Choosing the Right Metropolitan Ring for Your Business
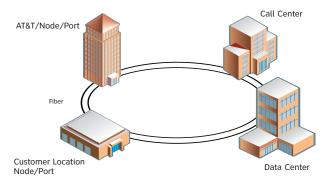
Introduction

Businesses are evolving and looking for more effective and efficient methods of handling bandwidth, performance and end-point needs. In addition, they are trying to anticipate future needs to help make good networking decisions. Metropolitan ring solutions are being used to consolidate network access facilities for multiple locations, connecting them with each other, the WAN, the Internet and with common carriers and carrier hotels. Instead of maintaining an array of separate access connections at each building, the enterprise can link offices to carrier and WAN facilities through a high-speed ring network. The consolidation of traditional transport access services can also reduce overall access costs.

Metropolitan ring designs remain very popular because the configuration enables a business to handle multiple voice and data applications on a single, highly reliable network, while extending LANs across multiple infrastructures. A typical ring design consists of Nodes, Ports and Fiber. A Node provides connectivity to the ring at customer premises locations and Central Office (CO)/Point of Presence (POP) locations. The Node at the CO/POP performs network monitoring, and is where ingress and egress from the private ring takes place. Ports provide a service interface to the node (i.e. "on ramp"), and are configured to the speed and protocol of the requested service. Nodes are connected via diverse fiber pairs. Fiber is the medium used to transport data around the ring.

Ring solutions are often used for data mirroring, storage applications and network access consolidation. They also enable more rigorous continuity and disaster recovery options. Two optical standards are used today with ring architectures to transport information. They are Synchronous Optical Network (SONET) and Dense Wave Division Multiplexing (DWDM). Each delivers particular benefits, meeting the growing needs of diverse business situations.

Network Ring Technology

This is a diagram showing a typical Metropolitan Ring Architecture. Rings are composed of three basic components: nodes, ports and fiber. Rings are connected through fiber connections. Fiber is the medium used to transport data around the ring.

SONET

SONET is an optical standard that is a widely recognized across the globe. This standard provides high-speed, fiber-based, full-duplex capabilities for voice, video and data. SONET is an ideal choice for supporting high bandwidth and failure resistant technologies. Many businesses use SONET as a dedicated private network to carry all traffic between metro locations, voice and data providers and Internet facilities. It uses a timing element to synchronize transmissions between sender and receiver, so data can be sent as large packets or blocks, instead of as individual characters. By dedicating individual time slots for each service, the synchronization aspect of SONET allows many lower speed services to be transported within a single, high-speed circuit. This allows data to travel the ring simultaneously at

very fast speeds. Each time slot can be configured to the specific speed and protocols of its service application, helping to ensure the quality of service and performance.

SONET is a great choice when network security is a concern. Due to the nature of fiber-based service, it is impossible to "Wire-Tap" fiber since the fiber itself is made up of strands of glass. Traffic riding across fiber travels in light pulses, eliminating eavesdropping. Unlike with copper connections, there is no cross traffic traveling on the fiber network. Should the fiber get "Tapped" into, the glass connections would break. If there is a physical break in the fiber, a SONET network will immediately detect it, trigger a service alarm and reroute the traffic across the network. SONET's "self-healing" network can detect fiber path outages and restore alternative routing within 50 milliseconds. Diversity options are also available by provisioning dual access connections entering the building at different locations. This helps ensure that there is no single point of failure.

Businesses that use SONET Rings may realize savings in access and management costs. For example, a communications company used SONET to connect multiple locations within a Metro. One location included a data center, connected to a back-up data center, which hosted sensitive records needing to be accessed from other locations. Another location was a call center requiring a large volume of voice traffic, while simultaneously accessing information from the data center, the Internet and other locations. All locations were making basic data transmissions (e-mail). Frame Relay, ATM, DS3's and T1's were being used and managed separately. The company consolidated these services onto a single SONET network, reducing the number of access points, providing greater security, improving reliability and requiring fewer people to monitor and manage the network.

SONET may also be designed with other popular features that may not have been available last year, such as Ethernet over SONET and Resilient Packet Ring Resilient (RPR). Resilient Packet Ring is a SONET-based feature. It was established according to IEEE 802.17, a standard designed for optimized transport of data traffic over fiber rings. RPR is designed to provide the resilience of SONET/SDH networks, but with packet-based transmission. As a feature of SONET, RPR will carve out a piece of the SONET ring to dedicate to transport packet-based Ethernet traffic. The remaining bandwidth can be used to transport traditional SONET (OCx, DSx) traffic. The Ethernet traffic carried on the RPR inherits all the benefits of the underlying SONET ring, such as protection switching. By treating all data as packets instead of as individual streams, RPR can increase the efficiency of Ethernet and IP services. RPR can help companies justify the investment of a private fiber network by using it as an Ethernet transmission medium. The ubiquity of Ethernet in many business environments can make RPR an attractive option.

