WHITE PAPER

NETWORK CONSIDERATIONS FOR BEST-IN-CLASS EXPERIENCES FACILITY-WIDE

INFRASTRUCTURE OPTIONS FOR OPTIMIZED CONNECTIVITY, SECURITY, AND VISIBILITY

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a Hewlett Packard Enterprise company

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EXPERIENCES CAN MAKE OR BREAK YOUR BUSINESS

Consistency is the watchword of the hospitality industry. Just as exceptional home-like experiences strengthen guest loyalty, failure to honor your marketing promises is a recipe for disappointment, abandonment and damaging social media posts that can take years to unravel.

Transient opportunities to influence brand loyalty, sentiment and satisfaction, for better or for worse, happen throughout a guest's journey. Taken together they form the overall guest experience, and the objective of the brand or property is to ensure it meet or exceed expectations of what that experience should be. Whether it is app-enabled property navigation, preferences-based dining suggestions, proximity-enabled housekeeping or lost child location services, skillfully blending digital capabilities and physical processes are critical for making or breaking the guest experience and affinity for your brand.

The need for consistent experiences also applies to facility operations, where they can affect productivity, profitability, safety, and staff enthusiasm. Examples include the ability to speedily locate luggage carts or dining trays, the provision of location-based panic buttons to improve personal safety and well-being, robust mobile voice options to smooth communications and uniform visibility across plant, equipment and networks for your security teams.

IP supports it all

Fundamental to delivering high-quality, consistent guest and staff experiences are your property's IP-based WLAN and LAN networks.

Although disparate systems once carried data, television and telephony, today's multimedia entertainment, comfort controls, door access, duress alarms, property navigation, voice telephony and video communications – along with their associated enabling technologies such as Wi-Fi 6 (also known as 802.11ax), IoT, cybersecurity and cloud-based productivity applications – have all converged to ride on IP networks.

With the right networking infrastructure supporting your common IP platform, you can roll out a broad range of new convenience, loyalty, safety, entertainment and marketing services quickly and easily. Where networks were once considered a cost center, now they can actually generate revenue via the marketing, loyalty, product placement, advertising and other services they host.

What's the right type of infrastructure for supporting your IP networks? The balance of this paper will help you answer just that.

ESCALATING EXPECTATIONS

Advances in mobile technologies have completely transformed guest expectations. In less than a decade, the bar has risen from providing free Wi-Fi in common areas to supplying guests and staff members with the capability to control everything, everywhere from their personal smartphones or corporate-issued handheld devices. Now we've entered a transitional period where guests and employees alike are no longer satisfied with touch screens – ubiquitous voice-activation and streaming video communications are coming to the forefront.

From a networking infrastructure perspective, this means investing in solutions that can provide sufficient bandwidth to meet the accompanying performance escalations. Industry experts suggest 4K video streaming and conferencing, the most bandwidth-intensive application known today, will need 25Mbps of throughput for a single instance. Just 100 guest devices simultaneously streaming 4K video need 2.5Gbps.

Streaming video won't be the only activity your infrastructure will be expected to support at any given time. There are also point of sale solutions, network printers, IoT systems for environmental and operational controls, connected physical security systems and typical workaday productivity applications. Each of these layers on further bandwidth requirements, ranging from 2Mbps to 20Mbps per device.

A network and application performance discussion shouldn't just be about the minimum requirements for each type of guest, staff or operations activity. It should focus on planning for infrastructure that scales to higher throughput and more use cases than are typical today. The key is deploying a solution that provides a solid return on investment while also enabling your brand to achieve its growth, revenue and experience goals.

FIBER OPTICS: THE WAY FORWARD?

For a variety of reasons, fiber optic networks have gained notice for offering high-bandwidth optical cabling to support IP networks, rather than using traditional copper Ethernet wires. Let's start with the fundamentals.

Fiber types

Fiber optics rely on cables to transmit signals. The two primary cable types are:

Single Mode Fiber (SMF) cables have a smaller core size that permits single type of light mode (ray of light generated by a laser) to travel through the fiber's core at a time. Due to the smaller core size, the quality of the light signal is higher. This makes SMF preferred for longer distance scenarios, including within a building, between multiple buildings or across a campus. SMF characteristics include:

- Delivers10Gbps over distances up to 10km (6.2 miles);
- Enables standardizing on one type of cable for multiple uses;
- Supports - multiple network architectures and is therefore likely to have a much longer lifecycle than other fiber optic cable types. It may already form the backbone at some properties.

