Access and Transport Architecture

Note: For work and wiki pages predating the January 2019 formation of the Access and Transport Architecture Work Area, see the retired Architecture and Migration Work Area and the Routing and Transport Work Area wiki pages.

2. ATA Work Area Project Streams and Projects

Project Deliverable and Document Numbering Note

Most projects use deliverable (e.g., tutorial slide deck) and document numbers assigned independent of inter-relation or project association. (e.g., TR-421, MR-433, MR-238, TR-224, TR-350, MR-367)

However, some deliverables or documents are numbered in a series associating them together as related or part of the same project using a suffix notation (e.g., TR-452.1, TR-452.2, TR-452.3, etc;. MR-452.1, MR-452.2, MR-452.3, etc.; TR-319 Base, TR-319 Part A, TR-319 Part B, etc.) The suffix, when used, is treated as an integral part of the document number for purposes of revision (e.g., TR.459.2 Issue 2), amendment (e.g. WT-390.2 Amendment 1), or correction (e.g., MD-521.2 Corrigendum 1). Note that the first deliverable in a series may or may not use the .1 suffix. (e.g., TR-459, TR-459.2, TR-459.3 vs. TR-452.1, TR-452.2, TR-452.3, etc., MR-521.1, MR-521.2, etc.).

Questions on ATA document numbering should be directed to the Work Area Directors.

2.1. ATA New Project Initiation Forms (NPIFs)

Project Page: ATA New Project Initiation Forms (NPIFs)

Work Area Director: Jonathan Newton , Vodafone.

Description: Proposed new projects for ATA or combination of Work Areas including ATA.

2.2. ATA Non-PS Assigned Projects

Project Stream Page: ATA Non-PS Assigned Projects

3. Work Area Overview

3.1. Mission Statement:

The Access and Transport Architecture (ATA) Work Area (WA) defines and specifies the architecture and equipment requirements for access and transport network infrastructure. ATA produces industry-agreed specifications for applications such as broadband Internet access as well as specifications for managing, testing, and maintaining these networks and their applications. This work typically takes the form of architecture, equipment requirements, test & implementation guidance, and education materials.

Work Area Director:

- Jonathan Newton , Vodafone

3.2. Business Impact:

Work Area Director: Jonathan Newton , Vodafone.

Description: Projects that don't fit under the scope of an existing Project Stream or if they fit under the scope of more than one Project Stream, are developed under the Non-PS Assigned category.

2.3. Access Architecture (AA) Project Stream

Project Stream Page: Access Architecture (AA) Project Stream

Project Stream Leads: Jonathan Newton, Vodafone

Mission:

The project stream mission is to advance access broadband network architecture in traditional and new areas to ensure quality connectivity leading to quality user experience. Identify and document the key functionalities and relationships between entities to facilitate the transition of networks to encompass new practices such as virtualization while documenting the key functionalities that need to be brought forward to enable a seamless evolution path.A critical element of the work is the long term support of existing and new physical and statically management network elements alongside agile and virtualized functions in what effectively will be a stable hybrid network. This enables seamless migration based on market acceptance on new technologies, protection of existing infrastructure investment and normal spread of deployment in different territories.The project stream will focus on:

1. New, distributed access network architectures, including some or all of which is virtualized.
2. Defining the access (e.g., AN, BNG) function, interfaces and interactions of the equipment within these new architectures
3. Defining the equipment requirements needed to support the new architectures
4. Migration from existing access networks to those deployed leveraging the new architectures, functions and equipment
5. Maintenance of existing access architecture, functions and equipment requirements

Business Impact:

The work creates the necessary foundation for all of the broadband network. It underpins new value-added services and application delivery for fixed access networks, for 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 broadband network mitigating the risks to existing revenue and enabling market-paced migration. Drive evolution of the network to improve scale, resiliency, reliability and security.

Scope:

Specifically the project stream covers the following areas:

- Overall broadband access network architecture from RG through BNG.
- Conventional Broadband Network Gateway (BNG) - definition, architecture, function definition and requirements.
- Disaggregated Broadband Network Gateway - definition, architecture, function definition and requirements.

A critical element of the work is the long term support of existing network elements alongside virtualized software based network functions, resulting in a stable network that may be evolved over time. This enables seamless migration of new networking technologies based on their market acceptance, at the same time protecting existing infrastructure investment, and deployment into new different territories. ATA specifications underpin the network infrastructure, value-added services and application delivery for fixed access networks, and allow deployment at the pace of each relevant market. Co-existence of physical and virtualized solutions for static and dynamic services create a network infrastructure mitigating the risks to existing revenue at the same time it leverages new networking technology according to market demand.

