Hotels and Resorts Prepare for a Secure Future with Optical LAN  
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Service and network convergence boosts revenue while lowering costs

Introduction

Hotels and resort properties need to keep pace with ever-evolving LAN technologies, including the growing use of fiber optic cabling and passive Optical LANs. It can be short-sighted and unnecessarily costly to continue to deploy copper-based LANs, which have higher capital expenses and operational costs, consume more energy, monopolize greater amounts of space, are less stable and pose a security risk. Fiber optic cabling and Tellabs Optical LAN solution represent a better LAN infrastructure and LAN equipment choice for hotels and resort properties striving to meet and exceed expectations over the next 30 years by providing the following benefits:

- Higher bandwidth at lower cost with future-proof Optical LAN
- Space savings
- Support for sustainability initiatives
- Services and network convergence, including wireless
- Graceful legacy services and network migration, both voice and video.

The purpose of this paper is to provide deeper explanations of these 5 points. We will explain why Optical LAN (OLAN) is a better alternative that meets and exceeds the needs of hotels, resorts and other hospitality entities. It supports properties’ voice, video, wireless access and security systems; fire detection systems; door access systems; automated billing mini-bar systems; point-of-sale systems; CCTV monitoring; digital signage and property management in a more cost-effective way for the next 30 years.

Optical LAN outperforms copper-based LANs

When building new hotels and resorts, or updating existing hospitality properties, fiber optic cabling should be promoted and copper cabling discouraged for the following reasons:

- Better bandwidth capacity
- Future-proof LAN infrastructure
- Greater reach with fiber optic cabling and passive OLAN
- OLAN and fiber optic cabling can impact the design of modern hotels and resorts.

Better bandwidth capacity — Fiber optic cabling, such as single mode fiber (SMF), has no theoretical bandwidth limit, unlike copper cabling. Today, SMF has proven to support 101 Tbps, but that ceiling is only an artificial limit based on the electronic transmission technology available today. Passive OLAN delivers gigabit rate speeds to hotel/resort guests and for all hotel/resort IP/Ethernet needs.

Future-proof LAN infrastructure — Historically, copper cabling cannot keep pace with the bandwidth demands of hotels and resort properties. Over the past decade, we have witnessed CATx copper cabling standards change from CAT3 through many generations and now to CAT8, which is being defined. More than 5 generations of CATx copper cabling were required as the hospitality service moved from 1 Mbps to 10 Mbps to 100 Mbps to 1 Gbps. With each generation of CATx copper cabling, hotels and resort properties were required to upgrade to the next generation — wasting money and negatively impacting facilities’ operations. Fiber optic cabling is smaller, lighter and stronger, and offers a tighter bend radius, higher bandwidth, greater reach, better EMI/RFI, faster connectors, longer life and greater security — all at a lower cost.

Optical LAN Outperforms COPPER-BASED LANS

Greater reach with fiber optic cabling and passive optical LAN — OLAN can reach 30 kilometers/18 miles across a passive network, 300 times farther than copper. Hotels and resorts can eliminate telecommunications closets and convert that space to revenue-generating uses, such as larger or additional guest rooms. Large hotels and resorts with acres of property benefit by maintaining one main data center that supports the entire property.

Optical LAN and fiber optic cabling can impact the design of modern hotels and resorts — Fewer active electronics and smaller form factor equipment mean lower power at the main data center (MDF) and fewer or no telecommunications closets, which reduce the building’s power load. Fewer thermals at MDF and reduced or eliminated telecommunications closets lower the HVAC load. A smaller MDF and reduced or eliminated telecommunications closets lower HVAC/power load. Fewer and smaller cables put less of a weight burden on a building (e.g., lighter cable, less/lighter cable support and management). With less weight in plastics, there is less smoke load on the building. Fewer floor and wall penetrations reduce fire hazard through fire stopping. These improvements earn valuable property space for hotel/resort revenue generation (e.g., more rooms, more beds), amenities and aesthetics.

Save space and increase revenue with Optical LAN
Hotels and resort properties that leverage fiber optic cabling and passive OLAN technologies can earn significant space savings. Ultimately, this real estate savings can be repurposed as more beds, more rooms, larger rooms and expanded hotel/resort amenities. The space savings can impact the following:
- Cabling
- Telecommunications closets
- Main data center
- Networks and services convergence
- Large hotel and resort properties.

