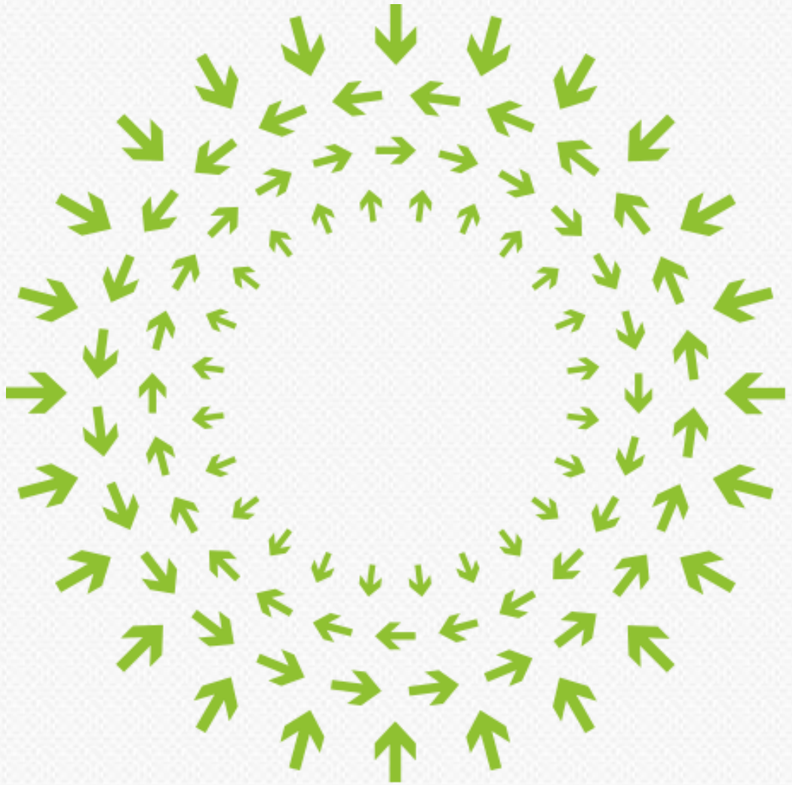


OPEN Compute Summit

March 10–11, 2015

San Jose

OPEN Compute Summit

Honey Badger and Panther+

Projects Update

Mike Yan
Facebook
Hardware Engineer

Agenda

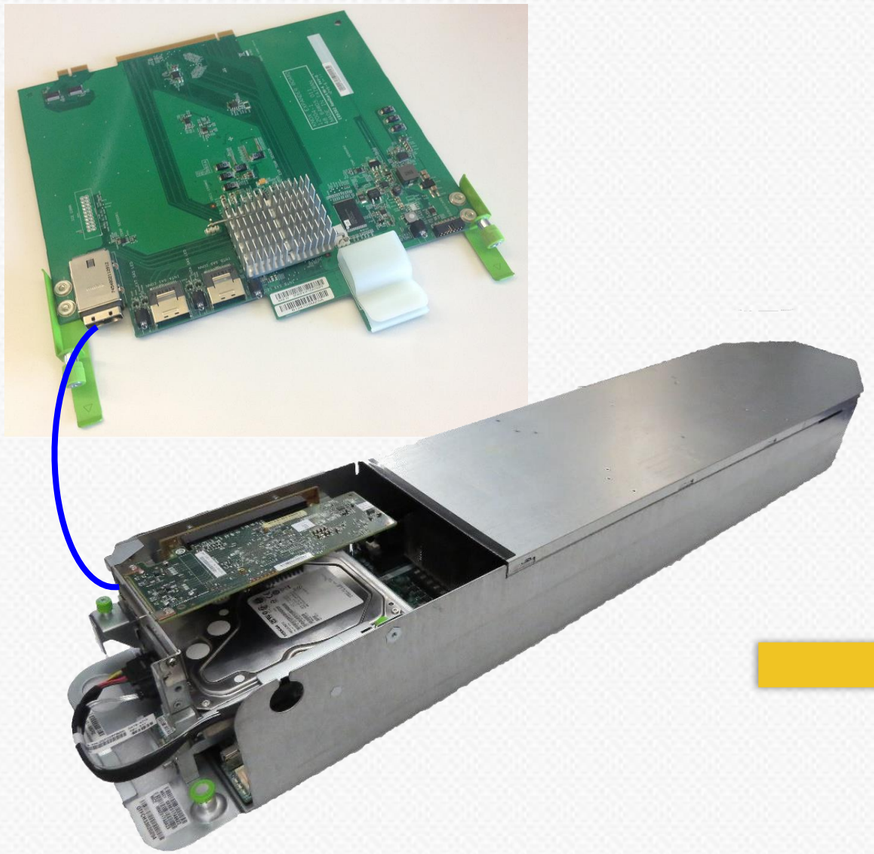
- Honey Badger and Panther+ Overview
- Panther+ and Use Cases
- Honey Badger Design Considerations
- Project Status Update
- OCP Contribution
- Q&A

