



White Paper: CMIS: Path to Plug and Play

OIF-CMIS-Plug-and-Play-01.0

Date Approved - September 16, 2024



White Paper created and approved

OIF

www.oiforum.com

The OIF is an international non profit organization with over 150 member companies, including the world's leading carriers and vendors. Being an industry group uniting representatives of the data and optical worlds, OIF's purpose is to accelerate the deployment of interoperable, cost-effective and robust optical internetworks and their associated technologies. Optical internetworks are data networks composed of routers and data switches interconnected by optical networking elements.

With the goal of promoting worldwide compatibility of optical internetworking products, the OIF actively supports and extends the work of national and international standards bodies. Working relationships or formal liaisons have been established with CFP-MSA, COBO, EA, ETSI NFV, IEEE 802.3, IETF, INCITS T11, ITU SG-15, MEF, ONF.

For additional information contact:

OIF

39221 Paseo Padre Pkwy, Suite J, Fremont, CA 94538

510-392-4903 info@oiforum.com

www.oiforum.com

Working Group: Physical Link Layer Working Group

TITLE: White Paper: CMIS:Path to Plug and Play

SOURCE: **TECHNICAL CO-EDITORS**

Ian Alderdice Ciena Corp. Phone: 1-613-670-2523 Email: ialderdi@ciena.com	Doug Cattarusa Cisco Systems, Inc 1 925 323 4400 dcattaru@cisco.com	Gary Nicholl Cisco Systems, Inc 1 613-862-9186 gnicholl@cisco.com
--	--	--

PLL WORKING GROUP CHAIR

David R. Stauffer, Ph. D.
Kandou Bus, S.A.
QI-I
1015 Lausanne Switzerland
Phone: +1 802 316 0808
Email: david@kandou.com

PLL WORKING GROUP, MANAGEMENT TRACK, VICE CHAIRS

Ian Alderdice Ciena Corp. Phone: 1-613-670-2523 Email: ialderdi@ciena.com	Gary Nicholl Cisco Systems, Inc 1 613-862-9186 gnicholl@cisco.com
--	--

ABSTRACT: In this white paper, we will discuss how CMIS advertising enables hosts to write generic software to manage CMIS compliant modules. We will show how existing application advertising allows for common provisioning procedures and propose a provisioning model driven by advertising. We will also show how upcoming changes in CMIS 5.3 can enhance that provisioning model.



Notice: This Technical Document has been created by the Optical Internetworking Forum (OIF). This document is offered to the OIF Membership solely as a basis for agreement and is not a binding proposal on the companies listed as resources above. The OIF reserves the rights to at any time to add, amend, or withdraw statements contained herein. Nothing in this document is in any way binding on the OIF or any of its members.

The user's attention is called to the possibility that implementation of the OIF implementation agreement contained herein may require the use of inventions covered by the patent rights held by third parties. By publication of this OIF implementation agreement, the OIF makes no representation or warranty whatsoever, whether expressed or implied, that implementation of the specification will not infringe any third party rights, nor does the OIF make any representation or warranty whatsoever, whether expressed or implied, with respect to any claim that has been or may be asserted by any third party, the validity of any patent rights related to any such claim, or the extent to which a license to use any such rights may or may not be available or the terms hereof.

Copyright © 2024 Optical Internetworking Forum

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction other than the following, (1) the above copyright notice and this paragraph must be included on all such copies and derivative works, and (2) this document itself may not be modified in any way, such as by removing the copyright notice or references to the OIF, except as needed for the purpose of developing OIF Implementation Agreements.

By downloading, copying, or using this document in any manner, the user consents to the terms and conditions of this notice. Unless the terms and conditions of this notice are breached by the user, the limited permissions granted above are perpetual and will not be revoked by the OIF or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE OIF DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE OR FITNESS FOR A PARTICULAR PURPOSE.