3.3. Scope:

ATA maintains the primary architectures for the work of Broadband Forum. The architectures, requirements and other deliverables reflect the control, management, and data plane aspects of the access, transport and routed networks used to provide operator, enterprise and "over-the-top" Internet based connectivity services. The deliverables of the work area are designed to leverage and integrate new industry technologies while protecting investment of current deployments. These deliverables provide the industry with a collective and consistent methodology to drive product development and service deployment.

- Conventional Access Node (AN)- definition, architecture, function definition and requirements.

Projects

Project Name and Page Link	Project Overview
459 - Multi-Service Disaggregated BNG with CUPS	**Overview** The Architecture and Transport Architecture (ATA) Working Area (WA) has a rich history in defining various BNG architectures and requirements, from classic functions such as L2TP LAC to more recent functions such as Network Enhanced Residential Gateway (NERG) and Public Wi-Fi access in MS-BNG. The MS-Disaggregated BNG (DBNG) is an on-going project at ATA. TR-459 serve as a foundation document in defining the the architecture and requirements for a DBNG. Standardizing interfaces and protocols will ensure interoperability between various types of control planes and user planes deployments. One of the key objective TR-459 is to ensure the DBNG provides the same broadband service offerings as a classic MS-BNG. Compared to a classic MS-BNG, the MS-DBNG have several key advantages such as independent user plane and control plane scaling, independent control and user plane life cycle management, and centralized control plane for configuration. The separation of the control plane and user plane enables more efficient use of resources and simplifies operations. In addition, BBF is a forum that allows synergy amongst various work area and creates a unified vision for the broadband industry. An example of this is WT-459 the protocol selected for the State Control Interface (SCI) named, Packet Forwarding Control Protocol (PFCP). PFCP, a protocol defined by 3GPP in TS 29.244 for control and user plane separation (CUPS) communication, is used for 4G and 5G 3GPP architecture. In WT-458, CUPS for fixed mobile convergence, BBF again selected PFCP for the SCI. This is one of many examples of how BBF is providing a platform for all stakeholders to collaborate and create synergy across different Working Areas with a unified vision for Broadband.The DBNG project continue to define and study new architecture and new requirement of interest to service providers and vendors. DBNG YANG modeling, DBNG CG-NAT, and DBNG User Plane traffic steering are just some of the current working projects related to DBNG. New DBNG topics are encouraged to be brought to the ATA group through contributions, the following **link** provide the most up-to-date topics. **Project Deliverables under Development** **See BBF Work in Progress - Projects, Project Streams, and Jira Links** Filter the table at the link above on Work Area = "ATA" and Project Stream = "Access Architecture"

Completed Project Deliverables

Title	Number	Description	Resources	Editors
Disaggregated BNG	MR-459			Kenneth Wan
Improving Service Resilience through BNG Disaggregation	MR-459.2			Jonathan Newton
Five Key Questions on the Disaggregated BNG	MR-459.3			Kenneth Wan
CUPS for a disaggregated BNG: Objective and Scope	MD-459.4			TBA
IPTV Multicast for the Disaggregated BNG	TR-459.3	This document defines the architecture and requirements to support IP Multicast for a disaggregated BNG defined in TR-459.		Nagaraj S Turaiyur

	CGN Functionality for Disaggregated BNG Project	TR-459.2	This document defines the architecture and requirements to support CG-NAT for a MS-DBNG defined in TR-459.		Kenneth Wan
	Control and User Plane Separation for a Disaggregated BNG	TR-459i2	This document defines the architecture, the requirements, and the protocol for a control and user plane separation of a disaggregated BNG.		Kenneth Wan
Subscriber Session Steering	**Project Overview** Purpose: As Broadband Networks become more dynamic with SDN control and Cloud Central office, it is now possible to programmatically control which User Plane (UP) function each individual subscriber should be connected to. This creates many advantages for an operator to offer different service propositions to different customers.At the same time, User Plane functions (such as the BNG) are becoming increasingly disaggregated and cloud native, with centralised control plane and subscriber state and the ability to scale out (add additional UP processing functions) to manage short term or long term changes in load. There is a need for a standardised approach for a disaggregated service function ,such as a disaggregated BNG (dBNG), to be able to be able to identify to which UP instance newly authenticating subscribers should be connected, or to request that existing subscribers should be redistributed or moved between UP instances. In other words, we need to define an architecture and interfaces such that the access network can offer an ingress load-balancing capability towards cloud-native user plane functions Motivation:				

