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FOR BUSINESS.

OCP SUMMIT



OpenBMC:

Open Source System Management Firmware Stack

Sai Dasari, Facebook

James Mihm, Intel

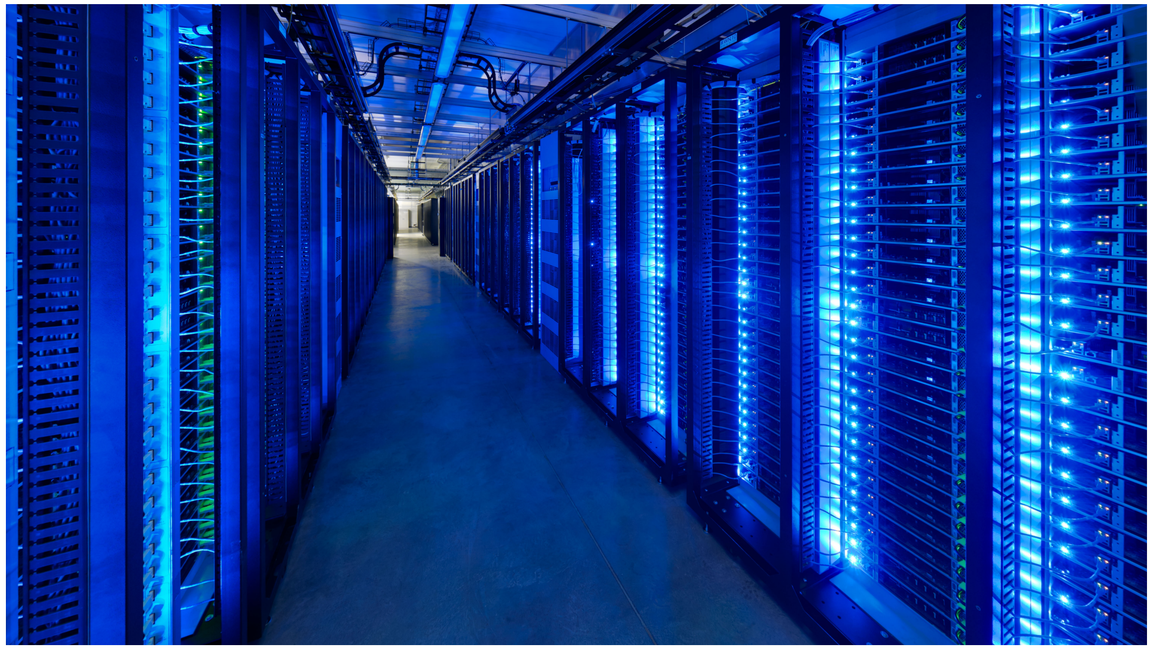
Agenda

- BMC Overview
- OpenBMC Community Project
- Q&A

BMC Overview

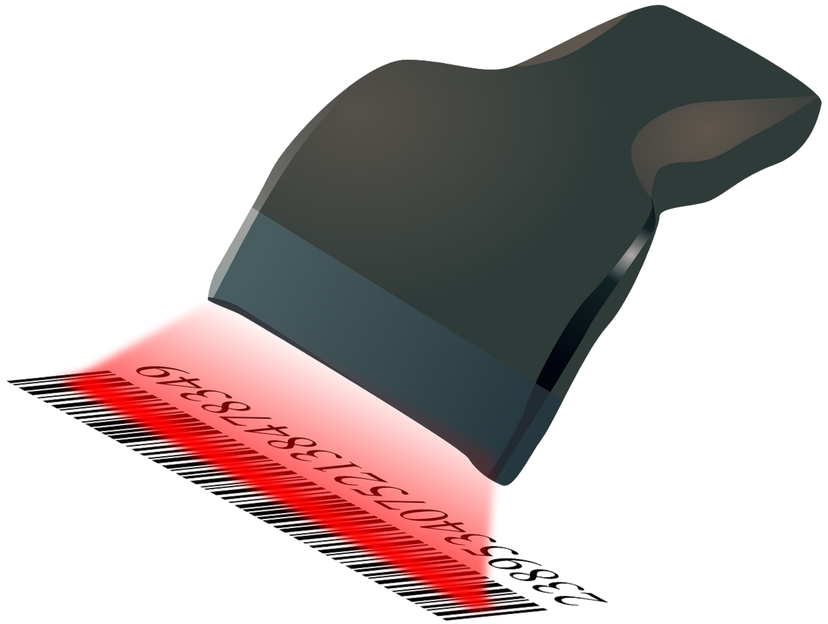
System Management @scale

- Remote Data Centers
- 24x7 Uptime
- Fault Tolerant
- 1 Service Tech. per 1000’s of systems



Inventory Info

- Manufacturer ID
- Manufacture Date
- Product ID
- Serial Number
- Asset Tag
- (optional) Configuration Info



Power Management

- Power Control
  - On, Off, Cycle
- Power Monitoring
  - Consumption
- Power Capping
  - Range: 20W to 100W+
  - P-State control



System Monitoring

- Sensors
  - Voltage, Temperature, Tach, GPIOs
  - Fan Speed Control
- Event Logs
  - Track Login
  - Power on/off
  - System Health events



Remote Debug

- Typical Debug
  - Remote Login
  - OS/Application Logs
  - CPU/Memory State Info
- Abnormal Cases
  - CPU Core dump
  - Remote Console (and history)



