



## Expansion Strategies for Cisco Systems ONS 15454

### INTRODUCTION

When it was first released in 1998, the Cerent 454 Optical Transport Platform, now called the Cisco ONS 15454, created a sensation. Especially popular among alternate carriers, the 15454 proved itself as a cost-effective solution as a multi-service provisioning platform.

Today, many 15454 customers with OC12 or OC48 rings are finding that they are running out of capacity. The increasing interest in Gigabit Ethernet and other high-speed services are pushing service providers' networks to the breaking point.

Network planners are attempting to *determine the least cost method of extending the capacity of their 15454 rings for the short term, and are also looking to select a solution that will provide more graceful and cost-effective capacity upgrades in the future.* These case studies look at how two service providers have deployed the Meriton Networks Agile Optical Networking (AON) architecture as an affordable way to add capacity to their 15454 rings. As background, an overview of the two approaches each service provider considered is also provided.

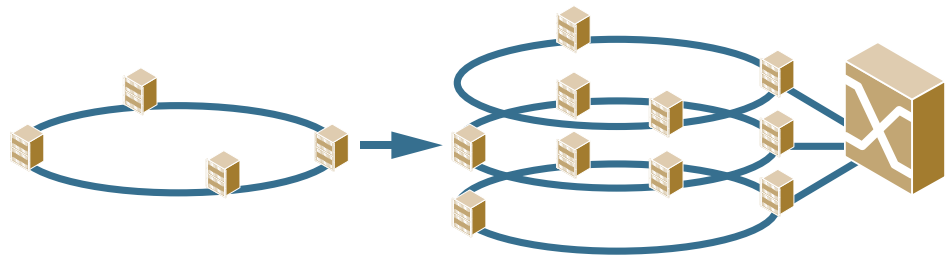
*Ed. Note: These customer case studies do not include actual cost figures, however, they do provide proven percentages from detailed economic comparisons. While the Meriton customers profiled here (and many others not profiled) have made Meriton privy to the cost information, the Company has been advised not to disclose the actual cost figures. That being said, Meriton has conducted numerous economic analyses and the percentages revealed in this document are accurate and current. For your situation, we encourage you to obtain an estimate for adding capacity to your 15454 rings from a Cisco representative and also obtain an estimate from a Meriton representative. We are confident the economic comparison will show the Meriton offering is the best solution, providing the most flexibility and scalability for the least cost, while minimizing service disruption and maximizing the value of your previous 15454 investment.*

**STACKED RINGS**

The first approach that many 15454 users might consider is to stack rings of additional 15454s. This approach is quickly discarded because of the sheer expense, as well as the host of other issues that it incurs:

- Managing stacked rings is a cumbersome venture that quickly taxes the lean, nimble operational teams in place at many service providers
- To interconnect several rings (i.e. greater than two), a switch is now required, which means additional expense and complexity
- This is not a scalable solution, adding only 2.5 Gb/s in capacity. Once the additional 2.5 Gb/s is used up, the service provider must carry the burden of yet another upgrade. Once that extra capacity is consumed, it's back on the upgrade treadmill, consuming scarce resources and causing great frustration
- Needlessly consumes valuable fiber resources
- Occupies scarce space in already-cramped POPs and sub-stations
- Uses expensive and cumbersome SONET/SDH capacity for the delivery of high-speed data services such as Gigabit Ethernet and storage area networking. Why add the extra layer of provisioning complexity when it is not warranted?

Given that so few service providers actually deploy stacked rings these days, it is further validation that the traffic driving the need for additional capacity is High-Speed Metro services; not lower-speed TDM traffic.



**Fig. 1** Stacked rings are expensive, requiring a switch for ring interconnection as well as additional fiber and space

**UPGRADE TO OC192**

Another approach for adding capacity is to upgrade the 15454 rings to higher-speed signals, say from OC48 to OC192. While this approach does deliver a 4-fold increase in capacity, it does so with some specific drawbacks. The age of the 15454 is one factor that affects the effort involved in upgrading:

- For the older “vintage 15454”, the upgrade is onerous, requiring the purchase and installation of a new shelf, new cards, software upgrades, as well as truck rolls and engineering time to deploy the upgraded gear. The phrase “forklift upgrade” comes to mind
- Newer 15454s are OC192-ready, so there are fewer issues, but the upgrade is still capital and time intensive for a solution that provides limited scalability. Once the 10 Gb/s of capacity are consumed, another expensive and time-consuming upgrade must be undertaken

Common to upgrading all 15454s are the following issues:

