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Open System Firmware

OSF (open System Firmware) – Intro and Progress Update

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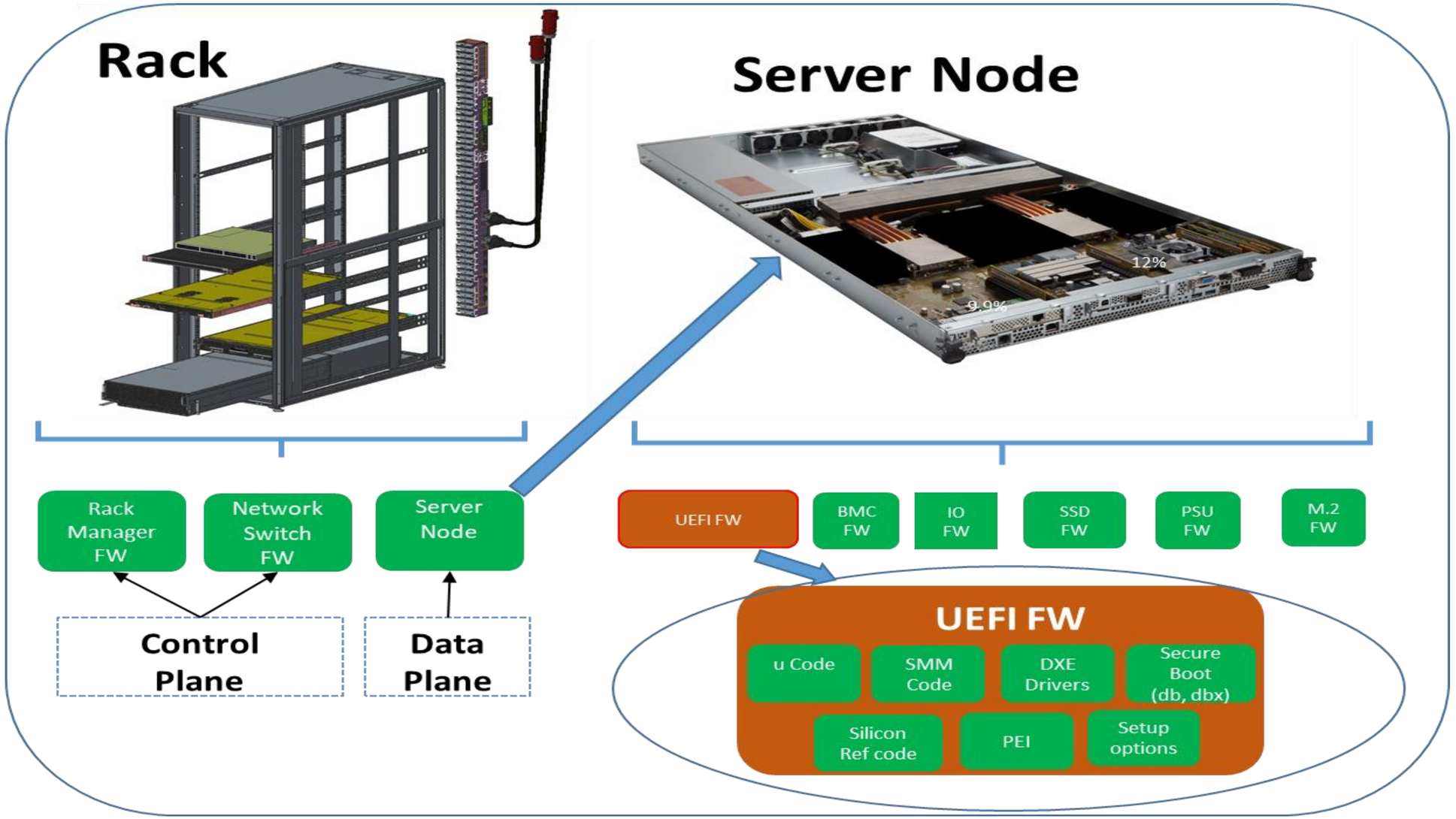
OCP/OSF – Project Lead

Where does System Firmware reside in a typical Cloud/Rack?