Cabling — One SMF strand can serve 128 gigabit Ethernet endpoints through the riser and horizontal pathways. Thus, hotels and resorts can serve a higher number of IP/Ethernet devices with less cabling, reducing cable girth, weight and plastics.

Main data center — One 11RU optical line terminal (OLT) (main data center aggregation) can serve 8,000 gigabit Ethernet endpoints within 20 km to 30 km. This means that hotels and resorts can serve a greater number of IP/Ethernet endpoints with fewer electronics, thus with less power and less heat (Figure 2).

Telecommunications closets — Due to passive optical distribution networks’ superior reach, OLAN reduces or even eliminates telecommunications closets. Hotels and resorts can repurpose that saved space for revenue-generating uses, such as larger or more guest rooms.

Networks and services convergence — Historically, LANs have been built with separate physical equipment and cable infrastructure for voice, video and data. This held true for hotels and resort properties, which had it even worse with the separate needs for wireless, environmental controls, automation, security and fire networks running on different cabling infrastructure. With fiber optic cabling and passive OLAN, all of these networks can be converged, including voice, video, data, wireless, building automation, building security and building environmental controls. Furthermore, analog voice (POTS) can be delivered on the same network as Voice-over-Internet Protocol (VOIP) unified communications. RF video and IP video for entertainment, security or hotel/resort services can all traverse the same fiber cabling and passive OLAN infrastructure. This service and network convergence saves hospitality facility operating expense (OpEx) as well as capital expense (CapEx).

Figure 2. Legacy copper-based LAN (above left) supports 2,000 IP/Ethernet endpoints, while OLAN (above right) supports 8,000 IP/Ethernet endpoints.
Large hotels and resort properties — Passive OLAN has the inherent benefit of being able to transport hospitality services across a span 300 times farther than a copper-based LAN can support, with no power, AC, ventilation, floor space or management needs. Across that extended passive optical network (PON), hotels and resort properties can enjoy fewer managed information and communications technology (ICT) devices and fewer LAN moving parts; thus, less things to buy, rack, stack, power, cool, vent, provision and manage — and fewer things to break. This all-fiber infrastructure can be used across a large hotel complex or campus and support the needs of neighboring facilities. Ultimately, all entities benefit from better network performance and low latency for critical services because there are fewer electrical-to-electrical transitions and optical-to-electrical conversions, which mean less energy consumed, less heat generated and reduced latency across the end-to-end network, whether transmitting building to building or campus to campus.

Optical LAN supports sustainability pursuits

Hotels and resort properties are active in sustainability initiatives. Fiber optic cabling and passive OLANS can help both directly and with an indirect "rippling effect" through:

- Energy savings
- Less plastics, PVCs and lead
- Credits toward USGBC/LEED, Green Globe or TIA/STEP
- ENERGY STAR programs.

Energy savings — Power reductions that can be achieved with passive OLAN include up to an 80% reduction in power and the total elimination of telecommunications closets. With less data center equipment, converged network services and no telecommunications closets, power savings ripple with fewer AC/DC, DC/DC, battery backup plants and lower emergency power generation demands. With less actively powered equipment and no telecommunications closets, a corresponding lower thermal rippling effect means less building heat load, lower air conditioning and fewer ventilation requirements. By adding up all the energy reductions, both power and thermal, the inherent benefits of fiber optic cabling and passive OLAN can provide calculated carbon dioxide reductions, which can be applied to improving the carbon footprint of hotels and resort properties.

Less plastics and PVCs — With less quantity, smaller size and shorter lengths of fiber optic cabling and converged network services, Optical LAN can reduce plastics associated with the cabling infrastructure measuring in 1,000s of pounds². The plastic jacketing that wraps around the silicon dioxide glass core is .357" circumference, while the plastic jacketing that cover CAT6a is .926" circumference. That equates to SMF having 61% less plastic jacketing. Then the savings is compounded since CAT6a cabling delivers one (1) service to one (1) gigabit port, while passive Optical LAN SMF cable can deliver service to 128 gigabit endpoints.

The same math used to calculate total plastics can be used as indicator for the levels of PVC that are introduced into a building by copper cabling. With less quantity and smaller size fiber cabling, Tellabs Optical LAN can reduce PVCs by 61%. Relative to sustainability goals, fiber optics should always be promoted and copper cabling discouraged when and wherever possible for the following reasons:

- Copper is a precious metal and its mining practices have a poor environmental record
- Copper cable has greater quantity of plastics and PVCs than SMF
- Old copper cables and abandoned copper cables can contain lead
- Plastics, PVCs and lead contribute to indoor environmental hazards
- Plastics, PVCs and lead contribute to fire and smoke hazards in buildings.