- Extensive time and resources are required
- Moving to OC192 optics may not be practical for service providers with older fiber plant
- Like stacked rings, this approach is misaligned with the true business drivers for the additional capacity. It is the growth in high-speed traffic that is forcing the need for more capacity, and not the growth in lower-speed traditional SONET traffic. *Why pay for an expensive SONET/SDH fabric to enable delivery of true service drivers such as storage, Video on Demand, Gigabit Ethernet, etc.?*

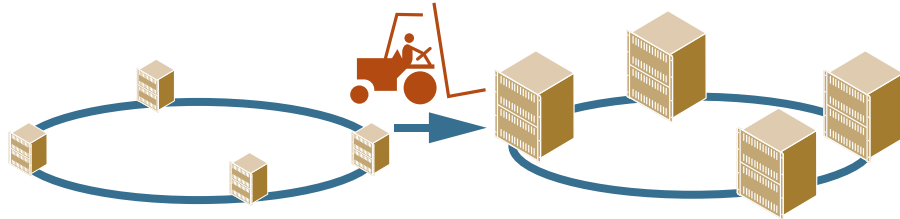


Fig. 2 Upgrading 15454s to OC192 requires substantial capital cost, time and operational resources

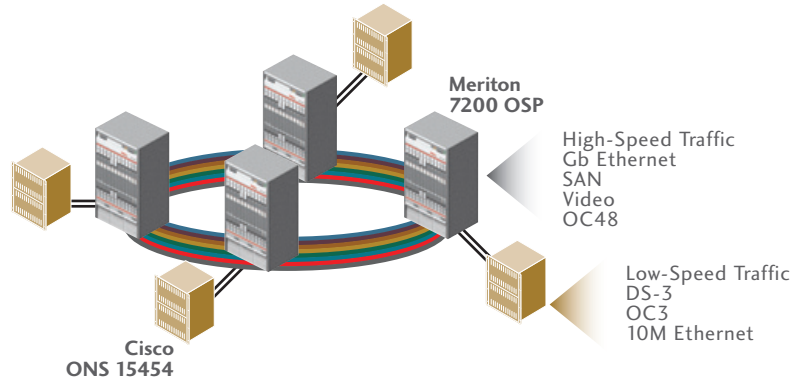
#### MOVE TO BEST-OF-BREED WDM

Another approach for adding capacity is wavelength division multiplexing (WDM). WDM is an inherently more **scalable** solution as multiple wavelengths can be transported on a single fiber pair. Moving to a WDM-centric solution is a much better alternative than stacking SONET/SDH rings or upgrading to OC192.

Vendors like Cisco and others have recognized that WDM is the optimal solution, and have quickly bolted WDM solutions to their SONET/SDH systems, calling them Multi Service Transport Platforms (MSTP). Customers need to recognize these solutions are simply two platforms “branded” as one. In the end, the service provider must assess each vendors’ strengths and weaknesses, and choose a best-of-breed WDM solution for deployment.

The Meriton Agile Optical Networking (AON) Architecture is widely recognized as a **best-of-breed WDM platform**. Why?

- It is the only architecture that provides an **end-to-end**, scalable solution from metro access to metro core and extending to regional distances
- No other architecture can match the **low cost points** of Meriton’s solution
- Only Meriton provides advanced protocol specific **performance monitoring** capabilities and error-rate trigger protection switching
- Unlike others, Meriton’s architecture **simplifies the network** and **reduces** ongoing OPEX costs
- The Meriton architecture **future-proofs** the network through its combination of inherent scalability, transparency and networking capabilities. Service providers can **respond rapidly** to requests for new services, new protocols, and never run out steam in their network
- Unique in the industry, Meriton’s support for **multiple topologies** means that it is a WDM infrastructure that can **mesh** where it needs to, while at the same time still supporting legacy SONET/SDH rings. Bottom line: service providers can build network capacity where it is needed



**Fig. 3** A Meriton WDM network provides **TWICE the capacity for less cost** than an OC192 upgrade, and enables the cost-effective delivery of all *high-speed services*. The multiple topology support of the Meriton solution means networks can evolve to **meshes**, while still supporting legacy SONET/SDH rings

**CUSTOMER SUCCESS STORY # 1**

This customer is a rural alternate carrier serving its customers mainly as a wholesaler. In 2000, the customer purchased a number of Cerent 15454s and deployed an OC48 regional network. The distances between the four main sites were 140 miles, 110 miles, 100 miles and 75 miles. In addition to the four 15454s located at the main sites, eight repeaters were used to extend the reach of the signal.

Over the years, the capacity of the OC48 was gradually utilized; the space available in the control buildings has become overcrowded; and the type of services end customers are requesting (Gigabit Ethernet) has put too much load on the customer’s existing SONET/SDH networks.

