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PON's Next Success is 25G PON

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Summary

Catalyst for 25G PON

25G passive optical network (PON) deployments are likely to begin in 2022 based on interviews with operators across the world. The basic catalyst for higher-speed PON is bandwidth demand, with momentum for 25G PON increasing as operators reuse their FTTP networks for higher-revenue customers and applications. These customers and applications include high-end gamers, enterprises, and 5G small cell transport, known as xHaul. PON has proven its success as the widely deployed fiber access infrastructure, supporting more than 680 million homes today. The PON ecosystem has a well-developed upgrade path, with 10G PON in deployment now, over the same optical distribution network (ODN) as earlier generations of PON technologies. 25G PON provides operators with an upgrade path to higher-bandwidth services, along with support for network slicing.

Omdia view

Communication service providers (CSPs) are seeking unified access networks and focusing on reuse of the ODN infrastructure, thereby saving capex while enabling efficient fiber asset usage. 25G PON is on the upgrade path for numerous CSPs, whether they are integrated, fixed-only, mobile-only, or wholesale operators. 25G is becoming a necessity, supporting growing bandwidth and enabling cost-efficient transport for 5G small cell networks. The 25G PON ecosystem is ready, encompassing subcomponent, component, and equipment vendors, along with software-defined access software solutions that support network slicing, where desired. The competitive strategies for deploying 25G vary from being the fastest access network provider to supporting enterprise services efficiently, and from supporting numerous retailers on a wholesale network to supporting 5G xHaul.

Recommendations for CSPs

- Begin evaluation now and join more than 10 operators around the world that have tested 25G PON prototypes.
- Examine future bandwidth requirements and develop use cases. Forecast future bandwidth needs among subscriber segments. Evaluate your opportunity to expand into higher-value subscriber and application segments using the same access network. Appraise the need for 5G xHaul transport – whether to be used internally or as a service to mobile operators.
- Determine how 25G PON supports your competitive positioning vis-à-vis competitors.
- Develop an implementation plan based on your use cases and competitive environment, along with your regulatory environment.
- Understand the coexistence options for 25G PON along with GPON and XGS PON.

PON's successful and expanding role

PON is a widely deployed technology, supporting more than 680 million homes around the world, with forecasts of adding 30 million more households, per year, for at least the next five years. PON's success comes from competitive cost points compared to point-to-point fiber access, its efficient use of fiber assets, and space and power advantages. In addition, PON technologies, both GPON and EPON, have easy upgrade paths to 10G. 10G PON equipment deployments are well underway with more than 6.8 million optical line terminal (OLT) ports shipped to operators around the world.

In addition to equipment shipments and FTTH penetration rates, PON's success can be seen from its deployment by different kinds of operators. Early deployments began with traditional operators, often incumbents, that were focusing on meeting the growing bandwidth demand by residential subscribers. Where permitted, electric utility companies began to deploy PON, providing fiber-based communications for internal use and for their customers. Next came mobile operators, as they acquired fixed networks, and viewed unified fiber access as key to FMC. Now we are seeing a growing number of wholesalers – both incumbents transformed into wholesalers, and over-builders (namely new network builders that see the financial opportunities of owning fiber access infrastructure for leasing to retail operators) with network-as-a-service (NaaS) commercial models.

The PON ecosystem is expanding, contrary to other communication equipment segments. The new entrants are seeing opportunities in the growing PON market, such as the ability to switch and route equipment to support PON OLT functions or, for cable operators, the ability to use the same cloud-based operating system regardless of the underlying medium, whether coax or fiber.

The use of PON for nonresidential applications and customers is gaining traction with 10G PON product availability, opening up new revenue streams on the same ODN. CSPs are focusing on PON infrastructure reuse, as discussed in the next section.

The single access network and 25G PON

The major barrier to fiber access networking is the cost of the underlying ODN, consisting of ducts, fiber cabling, splitters, passive equipment, and active equipment. Layer 0 technology innovations have reduced the costs of FTTP construction but the cost per premise is still high, ranging from $300 to several thousand dollars. The use of the FTTH ODN enables operators to add revenue streams from nonresidential customers over the same infrastructure.

Initially, PON infrastructure was considered "best efforts," meaning good enough for residential broadband, especially when large split ratios were deployed, such as a single OLT port supporting 64 subscribers. PON's technical capabilities have evolved and, in parallel, many operators are using lower split ratios, such as 1 by 16, to ensure adequate bandwidth today, and in the future for residential and nonresidential subscribers and applications.

Both GPON and EPON technologies were designed to support smooth upgrades. For example, operators can upgrade to 10G PON OLTs (the network side) without the need to replace customer premise ONTs or optical network units (ONUs). No changes are needed to ODN ducts, cabling, and passives. In addition, many PON equipment vendors have developed OLT line cards that concurrently support multiple generations of PON technologies, such as GPON and XGS-PON.

25G PON technology was developed to continue support for simple upgrades, with the flexibility of choosing which and when subscribers are upgraded. No changes are required to the ODN. Vendors plan to support 25G PON on the same line cards as 10G, thereby reducing costs and adding flexibility regarding the timing of network-side upgrades.

CSPs highlighted the importance of access network reuse throughout Omdia's interviews. For wholesale operators, 25G PON is cited as the "game changer," enabling symmetrical 10G+ for their numerous retail operator customers. Integrated operators focused on 25G PON's capabilities to support multiple revenue streams from residential and nonresidential customers on a single access network, thereby saving capex and opex. Mobile operators discussed 25G PON's xHaul transport capabilities – a key ingredient to the success of 5G wireless networks. Many operators presented their plans for network slicing. These use cases are discussed in the next section.

