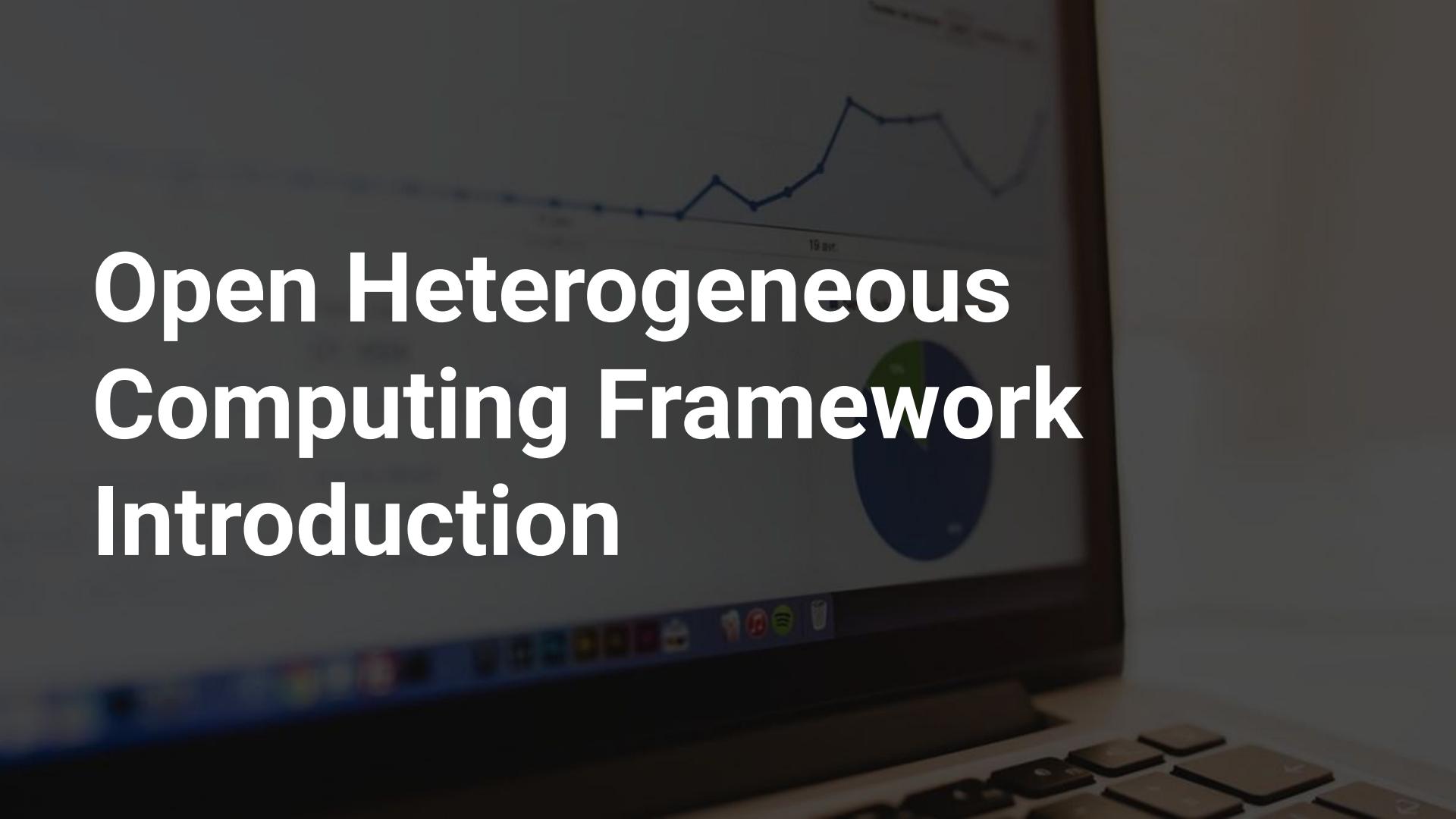


Open Heterogeneous Computing Framework Introduction



Agenda Breakdown - Morning Session

- 9:00 - 10:00 Introduction - OHCF Overview, Zhipeng Huang (Huawei)
- 10:00 - 10:30 Strategy For NFV Acceleration from China Mobile, Sheng Wang (China Mobile)
- 10:30 - 11:00 AI Platform Practices and learnings in China Mobile, Yong Liu (China Mobile)
- 11:00 - 11:30 The application of large scale GPU virtualization on iFlyTech cloud, Ruichen Xu (iFlyTech) - #7
- 11:30 - 12:00 TLS offloading solution using heterogeneous HW management, Xinran Wang (Intel) - #3
- 12:00 - 13:30 Lunch break

Agenda Breakdown - Afternoon Session

- 13:30 - 14:30 OHCF Unconference - Topics Introduction (OpenStack, Kubernetes, RISC-V, Rust-VMM, Linuxboot, OCP, ...)
- 14:30 - 15:50 OHCF Unconference - Discussions (All Attendee)
- 15:50: OHCF Unconference readout

A photograph showing several people sitting on a set of dark wooden steps. In the foreground, a person wearing a striped shirt and blue jeans is sitting with their head down. Behind them, two other individuals are visible; one is wearing a blue shirt and light-colored shorts, while the other is wearing a patterned shirt and dark pants. A pair of green flip-flops lies on the steps between the people. The background consists of more wooden steps leading up a hill under a clear sky.

All the cutting-edge applications needs
accelerators

New Era of Domain Specific Architecture

NPU

Neural network
processors for machine
learning



GPU

GPUs for graphics, virtual
reality, ML



SmartNIC/FPGA

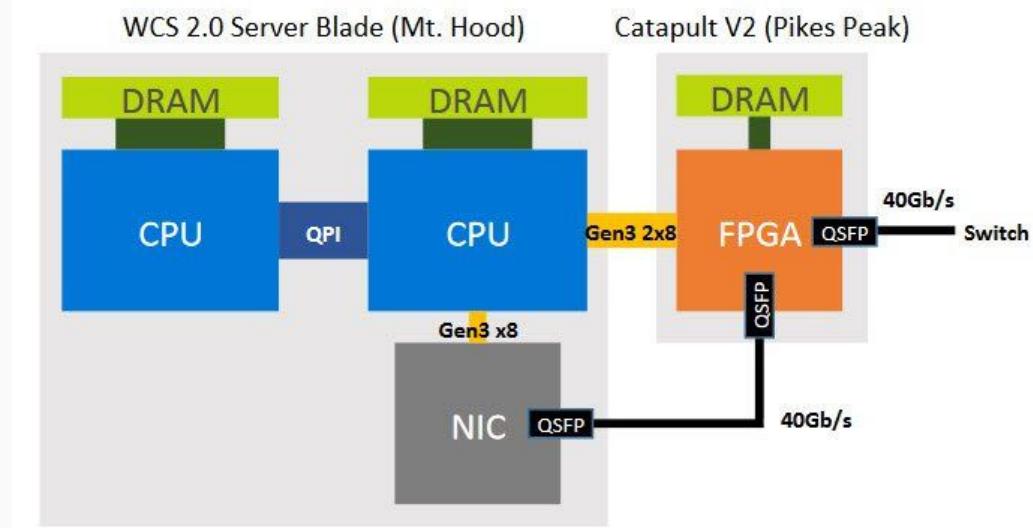
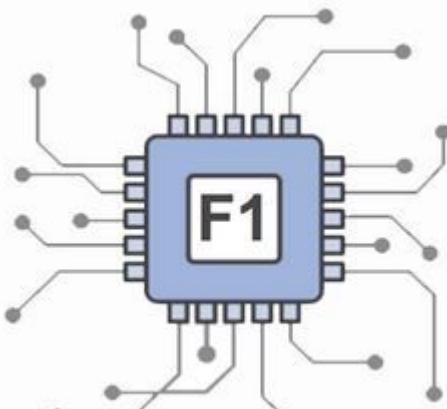
Programmable network
switches and hardware