Multimode fiber (MMF) cables have higher data capacity than copper and use low cost vertical-cavity surface-emitting laser (VCSEL) optics but only over short distances, such as within a data center. MMF characteristics include:

- Supplies 10Gps over distances limited to 550 meters (600 yards);
- Speeds drop markedly with distance, which tops out at 2km (1.2 miles);
- Requires updating the cables and all related components whenever standards are updated, adding significantly to capital and operating costs over the life of a commercial building.

Passive Optical Network (PON)

A passive optical network (PON) is a one-to-many architecture with an individual SMF multi-fiber cable bundle running from a central location and then splitting into multiple feeds. All endpoint devices share the aggregate bandwidth of the originating cable. PON has been most attractive to service providers because a PON minimizes fiber runs from the service provider's office to each customer's premise – whether a home, apartment complex, commercial building or industrial facility (see Figure 1: Service Provider PON Architecture).

GPON Network components

GPON Networks comprise of:

Optical Line Terminal (OLT) joins external communications connections (such as from a service provider) and internal data connections (such as enterprise servers and storage) in order to transmit data within a passive optical network (PON). Typical OLTs are layer 2 only. Regardless, all OLTs require an external power source to operate.

Optical Splitter (Splitter) is a passive beam-splitting device that divides a single optical signal into multiple signals. It is required for PON.

Optical Network Terminal (ONT) converts optical signals into formats usable by LAN and WLAN networks, televisions, VoIP telephony, IP surveillance cameras, and cable television. Modern ONTs exhibit a few characteristics of an Ethernet switch, but are vastly more limited in their capabilities.

Fiber Optic Architecture #1: Gigabit Passive Optical Networks (GPON)

GPON is a high speed PON, and its main attraction is a reduction in the IDF closet footprint required to support a fiber optic network within a building since it doesn't require a closet with Ethernet switches. GPON architecture is most commonly advocated by vendors for delivering what's referred to as fiber-to-the-x (FTTX), which can be a home (FTTH), a room (FTTR) or a desktop (FTTD). (See Figure 2: Basic GPON architecture for FTTX).

