Fiber Optic Cabling and Passive Optical LAN for Healthcare

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Popular Science Magazine December 2013 issue announced innovation awards for Tellabs' evolutionary ICT technology passive Optical LAN at Sandia National Laboratory and healthcare's next generation robotic doctor technology created by inTouch Health & iRobot Corp[1]. The serendipitous recognition of both leading edge technologies begs the question, can passive Optical LAN enable the next generation of healthcare ICT services? The answer is, yes!

Highlights

- Fiber optic cable has no theoretical bandwidth ceiling and no known obsolescence horizon
- Optical LAN while occupying 90% less space has 4x great GbE density and 300 times better reach
- By shrinking the data centers, having no TRs and less TEs means more area for critical care and beds
- Simplified LAN means healthcare IT staff requires less initial training and no on-going certification
- This fiber optic LAN can reduce cabling plastics measuring in 1,000s of pounds in healthcare facility
- Converge critical care services, along with patient entertainment, along with all wireless traffic with service segmentation, military grade security, low latency transmission and strict quality of service
- Reduce or eliminate HEPA tenting which is intrusive, disruptive and expensive
- Mobile diagnostic medical equipment benefits from fibers immunity to electromagnetic interference

Introduction

Healthcare facilities are going through rapid changes in recent years, however their ICT local area networks utilizing copper based LANs have remained the same relative to the equipment, cabling and network architecture for the past decade. It is time for healthcare LANs to evolve to support high bandwidth needs, wireless explosion, greater stability through constant availability and strict quality of service in support of their mission critical healthcare services. The better choice is for healthcare facilities to move forward with evolutionary fiber optic cabling and Tellabs Optical LAN that provides benefits in the following areas.

- Fiber Optics Cabling Benefits
- Space Savings
- Meet and Exceed Sustainability Initiatives
- Provide Services and Network Convergence, including Wireless
- Superior Stability
- And, Increased Security

The purpose of this paper is to provide deeper explanations of these six (6) points. Thus, provide a better alternative that meets and exceeds the needs of ambulatory, behavioral, critical access, hospital, lab, and long term healthcare facilities for the next 30 years and greater.

[1] Popular Science December 2013 - http://www.popsci.com/bown/2013/product/sandia-national-laboratories-fiber-optic-network

Fiber Optical Cabling Benefits

Today when building a healthcare facility that is expected to meet the medical needs of a community for the next decades, the local area network (LAN) infrastructure needs to be able to support capacities measured in terabyte. That can be done with fiber optic cabling. By using fiber optic cabling instead for copper cable, healthcare facilities can achieve the following benefits:

- Better Bandwidth Capacity
- Greater Gigabit Ethernet Access Density with far less Cabling
- Reduce Impact of Electromagnetic Interference
- Flexibility for Network Moves, Adds and Changes
- Less Intrusive Retrofits, Expansions and Up-Grade

Better Bandwidth Capacity – Historically copper cabling could not keep pace with the bandwidth demands of healthcare facilities. Over the past decade we have witnessed CATx copper cabling standards change from CAT3 to now CAT8 is being defined. Over 5 generations CATx copper cabling was required as healthcare data speeds moved from 1Mbps to 10Mbps to 100Mbps to 1Gbps. With each generation CATx copper cabling, healthcare facilities were expected to upgrade to the next generation wasting money and negatively impacting facilities operations. Fiber optic cabling such as Single Mode Fiber (SMF) has no theoretical bandwidth limit. Today SMF has proven to support 101Tbps[2], but that ceiling is only an artificial limit based on today's electronic transmission technology available. Since the healthcare facilities telcom infrastructure standard (TIA-1179) recommends using the highest performing cable media whenever possible – that is single mode fiber.

Greater Gigabit Ethernet Access Density with far less Cabling - One single mode fiber can serve 128 gigabit Ethernet end-points where 128 separate copper cables would be required to match. TIA-1179 calls for 45% rooms need 2-6 gigabit ports, 25% rooms need 6-12 ports and 30% need x>14 ports. If we calculate the TIA-1179 gigabit port requirement on a healthcare facility with 100 rooms (e.g. 45 = 6-ports, 25 =12-ports, 30 =16-ports) that would require a total of 1,150 gigabit ports. For the cabling, 1,050 gigabit ports would require 1,050 copper cables or that same number of gigabit ports could be served by just nine (9) fiber optic cables.