New Era of Domain Specific Architecture



Cloud Computing Beyond Hype



Open Source In Prime Time



OPEN
Compute Project®

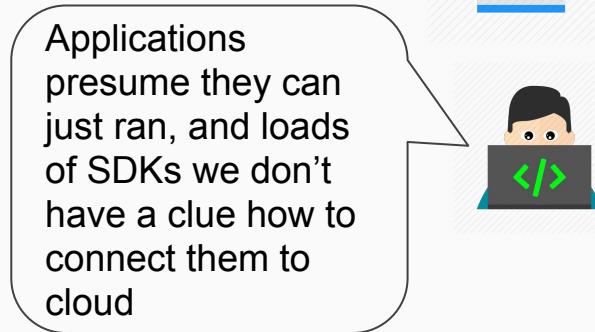
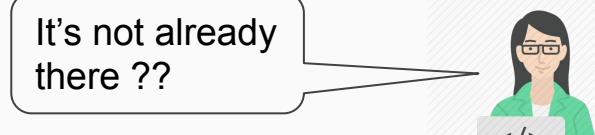
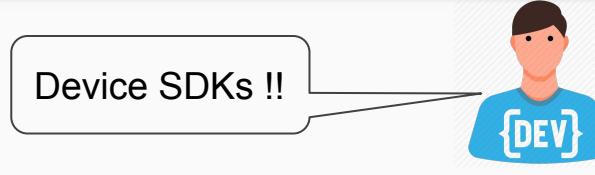
RISC-V
RISC-V®

However The Problem Few Talks About

What is the software ecosystem you need?

What is the hardware ecosystem you need?

What is the main problem you have?



Accelerator Dev

Application Dev

Cloud Infra Dev

Example



GPU talks: 3, FPGA talks: 0, Acceleration in general: 0, **out of nearly Four hundreds of accepted talks**



All the cutting-edge applications needs accelerators

But the Accelerators needs a formula cross the stack to move beyond the innovation chasm

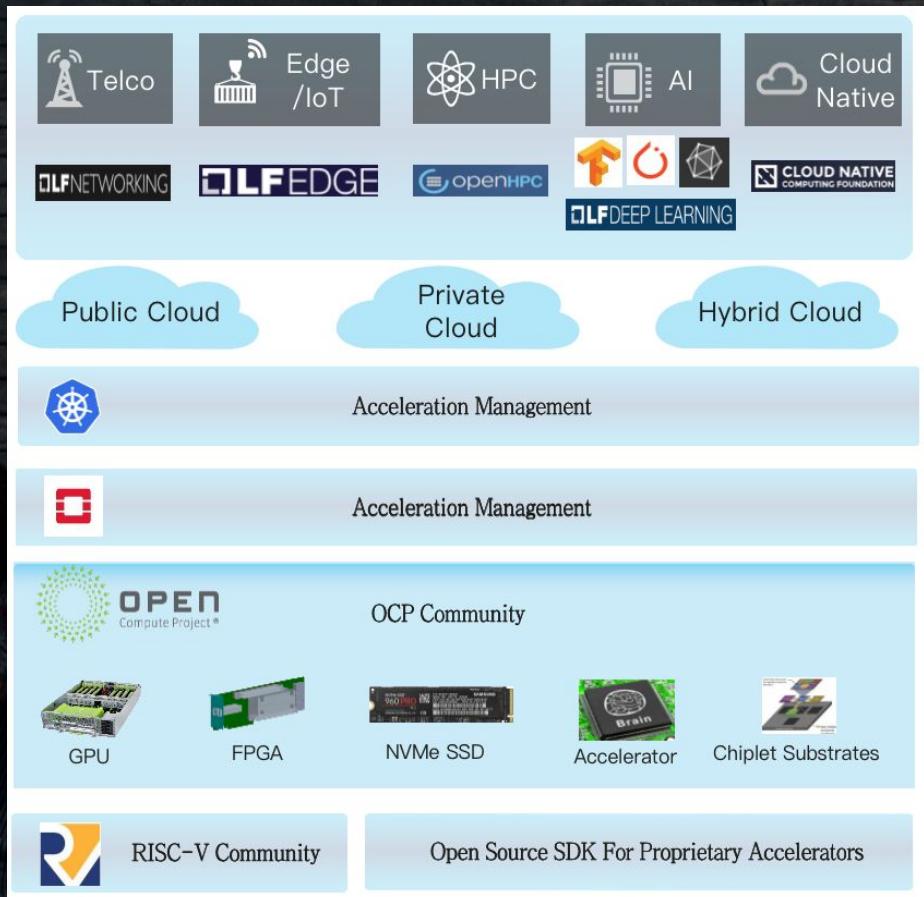


Proposal

Build an end to end open source reference framework for heterogeneous computing (i.e. the formula)

Open Heterogeneous Computing Framework

A developer driven open source initiative for building full stack reference framework
Formulas and PoCs for domain specific architectures



Proposal : Governance Structure

Open Heterogeneous Computing Framework



Proposal : Governance Structure

- **Overlay** cross foundation/community initiative
- **Lightweight** (no fee based membership structure, no heavy foundation style structure, no integration release, piggyback on current open source events)
- Encourage majority of the gap-fulfilling **development in upstream** communities
- **Developer oriented**: development champions (blueprints), and scenario champions (use cases)
- Use **plugfest/Tournament/PoCs** for the implementations verifies the blueprint (require sponsorship, start after 2020)

Proposal: Content

 GitHub, Inc. [US] | <https://github.com/open-heterogeneous-computing-framework> 🔍 ⭐