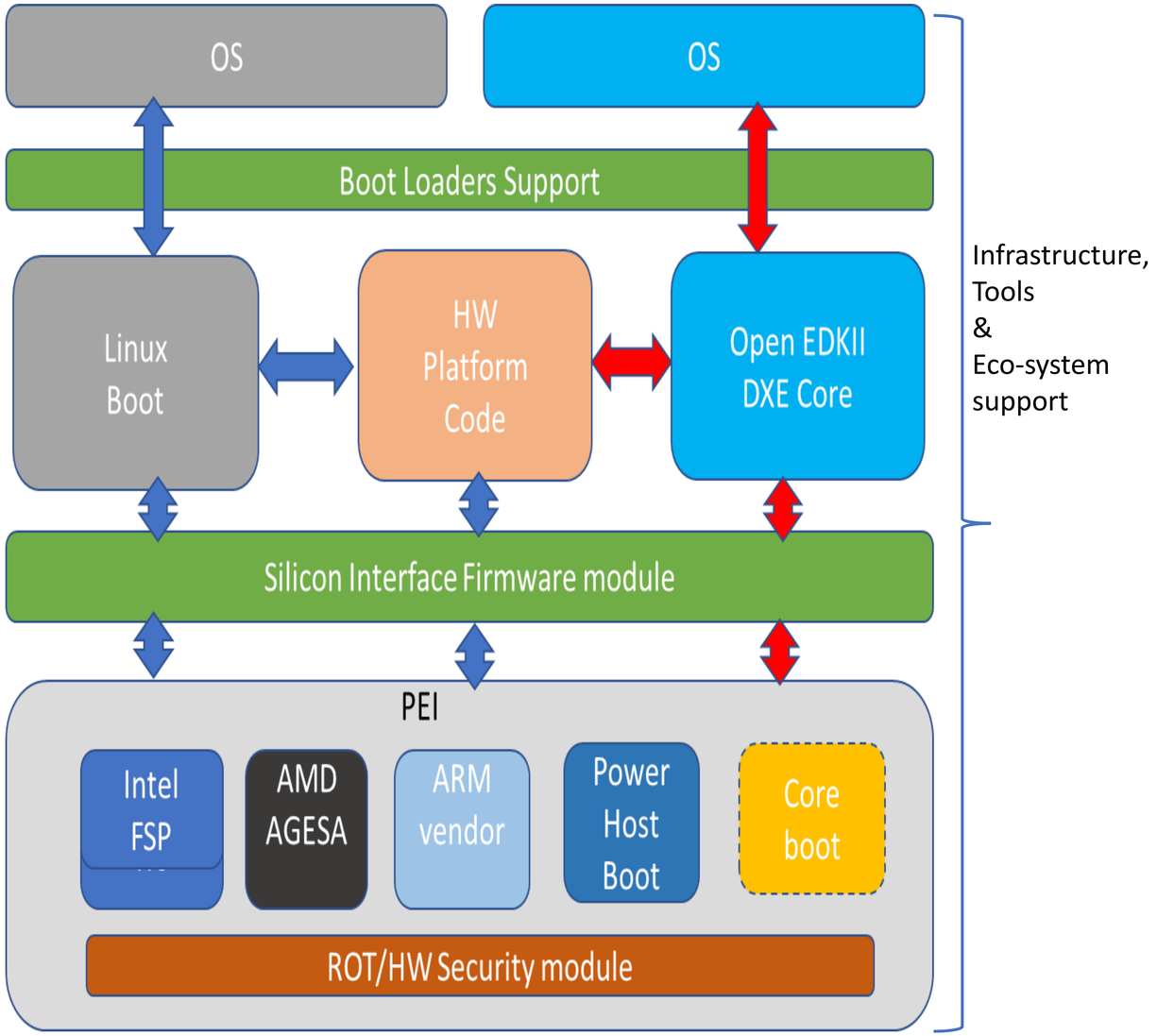


Current Challenges ‘System Firmware’ and Why Open?

- ‘Closed’ System Firmware impacting rapid prototyping of new or derivative products development.
- Variance in boot flows of different Silicon vendors’, causing inefficiencies in developing common System Firmware and maintaining the code .
- Various System Firmware implementations exists, but **not one single implementation** addresses the needs of different CSP use models.
- System Firmware current **development models not able** to keep pace with ‘High Octane’ Innovation by multiple Cloud HW vendors.
- Current implementations of System Firmware is **not Cloud Ready**

Truly Open ‘Solution’ = open HW+ open FW

Open System Firmware (OSF) - Intro



Mission: Develop an open source philosophy based 'system firmware' (BIOS) modules, to support different Operating Systems and different CPU silicon vendors.

Major Companies Contributing to OSF development: Microsoft, Intel, Google, Facebook, Lenovo, IBM, Two Sigma, ITRenew, 9 Elements, Cavium, AMD and many more.

Major Work Streams: Open EDKII DXE core, Linux Boot, Core Boot, Silicon Interface Firmware Module, Intel FSP, AMD AGESA, ARM boot code, HW platform module, Build tools, Automated test support, HW requirements, etc.

