tellabs

Take advantage of Tellabs FlexSym Series Optical LAN to gain unique choices that can optimize your 10G connectivity

- OLT ports either G-PON or 10G XGS-PON via XFPs – with NG-PON future!
- Optical distribution network split ratio can be designed up to 64-wide split
- OLAN over singlemode and multimode fiber cabling choices are available
- Optional single or dual feed Type-B PON protection improves network up-time
- ONTs can be G-PON, or 10G XGS-PON, and closet-based, or deep fiber placement
- G-PON ONTs stay, and add new 10G ONTs (bi-directional encryption) strategically
- ONT Virtualized Ethernet Port Extension is multi-rate 1G, 2.5G, 5G or 10G via SFPs

Right-Size Your Network For Optimal Performance, Capacity and Cost

Tellabs® FlexSym™ series Optical LAN better aligns space, energy, heat, noise, radiation, and costs, with your true bandwidth requirements for IoT, smart building, cloud and wireless.

The useful life expectancy of traditional enterprise LAN infrastructure is regrettably short with Ethernet switches, and copper cabling, historically being around five to seven years. Even more alarming is how quickly wireless technologies is evolving in the 3-5 years range. At each one of these transitions, the switch and cable manufacturers expected you to completely rip-and-replace your hardware and infrastructure (e.g. CAT3 to CAT5 to CAT7, etc…).

Every time higher bandwidth, like 10-gigabit, is introduced, it causes disruption in the LAN. The new equipment and cabling has different connectors, it occupies greater space, consumes extra energy, emits additional thermals, introduces greater noise, crosstalk and radiation, and it costs more money. Yet, this time around with 10G, not all services, devices and users truly require 10Gbps. In fact, the Microsoft's recommendation for the modern enterprise optimize user experience to the cloud is 512Kbps. Further aggravating the situation, traditional switch vendors are complicating matters these days by increasing network complexity, day one capital cost and year-over-year operational expenses.

So, how can you align space, energy, heat, noise, radiation, and costs, with your true network bandwidth requirements?

The answer is a Tellabs FlexSym series Optical LAN that gives you greater flexibility to right-size connectivity across the enterprise LAN – inside buildings and across an extended campus. Tellabs FlexSym Optical LAN better aligns space, energy, heat, noise, radiation, and costs with your real bandwidth requirements, which honestly is not going to be 10Gbps to everything.

Tellabs FlexSym Optical LAN provides flexible design across the end-to-end enterprise LAN that traditional design simply cannot, such as choices for:

- **Management**
- **Data Center**
- **Infrastructure**
- **Closet-Based**
- **Deep Fiber**

The truth is 10 Gbps is not needed everywhere in the enterprise network. Furthermore, the Local Area Network (LAN) users, services and device bandwidth through-put is ultimately limited by the Wide Area Network (WAN) connection. In fact, most users, services and end devices utilize far less bandwidth in the Mbps and Kbps range. Thus, “right-sizing” the network means providing flexible connectivity options for 1M, 10M, 100M, 1G, 2.5G, 5G and 10G in the most efficient and cost-effective manner – Tellabs FlexSym Optical LAN solution can do just that!

Management

A Passive Optical LAN has centralized intelligence and management. Therefore, from one screen you can manage the entire end-to-end connections as one virtual switch. This allows for virtual Ethernet port extension across an Optical LAN with software defined LAN agility and automation. That is, one can manage the network resources, in software, and dynamically allocate those network resource based on real-time needs. This is accomplished with global profiles in the Tellabs® Panorama™ PON Management software [Figure 1]. The global profiles orchestrate error-free, and more secure, operations. Finally, t Tellabs Panorama PON Management interface can be a choice between desktop, laptop, and smart phone for either G-PON and 10G XGS-PON virtual Ethernet port extension – and for both closet and deep fiber ONTs.

Figure 1: Tellabs Panorama PON Management software.

