



Common Management Interface Specification (CMIS) Interoperability Demo ECOC 2024

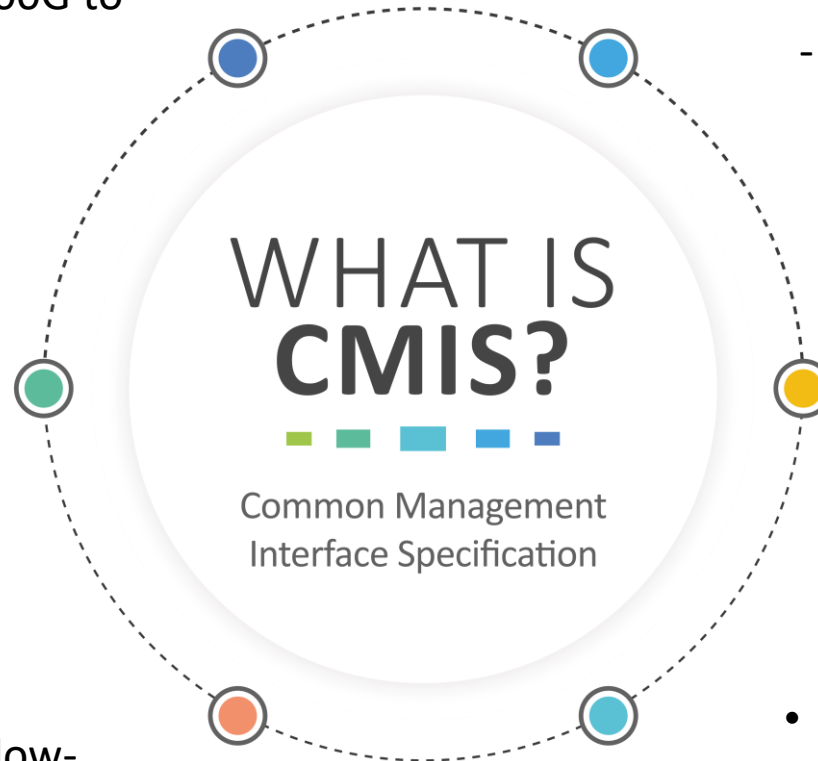
Why was CMIS started?

- CMIS was originally conceived to address industry pain points in module management :
 - Management of multiple form factors
 - Module initialization variability
 - Breakout – managing multiple different services (ie SFF-8024 codes)
- The industry has embraced CMIS leading to continued efforts to evolve CMIS with the addition of support for:
 - Co-packaging / ELSFP
 - Next gen modules based on 112G/224G
 - CMIS-LT, Link Training
 - CMIS-VCS, support for RTLR / Linear Pluggable Optics (LPO)



Eliminating Complexity for Pluggable Modules

- Module speeds ranging from 100G to 800G. Unites a wide range of transceiver classes under one management protocol
- Fully form factor agnostic: CMIS implementation is consistent and interchangeable between QSFP-DD, OSFP, QSFP, SFP-DD, SFP, CPO and ELSFP families of modules and more.
 - CMIS gives access to the low-speed I2C interface to control and program the module.



- Supports module types ranging from:
 - Active/Passive Cable Assemblies
 - Optical Transceivers
 - Coherent DWDM modules
 - ELSFP modules
- Provides communication between all compliant optical modules, switches, and server Network Interface Cards
- Enables interoperability between module and host and is used to test and debug the module

CMIS – Path to Plug and Play

- CMIS based modules are becoming more complex each year.
- Integration of modules into hosts is taking longer and often requires host software development to manage a new module.
- CMIS is looking to provide ways to reduce/eliminate the integration time.
- Long term goal is to be able to insert a new module into a host and manage the module (bring up module, initialize the datapath, standard CMIS defined monitoring) without any new host software development required.

CMIS – Path to Plug and Play

• **Provisioning**

- Common module state machine
- Common data path state machine
- Appsel based provisioning

• **Monitoring**

- Versatile Diagnostic Monitoring (VDM)
- Fixed Registers for common monitoring (Rx optical power, temperature, etc)

• **Advertising**

- Module describes itself to host
- Applicable to all parts of module management (provisioning, monitoring, upgrades, etc)

• **Upgrades**

- Common upgrade infra-structure

CMIS Memory Map

From I2C to module Memory Map

CMIS uses pages to turn the 256-byte TWI message into a memory map consisting of thousands of registers