Open Heterogeneous Computing Framework

End To End Open Source Reference Framework For Heterogeneous Computing



Repositories 3 People 1 Teams 0 Projects 0 Settings

Pinned repositories Customize pinned repositories

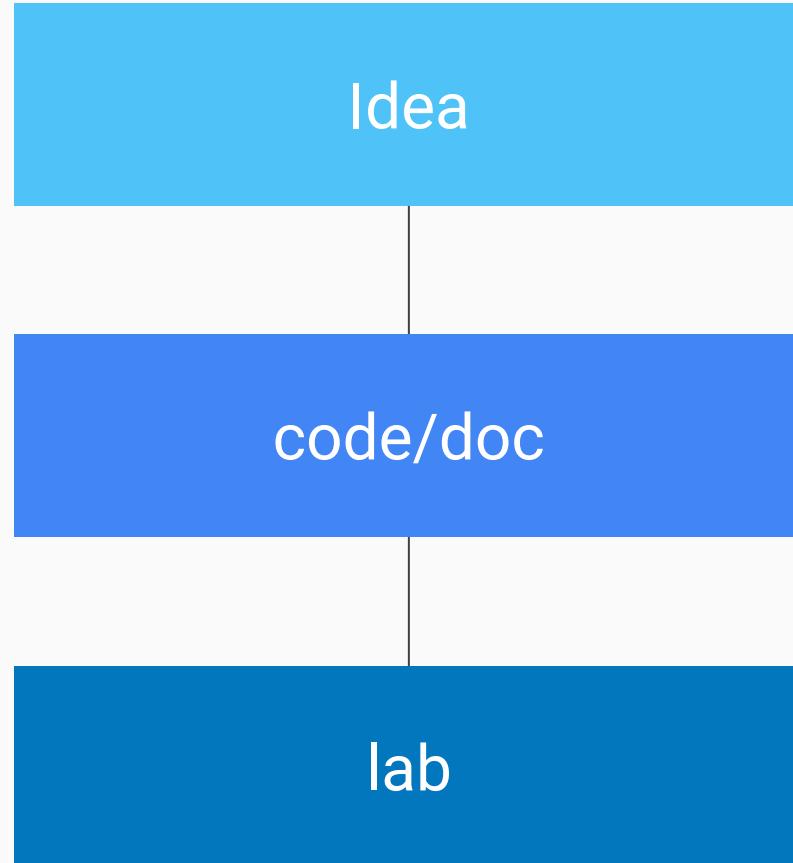
 **Formula** ≡
Open Source Reference Framework Design Blueprint For Heterogeneous Computing

 **HCIP** ≡
Heterogeneous Computing Improvement Proposal

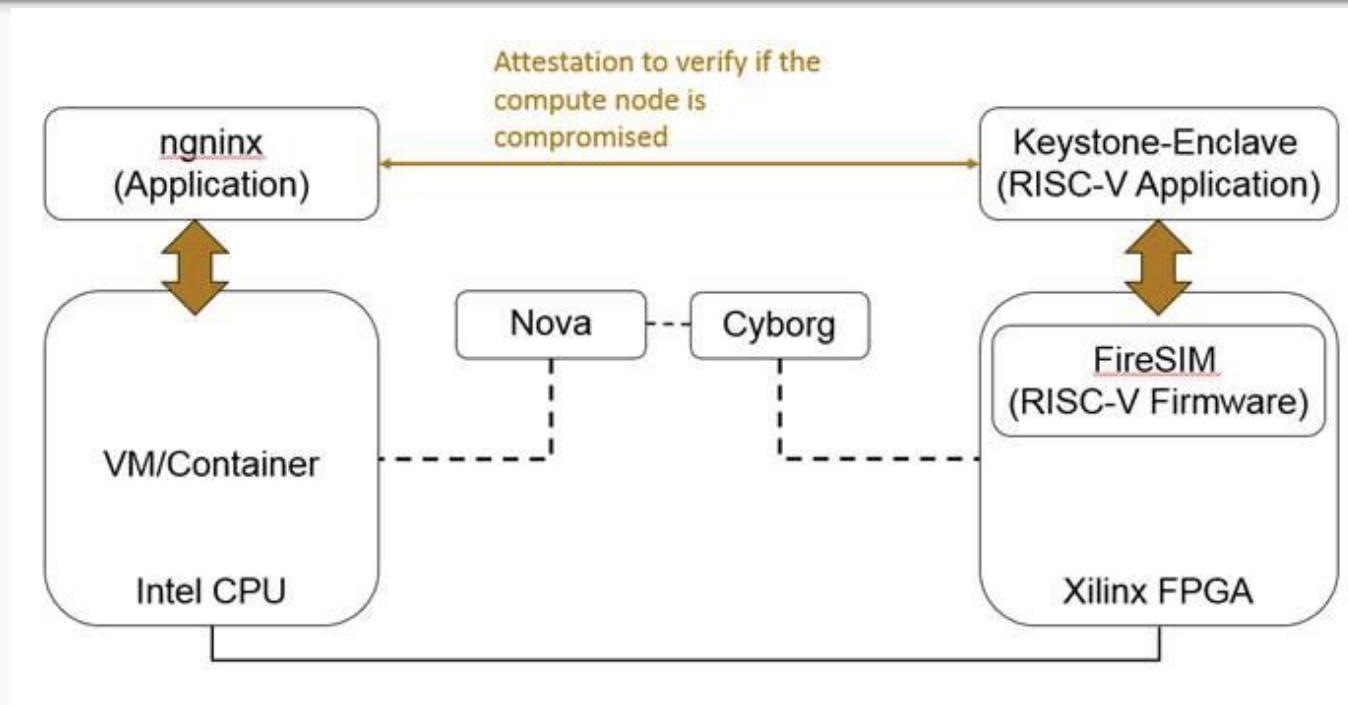
 **Specs** ≡
Open Source Specifications For Heterogeneous Computing

Collaboration With Foundations Focus On:

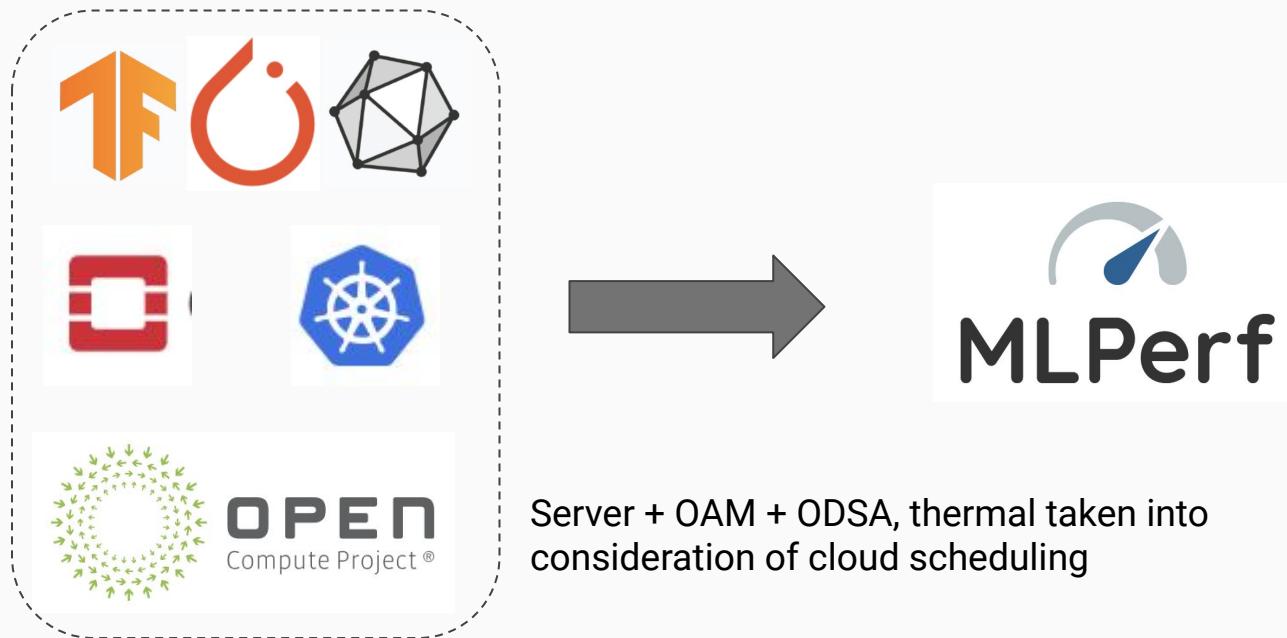
- **Messaging** in key events (talks, keynote, twitter hashtags, articles, blogs, ...)
- **Blueprint** / White paper composition/publication, **glue code** development (via github), **open source standard** for data model/bus access/more
- Openlab based **plugfests/tournaments/PoCs** (on-premise or cloud)



