Nokia CHM1R – The Industry's Most Flexible 400G Muxponder

Minimize Cost per Bit, Power, and Footprint; Transport 100 GbE and 400 GbE Services Efficiently

With a 7-nm CMOS process node, the next generation of coherent pluggable interfaces enables up to 400 Gb/s on a single optic and interface. This represents doubled pluggable interface capacity compared to the previous 200G coherent pluggable generation within the same footprint and the same power envelope. It significantly improves cost/bit/km by providing higher-performance optics. With the flexibility of various modulations and with support for different 400G technologies such as the OIF 400G ZR, OpenZR+, OpenROADM, and XR standards, the solution provides a rich set of deployment options including support for legacy and modern flexible-grid infrastructure. With the CHM1R muxponder and 400G pluggables now supported in the 1830 Global Express (GX) G30 Series, operators can increase the capacity of their installed base, improve fiber utilization, lower cost and power per bit, and reduce footprint. The solution provides native open APIs with both OpenConfig and OpenROADM YANG-based data models as well as streaming telemetry.

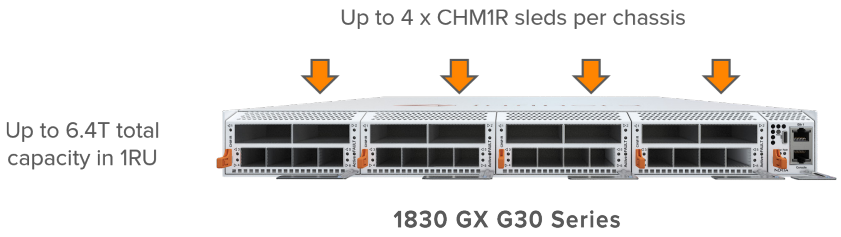

Figure 1: The 1830 GX G30 Series offers the latest 400G coherent pluggable technology including OpenZR+ and Open XR

1830 GX G30 Series CHM1R

The Nokia 1830 GX G30 Series enables the industry's most flexible transponder solution by utilizing the new 400G coherent pluggable generation and the CHM1R sled. The solution provides up to 6.4T of client and line capacity in a single rack unit. The CHM1R is optimized for point-to-point and meshed network infrastructures. With high-performance CFP2-DCO pluggable interfaces and 0 dBm output power, both FOADM and ROADM deployments are supported. Applications such as 100G to 400G muxponder, 400G to 400G transponder, a mix of 100G and 400G services, and OEO 3R regeneration can be realized with the lowest TCO.

The single-slot CHM1R sled provides up to two CFP2-DCO coherent flexible-rate line interfaces, with each interface able to support 400G-DP-16QAM, 300G-DP-8QAM, 200G-DP-QPSK, and 100G-DP-QPSK. FEC options include CFEC, OFEC, and XR FEC. The CFP2s supported are 400G ZR+, 400G OpenZR+, 400G OpenROADM, and 400G XR optics.

Benefits of the CHM1R

- Leverages high-baud-rate 400 Gb/s pluggables based on 7-nm DSP technology, supporting multiple sources including Nokia's XR optics
- Reduces cost per bit and power per bit while minimizing footprint
- Doubles fiber capacity compared to the previous coherent pluggable generation
- Supports deployments over fixed-grid and flexible-grid Nokia and third-party line systems
- Provides cost-effective transport of 100 GbE and 400 GbE client services over a wide range of distances – from metro DCI to long-haul
- Offers low-cost demarcation of 100G and 400G services
- Decouples router and transponder lifecycles
- Minimizes operational costs and speeds service delivery with automation enabled by the full set of 1830 GX G30 Series software features, including OpenROADM, OpenConfig YANG, RESTCONF/NETCONF open APIs, and gNMI/gRPC streaming telemetry

CHM1R sled

The images shown are for illustration purposes only and may not be an exact representation of the product.