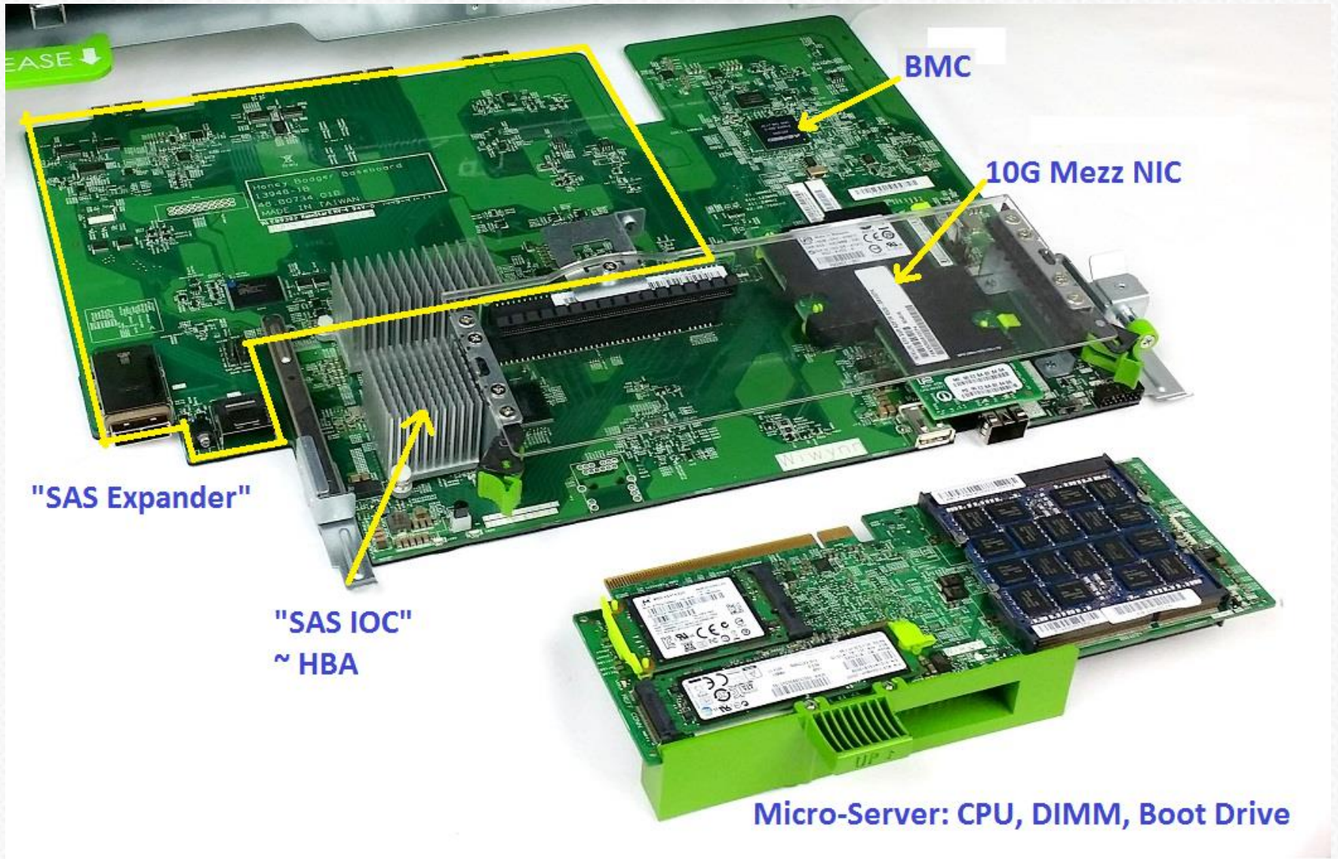
Honey Badger and Panther+ Overview

- Change Knox from JBOD to Storage Server
  - Mature storage platform + Micro Server card
  - Light Weight, Efficiency, Cost
  - Compact, Density, Cost
  - Modular, Flexibility, OCP, Backward / Forward Compatibility

Honey Badger and Panther+ Overview

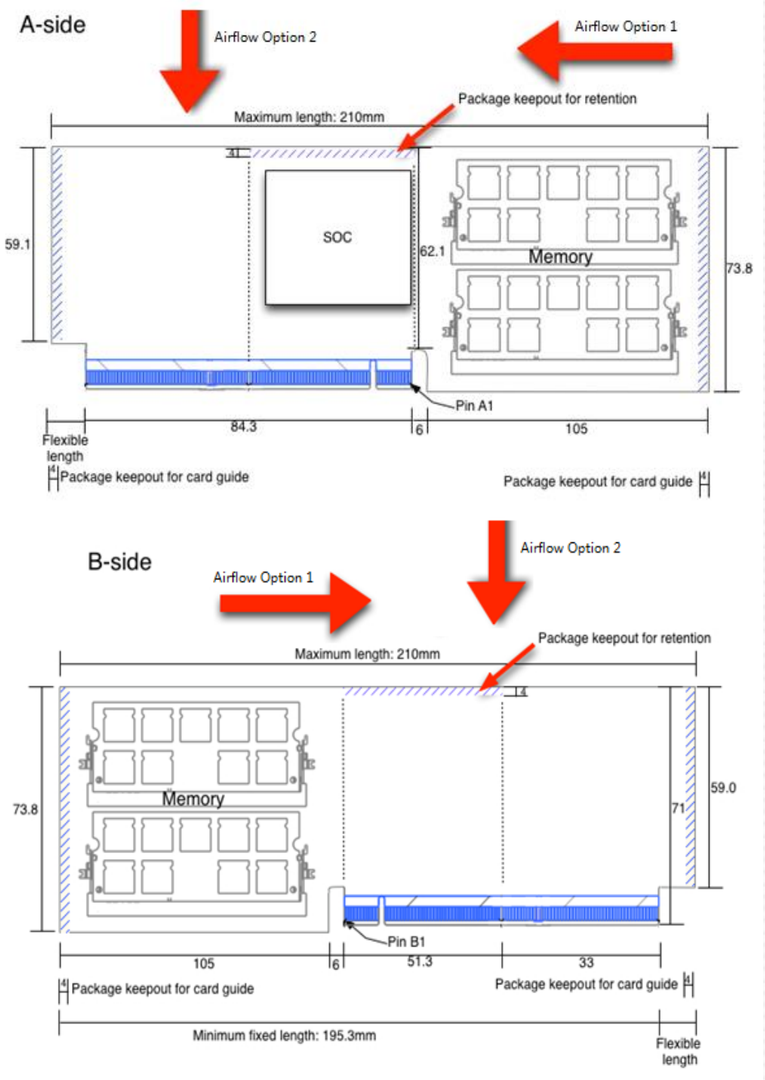
- Integrate a Micro-Server into Knox





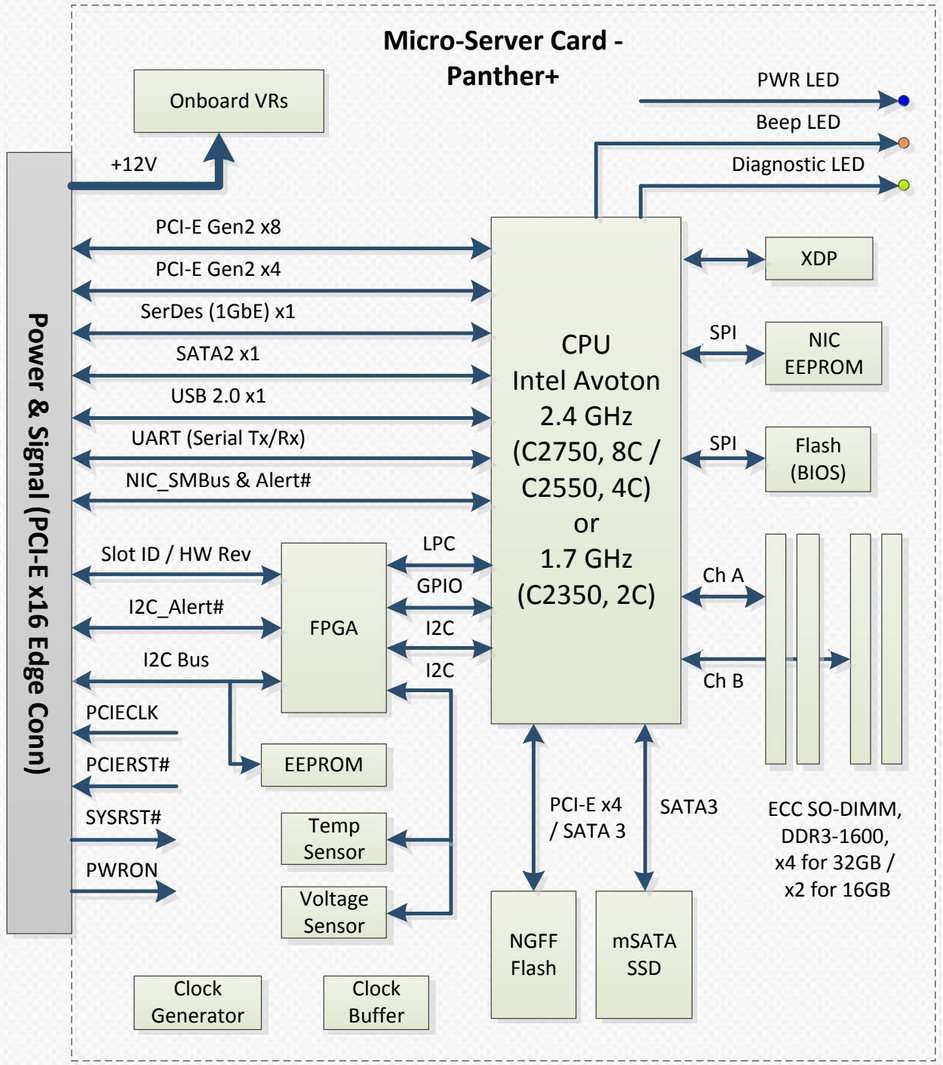
Panther+ Design and Use Cases

- Panther+ Design Overview
  - OCP Micro-Server V0.7 compliant
  - PCIe add-on card alike form factor
  - Compute node with key elements:
    - CPU, Memory, Boot Drive; Cache
    - PCIe, USB, UART, I2C; GbE
  - Intel Avoton SoC
  - Max power consumption < 40W
  - Developed by two ODMs