Now let's assume that each one of those 1,050 gig ports requires access drop cabling connectivity that is 300'. 1,050 300' lengths of CAT6a access cabling would weigh 12,285lbs and that bundle of 1,050 cables would be almost 2 feet in diameter. To serve 1,050 gigabit ports with fiber optic cabling would weigh just 10lbs and would be no more than 1 inch diameter bundle. Finally, the CAT6a cable cost at .33 per lineal foot would total $103,950 total and SMF costs at .11 per lineal foot would only cost $271 total [Figure: 1].

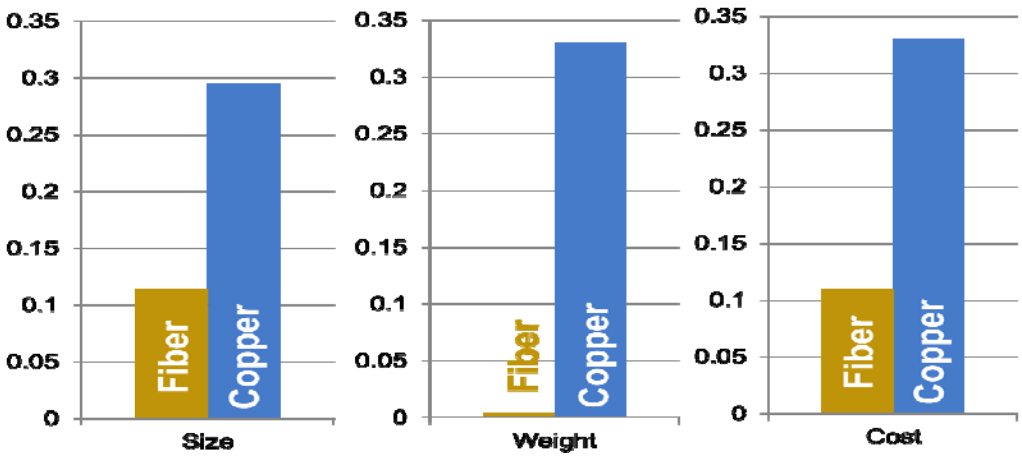

Figure 1: Per unit cost comparison of SMF and CAT6a cabling, such that diameter **size** SMF .11" / CAT6a .29", **weight** SMF .004lbs.ft./CAT6a .039lbs.ft., **cost** per foot SMF .11ft./CAT6a .33ft.

[2] NEC April 2011 - http://www.newscientist.com/article/mg21028095.500-ultrafast-fibre-optics-set-new-speed-record.html

Reduce Impact of Electromagnetic Interference – For delivering voice, video, data, security, automation, environmental and wireless services over fiber optic cabling there is no electromagnetic interference (EMI), no electromagnetic pulse (EMP), no cross-talk, fiber is non-corrosive, has no spark fire hazard and no magnetic issues. That means for healthcare facilities fiber is the best choice where exposure to magnetic fields, radiation, oxygen rich and chemicals is expected through-out the building and extended campus. Remember, we just cover how inherently there will be less fiber cables than copper cables. Then think about the benefits of not needing to engineer additional cable shielding and no need to extend length of cables because of copper cabling needed to be re-routed around problematic hospital areas. Finally, modern healthcare facilities are moving to the use of mobile diagnostic equipment that uplinks to the LAN via Wi-Fi. In the past copper cabling was re-routed around x-ray, ultrasound, cardiology and radiology equipment, but now if this same medical diagnostic equipment is portable, electrical interference needs to be taken into consideration through-out the entire borders of the healthcare facility.

Flexibility for Network Moves, Adds and Changes – We have already established that fiber infrastructure is smaller, lighter, fewer cables, shorter cables, handle greater bandwidth and is even less rigid than copper cabling. Hospital equipment, resources and staff need to be very mobile by nature. Thus, when a move, add or change is needed fiber optic cabling provides better flexibility, and easier, moves, adds and changes. Another point is that passive Optical LANs are managed centrally through element management software (EMS), thus daily IT change orders are executed as global key strokes at a centrally located desktop and do not require IT staff to run around re-provisioning geographically disparate LAN equipment at the main data center and then out at TRs and then perhaps addition provisioning at TEs.

