

# **Breaking Down Data Center Walls**

With 1.2T Short Haul (DCI), 800G Metro-Regional, 400G Ultra Long Haul



### Breaking Down Data Center Walls with N x 400G Lanes

Information within the data center, must leave the data center to be useful. This means that the principal line rates for wide area optical transport must be in multiples of 400G in order to transport ubiquitous 100GbE, growing 400GbE, and future 800GbE data services traffic efficiently.

Ribbon's industry-leading solution uses state-of-the-art 5nm-140Gbaud coherent optical transceivers to deliver unprecedented Nx400G lanes with:

- First ever 1.2T wavelengths for Short Haul (DCI) distances
- 800G wavelengths with 3X the reach of existing solutions based on 7nm-95Gbaud technology, for Metro-Regional applications
- 400G wavelengths for Ultra Long Haul distances that previously only 100G wavelengths were capable of covering

These abilities effectively break down data center walls, delivering 1.2T within major cities, 800G across entire states or small countries, and 400G covering entire large countries or economic regions. Moreover, Ribbon's solution delivers this with industry lowest power consumption at less than 0.12W/G.



### Lower Costs and More Flexibility

Ribbon's solution delivers more 100GbE and 400GbE transport capacity using fewer wavelengths and for longer distances. Fewer wavelengths translate directly to lower capital costs, and the low power use of these wavelengths results in lower operations costs.

Moreover, since these wavelengths can also transit across more ROADM hops than the previous solutions, they add flexibility to the network for rapid service provisioning and restoration.





# **Complete Solution**

In this document, we show how Ribbon delivers this industry-leading solution in the context of a complete set of solutions encompassing two transport optimizations applied to two platform types, enabling Ribbon to tailor specific solutions for all customer needs.

TRANSPORT SOLUTION	OT9408 COMPACT MODULAR PLATFORM	9600 STANDARD MODULAR PLATFORMS
Capacity-Reach (Performance) Optimized	1.2T Short Haul (DCI) 800G Metro-Regional 400G Ultra Long Haul	800G Metro-Regional 400G Ultra Long Haul
Cost-Power Optimized	400G Metro 200GRegional-LH	400G Metro 200GRegional-LH

Note: Intermediate wavelength rates in increments of 100G are also supported.

# **Two Types of Transport Solution**

Ribbon offers two types of optical transport solution that focus on different optimizations.

**Capacity-Reach (Performance) Optimized Transport** focuses on maximizing the line rate for any distance, channel width and fiber condition. Ribbon delivers this solution using Acacia's CIM8 next generation pluggable transceiver that is based on 5nm-140Gbaud Jannu DSP technology. CIM8 uniquely combines continuous baud rate up to 140Gbaud, with continuous modulation, to maximize the line rate from 400G to 1.2T. It operates with a spectral efficiency within about 1dB of the Shannon Limit, and leapfrogs the performance of current generation 7nm-95Gbaud technology. CIM8 also optionally supports AES-256 encryption on the entire wavelength at any speed without adding any latency.

With this solution, Ribbon can meet the most demanding needs of network operators by delivering 1.2T wavelengths for short haul (DCI) applications, 800G wavelengths that cover the entire extended-metro space with ease, and 400G wavelengths for ultra-long haul and submarine.







**Cost-Power Optimized Transport** focuses on providing strong enough performance for most metro applications at 400G, and long haul at 200G, with lower costs and electrical power. In the future, this solution will also support 800G metro and 400G long haul.

Ribbon delivers this type of solution using multisource pluggable transceivers that implement industry agreements from organizations like the OpenROADM MSA that emphasize interoperability, as well as from OpenZR+ and the OIF. For different applications and platforms, Ribbon uses two form factors of these pluggables, QSFP-DD and CFP2 DCO. In all cases, Ribbon optical transport only uses pluggables that launch wavelengths with a minimum of 0dBm or 1mW power, for transmission without regeneration across multiple hops in Metro CD/CDC ROADM networks.

# **Two Types of Platform**

Ribbon applies these transport solutions across two types of platforms, providing customers with choice to use whatever platform best suits their environment and application.

# Apollo 9408 Compact Modular Platform

is designed for the highest capacity and density applications. It is 600mm deep in a 2RU height with frontto-back cooling, which meet data center standards, and has eight sled slots. All sleds and common equipment modules such as controllers, power supplies, and fan units are field replaceable. It offers two types of sleds for the two transport optimizations, and these can be mixed in one platform.

 The MPJ1200\_2 double slot sled is a dual transponder/muxponder, delivering the capacityreach optimized solution for transport of 100GbE, 400GbE, and 800GbE (hardware ready) clients with wavelengths up to 1.2T. By using the CIM8 pluggables, customers can add and pay for capacity only when needed.

It has 2.4T capacity per card or 9.6T per platform, and a future planned version of this card doubles this capacity to 19.2T per platform.

• The MPQ\_8 double slot sled is also a dual transponder/muxponder, delivering the cost-power optimized solution for transport of 100GbE and 400GbE clients with wavelengths up to 400G. It supports eight QSFP-DD 0dBm pluggables, for a total line capacity per sled of 3.2T, or 12.8T for the entire platform.

