

# Bringing OpenBMC to HPE servers at Criteo: A collaborative model

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# Why Open-Source BMC Firmware?

- Ease debugging, enhance control and provide a security model through transparency
- Higher autonomy and quicker turnaround
- Benefit from open-source development methods
- Growing interest from Tier-2 service providers, as well as government agencies and some enterprise end users.



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## Criteo

- Adtech company
- Small Tier-2: 10 datacenters, 50k servers

## Standardize infrastructure on open firmware

- SONiC already in production
- Working on OpenBMC and LinuxBoot

## Target

- Migrate 8k HPE Gen10+ to OpenBMC (Apollo 2000 and DL325 with OCPv3 NIC)

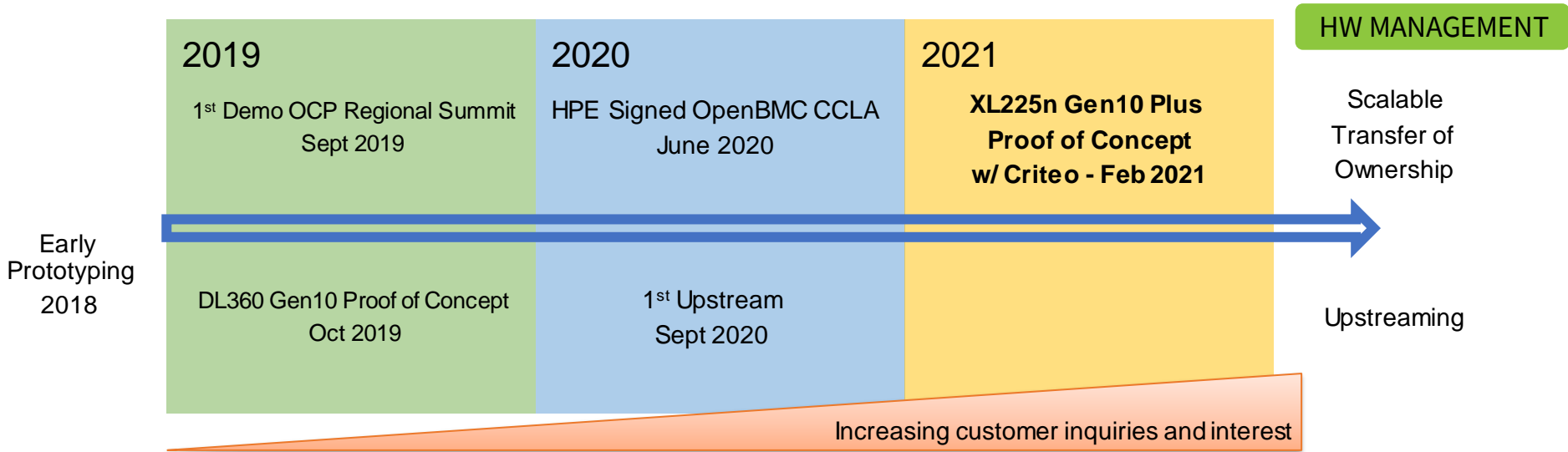
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**Hewlett Packard  
Enterprise**

# OpenBMC History



2.7 Release  
Aug 2021

2.8 "Dunfell"  
Release  
Jun 2021

2.9 "Gatesgarth"  
Release  
Feb 2021

2.10rc1 "Honister"  
May 2021

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# Challenges



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## Criteo

- No out-of-the-box OpenBMC offering
- Partner and build relationship with hardware vendor

## HPE

- Custom BMC ASIC required new SOC Enablement
- Silicon Root of Trust did not include an architected Transfer of Ownership process
- Upstreaming: HPE Server Hardware contains significant differences from currently enabled X86 designs

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# Root of trust

Transfer of Ownership: Who can sign the firmware binary that runs on the hardware?