Image Courtesy: www.embedded-computing.com

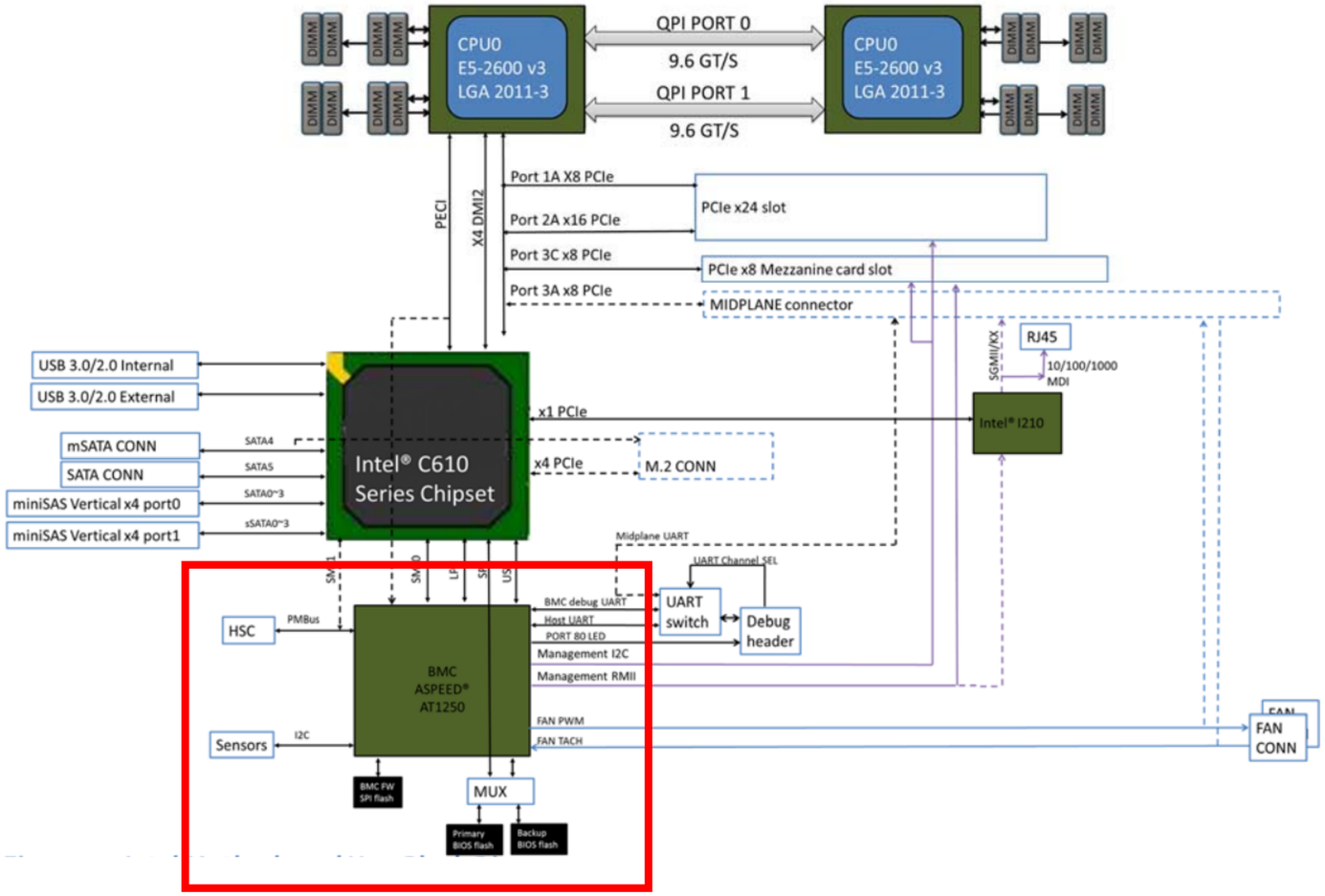
Firmware Update

- CPLD
- VR
- BIOS/UEFI
- NIC
- BMC



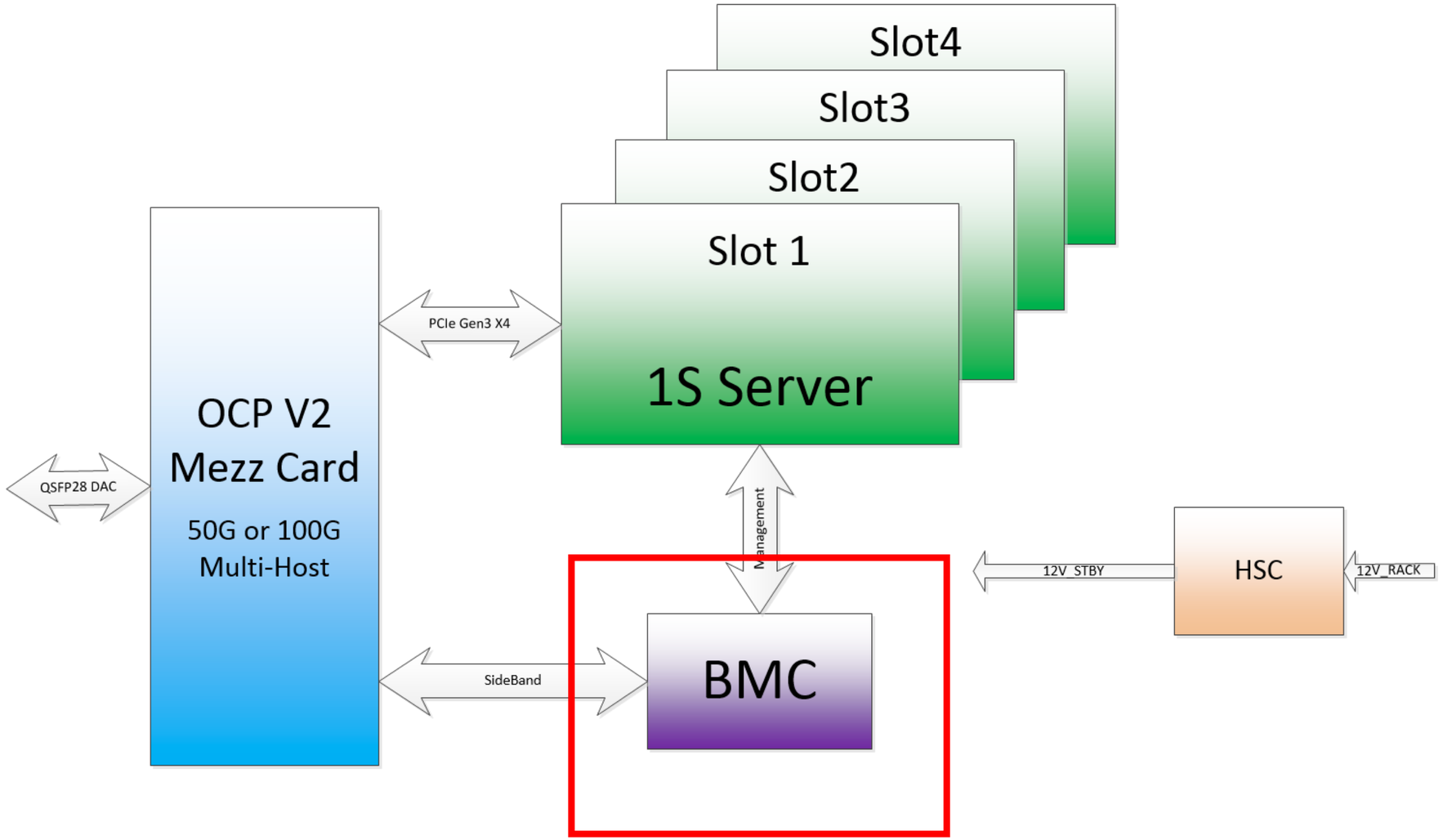
BMC Overview

- Baseboard Management Controller
- Provide System Management
- Autonomous System
  - CPU, Memory, Storage
- Stand-By Power
- Overhead?
  - Low Cost
  - Low Power



* Image Courtesy of Aspeed

Multi Host System - Yosemite



BMC SoC Details (AST2500*)

- CPU: ARM11@800MHz
- RAM: Up to 1G Byte, ECC, DDR4@1600Mbps
- Flash: SPI Flash
- LAN: Dual 10/100/1000Mbps MAC
- USB: USB2.0, USB1.1 HID
- VGA: PCIe VGA 2D controller (1920x1200)
- iKVM

* Courtesy of Aspeed

BMC SoC Details (Pilot4*)

- CPU: Dual ARM Cortex A9 500MHz
- RAM: DDR4@1600Mbps
- LAN: Dual 10/100/1000Mbps MAC
- Graphics Controller and Remote Keyboard
- SuperIO
- ClearKVM for remote KVM
- eSPI

* Courtesy of Aspeed

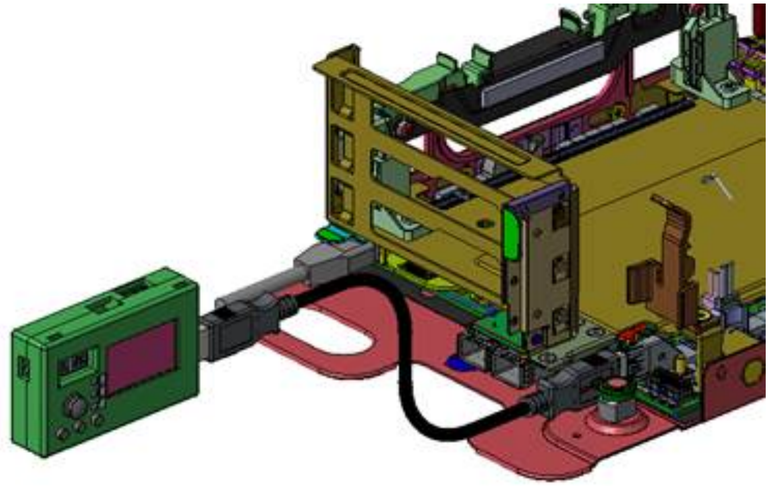
BMC SoC Details (NPCM705G*)

- CPU: Dual Core ARM Cortex A9 800MHz
- Co-Processor: 200MHz 32-bit RISC
- RAM: DDR4
- Network: Dual: RGMII, RMII/NC-SI
- Virtual Media and Keyboard, Video and Mouse Redirection (KVMR)
- Super I/O
- PCIe Gen-2 Root-Complex(RC)
- MCTP over PCIe
- eSPI