Cost Items for upgrading 15454 to OC192	Cost
■ OC 192 Optics	Contact Cisco, as per Ed. Note on Page 1
■ Timing, Communications, Control Card	Contact Cisco, as per Ed. Note on Page 1
■ Time Slot Assignment Card	Contact Cisco, as per Ed. Note on Page 1
■ Other Common equipment	Contact Cisco, as per Ed. Note on Page 1
<b>TOTAL COST</b>	<b>Substantial</b>

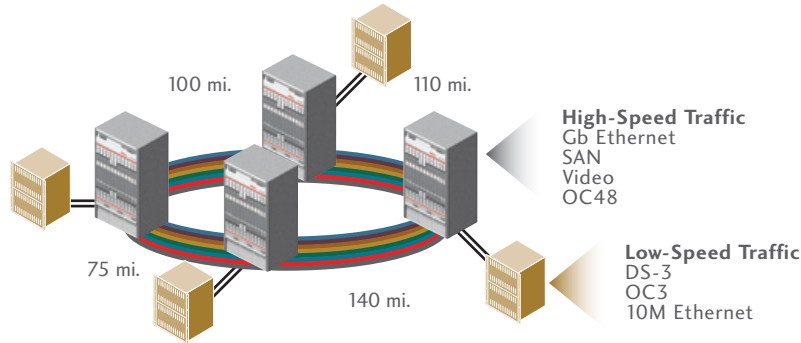
The capital cost to upgrade all the nodes on the backbone to OC192 (delivering a four-fold increase in capacity) was substantial. As the customer’s 15454s were “older vintage,” an in-service upgrade to OC192 was not possible. However, for the purpose of this economic analysis, we assumed that the shelves were OC192-ready, and only included the capital cost of the specific OC192 equipment.

The customer decided to explore other options, and evaluated the AON architecture from Meriton Networks. Given the span distances in the customer’s network, DWDM was necessary. The Meriton solution included four 7200 OSP (Optical Switching Platform) systems, one for each main site. Meriton’s managed regional product suite was used to ensure that the signal could be carried over the regional distances.

The 15454 OC192 upgrade would have provided a four-fold increase in capacity for the alternate carrier, for a total of 10 Gb/s. The Meriton solution provided 20 Gb/s in capacity for *slightly less than the cost of Cisco’s 10 Gb/s*. This is consistent with Meriton’s value proposition of getting *twice the capacity for less cost*.

Another advantage with Meriton’s solution was its SONET-like physical layer engineering. The spans are engineered once and can support one to 32 wavelengths, ensuring the spans will not have to be reengineered when additional wavelengths are added.

For no additional cost, the alternate carrier has a future-proof network with ample capacity to accommodate their customer’s requirements – now and in the years to come. Furthermore, the network can evolve to a mesh for High Speed Metro services, growing easily to new locations that require bandwidth.



**Fig. 4** The four 15454s remain to aggregate and transport low-speed SONET/SDH traffic while the four Meriton 7200 OSPs handle the high-speed services

The advantages to the alternate carrier have been dramatic:

- For less cost than the 15454 OC192 network upgrade, the alternate carrier has *doubled its network capacity*
- The Meriton solution future-proofed the network providing inherent *scalability*, easily growing to 32 wavelengths of capacity and beyond
- The *original investment is protected* because the alternate carrier will use its 15454s to aggregate and transport low-speed traffic, while using wavelengths for OC12/48 traffic, Gigabit Ethernet, video, 100 Mb Ethernet services, etc.

**CUSTOMER SUCCESS STORY # 2**

This customer is a CLEC with a four-node 15454 ring. All of the distances between the four nodes in this metro network are less than 80 km. The CLEC was fiber-constrained, and was running out of capacity on their OC48 network. In particular, the CLEC needed Gigabit Ethernet for offering Video On Demand (VOD).

The capital cost to upgrade the backbone nodes to OC192 (delivering a four-fold increase in capacity) was substantial. As the customer’s 15454s were “older vintage,” an in-service upgrade to OC192 was not possible. However, for the purpose of this economic analysis, we assumed that the shelves were OC192-ready, and only included the capital cost of the specific OC192 equipment (Lines 1 to 3, below). In addition, the CLEC needed to purchase additional 2.5 Gb/s add/drop cards, since there was only one OC48 ADM existing at each of the four locations.