Registers are grouped in pages of 128 bytes

Each page provides specific functionality

Banking allows module to instantiate multiple copies of a page

- 4x100GE: 4 banks of 100GE alarms/PMs

The *host* initiates all management interactions

The *module* can only respond

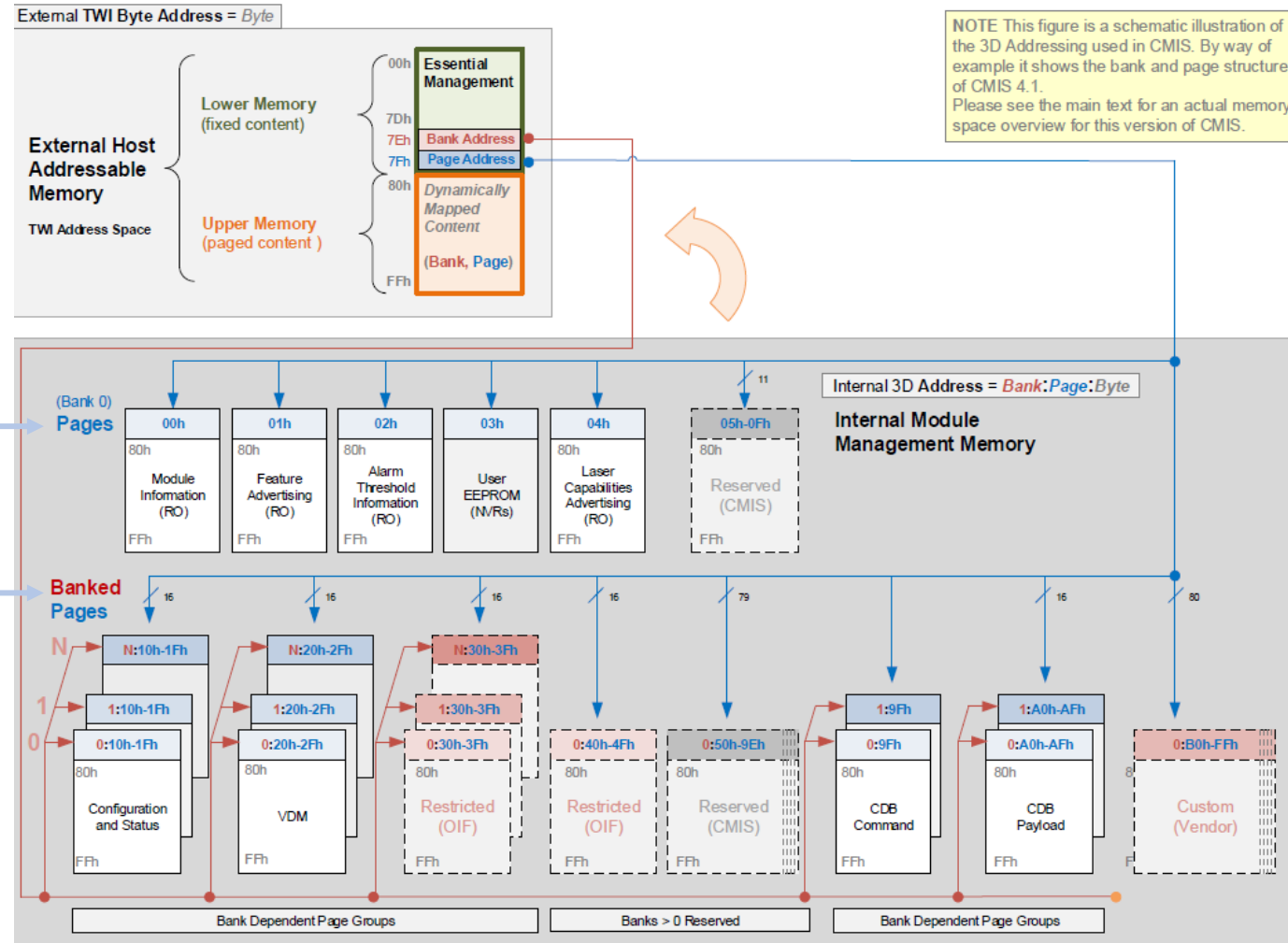


Figure 8-1 CMIS Module Memory Map (Conceptual View)

*Slide quoted from CMIS tutorial series
 – Gary Nicholl & Ian Alderdice, Dec 5th 2023 OIF CMIS Webinar

CMIS Module State Machine (MSM)