To reduce the total amount of cable for ICT broadband connectivity and ICT power connectivity, hospitality network designers can choose hybrid SMF cables that consist of optical fiber and 2 copper conductors, which will allow an optical network terminal (ONT) remote powering solution to be deployed.

Finally on this topic, it should be noted that SMF has no known horizon for obsolescence. This cannot be said for any copper cabling whether CAT3, CAT5, CAT6 or CAT8 — all of which have known obsolescence, at which point they need to be removed. The past decade has seen the extreme waste associated with CAT3 and CAT5 replacements — and CAT6 will repeat this same waste once again.

Credits toward USGBC/LEED, Green Globe or TIA/STEP — Hotels and resort properties may pursue USGBC/LEED, Green Globe, Living Building Challenge, TIA/STEP and other sustainability initiatives. Following these sustainability initiatives is good for business because they save OpEx and CapEx, and they are also good for the surrounding community. Fiber optic cabling and passive OLAN can contribute to these initiatives with direct energy savings; decreased operating costs; reductions in thermal loads for HVAC, harmful greenhouse gas emissions and waste sent to landfills; and increases in asset and property values. Also, passive OLAN deployments have received innovation points from USGBC/LEED (Figure 3).

Figure 3. USGBC/LEED levels of certification

ENERGY STAR programs — In the future it will be possible to earn ENERGY STAR credits. The test criteria and test methodologies have been established by the U.S. Department of Energy for Small Customer Premises Equipment and, in particular, the ONT that passive Optical LAN utilizes. Such criteria and methodologies will be important to hotels and resort properties as they actively pursue ENERGY STAR programs.

Converge services and networks, including wireless
Hospitality telecommunication needs are ideal for service and whole network convergence. Internet, phone, entertainment, CCTV, security and fire services can all be delivered over the same all-fiber LAN infrastructure. Passive OLAN is well suited to transport:
- Voice
- Video
- Wireless
- Building automation, environmental controls and security/surveillance.

Voice — OLAN can accommodate analog (POTS) voice, VoIP and unified communications simultaneously, enabling hotels and resort properties to use a mix of low- and high-cost telephone receivers more cost-efficiently. It also provides a graceful migration from legacy POTS voice PBXs to VoIP/unified communications IP PBXs in an efficient and cost-effective manner.

Video — OLAN can deliver CATV, satellite video, IPTV, CCTV, surveillance and conferencing content across the same all-fiber infrastructure. The video content can be in RF format or IP format, enabling hotels and resort properties to meet all video requirements cost-effectively. Whereas power over Ethernet (PoE) is needed to deliver electricity to IP cameras, passive Optical LAN ONTs support both low-power PoE and high-power PoE+. As with voice, these video options enable a graceful migration from legacy RF to future IP in an efficient and cost-effective manner. OLAN also has the ability to apply strict QoS that allows IP video applications to coexist with mission-critical services.

Wireless — A hospitality wireless network must have the ability to gracefully accommodate a large quantity of wireless devices and the enormous bandwidth requirements of all those wireless devices. From distributed antenna systems (DAS) solutions to robust Wi-Fi, fiber optic cabling and passive OLAN will save OpEx, CapEx, energy and space for hospitality needs. Hotels and resort properties can use OLAN to integrate their Wi-Fi network and backhaul WAP traffic to respective controllers in the main data centers. As for DAS, the inherent benefits of fiber optic cabling and OLAN apply to DAS network. Hotels and resort properties can use fiber infrastructure to lower DAS deployment costs across their extended campus and even integrate Wi-Fi seamlessly (Figure 4).

Building automation, environmental controls and security/surveillance — Fiber optic cabling and passive OLAN support high-density IP/Ethernet endpoints, which help the building management system (BMS) and building automation system (BAS) keep the costs down for traffic backhaul. Modern high-performance buildings have a wide variety of smart, environmental and automated IP/Ethernet needs. An all-fiber LAN is ideal for connecting and powering IP camera, card reader, door access, HVAC, lighting and safety IP/Ethernet endpoints. Similar varieties of security and surveillance services in today’s high-performance buildings can be converged efficiently and cost-effectively as well.

