



**Platform Management Communications Infrastructure (PMCI):  
MCTP and PLDM Enhancements for Advanced OCP Use Cases**

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## DMTF PMCI Working Group (WG)

- DMTF creates open manageability standards
- Platform Management Communication Infrastructure (PMCI) WG
  - Provides “Inside the box” communication and functional interfaces between components within the platform management subsystem
  - Creates specifications for MCTP, PLDM, and NC-SI
- Applicability to OCP: platform components communications, device Management....
- Example: OCP NIC 3.0 Design Specification leverages multiple PMCI standards

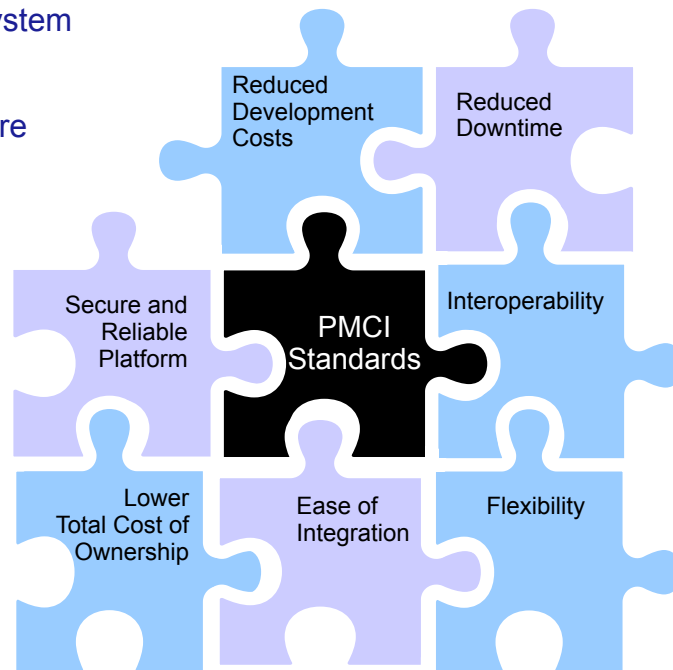
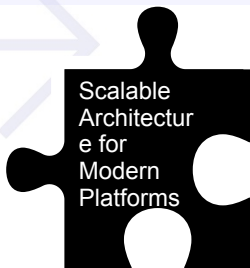
**OCP leverages and adopts PMCI standards**

## Why PMCI? Scalable Architecture for Modern Platforms

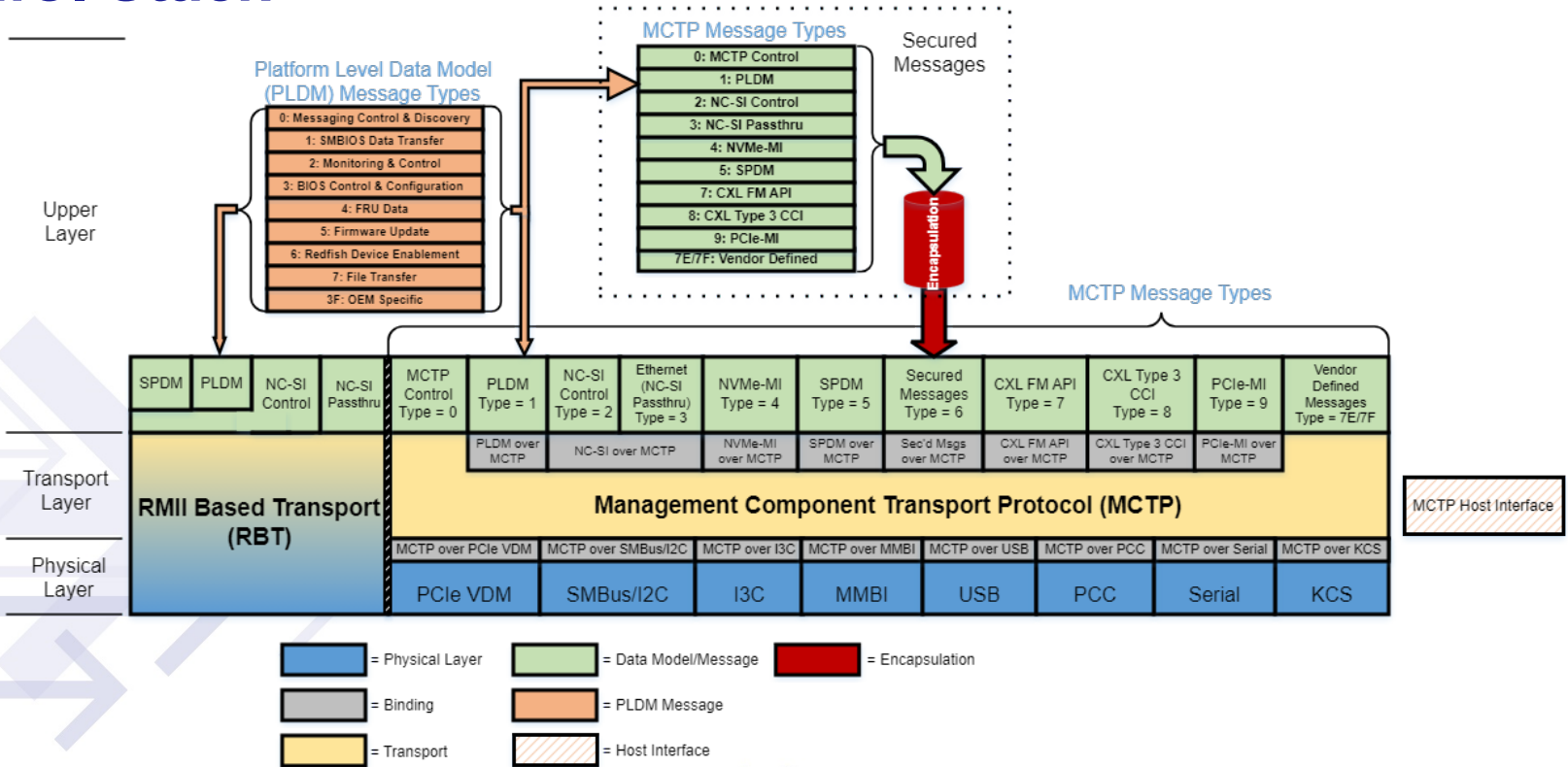
Over the last several years platforms have become increasingly complex. Standardized communication between devices and management elements is critical to obtain adoption across multiple implementations while reducing issues with system integration.