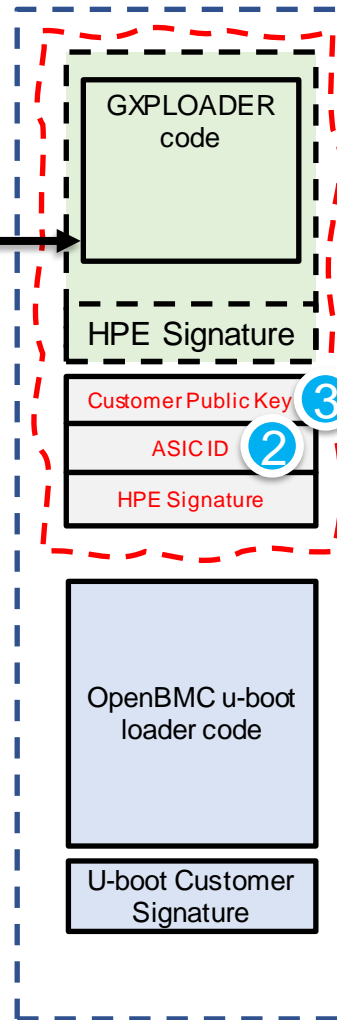
- HPE's BMC ASIC ("GXP") designed to run iLO 5 firmware
- Silicon Root of Trust designed to ensure HPE signed firmware
- No flexible "transfer of ownership" in the existing hardware

## Proof of Concept Solution

1. HPE GXPLOADER binary – HPE signed and can run on ASIC
2. Requires Customer Key Block
  - HPE signed
  - ASIC locked to a unique ASIC ID value
  - Contains customer public key for U-Boot validation

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1 Micro-bootblock  
Silicon Root of  
Trust  
validation 2



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1 Write protected  
Customer key  
block

3

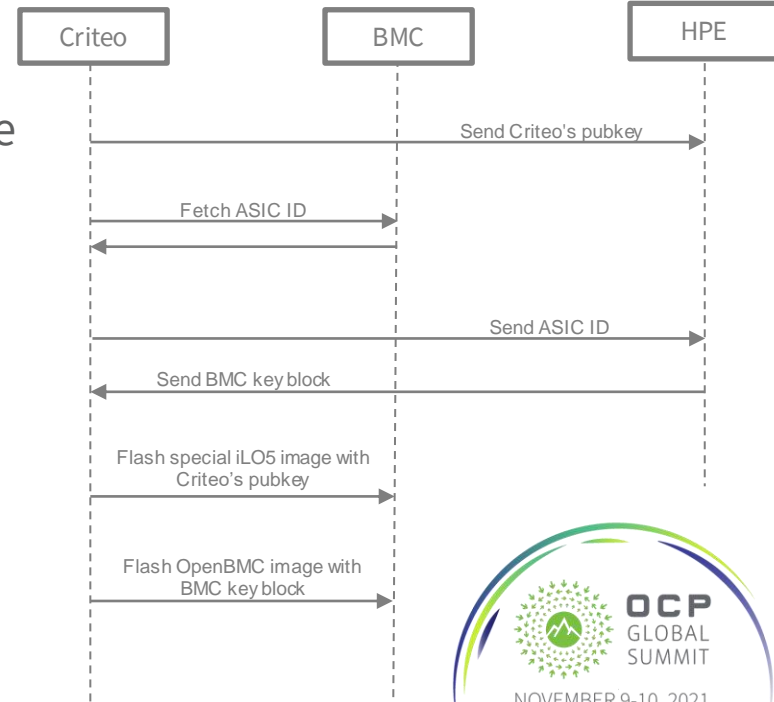


# Conversion process



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- Conversion process is cumbersome on current generation
- Collecting ASIC ID and exchanging them at scale is a work in progress
- Each BMC has a unique key block and thus a unique image
- Will be easier on future generation



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# Continuous integration and testing



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- Need to run tests for every commit on production hardware
- Covid impacted the way we develop firmware
- Production hardware doesn't always support flash emulator
- Make it look like something we already know/use:  
Smart PDU and network boot the kernel/initramfs
- Test suite needs a lot of improvements

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# Status

- Proof of concept delivered to multiple end users
- OpenBMC runs well on HPE GXP ASIC
- Collaboration working well
- Criteo has been able to fix bugs autonomously
- Upstreaming slower than hoped – backlog of patches
- Live demo on HPE booth with Criteo engineers

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# Next Steps

- Warranty and support model
- Architect a scalable “Transfer of Ownership” capability
- Decommissioning and circular economy impact
- Upstreaming and contributing value to the community



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# Call to Action

- Explore new BMC boot workflow
- Get in touch – Live demo on HPE booth

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Contact the community : <http://github.com/openbmc/openbmc>

Mailing list: <http://lists.ozlabs.org/listinfo/openbmc>

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