# Health Care
Application Note

High Bandwidth

The growing sophistication and personalization of health care is demanding higher bandwidth communications with greater rate, reach and reliability, or what Actelis refers to as *The 3 R's of EFM: Rate, Reach and Reliability*, more than ever before. Increased use of remote diagnostic tools and portable devices requires networks that reach all corners of hospitals and medical centers, while ever larger images generated by sophisticated scanning systems are placing increasing strain on core legacy network infrastructures. Such networks also have to cope now with real-time video, enabling doctors to perform remote consultations, for example, or allow medical students to observe operations without having to crowd into the observation theater. Meanwhile, HIPAA (Health Insurance Portability and Accountability Act) regulations covering fraud and privacy within health care stipulate that medical records in the U.S. should be kept in secure off-site locations, adding further fuel to access bandwidth demands.

These trends are driving demand for bandwidth to regional hospitals, medical centers, emergency services, off-site storage bunkers, and other distributed sites that are often not within reach of fiber and rely on E1/T1 leased lines, fractional E1/T1 Internet access, or dial-up services that are connected via a legacy TDM network. Actelis' Ethernet in the First Mile (EFM) solution enables service providers to meet all their health care customers' networking demands, without either the cost of fiber or the uncertain performance and coverage of alternative wireless mesh technologies. Using these new Ethernet over copper solutions from Actelis-based platforms, health care locations can obtain the bandwidth necessary to support medical imaging equipment, efficiently centralize record storage, while streamlining compliance with patient privacy regulations like HIPAA.

The Upgrade Challenge

Many health care operations currently have a variety of legacy services, including fractional T1/E1 lines and even dial-up modem services, that have become woefully inadequate for the combination of bandwidth intensive imaging, real-time video, off-site storage, and wireless backhauling applications now being implemented. Possible upgrade strategies include deployment of fiber, which is far too expensive for all but a few core circuits largely because of the trenching required, and wireless mesh, which cannot be relied on for critical life and death applications. But there is a much better solution already waiting in the shape of the existing copper infrastructure, which has the range and density to support both primary services and backhauling. Actelis' EFM over copper ML platforms are perfectly matched for these requirements, having been designed to extract maximum bandwidth over copper circuits irrespective of their quality, while being scalable in small increments, delivering both the reliability and Quality of

Ethernet Access Over Copper
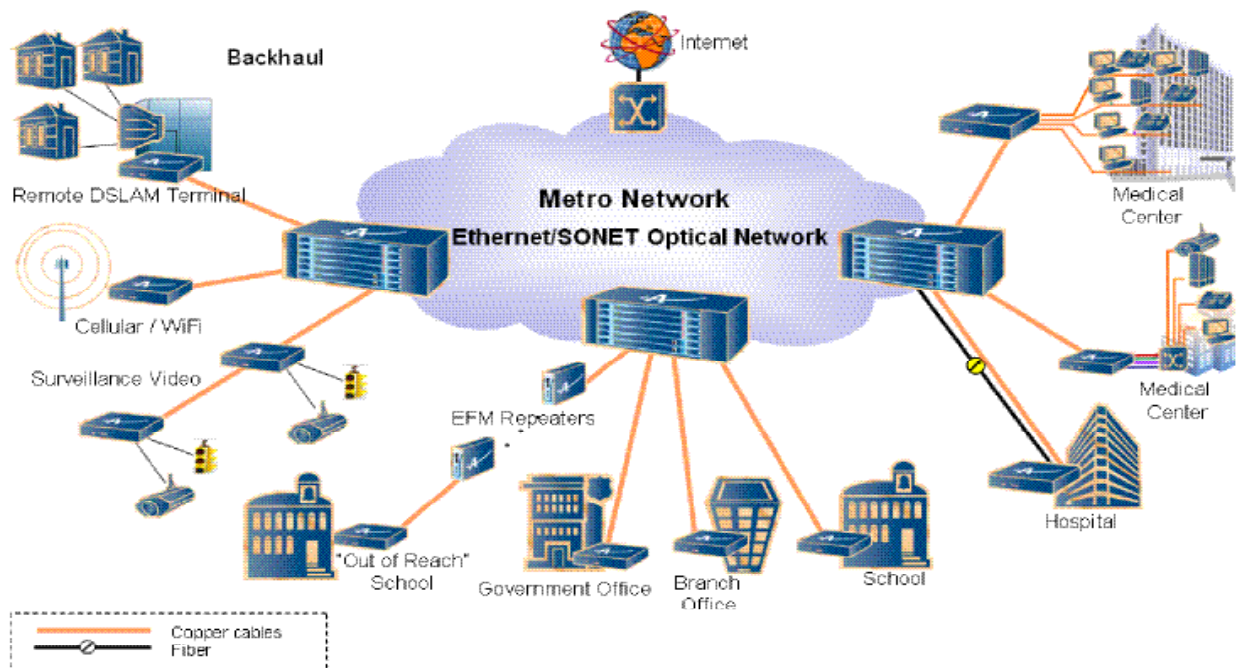
Extended Rate, Reach & Reliability