APOLLO OT9408 COMPACT MODULAR - HIGH CAPACITY



DATA CENTER 600MM DEEP F2B AIRFLOW

### **Capacity-Reach (Performance) Optimized**



### **Cost-Power Optimized**





### APOLLO 9600 SERIES STANDARD MODULAR - FLEXIBLE APPLICATIONS

TELCO 300MM DEEP L2R AIRFLOW

#### **Capacity-Reach (Performance) Optimized**



#### **Cost-Power Optimized**



### Apollo 9600 Standard Modular Platforms

are designed for maximum flexibility in a telco environment. They support any mix of transport, ROADM, and amplifier line cards in three sizes of platforms at 2RU, 5RU, and 15RU. Apollo 9600 offers two types of line cards for the two transport optimizations.

- The TM800\_2 double slot card is a dual transponder/ muxponder, delivering the capacity-reach optimized solution for transport of 100GbE, 400GbE, and 800GbE (hardware ready) clients with wavelengths up to 800G. By using the CIM8 pluggables it allows customers to add and pay for capacity only when needed.
- The TM400\_2 is a single slot dual transponder/ muxponder, delivering the cost-power optimized solution for transport of 100GbE and 400G bE clients with wavelengths up to 400G with CFP2-DC0 pluggables.

Ribbon also offers a choice of how the transport solutions on these platform can be controlled. This can be via Ribbon's Muse SDN Domain Controller, via open control interfaces such as OpenConfig, or for small deployments using a CLI or Web-LCT application.

# **Ribbon Approach Advantages**

### 1. Industry-best Capacity-Reach (Performance) Optimized Transport

Based on leapfrog 5nm-140Gbaud DSP transceiver technology, Ribbon surpasses by far current competitor approaches based on 7nm-95Gbaud technology. Specifically, our solution provides:

- An industry-first 1.2T single wavelength solution for short haul metro applications.
- "Real Metro 800G" that applies 16QAM modulation to wavelengths for transport across extended metro distances, with three times the reach of current solutions. Moreover, these wavelengths can transit multiple ROADMs hops, for added provisioning and restoration flexibility.
- Complete 400G long haul coverage using pure QPSK encoding, which previously only 100G wavelengths were able to deliver.





### 2. Progressive Cost-Power Optimized Transport

Ribbon's power-cost optimized solutions, using a mix of multisource pluggable transceivers, are particularly effective for metro applications. Moreover, as technology progresses they will start to rival the performance of capacity-reach optimized technology.

### 3. Industry-Leading Density and Power Efficiency

Through its compact modular design, the 2RU 9408 delivers industry-leading metrics, for high density and low power consumption, which is a critical factor for many deployments.

- For capacity-reach optimized solutions, running 1.2T wavelengths, the current platform density is 9.6T per 2RU, with a future-card design doubling that to 19.2T per 2RU. Power consumption is an industry-leading low of less than 0.12W/G.
- For cost-power optimized solutions, running 400G wavelengths, the current platform density is 12.8T per 2RU, which will double to 25.6T per 2RU when QSFP-DD 800G pluggables are available in a few years. This solution operates at an even lower 0.10W/G.

### 4. Pay-As-You-Grow Economics

All Ribbon transport solutions use pluggable line interfaces, including the 5nm-140Gbaud CIM8 pluggable for performance-optimized transport where most competitors use integrated interfaces. Ribbon customers can add and pay for only the capacity they need, and when they need it, without having to pay for excess and unused capacity up front, which is often the case with integrated interfaces.





### 5. Orderly Spectrum Use

Physics dictates that higher baud rates require wider channel widths. Ribbon's solutions operate within an orderly 75GHz/150GHz grid. This enables scalable and much more efficient spectrum use compared to competitor approaches based on a 112.5GHz channel width, which can easily lead to wasted or abandoned spectrum as the network evolves.



#### 6. Alien Wavelengths Anywhere

Customers can fulfill optical transport needs rapidly and economically by deploying Ribbon's advanced transport solutions as alien wavelengths over existing infrastructures. Continuous baud rate and modulation enables adjusting to any channel width and fiber condition, and we have dozens of field-proven alien wavelength deployments worldwide over other vendors' optical line systems (OLS). All Apollo transport equipment is open, and can be controlled via OpenConfig control interfaces as well as through Apollo EMS.





### 7. Layer 1 Optional Encryption

To satisfy security requirements, many network installations now mandate optical transmission encryption to prevent message interception through fiber tapping. Apollo's capacity-reach optimized solution provides this as an optional capability using industry-highest AES-256 encryption on the entire wavelength at any speed, and without adding any latency.

### In summary

Ribbon's "breaking down data center walls" solution provides a pyramid of benefts. At the peak is unprecedented transport reach, with lowest power use and highest density. This supported by a foundation other capabilities that facilitate deployment, operation, and growth.

Ultimately these combine to deliver an overall economic benefit of more capacity with fewer wavelengths over longer distances.



**Contact Us** Contact us to learn more about Ribbon solutions.

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