Building a more resilient optical network

How OTN-switching and mesh restoration are adding value to wavelength services.

A white paper from Bell

Bell

What's inside

With revenue and productivity increasingly dependent on network availability, organizations are demanding more than just speed and capacity from their wavelength services: they're looking for high levels of service resiliency and survivability as well. To meet that demand, service providers need to deliver more than just low latency and high capacity to customers.

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The need for more than just speed

As cloud computing and eCommerce continue to dramatically change the way business is conducted, organizations that rely on wavelength connectivity are demanding more than just speed from their service providers. With revenues so closely tied to website and data centre availability, wavelength services that offer additional features and options to protect against downtime are essential.

To keep pace with the demands of customers, service providers need to provide more than just speed and capacity. By taking advantage of the flexibility offered through a modern optical transport network (OTN) infrastructure, customers can deploy cloud applications that can increase service resiliency and survivability – minimizing downtime and its impact on revenue and productivity.

What today's organizations expect from their wavelength connectivity

Organizations of all kinds depend on wavelength (optical) connectivity to power their day-to-day operations. It is increasingly being used to support mission-critical applications deployed in enterprise IT environments, including enterprise resource planning (ERP), workforce collaboration, business continuity and disaster recovery.

Because of the speed and capacity optical networks can offer, the demand for 10 Gbps and 100 Gbps wavelength services has seen explosive growth in recent years – and shows no signs of slowing down.

Analysts expect the wavelength services market to see growth rates in the high single digits each year between now and 2021. The majority of new wavelength circuits deployed are now 10 Gbps rather than 1 Gbps. And with the price for 100 Gbps equipment becoming more affordable, 100 Gbps has shifted from planning to actual deployments for most service providers.

100 **Gbps market is predicted to increase from $111 million in 2015 to more than $560 million in 2021.** [1]

While the proliferation of high-bandwidth video services has played a large role in this growth, the demand for wavelength services among businesses has been driven primarily by the rise of cloud computing. As the cloud ecosystem develops, many organizations find wavelength services optimal for interconnecting their data centres in their private clouds to public cloud providers to benefit from a hybrid cloud approach when leveraging infrastructure-as-a-service (IaaS) capabilities. At a minimum, these organizations expect high-capacity, high-performance connections to their data centres.

[1] Frost & Sullivan (2016). *Wavelength Services Market Update, 2016.*

Why resiliency and survivability matter

A recent survey of IT professionals found that

89 percent

had reported at least one unplanned network outage in the last 12 months, with 60 percent of these outages lasting an hour or longer. [2]

Breaking down the cost of network downtime

Downtime costs medium and large businesses in North America a combined $700 billion each year, broken down as follows:

- Lost productivity (78%)
- Lost revenue (17%)
- Costs to fix the issue (5%)

Source: HIS Markit (2016). The cost of server, application and network downtime: North American enterprise survey and calculator

For most businesses, any amount of downtime is unacceptable. When networks go down, productivity and revenue take an immediate hit. The longer the downtime, the higher the costs.

Every business is different, with varying levels of risk tolerance and reliance on technology, making it difficult to pinpoint the exact costs of network downtime. One estimate puts the cost of downtime at $5,600 per minute – or more than $300,000 per hour.[3] For the average medium to large enterprise, this works out to about $140,000 per outage. Depending on the nature of the company involved, however, these costs can climb even higher: a single outage might cost a company in the financial sector as much as $540,000.[4] And for a service provider that provides connectivity to hundreds of customers, an outage lasting just one millisecond could potentially result in millions of loss in revenues.

Regardless of industry, vertical or business size, these costs will only continue to rise. With emerging technologies boosting productivity to new heights – but also significantly escalating the day-to-day expectations placed on companies by customers and partners – businesses can quickly grind to a halt when their digital systems stop working.[5]

Certain mission-critical applications, such as high-frequency trading, can be severely affected by just a few nanoseconds of downtime (let alone an entire hour). Other less-critical operations, like storage virtualization and synchronous disk replication, can tolerate only a few milliseconds of downtime. And while operations such as remote storage can handle 100 milliseconds or more of downtime, the end result is still the same: a negative impact on business revenue and productivity.

It isn't surprising, then, that among the key service attributes organizations are looking for from their wavelength providers, survivability and resiliency are near the top of the list.