* Courtesy of Nuvoton

OCP* LCD Debug Card

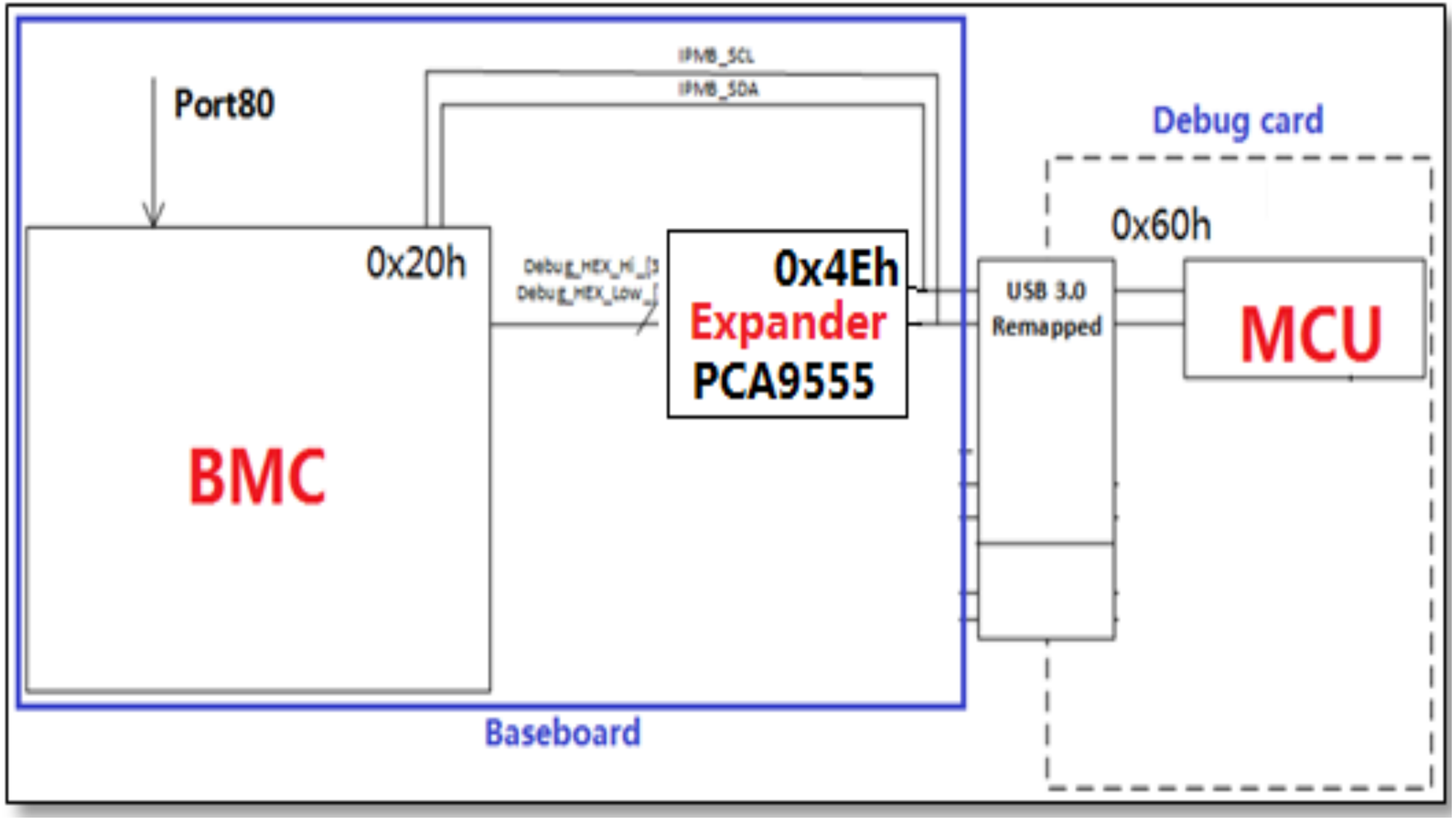
- **LCD**
  - System Information
  - POST Code
  - GPIO Status
  - SEL
  - Critical Sensors
- **Control**
  - Power
  - Reset
  - Console Selection
  - Hot Service
- **Spec**
  - https://www.opencompute.org/wiki/Server/SpecsAndDesigns