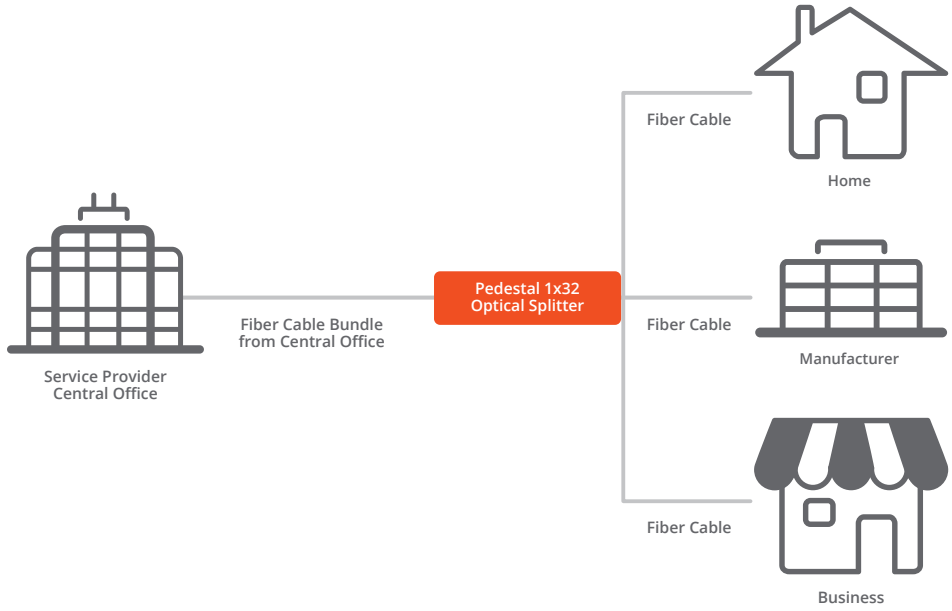

Figure 1: Service provider PON architecture

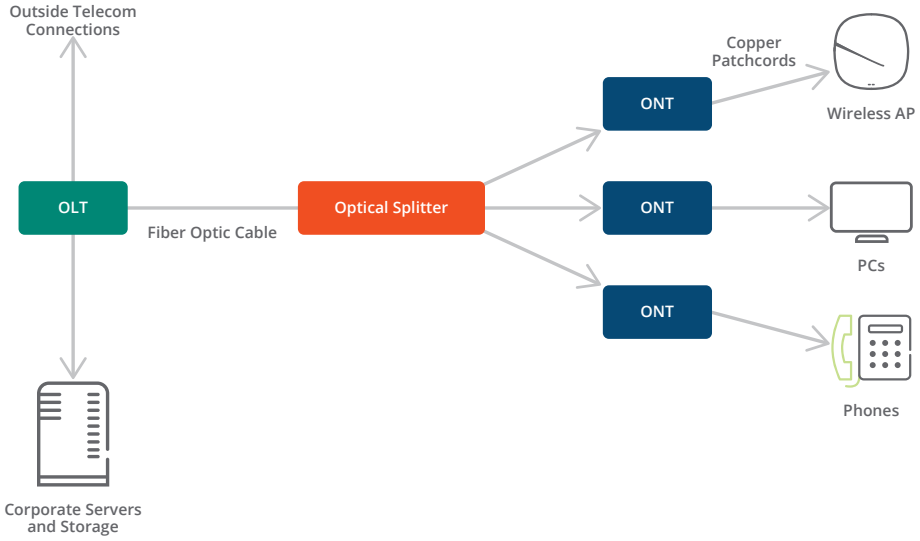

Figure 2: Basic GPON architecture for FTTX

Fiber Optic Architecture #2: Active Optical Network (AON)/Peer-to-Peer (P2P)

Just as PON is one-to-many, an Active Optical Network (AON) or Peer-to-Peer (P2P) is 1:1. Using this architecture, bandwidth from a central location runs to a single endpoint. In a hospitality setting, each fiber feed can run to an IDF and be plugged into an Ethernet network edge switch, which then transmits signals to multiple endpoints using a common IP protocol. To dissipate heat while minimizing power, fanless Ethernet switches can typically be used.

AONs supply bandwidth specific to the services, applications, and devices in use. Further, AONs dispense with OLTs, eliminating the costs and complexity of OLT/ONT pairing, and related requirements, in PON/GPON architectures. (See Figure 3: Hospitality property AON architecture.)

Additional Fiber Optic Considerations

Conversations around fiber optic architecture frequently include two other technologies worth noting, one that is currently available and the other still under development.

Powered Fiber

In situations where new cable pulls are cost-effective, an option that can be used is called "powered fiber." It combines a fiber optic cable and two copper conductors in one common sheath. The thickness of the copper conductors supports higher wattages and the fiber optic link supports runs up to 3 kilometers, making it an attractive option for outdoor applications in areas where lighting is desired, or wherever a very long cable run is needed.

However, the high cost of the transmitter and receiver required by powered fiber solutions price them out of the game for broader use in guest rooms.

Digital Electricity

A technology on the horizon with the potential to distribute power in brownfield situations is called "digital electricity." This technology uses specialized signaling cables, transmitters and receivers to provide up to 2,000 Watts over a maximum of 2,000 meters. However, there is a tradeoff between power and distance.

Digital electricity doesn't distribute data, necessitating installation of a separate Ethernet data cable or fiber. Justifying the deployment of two cables – one for power and one for data – hinges on achieving significant savings from such a novel power distribution format. Proof of this remains to be seen.