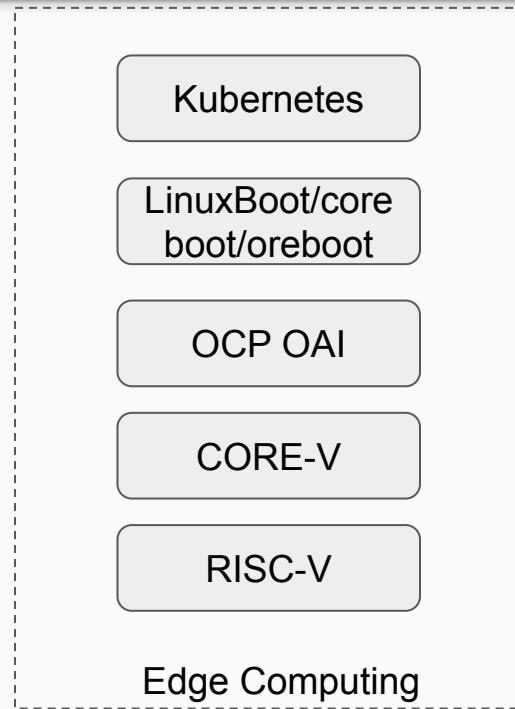
Example Scenario: Trust Computing



Example Scenario - Machine Learning application benchmarking



Example Scenario - Edge Computing



CFP: MVP Demo Targeting H2

Open Heterogeneous Computing Framework Demo 0



App: **LFDL**
Container Management:
CNCF-Kubernetes



Cloud Infra Management:
OpenStack-Nova, Placement, Cyborg



Hardware spec:
OCP-Server, OAM, ODSA

Plan For 2019 And Beyond

2019H1

Launching initiative,
increasing awareness



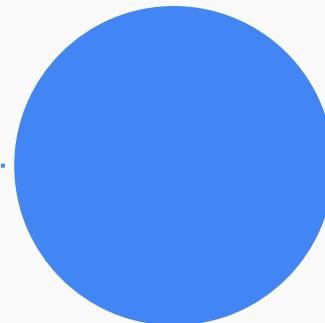
2019H2

MVP demo ready,
committed champions,
infra in place



2020 -

Engage users for more advanced
scenario building, deliver
reference framework in the form
of doc and code, lab ready





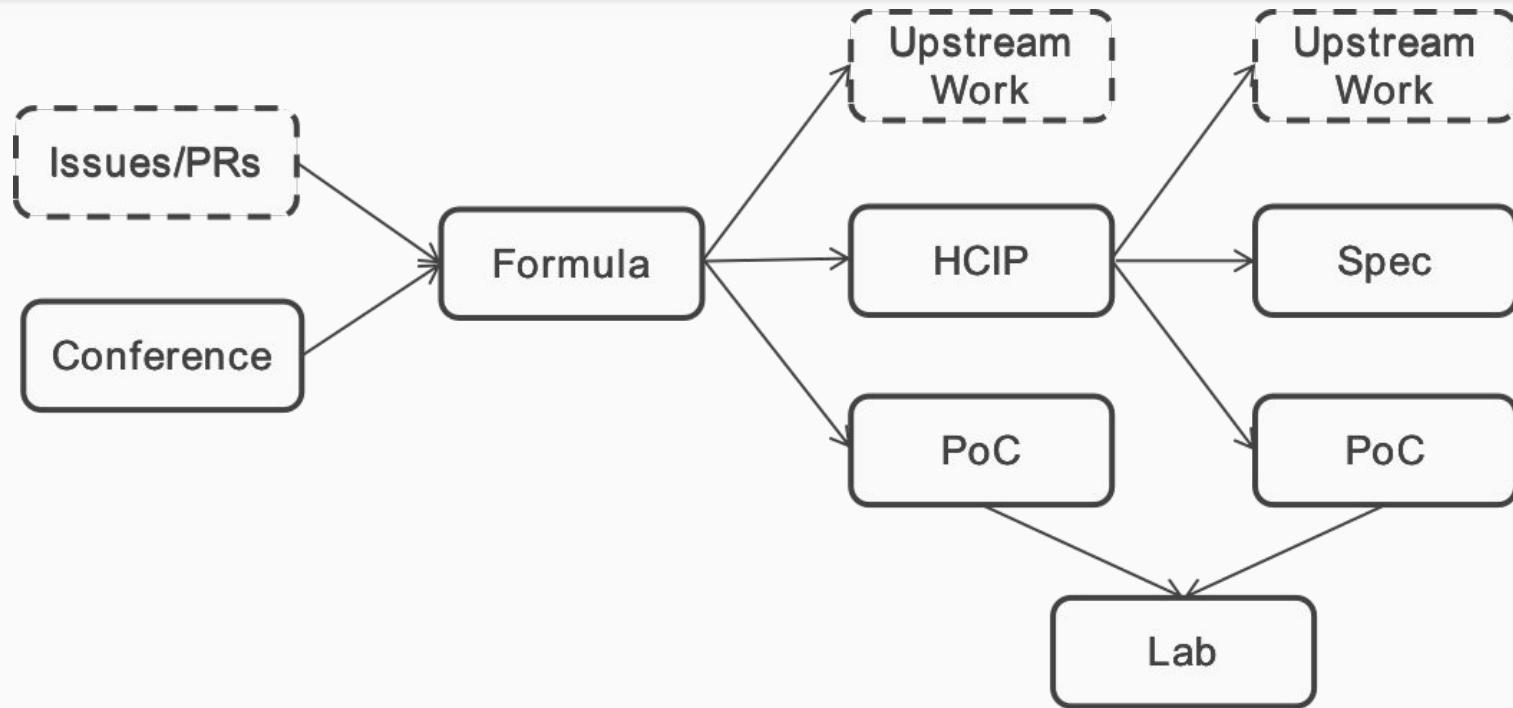
Formula

OHCF Formula

*Full Stack Open Source Design Spec For
Given Use Case that is utilizing
heterogeneous computing*