MSM

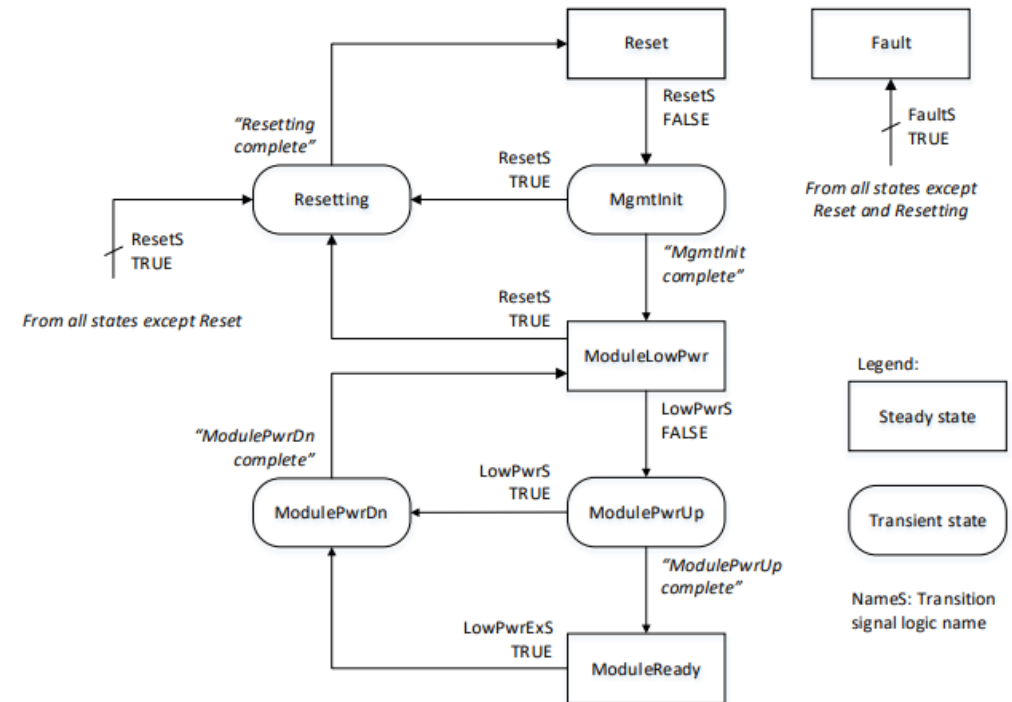
Used to progress the module from reset to low power mode and ultimately into high power mode

Use

Although this seems very basic, the advantage is that every CMIS module does this in the same way and allows the host to write MSM code one time for all the modules they support

Hosts can read the state of the MSM through register 3 in page 00h.

Code	Module State	Description
000b	-	Reserved
001b	ModuleLowPwr	
010b	ModulePwrUp	
011b	ModuleReady	This is the only state reported by flat memory modules
100b	ModulePwrDn	
101b	ModuleFault	
110b	-	Reserved
111b	-	Reserved



*Slide quoted from CMIS tutorial series
 – Gary Nicholl & Ian Alderdice, Dec 5th 2023 OIF CMIS Webinar

CMIS Data Path State Machine (DPSM)

DPSM

Used to progress the module from DP_Deactivated (laser off) to DP_Activated (laser on)

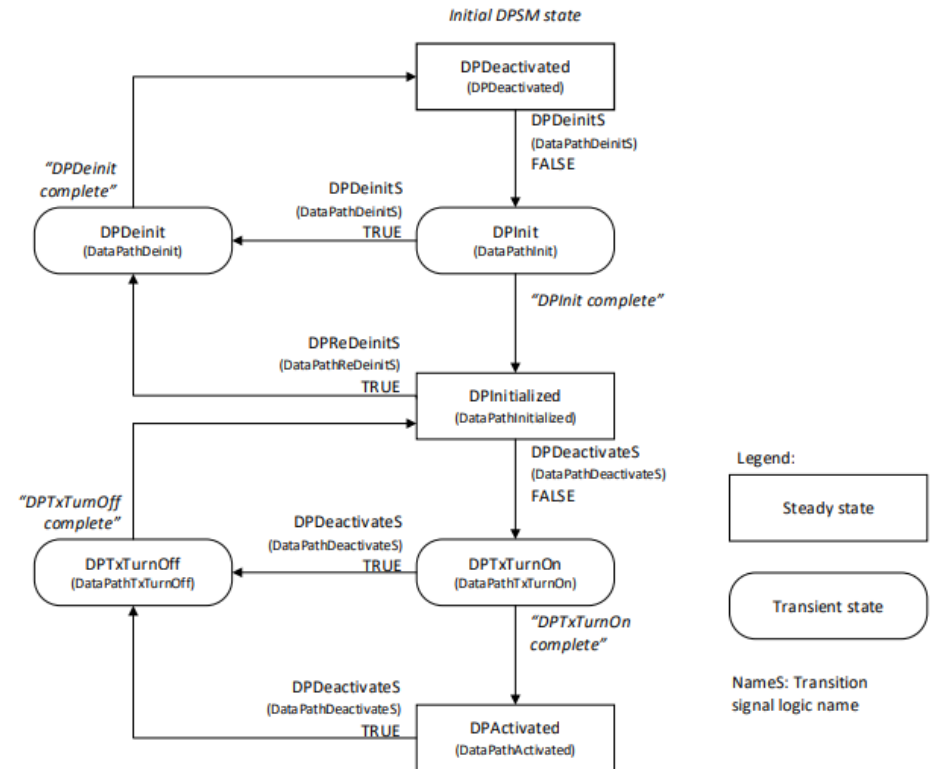
Use

Although not as simple as the module state machine, but commonality is also the advantage of this mechanism

