Enabling Runtime RAS for Xeon Platforms using Open System Firmware

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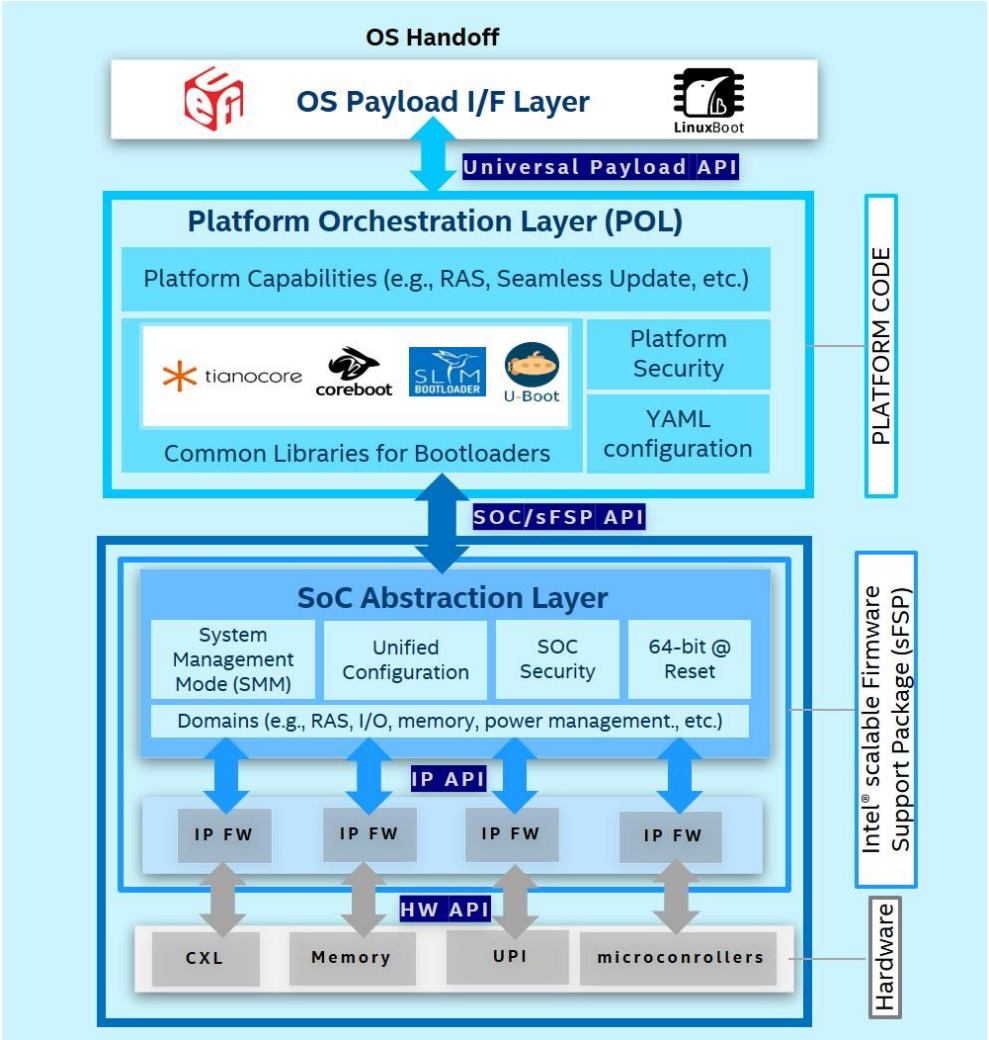
Agenda

- Background
- FSP-SMM API
- FSP-SMM binary layout
- SMM traditional Mode VS. Standalone Mode
- FSP-SMM flow
- OSF(coreboot)→FSP-SMM
- Traditional SMM transition to MM
- Converged SMM Solution (Future)

