

At-Scale Device Management Solutions for CXL Memory Device

EMPOWERING OPEN.



OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA



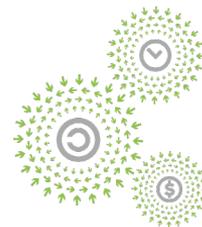
OSF

At-Scale Device Management Solutions for CXL Memory Device



OPEN SYSTEM
FIRMWARE

Jonathan Zhang, Meta
Hiral Patel, Meta



OPEN
PLATINUM™



OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

Agenda

- What is CXL Memory Device
- Control Path Technologies
- Solutions
- Call to Action

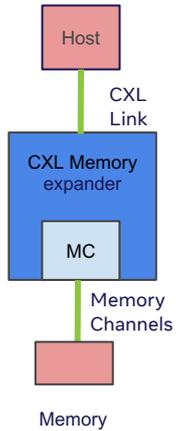


OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

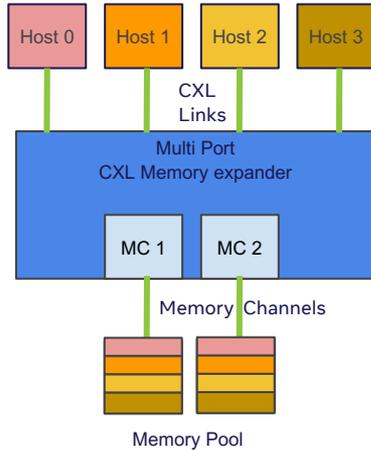
EMPOWERING OPEN.

