A YANG Data Model for CMIS Access and Control

draft-hi-ccamp-cmis-control-yang-00

22nd July, 2025

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Background and Motivations

- DCO transceivers (e.g., QSFP-DD) equipped with a router are managed/controlled with CMIS by NOS. NOS abstracts such physical layer, and enables operators to handle the DCO transceivers with standard/proprietary interfaces(e.g., NETCONF/IETF YANG, CLI)

- DCO transceivers' features are dependent on vendors' DSP (Digital Signal Processor) implementations, and NOS needs to be some development to support a DCO transceivers.
  -> There are some restrictions on combination of router/switch device and DCO transceivers.
- CMIS has custom pages as vendor specific fields, and there are no standard schema to handle the fields.

Is it useful to make a YANG model for accessing and controlling CMIS?

CMIS Structure Overview

- CMIS memory map divided into pages (each page has a 256-byte address space)
- Each page has several values, and “offset” and “size” can be used for indicating the target value
- Banks are used to support additional data blocks

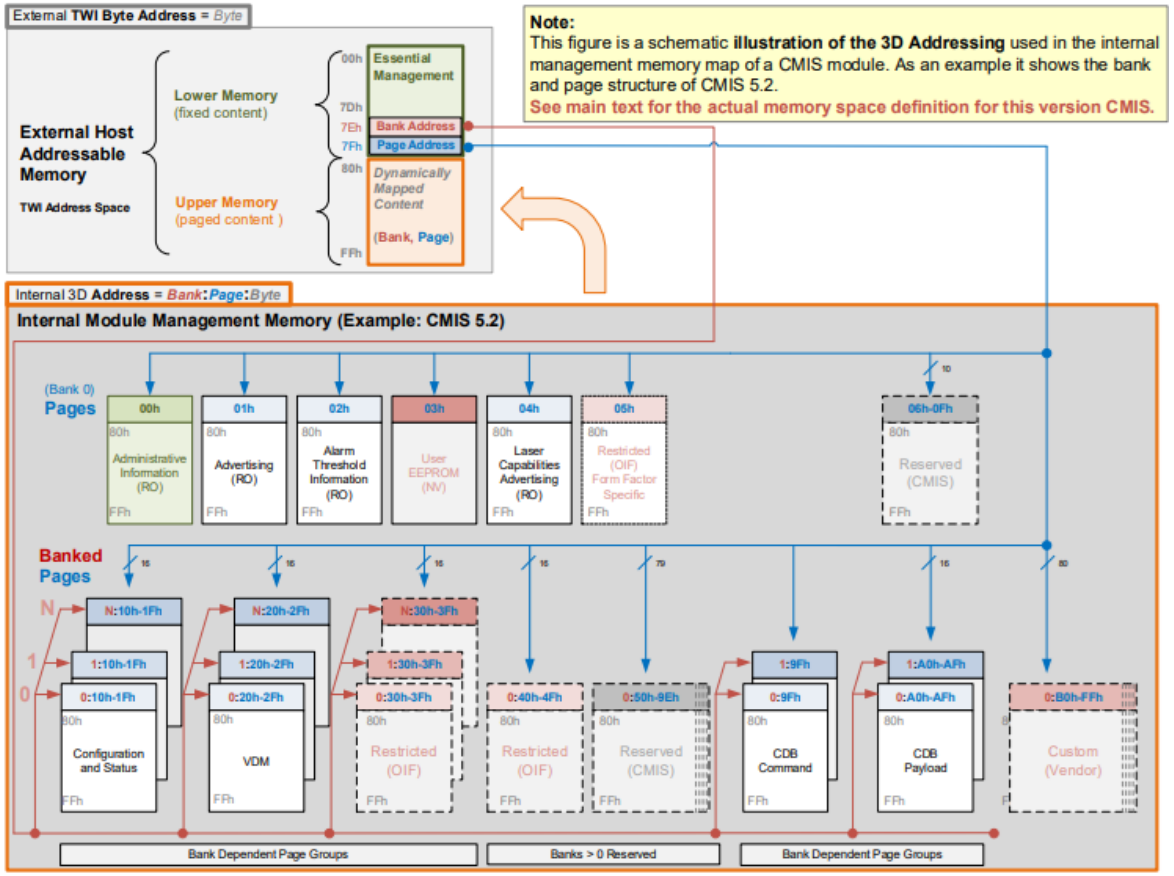


Figure 8-1 CMIS Module Memory Map (Conceptual View)