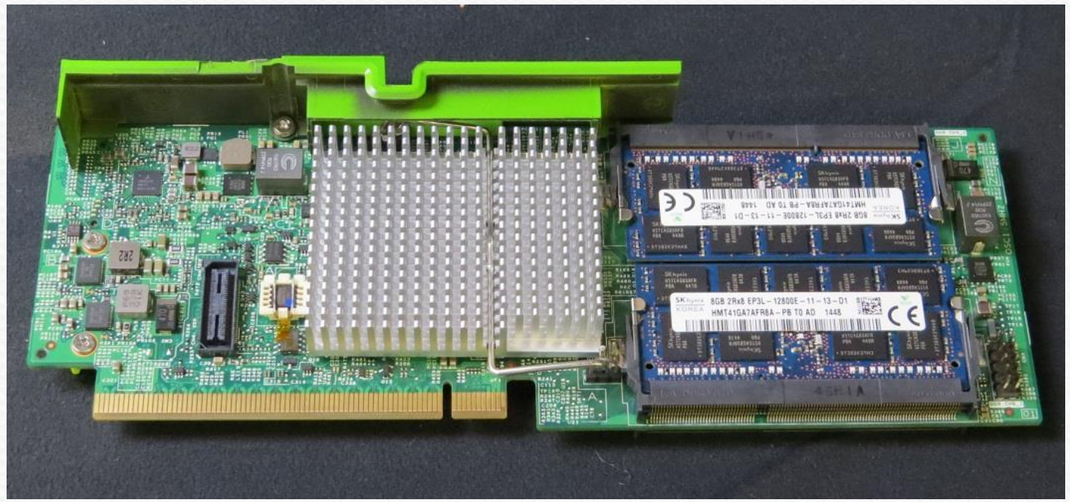
Panther+ Design and Use Cases

- Panther+ Design Highlights
  - Two local drives?
    - Boot / log
      - mSATA on SATA3
    - Photo index or cache
      - M.2 (NGFF), 2280, on SATA3
      - BOM option for PCIe x4
    - Consumer commodity
      - Transition from mSATA to M.2
      - EoL and qualification



Panther+ Design and Use Cases

- Configurations and Use Cases
  - High Config
    - Intel Avoton C2750
      - 8 cores, 2.4GHz, 20W TDP
    - Four SO-DIMMs
      - 32GB
    - One mSATA
      - 256GB
    - One M.2
      - 256GB



Panther+ Design and Use Cases

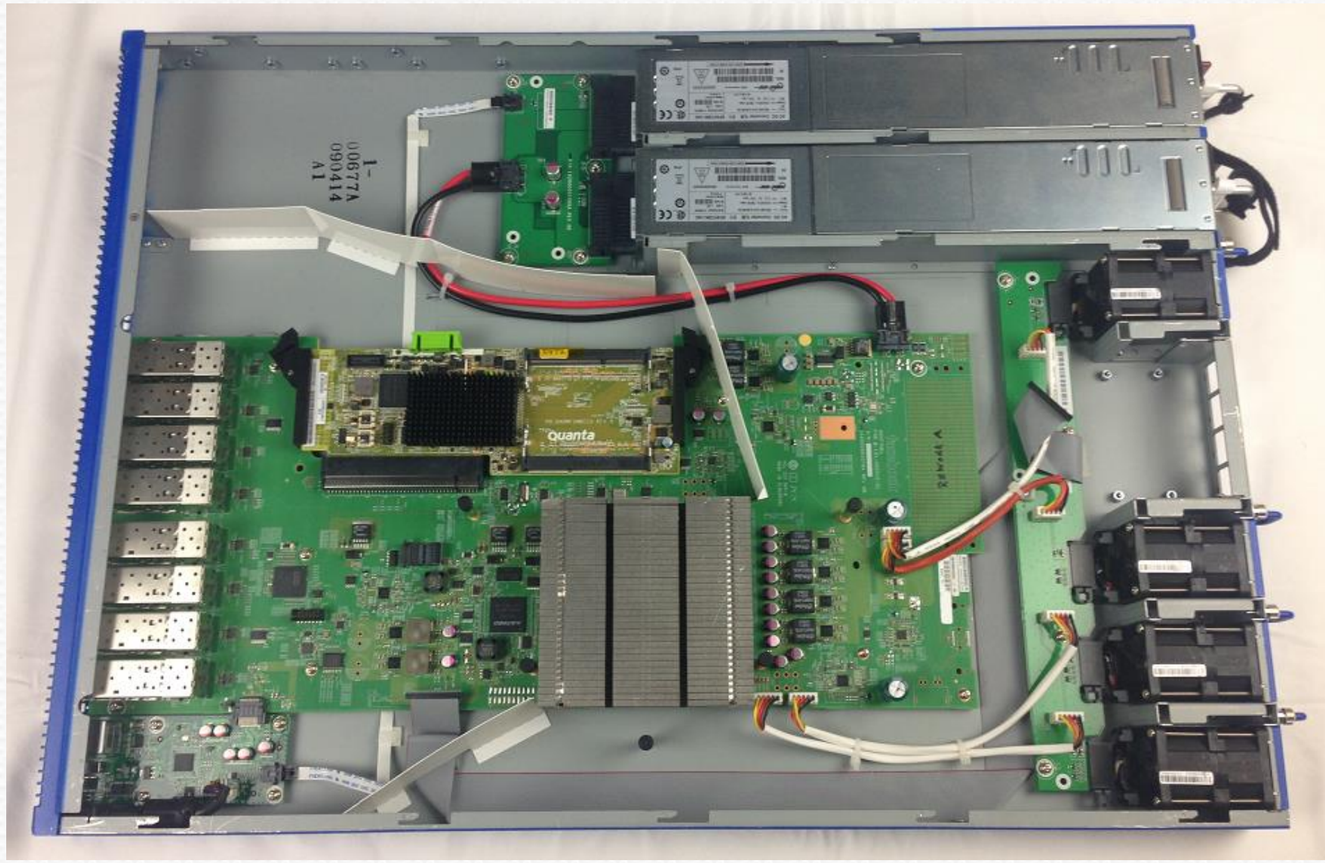
- Configurations and Use Cases
  - High Config
    - Total power ~37.3W
    - Developed by Wiwynn
    - Used in Storage Server
      - Honey Badger
        - Photo storage: Haystack / F4
        - Disaggregated storage node (for future)

Panther+ Design and Use Cases

- Configurations and Use Cases
  - Medium Config
    - Intel Avoton C2550
      - 4 cores, 2.4GHz, 14W TDP
    - Four SO-DIMM slots
      - 32GB max
      - 8GB POR
    - One mSATA
      - 128GB
    - Total power ~22.8W