Data Center

The Optical Line Terminal (OLT) will likely be located in the main data center. The purpose of an OLT is to act as a distribution and aggregation switch across an enterprise network. An OLT can provide greater connectivity density in a smaller footprint than a traditional network design. Right sizing 10-gigabit connectivity inside buildings, and across a campus, starts at the OLT. For example, from a 5 Rack Units (RU) high Tellabs® FlexSym™ Optical Line Terminal Six (OLT6) you can support up to 32 PON interfaces, up to 2,048 ONTs and up to 8,192 Ethernet connections assuming 4-port ONTs. The OLT6 can be optimized with either 2.5G G-PON or symmetrical 10G XGS-PON ports [Figure 2]. This is done by equipping the OLT6 with an 8-port Tellabs® FlexSym™ Optical Interface Unit Eight (OIU8) service module [Figure 3]. By simply picking the appropriate XFPs, one can fine tune how many PON ports at the OLT truly need to be either 2.5G G-PON or 10G PON. Best yet, the OLT hardware is ready for 25G PON and/or 40G NG-PON, so you will not require a rip-and-replace if those speeds are one day needed in the future.

Figure 2: Tellabs FlexSym Optical Line Terminal Six (OLT6)

Figure 3: Tellabs FlexSym Optical Interface Unit Eight (OIU8)

Infrastructure

There are many design choices that can be accommodated through-out the enterprise network infrastructure that directly impact engineering proper capacity for both high bandwidth and low bandwidth connectivity, including:

- **WDM Combiner**
- **Splitter Positioning**
- **Splitter Split Ratio**
- **Network Uptime**
- **Fiber Cabling**

WDM Combiner – The Tellabs® FlexSym™ XGS-PON Combiner can be utilized if G-PON and 10G PON are on the same fiber cable and optical splitter [Figure 4]. In the future there are no foreseen wavelengths conflicts, thus NG-PON2 can be deployed over today's infrastructure – this ensures that as bandwidth increases no disruptive rip-and-replace will be necessary. Optionally one can also segregate G-PON and 10G PON on separate physical infrastructures. This can be accomplished by simply designating different optical splitters, and associated fiber cabling, to be either G-PON or 10G PON.

Figure 4: Tellabs FlexSym XGS-PON Combiner

Splitter Positioning – Because of Optical LAN's many options for ceiling, floor, wall, MDF or IDF passive optical splitter placement, one can completely exit, and eliminate, the telecommunications closet. This is not always the case, but there are situations where building architects can take advantage of this ability. One can also choose centralized (e.g. close to data center or in data center), distributed (e.g. pushed out deep in the network) or cascade splitters (e.g. 1x4 splitter connects 1x8 splitters) depending on fiber availability, and space constraints in the buildings cable risers, horizontal, pathways and drops.

Splitter Split Ratio – With the availability of symmetrical 10G XGS-PON, optical splitter split ratios become even more advantageous for leveraging anything from 1x2 to 1x64. Now more than ever you can match actual bandwidth requirements with optical split ratio. For example, when designing for IoT and smart building device connectivity, one can deploy a high 1x64 split ratio. And, for deploying high bandwidth devices, such as IP Cameras and WAPs, one can utilize low 1x8 split or 1x16 split in order to dedicate more bandwidth to the services, users and devices that truly need the extra capacity.

Network Uptime – Traditional LAN design has established a very low standard for network availability at 99.9% network uptime (e.g. over 5 hours of annual network downtime). Even a simplistic Optical LAN design can achieve a better 99.999% network uptime (e.g. around 5 minutes of annual network downtime), which can be OK when critical services, users and devices are NOT connected and when day-1 capital costs want to be minimized. However, more often today's contemporary networks require always-on connectivity 7/24/365. That is, network downtime directly correlates to lost revenue, lost productivity and security vulnerabilities. This is why most Passive Optical LAN infrastructure designs chooses the optional support of Type-B PON Protection for the greatest 99.9999% uptime (e.g. less than 30 seconds of annual network downtime). Type-B PON protection provides redundant connectivity to OLT ports, OLT cards and geographically separate OLTs - this also allows for fiber cabling route diversity and ultra-high network reliability.