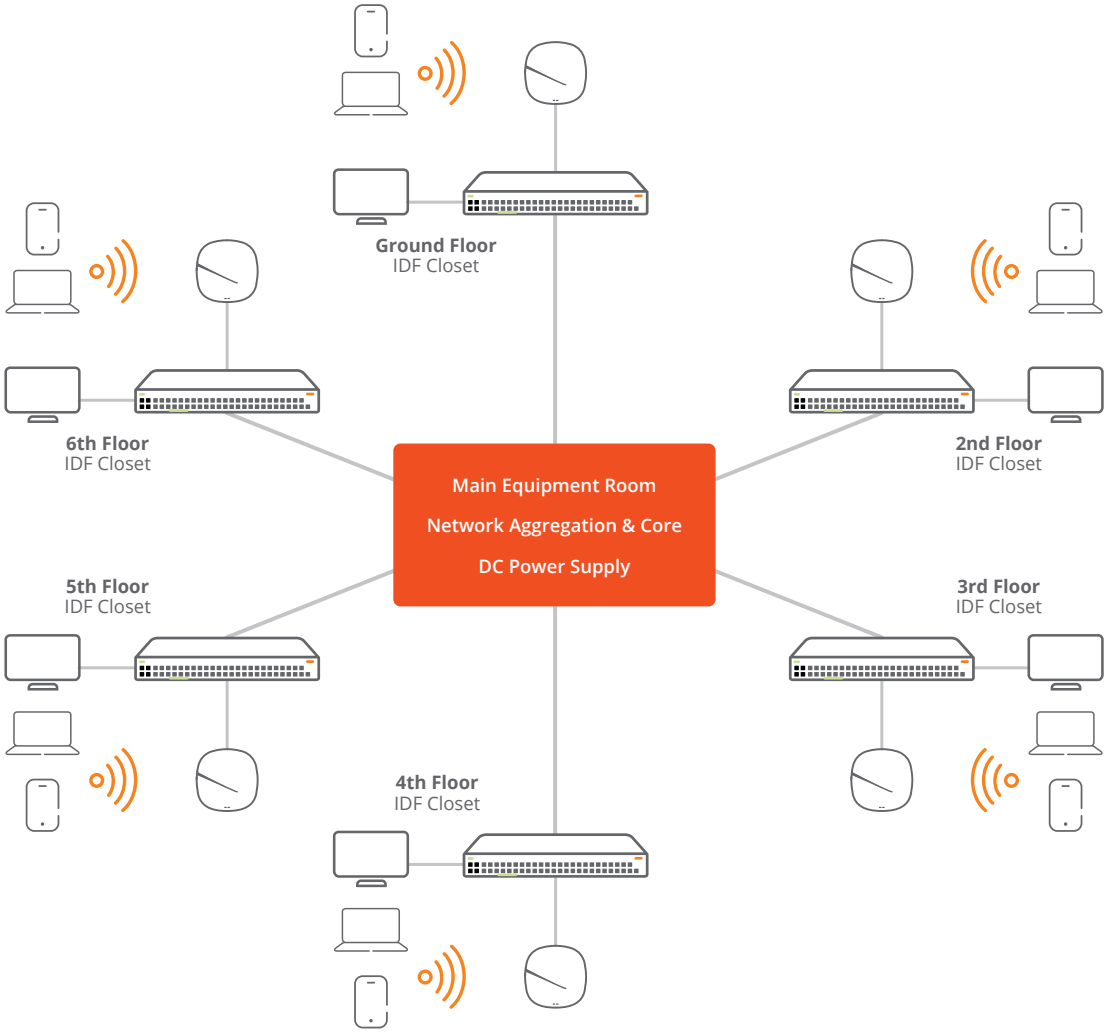

Figure 3: Hospitality property AON architecture

ASSESSING PON/GPON CHALLENGES

Bandwidth and performance are GPON drawbacks, it is prudent to understand the broader implications of PON/GPON networks before deciding if it's appropriate for your application.

Local power is required at every fiber termination point and for every device that otherwise would have been PoE-powered using Ethernet architecture. At any given hospitality property, this potentially means thousands of power supplies connected to AC outlets. Each supply will require battery backup or a UPS to provide service reliability comparable to a UPS-backed PoE network, adding appreciably to deployment and management costs.

Fixed bandwidth capacity per OLT port gets split between as many as 128 endpoints, based on the capabilities of the splitter. Endpoint examples include Wi-Fi access points, IoT devices and streaming video devices. The capacity of each OLT Port is about 2.5Gbps downstream and about 1.25Gbps upstream, translating to 20Mbps downstream and 10Mbps upstream per endpoint.