GitHub Repositories Collateral link:
https://github.com/opencomputeproject/OSF

Bi-weekly OSF discussions : Architectural reviews, workstream progress, design reviews, agenda setting and other collaborative discussions on OSF development. Contact the following to subscribe, participate and contribute:
gundrala.goud@ocproject.net
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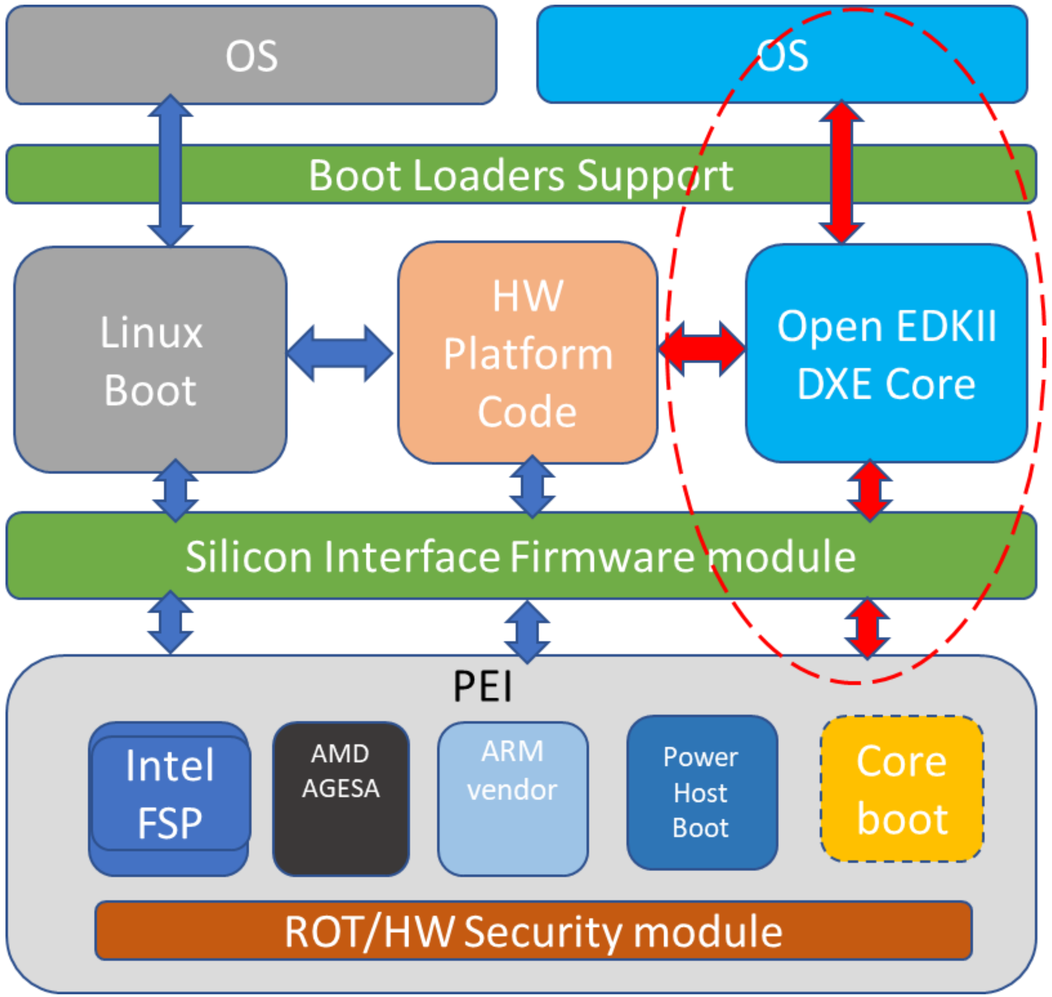
rajeev@opencompute.org

Collaborative Community development model

OSF workstreams summary and progress updates

Workstream name	Owner (Companies)	Progress update
PEI	**Intel**	Intel delivered as part of initial open EDKII based Mt.Olympus source tree; Intel continues to refine and update PEI module capabilities
Intel FSP binary	**Intel**	Intel delivered as part of initial open EDKII based Mt.Olympus source tree and more importantly fixed “and also fixed FSP module licensing issue, to enable other Github OSF repositions.
Core Boot	**9 Elements, FB**	Made tremendous progress, booting on a FB ref platform – stay tuned for detailed update from FB
Silicon Interface Firmware Module	**Intel**	Intel delivered initial document with suggested workflows and the architecture being reviewed at OSF bi-weekly calls and across industry forums seeking feedback
Linux Boot	**Google, FB, Two Sigma, ITRenew**	Made great progress – stay tuned for detailed update from Google, Two Sigma, FB and ITRenew
Open EDK II DXE core	**MSFT, Intel**	Initial tree developed and booting on Mt.Olympus OCP HW and currently adding additional capabilities. More details in the open EDKII workstream progress update slide.
HW platform modules	**HW supplier**	Mt.Olympus platform module already uploaded as a open EDKII package from MSFT and Intel.
Boot loader support	**OS vendor(s)**	Discussions underway
Build tools	**Two Sigma**	Made progress and identified gaps in current tool chains - WIP
Automated test support	**ITRenew, Google, Lenovo**	Made progress by leveraging existing open frameworks; Lenovo is passionate to take on this workstream and collaborate with Google and Horizon - WIP
Telemetry/Diags	**Owner need to be identified**	No update
FW variables standardization	**Intel, MSFT**	Intel, MSFT engineers working on architectural proposals - WIP
Source code control and bug tracking	**Google, 9 Elements, OCP/Rajeev**	GitHub based infrastructure was setup by OCP/Rajeev and continue to refine based on OSF members feedback
HW requirements to comply to OSF boot	**Two Sigma, MSFT**	Initial 0.5 version of document developed and OSF members reviewing it.
Security coding guidelines	**Owner need to be identified**	No update
AGESA RC binary	**AMD**	AMD is still working on this
ARM Boot code binary	**Cavium**	Just started engagement
Power Host boot	**IBM**	Just started engagement

Open EDK II DXE Core workstream Goals and Progress



Key Goals:

- Make complete OSF tree open with Silicon vendor's binary modules.
- Support multi-silicon architectures (Intel, AMD, ARM) and multi-OS (Windows and Linux).

