



- Optical LAN is simple, secure and scalable
- Fiber cable has no known bandwidth limits
- Fiber is more durable and is more secure compared to copper cable
- Fiber is less weight, reduces and eliminates cable congestion by reducing cable bundles
- There is no need to rip-and-replace or pull new cabling for future services with Fiber
- Optical LAN, based on G-PON technology, can eliminate telecom closets
- Optical LAN and Fiber offer synergies with Wireless, both Wi-Fi and DAS

Marriott Atlanta Marquis fiber-based network delivers high bandwidth, better security, smaller footprint and lower costs

Tellabs® Optical LAN, and fiber cabling, helps Marriott enjoy unsurpassed guest experiences over hotel's wired and wireless network.

Marriott International is a leading global travel company, with more than 5,500 properties in 100 countries and territories. The company operates and franchises hotels and licenses vacation ownership resorts under 30 brands. Forbes called Marriott, "one of the most innovative companies in the world."

Historically a hotel property's IT infrastructure was a complex and bulky combination of vendor driven media which were required for individual vendor dictated proprietary services. CAT3/5 for PBX, CAT5/6 for internet access, additional cabling for Wi-Fi, coax for TV programming and the like. Additionally, expensive and/or proprietary communications equipment were required to facilitate any type branding, or interactive managed service for the guest room TV. Traditional copper-based local area networks (LAN) require core Ethernet switching (in the MDF), multiple edge Ethernet switches (in the IDF), with distance limitations. IDF closets take up space, require power and need environmental accommodations. The legacy copper-based point-to-point architecture required multiple copper cables to be dropped into each guest room to serve various applications. Adding additional services, such as Energy Management often require additional cabling for the sole purpose of adding Zigbee or DAS or other wireless services.



The current traveler expects residential high definition TV, reliable and fast internet access, and highly available Wi-Fi and cellular coverage everywhere. There is continuing frustration with travelers, as these services continue to lag behind their expectations. How does one prepare for today's tech-dependent guests who expects access via mobile check-in, location services, mobile room key and digital concierge services from their smart phones, tablets, laptops and even wearable devices? The challenges of the Internet of Things, combined with demand for pervasive wireless access, has driven Marriott to evolve their LAN architecture to prioritize fiber optic cabling.

The purpose of this Atlanta Marriott Marquis case study will be to provide insight into the reasons Marriott installed fiber optic cabling and Tellabs® Optical LAN (OLAN) solution, and the specific challenges technology integrator VT Group helped Marriott overcome by doing so.

This case study will cover:

- Why Fiber Cabling and Tellabs Optical LAN?
- Unique Building Challenges overcome by VT Group
- Powering Considerations
- Guest Room Installation
- IPTV and Future Entertainment Considerations
- Synergies with Wireless Services, both Wi-Fi and DAS

Why Fiber and Tellabs Optical LAN?

With the current chaotic state of LAN technology and with constant evolution guaranteed in the future, Marriott took the industry leading position to deploy a LAN technology that easily adopts to ever-changing business and guest requirements. Thus, Marriott technologists made a strategic decision to promote fiber-based infrastructure, such as Passive Optical LAN as opposed to twisted pair copper and coax.

By utilizing a Single Mode Fiber (SMF) based Passive Optical LAN, Marriott can build more future proof hotels today that deliver the following benefits to hotel guests, employees, owners, operators and shareholders.

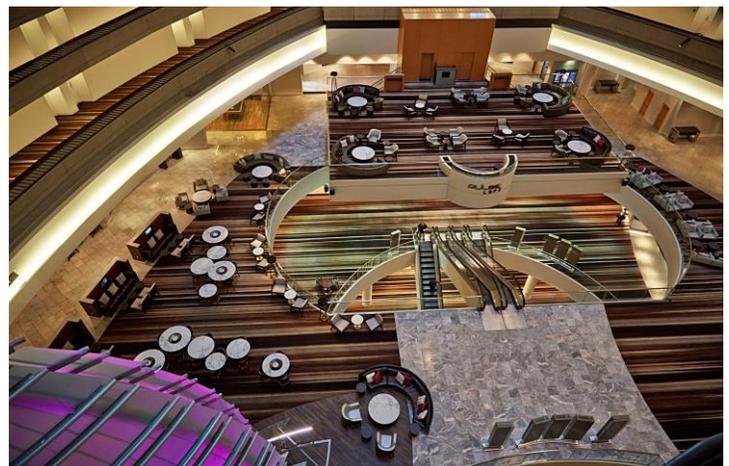
- Fiber has no known bandwidth limits
- Fiber is more durable than copper and more secure
- Fiber does not emit nor is it susceptible to electromagnetic interference
- Less weight, reduces and eliminates cable congestion (reduced cable bundles)
- There is no need to rip-and-replace or pull new cabling for future services
- OLAN, based on G-PON technology, can eliminate telecom closets (IDFs)