DMTF's PMCI specifications provide an extensible, common architecture for standardized communication between management subsystem components providing vendor choice and increasing interoperability.

**Bottom Line:** It is a scalable architecture designed for modern platform management that addresses the needs of system integrators and administrators through standardized interfaces.



# PMCI Stack





## Management Component Transport Protocol (MCTP)

- Base transport for “inside-the-box” communication.
- Suitable for use with multiple physical media: SMBus/I2C, PCIe, etc.
- Suitable for all computer platform types
- Supports logical addressing based on Endpoint IDs
- Provides simple message fragmentation/reassembly
- Built-in capability discovery and supports path transmission unit discovery
- Carries multiple message types: MCTP Control, PLDM, NC-SI, SPD...

**MCTP for platform components communications ~ TCP/IP for Internet**



## Recent MCTP Enhancements

- Base Specification 2.0
- Physical medium bindings
  - New: MCTP/USB, MCTP/I3C, MCTP/MMBI, MCTP/PCC
  - Enhancements to existing MCTP over PCIe VDM Binding
- New MCTP Message Types
  - CXL Fabric Manager API over MCTP
  - CXL™ Type 3 Device Component Command Interface over MCTP
  - PCIe-MI over MCTP
- MCTP Host Interface 2.0

# MCTP Base 2.0 Features Overview

Feature name	Reliable mode	Non-Reliable mode
Extending EID range	Mandatory	Mandatory
Enabling coexistence of MCTP 1.0/2.0	Mandatory	Mandatory
Hot-Insertion/removal support	Optional	Optional
Backward compliance with existing HW	Mandatory	Mandatory
Increasing concurrent messages count	Mandatory	Mandatory
Increase the number of outstanding packets	Mandatory	Mandatory
Forward looking header format	Mandatory	Mandatory
Medium and protocol agnostic header	Mandatory	Mandatory
Negotiate transmission unit size	Optional	Optional
Support for Secured Messages	Optional	Optional
Provide support for reliable & efficient large transfers	Mandatory	Not-required
Keep Rate-based Flow control support	Mandatory	Mandatory
Reliably detect message corruption	Mandatory	Optional
Pause/Resume flow control	Optional	Optional
Error/State Reporting	Mandatory	Mandatory



## New MCTP Physical Medium Bindings

- Binding spec includes packet formats, physical address format, message routing, discovery mechanisms, timings for a physical medium
- MCTP over USB
  - Enables high-speed low power USB interfaces for MCTP communications
  - Leverages USB native support for hot-insertion and removal
- MCTP over I3C
  - Result of close cooperation with the MIPI Alliance
  - Enables high-speed I3C serial bus based MCTP communications
- MCTP over MMBI
  - Builds on Memory Mapped Buffer Interface (MMBI) shared memory model
  - Enables efficient high-bandwidth memory based MCTP communications
- MCTP over PCC
  - Enables Platform Communication Channel (PCC) as communication interface for MCTP
  - Leverages existing ACPI framework
- MCTP PCIe VDM – now supports PCIe Gen 6 (both flit-mode and non-flit mode covered)