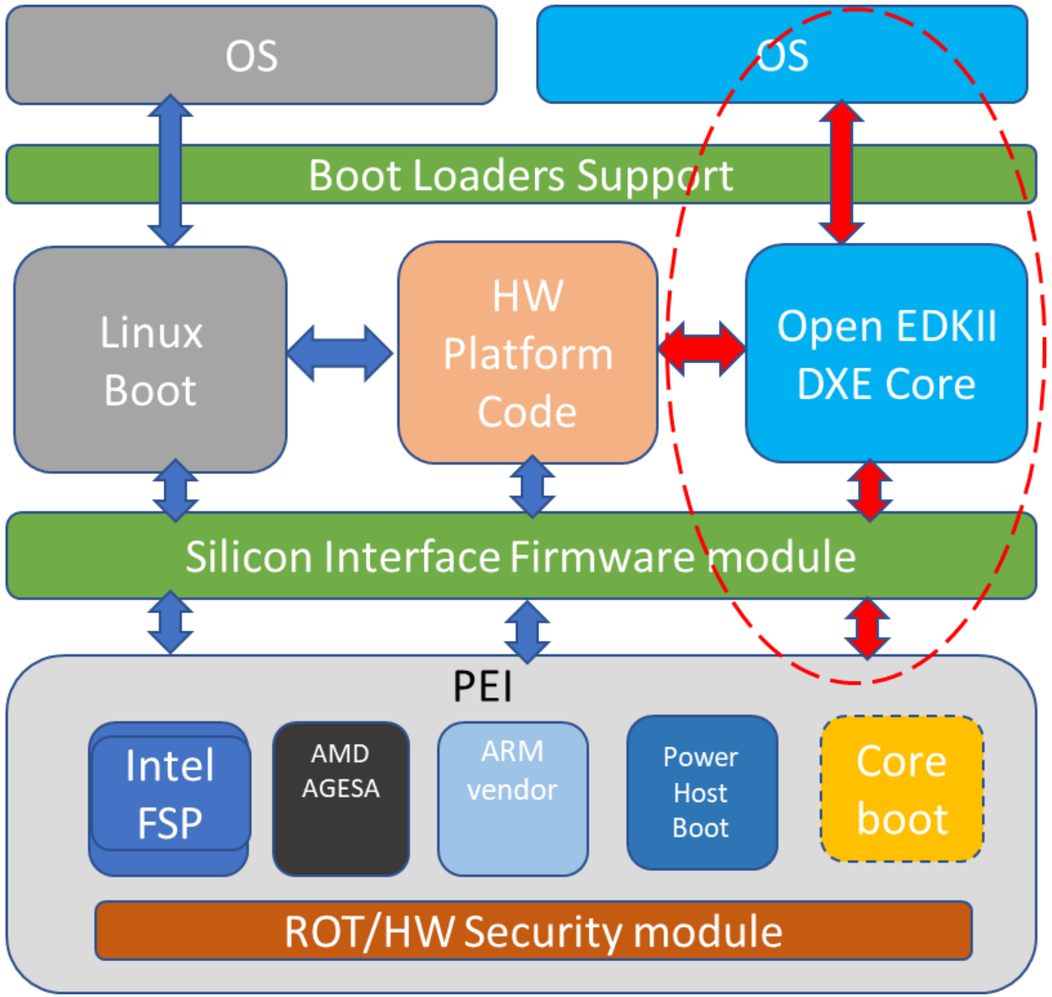
Development Progress:

- MSFT/Intel delivered initial open EDKII based tree to support Mt.Olympus HW **– Done**
- Open EDK II based tree boot optimizations on Mt. Olympus **- Done**
- FW update tool interfaces, **setup options, FW variables standardization, and IPMI interfaces** – **WIP**
- **Simply Setup and make it OOB configurable** - **WIP**
- Optimize the solution for Performance, Reliability, Serviceability, Scalability and Deployability – **WIP**
- Firmware Security features like Secure Boot, Measured boot, Signed FW, Secured Capsule FW update, etc. – **Plan to port to OSF tree**
- Support open security module (Cerberus) – **Plan to port to OSF tree**
- Open EDK on Mt. Olympus demonstrates additional features like HTTP boot and an order of magnitude reduction in boot time – attend Intel presentation session
- FSP and binary FV license updated https://www.phoronix.com/scan.php?page=news_item&px=Intel-Better-FSP-License after discussions in OCP OSF

**https://github.com/tianocore/edk2-platforms/tree/devel-MinPlatform/Platform/Intel/PurleyOpenBoardPkg/BoardMtOlympus

Let's together accelerate Open System Firmware development

Work Stream – Silicon Interface Firmware Module Progress



'Silicon Interface Firmware module' – Great progress made on initial proposals - WIP