* Open Compute Project @ https://www.opencompute.org/

Host System->Debug Card Interface

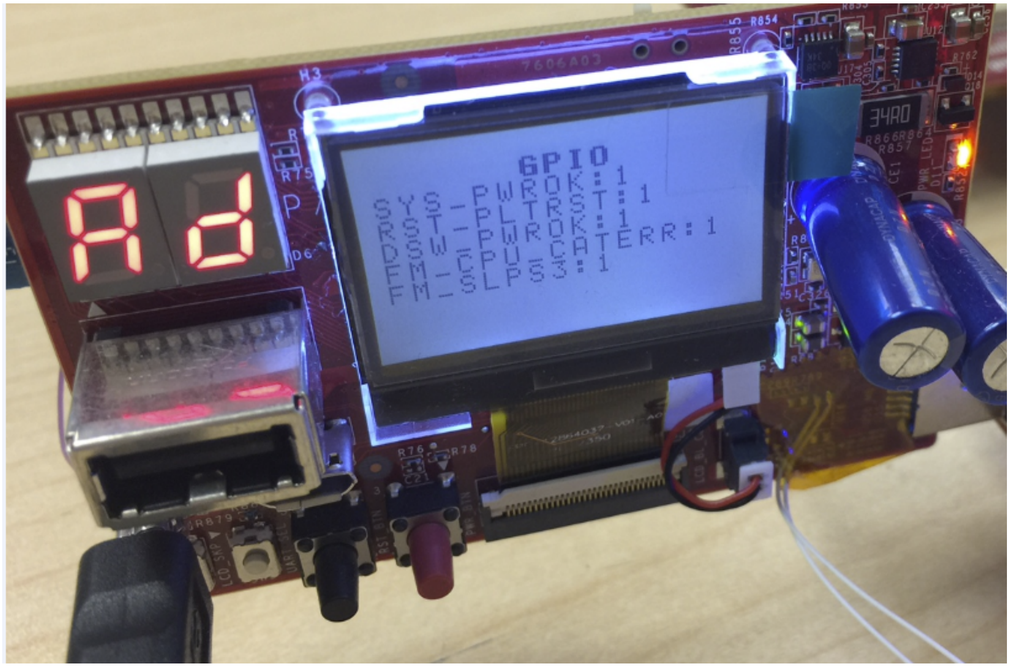


Example Debug Pictures#1

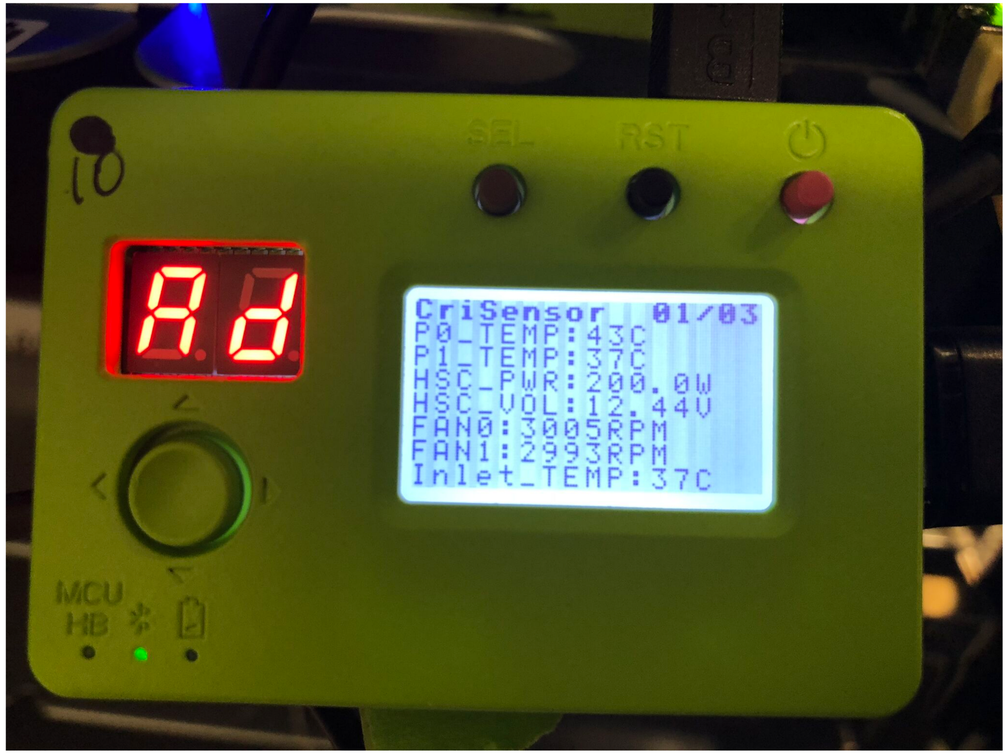


POST Code Status

GPIO Status

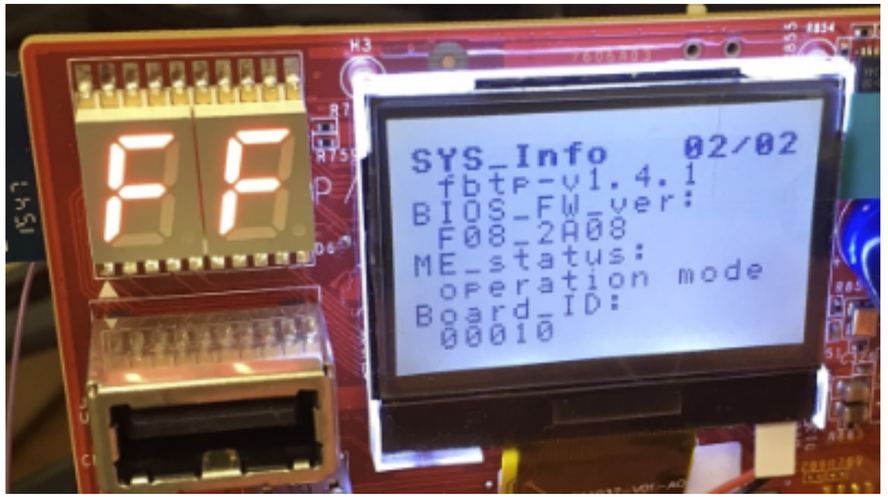


Example Debug Pictures#2



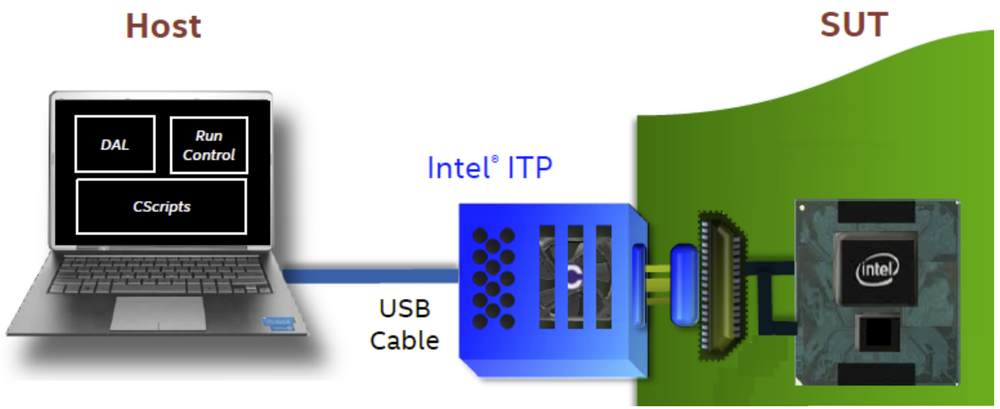
Critical Sensor Info





System Information

At-Scale Debug



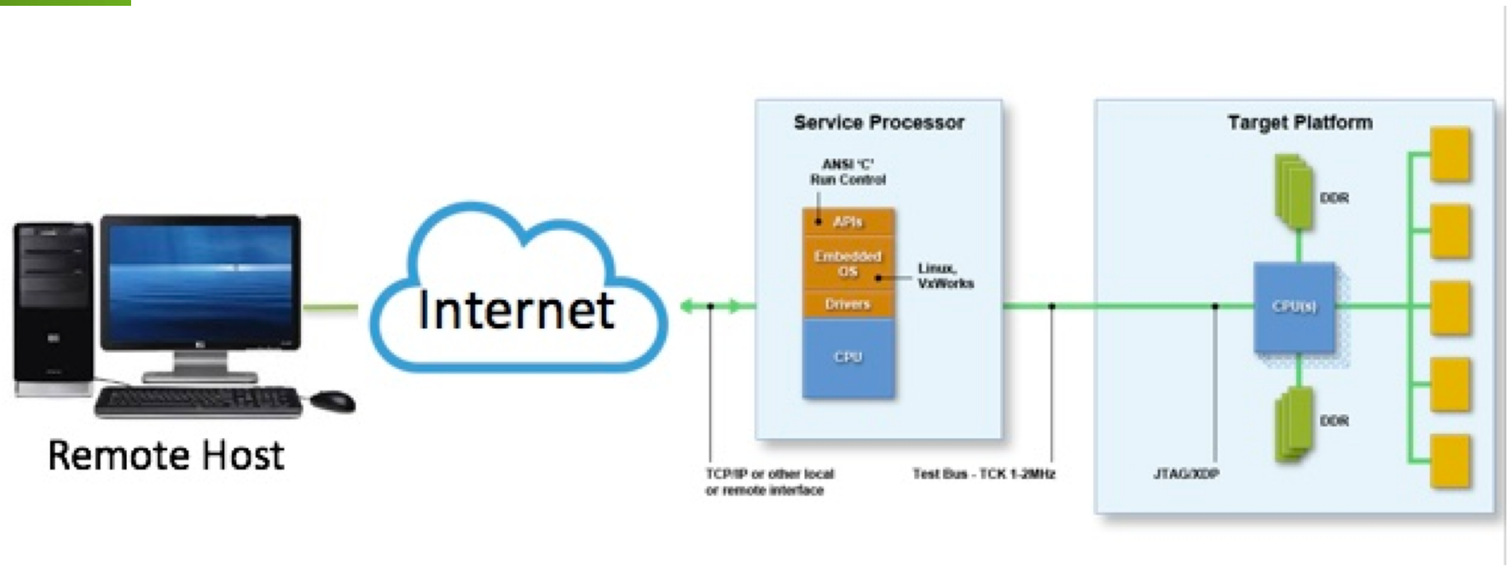
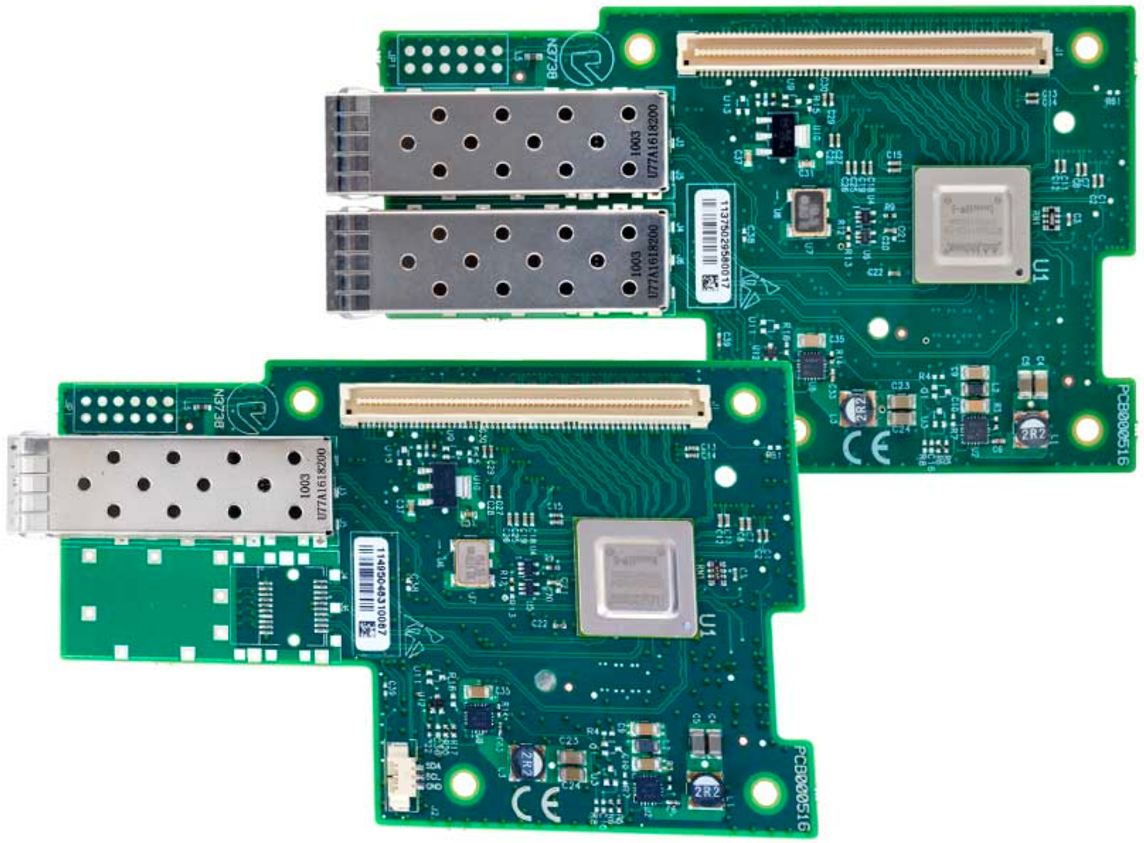