Every CMIS module does this in the same way and allows the host to write DPSM code one time for all the modules they support

*Slide quoted from CMIS tutorial series

– Gary Nicholl & Ian Alderdice, Dec 5th 2023 OIF CMIS Webinar



CMIS APPSEL Code

APPSEL

Application Select codes are used to provision a module
A module advertises a set of supported APPSEL codes that can be applied to the module

Example

Table shows the two supported APPSEL codes for a 400ZR module

Also shows the start of APPSEL 3 where FF indicates this is the end of supported APPSEL codes

86	Appl sel 1 Host Elec IF ID	11	ID from Table 4-5 SFF-8024: 400GAUI-8 C2M
87	Appl sel 1 module media if id	3E	ID from Table 4-7 SFF-8024: 400GBZR
88	appl sel 1 lane count	81	Host Lane Count: 8
			Media Lane Count: 1
89	Appl sel 1 host lane assignment opt	1	Application allowed to start on host lane 1. Refer to Section 6.2.1.1 for details
90	Appl sel 2 host elec if id	D	ID from Table 4-5 SFF-8024: 100GAUI-2 C2M
91	Appl sel 2 module media if id	3E	ID from Table 4-7 SFF-8024: 400GZR
92	Appl sel 2 lane count	21	Host Lane Count: 2
			Media Lane Count: 1
93	Appl sel 2 host lane assignment opt	55	Application allowed to start on host lane 1. Refer to Section 6.2.1.1
94	Host interface ID app 3	FF	first unused ApSel code

*Slide quoted from CMIS tutorial series – Gary Nicholl & Ian Alderdice, Dec 5th 2023 OIF CMIS Webinar

CMIS VDM – Versatile Diagnostic Monitoring

VDM

Wide range of modules supported by CMIS means assigning fixed registers for all observables and supported configs/combinations is *not* feasible
VDM provides 256 instances of observables and 64 thresholds that are defined by the module
CMIS and C-CMIS define a set of observable types that can be monitored (plus custom type)

Each VDM instance defined by

Type (e.g., media Pre-FEC BER, host errored frame, media PDL, etc.)

Lane being monitored (lane 1 for 400ZR media; lanes 1,3,5,7 for 4x100GE host lanes)

Threshold

Each VDM provides

Advertising of the instance (type, lane, threshold)

Observable Value (counts or floating-point reading)

Flags (high/low, alarm/warning)

*Slide quoted from CMIS tutorial series – Gary Nicholl & Ian Alderdice, Dec 5th 2023 OIF CMIS Webinar

CMIS CDB – Command Data Block

CDB

A mechanism to support bulk data transfer into or out of the module

Use

Most common use is module upgrade where the CDB is used to pass data into the module

CDB can also be used to pull data like Performance Monitoring and/or bulk data out of the module.

Module may choose how to support CDB and advertise via Pg01h.Bytes 163-165

Method

CDB consist of:

- Page 9Fh
 - 2 bytes of unique command ID (CMDID),
 - lengths of local payload, extended payload, response.
 - Check Codes.
 - <= 120 bytes of data
 - Use for both command and response.
- Pages A0h-AFh Extended Pay Load (<=2048 bytes)
- CDB completion flags in Low Mem Byte 8.
- CDB complete status Bytes 37,38.