- **Continue to evolve a workflow that can allow for binary FV, Intel FSP, Linux Boot, and Full UEFI server solutions**
- **Initial workflow proposals doc at: https://docs.google.com/document/d/1DWFdPrZlifSxznirN4r5QemmBEi6-1Fpfy0lac77arQ/edit**

- **Reviews and deep dives in forums at OSF bi-weekly calls and other industry forums like http://osfc.io**

Let's together accelerate Open System Firmware development

Open System Firmware

Linux Boot workstream progress update

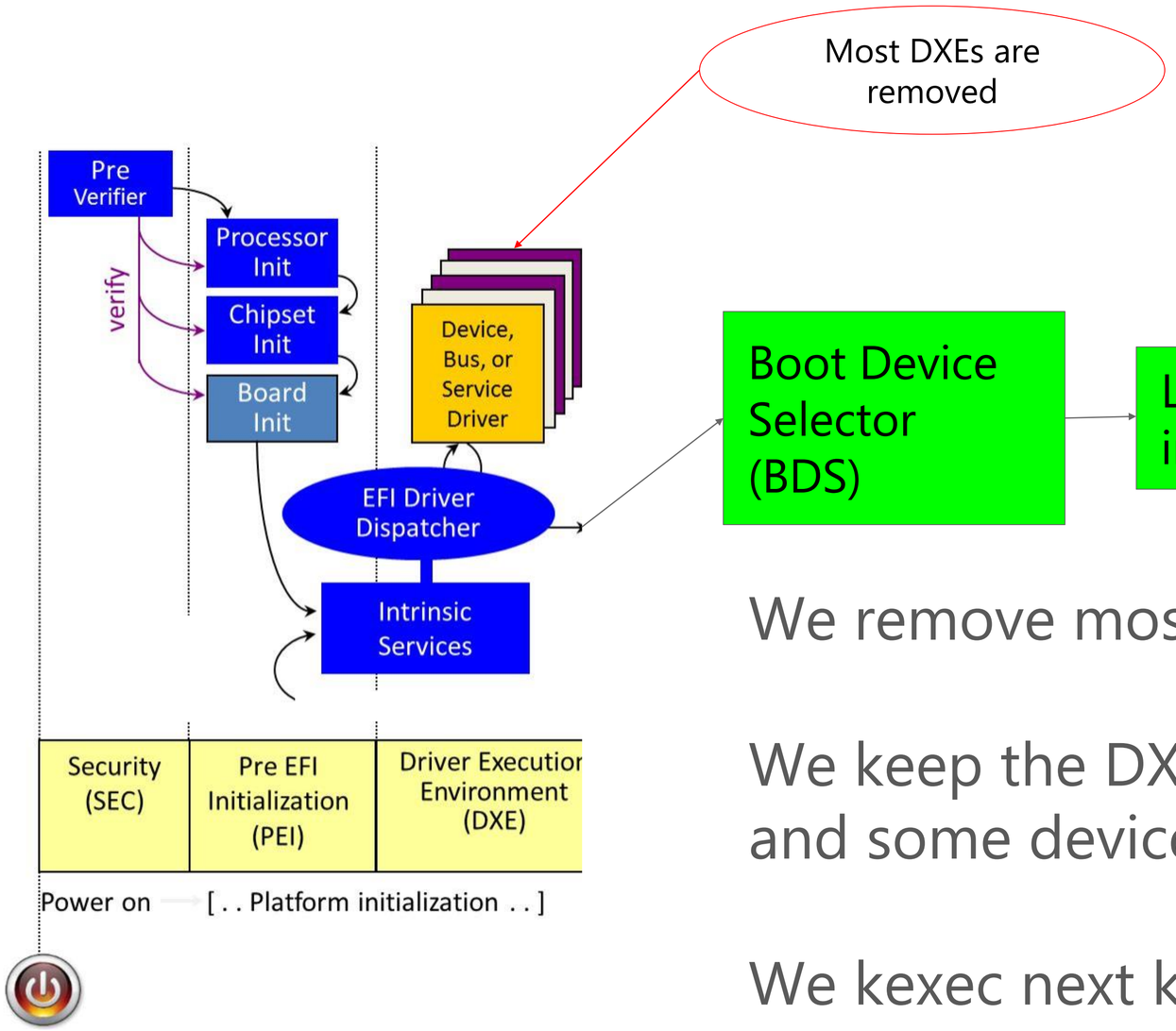
Chris Koch - Software Engineer/Google

Dave Hedricks – Firmware Engineer/Facebook

Recap: LinuxBoot on OSF

Linux knows how to initialize devices.

Compile kernel as a PE32 executable: EFI_STUB



We remove most DXEs.

We keep the DXECore around for ACPI and some device initialization.

We kexec next kernel (space).