Cost Items for upgrading 15454 to OC192	Cost
■ OC 192 Optics	Contact Cisco, as per Ed. Note on Page 1
■ Timing, Communications, Control Card	Contact Cisco, as per Ed. Note on Page 1
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■ Other Common equipment	Contact Cisco, as per Ed. Note on Page 1
<b>TOTAL COST</b>	<b>Substantial</b>

It was clear that the OC192 upgrade route was not optimal from a cost perspective. Also, since the driver for the new capacity was Video on Demand, the CLEC realized that they could offer this service, for less, using wavelengths. After extensive competitive bids, including some from other SONET/SDH vendors, the customer realized that none of the business cases built on SONET/SDH made sense. The CLEC opted to go with Meriton Networks' AON architecture, featuring the 3300 OSM (Optical Services Multiplexer) with Coarse WDM (CWDM), as well as the 7200 OSP and the 8600 NMS (Network Management System).

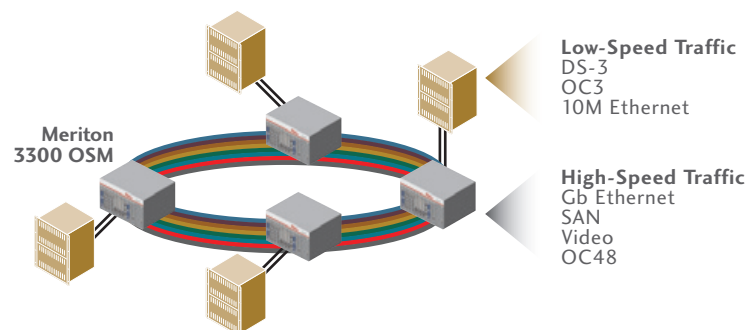
A key advantage of the Meriton solution is that capacity can be increased in increments of one wavelength at a time. An OC192 upgrade forces a 4-fold increase in capacity with commensurate increases in cost per wavelength. The Meriton solution enabled the customer to add one additional wavelength for approximately 6% of the cost of the full OC192 upgrade.

At four 2.5 Gb/s wavelengths (same capacity as OC192), the Meriton 3300 OSM was 41% less cost than the 15454 OC192 upgrade. Note that the economic analysis shows that at eight wavelengths, the savings are even more dramatic as Meriton 3300 OSM is an impressive 54% less than the cost of two OC192 upgrades.

With the Meriton 3300 OSM, the CLEC was able to get the **same capacity as the OC192 upgrade for 41% less cost**. There are other benefits that the CLEC received by going with a Meriton approach:

- **Maintained the investment** in the 15454 ring; using this infrastructure for low-speed SONET/SDH services
- Seamless and **proven interoperability** between Meriton Networks 3300 OSM and 15454
- Enables the offering of **affordable high-speed metro services**, such as Gigabit Ethernet for Video on Demand at higher margins and lower cost points as compared to the incumbent
- The operation of the network is much **simplified** using an "Out-of-the-box WDM" solution
- Transparency and scalability combined to provide a **future-proof** infrastructure, supporting a wide range of bit rates and protocols

Since deploying the Meriton AON architecture, the CLEC has been able to differentiate itself by offering services at much lower cost points, while still earning improved margins. With its cost-effective High Speed Metro service delivery platform, the CLEC is winning business and market share from the local incumbent.



**Fig. 5** For the same capacity as an OC192 upgrade, the Meriton 3300 OSM costs 41% less. The existing Cisco 15454s aggregate and transport low-speed SONET/SDH traffic while the Meriton 3300 OSM carries Gigabit Ethernet for Video on Demand applications, as well as other high-speed services

## KEY POINTS

When evaluating options for adding capacity to a Cisco ONS 15454 ring, look closely at the business drivers:

- High-speed services are driving the need for more capacity
- WDM is a better alternative than adding more SONET/SDH (either stacking rings or upgrading to OC192)
- Meriton's best-of-breed WDM architecture delivers TWICE the capacity for less cost than an OC192 upgrade
- Most importantly, Meriton customers have a high-speed network that is future-proof. The built-in scalability and transparency ensures that the service provider can rapidly respond to customer demands for additional bandwidth, new protocols, where and when needed
- Unlike other WDM solutions, Meriton is unique in its ability to simplify networks, provide an end-to-end solution, evolve to mesh topologies, offer advanced performance monitoring, all while meeting the lowest possible cost points