Selected use cases for 25G PON

CSPs are focusing on three major use cases for 25G PON, as discussed during interviews with Omdia.

Enterprise services

10G PON supports 1G, 2G, 4G, and 8G symmetrical services to enterprises. However, many operators want to offer 10G and higher symmetrical services to larger enterprises, with service guarantees, on the same ODN as lower-bandwidth service offerings. 25G PON enables support for enterprises at significantly lower costs than point-to-point fiber solutions and preserves fiber asset usage. As stated by one wholesale operator, "the size of the pipe is crucial for enabling our customers, the retail operators, to support enterprises; 25G PON ensures our ability to meet bandwidth requirements and service assurance parameters."

Global, fixed broadband services for enterprises are forecast to grow from $22.4bn in 2020 to $26.4bn in 2025, according to Omdia. Perhaps more importantly, fixed broadband services enable another $120bn in annual communication-related service revenue for CSPs.

Chorus (New Zealand) has begun XGS PON installations and is now evaluating 25G PON25G PON supports a capacity strategy. It will provide support for higher-bandwidth services to enterprise end users over the same PON infrastructure as GPON and XGS PON.

xHaul

PON technology, especially 10G PON, is used to support mobile backhaul on 4G networks, meeting bandwidth and latency requirements. 25G PON will support the higher-bandwidth requirements for backhaul and mid-haul requirements from dense 5G small cell deployments. The backhaul equipment market for outdoor small cells is forecast to grow from $820m in 2020 to over $1.4bn in 2024, which is a significant expense for integrated and mobile operators. Fiber-based technologies represent more than 60% of the total outdoor small cell mobile backhaul equipment, and the use of PON is a growing subsegment. PON's point-to-multipoint topology enables fiber asset efficiency versus point-to-point solutions. This efficiency becomes vital when a CSP plans to deploy significant volumes of small cells.

Historically, GPON and EPON have not been used for fronthaul due to bandwidth and latency requirements. 25G PON would meet the bandwidth requirements for 5G fronthaul but latency remains an issue. Consequently, vendors are developing latency solutions, such as Nokia Bell Labs' cooperative Dynamic Bandwidth Algorithm (DBA), which proactively warns the OLT when radio units (RUs) will need resources, resulting in lower latency overhead. Mobile and integrated operators are seeking lower-cost solutions such as PON, since fronthaul equipment costs are forecast to increase

from $500m in 2020 to over $1.1bn in 2024. Fiber-based technologies dominate the fronthaul market; 25G PON can become one solution for the 5G fronthaul market.

For Rakuten Mobile (Japan), 25G PON is a necessity, enabling efficient, fast time-to-market, and cost-effective transport for its 5G-millimeter cell site network. It has the bandwidth to support 5G xHaul requirements.

Network slicing

Next-gen PON, combined with software-defined access, enables network slicing. Network slicing allows CSPs to create virtual networks with different networking parameters, such as ultra-low latency for high-end gamers or for xHaul fronthaul. CSPs can move to NaaS models, which then enables service differentiation, which is a key competitive advantage. Several operators have publicly announced network slicing projects based on next-gen, using 10G PON today, with plans for 25G PON upgrades in the future.

Omdia's interviews revealed key interest in network slicing among wholesale, integrated, and mobile operators. The implementation plans varied among the operators, but objectives were similar – to enable support for differentiated services.

25G PON – A strong and growing ecosystem

The 25G PON ecosystem is strong and expanding. A 25GS-PON multi-source agreement (MSA) was signed in October 2020 by numerous companies, including operators, and equipment and component vendors. The membership list continues to expand. The industry group is focused on accelerating deployment of 25G PON solutions to meet growing bandwidth requirements in access networks.

25G EPON was approved by the IEEE in June 2020 and published in July 2020. Regarding 25G GPON, the MSA addresses the gap between XGS-PON and 50G GPON, since 25G GPON was not standardized by the ITU-T. The MSA Group developed optical specifications based on the IEEE 25G EPON standard; this supports the optical component vendors in their supply of 25G PON products. In addition, the MSA Group developed a Transmission Convergence layer, which is an extension of XGS-PON and covers management aspects, such as OMCI for ONT/ONU management and YANG for SDN-based OLT management. These activities promote the development of a robust ecosystem, along with a choice of equipment vendors.

It is important to note that several operators stated that they are not concerned about the lack of an ITU-T standard for 25G GPON. Many of them noted that 50G PON is too far away to meet their upcoming needs. They also expressed concerns over the cost of 50G PON compared to 25G PON. 25G PON takes advantage of existing 25G subcomponents, such as TIAs, APDs, and lasers, along with proven packaging expertise.

As stated in several interviews, "We, the CPSs, will ultimately determine the fate of the 25G PON ecosystem." CSPs are seeking the next upgrade step and 25G PON has the opportunity to fulfill the needs with proven PON technologies, existing 25G expertise, and an existing ecosystem.

Next steps

CSPs need to adopt a holistic view of fiber access networks, encompassing FTTH services and nonresidential services and applications. Successful access network reuse is a key factor in increasing revenue while controlling capex and opex, thereby leading to improved ROI. CSPs should begin evaluation of 25G PON, involving engineering and operation teams, as well as marketing and sales.

The success of 25G PON will be based on its ability to meet operator requirements at the right price point.

Appendix

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Omdia consulting

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