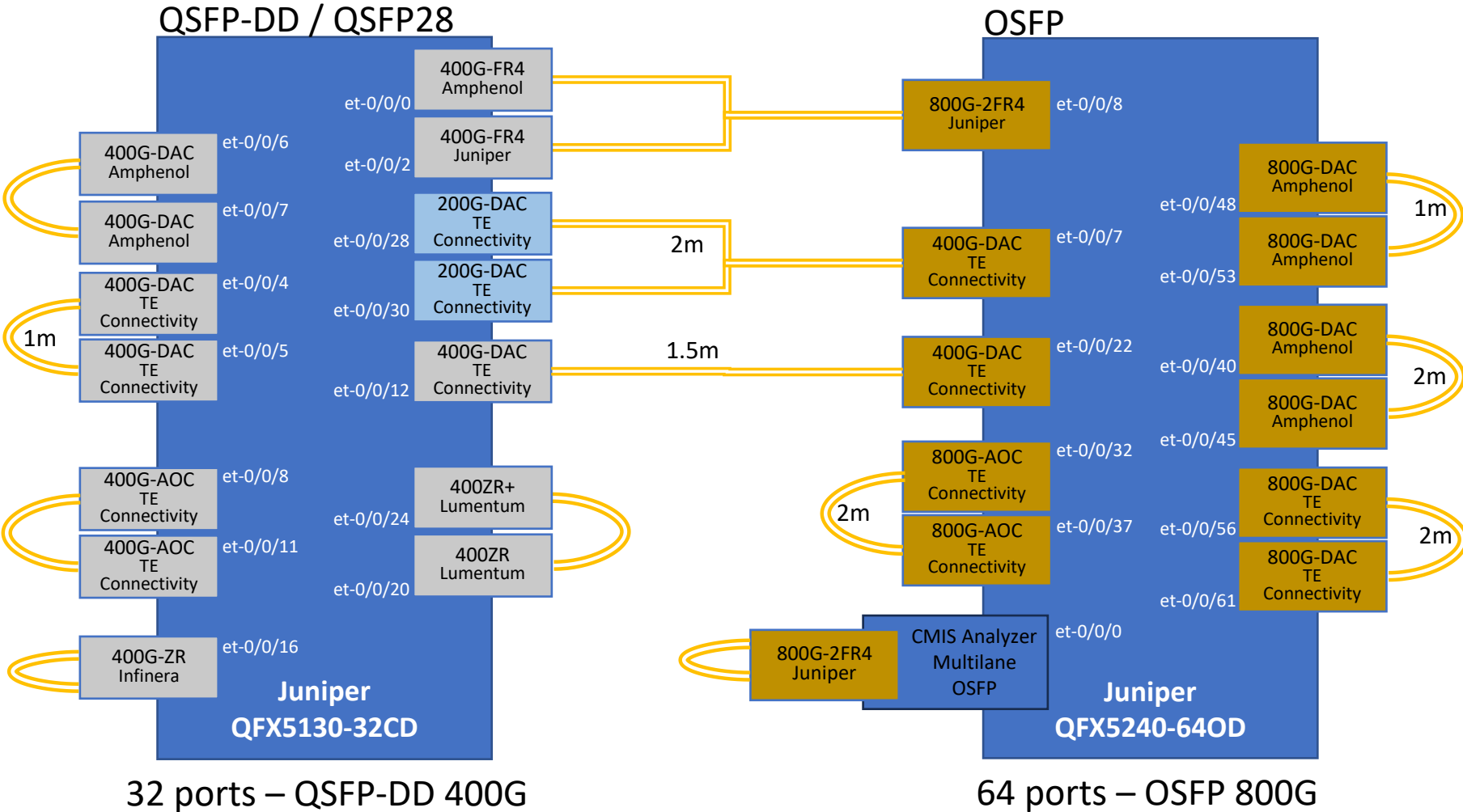
*Slide quoted from CMIS tutorial series – Hock Lim & John Forsythe, April 3rd 2024 OIF CMIS Webinar

CMIS Demo Overview – ECOC 2024

- 1 switch/router vendor – Juniper Networks
- 1 test equipment vendor – MultiLane
- 5 module suppliers – Amphenol, Infinera, Juniper Networks, Lumentum, TE Connectivity
- 6 interface reaches ranging from passive copper to coherent (DAC, AOC, FR4, 400ZR, 400ZR+, 400G-XR) – 400GbE & 800GbE support
- 27 switch ports populated
- 3 form-factors – QSFP-DD/QSFP28/OSFP
- CMIS versions – CMIS 3.0, 4.0, 5.0, 5.1