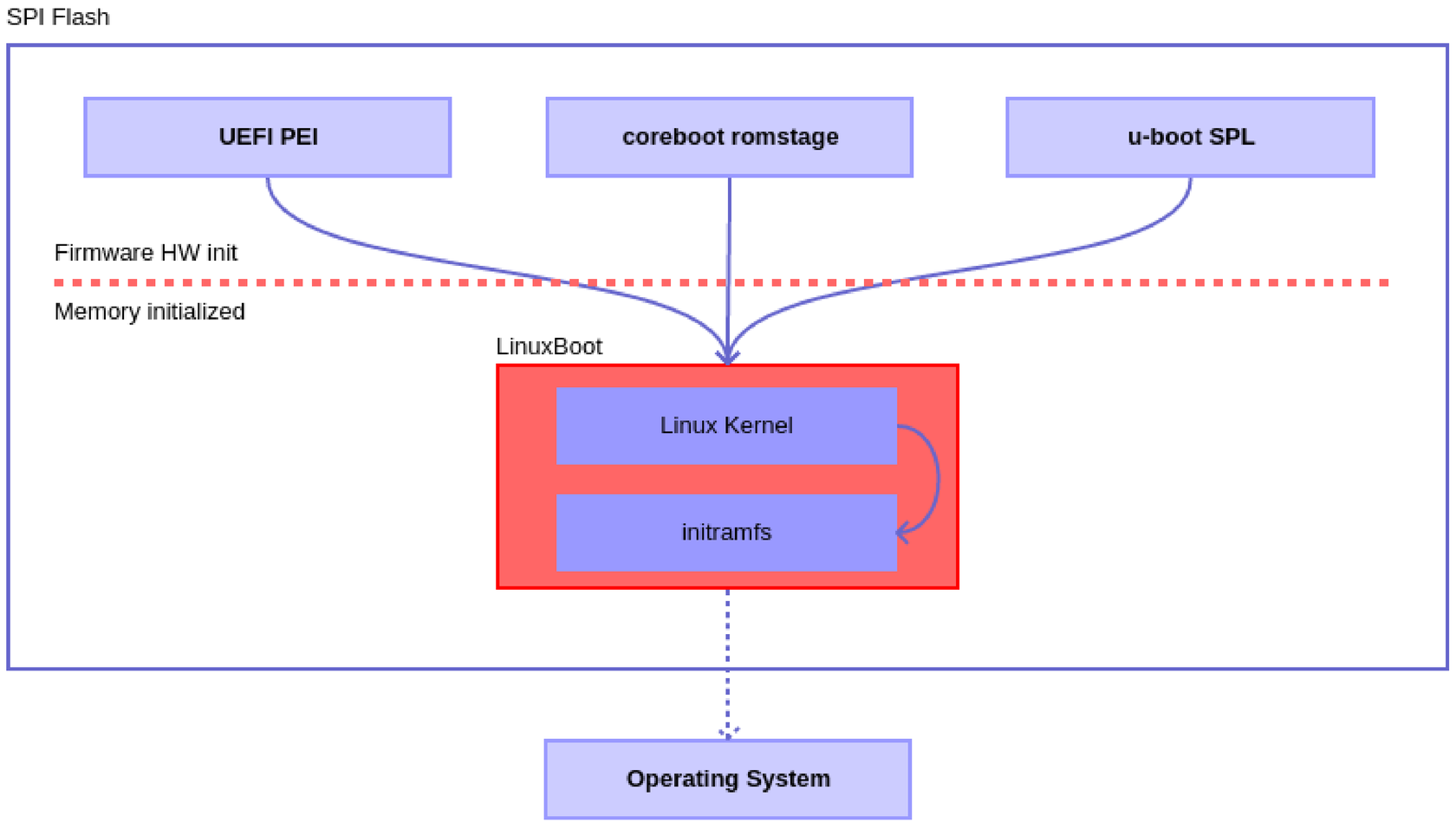
Recap: Options

not a new idea

- OpenPOWER
- ARM embedded devices
- LinuxBIOS aka coreboot :)

works with

- UEFI
- u-boot
- OPAL
- coreboot



Why?

- Linux has problems, too!
  - Yes, but it's **open, measurable, reproducible.**
  - Has drivers for everything.
- Kernel Engineers = Firmware Engineers.
  - How many of your SREs or Sysadmins know Linux vs UEFI?
  - Go see the Facebook talk!

Where We Are Today: Boards

- OCP
  - Winterfell
  - Leopard
  - Monolake
  - Tioga Pass
  - Wedge 100s
- Anything coreboot-compatible, e.g. Chromebooks.
- Your board?
  - We’re happy to help you prototype LinuxBoot on your board.

Where We Are Today

LinuxBoot is **agnostic** to the userspace, but we choose u-root.

- Userspace based on Go is maturing https://github.com/u-root/u-root
  - Easy Cross-Compilation
  - Easily Reproducible
- Facebook's Go bootloaders based on u-root: www.systemboot.org
  - DHCPv4, v6, SLAAC-based netbooting
  - Disk booting
  - High-level TPM library & CLI
- Custom bootloaders to fit **your** security model
  - Use systemboot/u-root framework to write your own.