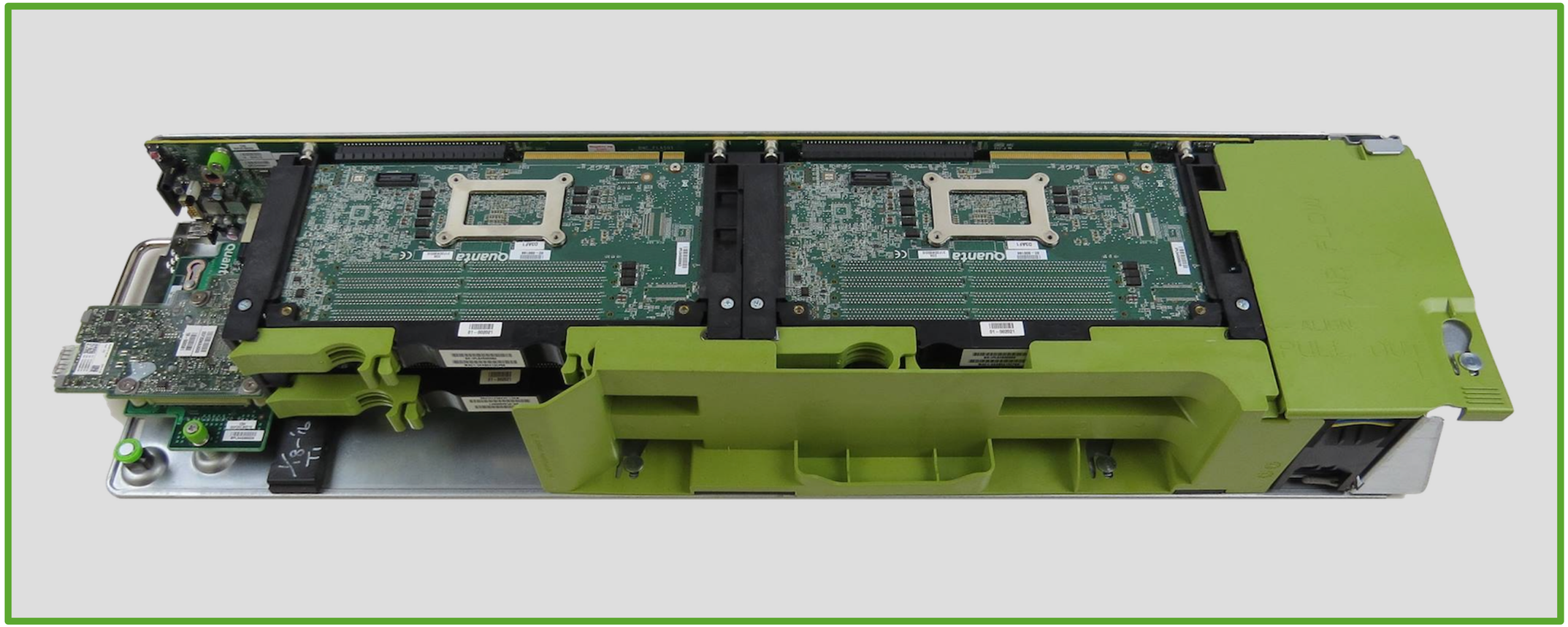
*Image courtesy of ASSET InterTech

OCP NIC Card



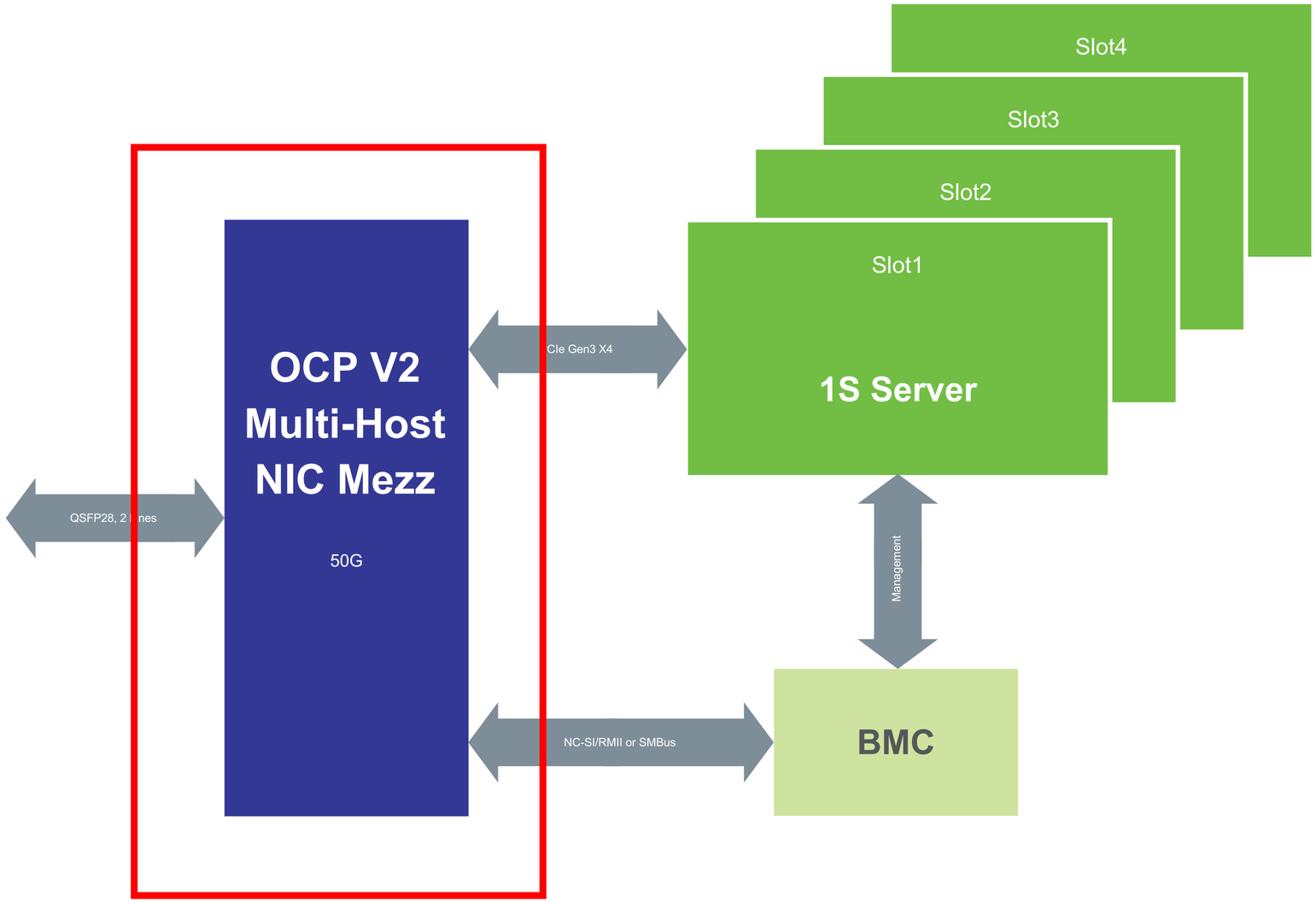
https://www.opencompute.org/wiki/Server/Mezz