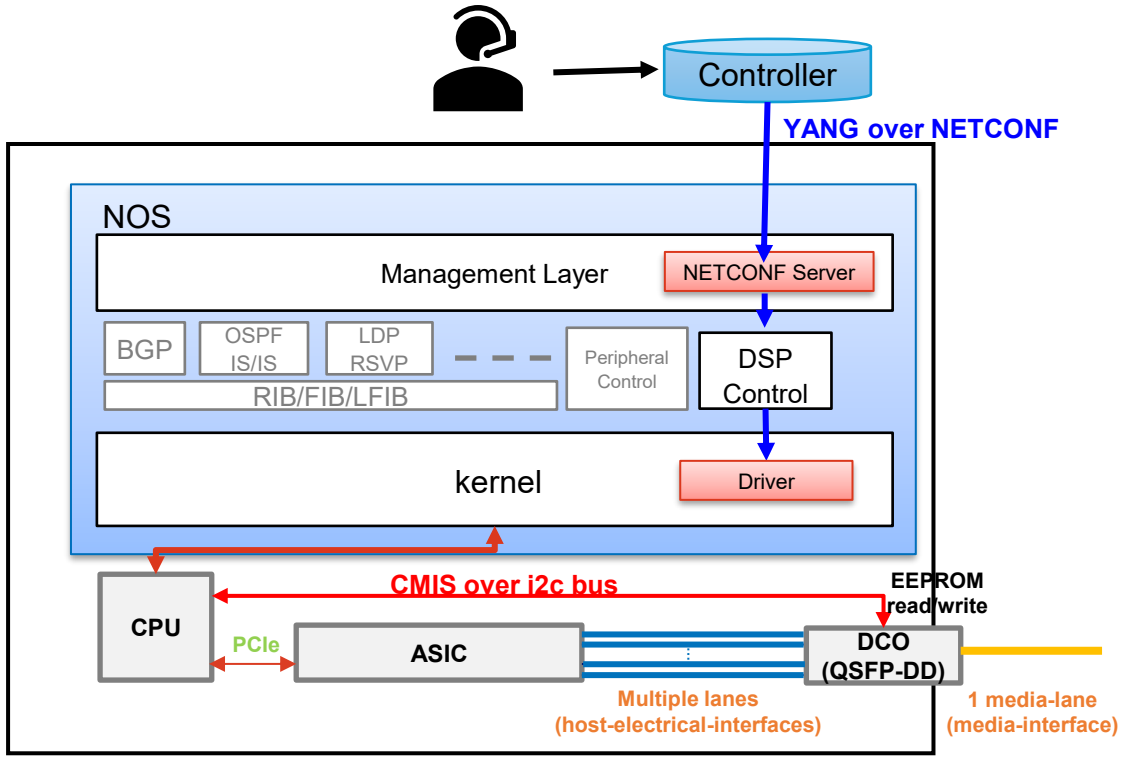
Table 8-1 List of CMIS Pages

Page	#	Page Description	Data per Bank	# Banks	Type	See
00h	1	Administrative Information	n/a	1 of 1	RO	8.3
01h	1	Advertising	n/a	1 of 1	RO	8.4
02h	1	Thresholds Information	n/a	1 of 1	RO	8.5
03h	1	**User** NV RAM	n/a	1 of 1	RW	8.6
04h	1	Laser Capabilities Advertising	n/a	1 of 1	RO	8.7
05h	1	**Restricted for OIF** (MSL extensions)[1]	n/a	1 of 1	-	8.8
06h-0Fh	10	**Reserved Pages** (CMIS)	n/a	1 of 1	-	-
10h	1	Lane and Data Path Configuration	8 lanes group	4 of 256	RW	8.9
11h	1	Lane and Data Path Status	8 lanes group	4 of 256	RO	8.10
12h	1	Tunable Laser Control and Status	8 lanes group	4 of 256	mixed	8.11
13h	1	Module Performance Diagnostics Control	8 lanes group	4 of 256	RW	8.12
14h	1	Module Performance Diagnostics Results	8 lanes group	4 of 256	RO	8.13
15h	1	Timing Characteristics	8 lanes group	4 of 256	RO	8.14
16h	1	Network Path Control and Status	8 lanes group	4 of 256	RW	8.15
17h	1	Flags and Masks	8 lanes group	4 of 256	RO/COR	8.16
18h	1	Lane and Data Path Configuration (Extensions)	8 lanes group	4 of 256	RW	8.17
19h	1	Lane and Data Path Status (Extensions)	8 lanes group	4 of 256	RO	8.18
1Ah-1Dh	4	**Reserved Pages** (CMIS)	8 lanes group	4 of 256	-	-
1Eh-1Fh	2	**Custom Pages**	8 lanes group	4 of 256	-	-
20h	1	VDM Observable Descriptors[1][64]	8 lanes group	4 of 256	RO	8.19
21h	1	VDM Observable Descriptors[2][64]	8 lanes group	4 of 256	RO	
22h	1	VDM Observable Descriptors[3][64]	8 lanes group	4 of 256	RO	
23h	1	VDM Observable Descriptors[4][64]	8 lanes group	4 of 256	RO	