Less Intrusive Retrofits, Expansions and Up-Grade – If network retrofit, expansion and up-grades are needed, fiber reduces much of the expense and operational impact. First, fiber infrastructure can reduce high-efficiency particulate absorption (HEPA) tenting requirements. HEPA tenting is intrusive, disruptive and expensive for healthcare facilities. With less cabling there is less reasons to access above ceiling, thus less impact relative to infection control and infection control risk. If necessary fiber can be run under the ceiling with little visibility (e.g. one SMF cable can support 128 gigabit end-points) and less infection control impact, thus less HEPA tenting. As for future network upgrades? Today's SMF cable supports 1GbE, 10GbE, 40GbE, 100GbE and wave division multiplex technologies, so whatever the future hold there is a high probability that the SMF LAN infrastructure will support all future healthcare demands and will not need to be touched.

Space

Healthcare facilities that leverage fiber optic cabling and passive Optical LAN (OLAN) technologies, can gain significant space savings. This real estate savings can ultimately be repurposed as more patient beds, larger patient accommodations; additional staff work area or other healthcare facility amenities. The space savings can be achieved through smaller or less:

- Main Data Center Equipment and Cabling
- Telecommunications Rooms (TR) and Telecom Enclosures (TE)
- Disparate Networks For Different Services
- Campus And Whole Geographical Regions

Main Data Center Equipment and Cabling – With TIA-1179 expecting 45% rooms need 2-6 ports, 25% rooms need 6-12 ports and 30% need x>14 ports, these gigabit port densities and cabling add-up quickly and can be overwhelming back at the main data center. By utilizing fiber optic cabling and passive Optical LAN technologies, healthcare facilities have a better alternative for managing this girth. One (1) Optical Line Terminal (OLT), the main data center aggregation chassis for Tellabs Optical LAN, can serve 8,000 gigabit Ethernet end-points within 12 to 18 miles. While a legacy copper LAN data center can only support 450 gigabit Ethernet end-points that could only reach 300 feet over copper. And, we already covered how one (1) single mode fiber cable can serve 128 gigabit Ethernet end-points [Figure 2] compared to one copper cable serving one gigabit end-point. To put this into prospective, Tellabs Optical LAN occupying 90% less space, has 4x greater GbE density and 300 times better reach compared to copper based LANs.

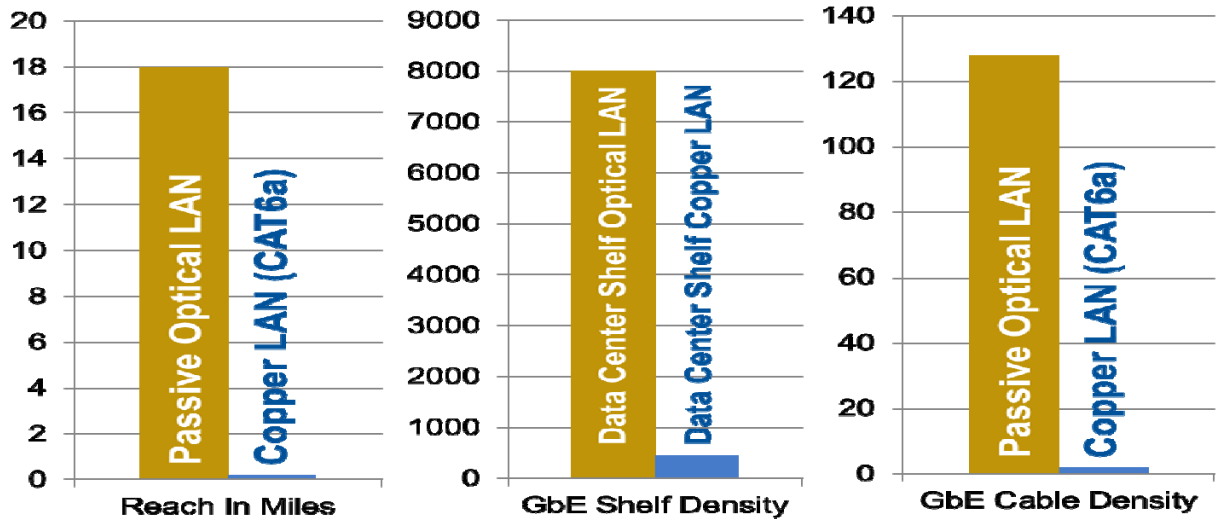

Figure 2: Comparison of OLAN reach 18 miles & copper LAN .06 miles, OLAN data center shelf density 8,000 GbEs & copper LAN 450 GbEs, OLAN/SMF cable density 128 GbEs & copper LAN/CAT6a 1

