Platform Management Communications Infrastructure (PMCI):

Technology Overview

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- The information in this presentation represents a snapshot of work in progress within the DMTF.

- This information is subject to change without notice. The standard specifications remain the normative reference for all information.

- For additional information, see the DMTF website.

- This information is a summary of the information that will appear in the specifications. See the specifications for further details

Agenda

- PMCI Working Group
- Platform Management Subsystem
- PMCI Protocol Stack
- Management Component Transport Protocol (MCTP)
- Network Controller Sideband Interface (NC-SI)
- Platform Level Data Model (PLDM)
- Security Protocol and Data Model (SPDM)

Goals of this Presentation

- **Provide an overview of PMCI technologies and standards**
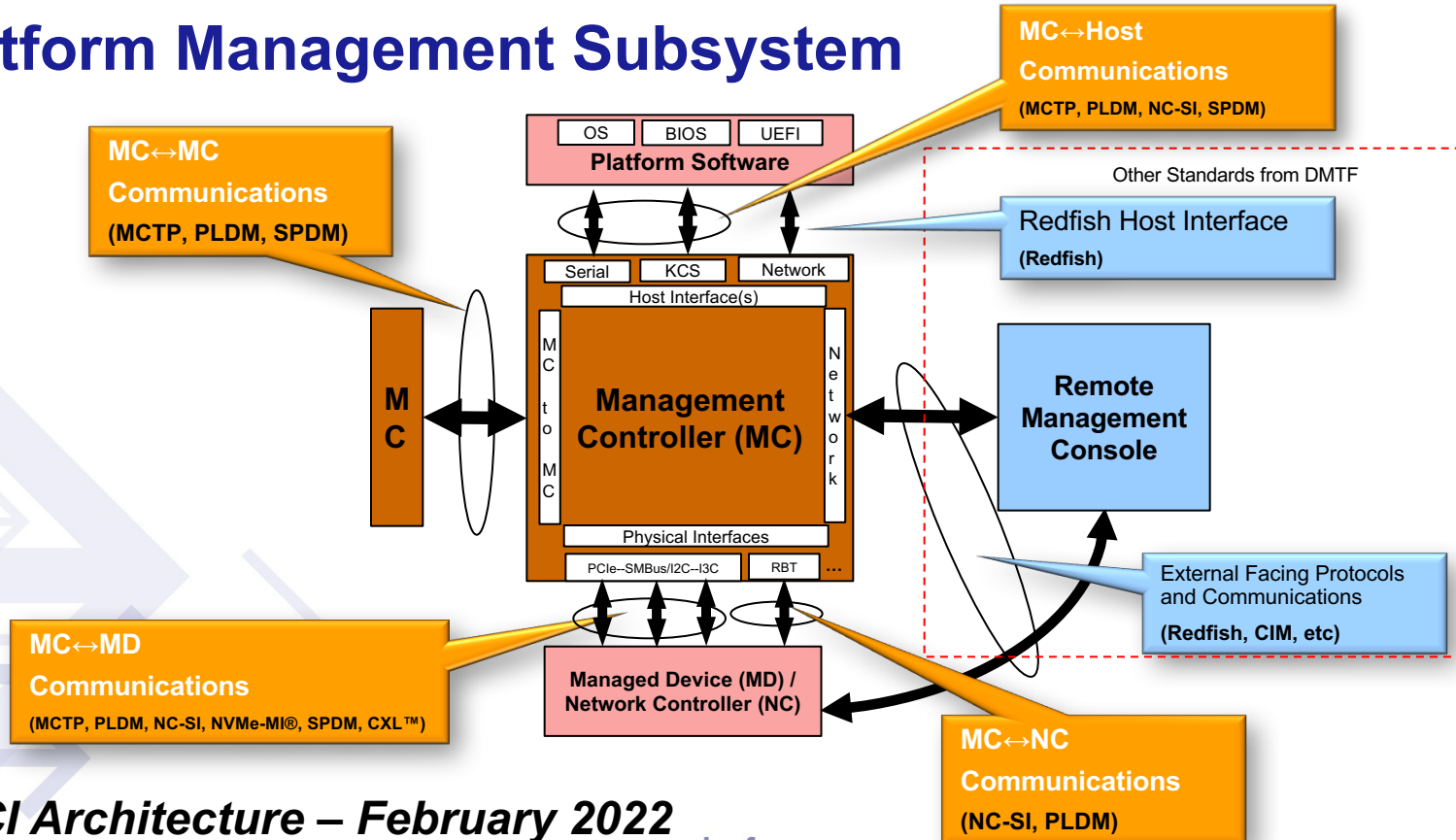- **Discuss management challenges addressed by PMCI technologies**

PMCI Working Group

- **P**latform **M**anagement **C**ommunications **I**nfrastructure

- PMCI suite of standards provide 'inside-the-box' communication and function interfaces between components within the platform management subsystem
  - Management Controller (MC) to Management Controller
  - Management Controller to Network Device (NC)
  - Management Controller to Managed Device (MD)
  - Host Interface to Management Controller