24h	1	VDM Samples[1][64]	8 lanes group	4 of 256	RO	8.19.2
25h	1	VDM Samples[2][64]	8 lanes group	4 of 256	RO	
26h	1	VDM Samples[3][64]	8 lanes group	4 of 256	RO	
27h	1	VDM Samples[4][64]	8 lanes group	4 of 256	RO	
28h	1	VDM TC Flagging ThresholdQuads[1][16] [2]	8 lanes group	4 of 256	RO	8.19.3
29h	1	VDM TC Flagging ThresholdQuads[2][16]	8 lanes group	4 of 256	RO	
2Ah	1	VDM TC Flagging ThresholdQuads[3][16]	8 lanes group	4 of 256	RO	
2Bh	1	VDM TC Flagging ThresholdQuads[4][16]	8 lanes group	4 of 256	RO	
2Ch	1	VDM TC FlagQuads[256] (threshold crossing)	8 lanes group	4 of 256	RO/COR	8.19.4
2Dh	1	VDM MaskQuads[256]	8 lanes group	4 of 256	RW	8.19.5
2Eh	1	**Reserved Pages** (CMIS)	8 lanes group	4 of 256	-	-
2Fh	1	VDM Advertisements and Dynamic Control	8 lanes group	4 of 256	RW	8.19.6
30h-3Fh	16	**Restricted for OIF** (C-CMIS)	-	-	-	-
40h-4Fh	16	**Restricted for OIF** (C-CMIS)	-	-	-	-
50h-9Eh	79	**Reserved Pages** (CMIS)	-	-	-	-
9Fh	1	CDB Command/Response with Local Payload	CDB Instance	2 of 256	RW	8.20
A0h	1	CDB EPL[1][128] Extended Payload Segments	CDB Instance	2 of 256	RW	8.21
A1h	1	CDB EPL[2][128]	CDB Instance	2 of 256	RW	
A2h	1	CDB EPL[3][128]	CDB Instance	2 of 256	RW	
A3h	1	CDB EPL[4][128]	CDB Instance	2 of 256	RW	
A4h ... ACh	9	CDB EPL[5][128] ... CDB EPL[13][128]	CDB Instance	2 of 256	RW	
ADh	1	CDB EPL[14][128]	CDB Instance	2 of 256	RW	
AEh	1	CDB EPL[15][128]	CDB Instance	2 of 256	RW	
AFh	1	CDB EPL[16][128]	CDB Instance	2 of 256	RW	
B0h-FFh	80	**Custom Pages**	Vendor specific	-	-	-