## New MCTP Message Type Bindings

- MCTP is designed to be able to transfer multiple Message Types
- A message type represents a group of messages used for a specific domain or an application
- DMTF has defined different types of messages (MCTP control, PLDM, SPDM...)
  - These message types can be carried over MCTP using DMTF defined bindings
- Messages defined by other SDOs or vendors can also be transported over MCTP
- CXL Fabric Manager API over MCTP (DSP0234 1.0 published in May 2021)
  - Compute Express Link™ (CXL) is an interconnect between CPU, accelerators, and memory devices
  - This binding enables a Fabric Manager (FM) to configure CXL devices over MCTP
- CXL™ Type 3 Device Component Command Interface (CCI) over MCTP (DSP0281 1.0: 12/21)
  - CXL Type 3 devices are devices that support CXL.io and CXL.mem protocols
  - Enables devices to be managed during runtime over MCTP via a Component Command Interface (CCI)
- PCIe-MI over MCTP (under development)
  - PCIe Management Interface (PCIe-MI) is used for the configuration, control, and status functions
  - Using this binding PCIe-MI commands are transferred between MCTP Endpoints

## Published MCTP Specifications

DSP #	Version	Title	Date
<a href="#">DSP0283</a>	1.0.1	Management Component Transport Protocol (MCTP) Universal Serial Bus (USB) Transport Binding Specification	21 May 2024
<a href="#">DSP0281</a>	1.0.0	CXL™ Type 3 Device Component Command Interface over MCTP Binding Specification	28 Dec 2021
<a href="#">DSP0261</a>	1.3.1	NC-SI over MCTP Binding Specification	29 Aug 2024
<a href="#">DSP0256</a>	1.0.0	MCTP Host Interface Specification	21 Jul 2010
<a href="#">DSP0239</a>	1.11.1	Management Component Transport Protocol (MCTP) IDs and Codes	19 Aug 2024
<a href="#">DSP0238</a>	1.2.1	Management Component Transport Protocol (MCTP) PCIe VDM Transport Binding Specification	23 Jan 2024
<a href="#">DSP0237</a>	1.2.0	Management Component Transport Protocol (MCTP) SMBus/I2C Transport Binding Specification	6 Apr 2020
<a href="#">DSP0236</a>	1.3.3	Management Component Transport Protocol (MCTP) Base Specification	25 Mar 2024
<a href="#">DSP0235</a>	1.0.1	NVMe™ (NVMe Express™) Management Messages over MCTP Binding Specification	3 Aug 2018
<a href="#">DSP0234</a>	1.0.0	CXL™ Fabric Manager API over MCTP Binding Specification	25 May 2021
<a href="#">DSP0233</a>	1.0.1	Management Component Transport Protocol (MCTP) I3C Transport Binding Specification	25 Mar 2024



## Platform Level Data Model (PLDM)

- An effective interface & data model for efficient access to
  - Low-level platform inventory, BIOS, and config data
  - Platform monitoring/control, alerting, event log, FRU, etc.
  - Firmware Update, Redfish Device Enablement (RDE), File Transfer
- Defines low level data representations and commands
- Provides transport independent Request/Response Model
- Supports a subtype to distinguish types of PLDM Messages
  - Allows messages to be grouped based on the functions
  - Allows the discovery of the functionality supported

**PLDM for platform components communications ~ L5-L7 layers of Internet**

## Recent PLDM Enhancements

- New PLDM Specifications
  - PLDM for file transfer
- New White Papers
  - PLDM Accelerator Modeling
  - PLDM CXL Memory Modeling
  - PLDM Host SoC Modeling
- Enhancements to Existing Specifications
  - PLDM Base Specification
  - PLDM for Redfish Device Enablement (RDE)
  - PLDM for Platform Monitoring and Control
  - PLDM State Sets
  - PLDM for FW Update
  - PLDM for FRU Data

## PLDM for File Transfer

- Provides an efficient data model for transferring debug data, log files, FRU files, etc.
- Describes messages & data structures used to transfer files between PLDM terminus
- Covers the following operations
  - Discovery of files and directories available on a PLDM terminus
  - Discovery of the file and directory metadata via PLDM PDR entries and sensors
  - Reading of files
- Leverages other PLDM specifications
  - DSP0240 PLDM Base specification for general PLDM protocol and multi-part transfers
  - DSP0248 Platform Monitoring and Control for file metadata via PDRs
  - DSP0248 Platform Monitoring and Control for providing monitoring file and state sensors
  - DSP0249 PLDM State Sets for file state sensor definition
- 1.0 version was recently published (August 2024)