Where We Are Today

- ITrenew selling **OCP LinuxBoot** systems
  - E.g. Winterfell
- Facebook experimenting with LinuxBoot
- Google experimenting with LinuxBoot
- Nexedi under test

Talks Later Today

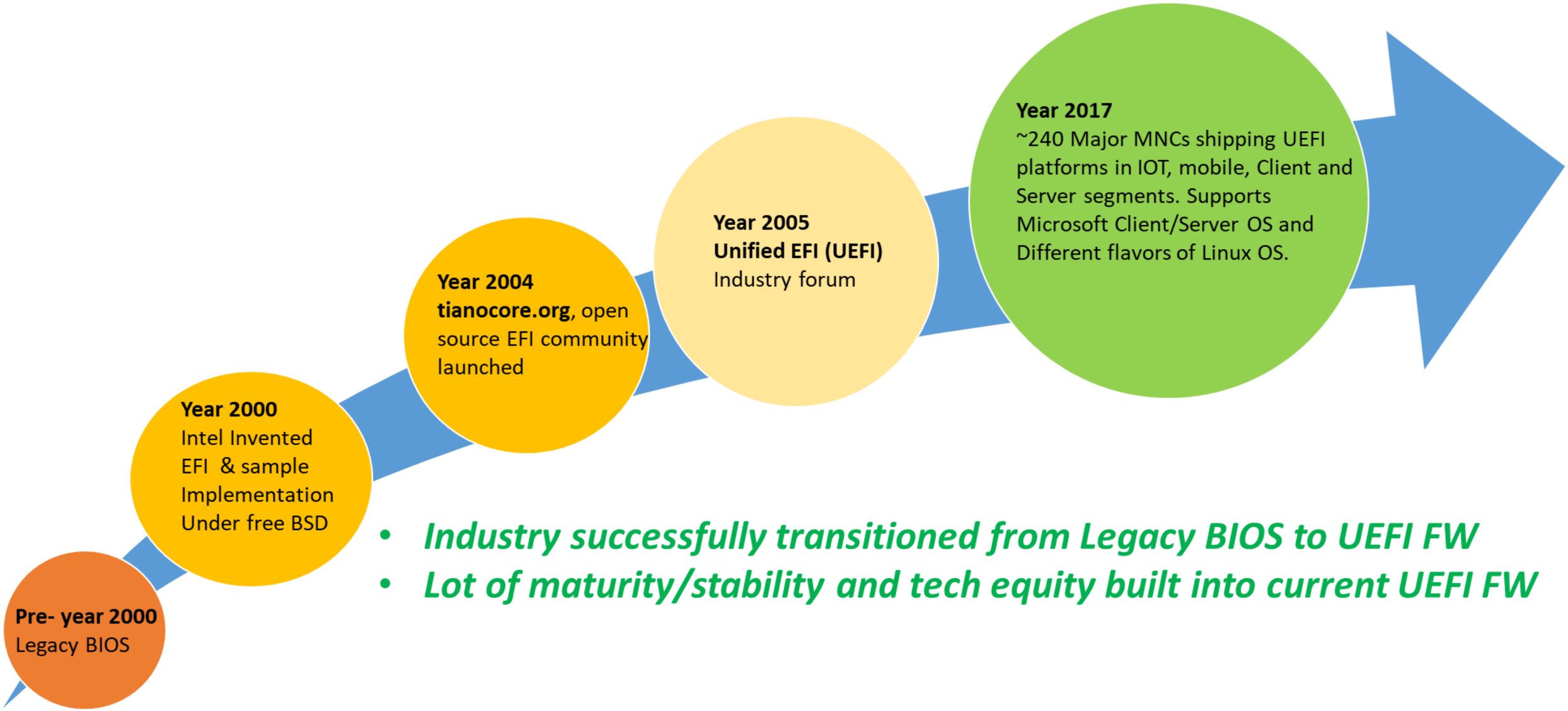
- Turning Linux Engineers into Firmware Engineers
  - Facebook
- LinuxBoot Continuous Integration
  - ITrenew
- LinuxBoot: Linux as a Bootloader
  - Google

Call for Action(s)

- **To learn and contribute, Please attend bi-weekly OCP/OSF calls (Thurs 10am to 11am US PST), dial-in info on www.opencompute.org**
- **Encourage each of you to bring-in your challenges, innovative ideas to OSF**
- **Contribute to workstreams->Great opportunity to showcase your passion in open system firmware development and enable industry**
- **Looking for owners to take on couple of workstreams**
- **Identify additional workstreams, own them and drive solution**