TABLE OF CONTENTS

1	INTRODUCTION	6
2	SCOPE	6
3	PROVISIONING BASED ON MODULE ADVERTISING.....	7
3.1	What is an application?	7
3.2	A method to provision applications using any version of CMIS.....	8
3.3	Example of proposed provisioning model	9
3.4	Enhancing the provisioning model.....	10
4	SUMMARY	11
5	REFERENCES	12
6	GLOSSARY.....	12

LIST OF FIGURES

Figure 3-1	Interfaces on a Coherent CMIS module.....	7
------------	---	---

LIST OF TABLES

Table 3-1	Host display of Media/Host codes for a DR4 module using SFF-8024 codes	9
Table 3-2	Host display of Media/Host codes of a coherent module using SFF-8024 codes.....	9
Table 3-3	Host display of Media/Host codes of a coherent module using CDB command.....	10

1 Introduction

The Common Management Interface Specification (CMIS) [1] was originally created to provide a management interface that would support many different applications. As modules become more complex, the original CMIS concept of capability advertising has become important in allowing these complex modules to describe themselves. When modules can fully describe their capabilities to hosts, hosts can write generic software functions to manage the module and not have to resort to module specific drivers. Existing host software is using common software functions to manage functionality like inventory data, module state machine, VDMs and firmware upgrades. Extending this concept into the handling of host-level application advertising would benefit the industry by allowing for faster integration of new modules and new capabilities.

In this white paper, we will discuss how CMIS advertising enables hosts to write generic software to manage CMIS compliant modules. We will show how existing application advertising allows for common provisioning procedures and propose a provisioning model driven by advertising. We will also show how upcoming changes in CMIS 5.3 can enhance that host-level provisioning model driven by additional advertising capabilities.

By establishing common management functions based on the module advertising defined in CMIS, we reduce the amount of effort and development time for module and host vendors. The integration time of new modules decreases and the time to deployment of new capabilities in end-user networks decreases. These actions help move the industry towards “plug and play” of CMIS based modules.

2 Scope

CMIS provides the ability for a module to advertise its capabilities to the host. This whitepaper describes how a host can use the advertised capabilities to configure a module for different applications in a generic manner. Through updates to CMIS, hosts will be able to grow the set of features that are managed through modules advertising their capabilities.

3 Provisioning based on module advertising

The goal of provisioning is to allow an end user to enable the desired service on the module. This can be in the form of CLI commands on a router or network level provisioning from network management software.

3.1 What is an application?

An **application** is a mode of operation for a module, defined by a specific combination of an industry standard host electrical interface and an industry standard media interface. For example, OIF 400ZR on the optical side of a module and IEEE 400GE on the electrical side of the module would be one application and OpenZR+ on the optical side of a module and IEEE 4x100GE on the electrical side of the module would be another application. Each module advertises the applications that it supports and hosts can select from those applications. Existing CMIS supports advertising for up to 15 unique applications with plans to increase this number to 120 in CMIS 5.3.

Each application is defined by an application descriptor (identified by a unique AppSel code) which contains a host code, a media code, host/media lane counts, host lane assignments and media lane assignments. Standardized host and media codes for 400GAUI-8, 400ZR, 400GBASE-DR4, OpenZR+, etc are defined in the SFF-8024 specification [2]. SFF-8024 defines a set of two-character hex values for standard interfaces and also defines a set of custom codes (C0h-FEh) for non-standard interfaces.