## New White Papers

- **PLDM Accelerator Modeling (1.0 published in June 2023)**
  - A hierarchical modeling scheme for an Accelerator card
  - Uses PLDM for Platform Monitoring and Control semantics
  - Supports consistent model of the hardware structure and config of an accelerator card
- **PLDM CXL Memory Modeling (1.0 published in June 2024)**
  - A generic and extensible device management model of CXL memory devices
  - Uses PLDM for Platform Monitoring and Control semantics
  - Focuses on CXL cards with DIMM slots & CXL modules with embedded memory
- **PLDM Host SoC Modeling (work in progress)**
  - PLDM model for a SoC using DSP0240 and DSP0248 (not a new PLDM Type)
  - Complements PLDM NIC, PLDM Accelerator, PLDM CXL Memory models
  - Enables SoC vendors to produce a model for common management functions



# Enhancements to Existing PLDM Specifications

- **PLDM Base Specification**
  - Multi-part data transfer support and PLDM initialization
- **PLDM for Redfish Device Enablement (RDE)**
  - Added support for Redfish Parallel Resource PDR and errata updates
- **PLDM for Platform Monitoring and Control**
  - CPER, file PDRs, Redfish parallel resource PDR, 64-bit sensor values, clarifications..
  - Work under development for scalable sensor model
- **PLDM State Sets**
  - Added support for file state sensors, CXL, DPU, voltage regulators, eOS state sensors...
- **PLDM for FW Update**
  - Added support for Opaque data, security, manifest data, package payload checksum, individual firmware device package, PCI ID revision...
- **PLDM for FRU Data (under development)**



## Published PLDM Specifications

DSP #	Version	Title	Date
<a href="#"><u>DSP0267</u></a>	1.3.0	Platform Level Data Model (PLDM) for Firmware Update Specification	13 Dec 2023
<a href="#"><u>DSP0257</u></a>	1.0.1	Platform Level Data Model (PLDM) for FRU Data Specification	3 Jan 2022
<a href="#"><u>DSP0249</u></a>	1.2.0	Platform Level Data Model (PLDM) State Set Specification	17 Jul 2024
<a href="#"><u>DSP0248</u></a>	1.3.0	Platform Level Data Model (PLDM) for Platform Monitoring and Control Specification	5 Aug 2024
<a href="#"><u>DSP0247</u></a>	1.0.0	Platform Level Data Model (PLDM) for BIOS Control and Configuration Specification	23 Apr 2009
<a href="#"><u>DSP0246</u></a>	1.0.1	Platform Level Data Model (PLDM) for SMBIOS Transfer Specification	11 Dec 2009
<a href="#"><u>DSP0245</u></a>	1.4.0	Platform Level Data Model (PLDM) IDs and Codes Specification	22 May 2024
<a href="#"><u>DSP0242</u></a>	1.0.0	Platform Level Data Model (PLDM) for File Transfer Specification	5 Aug 2024
<a href="#"><u>DSP0241</u></a>	1.0.0	Platform Level Data Model (PLDM) Over MCTP Binding Specification	23 Apr 2009
<a href="#"><u>DSP0240</u></a>	1.2.0	Platform Level Data Model (PLDM) Base Specification	5 Aug 2024
<a href="#"><u>DSP0218</u></a>	1.2.0	Platform Level Data Model (PLDM) for Redfish Device Enablement	5 Aug 2024
<a href="#"><u>DSP2067</u></a>	1.0.0	PLDM CXL Memory Modeling White Paper	24 Jun 2024



## Summary

- OCP continues to drive hardware specifications for platforms and components
- DMTF PMCI WG defines specifications for platform management component intercommunications
- OCP has leveraged DMTF PMCI specifications for MCTP, PLDM, and NC-SI
- Recent MCTP enhancements include new physical bindings, next generation MCTP transport, and additional message types over MCTP
- Recent PLDM enhancements extended PLDM for file transfer, added models for accelerators and memory, and enhanced the existing PLDM specifications
- OCP management use cases will benefit from recent MCTP/PLDM enhancements



## Request for Industry Feedback

**Please provide feedback to your PMCI WG representative or the DMTF Feedback Portal at <https://www.dmtf.org/standards/feedback>**



For more information,  
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Learn about the PMCI working group at  
[dmf.org/standards/pmci](http://dmf.org/standards/pmci)

**Thank you!**