The Key Role of Industry Standards in Services-led Broadband

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From residential services like cloud gaming with VR headsets to business services and home-working with high upload demands, the average broadband service is made up of many different types of broadband subscribers, all with different service requirements. Add in IoT, smart home devices, video streaming, and security controls, and it becomes clear that today's broadband ecosystem is made up of increasingly diverse devices, technologies, and services—all of which need enhanced Quality of Service (QoS) and Experience (QoE).

Newer and increasingly interactive applications have made users aware that connectivity, higher speeds, and bandwidth is not enough to enjoy the full potential of their devices and services. This has sharpened the focus of the entire industry to increase the value of broadband to the end customer. Connectivity alone is no longer enough. Smarter Customer Premises Equipment (CPE), and cloud-based services that drive an "à la carte" and differentiated service offering at the touch of a button, will be essential for network operators to deliver superior QoE and secure the new revenue opportunities at their disposal.

Taking customer QoE into consideration

Because our "always on," ultra-connected lifestyle demands so much more from our networks, QoE can no longer be ignored. The International Telecommunication Union (ITU) defines QoE as "the overall acceptability of an application or service, as perceived subjectively by the end-user." QoE is a measurement used to help understand and analyse the individual experiences of actual users when they interact with an application or service.

When broadband speed and bandwidth is no longer an inhibitor, QoE will be regarded with equal importance or even as *more* important. As traditional revenue steadily declines, the majority of employers are willing to adopt home-working and harness new revenue models that keep residential broadband and the home worker separate.

The emergence of applications such as Virtual Reality (VR), Augmented Reality (AR), the metaverse, and other high-bandwidth, latency-sensitive applications have the potential to place tremendous strain on broadband networks. Equally, using connected devices and networks to store and share sensitive data has exposed end-users to a greater threat landscape, as well as highlighted the network-based security solutions needed to secure both the device and the network it is on. The main challenge for operators is

having the ability to manage this wide spectrum of devices and services, along with the varying requirements they bring.

This has shifted the focus of future broadband towards a services-led approach, and as a result, networks must become more sustainable. The industry must take an innovative approach to shift from typically connection-based broadband to a service-orientated ecosystem, and the requirements across the network to deliver an end-to-end QoE service model.

Industry standards: dealing the interoperability hand

Broadband and telecoms decision makers across the globe need to collaborate and create an interoperable ecosystem to ensure that the future investment needs of service providers are addressed, and greater value ultimately delivered to residential and business subscribers.

Relevant industry standards that support the current and future investments needed for the entire broadband ecosystem are critical, to arm service providers across the globe with a clear understanding of the best practices, architectures, and new technologies. Standards provide a common framework that can ensure a service providers' network and service deployments are both proven and leverage a truly multi-vendor approach. This allows service providers to avoid vendor "lock-in" and marries the best of regulatory requirements, vendor solutions, open-source software, and open standards.

Industry standards are going to play a significant role moving forward when it comes to making deployments easier, increasing multi-vendor network interoperability, and supporting the wider broadband community. This will be beneficial to end users who will experience the QoE they desire for a range of different applications such as those in the connected home. Once vendors' products are trusted and proven, operators and equipment manufacturers can act with confidence, knowing that their products meet

the end users' requirements. It is only through interoperability—from the cloud all the way to the device—that the door can be opened to new use cases essential in addressing the rising consumer demand and expectations. This presents a great opportunity for service providers to offer premium services such as Wi-Fi management, network security, parental control, and home automation.

Come together - a collaborative broadband ecosystem

Operators know they have a strategic decision to make, to remain a "utility-like" connection-based network operator or to increasingly add new services and intelligent application aware broadband QoE, but how they do that has, until now, remained elusive. This is thanks to the work of industry standards that has provided the broadband industry with new insights, innovations, and holistic solutions to industry challenges.

For example, the demand for better network services has presented operators with the opportunity to leverage end-user network gateways such as Wi-Fi routers as a platform to unlock a myriad of third-party applications and services. These end-user gateways often serve as the central point for connectivity and network security inside the home.

The exploitable functionality of an additional app-like service layer right at the edge of the network will allow more control and better resilience for all the players in the ecosystem, as well as improving choice and the overall experience for customers. This paves the way to what many could see as the broadband service provider's own "dynamic app store"—driving any additional services to be uniquely stored on the subscriber's broadband gateway and separated into individual secure software containers.

By leveraging a centralized internet gateway device or other CPE, service providers can effectively deploy, activate, and manage third-party applications. This includes parental controls, private homeworking, Wi-Fi analytics, smart home functions, or any third-party entertainment and gaming services and security solutions for consumers. Service providers can differentiate and scale their business models accordingly to provide a more customizable offering to each subscriber. This will allow the

industry to cater to multiple market segments, such as teleworkers, e-health, security, home automation, and AR and VR.

App-enabled services gateways could, for example, monitor and troubleshoot regimens that support unloading bad applications and isolating bad network devices to protect the end-user when needed. These innovative gateways will be hardened against cyber-attacks, be able to operate over a broader range of environmental conditions, and be robust to changes in technology and equipment failures by upgrading and migrating customer applications and data on-demand. Expansion and operation with all networked devices to extend connectivity and support IoT services is also enabled through the new gateways.

Transitioning from connectivity-driven

The home has become a "technology hub" with an array of devices for all different kinds of uses. It is the responsibility of the operator to unlock the full potential of these devices and provide the end customer with a seamless experience. Operators have long realized that the broadband industry has outgrown speed and connectivity, shifting to a services-led model to accommodate for the new and colourful ecosystem of technologies available.

Standards Development Organizations (SDOs) have pinpointed that there is a clear need for agile network service delivery from proof of concept to real-world deployments, monetization and differentiation of services, and a multi-service broadband network. By leveraging industry standards, operators can derive optimum value from this shift to a services-led approach.

The ongoing work of standards development organisations and open source foundations, including the likes of Broadband Forum, the Connectivity Standards Alliance, RDK, and prpl Foundation, continue to support the shifting focus of the whole broadband ecosystem towards services-led broadband. Notably, Broadband Forum has released technical standards such as [TR-369 (USP)](#), [TR-181](#), [QED TR-452](#), and [Metric testing TR-471](#) that are enabling service providers to effectively manage and monitor their subscribers' CPE and smart homes to provide the best QoE.

An interoperable ecosystem that is aligned with industry standards can unlock revolutionary tools, such as an app-enabled gateway that operators can leverage to adapt to the changing requirements that end users demand within the home.