Telecommunications Rooms (TR) and Telecom Enclosures (TE) – Passive Optical LAN has the inherent benefit of being able to transport healthcare services across a span of 12 to 18 miles with no power, A/C, ventilation, floor space and management needs. This means that Telecommunications Rooms can be eliminated and the number of Telecom Enclosures can be reduced. With the elimination of Telecommunication Rooms, healthcare facility benefit from lower network operational costs (e.g. less touch points for healthcare IT staff), less power plant, less power backup, less air conditioning load and of course freed-up floor space. TIA-1179 calls for TRs and TEs to accommodate 100% future growth requirement, so typically these rooms are larger than industry standards. Healthcare facilities often require two (2) to four (4) per floor, and that can quickly add up to total numbers from 10s to 100s of these rooms spread-out across a facility or campus.

Disparate Networks for Different Services - Historically, LAN networks have been built with separate physical equipment and cable infrastructure for voice, video and data. This held true for healthcare facilities and was even made worse with the separate needs for wireless, nurse call, building automation, patient entertainment, CCTV, security and fire networks running on different infrastructure. With fiber optic cabling and Tellabs Optical LAN every single one of these networks can be converged. This is inclusive for voice, video, data, wireless, building automation, building security and building environmental controls. Furthermore, analog voice (e.g. POTS) can be delivered on the same network as voice over IP unified communications. And, RF video and IP video, for patient entertainment, security or medical care, can all traverse the same fiber cabling and passive Optical LAN infrastructure. This service and network convergence saves healthcare facility operational expenses as well as capital expenses.

Campus And Whole Geographical Regions - Passive Optical LAN has the inherent benefit of being able to transport healthcare services across a span of 300 time longer than copper based LAN's can support with no power, A/C, ventilation, floor space and management needs. Across that extended passive optical network, healthcare facilities can enjoy fewer managed ICT devices, fewer LAN moving parts, thus less things to buy, rack, stack, power, A/C, ventilate, provision, manage and fewer things to break. That means that this all fiber infrastructure can be used across large regional hospital campus and support the needs of neighboring clinics and network physicians. Ultimately all entities benefit from better network performance and low latency for critical services. This is because there are fewer electrical-to-electrical transitions and optical-to-electrical conversions and thus less energy consumed, less heat generated and then reduced latency across the end-to-end network whether transmitting building-to-building or campus-to-campus.