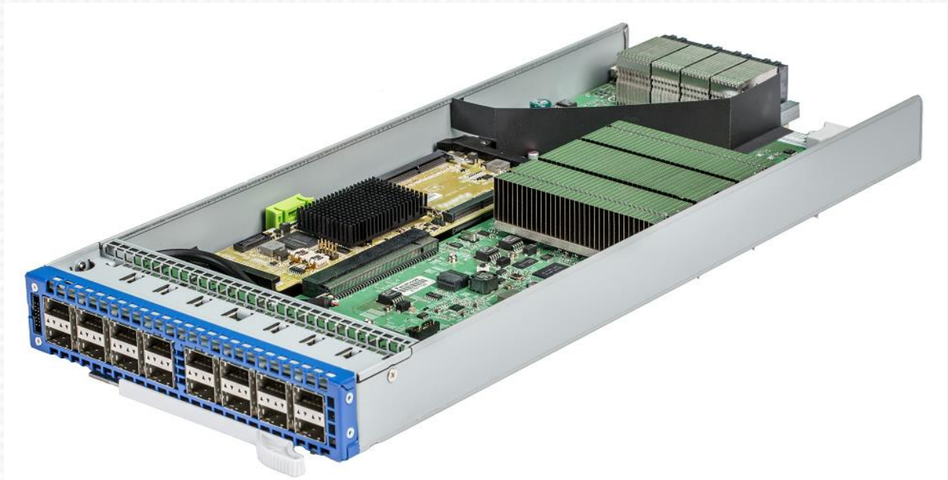
Panther+ Design and Use Cases

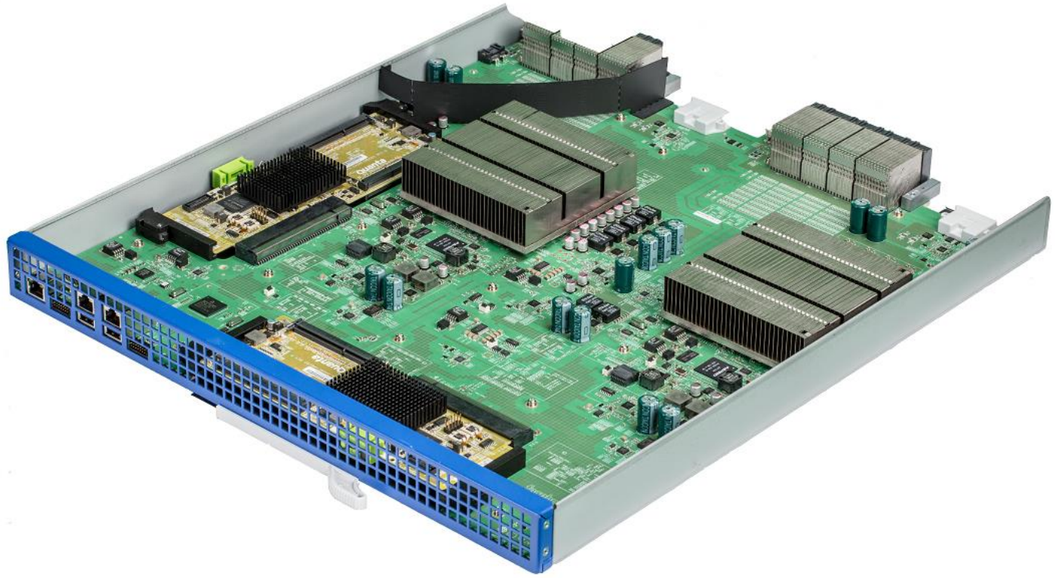
- Configurations and Use Cases
  - Medium Config
    - Developed by Quanta
    - Used in Network Switch
      - Wedge: ToR switch



Panther+ Design and Use Cases

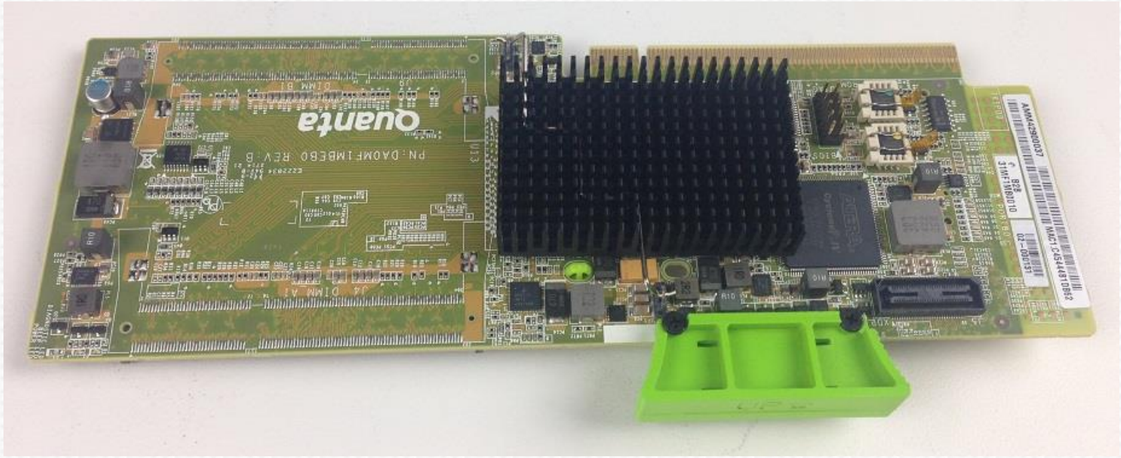
- Configurations and Use Cases
  - Medium Config
    - Used in Network Switch
      - Six-Pack: line card, switch fabric





Panther+ Design and Use Cases

- Configurations and Use Cases
  - Low Config
    - Intel Avoton C2350
      - 2 cores, 1.7GHz, 6W TDP
    - One SO-DIMM slot
      - 8GB
    - One mSATA
      - 64GB
    - Total power ~11.3W
    - Rack and power monitoring devices

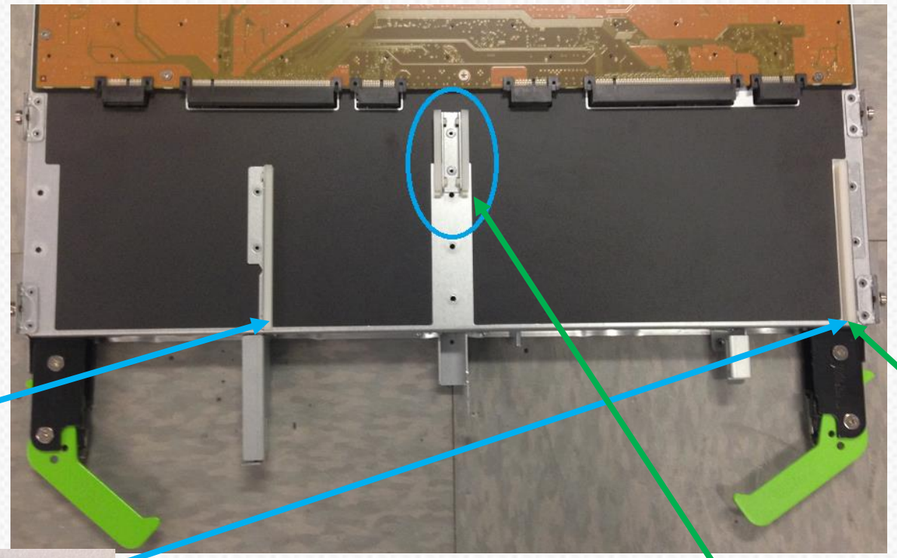


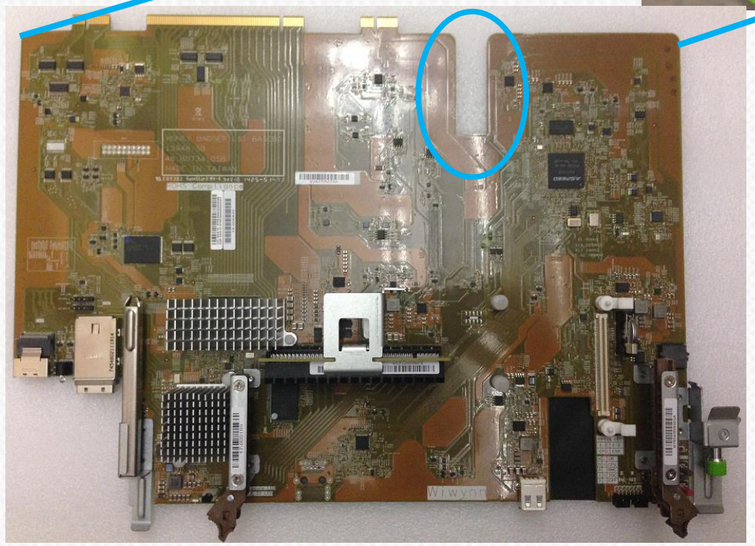
Honey Badger Design Considerations

- Why?
  - CPU utilization rate
    - <20% for Haystack w/ IVB
  - Density
    - 1/3 extra space for server
    - 2 OU wasted out of 10 OU
  - Increasing demands
    - Warm / cool data
    - Photos
    - Videos

