INFOBRIEF

Broadband network design checklist

Consider the following factors to ensure market success.

1. Prepare your access network for a flexible response in the fast-paced broadband market.

New applications and use cases, evolving customer demand, and opportunities to serve more communities are all part of a new and evolving broadband market.

Take as an example legacy architectures for optical line terminals (OLT). They usually have a chassis-based or pizza-box form factor. The size and footprint of these network elements dictate where the equipment can be deployed (physically and economically), and scaling to higher capacities is not graceful. This leads to deploying too much or too little capacity at given locations, thereby negatively impacting investment.

A new level of flexibility is crucial to deploying capacity in the location where it is needed, when it is needed, and in the increment which is needed. It is difficult to forecast where demand might occur, so be sure your broadband solution has the flexibility you need.

2. Analyze the total cost of ownership (TCO), not just initial CAPEX.

Although the initial investment in network infrastructure is a crucial phase of any buying decision, it should not be evaluated in isolation. The cost of operating the network, expanding coverage, scaling additional capacity, offering new services, and capturing new revenue opportunities are equally important to the success of the network operator beyond just initial CAPEX.

Ciena's micro-OLT (uOLT) is the industry's first fully functional OLT in a small form factor pluggable. The uOLT turns qualified Ethernet ports in a host switch or router into an OLT on a port-by-port basis (no dedicated chassis required), while other ports can be used for other services (Ethernet, IP, TDM, OLT, and so on).

Therefore, the OLT function can be deployed anywhere in the access network (street cabinets, pole, strand, or central office), and it can be scaled by simply adding more uOLTs into available router ports for a true pay-as-you-grow deployment model.

Network operators can also offer enterprise business services over IP or dedicated Ethernet and mobile xHaul, as well as a passive optical network (PON). This all comes from the same aggregation router in a highly optimized footprint to reduce energy and space requirements, thereby accelerating sustainability while significantly reducing operational expense.

For operations and management, consider a network control suite that can support multiple services and layers—simplifying operations and increasing service agility.

Evaluate how closely you can match capacity deployment to market demand. Does your network design force you to deploy more capacity than you need simply due to the constraints of the equipment used in the network design, or does it have the granularity needed to grow incrementally? Finally, consider the

operational savings and the long-term sustainability model of your design. Are footprint, power usage, and cooling being optimized or compromised by the design?

3. Be prepared to rapidly expand your addressable market.

Even if you're initially focused on upgrading the residential broadband offering to your existing service area, evaluate your network design for its ability to expand quickly into new markets or to rapidly deploy new services. For example: How quickly can you deploy PON into new geographies? Can you offer multiple services out of the same converged router (including PON) so that you can monetize your network infrastructure by offering multiple services?

4. Create a scalable network to meet demand.

Network operators are looking for the best and most efficient way to serve their customers. Delivering broadband service over a rigid infrastructure can hinder those efforts, resulting in poor customer satisfaction, customer churn, and loss of revenue.

One option is to broaden service tier offerings. New cloud-based applications will continue to require more bandwidth, which will continue to put strain on the network. A network that can scale according to customers' needs where and when it is needed can have a positive impact on market success. This is not only true when considering PON deployment and OLT architectures but also the architecture and deployment flexibility of the broadband network gateway (BNG).

Legacy (chassis-based) BNGs, with their historically closed architectures, make it difficult to address rapidly changing demands for scalability and flexibility. In your network design, consider Ciena's virtual Broadband Network Gateway (vBNG), which has an open architecture and is built to the Broadband Forum's TR-459 standard: "Control and User Plane Separation for a disaggregated BNG." User planes can be sized and placed anywhere in the network with a vBNG and then scaled gracefully to meet traffic demand, which is essential for market success.

A network design that includes XGS-PON pluggables (like the uOLT) can incrementally scale a port at a time as easily as it can be deployed at scale—an important consideration in a highly dynamic market. Scaling also includes the ability to move to higher speeds. It is important to think ahead to 25GS-PON. A pluggable OLT model means that as 25GS-PON emerges, it can also be deployed in qualified Ethernet ports. This allows the combination of XGS-PON and 25GS-PON to coexist and give operators the needed flexibility to address use cases where each technology can best be applied. Operators will likely first use 25GS-PON strategically for large enterprises, campus environments, access network aggregation, mobile transport, wholesale connections, and high-end residential customers.