OLTs must be paired with ONTs, meaning an attempt to reduce the number of endpoints, in an effort to gain bandwidth, increases the number of both OLTs and ONTs that must be purchased.

OLTs and ONTs typically proprietary, coming from the same manufacturer and be paired according to the manufacturer's specifications. This runs contrary to the IT industry trend toward open, interchangeable solutions that reduce vendor lock-in.

OLTs and ONTs must be licensed and require support contracts with external providers. Since PON/GPON configuration and management differs substantially from traditional LAN/WLAN networks, providers skilled in this part are needed but may be in short supply.

Powered ONTs only deliver a maximum of 30 watts of PoE – equivalent to 802.3at. This is insufficient to power all of the connected and IoT devices you're likely to deploy, like Wi-Fi 6 access points, LED lighting, physical access systems, video solutions, voice telephony and a range of others. Although newer models offering 100 watts are on the horizon, options are currently limited and higher power ONTs may require installation by a licensed electrician.

The GPON communication protocol is unique, creating significant challenges for converging management and security across fiber and LAN/WAN networks. Specialized integration work is required to unify management, reduce complexity and deliver uniform security across media and systems.

To recap: PON/GPON architectures fail to provide the power you'll need for connected devices, ranging from Wi-Fi access points to IoT solutions and security systems. Further, PON/GPON solutions typically exhibit proprietary component, protocol and management requirements, adding to costs and complexity over the short and long term.

SMART RATE: THE INTELLIGENT CHOICE

Ethernet has a proven and successful track record as an open-standards solution for reliably and resiliently providing data transmission and centralized PoE power. Now, it can also deliver the higher bandwidths needed for your converged data, video and voice network.

Smart Rate delivers multi-gigabit speeds and more

A leading solution using the enhanced 802.3bz multi-gigabit Ethernet standard is formerly called HPE Smart Rate. It permits Wi-Fi 5 (802.11ac) and Wi-Fi 6 access points, as well as IoT devices and other connected systems, to obtain up to 10Gbps speeds and with IEEE 802.3bt switches 60W PoE over existing CAT5e and CAT6 Ethernet cabling.

To put it another way, Smart Rate enables property owners with existing Ethernet architectures to make a wholesale performance upgrades for answering the escalating performance expectations without pulling new cable. This yields meaningful cost and time savings, and lowers complexity compared with replacing Ethernet copper cabling with fiber.

In situations where re-cabling is a option, installing CAT6A cable cost-effectively increases the flexibility of Smart Rate for supplying ever-greater bandwidth, and higher PoE, as Ethernet standards continue to evolve.

Technology You Can Support

From a management perspective, Ethernet switching solutions with Smart Rate and management are easier to integrate with, unlike the specialized expertise required for PON/GPON.

Leading Smart Rate multi-gigabit Ethernet solutions go a step farther by providing a wealth of intuitive new tools, centralized dashboards and AI-powered analytics for unifying and automating LAN and WLAN operations. With thousands of devices soon to connect to your network, eliminating manual tasks is key to minimizing IT overhead. These tools enable IT teams to transition from break/fix to predictive mitigation by uncovering potential issues before they affect staff or guest experiences.

AON + SMART RATE = BETTER TOGETHER

If you're constructing a new property, or remodeling an existing one, combining an AON with a Smart Rate multi-gigabit Ethernet solution. This strategy gives you the flexibility to upgrade as new AON and Ethernet capabilities are introduced, at significantly more economical price points than proprietary PON/GPON solutions.

Also, switches don't require special pairing and can be procured from any vendor, unlike OLTs and ONTs. Finally, switches provide unified network management, which can reduce both complexity and ongoing operational costs. (See Figure 4: AON and Smart Rate Ethernet architecture)