As data centres become the locations where businesses consolidate all their IT resources, the optical networks connecting those data centres play an increasingly critical role in disaster recovery planning. But to reduce downtime and maximize service availability, data centre interconnections must evolve from static configurations to a new level of operational performance, providing connections that have the ability to be dynamically rerouted if they fail to achieve required IT survivability specifications and maintain rapid changes in connectivity to the cloud.

[2]Dickey, J. (October 2016). *What does a network outage really cost? ITProPortal.* Retrieved from http://www.itproportal.com/features/what-does-a-network-outage-really-cost.

[3]Lerner, A. (July 2014). *The cost of downtime. Gartner Blog Network.* Retrieved from http://blogs.gartner.com/andrew-lerner/2014/07/16/the-cost-of-downtime.

[4]Avaya (March 2014). *Network downtime results in job, revenue loss.* Retrieved from http://www.avaya.com/en/about-avaya/newsroom/news-releases/2014/pr-140305.

[5]Leitch, G. (November 2016). *Why network downtime costs are increasing. Data Resolution.* Retrieved from https://dataresolution.net/network-downtime-costs-increasing.

New possibilities through OTN switching

Wavelength optical services typically provide transparent connectivity: they're designed to provide high bandwidth and lower latency performance compared to Layer 2 or Layer 3 service offerings. However, increasing cloud service adoption and enterprise expectations have created a steady trend toward adding more value and more features into wavelength service offerings. For enterprise customers the key to being able to leverage cloud services to deliver mission critical applications is to choose a provider with a leading-edge transport infrastructure that incorporates OTN switching and an intelligent control plane.

An OTN-switched infrastructure with an intelligent control plane enables a self-aware network that autonomously maintains knowledge of all its available resources and assets, resulting in faster decision making and higher degree of control. This makes it possible to automate a wide range of end-to-end network operations, including network discovery, service turn-up and tear down and maintenance planning and execution – resulting in improved service resiliency and reliability.

What is OTN?

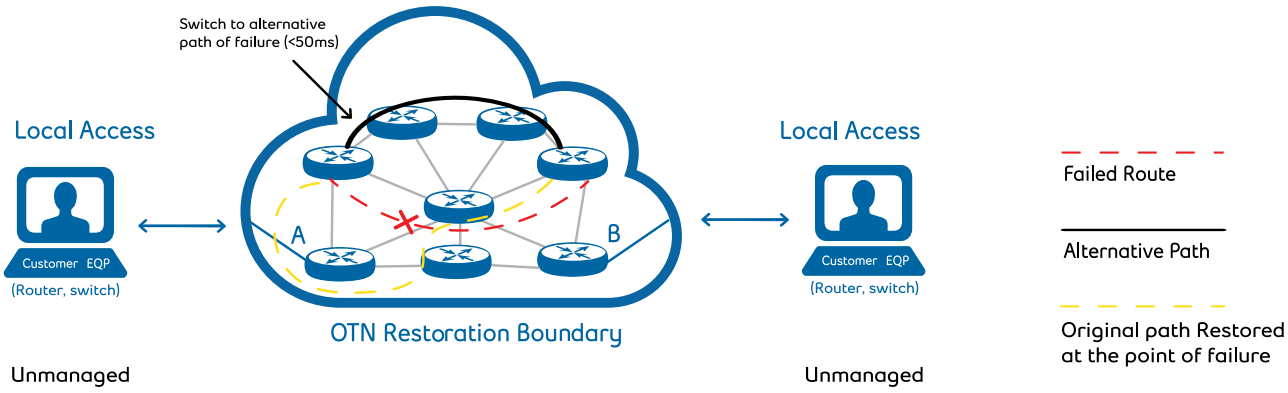
An optical transport network (OTN) refers to a set of optical network elements, connected by optical fibre links, that can provide functionality of transport, multiplexing, switching, management, supervision and survivability of optical channels carrying client signals.

OTN allows a number of different services to be carried over a wavelength, with OTN switching providing the capability to switch services to meet the needs of different users.