Optical LAN enables graceful migration of legacy services and networks
The reality of today’s hospitality ICT is that networks often include a mix of analog and digital services. The 100% “rip-and-replace” of legacy services and networks can impose burdens on costs and on the IT staff’s ability to support new technologies. OLAN has the unique ability to support both analog and digital services simultaneously, thus easing the transition to pure IP/Ethernet. The transition can be accomplished through the following means:
- Voice
- Video
- IT workforce stability.

Figure 4. Optical LAN boosts density, reach and coverage for Wi-Fi, and improves business cases for DAS deployments by leveraging existing all-fiber infrastructures.
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For IP video, the IP-formatted video (both HD and SD quality) flows across passive OLAN, leveraging deterministic IGMP multicast. Local cached content for video on demand and other interactive services with options for local content insertion (e.g., hotel/resort news, local advertising, training) (Figure 7).

IT workforce stability — Legacy copper-based LANs have equipment on every floor of every building that requires physical monitoring, provisioning and maintenance. The IT staff requires weeks of training to be comfortable with the programming of moves, adds, changes (MACs) and other network modifications. OLAN simplifies the aggregation, distribution and access with less equipment and less cabling, thus requiring fewer IT staff touches. The passive portions of this network require zero attention from the IT staff. Tellabs Optical LAN MACs can be executed at the centrally located Tellabs® 3109 Element Management System workstation with preexisting global profiles, or the MACs can happen dynamically with the aid of higher-level network access control (NAC) protocols. With this simplified network architecture, the IT staff needs less training, and no annual certification is required to support passive OLANs. Optical LAN training takes 5 days compared to copper-based LAN training, which takes weeks or even months. Furthermore, expensive and time-consuming formal certification programs that take up IT staff time are unnecessary, keeping the staff on the job instead. In the end, OLANs help CIOs, IT managers and IT staff compensate for today's lean IT workforce, keep pace with evolutionary innovations, manage regular heavy workloads and assist with the retention of quality IT employees.

Voice — VoIP phone connections can be done via IP/Ethernet path utilizing the RJ-45 connectors on ONTs, which provides full support for IP PBX, unified communications systems and associated application servers. Simply stated, the pure VoIP with IP phones is connected directly to PBX and is transparent over Tellabs equipment through the IP/Ethernet data path.

Analog phone interconnections (e.g., TDM and POTS) are supported via an RJ-11 connector and are immediately converted to IP/Ethernet-centric session initiation protocol (SIP) ATA for transport across the passive OLAN. The call flow is converted from SIP back to analog at the Tellabs® 1000 Voice Gateway positioned in the main data center, enabling passive OLAN to support SIP-based VoIP phones and/or analog phones simultaneously. The network-side connectivity can be legacy circuit-switched PSTN or analog PBX or IP PBX, enabling hotels and resort properties to benefit from significant capital savings associated with deferral of VoIP phone purchases and the potential for VoIP migration without impacting an existing TDM voice-switch investment (Figure 5).

Video — With RF video, the analog video is carried on the network using a third 1550 nm wavelength across passive OLAN infrastructure. The video signal format delivered is defined by SCTE standards, from either a CATV- or satellite-content provider. A standard coaxial interface supports 54–900 MHz CATV channel content in both high-definition (HD) and standard-definition (SD) quality (Figure 6).

For IP video, the IP-formatted video (both HD and SD quality) flows across passive OLAN, leveraging deterministic IGMP multicast. Local cached content for video on demand and other interactive services with options for local content insertion (e.g., hotel/resort news, local advertising, training) (Figure 7).
Conclusion

By taking advantage of the benefits of fiber optic cabling and passive OLAN, hotels and resort properties can surpass the efficiency and cost savings of modern high-performance LANs. By deploying Tellabs Optical LAN in buildings and across an extended campus, hospitality facilities can lower capital expenses and operational costs, consume less energy, convert saved space into revenue-generating space, improve LAN stability and tighten network security.

For more information, please contact your local Tellabs sales representative or local Tellabs sales office or visit www.tellabs.com.

Next Step:
For more information about Optical LAN being simple, secure, stable, scalable and costing less, please contact your local Tellabs sales representative or local Tellabs sales office at the phone numbers below or visit www.tellabs.com/solutions/opticallan/.

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