On the client side, the CHM1R provides four QSFP-DD cages for QSFP-DD/QSFP28 pluggable interfaces, enabling up to 4 x 100 GbE (DAC, AOC, SR4, SR4.2, LR4, PSM4, CWDM4, ER4, ER, DR, FR), up to 4 x OTU4 (LR4, ER, DR, FR), up to 2 x 400 GbE (DAC, DR4, FR4, LR8, LR4, SR8, XDR4), or a flexible mix of these client interfaces.

Other features include OTN L1 encryption; RMON and test signal; delay measurement; loopbacks; PRBS test; OTS, OMS, and OCH protection; and LLDP for Ethernet clients.

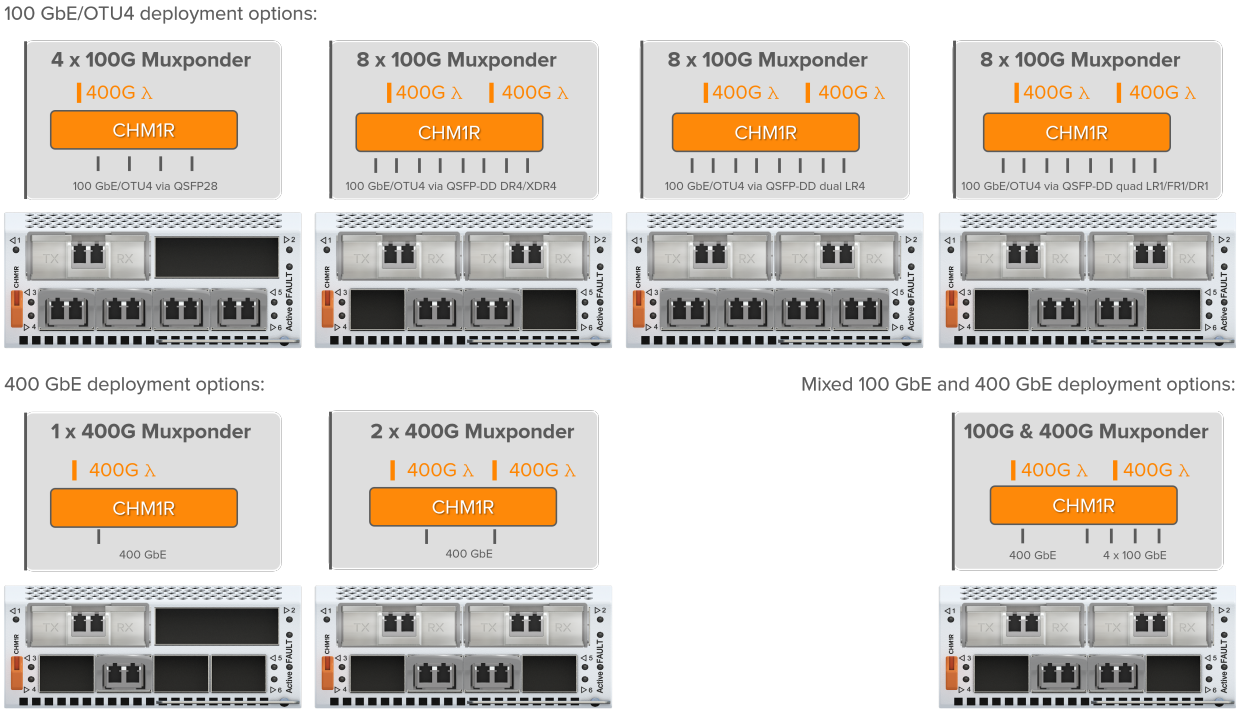

Figure 2: The sled provides multiple deployment options

Pay as You Grow and Power as You Grow

The CHM1R sled is deployed in the 1830 GX G31 platform, with up to four CHM1R sleds supported in a single chassis, providing up to 6.4 Tb/s of total capacity in 1RU with 3.2 Tb/s line and 3.2 Tb/s client capacity. Each line interface on the CHM1R module is a coherent pluggable DCO interface and can be deployed when needed, enabling a true pay- and power-as-you-grow deployment model. The sled supports a mix of 100 GbE and 400 GbE client services using pluggable QSFP28/56/DD interfaces. The 1830 GX G31 1RU 600-mm chassis can be easily stacked to support full fiber capacity, and with only eight G31 chassis (8 x 1RU), the full fiber capacity of 25.6T in the extended C-band can be realized.