Another monetary reason for Marriott to choose Passive Optical LAN is because it assures the least amount of business disruption during existing hotel renovations, such as guest disruption, inconvenience and even displacement. All of which results in direct loss of revenue when room, floors, or whole hotels assets sit idle during LAN upgrades. It is also Marriott's desire to reduce the frequency of infrastructure and equipment upgrades, therefore their choice of fiber cabling and Optical LAN is because it represents the most graceful migration moving forward with the least amount of foreseen business disruptions; 802.11ac and 4K TV ready = truly future

Building Challenges VT Group Overcomes

The 52-story Marriott Atlanta Marquis is an iconic downtown hotel and posed some interesting building challenges for technology integrator VT Group. The hotel's greatest architectural feature is its large cavernous atrium. The atrium spans the entire height of the building and consists of two vertical chambers divided by elevator shafts and bridges. Stunningly beautiful to see, and featured in many major motion pictures, the building's concrete architecture creates challenges for the cabling vertical risers, cabling horizontal pathways and telecommunications equipment rooms.

The original design for the traditional copper-based LAN required many large coring holes on every floor in two locations for east and west vertical risers; a loud and dirty construction process that is extremely disruptive. The core drilling disruption in an active hotel comes in the form of noise, dust, vibration and construction detours that are extremely annoying to the hotel guests. There was also the requirement of two (east and west) telecommunications equipment rooms on each floor, complete with steel doors, security, powering, power backup, fire/safety and HVAC to accommodate all the traditional copper-based LAN Ethernet switches.





The Tellabs Optical LAN only required the main distribution switch, called the Tellabs 1150E Optical Line Terminal (OLT1150E) to be positioned in the main data frame (or MDF). From there fiber was connected to all the Optical Network Terminals located behind access paneling in each guest room. In between, there were far fewer smaller core holes needed per floor and existing janitor closets were used to position the passive optical splitters. This resulted in over \$100,000 savings for the Optical LAN installation and substantial on-going operational savings by eliminating the 22 would-be telecommunications equipment rooms.

Guest Room Installation

Marriott chose to install two fiber cables (compared to 4-6 for legacy or traditional copper LANs) into each guest room to meet today's requirements and to provide a second spare fiber as an insurance policy for un-foreseen future needs. The difference in savings from running two fibers in a single cable compared to installing multiple twisted pair copper cables and coaxial cables is exceptional [Table 1].

Marriott chose the Tellabs 120C Mini Optical Network Terminal (ONT120C) for its small form-factor and its ability to integrate into guest room furniture. The ONT120C is purpose built to be integrated into enclosures or furniture. Its purpose is to provide the in-room optical to electrical conversion and Ethernet connectivity. It transmits and receives the G-PON signal from the OLT in the main data center and delivers standards based gigabit speed connectivity at its Ethernet interfaces and delivers Power over Ethernet to the subtended powered devices. The ONT120C is secured inside electrical boxes or just drywall-mud rings, and only exposes a flush faceplate. It is located behind a hidden access panel that is part of an all wood TV entertainment center built into each room. Inside the access panel, there is the fiber termination, remote power connection, ONT120C, TV STB and Ruckus Networks Wi-Fi Access Point.

Powering Considerations

The Passive Optical LAN installation at Marriott Atlanta Marquis showcased three enterprise centric innovations for remote powering, composite fiber cabling and Power over Ethernet (PoE). In order to remove the need for a local powering source in all the guest rooms for all the ONTs, VT Group instead designed a centralized remote powering solution. This consists of an AC power fed centralized powering solution, co-located with the passive optical splitters in the maintenance closet, that delivered 48-56vdc powering to all the ONTs.