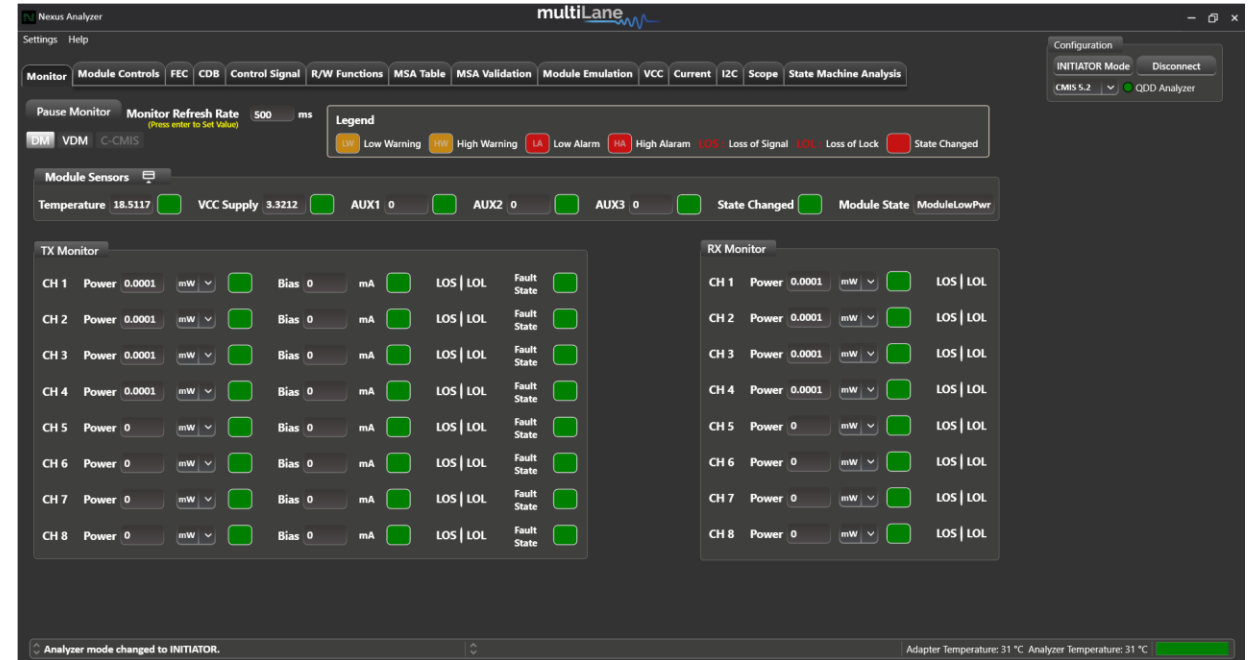
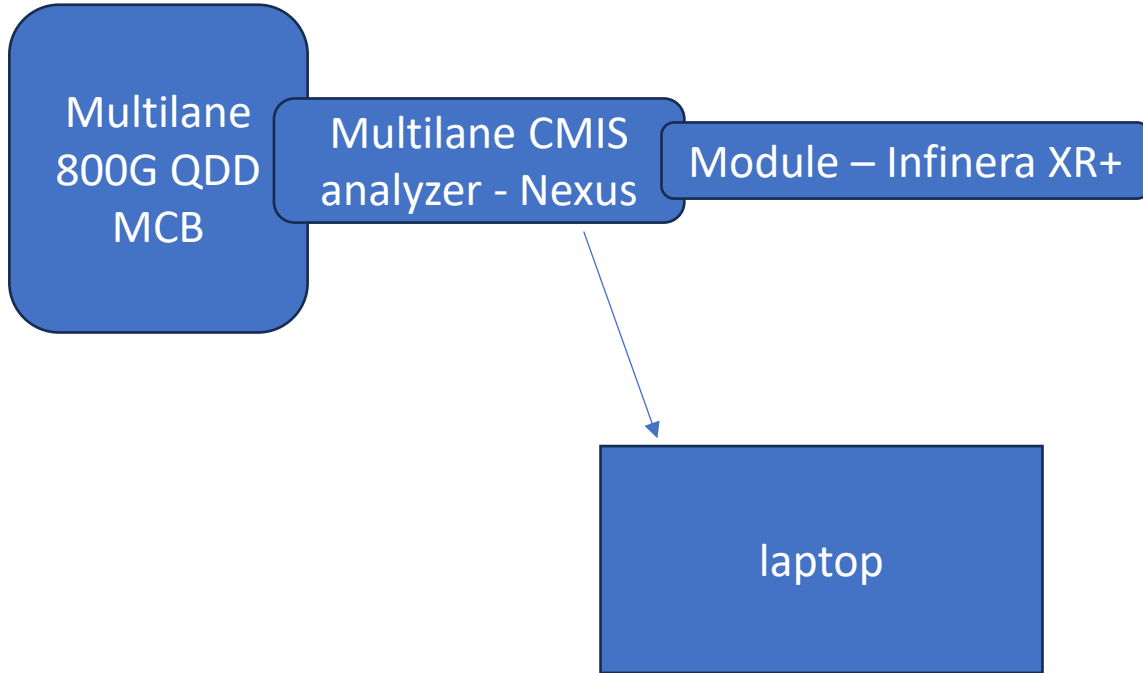
One common management platform - CMIS

Demo A – CMIS Tools for Path to Plug and Play



- ❑ 1 system vendor
 - Two switches in QSFP-DD and OSFP form factor
- ❑ 1 test-measurement vendor
- ❑ 5 module vendors
- ❑ 6 module types
- ❑ 27 ports populated
- ❑ Modules in 3 form factors,
 - QSFP-DD
 - QSFP28
 - OSFP
- ❑ CMIS rev. covered:
 - 5.1/5.0/4.0/3.0

Demo B - APPSEL Based Provisioning



This CMIS demo is showcasing:

- Digital monitoring interface showing transceiver power monitoring
- MSA validation showing full CMIS registers sweep
- DUT AppSel code advertisement and transition of Infinera XR+ module

CMIS Modules

Large range of form factors, applications & capabilities



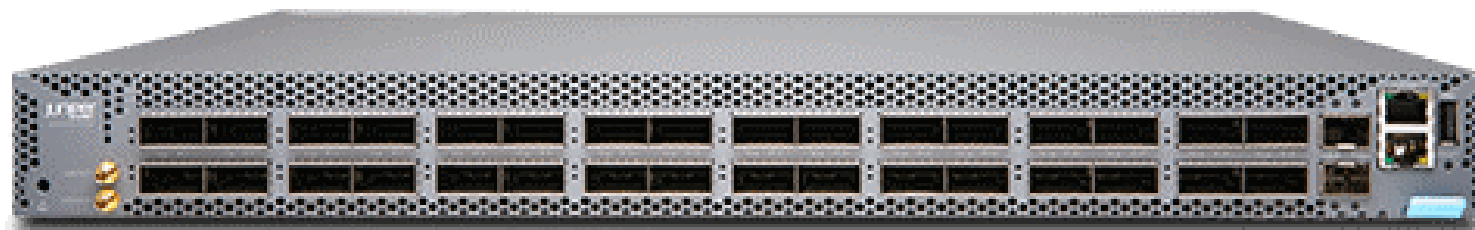
CMIS Host Switch/Routers



QFX5240-640D

OSFP

- ❖ 800G/2x400G/8x100G
- ❖ < 800GbE

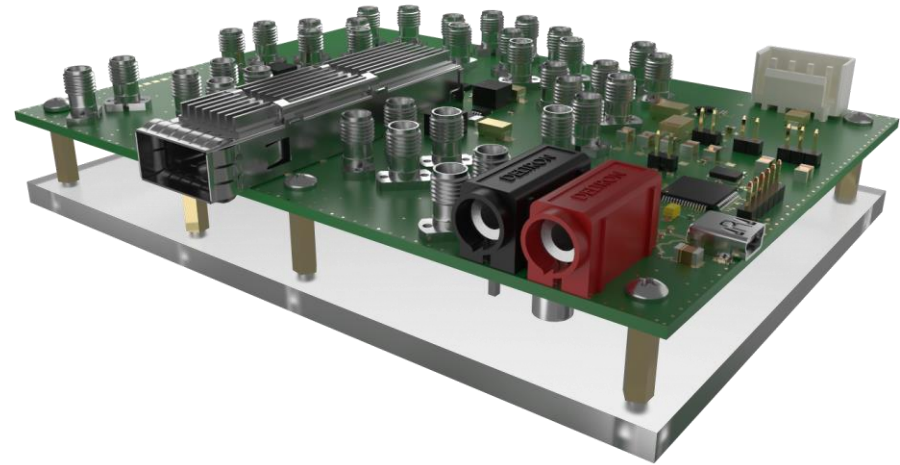


QFX5130E-32CD

QSFP-DD

- ❖ 400G/100G/50G/40G/10G
- ❖ 2x200G/4x100G/2x100G/2x50G/4x25G/4x10G

CMIS Test Equipment



multiLane 

CMIS – A Family of Documents

CMIS (Common Management Interface Specification) IA, Current Rev 5.3

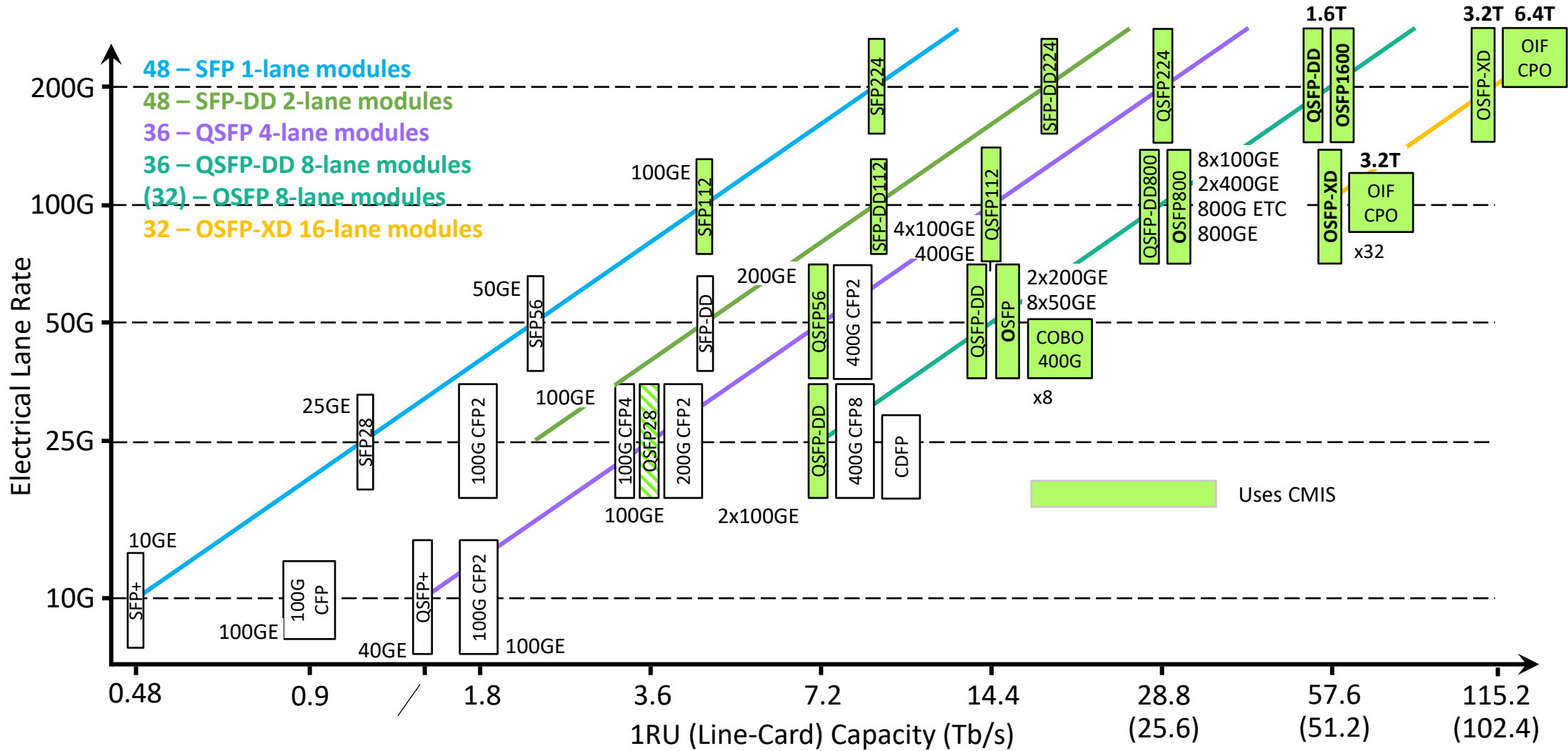
CMIS IA is the foundation for the plug-and-play and has a family of supplements for specific applications

- C-CMIS – Coherent CMIS, Provides extensions to CMIS to manage modules with coherent interfaces.
- CMIS-FF – CMIS Form Factor, Provides details of HW pins and related registers for different module form factors.
- CMIS- ELSFP – CMIS External Laser Small Form Factor Pluggable, Provides details for managing Co-Packaging and ELSFP modules.
- CMIS-LT* – CMIS Link Training, Provides details for managing host-side link training on CMIS modules.
- CMIS-VCS* – CMIS Versatile Control Set, Provides details for managing electrical characteristics of host interfaces.

CMIS works in conjunction with other industry standards like SNIA SFF-8024 and hardware MSAs.

*Some CMIS extensions are under development and have not been published yet.