Network Operators will not be able to effectively deploy disaggregated service functions such as the dBNG without a standardized approach to balance and move subscribers between UP instances. Service Providers increasingly desire to differentiate the services that are offered to individual customers (eg low latency / by revenue / for high throughput).   This project will enable increasing differentiation by steering subscribers to a suitable UP function. This could include UP that are deployed to offer different SLA (i.e edge services). It may also include use cases where a subscriber-specific User Plane is created on demand, to which the subscriber session is then dynamically connected.Network Operators need new tools to be able to manage and upgrade networks as the industry moved to sdn /nfv. Session Steering will enable software deployment approaches in line with the cloud paradigm (such as automated incremental upgrades with canary testing on a small number of subscribers), as well as additional network resilience.Our industry is under increasing pressure to reduce power usage. The ability to dynamically move active subscribers between functions without service impact will allow hardware / software to be temporarily removed from service at certain times of the day.

Scope:

This project will create a WT that defines an architecture for Subscriber Session Steering, using the dBNG as an exemplary function.

The following are in scope for inclusion in the project:Phase 1:

- Identification & definition of the opportunities and use cases for session steering.

Phase 2:

- How to identify the UP instances that can serve a subscribers requirements
- How to balance newly authenticating subscribers amongst the available UP instances that can meet their requirements.
- How to request that a subscriber or group of subscribers is moved from one UP instance to a different UP instance (without customer impact if at all possible).
- How a change in subscriber policy can trigger a change in the placement of a subscriber.
- Requirements on the SDN controller to support session steering
- Requirements for the Service Function (eg dBNG) to support session steering
- Identification of the protocols and interfaces that will be used

Note: the term 'Subscriber Session' is used within the context of this NPIF as per the definition in TR-146. It is recognized that there may be use cases for steering with a different context of session (IP session or even IP Flow), but this is currently out of scope.

Project Deliverables under Development

See **BBF Work in Progress - Projects, Project Streams, and Jira Links**

Filter the table at the link above on Work Area = "ATA" and Project Stream = "Access Architecture"

Completed Project Deliverables

Title	Number	Description	Resources	Editors

497 - Public Wi-Fi User Authentication

Project Overview

Public Wi-Fi user authentication and data local forwarding technical requirements

Purpose:

This project aims to define the network architecture and technical requirements for Wi-Fi users to be uniformly authenticated by AC and local forwarding of user data, so that Wi-Fi devices developed by device manufacturers can meet the requirements of Wi-Fi networking and operation requirements. This project is to focus on the requirements and use case aligned and complementary to TR-321.

Motivation:

Further promote the development of Wi-Fi networking technology. The implementation of this project can realize the networking technology of Wi-Fi users focusing on AC authentication and management and local forwarding of user data. A variety of AC devices can be used for networking, including traditional dedicated AC and NFV based virtual AC (vAC) , etc. AC can also be deployed in the cloud. This networking mode can meet the new requirements of operators.

Scope:

Based on the TR-321 architecture 3, the project contents including the following three aspects shall be carried out

1.Define networking scenarios.

1The AC is deployed on the network cloud, and the AP connects to the AC through the Internet by a gateway device.

2The AC is deployed on the edge of the metropolitan area network or on the access network side, and APs access the AC through dedicated lines.

2.Propose user cases and formulate operation processes,

1) User address allocation operation process.

2) User association process.

3) User online operation process.

4) User offline operation process.

3.Put forward equipment technical requirements.

