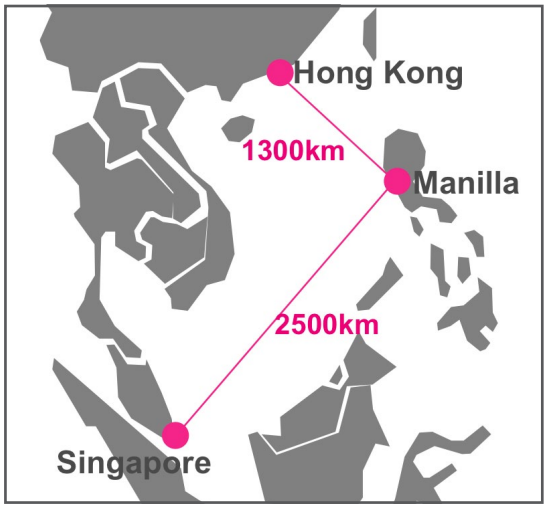
Apollo Maximum Capacity 5nm-140Gbaud Submarine Transport

With a unique capability to combine controls for continuous baud rate to an industry leading 140Gbaud, with continuous modulation, Apollo coherent optical transport extracts the *maximum spectral capacity* from submarine fiber optic cables, delivering the most services per submarine link.

Priority One – Maximizing the Capacity of Submarine Fiber Optic Plant

Oceans and seas account for 70% of the surface of our planet, so it is no surprise that submarine cables carry the bulk of the world's international telecommunications traffic. About 450 international and 100 intra-country submarine cables spanning nearly one-million kilometers provide the connectivity fabric for our global Internet and cloud economy.

A distinguishing feature of submarine fiber optic cable is its high cost. Starting with premium low loss fiber, submarine cables incorporate integrated waterproof amplification electronics and are specially reinforced to protect them during installation and against harsh marine conditions. Repairing breaks and servicing faulty electronics requires raising the cable to the surface, which is a costly operation and can lead to further complications. This all translates to a priority for service providers to extend the life and extract the maximum spectral and services capacity from their submarine fiber optic plant, done of course, as economically as possible.

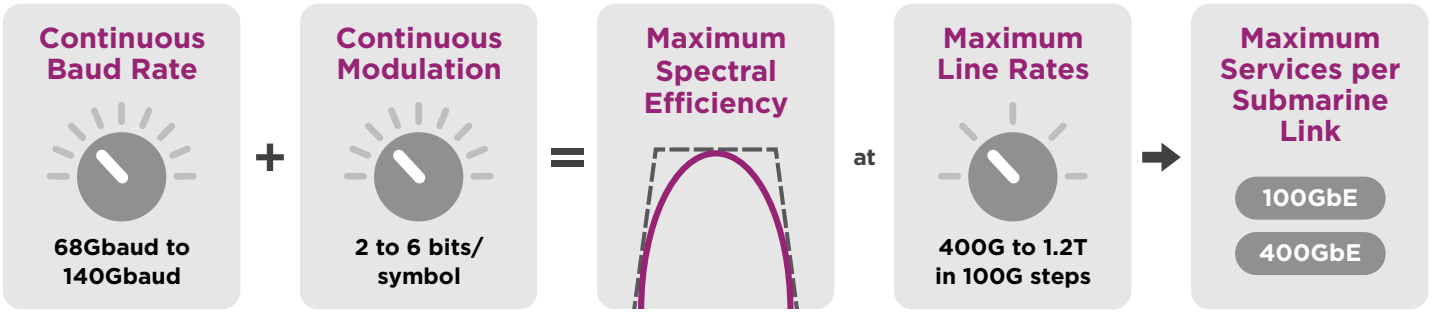


Ribbon South China Sea Submarine Transport Solution

Maximum Submarine Capacity with Fewer Wavelengths

Ribbon is a leader in introducing the newest generation of 5nm-140Gbaud optical transport technology, which extracts the maximum spectral and services capacity at the lowest cost for submarine fiber optic transmission using two powerful programmable capabilities:

1. **Continuous baud rate** in increments of one Gbaud up to an industry fastest 140Gbaud;
2. **Continuous modulation** from 2 to 6 bits per symbol, in increments of 0.1 bits.