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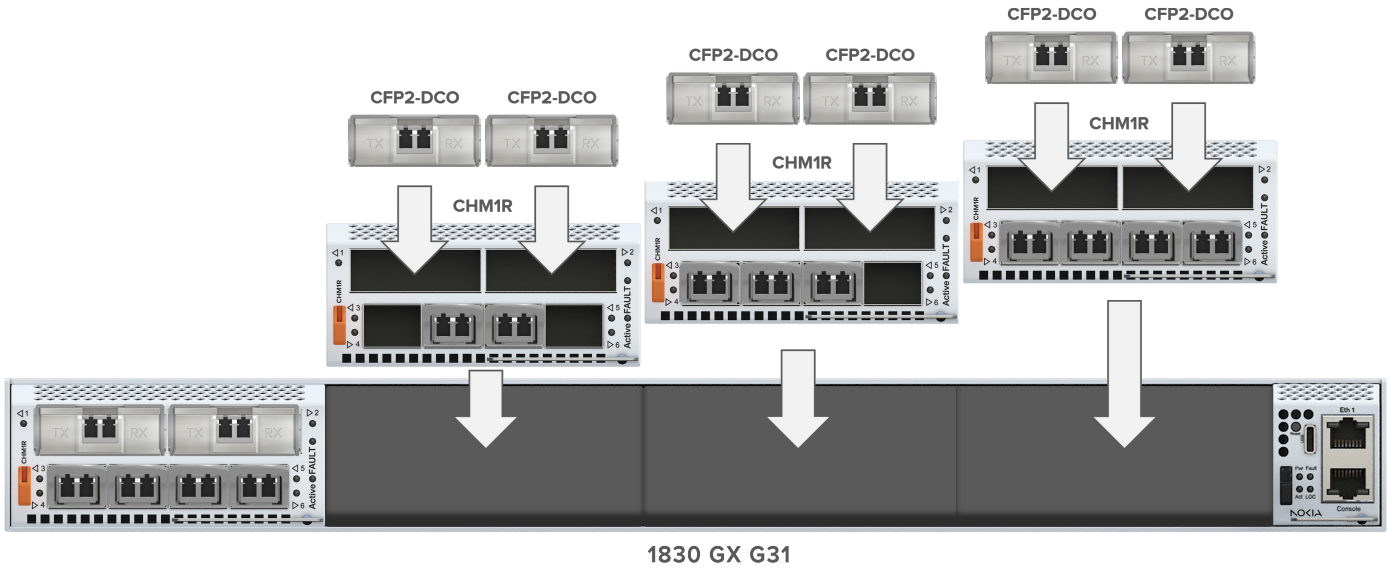

Figure 3: Plug-and-play sled-based design

Here are some configuration examples:

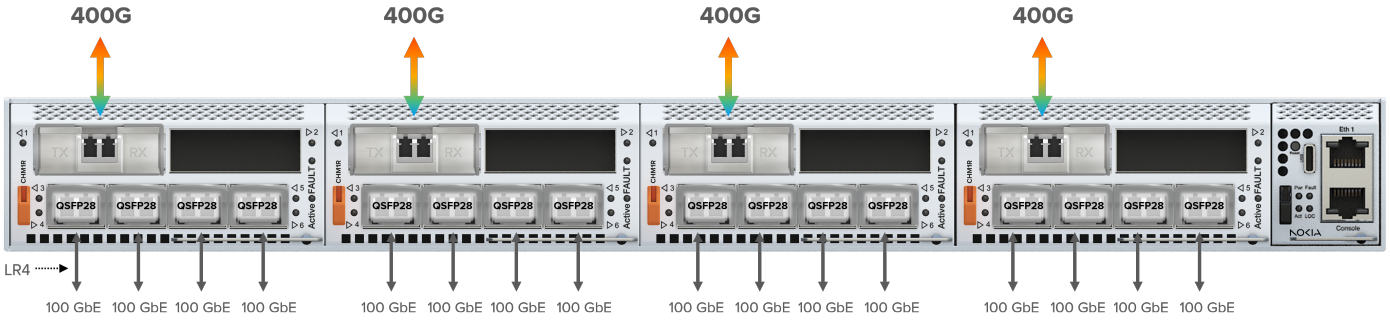

Figure 4: Example configuration: 16 x 100 GbE muxponder

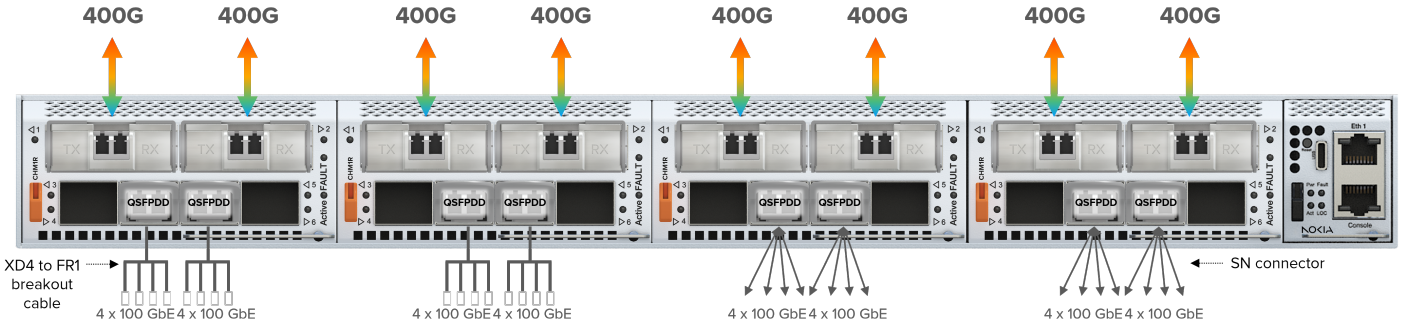

Figure 5: Example configuration: 32 x 100 GbE muxponder

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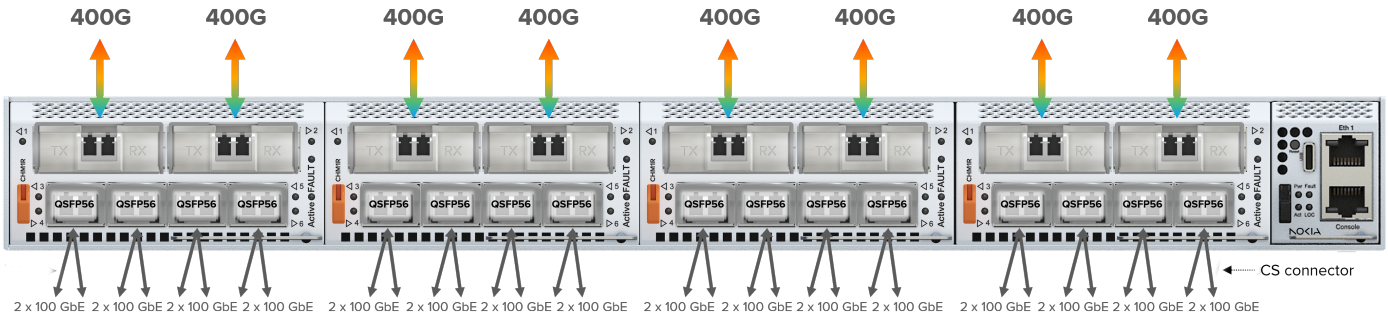