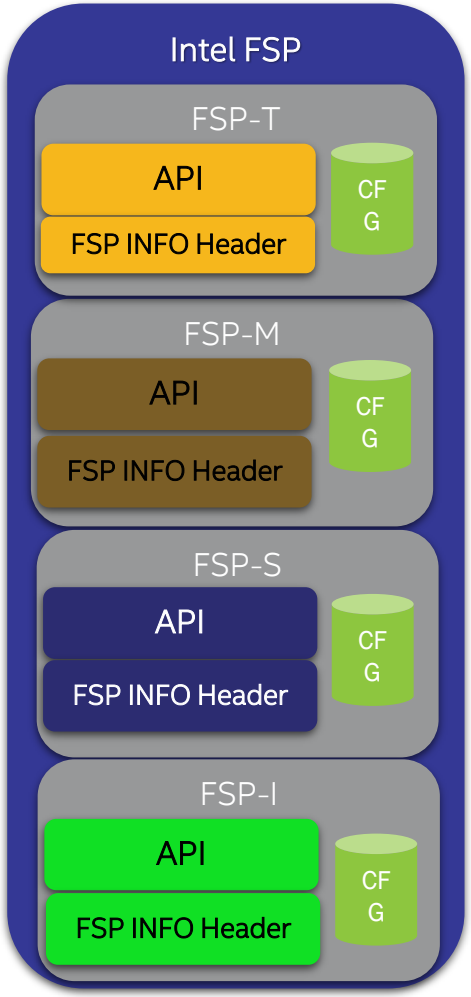
Background

- Current FSP2.3 does not include SMM related function, bootloaders own SMM foundation and feature itself.
- However, for some SMM functions like server RAS runtime features, it is not easy for bootloader (like coreboot/SlimBoot) to support it.
- It will be a solution for non-EDKII bootloader with FSP-SMM to support SMM foundation and features.

