Residential Broadband Network Design Checklist

What you need to consider to ensure market success

1. Broadband is a fast-paced market. Prepare your network for an agile response.

New applications, different customer demands, and additional communities to serve are all part of new and evolving broadband market dynamics. Adding more cards to a legacy solution architecture is a hindrance to implementing a flexible and agile next-generation broadband network. It wastes your investment and does not allow you to adapt to future business objectives. Having scalable, modular, open, and automated network infrastructure is fundamental to ensure your competitive edge. The ability to serve more customers and offer more bandwidth—without needing to replace network infrastructure—is decisive in guaranteeing a differentiated Quality of Experience (QoE) to your customers.

2. A complete Total Cost of Ownership (TCO) analysis is essential to guarantee competitiveness.

Although the initial investment in network infrastructure is a crucial phase of any buying decision process, it can't be evaluated alone. The cost of operating the network, expanding coverage, scaling capacity, offering new services, and capturing new revenue opportunities is more impactful to the success of network operators than just initial CAPEX. Elements such as high XGS-PON port density per Rack Unity (RU) with the simplicity of XGS pluggables, a clear path to higher speed PON like 25GS-PON, and the capacity to support 100/200/400 Gb/s coherent optical uplinks in a highly energy efficient infrastructure are essential factors in evaluating your network solution cost. On the software side, you need to look for a domain controller that can support multiple services and layers—simplifying operations and increasing service agility. Finally, a virtualized subscriber manager (such as a virtual Broadband Network Gateway [vBNG]) that can scale with the demand and support Control and User Plane Separation (CUPS) to improve your network performance

and security while reducing cost, should be at the top of your list when implementing or evolving a residential broadband infrastructure.

3. Be prepared to rapidly expand your addressable market.

Even if you're focused on providing residential broadband services to a new community or evolving the existing broadband network infrastructure to support new services, you must be ready to address additional business opportunities. This also helps you to expand your addressable market while blocking new entrants to your incumbent market. Monetizing your network infrastructure by offering business services or supporting a Mobile Network Operator (MNO) expanding to a new location by providing xHaul wholesale services shouldn't require you to implement a network overlay or invest in a different set of equipment that wastes CAPEX, power, and space. Your residential broadband solution should allow you to be as focused or diversified as you want by leveraging the same platform and network infrastructure.

4. A scalable network is essential to guarantee customers' QoE.

Network operators are competing for customers and looking to have better service offerings. One option is to broaden your service tiers. While some network operators offer symmetrical services of 100 Mb/s or more, others in more competitive areas are already moving to multiple Gb/s. Having a network that can scale according to customers' needs is paramount to ongoing market success. While existing applications allow network operators to take advantage of higher oversubscription levels, new cloud-based applications will require more bandwidth to directly impact network capacity. Higher-speed PON interfaces that can scale access is one side of the equation, but it's also fundamental to have Optical Line Terminals (OLTs)

with switching and uplink capacity to support new services. Leveraging XGS-PON or 25G-PON to offer premium services without proper network infrastructure to support it will negatively affect your customers' QoE, creating frustration and inevitable churn. You must properly plan your network uplinks, aggregation, and middle-mile capacity to support your customers' future demands.

5. Your ability to start small and grow with demand is essential.

Implementing a new network, expanding an existing one to cover new areas, or evolving to support new applications demands significant investment—albeit with uncertainty about customer adoption rates. Legacy technologies force customers to decide between the capacity to support a higher demand or limiting their ability to grow. Many network operators suffer from idle capacity in one location and insufficient resources in another. Moreover, regional or rural deployments need a solution to grow with their customer base and associated revenue. This allows Regional Service Providers (RSPs) to optimize initial investments to cover more communities while reducing risks by fostering long-term sustainability. Achieving this requires a modular solution that cost-effectively scales with demand. A router-based OLT allied with XGS-PON pluggables can start small, supporting hundreds of customers, and scale to support tens of thousands of customers in a single location without high upfront investment or short-term equipment replacement. The management solution must scale to support this wide range of OLTs to give network operators peace of mind that their future opportunities are protected.