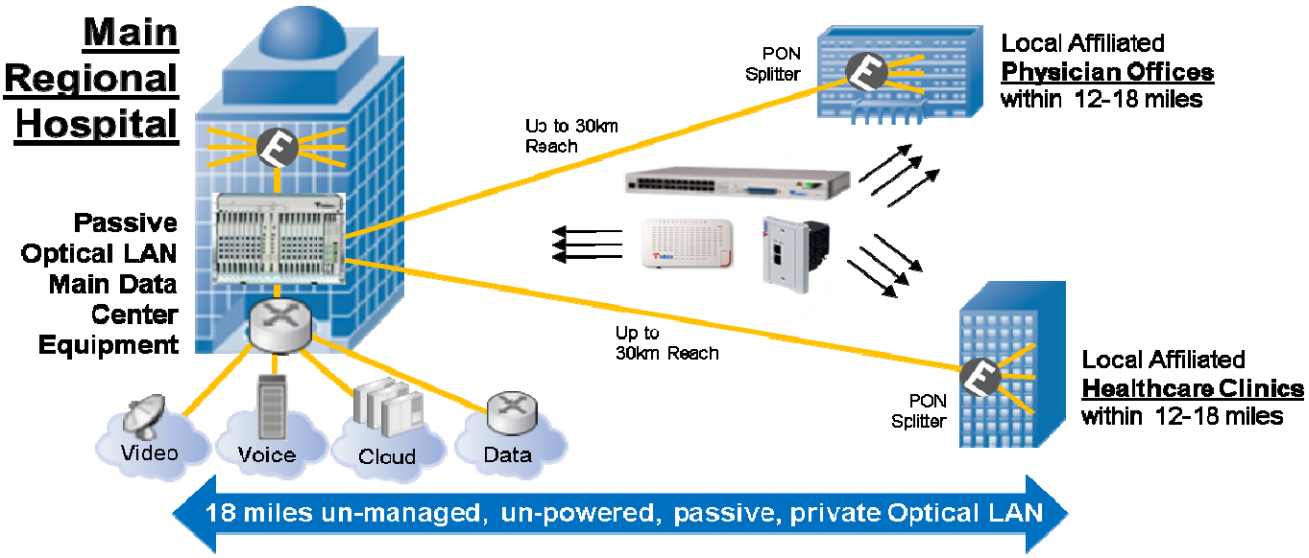

Figure 2: Private LANs serving regional healthcare facilities lowering latency and improving performance

Sustainability

Not only are healthcare facilities active with sustainability initiatives, there facilities are also heavy power users within the surrounding municipality. Fiber optic cabling and Tellabs Optical LANs can help both with direct help and indirect "rippling effect" with:

- Energy savings
- Less Plastics, PVCs and Lead
- Credits towards USGBC/LEED or GreenGlobe or TIA/STEP
- Energy Star Programs

Energy Savings – Since healthcare facilities are "super-power-user" for the local municipal power generation utility, energy savings are very important being that they are constant, reoccurring and thus can provide year over year operational savings. Not only that, energy savings can reduce the power demand for the local municipal electrical utility company. Power reductions can be achieved with passive Optical LAN provides up to 80% reduction in power and the total eliminates TRs. With less data center equipment, converged network services and eliminated TRs, there is a power rippling effects savings with less AC-DC, DC-DC, battery backup plant and emergency power generation demands. With less actively powered equipment and no TRs also comes thermal load reduction through-out the entire building. There is also a corresponding lower thermal rippling effect, because lower thermals means less building heat load, lower air conditioning and less ventilation requirements. By adding up all the energy reductions, both power and thermal, the inherent benefits of fiber optic cabling and Tellabs Optical LAN can provide calculated CO2 reductions. That is, all of the above can be accounted for mathematically and applied to lowering a healthcare facilities lower carbon footprint.

Less Plastics, PVCs and Lead - 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 pounds[3]. 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 end-points. The same math used to calculate total plastics can be used as indicator for the levels of PVC and lead that are introduced into a building by copper cabling. With less quantity and smaller size fiber cabling, Tellabs Optical LAN can reduce PVCs and lead 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 it's mining practices have poor environmental record
- Copper cable has greater quantity of plastics, PVCs and 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, healthcare network designers can choose hybrid single mode fiber cables that consist of optical fiber and two copper conductors, which will allow for ONT remote powering solution to be deployed.

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

Credits towards USGBC/LEED or Green Globe or TIA/STEP – Healthcare facilities have USGBC/LEED, GreenGlobe, Living Building Challenge, TIA/STEP and other sustainability initiatives. Following these sustainability initiatives are good for business (e.g. save operational expenses and capital expenses) and good for the surrounding community. Fiber optic cabling and Tellabs Optical LAN can contribute to these initiatives with direct energy savings, indirect lowering thermal loads for HVAC, reduces harmful greenhouse gas emissions, lowers operating costs, increase asset/property value and reduces waste sent to landfills. Also, passive Optical LAN 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 gain Energy Star credits. The test criteria and test methodologies have been established by Department of Energy for Small Customer Premises Equipment and in particularly the Optical Network Terminals (ONT) that Tellabs Optical LAN utilizes. This is important to healthcare facilities as they actively pursue Energy Star programs.