Composite fiber cabling, or hybrid fiber cabling, bundles two wire conductors (16AWG or 20AWG) along with the fiber. This hybrid fiber cabling is used between the centralized powering solution, passive optical splitters and the guest room ONTs. This allows for efficient pairing of fiber for the G-PON transmission to ONT and two wire conductors for the low power 48-56VDC to energize the ONT.

Enterprise centric ONTs are capable of providing PoE to the subtended Powered Devices (PDs). Standards based IEEE 802.3 PoE can be used to power VoIP phones, Wi-Fi Access Points and IP Cameras. Link Layer Data Protocol (LLDP) is employed for auto-provisioning, inventory and PoE power management of the subtended PDs. At the Atlanta Marriott Marquis deployment, the PoE was used to power the Ruckus Network Wi-Fi Access Points in the guest rooms.

Cable	Cost	Diameter	Weight	Bend Radius	Pull Tension	Future Capacity
Six 300ft Copper CAT6a	\$594 1,800 feet	1 inch bundle	70 pounds	Curve over 1 inch	25 pounds	Measured in Gigabits
Two 300ft Fiber (SMF)	\$66 600 feet	Less than 1/8 inch	Little over 2 pounds	Curve Less than 1/4 inch	48 pounds	Measured in Terabits

Table 1: A comparison of CAT6A copper cabling to Single Mode Fiber (SMF) cabling

IPTV and Future Entertainment

The Atlanta Marquis planned to implement Marriott's new Guest Room Entertainment standard with plans to support future entertainment options. The existing coax cable was not adequate and required significant improvements to support the new entertainment standards. However Passive Optical LAN design upgrade, the new enhanced IPTV service was seamlessly deployed over the fiber network connecting either directly with the display system or through the Ruckus Network wall plate to the display system. This improved the guest entertainment experience, since the patrons were now able to receive the complete interactive entertainment experience and access content from the internet through the converged design.

Synergies with Wireless, both Wi-Fi & DAS

At the Marriott Atlanta Marquis, the Tellabs Optical LAN was chosen to handle the wireless backhaul transport of the Ruckus Network Wi-Fi Access Points traffic. Passive Optical LAN provides a greater system reach, and density, for improved performance and coverage for Wi-Fi service. As Passive Optical LAN interoperates with established Wi-Fi vendors it allows for Wi-Fi controller functionality to be provided by best of breed Wi-Fi manufacturers such as Ruckus Networks. The Ruckus Networks controller functionality adds dynamic provisioning, interference correction, load balancing and coverage optimization as is required in a modern high performance hotel network deployment.

Marriott's decision to promote fiber-based infrastructure has a positive impact with Distributed Antenna Systems (DAS) and the improvement of cellular coverage inside buildings. There are DAS solutions available on the market today that utilize fiber between the headend equipment and the remote node antennas. This means that DAS and Passive Optical LAN can gain additional synergies with combined powering, power backup and fiber management between them that can improve the business case economics for deploying DAS. To be clear, the DAS traffic does NOT traverse the Optical LAN equipment, but it can leverage the same fiber infrastructure that Passive Optical LAN utilizes. Thus with the fiber-based infrastructure at Atlanta Marriott Marquis, the foundation for future cost-effective DAS implementations has been secured in advance.

Marriott Innovation Creates and Enables Unsurpassed Guest Experience

The Single Mode Fiber, VT Group engineering and Tellabs Optical LAN system installation at Atlanta Marquis truly does position Marriott as one of the most innovative companies in the world. Marriott stands ready for their tech-savvy guests to access mobile check-in, location services, mobile room key and digital concierge services from their smart phones, tablets, laptops and even wearable devices. They are prepared for whatever the Internet of Things future brings because of their commitment to fiber-based LANs, Single Mode Fiber and Passive Optical LAN in particular, allowed them to deliver the high bandwidth, more secure, smaller footprint, lower cost, and future proof LAN that benefits their hotel guests, employees, owners, operators and shareholders.



Take the next step. Contact Tellabs today.