A SONET Ring should be considered if an enterprise:

- Is carrying traffic larger than DS3 between 2 or more locations

- Is implementing a strategic plan that anticipates network growth

- Demands network reliability and redundancy, with overall survivability for critical applications

- Requires private, dedicated network for sensitive applications

- Needs to link multiple sites together

- Requires guaranteed high performance and reliability (SONET carries 99.999 reliability)

DWDM

DWDM is often called the next generation of SONET. However, it is actually not SONET protocol at all. DWDM is an optical technology used to increase bandwidth over existing fiber optic backbones. It is complementary to SONET, in that SONET can be transported across a DWDM-based network. DWDM works by combining and transmitting multiple signals simultaneously, at different wavelengths, on the same fiber. Basically, one fiber is transformed into multiple virtual fibers. Multiplexers are used at each entry and exit point to assign particular kinds of communication to particular wavelengths of light on the ring. This effectively partitions the fiber so that different kinds of traffic can travel simultaneously without interference. This approach is protocol and bit-rate independent. DWDM networks can carry different types of traffic at different speeds.

DWDM allows for multiple protocols at the wavelength level, and different protection options as well. That means DWDM networks can include extra protection on certain kinds of traffic, but not on other, less-sensitive traffic. For example, a hospital might apply extra protection to ensure that the connections that carry patient record information are being carried to the Storage Area Network and Data Centers, while lower priority traffic such as email and Internet access could be delivered via a more traditional DWDM protection design. By managing the network down to the wavelength, IT managers can make sure that they are using the DWDM ring to it's full potential. This enables businesses to save money in overhead, operating costs, as well as upgrade and future build out costs.

Like SONET, DWDM can be very cost-effective by allowing users to manage all their traffic over one flexible and secure network. However, DWDM goes a step further by supporting most common Optical protocols. It can support SONET, video, storage and Ethernet on a single DWDM-enabled ring. SONET can only support SONET protocol traffic (including Ethernet over SONET), which is sufficient for many users. Applications such as broadcasting, which use video protocol, perform better on DWDM because it does not need to be translated to SONET.

Storage Area Networks (SANs) are one of the main drivers for customers to select DWDM. Because DWDM transports native SAN protocols, it saves IT managers the extra expense of translating SAN traffic from the servers into another protocol to traverse the network. In addition, DWDM has preferred protection options that help avoid the substantial business and financial risks and potential loss associated with lost data, data recovery and downtime that may be present while using a less reliable network.

DWDM should be considered if an enterprise:

• Has multiple locations that need to be connected

• Needs a Storage Area Network

• Requires support for bandwidth intense applications

• Needs to place different protection options on each application

• Needs to support multiple protocols

• Is growing beyond a standard OC-48 SONET in the next few years

Making the Choice

Choosing a ring technology is a matter of striking a balance between cost, security, protection, bandwidth and anticipated future growth. SONET is a good choice for companies with two or more locations in a single metro that may be looking to consolidate transport services. Due to the inherent self-healing ability of SONET, it is a solution for businesses needing optimal security and reliability. SONET also offers businesses the ability to transport traditional Ethernet traffic via the RPR feature. DWDM addresses many of these requirements, but is a better choice if a business needs more protocol options than SONET gives, wants to provide a storage area network, needs to support broadcast video, needs to provide different levels of protection for applications, or uses multiple bandwidth-heavy applications.

Security is the number one value in any optical network. SONET and DWDM can both be deployed within a dedicated optical network in which the fiber and its associated hardware are provided for the

exclusive use of a single customer. No other business can use the same fiber components. The networks may be designed with diverse entry points to further ensure no single point of failure. Ring architectures are known for their reliability and performance, and provide the most value to businesses needing the combination of high security and heavy bandwidth. Health care companies, financial services firms, government agencies and broadcasters are leaders in the deployment of private optical networks.

The technology of optical networking is a very dynamic area. Interested enterprises need to review their entire network portfolio (conduct a complete inventory) to understand where they can consolidate services to maximize efficiencies and save costs. In order to optimize on network investments, businesses should create a networking plan with at least three years outlook to anticipate future growth, technology trends and bandwidth needs. It can be costly and time consuming to build and deploy a new network. Designing a network that will work now and a few years forward is a sensible way to make technology investments.

When planning an optical ring, or when considering ring upgrades, it's important to work with a partner that understands the benefits and limitations of each technology. AT&T is a recognized leader in fiber optics, experienced in the pros and cons of current standards, and engaged in the evolution of future specifications. AT&T uses ring architectures to carry traffic within its own network. With a comprehensive set of ring products and technologies, and a broad global footprint, A&T helps enterprises configure custom ring networks that meet their individual needs, now and for the future.

For more information contact your AT&T Representative or visit us at www.att.com/business.