Service (QoS) demanded by applications such as remote video-based consultation. Furthermore, Actelis' ML platforms can carry all services, including video, voice, and data, as well as backhaul traffic from campus Wi-Fi hotspots. These ML platforms are capable of uniting previously distinct systems onto a common platform, providing universal campus-wide access to all applications.

Health Care Applications Driving Bandwidth

At least eight major categories of health care applications can be identified, and they are all driving demand for greater and more reliable bandwidth capable both of transporting large files and supporting real time data delivery.

Data Transport

The health care sector has witnessed a revolution in scanning over the last 10-20 years, requiring transmission of very large images generated by x-rays, ultrasound, magnetic resonance, CT, and other technologies. This is placing a strain on the network infrastructure, causing contention for bandwidth that may be needed more urgently by other applications. Actelis' ML platforms can liberate all the bandwidth needed from the existing copper infrastructure within and between campuses, and make this available as required on an incremental basis. This scalability is achieved by Actelis' EFM 802.3ah based copper-bonding technology, which enables bit rates to be stepped up incrementally by recruiting additional copper pairs, up to a maximum of 32 pairs exceeding 100 Mbps throughput. Copper-pair bonding also insulates the network against failure of individual copper pairs, since the network can reconfigure itself around the remaining pairs in the bonded circuit. Thirdly, copper-pair bonding protects against eavesdropping as data is split between the constituent pairs of a circuit during transmission, making it harder to tap the whole link successfully and reconstitute the data. Consequently, this all means that these critical large image files can be delivered anywhere within the health care network quickly, reliably, and securely.

Video Medicine

Use of video conferencing and IP television in health care is growing quickly. Video conferencing allows consultations to take place remotely, saving traveling time for both patients and doctors. Television is also being used increasingly for training medical students who no longer need to be present in an observation theater and can sometimes obtain a better view of operations remotely via high-resolution cameras. Even some surgical instruments themselves now carry fiber-optic cameras, feeding back images that can help the surgeon manipulate instruments or for analysis. There is also a requirement to backhaul video used for monitoring the condition of patients or for security. All these video applications require reliable high-bandwidth, real-time communication that Actelis' ML platforms provide. Video calls for higher QoS than other applications, and the IP packets of a video stream must be given priority to ensure they arrive on time. Actelis supports this by applying priorities specified in the IP Layer 3, as well as in the Ethernet Layer 2.