CXL Memory System Topologies



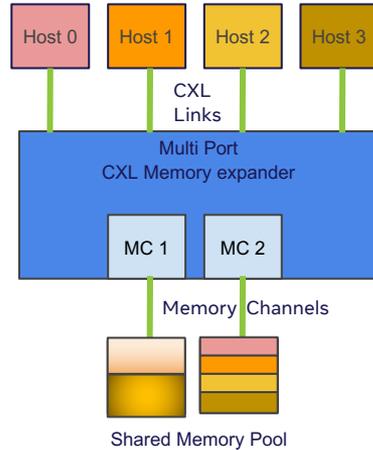
Direct attached

Add Capacity
Add Bandwidth
Slower-cheaper tier



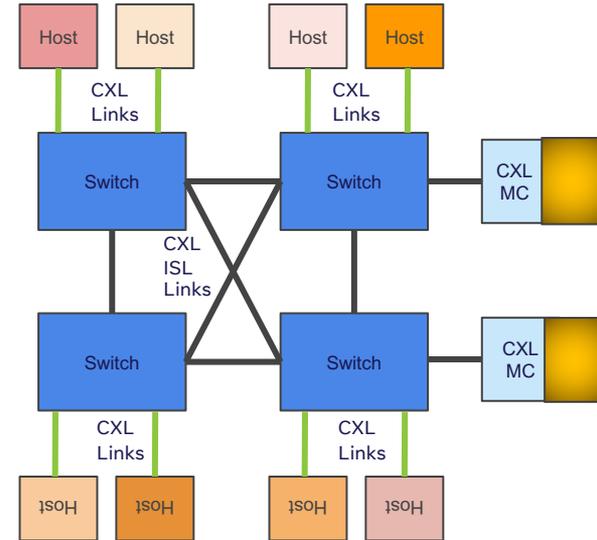
Pooled Memory

Amortize CXL infra cost
Flexible allocation



Shared Memory

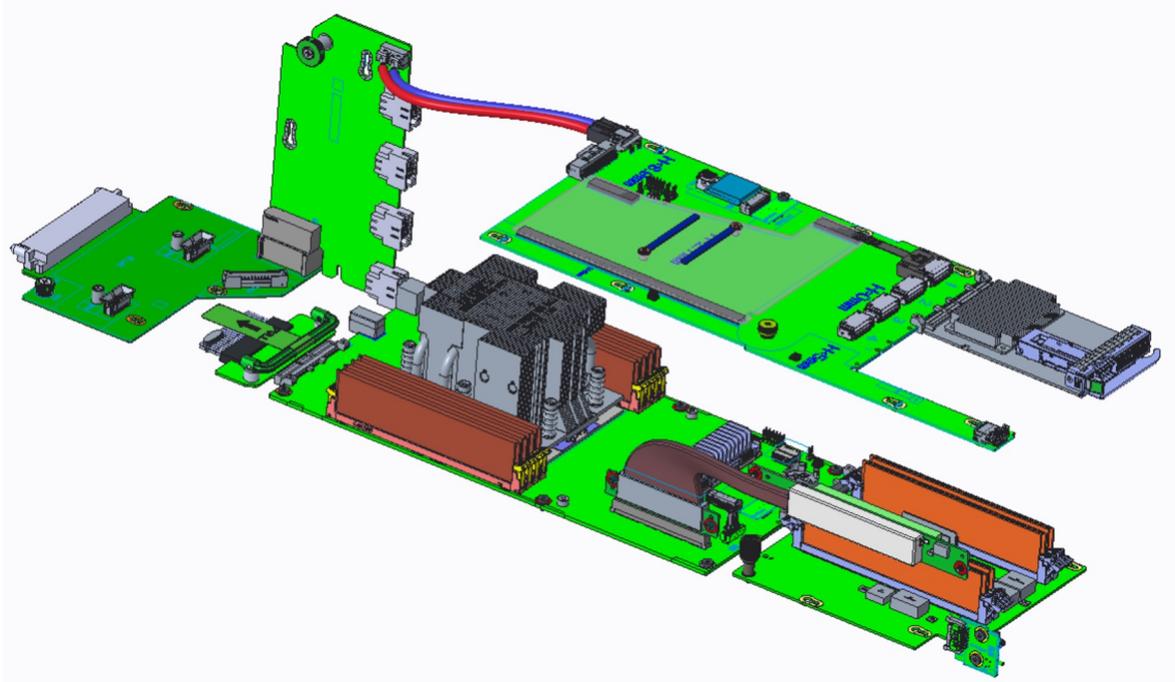
Deduplication
Host2host communication
large datasets