Figure 6: Example configuration: 32 x 100 GbE muxponder using CS connector

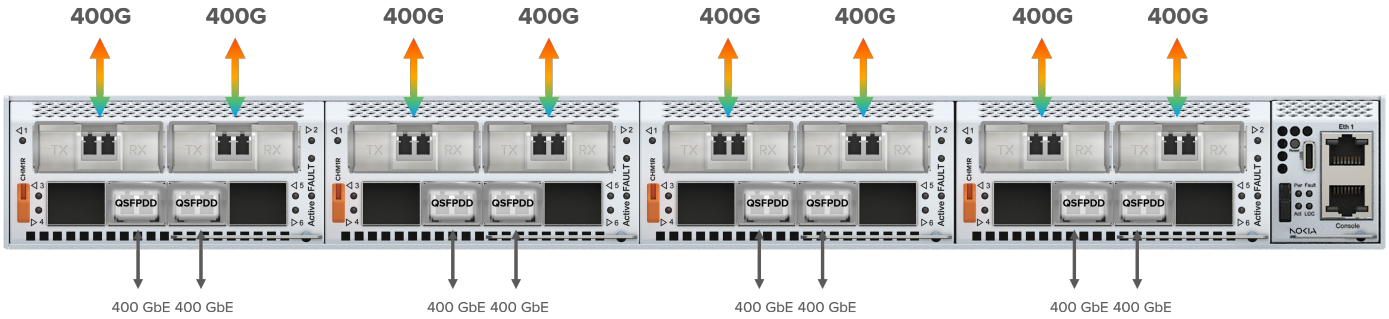

Figure 7: Example configuration: 8 x 400 GbE transponder

Maximize Capacity-Reach and Fiber Capacity While Reducing Power Consumption

The CHM1R's 400G technology supports significantly higher performance compared to 200G pluggable technology and can be programmed with a wide range of interface rates from 100 Gb/s DP-QPSK to 400G DP-16QAM to meet multiple different network scenarios and requirements from DCI to long-haul. It improves wavelength-capacity-reach significantly over the previous 200G technology generation and reduces signal regeneration requirements.

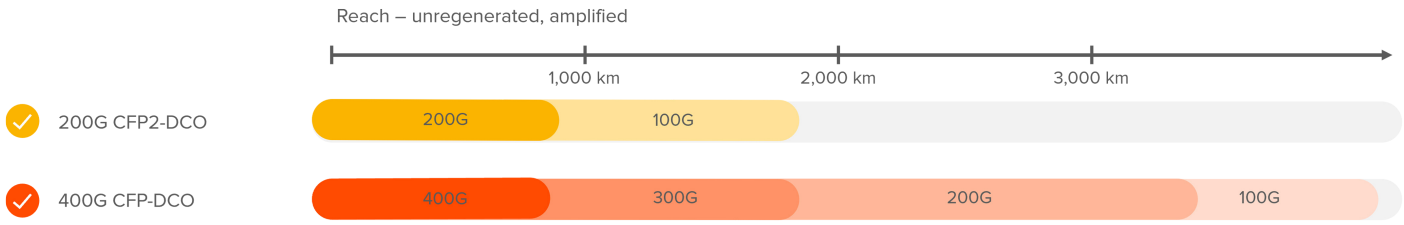

Figure 8: The CHM1R's 400G technology significantly improves capacity-reach over the 200G technology generation

In addition to reach enhancements, the 400G coherent technology improves spectral efficiency, and up to 25.6T can be transported within a single fiber in the extended C-band spectrum – 64 x 400 Gb/s wavelengths. Compared to the previous coherent 200G DCO pluggable generation that could only deliver up to 19.2T capacity per fiber, the 400G coherent technology improves fiber utilization by over 33%.

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Automation Enabled by Open APIs and Streaming Telemetry

The 1830 GX G30 Series supports management, automation, and streaming telemetry via open interfaces. It supports WebGUI, CLI, SNMP, TACACS+, syslog, YANG-modeled NETCONF and RESTCONF APIs, and gNMI/gRPC streaming telemetry. It is OpenConfig and OpenROADM compliant. In-band management is supported via GCC0 on the line interfaces, out-of-band management via Ethernet interfaces, and commissioning via the console interface. An OSPF-based DCN is supported. Additional manageability features include zero-touch commissioning, RMON, LLDP, and PRBS test generation and loopbacks. The 1830 GX G30 Series is also supported under Nokia's Transcend Network Management System and Transcend Controller in the Transcend Network Suite.