Honey Badger Design Considerations

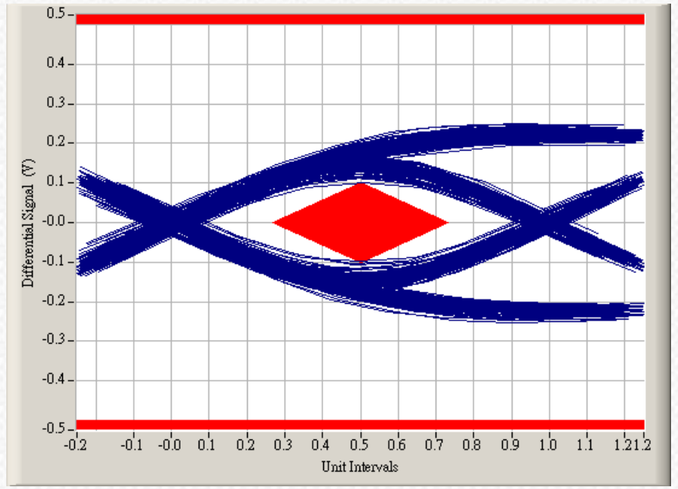
- How?
  - Backward compatible with Knox SEB
    - Short center card guide

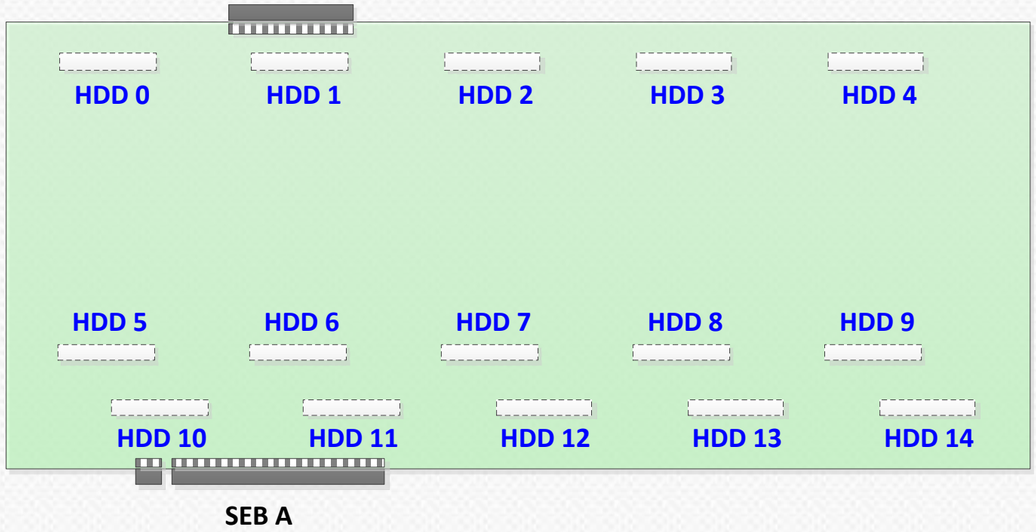


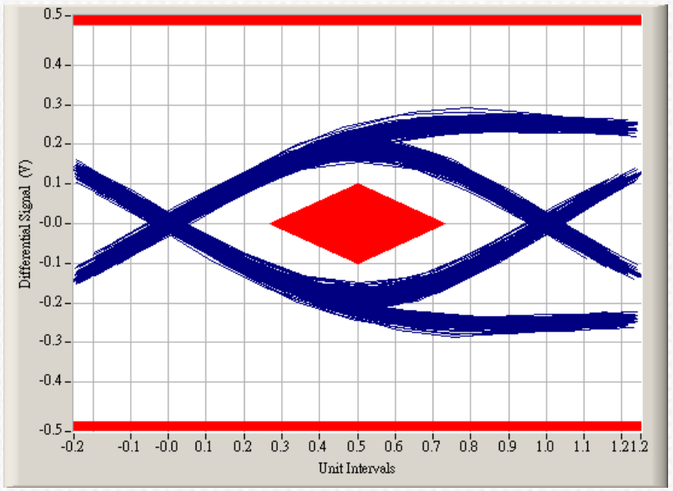


Honey Badger Design Considerations

- How?
  - New DPB with low loss PCB
    - More SI margin for SATA 6G
      - HDD 9 and HDD 14