Fabric Memory

Scaling to huge datasets

Sample CXL Memory System

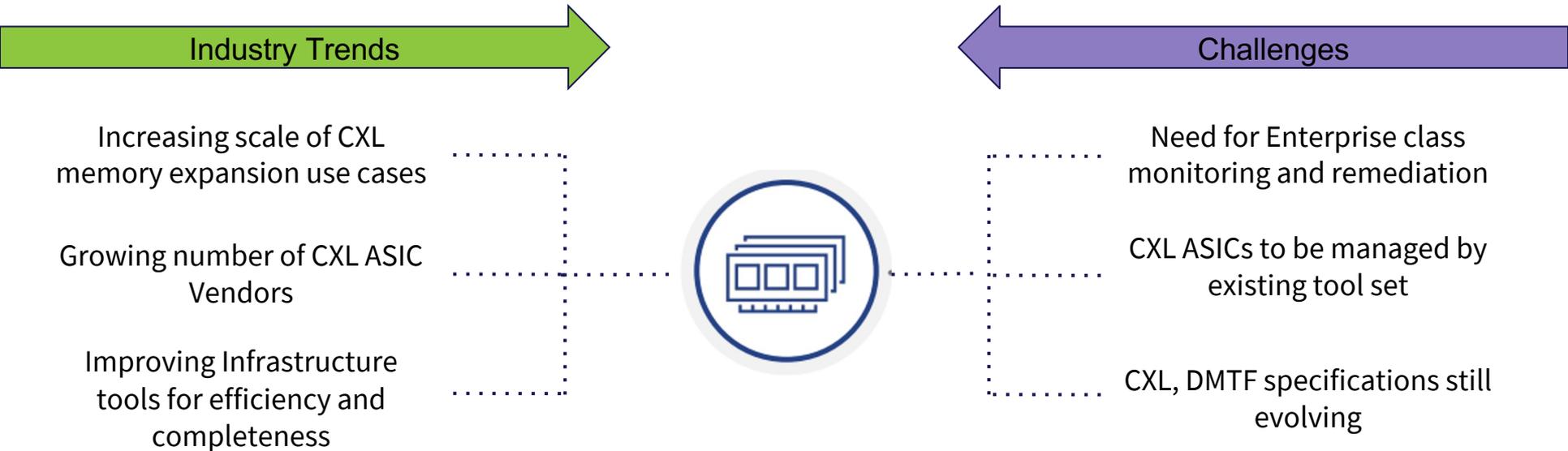


OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

At-Scale Management Challenges



Agenda

- What is CXL Memory Device
- Control Path Technologies
- Solutions
- Call to Action

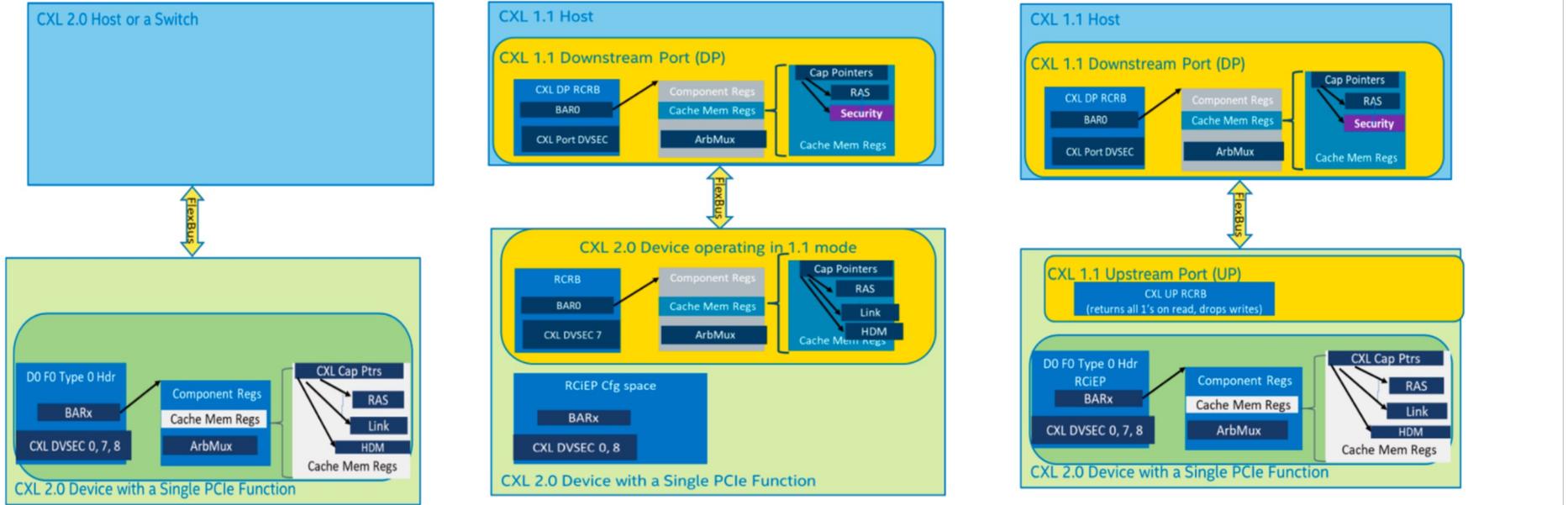


OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

Register Access



2.0 Host + 2.0 Device

1.1 Host + 2.0 Device (RCRB mode)

1.1 Host + 2.0 Device (non-RCRB mode)



Component Command Interface

- Information and Status
- Events / Logs
- Firmware Update
- Memory Device Commands (Such as identify, poison)
- Vendor Defined Commands
- Others