Mesh restoration

While traditional optical networks typically offer some type of path redundancy and a failover time of less than 50 milliseconds, they cannot survive multiple or simultaneous failures. In contrast, a mesh-based network managed by an intelligent control plane can provide that level of survivability by rapidly rerouting connections around network failures – minimizing the risk of disruptions without the need to assign a dedicated protection path for each customer.

As illustrated below, the intended working route through the network is depicted as the red line from point A to point B. If the working route fails at any point (indicated by the red 'X'), a restoration path is automatically calculated at the time of the failure and the traffic will then be routed through a dynamically computed path (as illustrated by the yellow dotted line). The intelligent control plane makes the decisions on where to redirect the traffic based on its awareness of the network resources and the attributes assigned to the customer's service specifications.



Restoration of the failed circuit will continue until the original working route has been repaired. Without OTN-enabled restoration, the customer's service would remain completely down until the original outage is repaired.

Although recovery does take slightly longer than a dedicated protection path, mesh restoration will protect against multiple network failures and guarantee constant service availability.

Mesh restoration with protection

For maximum survivability, OTN switching also offers mesh restoration with dedicated protection paths, creating a more resilient service offering than can tolerate multiple failures while also offering switch times of less than 50 milliseconds.

In short, this approach provides users with a double layer of protection: if the working route fails, traffic shifts over to the protection route. If that route fails, it moves over to the dynamically calculated restoration path. In this way, mesh restoration provides a clear advantage over non-OTN static restoration, where a fault in the secondary path would result in a total service outage for the end user.

Wavelength service options

Most service providers have typically offered wavelength service options such as unprotected or 1 + 1 protection, however, to ensure your data is secure at the highest level, protection with restoration is recommended.

Traditional services offered:

Unprotected

No restoration is provided.

Restoration time: N/A

Protection only

A protection path and a working path are provisioned with no restoration capability on either. In the event of a service interruption on the working path, connectivity will be maintained on the protection path. The working path will be offline until the cause of the interruption is corrected.

Restoration time: < 50 milliseconds

Emerging service options:

Restorable

Restoration to an alternate route across the Bell network will be provided in the event of an interruption of an established working path, subject to availability.

Restoration time: Base (standard priority): < 10 seconds
Premium (high priority): < 1 second

Protection with restoration

A protection path and a working path are provisioned with restoration capability on both. In the event of a service interruption on the working path, connectivity will be maintained on the protection path, which becomes the new working path. A new protection path will automatically be established to ensure constant circuit protection.

Restoration time: Base (standard priority): < 10 seconds
Premium (high priority): < 1 second

Conclusion

With more business applications evolving toward virtualized cloud deployments, network resiliency is critical in order to deliver superior application performance and maintain business continuity. As the market changes, telecom service providers must continuously evolve their ultra high-bandwidth wavelength services to meet customers' needs.

Increasingly, customers are looking to optical connectivity as the mission-critical backbone of their IT infrastructure. As a result, restorable networks will be required to keep pace with hybrid cloud IT deployments so that business can fully enable their digital transformation with confidence.

To meet customer and market demands Bell has upgraded our network to a modern optical transport infrastructure with OTN switching and an intelligent control plane. Bell's intelligent control plane, the brain of our OTN-switch network, can automatically react to network changes such as multiple simultaneous failures (e.g., fibre cuts, hardware failures), changes in network topology or an increase in latency in some of the network's critical spans — all in real time. As a result, the Bell Wavelength service now includes a wider selection of protection and restoration options delivering an added level of survivability and resiliency to our already highly dependable network.

About Bell

Business that demand flexible, dynamic and intelligent network infrastructure choose Bell. With the first 100 Gbps dense wavelength division multiplexing (DWDM) WAN service in Canada, Bell Wavelength service helps to ensure your mission-critical applications are always available – without compromising speed, performance or security. You'll be able to run multiple protocols over a single network, reducing costs, saving time and freeing up resources. And, with the most points of presence in Canada, Bell makes it easier to connect your employees and teams – no matter where they're located.

Bell Wavelength service provides ultra-high bandwidth and low-latency connectivity for video, Big Data and more. It's an ideal companion to many of our data centre offerings, such as Co-location and Virtual Data Centre.

Visit our website for more information about Bell Wavelength service. If you would like to learn more about how Bell can help you with your network and connectivity requirements please contact your Bell representative. We'll help you find the right solution for your business.