5. Start small and grow with demand.

Implementing a new network, expanding an existing one into new geographies, or evolving to support new applications can demand significant investment—albeit with uncertainty about customer adoption rates.

Legacy architectures that are chassis-based or pizza-box form factor equipment (small, medium, or large) often force operators to choose between deploying too much capacity to support an anticipated growth in demand far ahead of actual growth or compromising and not deploying enough capacity at a given location in the case where demand does not manifest as anticipated.

Many network operators suffer from idle capacity in one location or insufficient capacity in another. Moreover, regional or rural deployments need a solution to grow with their customer base and therefore with associated revenue.

A design is needed that matches capacity deployment as close to actual traffic growth as possible. This allows PON access providers to optimize initial investments to cover more communities while reducing risk. A flexible solution that cost-effectively scales with demand is required. Network operators should strive for a network design that can be deployed and efficiently scaled to rapidly deliver service when and where it is needed.

6. Look for flexibility and openness to support future technologies.

Predicting what technologies and network functions will be required to support future applications is challenging. Metaverse, cloud gaming, and virtual reality/augmented 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 ensure your chosen solution is flexible enough to adapt to future demands. It's important that a software-defined vBNG can easily add new features without adding new hardware or can support and implement policies across a broad set of services and adapt to new services.

7. Prepare for the path ahead with next-generation broadband architecture.

Broadband services are not new, but they are now closely associated with concepts like performance, low latency, high availability, sustainability, and affordability. Societal expectations have drastically changed regarding what's expected for broadband services, so the network must evolve accordingly.

Incremental innovation over legacy architectures is insufficient to create a network design needed for the future. We are in a defining moment—where a once-in-a-generation public and private investment in broadband will redefine how internet access is delivered and consumed for both personal and business applications. It is an opportunity to rethink how innovation can be used to address new opportunities. Fiber has a 30-year life, and it's imperative to ensure your network design has the flexibility, scalability, and sustainability to carry you well into the future.

8. Realize that openness and flexibility do not have to mean complexity.

Planning, designing, integrating, deploying, and managing a broadband network can be daunting for network operators of all sizes.

It's important to consider a network design that supports open standards and interfaces. This flexibility leads to choice in the selection of certain network equipment or functions. An example is investing in a solution that is open and enables support for third-party ONUs using the open ONU management and control interface (OMCI). This helps enable deployment of various ONUs that can best meet the needs of a diverse customer base.

Capitalizing on the benefits of an open architected solution also requires people with the right experience, insights, and tools to tie network elements into a cohesive solution. Consider if your team has the breadth of skill to handle both the network design and implementation. If some or all that needs to be augmented, then be sure to engage a trusted expert with the capability and service offering to get you where you need to go.

9. Simplify the visibility, operations, and management of your network.

While the initial cost of deploying or expanding a network is one of the primary factors when choosing a vendor or an architecture, the cost of ongoing network management and operation is an important consideration. Network operators are often encumbered with multiple legacy network management systems (NMSs) or controllers. An efficient broadband network design should also include a flexible and scalable network control suite that can perform infrastructure, service, and subscriber lifecycle management to simplify operations, reduce OPEX, and transform your access network.

10. Don't compromise on sustainability.

Companies are taking responsibility as stewards of the planet, setting corporate objectives for sustainability and looking for network designs with positive environmental impact.

The challenge is that power, cooling, and real estate costs for access networks continue to increase, which consumes more OPEX. Traditional access networks are built with single-purpose power-hungry equipment that consumes an inordinate amount of space with limited options (small, medium, or large) and requires power and cooling even when not fully populated.

To accelerate sustainability goals, it's critical to implement a network design that requires significantly less power and space to operate. The ability to reduce the environmental impacts of your access network begins with deployment of a converged access router enabled with pluggable uOLTs. This network design is not constrained by fixed equipment sizing (small, medium, or large) and only incrementally uses space, cooling, and power as needed.

Several services can be delivered with a single converged router, thereby eliminating the need for multiple network components in the solution. Considering this in the network design also enables delivery of several revenue-generating services (Ethernet, IP, TDM, and OLT) from the same converged platform.

Flexible and future-ready broadband solution

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