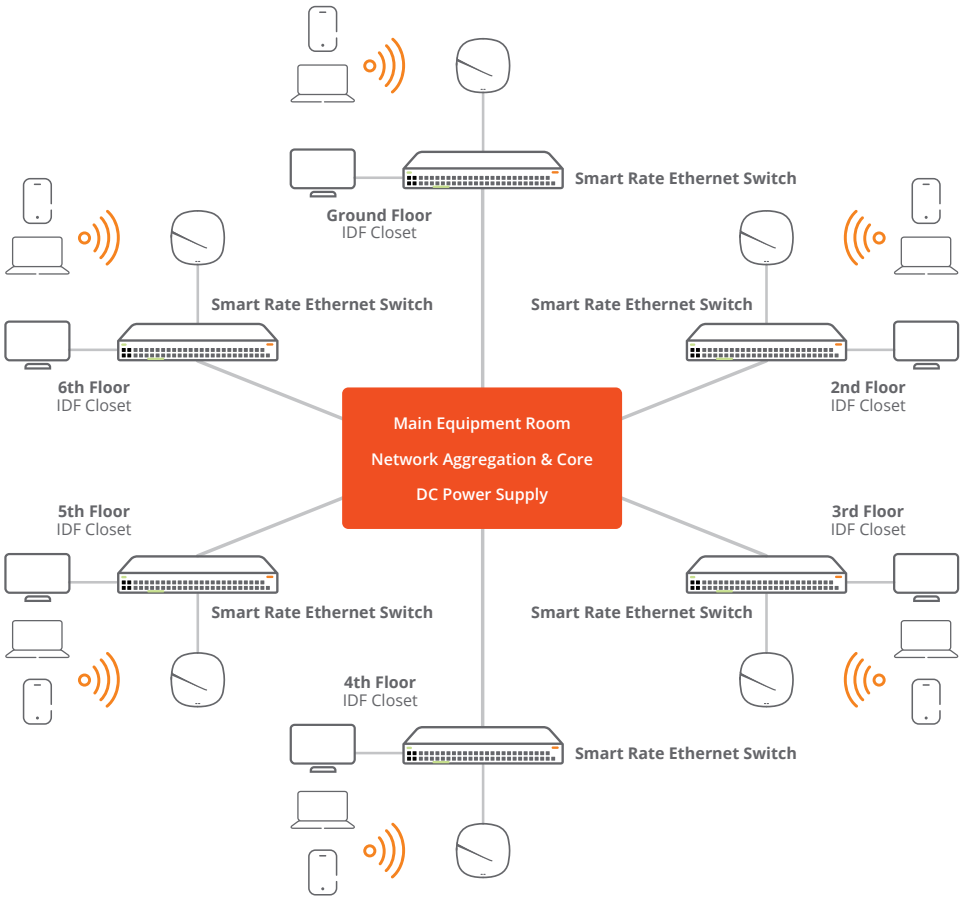

Figure 4: AON and Smart Rate Ethernet architecture

BEYOND 10Gbps

Estimates by leading industry experts suggest 10Gbps will meet the needs of every current and foreseeable application.

With development already well underway for terabit speeds, new IEEE standards will deliver ever-higher throughputs.

SUMMARY

Whether you're planning a network upgrade or designing a new building, successfully delivering guest experiences depends upon laying the right networking foundation. As you're weighing the benefits of open-standards, vendor-agnostic solutions like Smart Rate multi-gigabit Ethernet against proprietary PON options, it's critical to go beyond comparing short-term purchasing costs. To get the best option for your brand, be certain to calculate long-term capital and operating expenses that will impact your overall return on investment.

From a performance perspective, GPON is typically presented as the closest contender to Ethernet. However, important considerations like power distribution costs and vendor lock-in expenses can tip the scales. Consideration has to be given to the ease and cost with which the network infrastructure can elevate or hinder the guest experience.

With properties now adding Wi-Fi access points to every guest room to handle everything from multimedia conferencing to door access controls and location-based site navigation, you have to consider which technology is best suited to meet those needs.

Given the synergies between copper and fiber, many owners choose this approach, where an AON is used in the data center with Smart Rate multi-gigabit Ethernet supplying connectivity everywhere else – guest rooms, conference facilities, operations centers, HVAC rooms and back offices. This approach is well proven to address all current needs and flexible enough to future-proof investments.

The Bottom Line

Embracing latest networking hype doesn't ensure a cost-effective future-ready network, while overlooking a solid technology, like PoE, can lead to headaches for years to come. No matter which infrastructure you ultimately choose, only a thorough evaluation of advantages and tradeoffs will yield a solution that delivers the experiences on which you and your guests can count.

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