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CASE STUDY

Mini-Metro Networks and Their Use in Medical Networks

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Overview

Today, metro networks can consist of large and expensive installations, which are operated by large cities or by telecommunication companies. These networks are routinely expensive for customers because the cost of implementation by these service entities is so high.

Why are these costs so high? Any company that has trenched large areas and buried fiber cables will say (if they are still in business) that the main cost is the fiber. Other companies that have bought fiber for pennies on the dollar from failed fiber installers will say the cost of SONET systems for the Metro network are so high, and at a routine cost of \$100,000 or more for an OC-192 (10-Gigabit) port, that is indeed the case.

What if a small metro network could be constructed using existing fiber, and with lower cost 10-Gigabit speeds and simpler management requirements, but could offer some of the original capabilities that a SONET based system could? Would the price drop to reasonable levels? What *is* a reasonable level?

Anonymous Definition

Metropolitan area networks connect businesses to businesses, and businesses to WANs and the Internet.

A MAN is typically a backbone optical network that spans a metropolitan area, usually in a ring configuration.

The telephone companies have provided MAN services in the form of SONET rings for years.

These services are based on TDM (time division multiplexing), which is more suitable for voice than data.

Customers connect into the ring via ISDN, T1, fractional T1, and even T3 lines.

However, even for short distances, these connections are expensive.

Raptor Comments

The demand for Ethernet based MAN systems is growing at around 800%/year.

Companies that own strategic fiber, and that are willing make the move, can be part of this escalation in business.

Such companies would become prime targets for acquisition when the large Telcos realize they are losing business to these mini-metro networks

Case Statement

Consider the following problem.

T1 lines cost between \$800 to \$1200 per month and allow a maximum of 1.5 Mbps, T1 lines are rarely capable of reaching this level, resulting in the installation of multiple T1s. When the T1 count reaches 4 to 5 links, it is often cheaper to use a T3 or Fractional T3, which allows up to 45 Mbps of capability. When using T1s to link to a service provider, the customer needs a relatively low-cost WAN router to service the links, but the move to T3 often requires an upgrade to a more costly router. In either case, a router is used to interface to the WAN connection. Multiple T1s or a T3 can cost as much as \$8,000 a month even when it is not always capable of producing a full 45 Mbps.

A number of clients have agreed that a Gigabit Ethernet link, which guarantees at least 300 Mbps would be perfectly priced at \$3,000–\$4,000 per month and would directly cause many of them to switch quickly from existing services.

The Raptor Solution

Given the above to be true, if this network could also allow VPN-type services by creating point-to-point connections between sites by using Virtual LAN technology, with Quality of Service (QoS) guarantees that ensures that VoIP, Video conferencing, and Storage for backups/replication/mirroring operate correctly, then the attractiveness of this solution becomes unbeatable.

The Raptor Solution

Metro networks are seen as being highly robust and reliable. The Ether-Raptor “Eight-Pack” is a resilient design with multiple active-active links working at layer 2, which keeps latency low and therefore allows VoIP to work correctly. The Ether-Raptor mini-metro network would also allow customers to effectively “Dual-Attach” to its units using a simple industry standard called IEEE802.3ad (Link Aggregation), which allows these metro links to interface directly into the current switching structure of the client without the need for a routing system to be at the client side.