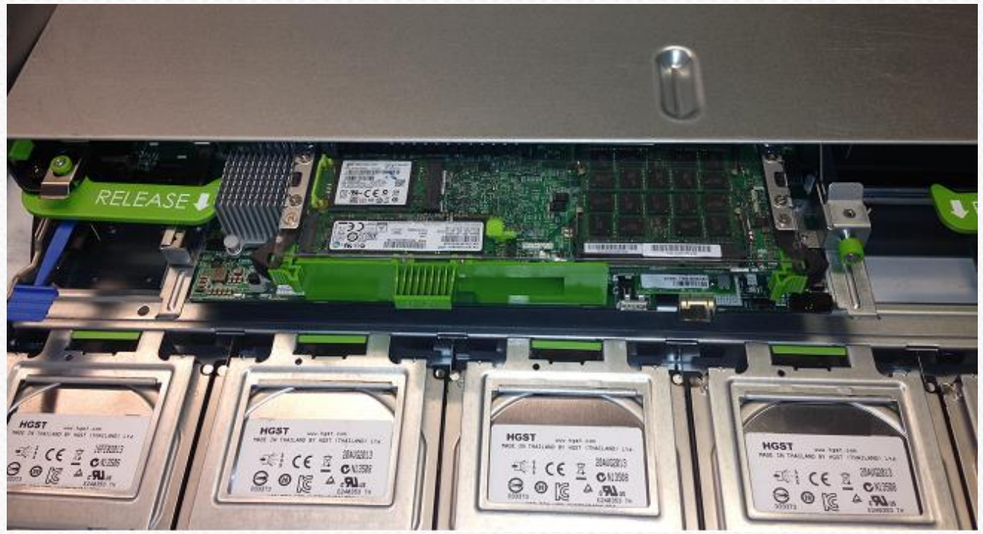






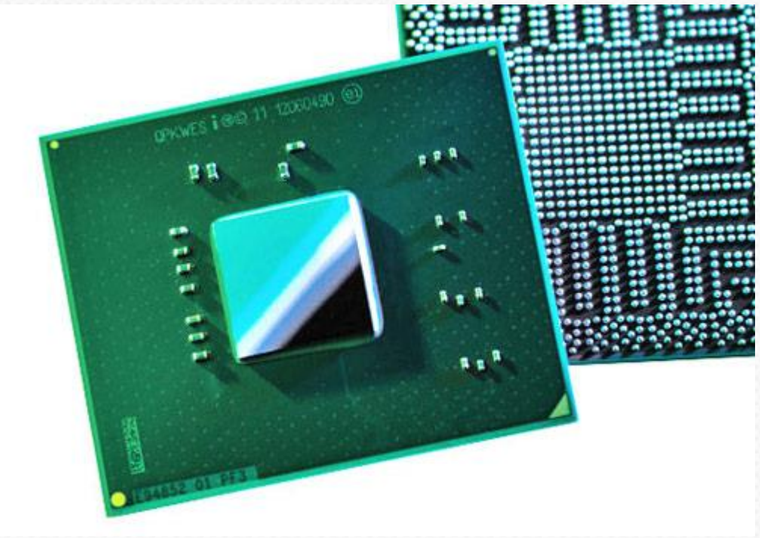
Honey Badger Design Considerations

- How?
  - Power on/off button on PTB
    - Easier for service purposes



Honey Badger Design Considerations

- What's changed?
  - CPU computing capability
    - SpecInt
      - Avoton ~97 vs IVB ~250
    - Haystack results
      - All similar to current Knox with Winterfell
        - Read only
        - Read / Write mixed
        - Sequential operation

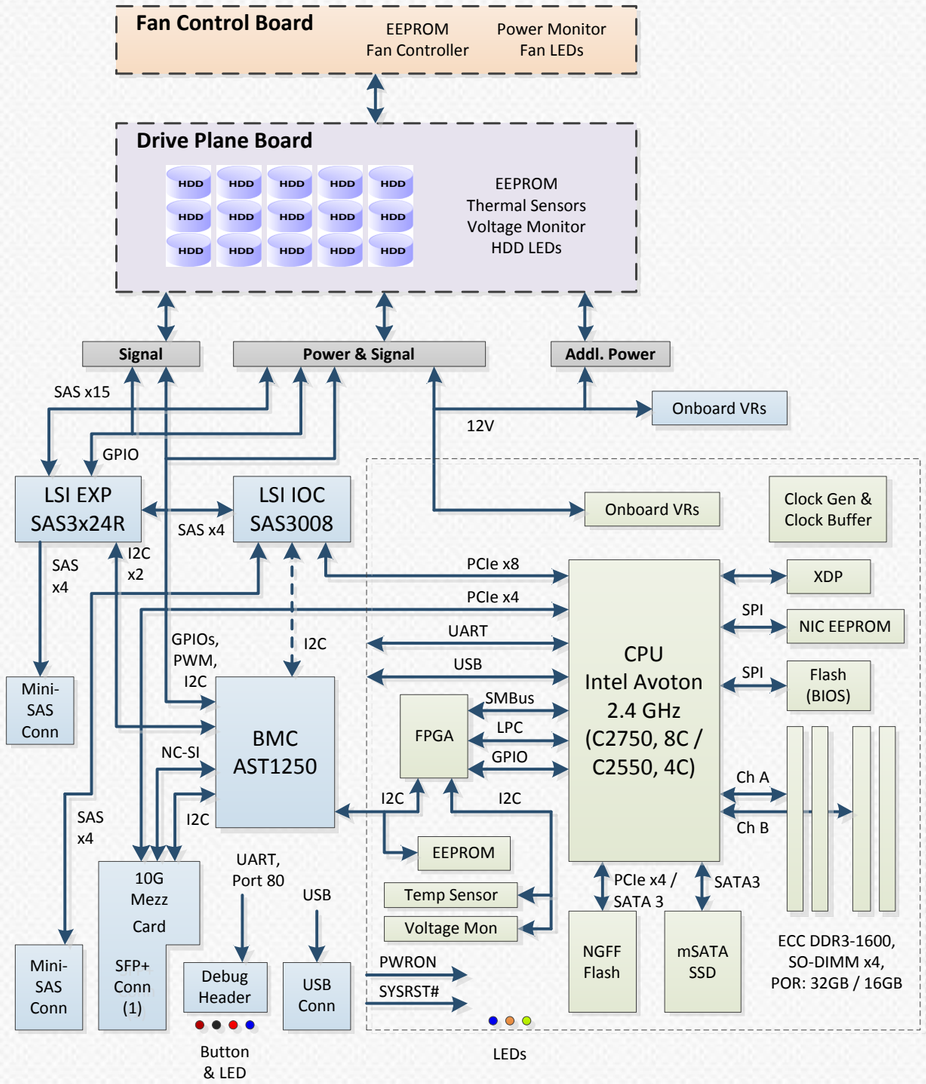


Honey Badger Design Considerations

- What's changed?
  - Total amount of memory
    - 32GB max
      - vs former 96+GB
    - Index in SSD
      - 256GB
      - First load time
      - Persistent after power cycle

Honey Badger Design Considerations

- What's the same?
  - DAS architecture
    - Server with directly attached Storage
  - Block diagram and highlights
    - Same BMC solution as OCP Servers
      - Consistency in HW
      - More similarity in management SW

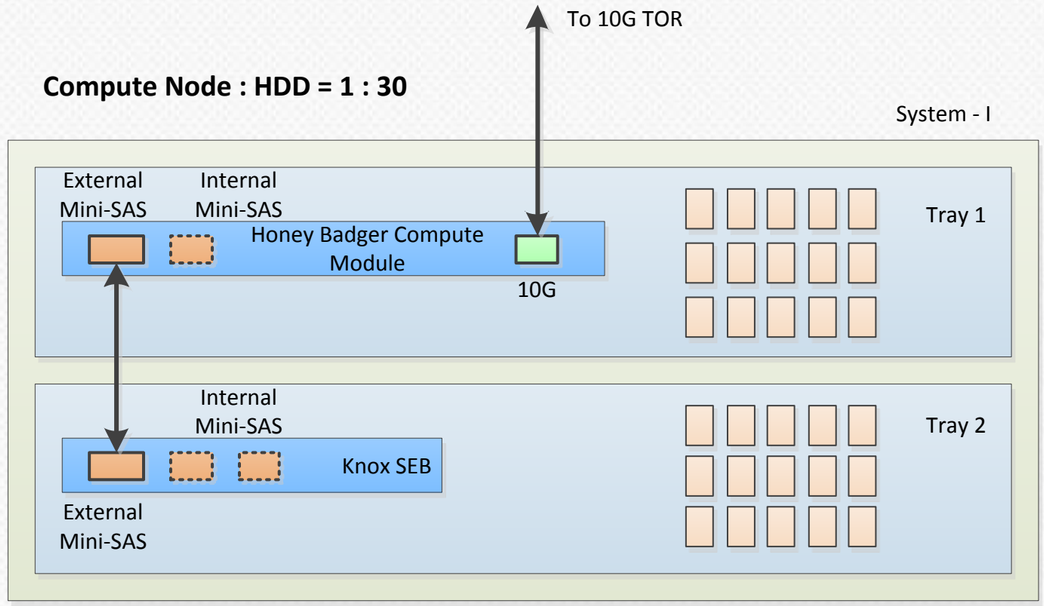


Honey Badger Design Considerations

- What's the same?
  - OCP 10G Mezz NIC
    - From two vendors
    - Only single port supported
  - OCP debug card
    - Two driving sources:
      - Panther+ POST code
      - Storage system (Knox) error code