Technical Specifications

Application

- 100G to 400G muxponder
- 400G to 400G transponder
- Mix of 100G and 400G service transport
- OEO 3R regenerator
- OTN muxponder, OTN transponder
- Ethernet muxponder, Ethernet transponder
- Mix of OTN and OpenZR+

Physical Interface

- CFP2-DCO, QSFP-DD, QSFP56, QSFP28

Line Interfaces

- CFP2-DCO pluggables:
  - ZXS-C2DWDMFA-40
  - ZXS-C2DWDMF2-40
  - XRCFCD400PAE5INZ
- Two pluggable interfaces
- 400G generation coherent technology with 7-nm DSP
- 100 Gb/s-400 Gb/s in 100G increments
- Tuneable 28-63 Gbaud
- FEC: CFEC, OFEC, and XR FEC; 15% FEC and 7% FEC options
- DP-QPSK/8QAM/16QAM
- Time-domain hybrid modulation
- Non-differential encoding
- Spectral shaping including WSS filtering mitigation
- Non-linear compensation
- 50-ms line protection including coherent colorless add/drop
- Performance monitoring: CD, PMD, PDL, Q-factor, pre-FEC BER, OTU-level PM, delay measurement
- Chromatic dispersion tolerance of >300 ns/nm (100 Gb/s PM-QPSK)
- PMD: Up to 50 ps mean DGD (100 Gb/s PM-QPSK)
- SOP rotation tolerance: >3 Mrad/s (100 Gb/s PM-QPSK)
- Wire-speed ODU4 AES-256 encryption for 100G and 400G clients
- GCCO in-band management on the line port OTUk
- PRBS test and loopback

Client Interfaces

- 2 x QSFP28/56/DD + 2 x QSFP28/56 per CHM1R
- 400G: AOC, DAC, FR4, SR8, LR4, DR4, XDR4, LR8
- 100G: LR4, LR4 DR, LR1, SR4, PSM4, CWDM4, ER4, DR1, AOC, MR ER4L

Other Features

- OTS, OMS, and OCH protection
- Interworking with RD20, RD09, POL, OPSM
- Interworking with third-party OpenROADM and ZR/ZR+
- Generic Communication Channel (GCC0) support
- OTN L1 encryption
- Secure boot
- LLDP snooping on each 400 GbE/100 GbE client port
- RMON and test signal
- TCM
- Delay measurement
- Facility and terminal loopback
- Client hairpin
- OEO 3R regen capability without client

Management Options

- Management and control platforms:
  - Nokia Transcend Controller
  - Nokia Transcend Network Management System
- Command line interface
- Zero-touch commissioning
- Syslog
- TACACS+/RADIUS
- WebGUI
- NETCONF
- RESTCONF
- Native YANG models
- OpenConfig
- OpenROADM
- gNMI/gRPC
- SNMP fault and performance management
- OSPF-based DCN

Environmental

- Max power dissipation 148 W
- Operating temperature: 0° C to 45° C/32° F to 113° F

Technical Specifications

- Transport and storage: -40° C to 70° C/-40°F to 158° F/40° C + 93% RH
- Humidity: 5% to 90% non-condensing

Regulatory and Compliance

- RoHS-6 compliant and lead-free per Directive 2002/95/EC
- GR-3160-Core Generic Requirements for Telecommunications Data Center Equipment and Spaces
- Telcordia GR-326-Core Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies
- Telcordia GR-1435-Core Generic Requirements for Multi-Fiber Optical Connectors
- Emissions: FCC Part 15 Class A, EN55022/CISPR Class A Compliant, CE Laser Safety: ANSI Class 1M, IEC Class 1M, EN 60825-1/2, 21 CFR 1040 US FDA CDR, Class 1
- Electrical safety: UL 60950, CSA22.2 60950 and IEC 60950

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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