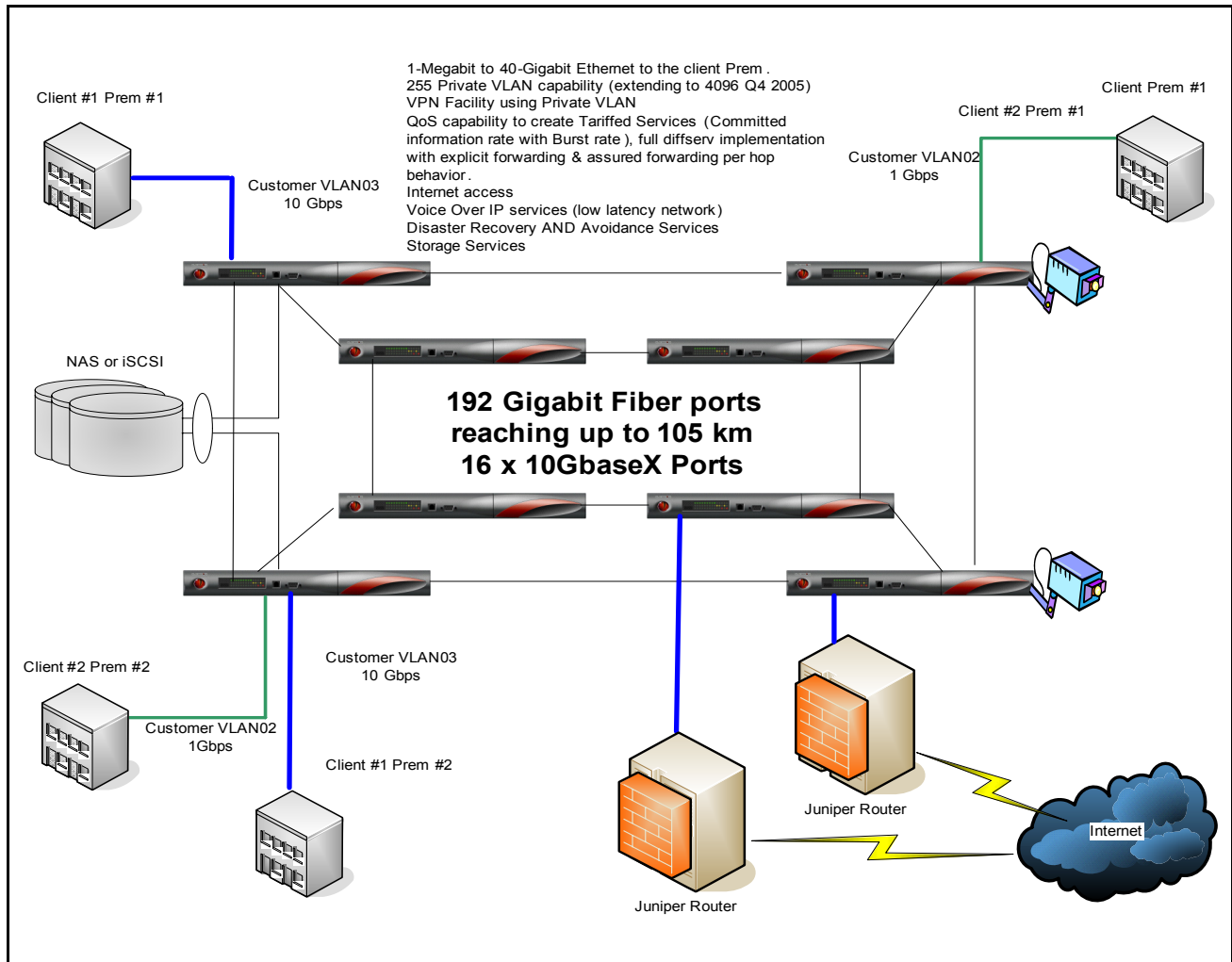


FIGURE 1. Raptor Metro “Eight-Pack” Network

All clients would be connected on separate virtual LANs that allow a level of internal security. The mini-metro network would join the Internet via two routers, which would perform access control to the Internet via 2 x 10-Gigabit (OC-192) ports. These ports allow a redundant Internet connection and create a secure internal private network for the entire mini-metro network. Each client gets a single, or for higher cost a dual, Gigabit Ethernet fiber link into their facility, and they are allowed to have a certain block of IP addresses from the pool created. They could even configure the Metro network to act as a DHCP controller for them, in effect, outsourcing their IT to the provider.

Cost Benefits

The provider can operate as a simple Internet Service Provider (ISP) and allow access to the Internet or extend services to include VoIP, Video Conferencing/Delivery, and Storage backup/replication over the network. Clients/users may wish to use their own firewalls or may rely on the provider to offer a complete solution.

Mini-metro network providers can interconnect these networks together with low-cost Ether-Raptor 10-Gigabit Ethernet links, creating larger metro networks connected by 20 to 40 Gigabit aggregated links.

Extract from a Light Reading Article "Building 10-Gig/DWDM MANs" issued October 27, 2000.

Although it may not seem important when compared to the technical advantages, Ethernet can be relatively easily sold to most customers.

Most enterprises already have experience with Ethernet and would be willing to accept its use by service providers, especially if outsourcing is a possible option.

The use of Ethernet across the MAN and WAN also expands its market penetration, increasing its popularity even further.

Ethernet also provides a means to avoid re-engineering an existing customer premises network; this leads to quicker implementation, lower implementation and management costs, all of which results in happier customers. A more simple management and billing structure for the provider, makes everyone happier.