[3] 3M 2013 - http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UF6EVsSyXTtoxTXoxTEEVtQEVs6EVs6EVs6E666666--&fn=POLS_White_Paper.pdf

Service and Network Convergence, including Wireless

Healthcare telecommunication needs are ideal for service and whole network convergence. Everything from nurse call, building automation, patient entertainment, CCTV, security and fire services can be delivered over the same all-fiber LAN infrastructure. Passive Optical LAN is well suited to transport:

- Voice
- Video
- Wireless
- Building Automation, Environmental Controls and Security/Surveillance

Voice - Optical LAN can accommodate analog (POTS) voice, VoIP and unified communications simultaneously. This allows healthcare facilities to use low cost and high cost telephone receivers more cost effectively. It also provides a graceful migration from legacy POTS voice analog PBXs to VoIP/unified communications IP PBXs in an efficient and cost effective manner.

Video - Optical LAN 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. This allows healthcare facilities to cost effectively deliver ALL video requirements. Where Power over Ethernet (PoE) is needed to deliver electricity to IP cameras, Tellabs Optical LAN ONT support both low power PoE and high power PoE+. Just like with voice, these video options allow for a graceful migration from legacy RF to future IP in an efficient and cost effective manner. Optical LAN also has the ability to apply strict quality of service that allows IP video applications to co-exist with mission critical health services.

Wireless – Doctors, nurses, staff and patients are highly mobile and require high quality, continuous access to voice, video and data services. A healthcare wireless network must have the ability to gracefully accommodate 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 Optical LAN will save operational expenses, capital expenses, energy and space for healthcare needs. Tellabs Optical LAN has already been deployed with industry leading Wi-Fi manufactures (e.g. Cisco, Aruba, Ruckus). Healthcare facilities can use Optical LAN to integrate Wi-Fi network and backhaul WAP traffic to respective controllers in the main data centers. As for DAS, once again the same inherent benefits of fiber optic cabling and optical LAN apply to DAS network. Healthcare facilities can use fiber infrastructure to lower DAS deployment costs across their extended campus and even integrate the Wi-Fi seamlessly [Figure 4].

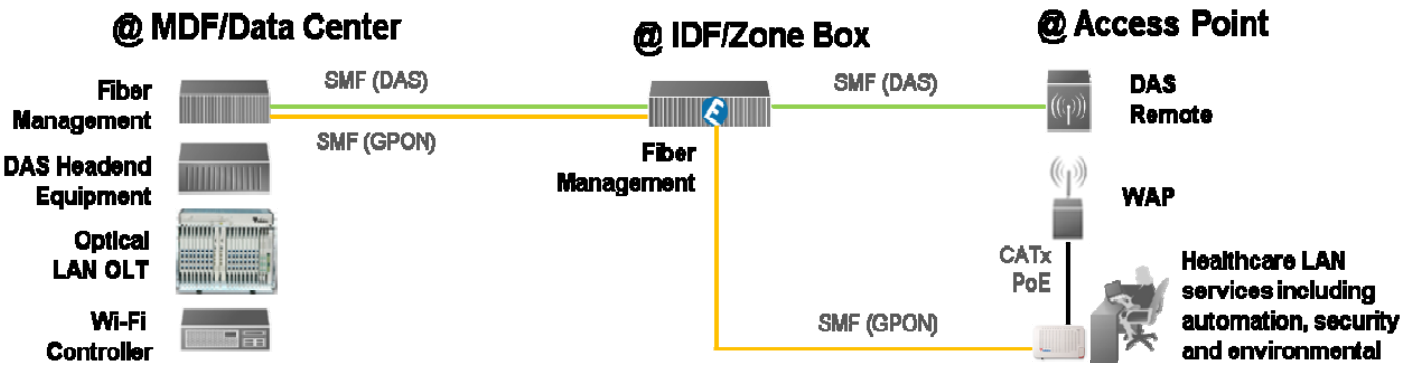

Figure 4: Optical LAN improves density, reach and coverage for Wi-Fi, and improves business case for DAS deployments by leveraging existing all fiber infrastructures

Building Automation, Environmental Controls and Security/Surveillance – Fiber optic cabling and passive Optical LAN ability to support high density IP/Ethernet end-points helps Building Management System (BMS) and Building Automation System (BAS) keep costs down for traffic backhaul. Modern high performance buildings have a wide variety of smart, environmental and automated IP/Ethernet needs. As stated earlier, an all-fiber LAN is ideal for connecting and powering IP cameras, card readers, door access, HVAC, lighting and safety IP/Ethernet end-points. Modern high performance buildings have a wide variety of security and surveillance, that can be converged efficiently and cost effectively as well.