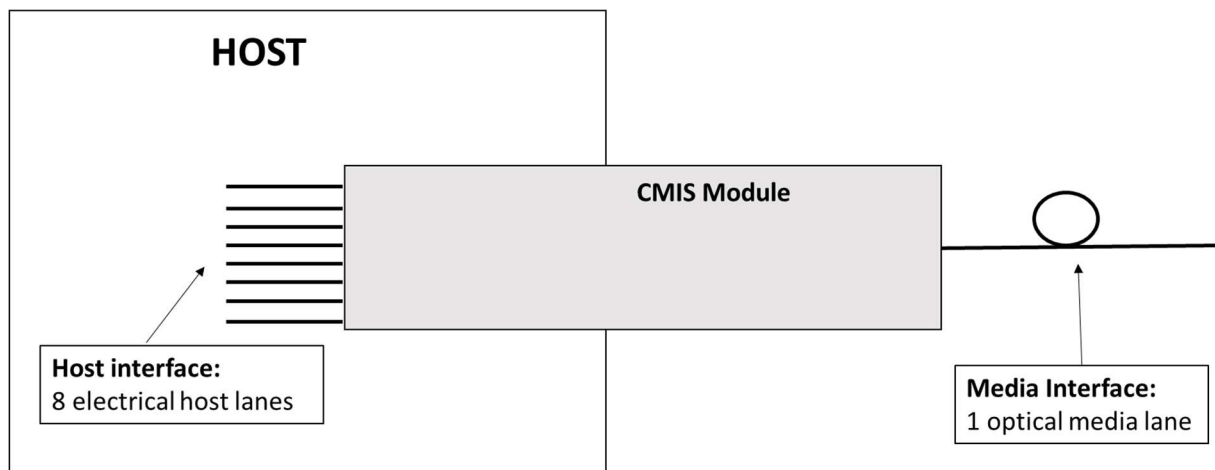


Figure 3-1 Interfaces on a Coherent CMIS module

For a host to validate and accept a module, the host interface (i.e. 400GAUI-8, 100GAUI-2, etc.) of the host must match the host interface of the module. The module advertises the host interfaces that it supports, the host reads the module advertising and determines which applications on the module are compatible with the host. The media side interfaces do not have to align with the host, only with the far end module that it is connected to, meaning that hosts should not exclude an application based on whether the media code is recognized by the host or not.

Custom media codes present a challenge because the custom media codes for each vendor mean something different. In existing CMIS, there is no way to distinguish between a non-standard code on vendor A's module and the same non-standard code (with different meaning) on vendor B's module. This means that end-users need to have application descriptions from a data sheet to provision or hosts may need to add special code in their module provisioning code to handle each vendor. In CMIS 5.3,

new CDB commands were introduced to help modules describe the attributes and text descriptor of each application. These new CDB commands enable the end-user and host to understand each application without relying on external documentation like a data sheet, see section 3.4.

3.2 A method to provision applications using any version of CMIS

This paper is proposing two enhancements for provisioning.

1. Hosts use module advertising to create a table of applications and present that table in human readable form. This table would show the numbered applications and their descriptions. Hosts would inspect the application to determine whether the host code is valid for the host. The media code would not be used to determine validity of the application.

Note: Host code validation is only part of the validation process, other factors like power dissipation and lane configuration should be factored as well.

2. Hosts allow users to provision the module based on the number of the application descriptor from the table created in enhancement #1. Only applications that were validated in the enhancement #1 can be applied through the CLI. The CLI will reject any provisioning command for an application that is not valid.

3.3 Example of proposed provisioning model

Tables 3-1 and 3-2 show the media and host codes from a set of application descriptors for a 400G-DR4 module and a coherent module with 400ZR, 400ZR+ and custom media codes. Host lane assignments are important for application descriptors but are not covered in this white paper which focuses on the media and host codes, respectively.

The tables show how these application descriptors can be displayed on a host CLI using existing CMIS. The SFF-8024 codes do not provide human-readable values, but host software can store the names of the standardized codes. By reading the advertising and using defined strings for each code, the host can provide a table of applications in human readable options, shown in bold in the table below.

AppSel code	Application Name (built from AppSel advertising codes and stored strings)	Media Code (from AppSel advertising)	Media Code Name (from strings stored in SW based on AppSel advertising)	Host Code (from AppSel advertising)	Host Code Name (from strings stored in SW based on AppSel advertising)	Host Supported Application
1	400G-DR4:400GAUI-8	1Ch	400GBASE-DR4	11h	400GAUI-8	Y
2	100G-DR:100GAUI-2*	14h	100GBASE-DR	0Dh	100GAUI-2	Y

Table 3-1 Host display of Media/Host codes for a DR4 module using SFF-8024 codes

*See the fourth byte in the Application Descriptor (HostLaneAssignmentOptions) that identifies the number of instances that can be supported and the Host lane assignment for each instance.