Back-up

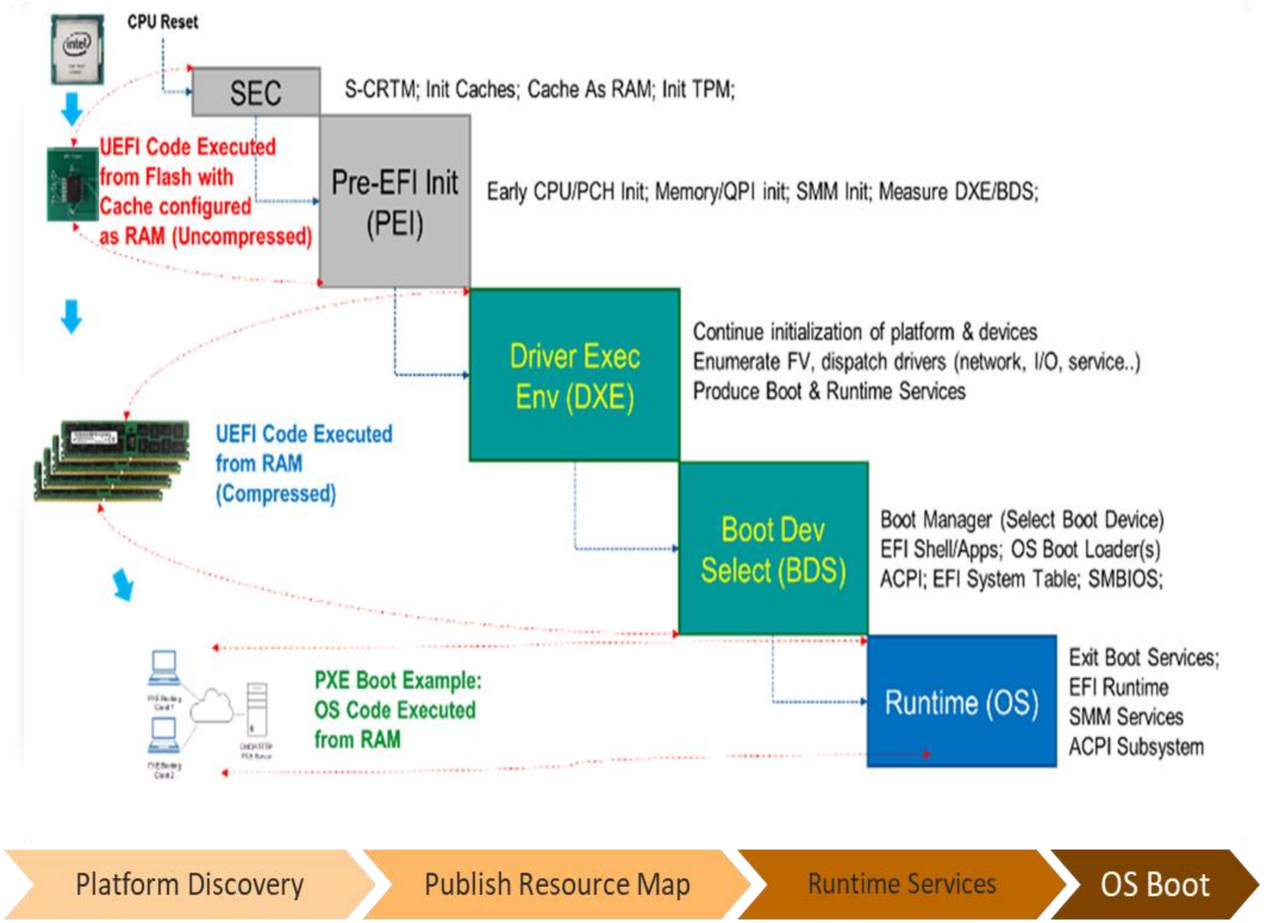
Background and UEFI FW progression….

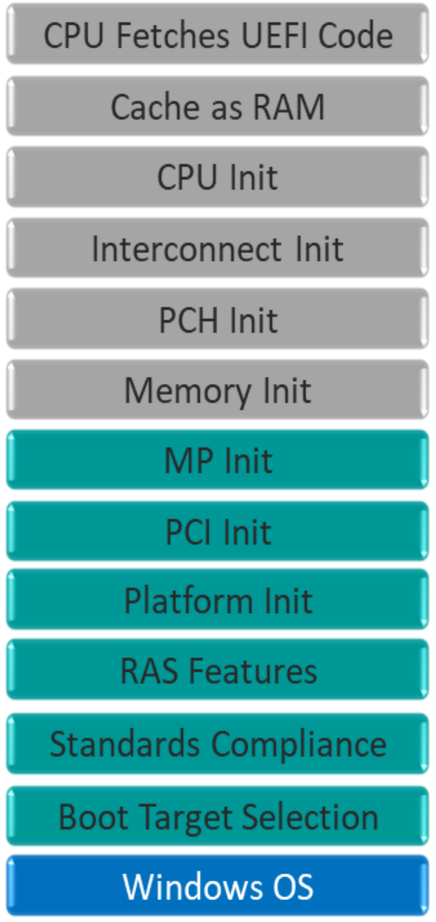


- ***Industry successfully transitioned from Legacy BIOS to UEFI FW***
- ***Lot of maturity/stability and tech equity built into current UEFI FW***

Let’s leverage UEFI learnings to Open System Firmware initiative

Current State of UEFI FW implementation …





Current Gaps:

- **Not truly ‘Open’ - Commercial products with EDKII core based UEFI FW solutions still shipping with proprietary content**
- **Silicon/Chipset modules are not open**
- **Not Optimized for ‘Cloud’ Use Models**

Open EDKII workstream is expected to address current gaps and be cloud ready

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