Fiber Cabling – Even in the situation where there is existing multimode cabling already in the building riser, horizontal or pathways, there are choices that support Passive Optical LAN over either multimode or singlemode cabling. By using multimode optical splitters, currently available in either Tellabs® FlexSym™ Singlemode to Multimode 2x8 Splitter and Tellabs® FlexSym™ Singlemode to Multimode 2x16 Splitter split ratios, one can supports OLAN over OM1, OM2, OM3 and OM4 fiber cable types [Figure 5]. The SMF to MMF optical splitters are passive, so these multimode splitters are highly reliable, require no monitoring and no maintenance. In fact, Optical LAN can uniquely deliver 10-gigabit over multimode fiber cabling further (up to 550m) when compared to traditional LANs options.

Figure 5: Tellabs FlexSym Singlemode to Multimode 2x8 Splitter (pictured) and Tellabs FlexSym Singlemode to Multimode 2x16 Splitter also available

Closet-based

If a customer chooses to leave the last 100 meters of copper cabling in place, and not touch the final access drops in the walls, then closet-based ONTs can be chosen. In fact, with the 48-port 10G XGS-PON Tellabs® FlexSym™ 248 Optical Network Terminal (ONT248)*, you can perform an economical one-to-one closet-based workgroup switch replacement - power, cable, and cable management, all stays the same [Figure 6].

This closet-based ONT switch replacement offers a break from the inherently flawed, and ever-growing complexity, and increasing costs, of the status quo traditional LAN design. This architecture allows customers to gain the advantages of OLAN vastly improve operational efficiencies, greater security, and reduced technical refreshes, without disrupting the last stretch of copper cable in the workplace. Less fiber cabling is needed in the data center, risers, horizontal and telecom closets, since the closet-based ONTs reduce uplink cabling (e.g. multiple bidirectional wavelengths on single fiber) compared to traditional workgroup switch footprint.

For example, if you built a traditional enterprise LAN with one (1) aggregation/distribution switch, and eighty-four (84) closet-based 48-port workgroup switches, you would be serving 4,032 gigabit Ethernet connectivity. With that legacy design you would expose 85 IP addresses to protect, 85 full-function complex switches to secure (STIG), 85 switches to provision, 85 software loads to maintain and you would have 85 physical maintenance interfaces (CLI) as points of security vulnerability. With a Passive Optical LAN design, you would have one (1) OLT and eighty-four (84) 48-port closet-based ONTs, thus still serving 4,032 gigabit Ethernet connections. Now with this contemporary Optical LAN design, you only have one (1) IP address to protect, one (1) OLT to secure (STIG), one (1) OLT to provision, one (1) software load to maintain and one (1) OLT provisioning port to secure - thus a significant reduction in network points of security vulnerability.

Furthermore, the closet-based ONT248 provides a graceful migration, by means of an intermediate step, towards optional deep fiber ONTs LAN design - especially for renovations, upgrades, and additions at existing facilities (e.g. brownfield). It also warrants noting that the ONT248 are environmentally hardened, and have a temperature range from -5°C / +23°F to +55°C / +131°F – thus, the year-over-year HVAC costs can be reduced, or eliminated, where it is installed.

For powered device connectivity using Power over Ethernet (PoE), IEEE 802.3af PoE, PoE+ IEEE 802.3at (Class-4 negotiations) and IEEE 802.3bt (4PPOE) can be selected. The ONT248 can support all 48-ports of 4PPoE supporting 802.3af/at/bt and all 48-ports suppling 60 watts per port, with a total capacity of up to 3,000 watts possible with dual power supplies utilized.