Agenda

- What is CXL Memory Device
- Control Path Technologies
- **Solutions**
- Call to Action

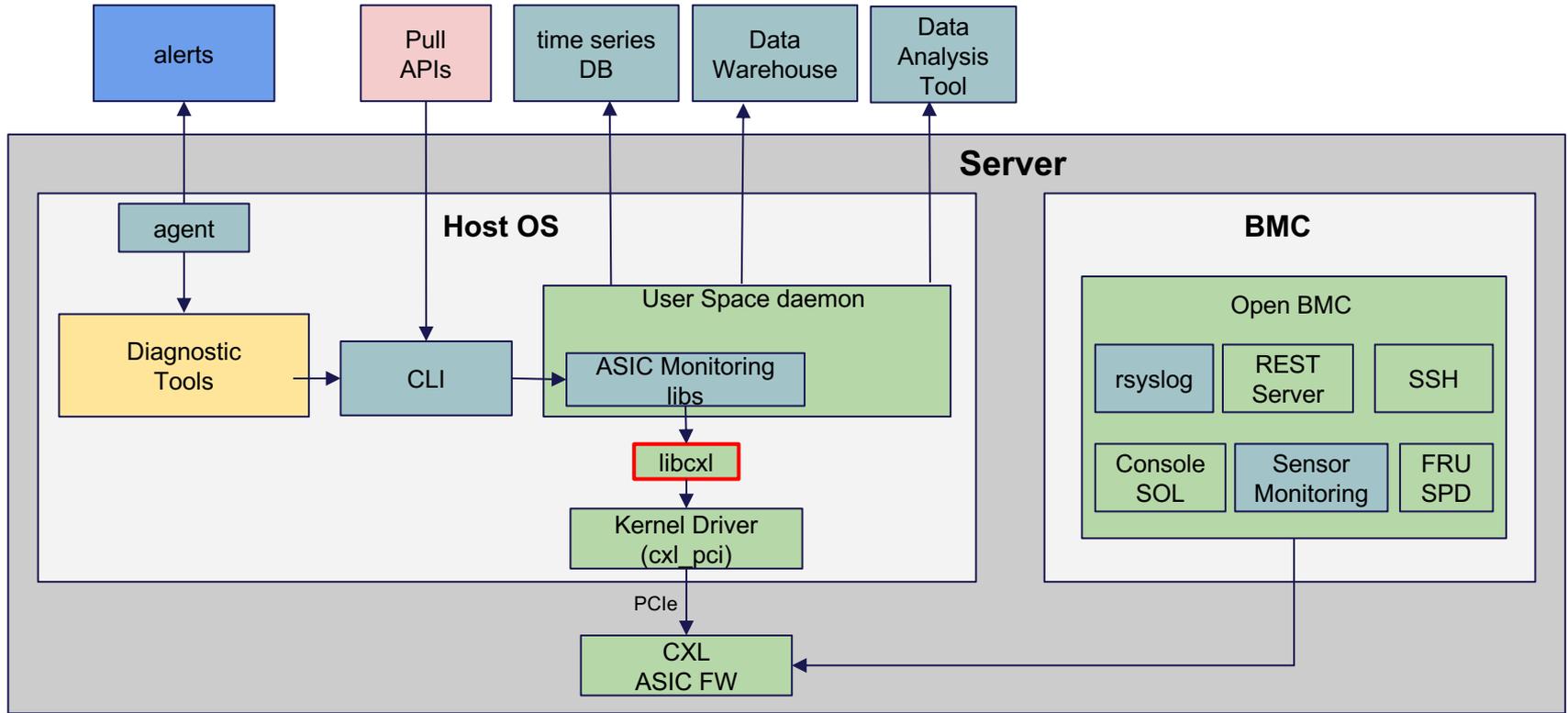


OCP
GLOBAL
SUMMIT

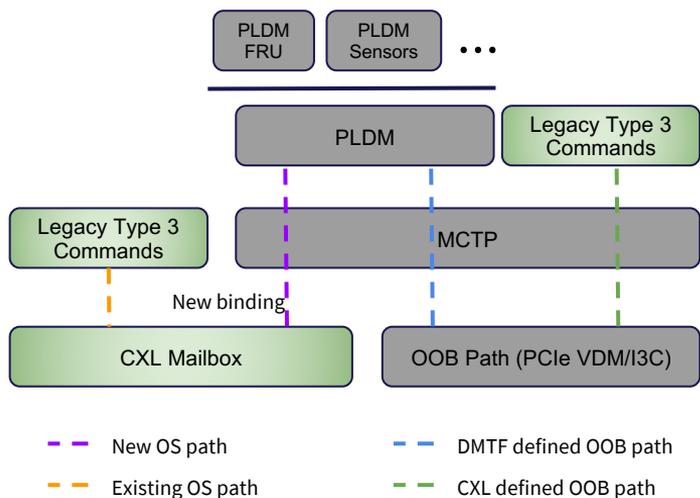
OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

Health Monitoring



Device Inventory



CXL Command Interface (CCI)

- Memory Media Events (Errors)
- Firmware Update
- Device Specific Logs
- Device Health & Alerts
 - Media Life Thresholds
 - Temperature Thresholds
 - Correctable Error Thresholds
- Memory Media Capacity & Label Config
- Memory Media and Poison Management
- Persistent Memory Management & Security
- Memory Media Maintenance & Repair
- Memory Media Testing
- Memory Media Initialization
- Memory Media Configuration

Device in Memory System & DRAM WGs

Platform Level Data Model (PLDM)

- Viral Product Data/FRU/Device Hierarchy
- PMIC/VR Configuration & Status Reporting
- Performance Telemetry
- Power Telemetry & Configuration (Throttling)
- Thermal Telemetry & Configuration (Throttling)

Memory Specific FRU Info

Performance Telemetry

Thermal Telemetry

Develop in Manageability Sub-Team (MGST)



