S.A.	Lantiq
Alcatel-Lucent	Marvell Semiconductor Inc
Aptean	Microsemi
Arris	NEC
AT&T	Nokia Siemens Networks GmbH & Co. KG
AVM	NTT Corporation
Belgacom	OneAccess*
Bell Canada	Oracle
British Sky Broadcasting Limited	Orange
Broadcom	Pace
BT	PT Inovacao e Sistemas, S.A.
Cable Television Laboratories, Inc.	Qatar National Broadband Network (Qnbn)
Calix Networks	Qualcomm Incorporated
CenturyLink	RAD Data Communications
Charter Communications	Sagemcom Broadband
China Mobile Communications Corporation	Softbank BB Corp.
China Telecom	Sumitomo Electric Industries
China Unicom*	Swisscom (Switzerland) Ltd.
Chunghwa Telecom Labs	TDC A/S
Cisco Systems	TE Connectivity
Comcast	Technicolor
Coriant R&D GmbH	Telecom Italia S.p.A
D-Link	Telefonica Standards
Deutsche Telekom	Telekom Malaysia R&D*
ECONET*	Telenet NV
Eircom, Ltd	TeliaSonera
Entropic Communications	TELUS Communications, Inc.
Ericsson	Time Warner Cable
EXFO	Tollgrade Communications
Fastweb SPA	TTNet A.S.
Google	Verizon
Hellenic Telecommunications Organization*	Vitesse Semiconductor A/S*
Huawei Technologies Co., Ltd.	Vodaphone Group Services
Ikanos Communications	Zinwell Corporation*
JDSU	ZTE Corporation

Small Company Principal (24)

A TLC SRL*	Metanoia Communications
Affinegy	Mitsubishi Electric RCE France
AIMS (INT) Ltd.	MT2
ASSIA, Inc.	Oliver Solutions*
AvSystem	QA Café
Axiros	Real Communications
Cambridge Industries Group Limited	Sckipio Technologies
Dimark Software, Inc.*	Sparnex Instruments
GreenWave Systems	Telebyte, Inc.
Incognito Software	Thinxtream Technologies Pte Ltd
Iphotonix	Tracespan Communications
LAN	UNH Interoperability Lab

Auditing (43)

3M Communication Markets*	Friendly Technology (FTL) Ltd.	Tecom Co., Ltd.
Active Broadband Networks*	Gemtek Technology Co.	Teldat*
Agama Technologies	Genexis	Telekom Slovenia
AirTies	Icotera*	Telenor
Allied Telesis	KCCS Mobile Engineering Co., Ltd.	Telkom SA Ltd
Arcadyan Technology Corp.	LSI Corporation	Telstra Corporation Ltd.
Askey Computer	Observa Telecom	Tilgin
Blu-Castle SA	OPT New Caledonia	Transmode
Bouygues Telecom	Reliance Jio Infocomm Ltd	Triductor Technology*
Cortina Systems	SaskTel	Westermo
ECI Telecom	ServComm Inc.	XAVI Technologies*
Edimax Technology Co., Ltd	Shenzhen Gongjin Electronics Co., Ltd.	Zhone Technologies
Fiberhome Telecommunications Technology Co., Ltd.	Sigma Designs	Zyxel Communications
Finisar Shanghai Inc.*	SMC Networks	
Foxconn	Spark New Zealand	

Associate (12)

ETRI	National Exchange Carrier Association
Fraunhofer Institute	National Media and Infocommunications Authority
Industry Canada	Point Topic
Informa T&M (BBWF)	Research Institute of Telecommunications Transmission (RITT)
ITRI	Tecnalia Research & Innovation
Layer123	TNO

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, 2014 and 2013

	2014	2013
Assets		
Cash	$804,529	$698,370
Certificates of deposit	442,000	560,000
Accounts receivable	325	2,210
Accrued interest receivable	5,324	5,849
Prepaid expenses	58,236	37,975
Investments in marketable securities	1,360,455	1,247,786
Total Assets	$2,670,869	$2,552,190
Liabilities		
Accounts payable	$224,768	$113,281
Deferred membership dues and sponsorship	453,431	555,100
Total Liabilities	678,199	668,381
Net assets - unrestricted	1,992,670	1,883,809
Total Liabilities and Net Assets	$2,670,869	$2,552,190

STATEMENT OF ACTIVITIES FOR THE YEARS ENDED:
December 31

	2014	2013
Revenue		
Membership dues	$1,306,675	$1,318,300
Meeting fees	266,365	276,150
Sponsorships	111,000	58,211
Interest and investment income	67,801	72,145
Other	2,980	—
Total Revenue	$1,754,821	$1,724,806
Expenses		
Meetings	$566,229	$568,542
Trade shows	27,337	34,333
Management fees	583,600	626,600
Marketing and public relations	300,045	324,722
General and administration	80,379	120,709
Strategic initiatives	78,754	95,175
Miscellaneous/contingency	9,616	797
Total Expenses	$1,645,960	$1,770,878
Change in Net Assets	108,861	(46,072)
Net Assets – unrestricted		
Beginning of year	1,883,809	1,929,881
End of year	$1,992,670	$1,883,809

2015 MEMBERSHIP LEVELS

The Broadband Forum is an international non-profit industry association focused on engineering smarter and faster broadband connections. Our work defines best practices for global networks, enables service and content delivery, establishes technology migration strategies, engineers critical device and service management tools, and is key to redefining broadband.

Principal Members – $ 13,250 US

• Attendance to all annual, general and committee meetings of the Forum

• One vote each on all Forum issues, technical reports, and marketing reports

• Access to all working documents, contributions, technical reports, tutorials and meeting minutes

• Eligibility to run for Board of Director and Committee officer positions

• Eligibility to submit Technical Committee and Marketing Committee contributions

• Eligibility to take part in Forum testing events and programs (including those co-hosted with other organizations)

• Eligible for Committee Working Group Chair positions

• Subscription to all Broadband Forum email mailing lists

Small Company Principal Membership – $ 5,700 US

• All the privileges listed above for a Principal Member

Note: In order to allow for a more cost-effective membership for medium-sized companies, the Board of Directors has decided to increase the annual revenue threshold for the Small Principal member category. Starting from 2012, this threshold is set at $20 million USD, which means Small Company Principal Members must have had annual revenues under $20 million USD in the previous year. They are required to submit a letter from their CEO stating this.

Auditing Membership – $ 4,700 US

• Attendance to all annual and general (i.e., Summit and Plenary) meetings of the Forum

• Access to all working documents, contributions, technical reports, tutorials and meeting minutes

• Subscription to all Broadband Forum email mailing lists

• Eligibility to take part in Forum testing events and programs (including those co-hosted with other organizations)

• Auditing members may NOT attend committee meetings (i.e., Technical and Marketing Working Group meetings) of the Forum and are NOT eligible to submit Technical Committee or Marketing Committee contributions or vote on Forum issues, technical reports or marketing reports

Associate Membership – $ 1,250 US

• Attendance to all annual, general and committee meetings of the Forum (but not eligible to vote)

• Access to all working documents, contributions, technical reports, tutorials and meeting minutes

• Eligible for Committee Working Group Chair positions.

• Subscription to all Broadband Forum email mailing lists

Note: Associate Members must be not for profit or educational institutions. Institutions will be approved for membership annually by a majority vote of the Board of Directors.

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