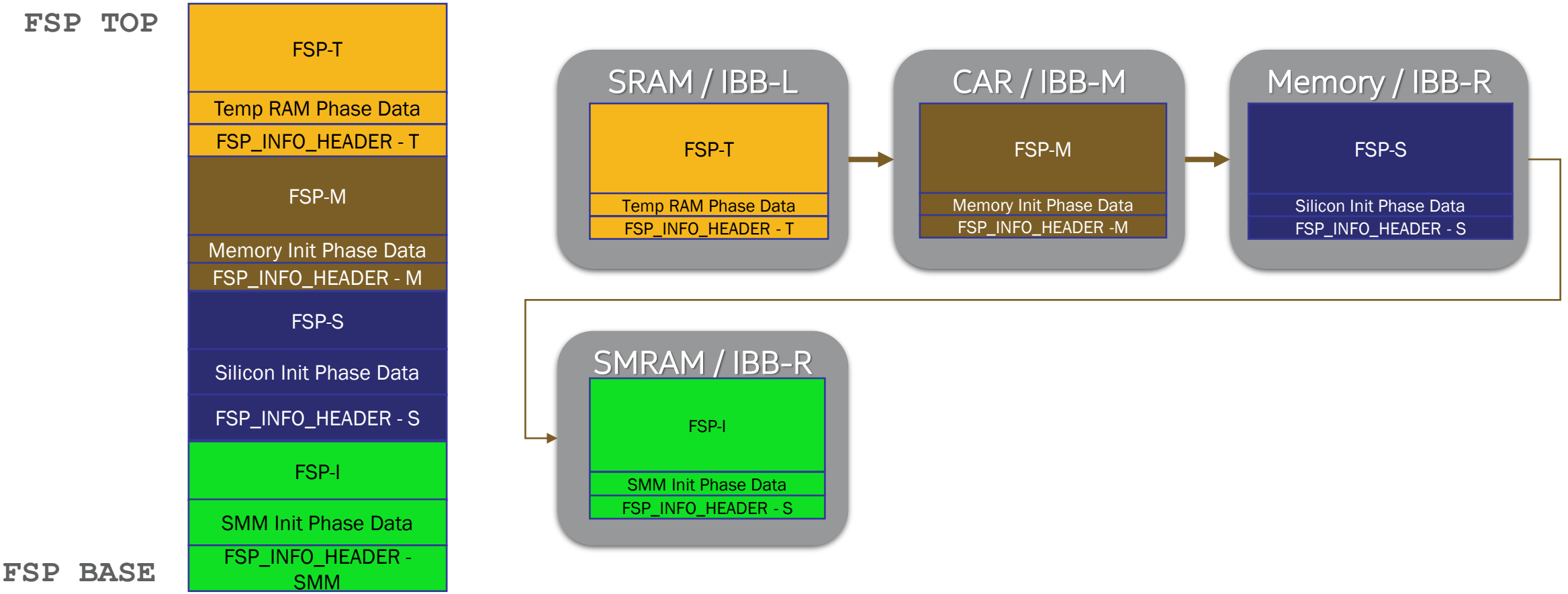


FSP-SMM API

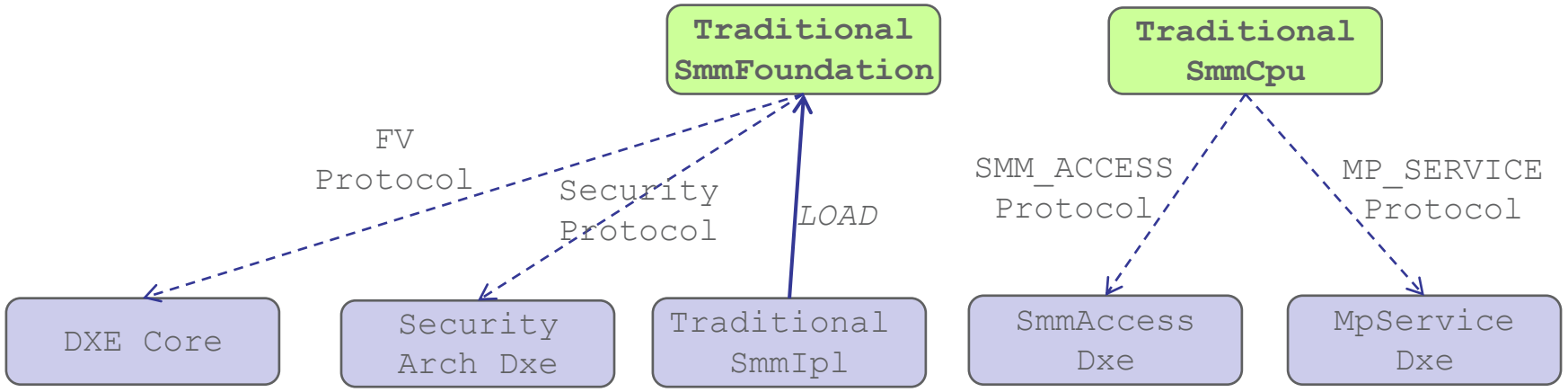
- The Intel® FSP binary follows the UEFI Platform Initialization Firmware Volume Specification format.
  - Split into 4 separate FVs
- FSP-SMM: SMM initialization phase (FSP owns SMRAM)
  - Primary purpose of this phase is to provide a collection of **silicon** SMI handlers that provide value-add services that a bootloader can use.
    - **FspSmmInit()** : Initialize SMM Foundation, dispatch all Standalone MM drivers, build SMM environment, install all SMI handlers.