OCP Multi-Host Yosemite system



https://www.opencompute.org/wiki/Server/SpecsAndDesigns-old

Multi-Host Yosemite topology



OCP NIC evolution

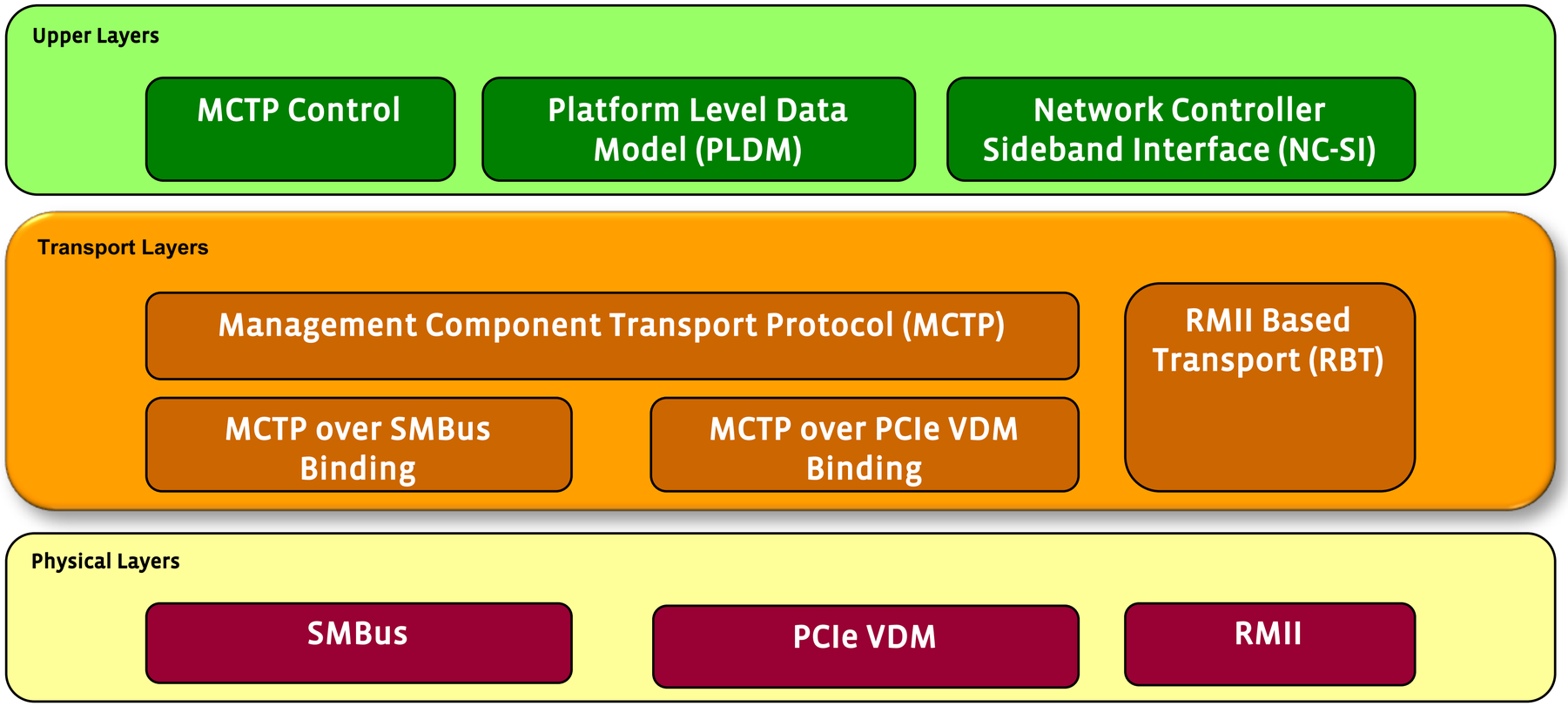
- OCP Spec v0.5 (2012)
  - 10G
  - X8 PCIe Gen3
  - I2C Sideband
  - 2x SFP
- OCP Spec v2.0 (2015)
  - 10G/25G/40G/50G/100G
  - X16 PCIe Gen3
  - I2C and RMII sideband
  - Upto 4x SFP28, 2xQSFP28, 4x RJ45
- OCP Spec v3.0 (2018)

- Industry Adoption (public)
  - Broadcom Limited
  - Chelsio
  - Intel
  - Mellanox Technologies
  - Qlogic
  - Quanta
  - Silicom
  - WiWynn
  - Zaius (Rackspace/Google)

NIC management use cases

- Pass-through Management traffic control
- Inventory of NIC capabilities and parameters
- Port link status reporting and NIC Statistics
- Notifications: driver presence state changes, link status change, soft reset, etc.
- Inventory of provisioned BMC MAC addresses
- Temperature reading
- Inventory and configuration of host PCIe functions
- Firmware inventory (versions of images, firmware package string) and update

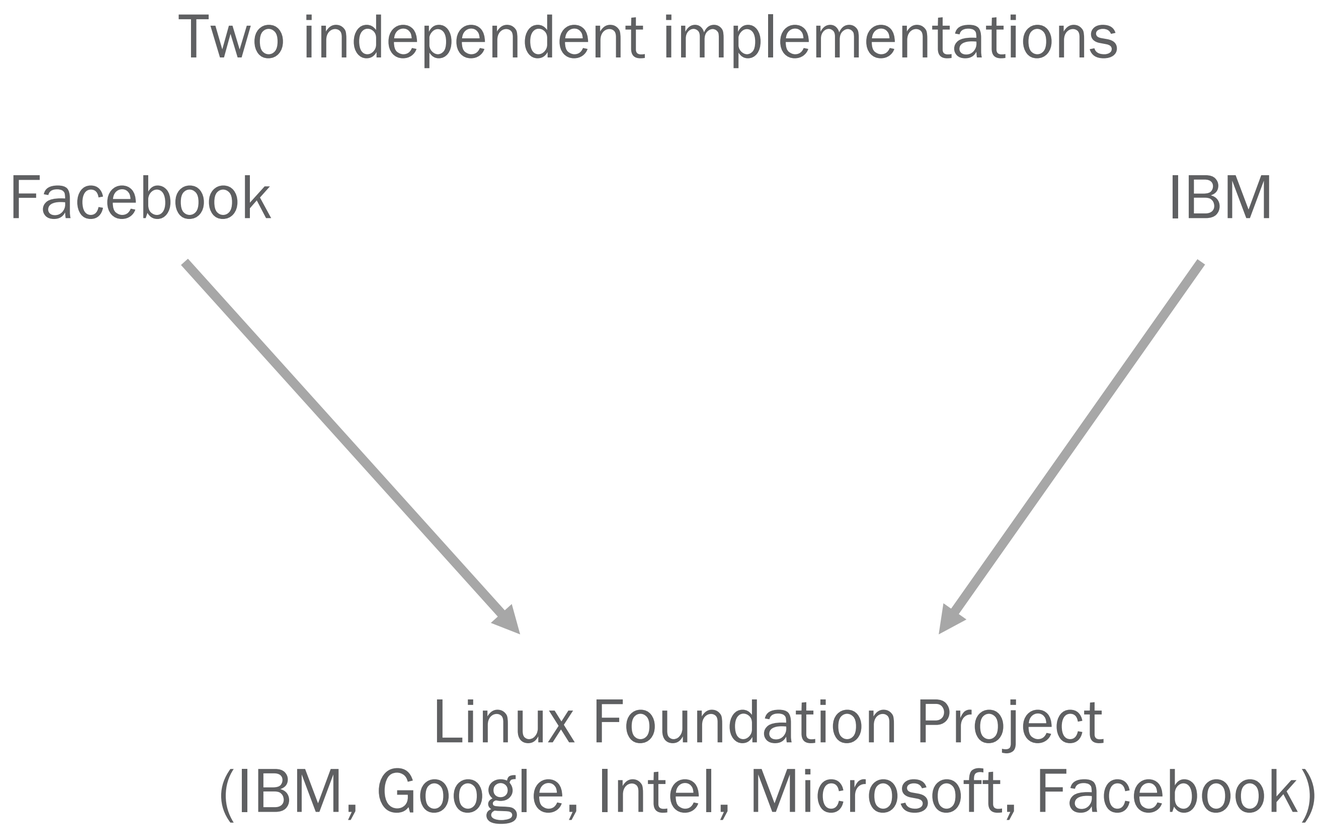
PMCI* components used by OCP NIC



*Platform Management Components Intercommunications (PMCI) WG of the DMTF defines MCTP, NC-SI, and PLDM Standards


OpenBMC

A Brief History of OpenBMC Project



OpenBMC Overview



- Open Source System Management embedded Linux distribution
- Linux Foundation Community Project
- Software/Tooling use unified firmware interface
- Heterogenous architectures in DC can be managed seamlessly