<https://github.com/open-heterogeneous-computing-framework/community/tree/master/formula>

How to make an OHCF Formula





HCIP

Heterogeneous Computing Improvement Proposal

at the core of OHCF working mechanism for standardization

<https://github.com/open-heterogeneous-computing-framework/HCIP>

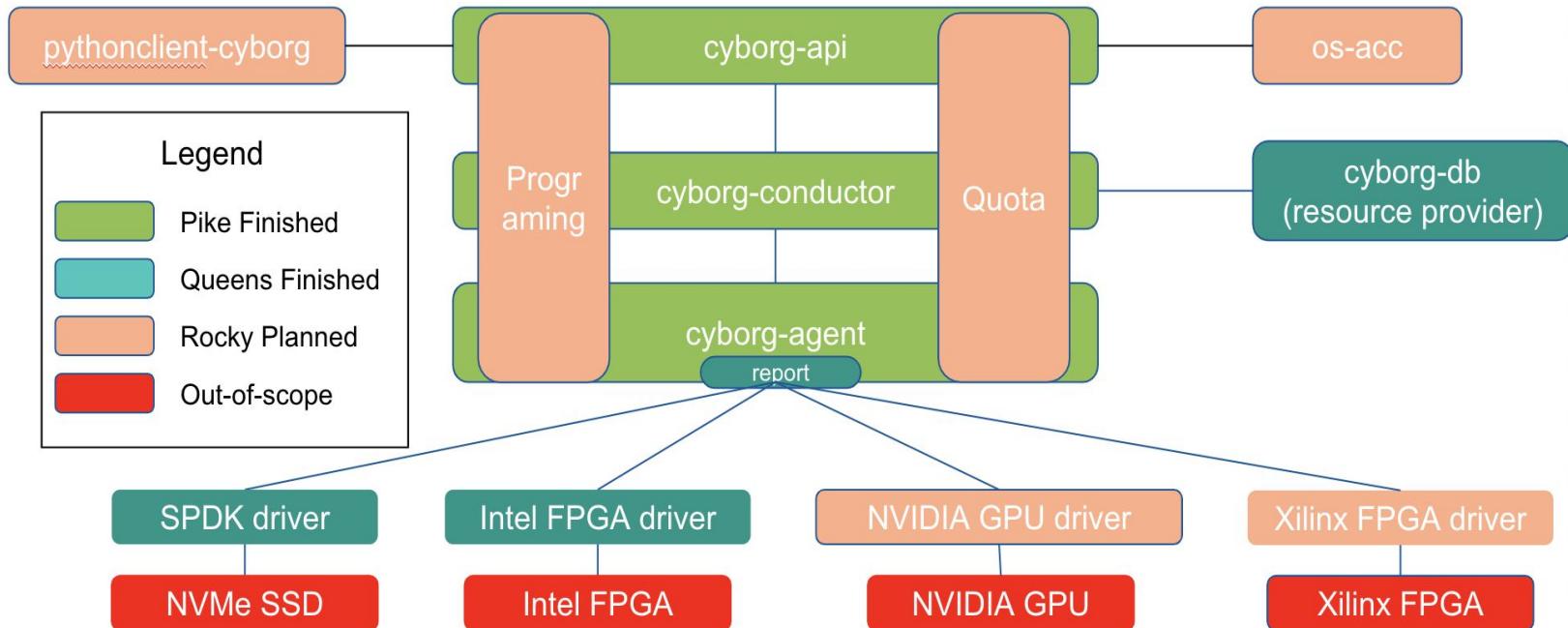
Democratizing Acceleration !