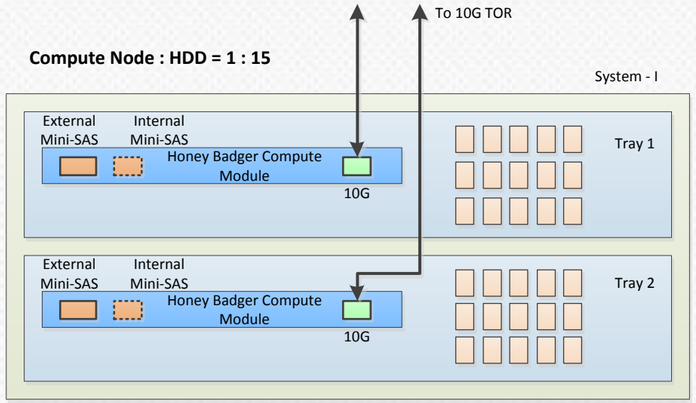
Honey Badger Use Cases

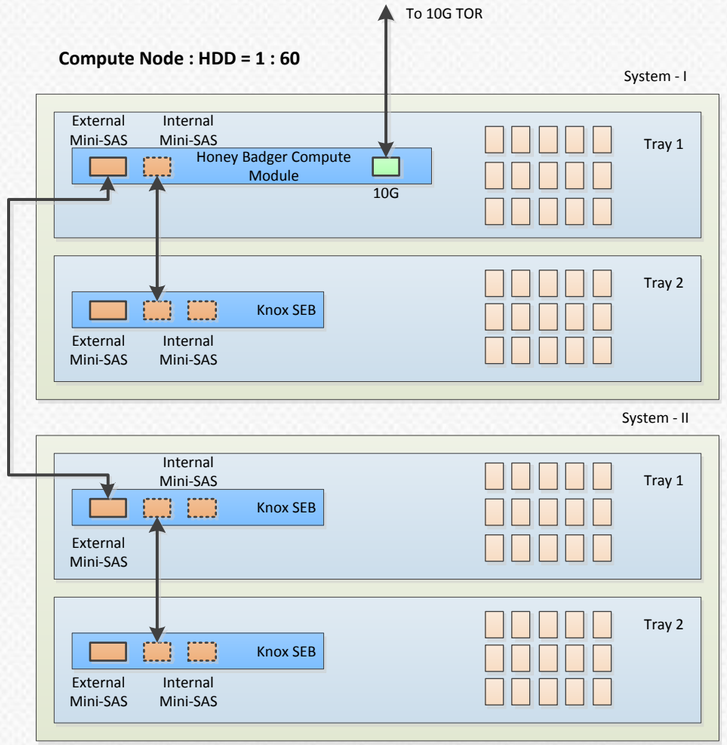
- Tested Use Cases
  - Use case 1:30
    - One system
    - One Knox tray with SEB
    - One Honey Badger tray
      - One head node handles 30 HDDs
    - One 10G DAC cable to ToR
    - One Mini-SAS cable between trays

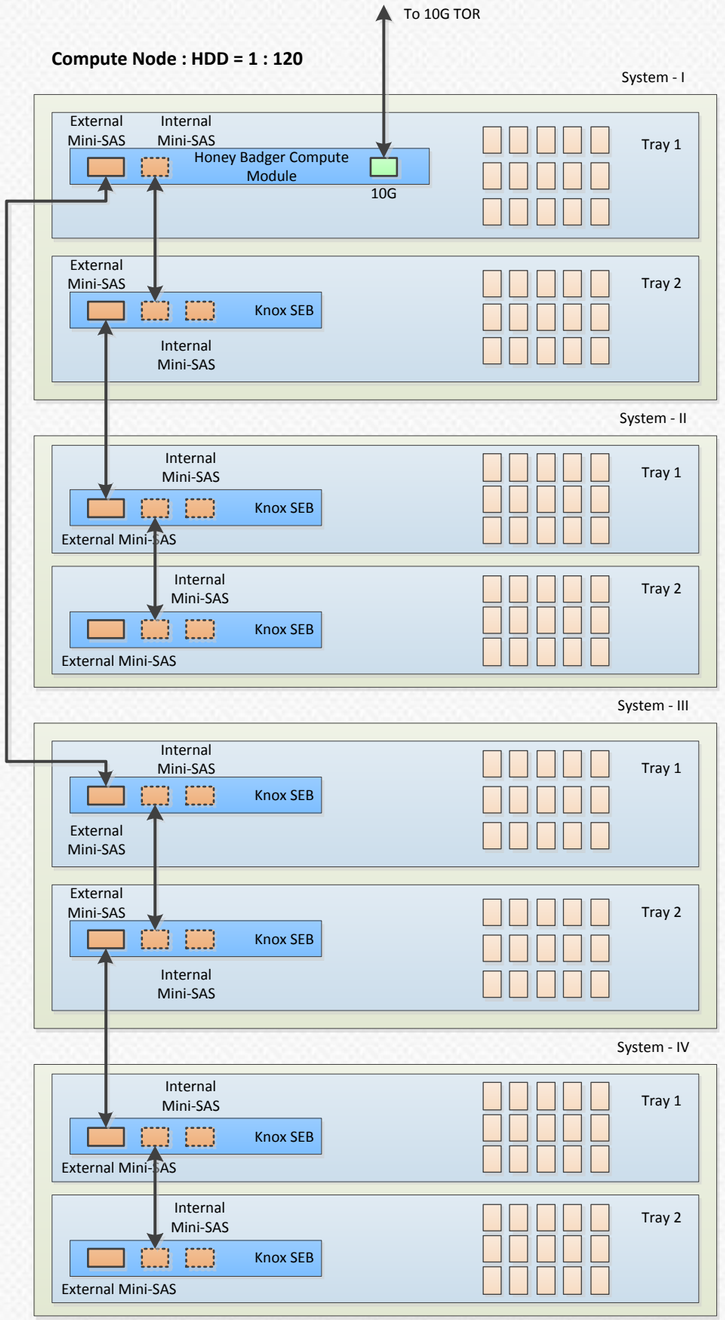


Honey Badger Use Cases

- Other Suggested Use Cases
  - Use case 1:15
  - Use case 1:60
  - Use case 1:120







Project Status Update

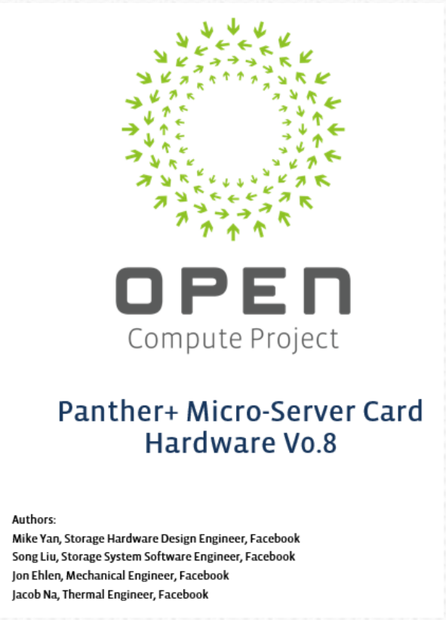
- Panther+
  - OCP networking switches
    - Wedge
      - Mass Production
    - Six-Pack
      - DVT
  - Rack and power monitoring devices
    - Hold after DVT

Project Status Update

- Honey Badger
  - Only build Avago / LSI solution
    - PMC-Sierra solution status?
  - Only build and test “Feature Model”
    - “Entry Model”
  - Only build and test 1:30 Use Case
  - Cloud SATA HDD?
    - Tested in DVT
    - Hold now
  - PVT / Pilot MP