https://www.oiforum.com/wp-content/uploads/OIF-CMIS-05.2.pdf

Concept of Proposal

- Proposed YANG model provides a schema to access and control DSP's register with CMIS format.
  - "page-num" and "bank" are used for indicating target memory
  - Read/Written data is defined with "offset", "size", and "data-value".
- This YANG is augmented to "ietf-interfaces".




```
module: ietf-cmis-control

  augment /if:interfaces/if:interface:
    +--rw cmis-control
       +--ro cmis-enabled?   boolean
       +--ro cmis-version?   string
       +--rw cmis-page* [page-num]
          +--rw page-num              uint8
          +--rw bank                  uint8
          +--ro page-access-type?     access-type
          +--rw description?          string
          +--rw value* [offset]
             +--rw offset                   uint8
             +--rw size                     uint8
             +--ro value-access-type?       access-type
             +--rw value-data               binary
             +--rw description?             string
```

Page Info.

Value Info.

Tree diagram of proposed YANG

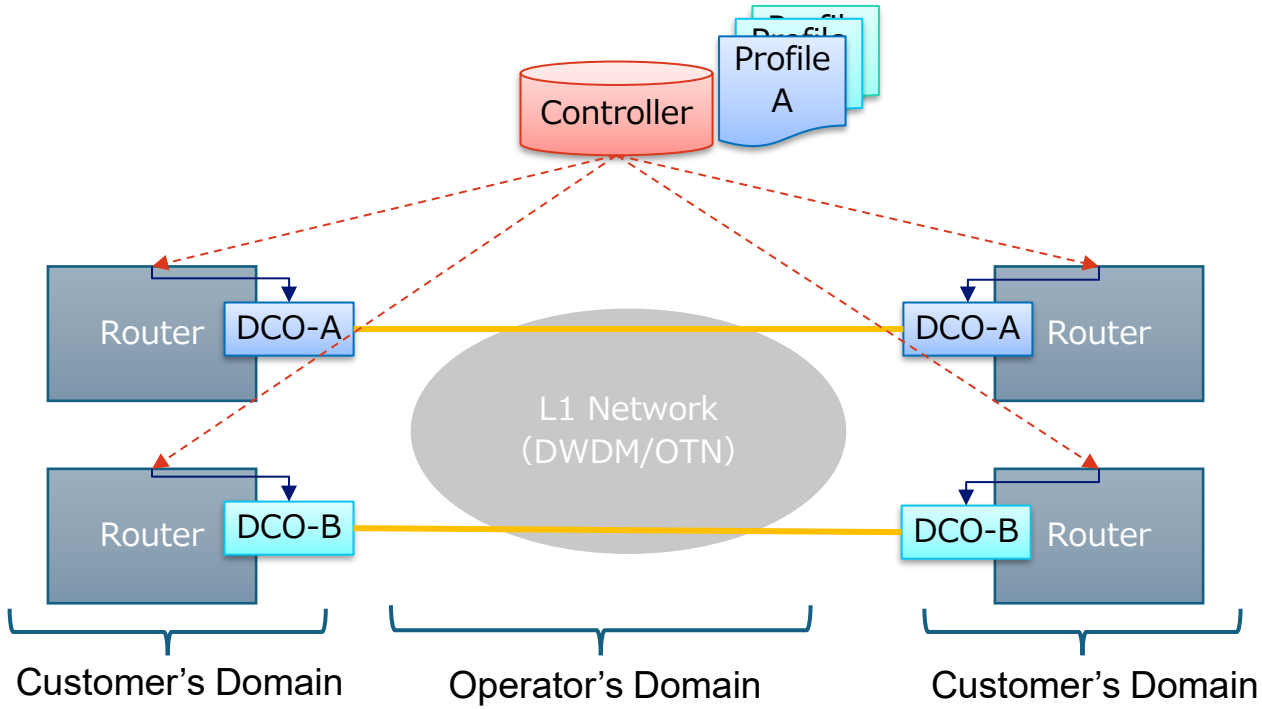
Usecases

- **Usecase1: Centralized Control of Pluggable DCO Modules (L1 Private Network Service)**