6. If you want to implement a future-ready broadband network, look for openness.

Predicting what technologies and network functionalities will be required to support future applications is challenging. Metaverse, cloud gaming, and extreme reality are good examples of highly network-dependent technologies, and we've barely touched their potential. If you want to create a network that can cost-effectively evolve, you must guarantee your chosen solution is open to allow you to define which technology you need to create best-of-breed infrastructure. Future-proofing via best-of-breed networks requires the freedom to adopt the right technology at the right place and at the right time—without being constrained by vendor lock-in. Having a fiber-based access network in which the OLT can connect with different vendors' Optical Network Unit (ONU)/

Optical Network Terminal (ONT), a vBNG that can authenticate multiple gateway option, and domain controller that efficiently manages a multi-layer, multiservice network and uses open APIs to interconnect your in-house or third-party tools is what makes your network future-proof. This should be at the top of your list.

7. With next-generation broadband architecture, you'll be ready for the future.

Although residential broadband services are not new, they're now deeply associated with concepts like performance, low latency, high availability, sustainability, and affordability. Societal expectations have drastically changed regarding what's expected from residential broadband services, so your network must evolve accordingly. Incremental innovation over legacy architecture is insufficient to create the network you need for the future. Investing in solutions based on single-application chassis and cards, feature-poor OLTs that require an external router, monolithic platforms that must be replaced with growing, hardware-based BNG that does not scale and a closed ecosystem requiring multiple management systems to support an end-to-end solution will significantly impact your ability to provide your customers with the services they need and the profitability and sustainability you expect. As you plan how to deploy a new network—or evolve or expand an existing one—it's fundamental to pursue a broadband architecture that's open, modular, and scalable and integrates routing and switching functionality with XGS-PON pluggables in the access and coherent optical pluggable for uplinks. Together, this provides a powerful and straightforward path, allowing you to start small and grow with evolving customer demands. The same architecture should leverage virtualized and disaggregated subscriber management functions (vBNG) to increase service performance, scalability, and reliability, as well as reduce cost. Openness, coupled with a multi-layer, multi-service domain controller, provides you with the ability to build a best-of-breed network that addresses your specific market requirements. New waves of applications will require more from your residential broadband than a legacy architecture can provide, so you must think ahead to succeed in your served markets.

8. If you think an open and multi-vendor solution means complexity, look again.

Planning, designing, integrating, deploying, and managing a broadband network can be daunting for network operators of all sizes. Evaluating a closed single-vendor solution is tempting,

but also risky because of being locked into that vendor's innovation roadmap and financial viability. It's fundamental to weigh the short-term benefits of a simple initial implementation against the impact of a limited network solution that jeopardizes your long-term ability to compete. To capitalize on benefits of a more robust open-architected solution requires people with the right experience, insights, and tools to tie those technology pieces into a cohesive solution, specific to your market's needs, and then effectively promote and profitably deliver it to your customers. Consider if your team has the breadth of skill to handle either the entire implementation, or just part of it. Then, be sure to engage a partner with an end-to-end view who can get you where you need to go.

9. Managing, visualizing, and operating your network cannot be a relay race.

While the cost of deploying or expanding a network is one of the primary factors when choosing a vendor or an architecture, the cost of managing and operating the network is also critical to guarantee you'll have a competitive price for an agile service. A broadband network solution that includes a flexible and scalable domain controller that can manage your infrastructure from the ONU/ONT at the customer's home to the optical core—including the OLT, IP aggregation, and optical line systems—is a significant driver to reduce cost, time to market, and time to revenue. It's also essential that your software solution supports open API to enable integration with existing in-house or third-party systems, allowing you to fully automate certain less-critical activities.

10. Sustainability is the name of the game, and it has many faces.

Just like broadband connectivity, sustainability is no longer just optional—it's become a fundamental requirement for people around the world. This means it's critical to implement a solution that requires significantly less power and space to operate. Temperature-hardened or weatherized platforms that can support more challenging deployment scenarios without needing climatization improves your network performance and simplicity while reducing cost, power requirements, and time to revenue. Opting for a more modular and scalable architecture will allow you to support more services longer—reducing the need to constantly refresh your network infrastructure, lowering your CAPEX requirement, protecting your investment, and reducing your operation's environmental impact. For networks being upgraded, remember to consider retrieving and repurposing or disposing of old equipment sustainably. As environmental impact is at the forefront of most organizations' Environmental, Social, and Governance (ESG) initiatives, another critical aspect is long-term economic sustainability. Network operators leveraging governmental stimuli money or venture-capital investments need to create a healthy and self-sustainable business to support their communities and customer base. A solution with highly optimized energy and space requirements that scales to support your customers' future demands and incorporates a software layer that simplifies operations is the foundation of a successful operation. Adding the ability to deliver multiple services—increasing your revenue opportunities without requiring any significant additional investments—puts you at an advantage to thrive in this exciting market.

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