Campus Connectivity

There is a growing demand within health care for connecting different applications and sites within a single high-speed infrastructure, rather than via an unmanageable mesh of low-speed links. There is a pressing need to interconnect different functions within health care, such as doctor's offices, laboratories, surgery centers, patient rooms, and administrative quarters, with a network that allows reliable high-speed connectivity, while maintaining secure boundaries. Actelis' ML platforms facilitate this by providing a robust Ethernet-based backbone that can also be segmented into separate VLANs, each with its own security rules. The ability to partition the infrastructure into secure VLANs that are, in effect, separate networks means that health care authorities can adopt a single platform with the confidence that users can be restricted where necessary to their own applications and data. This is important for compliance with HIPAA regulations governing security of medical records for example.

Highlights

- Ethernet Security Standards
- Meets HIPAA Security for Off-site Medical Record Storage
- Fiber Quality Transmission
- MEF Certified Ethernet Capabilities
- Rapid Service Deployment
- Superior Rate and Reach
- Low Delay and Jitter for Voice and Video Transmission

Applications

- Data Transport
- Video Medicine
- Campus Connectivity
- Off-campus Buildings and Satellite Offices
- Medical Record Transmission
- Wi-FI Backhaul
- Building Security

Accelerate Everything

High Performance
High Quality

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Off-campus Buildings and Satellite Offices

Many health care facilities are located away from the main campus, or hospital site, distributed across local doctors' offices or treatment centers and sometimes in quite remote locations. In such cases the traditional copper infrastructure is the only physical medium in place, and Actelis can provide the necessary reach to interconnect the more remote sites. The availability of bonding enables the platform to deliver higher bandwidth to larger satellite sites, while Actelis' XR329 Repeater is available to extend the network over longer distances up to 25 miles from the nearest central office (CO). Actelis' support for remote monitoring is also critical for reducing the cost of maintaining large numbers of small distributed sites. Buildings of all sizes—some at remote locations with differing bandwidth requirements—can be interconnected into a single high-speed Ethernet network.

Medical Records Off-site Storage

HIPPA regulations make off-site storage of medical records compulsory. T1/E1 lines are an expensive option with little scope for expansion, while fiber is impractical and even more costly. Ethernet over copper is cost effective, reliable, and ensures that these off-site links can be incorporated into the backbone network. It also helps meet the HIPPA security guidelines, in particular, by Actelis' support for the SSH2 (Secure Shell) protocol, defined by the Internet Engineering Task Force within the SNMP (Simple Network Management Protocol) standard. This provides secure encrypted connections between clients and servers, with the ability to authenticate users. SSH2 has emerged as a powerful and flexible tool enabling military agencies to harness the power of encryption for secure communications. The use of channel bonding confers further protection against eavesdropping, since data is split between the constituent pairs of a circuit during transmission, making it harder to tap the whole link successfully and reconstitute the data.

Wi-Fi Backhaul

Portability and mobility are increasing requirements within hospitals, especially given the proliferation of handheld monitors and PDAs used by doctors for taking notes and obtaining information while on the move around the campus. These devices are often connected to Wi-Fi networks, which, in turn, need backhauling into the core Ethernet network. Actelis' ML platforms provide this backhauling capability with point-to-multipoint systems that reach out to the various distributed WiFi hot spots within a hospital or health care campus.

Building Security

A number of high-profile incidents in public buildings have heightened concerns over physical security and building/room access control. This has led to installation of more surveillance cameras and other security monitors throughout health care sites. The existing copper infrastructure usually extends throughout the campus so the same copper network can backhaul video to one control center serving all security devices, making it easier to respond to emergencies through instantaneous surveillance and subsequent rapid execution of lock down procedures.

Conclusion

A campus-wide Ethernet over copper network, powered by Actelis' ML platforms, ensures that all health care functions are integrated into a common secure Ethernet platform, even as they outgrow legacy communication links such as T1/E1s. This is accomplished while keeping down IT costs and providing a single point of management and control. Actelis' ML platforms can be scaled up as bandwidth demands continue to grow by recruiting additional copper pairs into bonded connections as required exceeding delivery of 100 Mbps over copper. Furthermore, Actelis XR239 Repeaters enable full coverage of even the most distant location while providing reliable high bandwidth transmission.