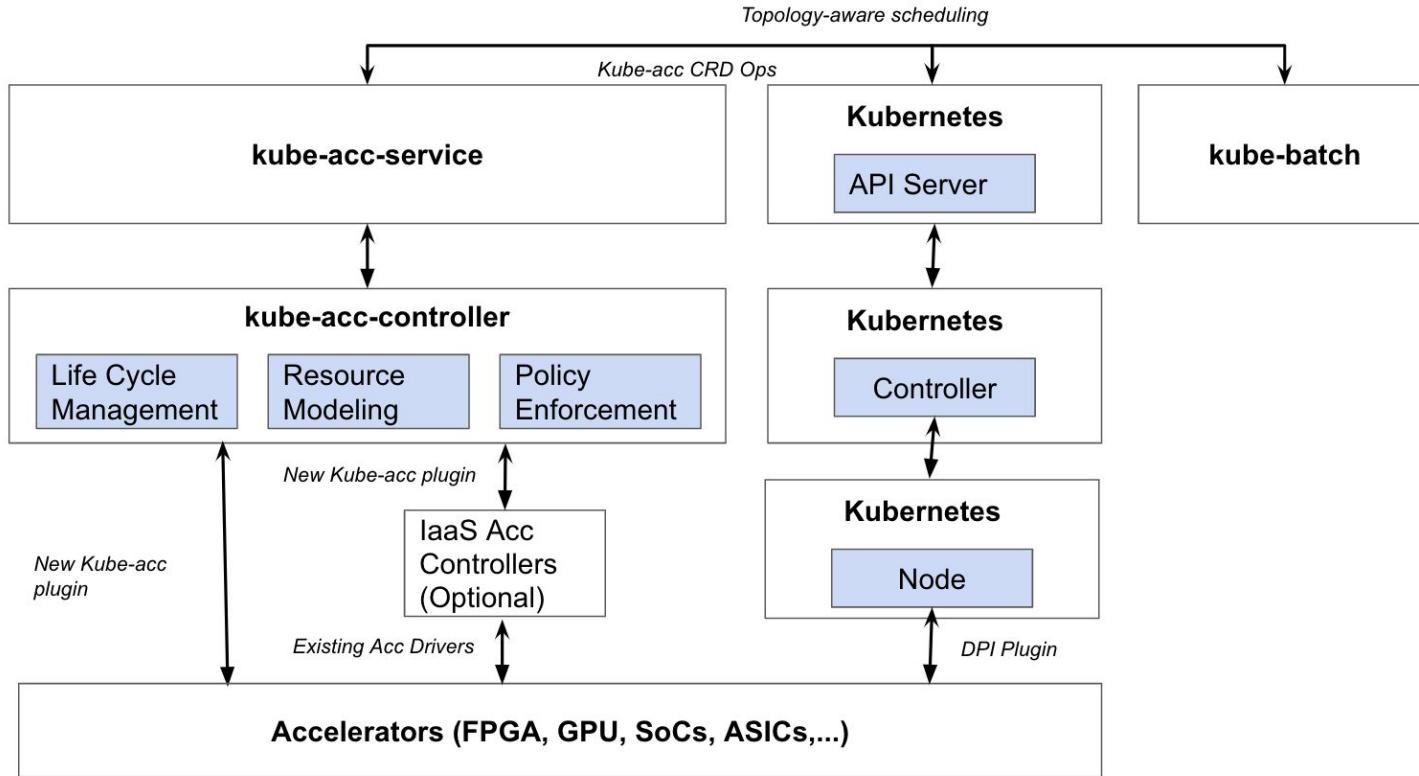
OHCF Unconference



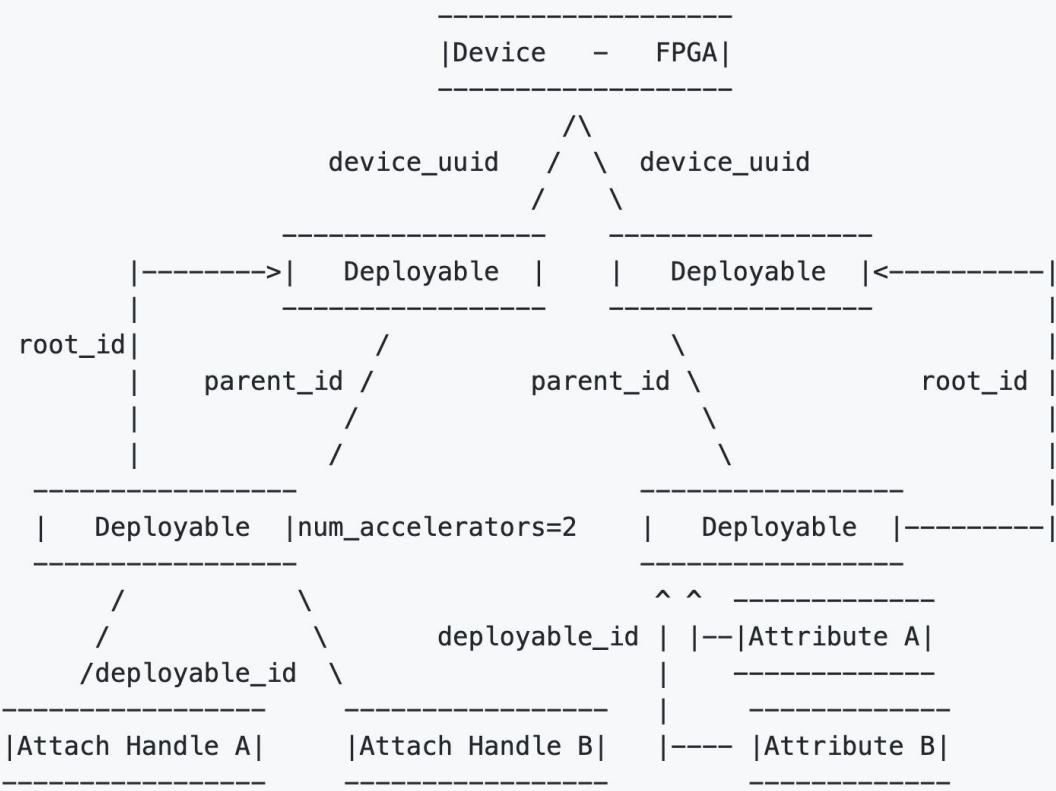
Unconference: OpenStack



Unconference: Kubernetes



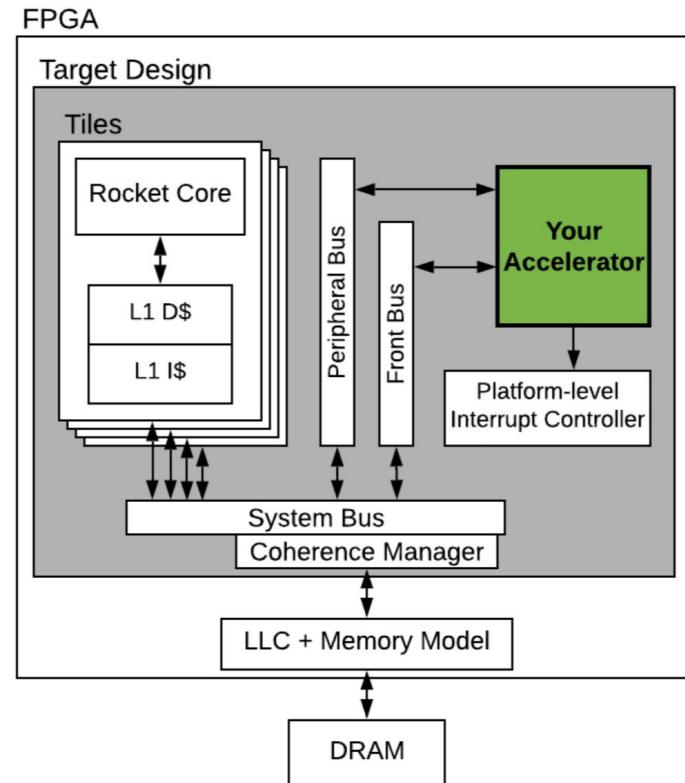
Unconference: Metadata



| name | value | nullable | description |
|---------------|---------|----------|---------------------------------------|
| bs-name | aes-128 | False | name of the bitstream(not unique) |
| bs-uuid | {uuid} | False | The uuid generated during synthesis |
| vendor | Xilinx | False | Vendor of the card |
| board | KU115 | False | Board type for this bitstream to load |
| shell_id | {uuid} | True | Required shell bs-uuid for the bs |
| version | 1.0 | False | Device version number |
| driver | SDX | True | Type of driver for this bitstream |
| driver_ver | 1.0 | False | Driver version |
| driver_path | /path/ | False | Where to retrieve the driver binary |
| topology | {CLOB} | False | Function Topology |
| description | desc | True | Description |
| region_uuid | {uuid} | True | The uuid for target region type |
| function_uuid | {uuid} | False | The uuid for bs function type |
| function_name | nic-40 | True | The function name for this bitstream |

Unconference: RISC-V

- Any accelerator can be integrated (if it fits inside FPGA)
- Develop and test software for your accelerator in Linux environment before having the chip in hand
- Get fast and accurate performance results



Unconference: RISC-V

Cloud Management
(OpenStack,Kubernetes, etc...)

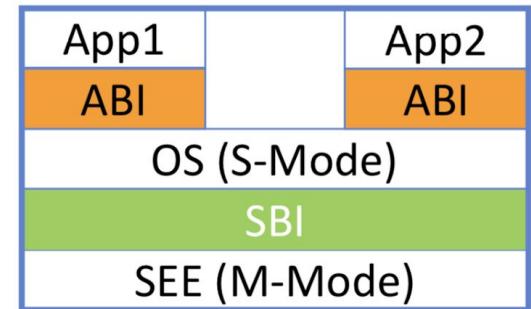


RISC-V Core Capabilities (topology,
socket closeness, affinity, power, ...)