Stability

TIA-1179 specifically calls out the need for "maximum reliability, therefore LAN stability is a high priority for healthcare facilities. There are five (5) distinct areas where fiber optic cabling and passive Optical LAN can improve LAN stability while improving operational efficiencies and lowering costs.

- Network Availability
- Optical Distribution Network (ODN) redundancy
- Main data center equipment (OLT) redundancy
- The Human Factor
- IT Workforce Stability

Network Availability - Healthcare and hospitals facility LAN downtime puts critical care at risk. Legacy copper based LANs base architecture advertises 3-9s availability or 99.9% up-time or 8 hours 45 minutes downtime annually. To compensate for the horribly high annual downtime, legacy copper based LANs over engineered the amount of capacity, power, common control, paths, access, aggregation, switching, core and cabling at the expense of healthcare facilities financial budget. Tellabs Optical LANs have been deployed in carrier service provider networks for decade and have provided measured tested carrier-class service of 5-9s availability or 99.999% up-time or 5 minutes 15 seconds annual downtime for a fraction of the cost. Being born from carrier service provider world, means that the underlying telecommunication equipment is purpose built to deliver life-line voice service year-over-year.

Optical Distribution Network (ODN) redundancy – Tellabs Optical LAN has the ability to build ODN architectures that support 6-9s or 99.9999% up time or 30 seconds of annual downtime in a cost effective manner. Type-B PON redundancy provides that cost effective 6-9s availability. This allows healthcare facilities to deploy two diverse cabling pathways between main service entrances, data center, telecommunications rooms. This is most important for the critical care areas. In fact, TIA-1179 calls for optical fibers at the equipment outlet to be terminated to a duplex optical fiber outlet/connector. Thus, we suggest installing a duplex SMF run to each location to be compliant with the generic cabling standards and still be able to support Optical LAN with future growth capacity or redundancy all the way to the outlet/connector [Figure 5].

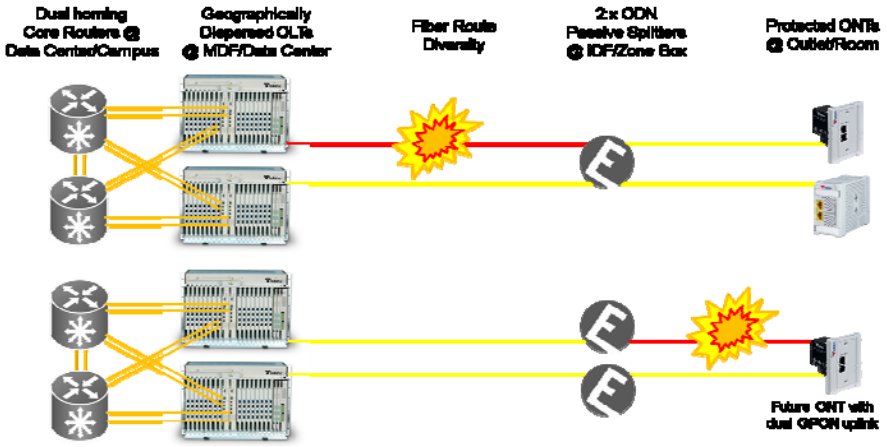

Figure 5: Option for redundancy to IDF/zone box, or option for redundancy down to outlet/room

Main data center equipment (OLT) redundancy - Main data center equipment OLT has equipment redundancy at network uplink, Ethernet switching unit, common control, timing, power input and fan. This is inclusive of a power architecture that supports elegant remote powering and ties to building redundant power system seamlessly. This is the means by which passive Optical LAN can deliver 5-9s availability or 99.999% up-time. Simply state, if a small form factor OLT or workgroup switch, does not have redundant network uplink, Ethernet switching unit, common control, timing, power input and fan, then its availability and up-time will suffer drastically. This is the equipment redundancy that allows for non-service affecting side-switching, fail-over and/or card-swapping with switching times of less than 50ms. Any fail-over of redundantly deployed cards in the system generates an alarm through the Element Management System alerting key IT personnel, although service remains intact due to protection.