Figure 6: Tellabs FlexSym 248 Optical Network Terminal (ONT248) is currently in controlled Limited Availability release status*

Deep Fiber

Extending fiber connectivity, as deep as possible, inside buildings, and across a campus, is ultimately best as it allows enterprise LANs to fully realizes the undeniable fiber cabling benefits. Deep fiber ONTs have a wide array of mounting choices, such as wall, floor, ceiling, desk, furniture and they are fully plenum rated. These ONTs can be either G-PON, or 10G XGS-PON. This is a very important point, as this allows for the cost effectively focus G-PON ONTs for x<1Gbps connectivity for IoT and smart building applications. Conversely, it also allows for the symmetrical 10G ONTs (bi-directional encryption) to be added strategically only where x>1Gbps capacity is truly needed – perhaps for WAPs and IP cameras. For example, 10G PON, with the 5-port 10G ONTs, you can connect multiple Wi-Fi 6 (IEEE 802.11ax) devices, using the 2.5G interface from multi-rate SFP+, and transmit over 10G PON, and the math perfectly aligns with the available bandwidth (e.g. 4 x 2.5G = 10G). This optimization is possible because the 10G PON ONTs support virtualized Ethernet port extension from multi-rate 1G, 2.5G, 5G or 10G SFP+ choice – not all the way from back at the closet (e.g. 100 meters), but as close to the end-points as possible (e.g. a couple of meters). This means that bandwidth can be exactly matched at the final connection to the enterprise service, user or device – this is a far more efficient network design that traditional LAN footprint can't replicate.

The 10G XGS-PON Tellabs® FlexSym™ 205 Optical Network Terminal (ONT205) provides flexible and symmetrical extended Ethernet connectivity over a passive optical network at multi-rate 1G, 2.5G, 5G and 10G Ethernet speeds. The ONT205, like all other Tellabs FlexSym Series enterprise focused products, supports advanced Ethernet IEEE features, such bridging, LAG, VLAN, ACL, PoE, LLDP, NAC, 802.1x, AS-SIP, and other must-have protocols are supported that satisfy true enterprise requirements.

For Power over Ethernet (PoE) support, IEEE 802.3af PoE, PoE+ IEEE 802.3at (Class-4 negotiations) and IEEE 802.3bt (4PPOE) can be selected on the ONT205. The ONT205 can support three ports of 4PPoE supporting 802.3af/at/bt. The maximum PoE power when local powered is 140 watts and the maximum PoE power when remote powered is 90 watts.

Figure 6: Tellabs FlexSym 205 Optical Network Terminal (ONT205)

Right-size your network for optimal performance, capacity and cost for flexible management, data center, infrastructure, closet-based and deep fiber configurations!

A Tellabs FlexSym Optical LAN design provides greater Ethernet density in a smaller footprint for IoT and smart building connectivity. It delivers end-to-end QoS ensures better user experience for cloud-based and OLAN as a Service. It can connect four Wi-Fi 6 (IEEE 802.11ax) at 2.5G over 10G perfectly aligns with 5-port ONTs. Finally, it is very important to note that single mode fiber, 25G PON and 40G PON, are leading choices for future 5G wireless infrastructure.

To ensure the enterprise network architecture properly aligns space, energy, heat, noise, radiation, and costs with your actual bandwidth requirements, a Tellabs FlexSym Optical LAN solution puts flexible choices in the hands of Architects, Engineers, Consultants and IT staff. To accommodate the low bandwidth connectivity needs like IoT, smart building and office workplace – choose low cost G-PON ports at the OLT, and G-PON ONTs, along with utilizing higher optical split ratio (e.g. 2x64). For the high bandwidth needs like IP cameras and wireless – choose 10G PON ports at the OLT, and 10G PON ONTs with multi-rate Ethernet, and then consider lowering the optical split ratio (e.g. 2x16) to support the additional capacity required.

Thus, a Tellabs FlexSym Optical LAN true enterprise network design does gives you better choices to right-size connectivity inside buildings and across an extended campus. It optimizes space, energy, heat, noise, radiation, and costs with your true bandwidth requirements.

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