Front-Panel and Embedded I/O – CMIS Adoption



What's next for CMIS?

- The OIF management track team is working on the next release of CMIS which will include:
 - Working with the OIF electrical track to support link training approaches for upcoming higher-speed electrical interfaces like CEI-112 and CEI-224.
 - Working with the OIF Energy Efficient Interfaces (EEI) track to define the management of CPO and ELSFP modules.
 - Working with other MSA groups to update the definition of Form Factor Specific Hardware Signals.
 - Expanding the number of supported applications by growing the number of Appsels
 - VCS - Versatile control set & RTL - Retimed Transmitter and Linear Receiver
 - Increase the speed of the management communication interface (MCI)

CMIS Tutorial Series

Topic	Date	Presenter
Network path state machine (NPSM) - Upcoming	Oct-9 2024	Eric Maniloff, Ciena
Command Data Block (CDB)	April-3 2024	John Forsythe, TE connectivity Hock Lim, Lumentum
Versatile Diagnostic Monitoring (VDM)	Feb-28 2024	Todd Rope, Marvell
Data path state machine (DPSM) and Application Advertising (APPSel)	Feb-7 2024	Doug Cattarusa, Cisco Paul Brooks, Viavi solutions
Common management interface specification (CMIS): “Exploring the technical depth of CMIS”	Dec-5, 223	Ian Alderdice, Ciena Gary Nicholl, Cisco

CMIS Demo – Participating Members

Amphenol



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NETWORKS

 **LUMENTUM**

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