* Courtesy of Aspeed

Community Calls

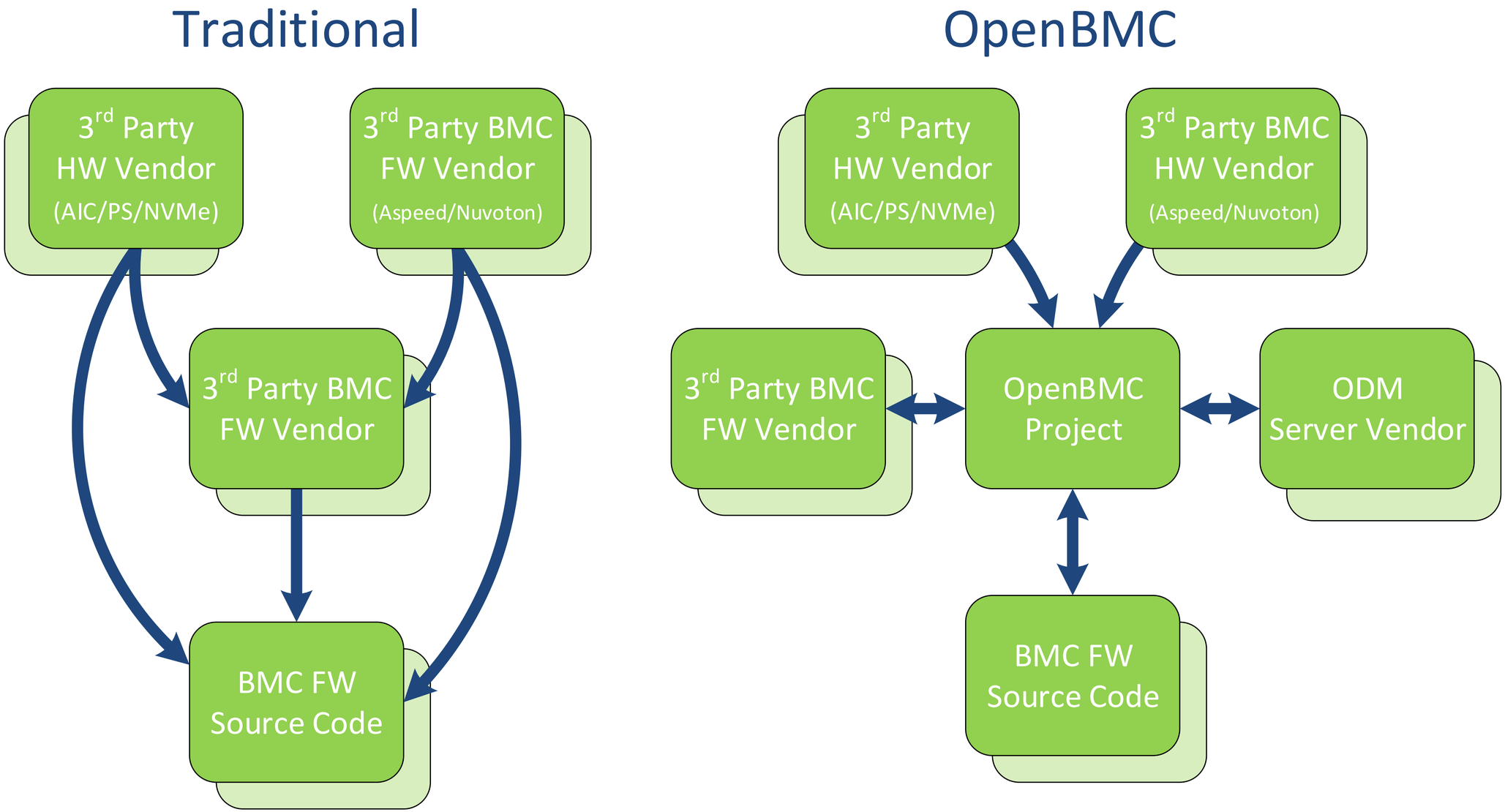


- Weekly Community Telecon – Mondays 10am CT (1500 UTC)
- Redfish – Mondays 4pm CT (2100 UTC)
- Security – Wednesdays 12pm CT (1700 UTC)
- Test – Thursdays 10:30am CT (1530 UTC)

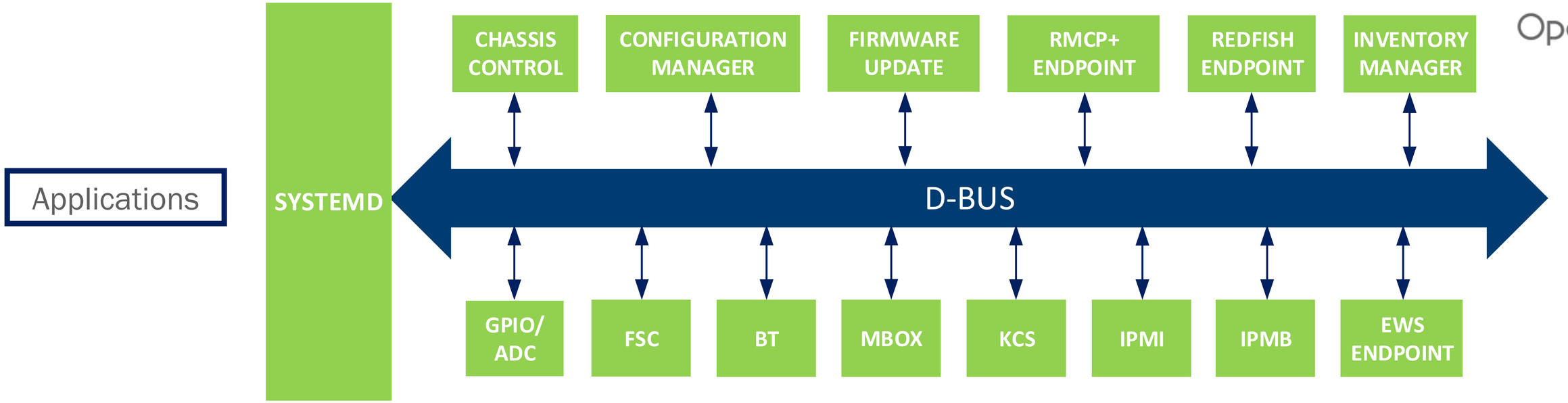
- See https://github.com/openbmc/openbmc/wiki

* Courtesy of Aspeed

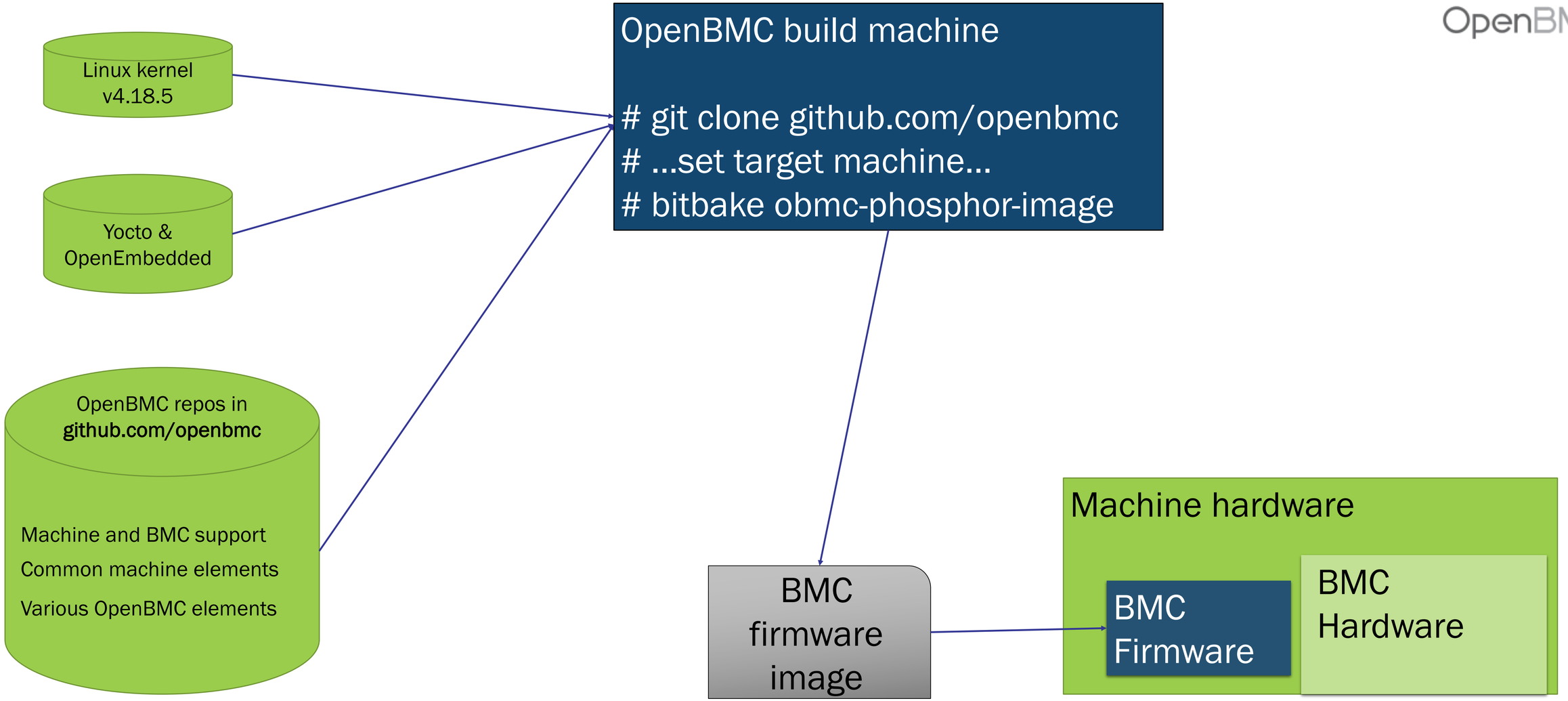
OpenBMC Development Model



OpenBMC Architecture



OpenBMC Build



Getting Started



- Build Setup
  - Ubuntu/Fedora Pkgs
  - Download github:openbmc
  - Target hardware
  - Build
- Validation and Testing
  - Jenkins
  - QEMU
  - CI tests
  - Robot Framework
- Contribution
  - Submit Code/Design
  - Gerrit Reviews
- Bug Reports
  - Github