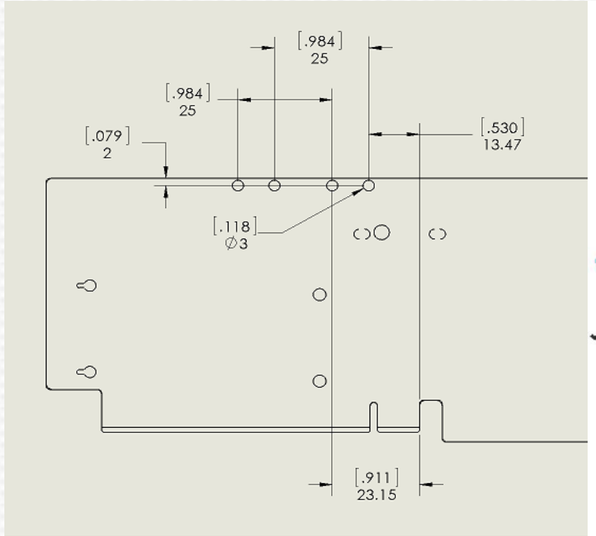
OCP Contribution

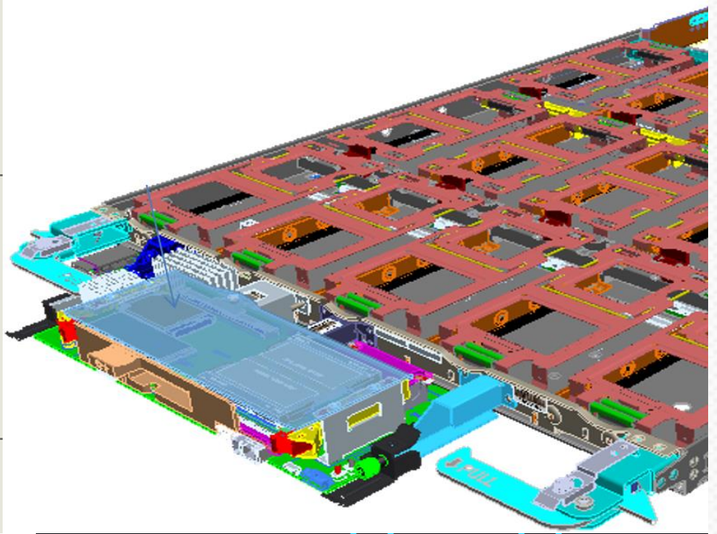
- As usual
  - Specification by Facebook
    - Honey Badger
    - Panther+
- New!
  - Full Design Package, by both two ODMs
    - Honey Badger
      - Wiwynn
    - Panther+
      - Quanta

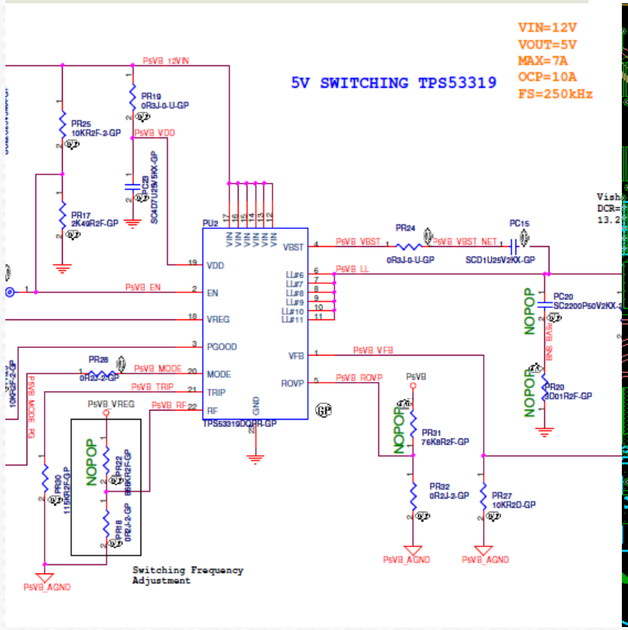


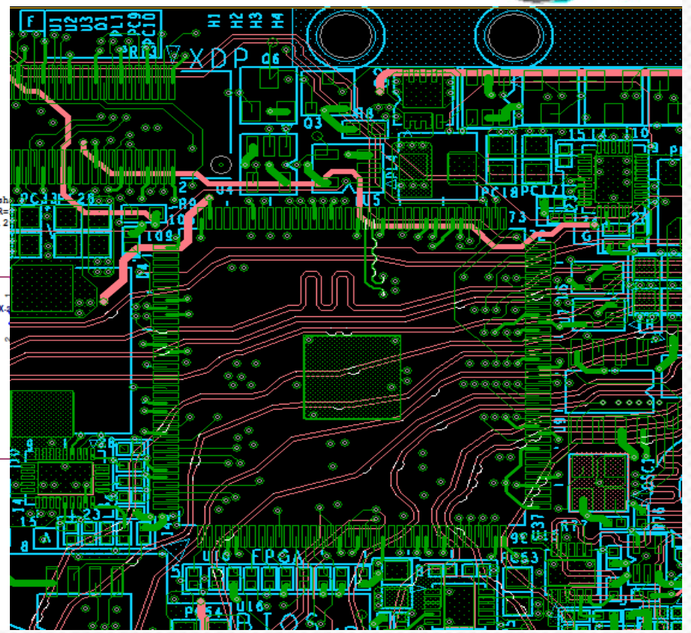
OCP Contribution

- Full design package:
  - Mechanical
    - 3D files
    - 2D drawings
    - BOM, all levels of assemblies
  - Electrical
    - Schematics
    - Layout board files, stack-up
    - Gerber files, test coverage
    - BOM, with vendor and P/N



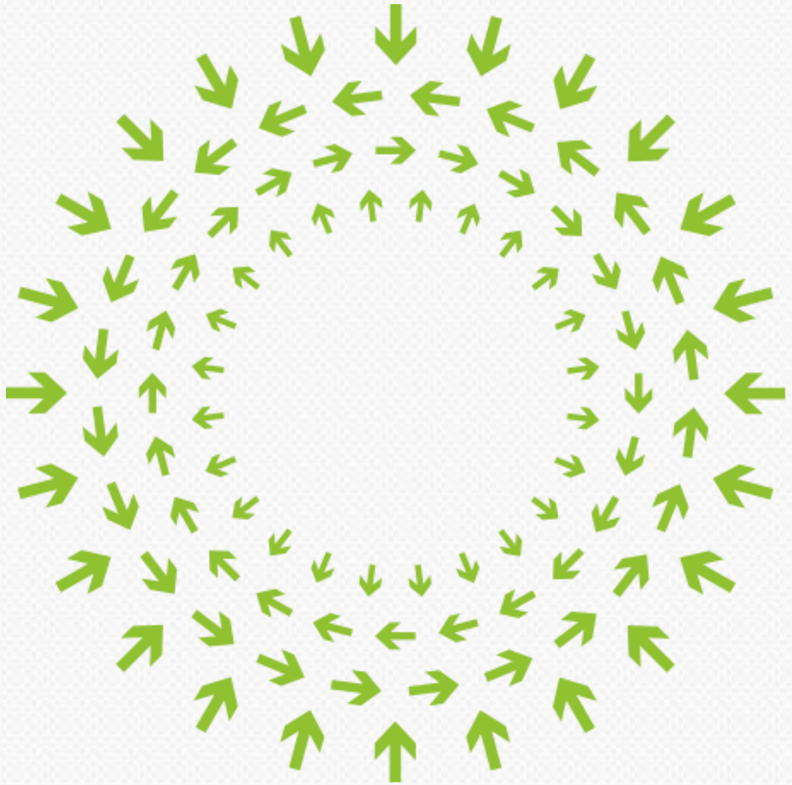






Q&A

- Contact me:
  - **Mike Yan** on Facebook
  - E-mail: yong@fb.com
  - Facebook OCP Booth: #D4



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