- Formed in 2005, initial standards released in 2007
  - Creates specifications for MCTP, PLDM, NC-SI, and SPDM

- Over a decade of implementations within server and desktop provides

PMCI technologies and interfaces are complementary and enabling to DMTF external facing data models/remote management protocols
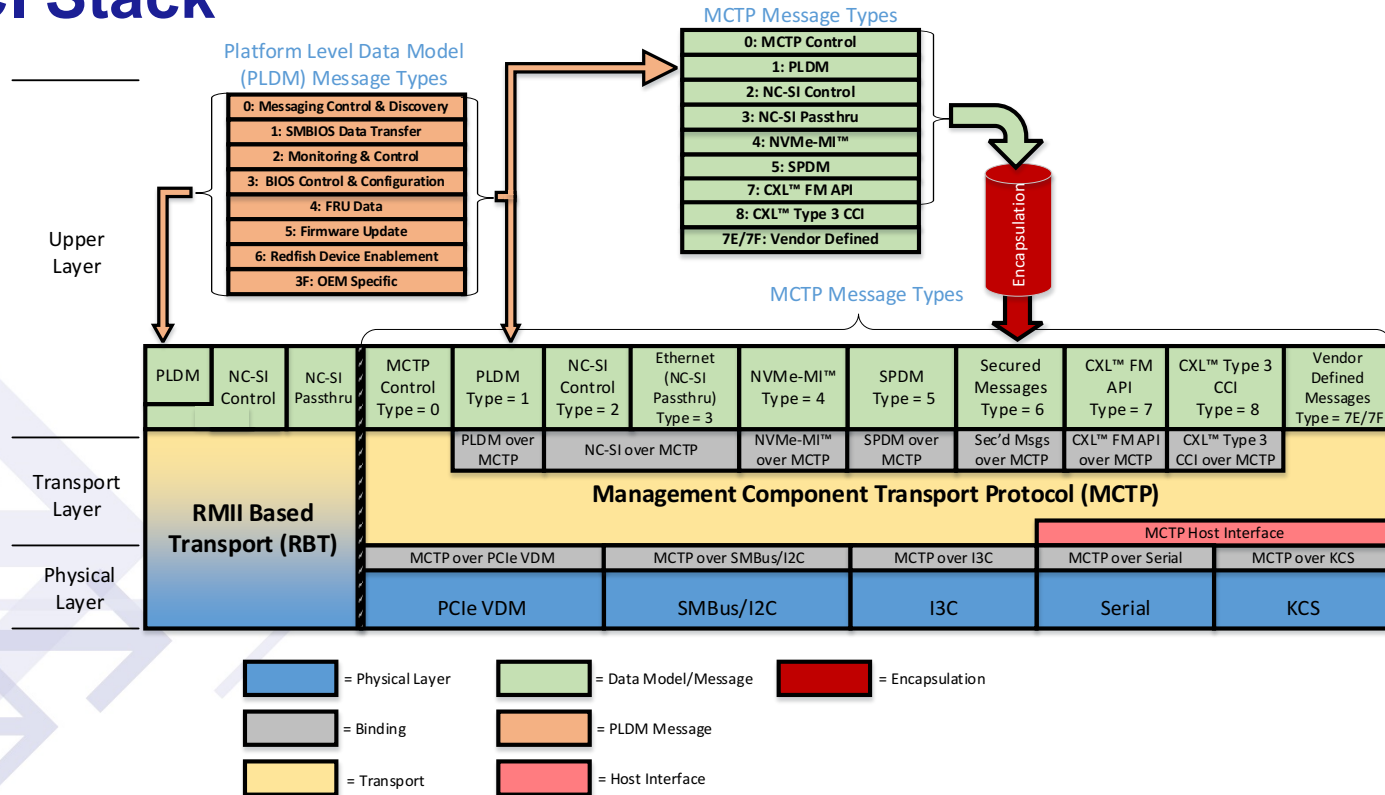
Provides a Scalable Architecture for Modern Platforms

Platform Management Subsystem

MC↔Host Communications
(MCTP, PLDM, NC-SI, SPDM)

MC↔MC Communications
(MCTP, PLDM, SPDM)

OS | BIOS | UEFI
Platform Software

Other Standards from DMTF

Redfish Host Interface
(Redfish)

Serial | KCS | Network
Host Interface(s)

MC

MC to MC

Management Controller (MC)

Network

Physical Interfaces
PCIe--SMBus/I2C--I3C | RBT | ...