Release Priority Features



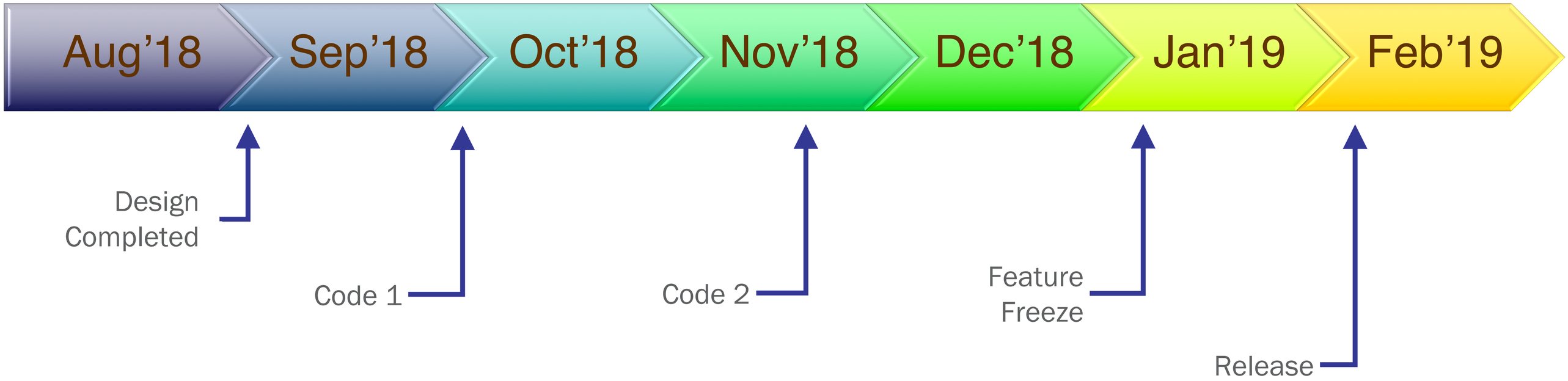
- User Management
- KVM over IP
- Remote Media
- Signed Firmware Update
- LDAP
- IPMI 2.0
- IPMB Support
- Redfish
- IPv6 support
- Secure Boot
- SSH based Serial Over Lan
- KCS Host Interface
- BT Host Interface
- PECI
- Dynamic Sensor Configuration & Scanning
- Fan Speed Control / Thermal Mgmt
- Remote Host JTAG Debug
- SSL Certificate Generate/Upload
- LED Management
- Event Logging
- Yocto refresh (Thud 2.6)
- Automated Testing

Feature Backlog



- SNMP Traps
- GUI Enhancements
- PMBus
- MCTP (SMBus & PCIe)
- SSIF
- HBA Management Library
- PCIe Switch Management
- NVMe Management
- GPU Management
- OOB Firmware Update
- File System Hardening
- Component Recovery
- Restricted Shell
- Power Capping
- Host Console Redirection
- Controllers Console Redirection
- Out of Band Host State Dump
- OCP LCD Debug Card Support
- POWER On Chip Controller (OCC) Support

Release Milestone Planning



First Release Target Date is February 4 – 7, 2019

OpenBMC Hackathon Fall Event



Date: October 9th - 11th, 2018

Location: Intel Corporation
Jones Farm Campus -- Building 5 (JF5)
2111 NE 25th Ave.
Hillsboro, Oregon 97124

See the OpenBMC mailing list for registration instructions

Seating is limited due to space constraints.

OpenBMC Hackathon Topics



On Boarding/Training

Writing and Debugging Code

User Management

Linux Drivers

Redfish

IPMI

Validation

WebUI Design

Demonstrations

Hardware Requirements

Bootloader

Secure Boot

Security

BMC Device Enablement

Logging and Debug mechanisms

Telemetry Data

Event Alerting

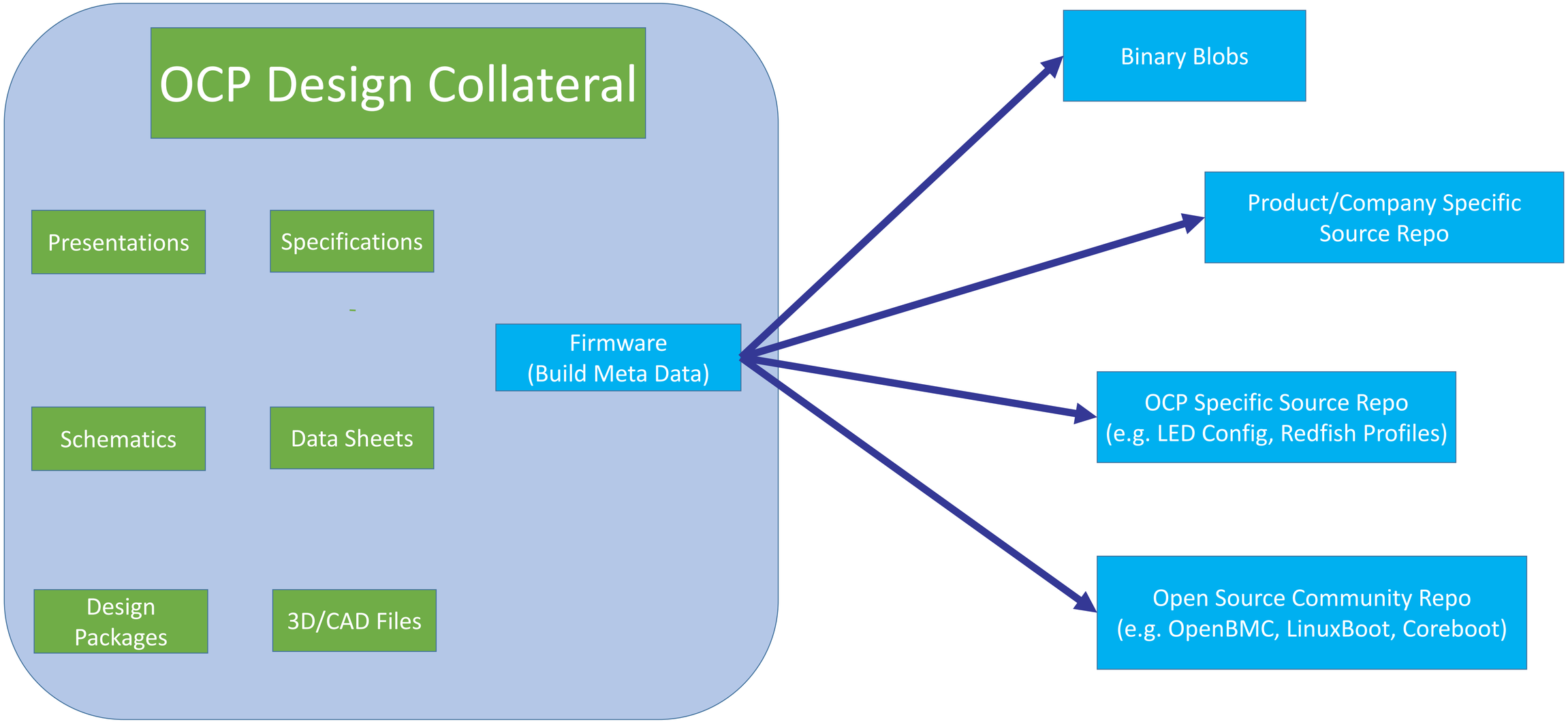
Development and Release Planning

Additional Resources



- Source Code:
  - https://github.com/openbmc
- Continuous Integration Testing
  - https://openpower.xyz
- Code Reviews
  - http://gerrit.openbmc-project.xyz
- Contact
  - Mail: openbmc@lists.ozlabs.org
  - IRC: #openbmc on freenode.net
  - Riot: #openbmc:matrix.org
- Web Page:
  - www.openbmc.org

OpenBMC for OCP Ecosystem





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