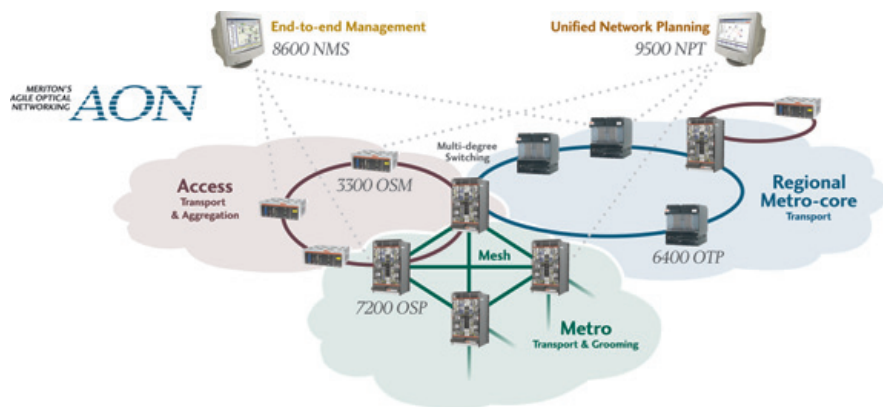


Fig. 6 Meriton's Agile Optical Networking portfolio comprises the 3300 OSM at the access layer, 7200 OSP for multi-degree switching in the metro core and the 6400 OTP for flexible transport in metro core-regional networks, all supported by unified network planning and management systems.

The 7200 OSP (Optical Switching Platform), an integrated wavelength transmission system and switch, is the key edge/metro platform for switching and grooming at the wavelength and sub-rate levels. The 7200 OSP supports point-to-point and ring topologies as well as meshing for multi-degree applications. Recognizing the advantages of coarse and dense WDM, the 7200 OSP supports both CWDM and DWDM simultaneously and translates to and from both seamlessly.

Meriton's advanced transport platform, the 6400 OTP (Optical Transport Platform), incorporates ROADMs capabilities for handling all transmission requirements across the metro-core and regional areas. The 6400 OTP fully supports reconfigurable WDM across metro core and regional network links using its unique modular pay-as-you-grow ROADM technology and choices of advanced tunable or fixed transponders. The 6400 OTP also supports service termination and aggregation (e.g. SONET/SDH, Ethernet, SANs).

The 3300 OSM (Optical Services Multiplexer) is the transparent optical multiplexing device for the access. Versatility and low-cost are key characteristics of the 3300 OSM. The 3300 OSM provides the functionality to directly deliver all High Speed Metro services. Support for CWDM and DWDM is provided, alongside the unique ability to sub-rate multiplex multiple protocol and bit-rate independent services onto a single lambda.

Critical to the AON architecture is the suite of network planning/design and service management tools. The 9500 NPT (Network Planning Tool) is a network planning/design package that allows users to quickly design the most efficient networks based on network demand and span information. Providing end-to-end automated network planning, the 9500 NPT saves tremendous amounts of time and money, as well as ensuring excellence in network design and optimization. Meriton's best-in-class 8600 NMS (Network Management System) offers the ease of true point-and-click lightpath-level operations, administration, maintenance and provisioning (OAM&P). The 8600 NMS is the only true network management system offered by a WDM vendor.

The key advantages of the AON architecture include:

- Substantial OPEX and CAPEX savings while providing scalable, dynamic infrastructure
- Outstanding network visibility through layers 0, 1 and 2 performance monitoring
- Evolves metro WDM from transport structures to revenue-centric service delivery networks
- Topology independent for ultimate flexibility
- Distinct access and core products support all networks from a single wavelength to hundreds of wavelengths
- Bit-rate and protocol independent for efficient delivery of all high-speed services
- Can start small with point-to-point connections and grow incrementally as demand dictates

The Meriton Agile Optical Networking solution gives network operators a flexible set of transport products and technologies to build today's multi-mission agile business networks with a future-proof migration path to full OTN requirements.

We have shown how Meriton Networks has a compelling approach for adding capacity to a SONET/SDH ring. While this discussion has been specific to the Cisco 15454, it is equally applicable to the MSPPs from other vendors such as

- Nortel Optera Metro 3500
- Lucent Metropolis DMX
- Fujitsu Flashwave 4500

If you are interested in learning more about Meriton Networks and how we can help you get twice the capacity for less cost, please contact us.



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#### ABOUT MERITON NETWORKS INC.

Meriton Networks Inc., provider of the optical networking foundation for 21<sup>st</sup> century networks has developed the industry's first unified end-to-end Agile Optical Networking architecture. Meriton customers, which include incumbent and competitive carriers as well as world-class enterprises, deploy a single, cost-effective solution that addresses the issues of fiber relief and network cost reduction, while also enabling the delivery of all high-speed metro and regional services. The Meriton solution includes metro access, metro core and regional extension products, which are fully managed by a best-in-class suite of network and service management and network planning tools.

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