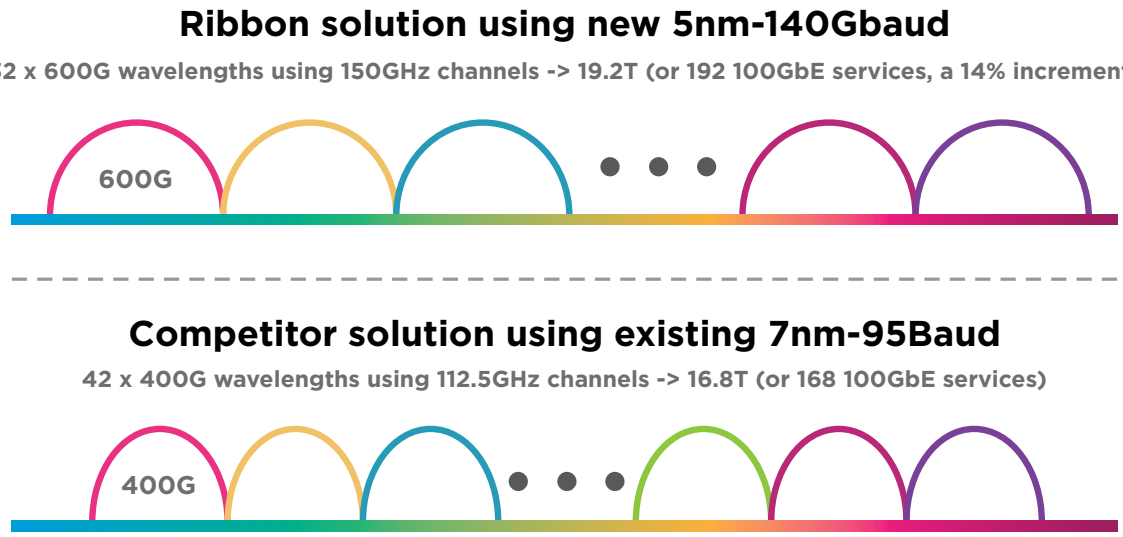


Maximum Spectral Efficiency

By uniquely combining fine controls on both the baud rate and the modulation, Apollo is able to shape the optical signal right to the edge of the Shannon Limit, taking into account different spectral loss profiles along the fiber. Apollo also applies proprietary non-linear equalization algorithms to maximize capacity on older fibers.

Maximum Services per Submarine Link

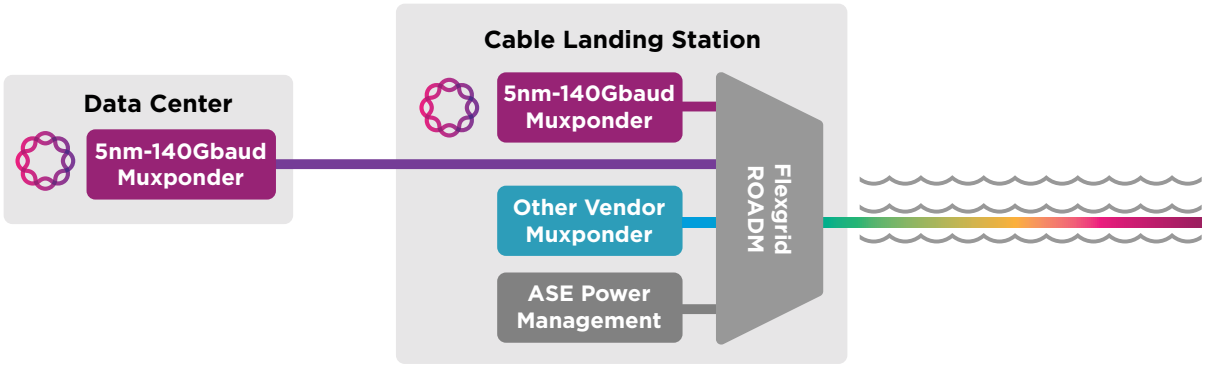
For any given fiber distance communications theory dictates a maximum modulation density, beyond which a signal is no longer recoverable from the underlying noise. The only way then to increase the line rate is by boosting the baud or symbol rate. By supporting an industry-fastest 140Gbaud, Apollo is able to achieve industry-fastest line rates for a given modulation. This translates directly into more services over fewer wavelengths and at lower costs.