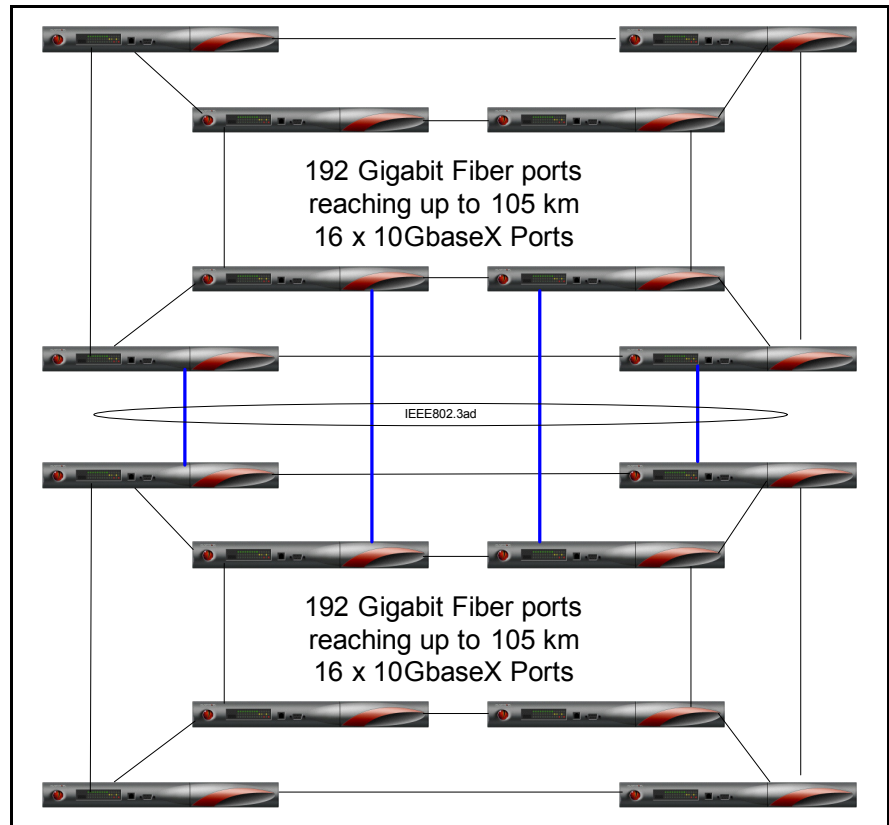


FIGURE 2. Two Raptor Eight-Packs Interconnected at 80 (Full-Duplex) Gbps

When mini-metro networks are connected this way, Internet connectivity redundancy is enhanced to allow multiple access points to the Internet and customer reach over distance from city to city, county to county, or even state to state.

Cost Benefits

If a medical group (or a number of medical groups) wanted to install one of these mini-metro networks, there would be the significant cost benefits. Obviously, the easiest place to look for savings is in WAN costs. If any medical center or hospital was offered a 1-Gigabit fiber link (perhaps even a redundant two-fiber setup) for around \$4,000 a month, this would be enough of reason to move from traditional T1/T3 WAN links and consider attaching to the mini-metro network.

Cost Benefits

Any company looking to install a mini-metro network for medical use would need to look at the cost benefits. The example below provides a hypothetical situation based on the premises presented in this study.

Example: Hardware costs for one mini-metro network

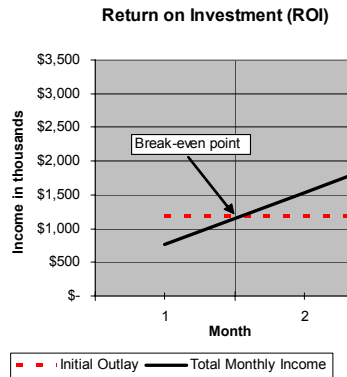
Costs:

Ether Raptor switching system "Eight-Pack"	\$200,000
Juniper M160 Base Unit	\$125,000
1 Port SONET/SDH PIC SM SR-2	\$195,000
1 Port 10Gbase	\$165,000
Juniper M160 Base Unit	\$125,000
1 Port SONET/SDH PIC SM SR-2	\$195,000
1 Port 10Gbase	\$165,000
Total Initial Outlay	\$1,170,000

Income:

192 Gigabit Ports per system, Monthly income @ \$4,000	\$768,000
Annual income	\$9,216,000
ROI (See chart.)	< 2 months

Overall return on investment (ROI) can be extremely rapid.



The ROI is less than two months in this example.

Of course a full 8-pack is not necessary at the beginning. A 4-pack or 6-pack system may be more attractive, with an upgrade later (upgrade simply means adding more switches) to as much as 15 switches with a potential total of 340 Gigabit ports available. The IT person who maintains the network can preprovision switches that are planned. When the physical switch arrives, it simply picks up its configuration and meshes into the network transparently.

Many hospital campuses are well suited to specifically targeted mini-metro systems and benefit from the resiliency engendered by a fully-meshed virtual chassis, which simplifies so many other features in the operation of the hospital IT department and at lower cost.

Even a single hospital building can benefit from a mini-metro network, where each floor has a metro element, fully meshed to other floors, and creating a highly-resilient network backbone, without expensive core switch systems.

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