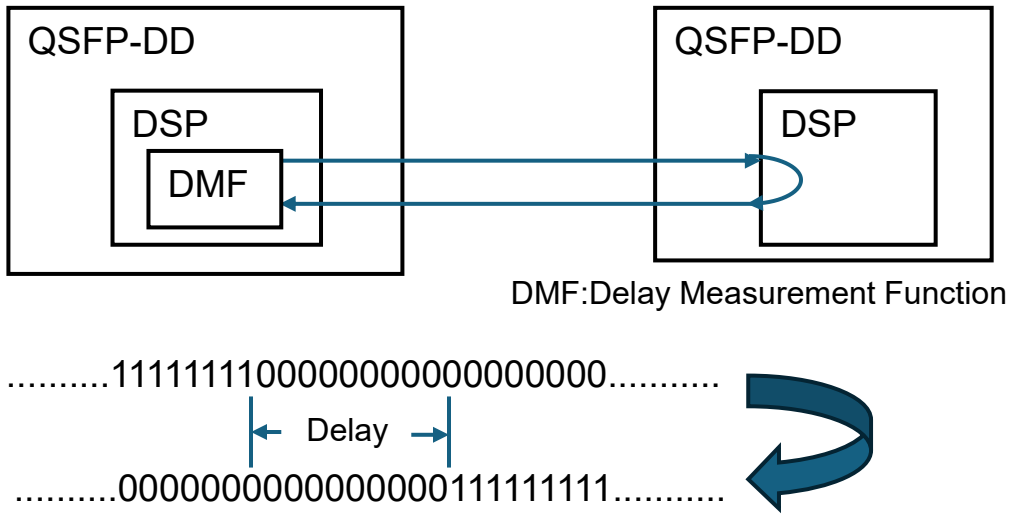
  A L1 private network service provider can control only DCO pluggable modules equipped with customer's routers independently of routers' implementations.

- **Usecase2: Using Custom Pages**

  High accuracy metrics of the optical layer can be measured by using custom pages (e.g., optical characteristics, ns ordered delay)



<Centralized Control of Pluggable DCO Modules>



<Using Custom Pages(High Accuracy Delay Measurement)>

Primitive Mode

- As simpler data model, “primitive-mode” YANG is also proposed.
- Primitive mode has a flat data structure.

```
module: ietf-cmis-control

  augment /if:interfaces/if:interface:
    +--rw cmis-control
       +--ro cmis-enabled?   boolean
       +--ro cmis-version?   string
       +--rw cmis-page* [page-num]
          +--rw page-num             uint8
          +--rw bank                 uint8
          +--ro page-access-type?    access-type
          +--rw description?         string
          +--rw value* [offset]
             +--rw offset                uint8
             +--rw size                  uint8
             +--ro value-access-type?    access-type
             +--rw value-data            binary
             +--rw description?          string
```

<basic model>

```
module: ietf-cmis-control-primitive

  augment /if:interfaces/if:interface:
    +--rw cmis-control-primitive
       +--ro cmis-enabled?           boolean
       +--ro cmis-version?           string
       +--rw primitive-cmis-page* [page-num]
          +--rw page-num    uint8
          +--rw bank        uint8
          +--rw offset      uint8
          +--rw size        uint8
          +--rw value       binary
```

<primitive-mode>

Security Considerations

- This YANG module itself does not introduce additional security vulnerabilities beyond those already covered in existing YANG specifications.
- It depends on standard secure transport mechanisms such as SSH/TLS for NETCONF/RESTCONF.
- Since it enables direct read/write access to CMIS registers, strict access control is required to prevent unauthorized or accidental changes.
  → NACM might be useful for preventing to access to un-appropriate registers.
- Operators should implement appropriate authentication and authorization to protect sensitive optical module configurations.

Next Actions

- Extend the YANG for “RPC” and “Action”.
- Clarify the relationship with other related documents.
  e.g., draft-rokui-ccamp-actn-wdm-pluggable-modelling-02

- Your feedback will be appreciated.

Thank you!