The Human Factor – Unfortunately, human error is the most frequent cause of network downtime[4], so what can we do? What we can do is promote more machine-to-machine actions and less human touches. This can be done with centrally managed LAN model with robust Element Management System (EMS). Historically, legacy copper based LANs have been managed by IT professional running around to each individual active Ethernet node and executing moves, adds and changes by hand at the local craft interface. This environment is ripe for human error. Tellabs Optical LANs, with its extended reach over un-managed and un-power optical distribution network, have been optimized for remote and global management of moves, adds and changes. EMS also adds system wide alarm management and event management that inserts the ability to monitor, diagnose LAN problems and provide immediate remedy. This helps reduce operational costs and minimizes human error, for today's lean IT staff.

IT workforce stability - In the legacy copper based LANs, you have LAN equipment on every floor of every building requiring physical monitoring, provisioning, maintenance and the IT staff required weeks of education training to be comfortable with the programming of moves, adds, changes (MACs) and other network modifications. Optical LAN simplifies the aggregation, distribution and access with less equipment and less cabling, thus less IT staff touches. The passive portions of this network of course require zero attention from the IT staff. Optical LAN MACs can be executed at the centrally located EMS workstation with pre-existing global profiles or the MACs can happen dynamically with the aid of higher level network access control (NAC) protocols. Because of this simplified network architecture there is less training and no annual certification required of IT staff supporting passive Optical LANs. Training can be accomplished in 5-days, compared to copper based LAN training extending weeks if not months. Furthermore, there is no need for expensive and time consuming formal certification programs for the IT staff that often pull them off the job for extended periods of time. In the end, this helps CIO, IT managers and IT staffs compensate for today's lean IT workforce, keep pace with evolutionary innovations, manage the daily heavy workloads and assists with the retention of quality IT staff.

Security

Healthcare facilities have a high responsibility for security of medical records. This is the basic premise behind Health Insurance Portability and Accountability (HIPAA). Fiber optical cabling and Tellabs Optical LAN once again provides a more secure LAN, while saving costs. This all-fiber LAN is preferred by the US federal government and US military for their most top-secret secure LANs for the following reasons

- Cable and Equipment Security
- User and System Security
- All-Secure PON Option

[4] Infonetics Research 2008 - http://www-05.ibm.com/uk/juniper/pdf/200249.pdf

Cable and Equipment Security – Fiber optic cable in inherently more secure than copper. Fiber is not subjected to interference, nor does it introduce interference. It needs to be physically tapped to gain access and since passive Optical LAN uses stateful protocol, that intrusion attempt will be detected. Conversely, copper acts as antenna and broadcasts radio frequencies that can be intercepted without physical tap. Optical LAN adds additional levels of security, such as 128 bit Advanced Encryption Standard (AES) symmetric-key encryption that is constantly churning on all downstream traffic. At the Optical LAN ONT level security, an ONT is an un-managed device with no craft user interface, thus, ONTs are tapper proof.

User and System Security - The element management system presents strict user security with definable role hierarchy. User authentication and authorization protocols for network access control are supported, such as IEEE 802.1x in conjunction with the RADIUS protocol. These mechanisms allow for advanced intrusion detection that protects against unauthorized activity that will immediately trigger port disablement if intrusion is detected. This, and all of the above, is important for meeting and exceeding Health Insurance Portability and Accountability Act (HIPAA) requirements and discerning between trusted and non-trusted activities.

All-Secure PON Option - There is also an option for armored and alarmed fiber with 24/7/365 monitoring for the highest security needs. All-Secure PON provides real-time intrusion detection across large geographical area rather than inefficient post incident retro-active human inspections.

Conclusion

Healthcare facilities need to keep pace with the ever evolving LAN technologies including promoting the use of fiber optic cabling and passive Optical LANs. It makes no sense to continue to deploy copper based LANs that have higher capital expenses, higher operational costs, consume more energy, monopolize greater amounts of space, are less stable and pose security risk. Fiber optic cabling and Tellabs Optical LANs represents the best LAN infrastructure and LAN equipment choice for healthcare facilities striving to meet and exceed ICT expectations over the next 30 years.

For more information, please contact your local Tellabs sales representative, local Tellabs sales office, at the phone numbers provided below or visit www.tellabs.com.

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