AppSel code	Application Name (built from AppSel advertising codes and stored strings)	Media Code (from AppSel advertising)	Media Code Name (from strings stored in SW based on AppSel advertising)	Host Code (from AppSel advertising)	Host Code Name (from strings stored in SW based on AppSel advertising)	Host Supported Application
1	400ZR:400GAUI-8	3Eh	400ZR-AMPLIFIED	11h	400GAUI-8	Y
2	400ZR:100GAUI-2	3Eh	400ZR-AMPLIFIED	0Dh	100GAUI-2	N
3	ZR400-OFEC-16QAM:400GAUI-8	46h	ZR400-OFEC-16QAM	11h	400GAUI-8	Y
4	ZR400-OFEC-16QAM:100GAUI-2	46h	ZR400-OFEC-16QAM	0Dh	100GAUI-2	N
7	CUSTOM_C0:400GAUI-8	C0h	CUSTOM_C0	11h	400GAUI-8	Y
8	CUSTOM_C0:100GAUI-2	C0h	CUSTOM_C0	0Dh	100GAUI-2	N

Table 3-2 Host display of Media/Host codes of a coherent module using SFF-8024 codes

Once a host enables CLI commands to display the module’s application descriptors in a human readable table, descriptors 1-2 in Table 3-1 and 1-6 in Table 3-2, then the end-user can proactively choose which supported application to enable based on the link requirements. In the example in Table 3-2, the module supports 100G-GAUI-2 and 400G-GAUI-8, however, the host only supports 400G-GAUI-8 leading

to some applications being marked as invalid. The host would only need to add an additional CLI command to provision the module based on the AppSel code number. These two CLI commands are a large step towards the path to plug and play.

3.4 Enhancing the provisioning model

To enhance this provisioning model, CMIS 5.3 is adding new functionality to better describe the custom media codes, resulting in a descriptive name for users. New Command Data Block (CDB) commands are being added into CMIS 5.3 that allow the module to advertise the details of each custom media code. Hosts can read this information and provide details of the media interface on the CLI for users to select from the options. Since these features are generic and based on advertising, the host can build these descriptive strings, shown in bold in Table 3-3 below, without writing vendor specific code.

AppSel code	Application Name (built from CDB)	Media Code (from AppSel advertising)	Media Code Name (from CDB command based on AppSel advertising)	Host Code (from AppSel advertising)	Host Code Name (from CDB command based on AppSel advertising)	Host Supported Application
1	400ZR:400GAUI-8	3Eh	400ZR-AMPLIFIED	11h	400GAUI-8	Y
2	400ZR:100GAUI-2	3Eh	400ZR-AMPLIFIED	Dh	100GAUI-2	N
3	ZR400-OFEC-16QAM:400GAUI-8	46h	ZR400-OFEC-16QAM	11h	400GAUI-8	Y
4	ZR400-OFEC-16QAM:100GAUI-2	46h	ZR400-OFEC-16QAM	Dh	100GAUI-2	N
5	Custom_CO_ModVend-400-YFEC-XXGBaud-MOD:400GAUI-8	C0h	400-YFEC-XXGBaud-MOD	11h	400GAUI-8	Y
6	Custom_CO_ModVend-400-YFEC-XXGBaud-MOD:100GAUI-2	C0h	400-YFEC-XXGBaud-MOD	Dh	100GAUI-2	N

Table 3-3 Host display of Media/Host codes of a coherent module using CDB command

4 Summary

This white paper looks at a different approach to module provisioning and how advertising-based provisioning can be used by host software to manage the module in a generic way. Extending the concept of advertising-based management to all aspects of module management will bring us closer to our goal of enabling plug and play for CMIS based modules.

As described in the white paper, current CMIS architecture and further enhancements introduced in CMIS 5.3 enable host platforms to easily integrate new pluggable modules and new applications. This can be done without changing host software, enabling “the path to plug and play” for CMIS modules and simplifying integration and deployment.

5 References

- [1] S. Langenbach, "Implementation Agreement (IA) Common Management Interface Specification (CMIS)," Optical Internetworking Forum, OIF-CMIS-05.2, 2022. [Online]. Available: www.oiforum.com
- [2] V Koleva , "SFF Module Management Reference Code Tables " SNIA, SFF-8024 V4.11, 2023. [Online]. Available: <https://www.snia.org/technology-communities/sff/specifications>

6 Glossary

CDB	Command Data Block
CLI	Command Line Interface
CMIS	Common Management Interface Specification
VDM	Versatile Diagnostic Monitoring