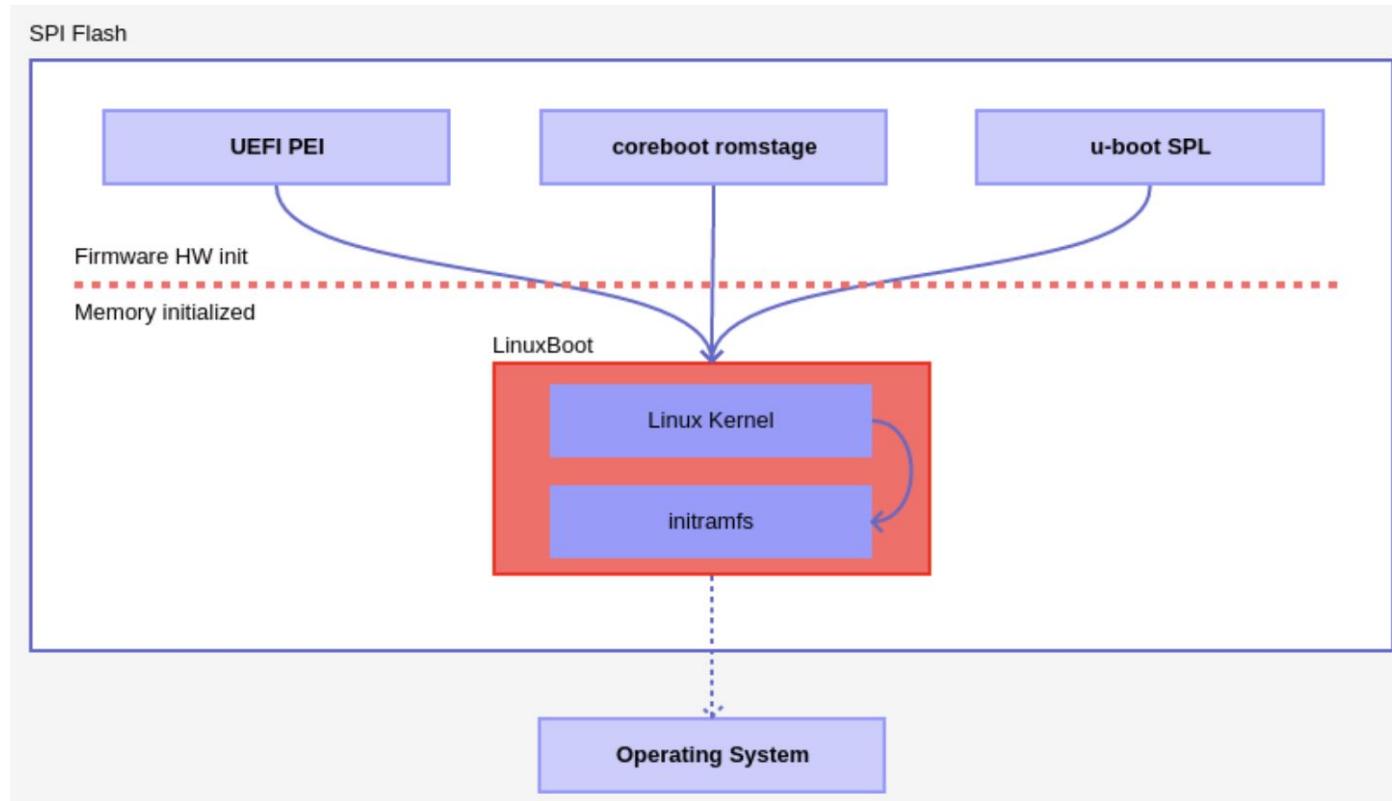
RISC-V Core Based Accelerator

Unconference: RISC-V (OpenSBI)

- SBI stands for RISC-V Supervisor Binary Interface
 - System call style calling convention between Supervisor (S-mode OS) and Supervisor Execution Environment (SEE)
- SEE can be:
 - A M-mode RUNTIME firmware for OS/Hypervisor running in HS-mode
 - A HS-mode Hypervisor for Guest OS running in VS-mode
- SBI calls help:
 - Reduce duplicate platform code across OSes (Linux, FreeBSD, etc)
 - Provide common drivers for an OS which can be shared by multiple platforms
 - Provide an interface for direct access to hardware resources (M-mode only resources)
- Specifications being drafted by the Unix Platform Specification Working group
 - Maintain and evolve the SBI specifications
 - Currently, SBI v0.1 in-use and SBI v0.2 in draft stage



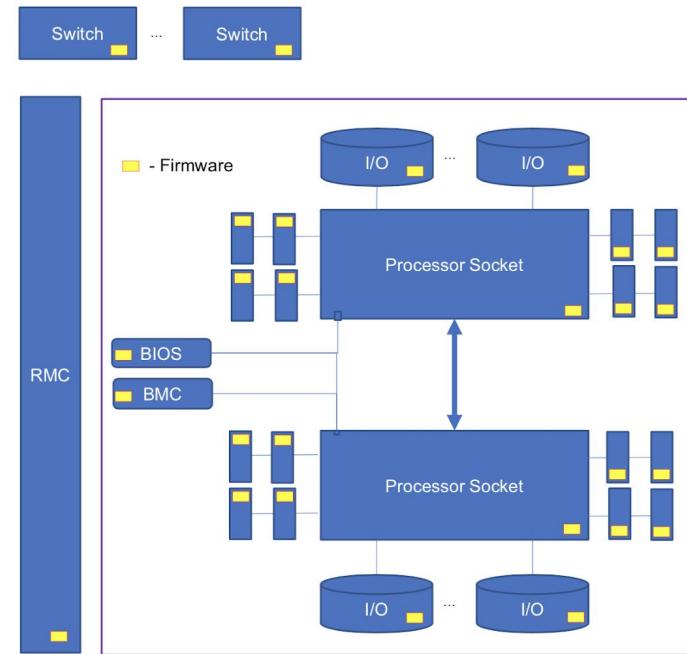
Unconference: OCP (Open System Firmware)



Unconference: OCP (Open System Firmware)

Cloud Demands High Service Availability (cont...)

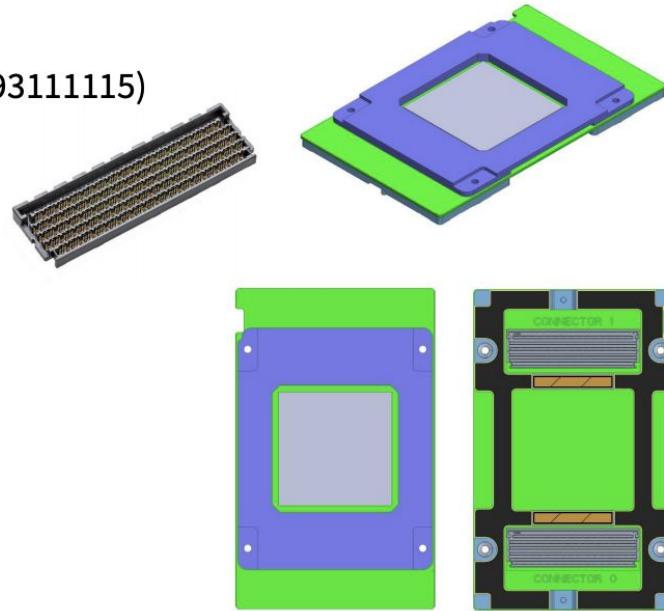
- Today's OCP system contains many hardware components with firmware
 - System Firmware – BIOS, BMC, etc.
 - Device Firmware – Microcode, Network, TPM, Storage, SCM, Custom FPGA, PSU etc.
- Over life time of the system, the firmware components are updated to address:
 - Security, Power, Performance, debug, bug fixes, fleet freshness, fleet hygiene, etc.
- In most cases, system is rebooted to activate new firmware