Remote Management Console

External Facing Protocols and Communications
(Redfish, CIM, etc)

MC↔MD Communications
(MCTP, PLDM, NC-SI, NVMe-MI®, SPDM, CXL™)

Managed Device (MD) / Network Controller (NC)

MC↔NC Communications
(NC-SI, PLDM)

PMCI Architecture – February 2022

www.dmtf.org

5

PMCI Stack

Platform Level Data Model (PLDM) Message Types

Type	Description
0:	Messaging Control & Discovery
1:	SMBIOS Data Transfer
2:	Monitoring & Control
3:	BIOS Control & Configuration
4:	FRU Data
5:	Firmware Update
6:	Redfish Device Enablement
3F:	OEM Specific

MCTP Message Types

Type	Description
0:	MCTP Control
1:	PLDM
2:	NC-SI Control
3:	NC-SI Passthru
4:	NVMe-MI™
5:	SPDM
7:	CXL™ FM API
8:	CXL™ Type 3 CCI
7E/7F:	Vendor Defined

Encapsulation

Upper Layer

MCTP Message Types

Transport Layer

Physical Layer

PLDM	NC-SI Control	NC-SI Passthru	MCTP Control Type = 0	PLDM Type = 1	NC-SI Control Type = 2	Ethernet (NC-SI Passthru) Type = 3	NVMe-MI™ Type = 4	SPDM Type = 5	Secured Messages Type = 6	CXL™ FM API Type = 7	CXL™ Type 3 CCI Type = 8	Vendor Defined Messages Type = 7E/7F

| | | | PLDM over MCTP | NC-SI over MCTP | | NVMe-MI™ over MCTP | SPDM over MCTP | Sec'd Msgs over MCTP | CXL™ FM API over MCTP | CXL™ Type 3 CCI over MCTP | |

RMII Based Transport (RBT)

Management Component Transport Protocol (MCTP)

MCTP Host Interface

| MCTP over PCIe VDM | MCTP over SMBus/I2C | MCTP over I3C | MCTP over Serial | MCTP over KCS |

| PCIe VDM | SMBus/I2C | I3C | Serial | KCS |

Legend:
- = Physical Layer
- = Data Model/Message
- = Encapsulation
- = Binding
- = PLDM Message
- = Transport
- = Host Interface

Management Component Transport Protocol (MCTP)

- Base transport for "inside-the-box" communication

- Suitable for use with multiple media: SMBus/I2C, PCIe, I3C, 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, NVMe-MI™, SPDM, CXL™ FM API/CCI Type 3

MCTP Base Specification = DSP0236

Additional MCTP specifications at www.dmtf.org/standards/pmci

Network Controller Sideband Interface (NC-SI)

- A common interoperable sideband interface and protocol:
  - Used to transfer management traffic between a management controller (MC) and network controller (NC).
  - Can be transported via MCTP or RBT

- NC-SI Communications
  - Pass-through Management Traffic
  - NC-SI Command/Response Packets
    - Command (Response) sent by MC (NC) to NC (MC).
    - Request/Response Semantics.
    - Functions: Control, Configuration, Status, Statistics, etc.
  - NC-SI Notification Packets
    - Generated and sent by NC to MC.
    - Functions: OS/Link Status Change, NC Soft Reset.

NC-SI Base Specification = DSP0222

Additional NC-SI specifications at www.dmtf.org/standards/pmci

RMII-Based Transport (RBT)

- NC-SI Binding over Reduced Media Independent Interface™ (RMII)
  - Physical-level interface is based on RMII
  - Media-level interface is based on Ethernet

- Defines hardware arbitration scheme
  - Enables sharing a single RMII-based NC-SI bus
  - Prevents two or more NC-SI packages from transmitting at the same time

RBT defined within NC-SI Specification = DSP0222

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, firmware update, etc.
  - Redfish enablement for managed devices (RDE)

- Defines low level data representations and commands

- Provides transport independent Request/Response Model

- NIC Model Reference available

- 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 Base Specification = DSP0240

Additional PLDM specifications at www.dmtf.org/standards/pmci

Security Protocol and Data Model (SPDM)

- Developed by Security Task Force within PMCI Working Group

- Defines message exchange, sequence diagrams, message formats, and other relevant semantics for authentication, firmware measurement, and certificate retrieval.

- Version 1.1 adds support for session key exchange protocols
- Version 1.2 adds support for certificate provisioning, alias certificates, and message fragmentation

- Support for secured messages over MCTP

- Sample Implementation of SPDM provided by the SPDM Code task force within PMCI
  - https://github.com/DMTF/libspdm

SPDM Base Specification = DSP0274

Additional SPDM specifications at www.dmtf.org/standards/pmci

Summary

- Platform Management Communications Infrastructure (PMCI) WG defines:
  - "Inside the box" communication/functional interfaces between components

- PMCI interfaces complementary/enabling to external facing data models and protocols

- Management Component Transport Protocol (MCTP):
  - Transport for internal communications & carry multiple message types

- Network Controller Sideband Interface (NC-SI)
  - An interface to transfer management traffic between MC & NC

- Platform-Level Data Model (PLDM)
  - An interface/data model for low-level management data/functions
  - Extensible request/response style transport independent messaging

- Security Protocol and Data Model (SPDM)
  - Authentication, firmware measurement, and certificate retrieval/provisioning
  - Session key exchange
  - Secured Messages over MCTP

PMCI specifications at www.dmtf.org/standards/pmci

Acknowledgement

Thanks to all the contributors and participants of the PMCI Working Group!