Project Deliverables under Development

See BBF Work in Progress - Projects, Project Streams, and Jira Links

Filter the table at the link above on Work Area = "ATA" and Project Stream = "Access Architecture"

	Completed Project Deliverables				
	Title	**Number**	**Description**	**Resources**	**Editors**

515 - Security Considerations for IPv6 Broadband Networks	Purpose: To provide some ipv6 deployment considerations to mitigate Ipv6 risks, and then also specify the IPv6 security requirements of network equipment in broadband network. Scope: Phase 1: • Review the current BBF specifications on IPv6 security, including TR-146, TR-177, TR-187, TR-242, TR-296, to help understand the impacts and updates brought by this project. • Introduce IPv6 security techniques, such as CGA, SEND, IPsec, BGPsec, RPKI, SAVI & SAVNET etc. • Specify IPv6 security requirements for the network elements at broadband network, including RG, access nodes and BNG. • Provide deployment considerations for IPv6 security (e.g., SLAAC, DHCPv6, IPv6 Transition/Co-existence, SRv6 security considerations, etc.) Phase 2: • Specify test plan for IPv6 security requirements **Project Deliverables under Development** **See BBF Work in Progress - Projects, Project Streams, and Jira Links** Filter the table at the link above on Work Area = "ATA" and Project Stream = "Access Architecture" **Completed Project Deliverables**

Title	**Number**	**Description**	**Resources**	**Editors**

2.4. Performance, Experience, and Application Testing (PEAT) Project Stream

Project Stream Page: Performance, Experience, and Application Testing (PEAT) Project Stream

Project Stream Leads: Fabio Giudici

Mission:

The project stream mission is to advance testing in traditional and new areas to ensure quality connectivity leading to quality user experience.

The project stream will focus mainly in two areas:

1. Enhanced packet layer performance testing e.g.,bandwidth/capacity, min/average/max latency measurements and jitter, loss, etc and
2. Testing that goes beyond traditional packet layer performance to test and analyze the application and service layer quality

Both are needed to provide insight into quality of experience and application outcomes such that the network, while essential, becomes an invisible part of the customer experience.

Business Impact:

Provide the information needed to analyze a network's detailed performance allowing service providers to offer not only higher capacity connectivity services, but also higher quality connectivity services.

This in turn enables and accelerates industry adoption and deployment of new services and infrastructure.

Scope:

Specifically the project stream covers the following areas of connectivity quality testing:

- CE to IP Edge testing extends Broadband Forum's OAM framework with architectural and nodal requirements to enable Customer Equipment to IP Edge service assurance of broadband subscribers, both for business and residential connections.
- IP Layer Capacity Metrics and Measurements harmonizes the Industry around a specific set of Capacity metrics and measurement method with clear benefits of multi-dimensional performance assessment at existing and new Gigabit-rate access speeds.
- Quality Experience Delivered is a method of systems performance analysis that decomposes a round trip time into constituent components enabling the networks performance to be analyzed and traced to sources causing performance degradation (packet loss/delay), be they structural (architecture/design), network dimensioning (link speeds etc.) or network load/scheduling related.
- Broadband Service Metrics Project aims to identify sets or suites of metrics or Key Performance Indicators (KPIs) that impact service delivery.

Project Name and Page Link	Project Overview
Performance Measurement from CE to IP Edge Project	**Project Overview** This project will extend Broadband Forum's OAM framework with architectural and nodal requirements to enable Customer Equipment to IP Edge service assurance of broadband subscribers, both for business and residential connections. The main business drivers for this work are:

- Define standardized mechanisms for performance measurement (e.g. delay, jitter, loss) between network side of the RG/CPE and access side of the BNG/PE
- Give service providers insight on how their access network is performing
- Ability to use existing but not currently deployed tools

The BBF is in a unique position to give service providers the tools they need in this subject matter, defining a solution that allows measurement and exposure of RG/CPE to BNG/PE network performance and addresses the current gap.

Project Deliverables under Development

See BBF Work in Progress - Projects, Project Streams, and Jira Links

Filter the table at the link above on Work Area = "ATA" and Project Stream = "Performance, Experience, and Application Testing (PEAT)"

Completed Project Deliverables

	Title	Number	Description	Resources	Editor(s)
	Performance Measurement from Customer Equipment to IP Edge	TR-390	This specification extends Broadband Forum's OAM framework with architectural and nodal requirements to enable Customer Equipment to IP Edge service assurance of broadband subscribers, both for business and residential connections.		Guiu Fabregas , Nokia
	Performance Measurement from Customer Equipment to IP Edge	TR-390i2	This specification extends Broadband Forum's OAM framework with architectural and nodal requirements to enable Customer Equipment to IP Edge service assurance of broadband subscribers, both for business and residential connections. - Using STAMP		Gregory Mirsky , Ericsson
	Performance Measurement between Customer Equipment and IP Edge	TR-390.2a1	Quality Attenuation Measurement in Broadband Access Network using STAMP		Gregory Mirsky, Ericson
Broadband Quality Experience	**Project Overview**				

Delivered (Broadband QED) Project	This project will deliver documentation that gives a comprehensive overview of Quality Attenuation and its applicability to broadband networks. It will cover the theory, measurement technique, use-cases and benefits of the approach.