Unconference: OCP (OAM)

OCP Accelerator Module Spec

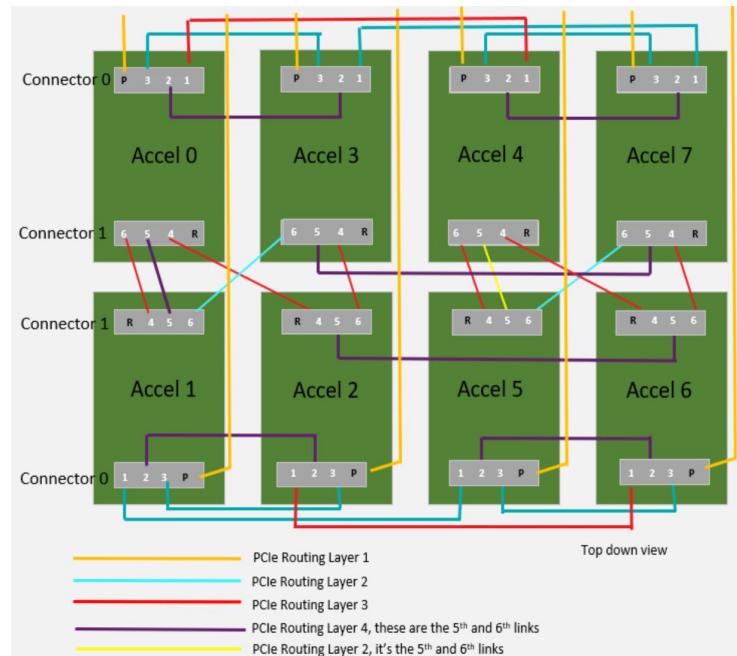
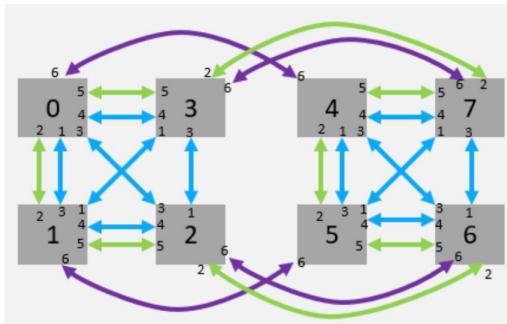
- 102mm x 165mm Module Size
- With two high-speed Mirror Mezz connectors (MPN: 2093111115)
- 12V and 48V input DC Power
- Up to 350w (12V) and up to 700w (48V) TDP
 - Up to 440W (air-cooled) and 700W (liquid-cooled)
- Support single or multiple ASIC(s) per Module
- Up to **eight** x16 Links (Host + inter-module Links)
 - Support one or two x16 High speed link(s) to Host
 - Up to seven x16 high speed interconnect links
- Up to 8* Modules per Baseboard
- System management and debug interfaces



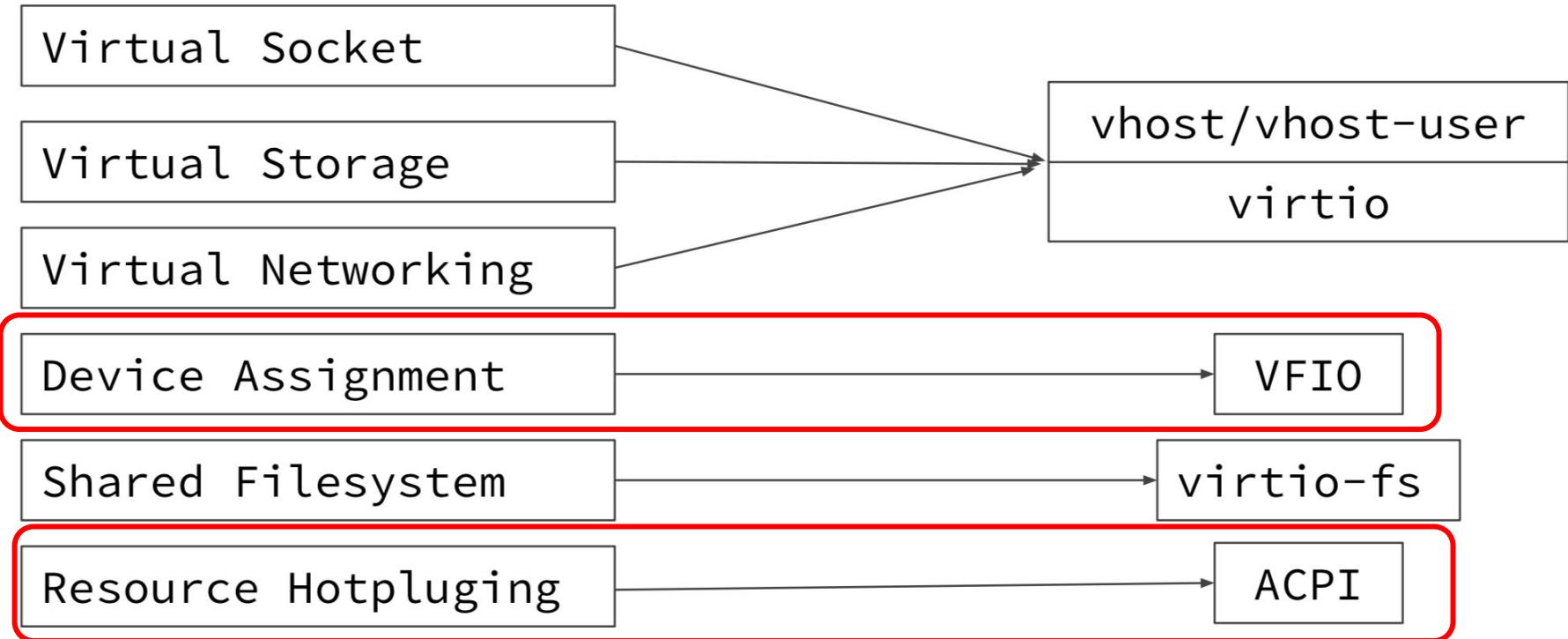
Unconference: OCP (OAM)

OAM Topology Examples

Hybrid Cube Mesh



Unconference: rust-vmm



Unconference: more ideas ?

- Write on the sticker and put it on the whiteboard
- Form a group to discuss what is needed for that idea to happen



Thank You!

Feel free to submit an issue or join slack channel to start discussion !

ohcf.slack.com

<https://github.com/open-heterogeneous-computing-framework/>

zhipengh512@gmail.com

Backup