OCPI
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

Device and Memory management



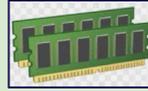
Firmware Management

- FW Transfer
- FW Activate
- Get FW info

Firmware Security

- Secure boot
- Secure update

Device FW
Management



SMBIOS

Type 16: Memory Array

Type 17: Memory Device

Type 19: Memory Mapped
Array Addresses

BDAT

DIMM Training Logs

Memory
Management



CDAT

Coherent Device
Attribute Table

CPMU

CXL Performance
Monitoring Unit

Performance

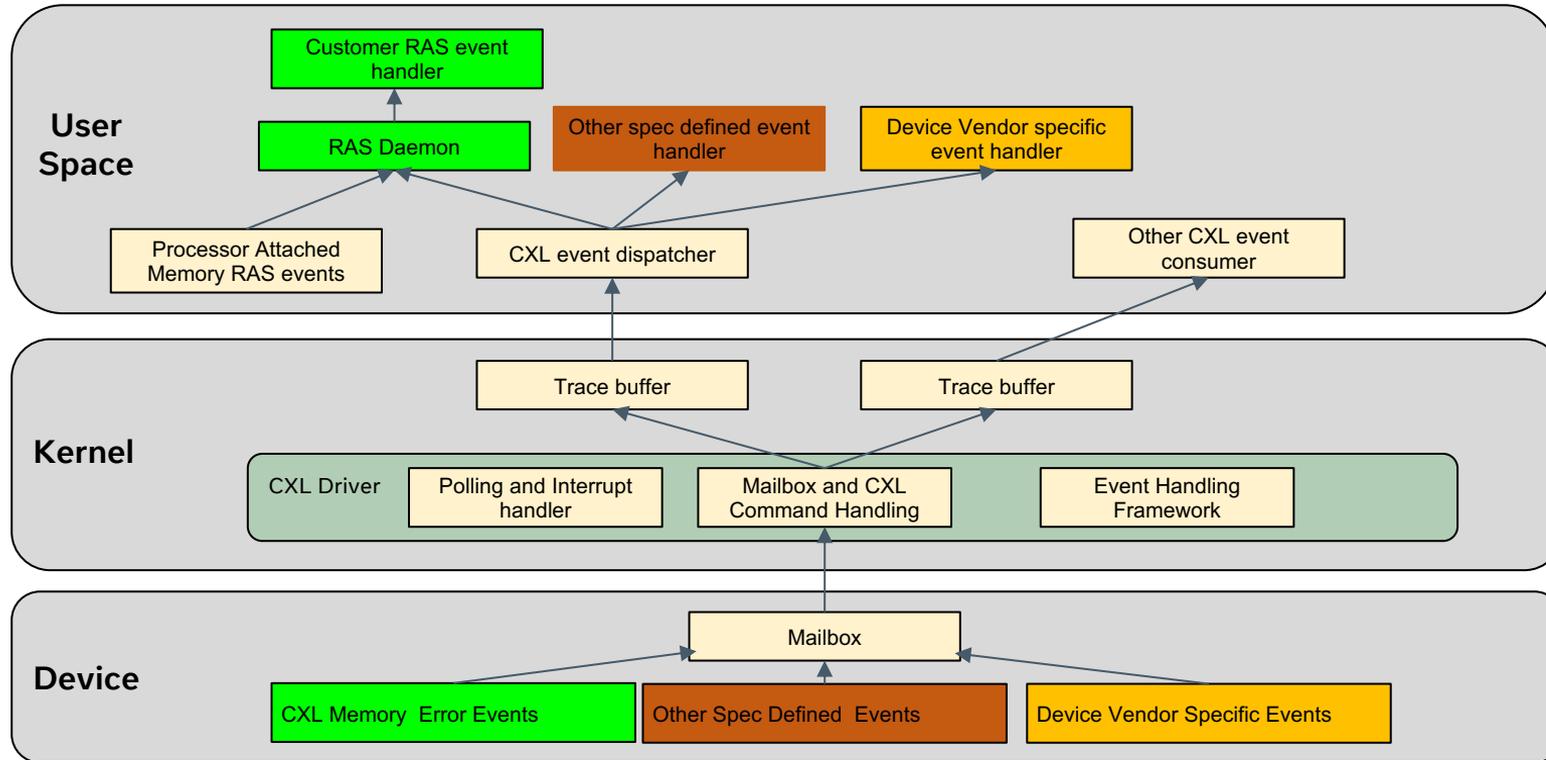


OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

RAS and Event Management



Reset

- Conventional Resets

- Cold Reset
- Warm Reset
- Hot Reset

- Un-conventional resets

- Functional Level Reset
- CXL Reset

- Performed by writing 1 to “Initiate CXL Reset” bit in DVSEC 0 Control 2 register of Device 0, Function 0
 - All CXL physical and virtual functions in SLD device are reset
 - Only LD of an MLD device related to Host initiating CXL Reset are reset. Other LDs are not affected
- CXL Reset used to reset CXL.cache and CXL.mem along with CXL.io domains
 - Memory controller, cache and buffers are reset
 - Non-CXL functions are not reset as they don't participate in CXL.cache or CXL.mem protocol
 - DVSEC register indicates which functions are non-CXL and hence do not get reset
 - Does not affect CXL physical link
- MLD Devices required to support CXL Reset
 - SLD Devices support either FLR or CXL Reset
- Once CXL Reset is complete, all CXL functions must be re-initialized before reuse



Call to Action

Join CXL forum (MSWG, SSWG, MGST) and relevant standard (DMTF)
kernel/OS development



OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

EMPOWERING OPEN.

Thank you!

EMPOWERING OPEN.



OCP
GLOBAL
SUMMIT

OCTOBER 18-20, 2022
SAN JOSE, CA