Project Deliverables under Development

See BBF Work in Progress - Projects, Project Streams, and Jira Links

Filter the table at the link above on Work Area = "ATA" and Project Stream = "Performance, Experience, and Application Testing (PEAT)"

Completed Project Deliverables

Title	Number	Description	Resources	Editor(s)
Broadband Quality Experience Delivered (Broadband QED)		Documentation of broad-ranging study	**CONTRIB-21189** - Getting issue details... STATUS	Peter Thompson , PNSol Bruno Cornaglia, Vodafone
Motivation for Quality Broadband (QED & Quality Attenuation)	MR-452.1	First MD in the series for MD452, describing the motivation for QED	**CONTRIB-21664** - Getting issue details... STATUS	Jonathan Newton , Vodafone

Text for MR on QED Uses in Lab Evaluation & Network Design	MR-452.4	draft Marketing Document on use of Quality Attenuation in NW design & lab evaluation phases	**CONTRIB-22449** - Getting issue details... STATUS	Gavin Young , Vodafone Peter Thompson , PNSol
proposed text for MD on QED for creation of application SLA	MR-452.2	Proposes a draft for an MR in the MR-452.x series to cover the use of DeltaQ in managing customer SLA.	**CONTRIB-22309** - Getting issue details... STATUS **CONTRIB-22673** - Getting issue details... STATUS **CONTRIB-22674** - Getting issue details... STATUS	Jonathan Newton , Vodafone
Quality Attenuation Architecture and Requirements	TR-452.1	First TR for the revised NPIF - in Final Ballot	**CONTRIB-22003** - Getting issue details... STATUS **CONTRIB-22012** - Getting issue details... STATUS **CONTRIB-22119** - Getting issue details... STATUS Outstanding issues	Peter Thompson , PNSol Rudy Hernandez , Spirent

	Quality Attenuation Measurements using Active Test Protocols	TR-452.2	Second WT for the revised NPIF	**CONTRIB-22056** - Getting issue details... STATUS **CONTRIB-22800** - Getting issue details... STATUS **CONTRIB-22825** - Getting issue details... STATUS	Peter Thompson , PNSol
	Quality Attenuation Measurements Using L2 PM OAM	TR-452.5	This Technical Report addresses the implementation of Quality Attenuation (Q) measurement using Data Link Layer (L2) Active Test Protocols.		Fabrizio Guidotti OutSys Fabio Giudici , OutSys

IP-Layer Capacity Metric, Related Metrics, and Measurement Methods Project	**Project Overview** Standardize the IP-Layer Capacity Metric and Measurements with the benefit of BBF membership's unique expertise and perspectives. Ideally, to harmonize the Industry around a specific Capacity metric and method with clear benefits of multi-dimensional performance assessment at existing and new Gigabit-rate access speeds. **Project Deliverables under Development** **See BBF Work in Progress - Projects, Project Streams, and Jira Links** Filter the table at the link above on Work Area = "ATA" and Project Stream = "Performance, Experience, and Application Testing (PEAT)" **Completed Project Deliverables**

Title	Number	Description	Resources	Editor (s)
Maximum IP-Layer Capacity Metric, Related Metrics, and Measurements	TR-471 TR-471i2 TR-471i3		Click Here	Al Morton, AT&T
Maximum IP-Layer Capacity Metric and Measurement	MR-471.1 MR-471.2		Click Here	Al Morton, AT&T

| Broadband Service Metrics Project | **Project Overview**

This project is to address the needs of an operator to monitor and assure a platform for service delivery, encompassing QoS flows or slices across the network as well as vital aspects of service origination such as computing platforms, resources and sessions. The scope is limited to identifying sets or suites of metrics or Key Performance Indicators (KPIs) that impact service delivery. Sets of metrics can each apply to a class of services or application flows, and there is also a common set of service metrics.

Project Deliverables under Development

See BBF Work in Progress - Projects, Project Streams, and Jira Links

Filter the table at the link above on Work Area = "ATA" and Project Stream = "Performance, Experience, and Application Testing (PEAT)"

Completed Project Deliverables

Title	Number	Description	Resources	Editor (s)