Example of how Apollo achieves better spectral and services efficiency, and lower costs via fewer wavelengths, than competitor solutions

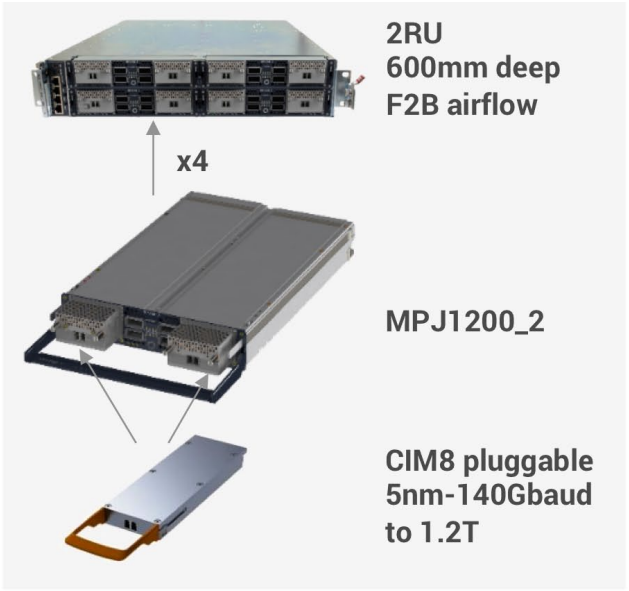
Maximum Submarine Capacity with Fewer Wavelengths

Apollo delivers this superlative submarine transmission solution for 100GbE and 400GbE clients. Over D+ submarine cable, Apollo is able to deliver 800G wavelengths for over 2000km, and has virtually unlimited reach at 400G. As shown below, Apollo submarine transmission is deployable both at the landing station and in the data center, and can be deployed as an overlay alongside existing wavelengths from other vendors.

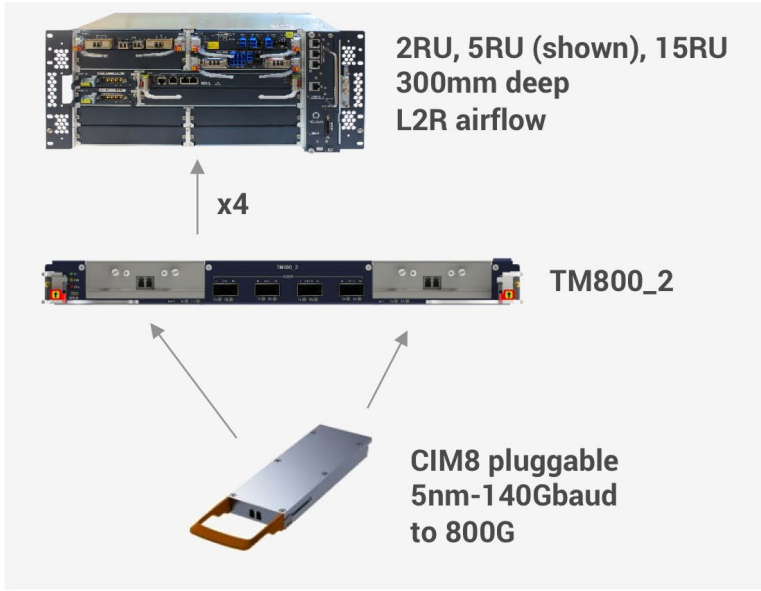


The core technology for Apollo submarine transport solutions is Acacia's 5nm-140Gbaud CIM8 pluggable module. As shown, this is deployable in a pay-as-you-grow fashion in two Apollo platforms, the 9408 high density compact modular platform, and the 9600 series tailorable applications platforms.

Apollo 9408
High Density Applications



Apollo 9600 Series
Tailored Applications



Total Submarine Transport Solution with Multiple Advantages

Ribbon's Apollo 140Gbaud submarine transport is a total balanced solution with multiple value adds.

Maximum spectral efficiency with fewer wavelengths. As discussed above this is the foundation for the solution. By exploiting continuous baud rate and modulation controls, up to a blazingly fast 140Gbaud, Apollo maximizes the line rate for any channel width and fiber condition right to the edge of the Shannon Limit.

Landing site and data center deployments. Apollo's 140Gbaud transmission solution can be deployed both at landing sites using conventional telco platforms, or in data centers using the new 9408 compact modular platform featuring F2B cooling along with telco NEBS.

9408 Compact Modular Transport Platform

Flexible and fixed grid. All solutions can operate in flexible grid submarine fiber optic cable with no constraints on channel width, as well as in fixed grid applications.

Disaggregated overlay deployment. Apollo submarine transport can be deployed as a stand-alone solution using an Apollo NMS or as an overlay to an existing system with OpenConfig control. Moreover, Apollo has a proven record of deploying its native wavelengths running alongside existing competitor system wavelengths.

Optical performance monitoring. Built-in monitoring provides continuous feedback on optical power, OSNR, and other performance parameters. By tracking historical trends, potential service affecting issues can be flagged well in advance.

Contact Us Contact Ribbon to learn how we can Optimize your Submarine Optical Transport