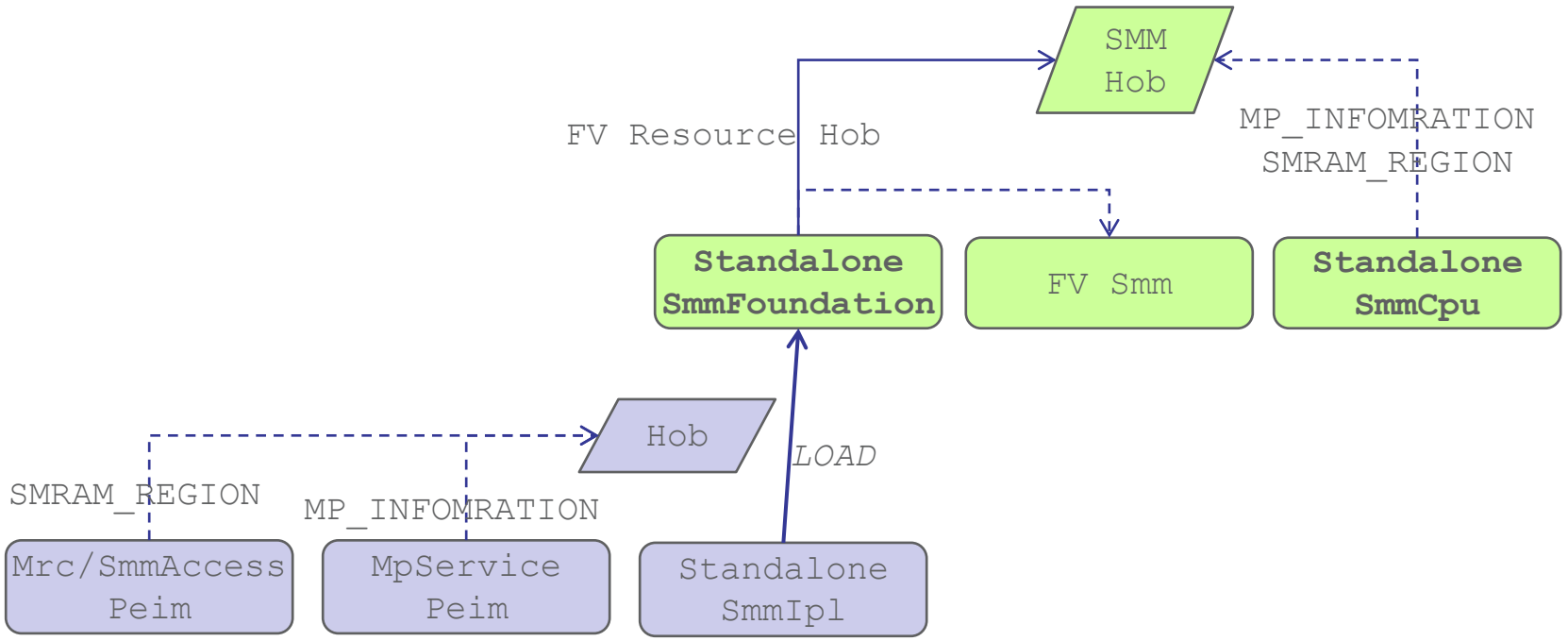
FSP-SMM binary layout



SMM Traditional Mode

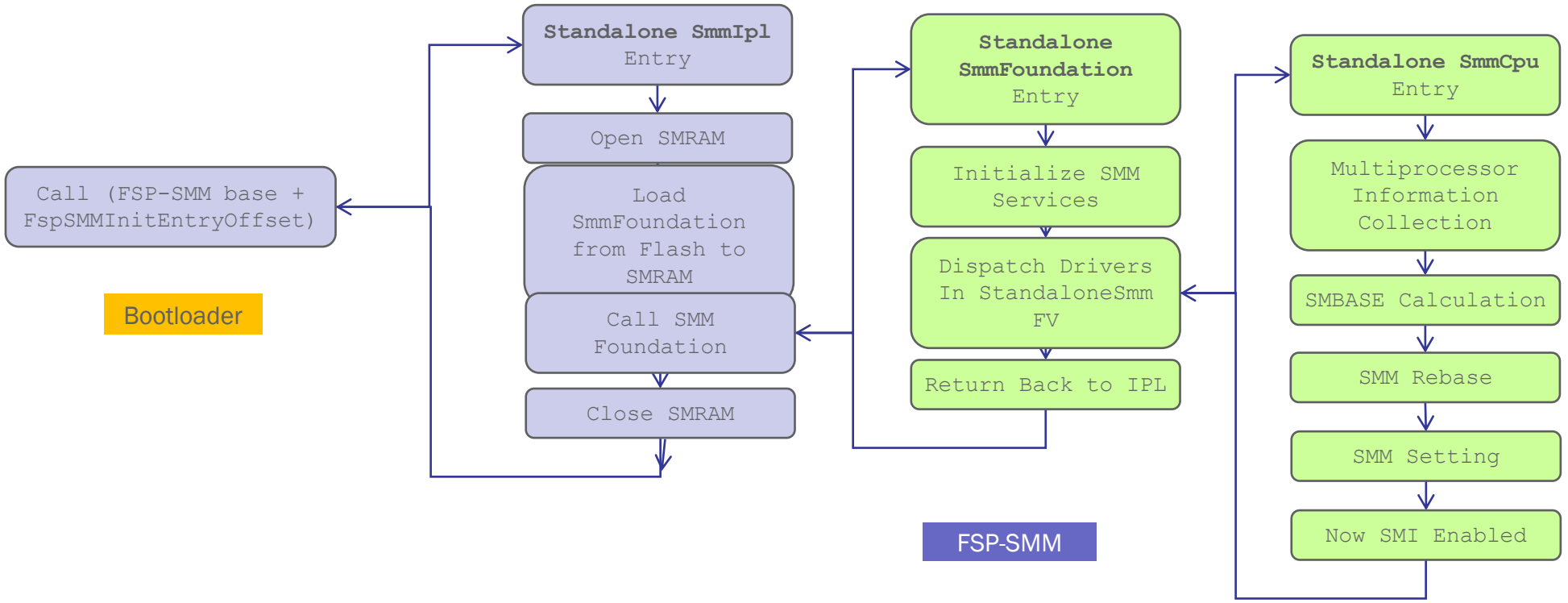


Standalone Mode



Standalone: SMM will not run DXE code.

FSP-SMM Boot Flow

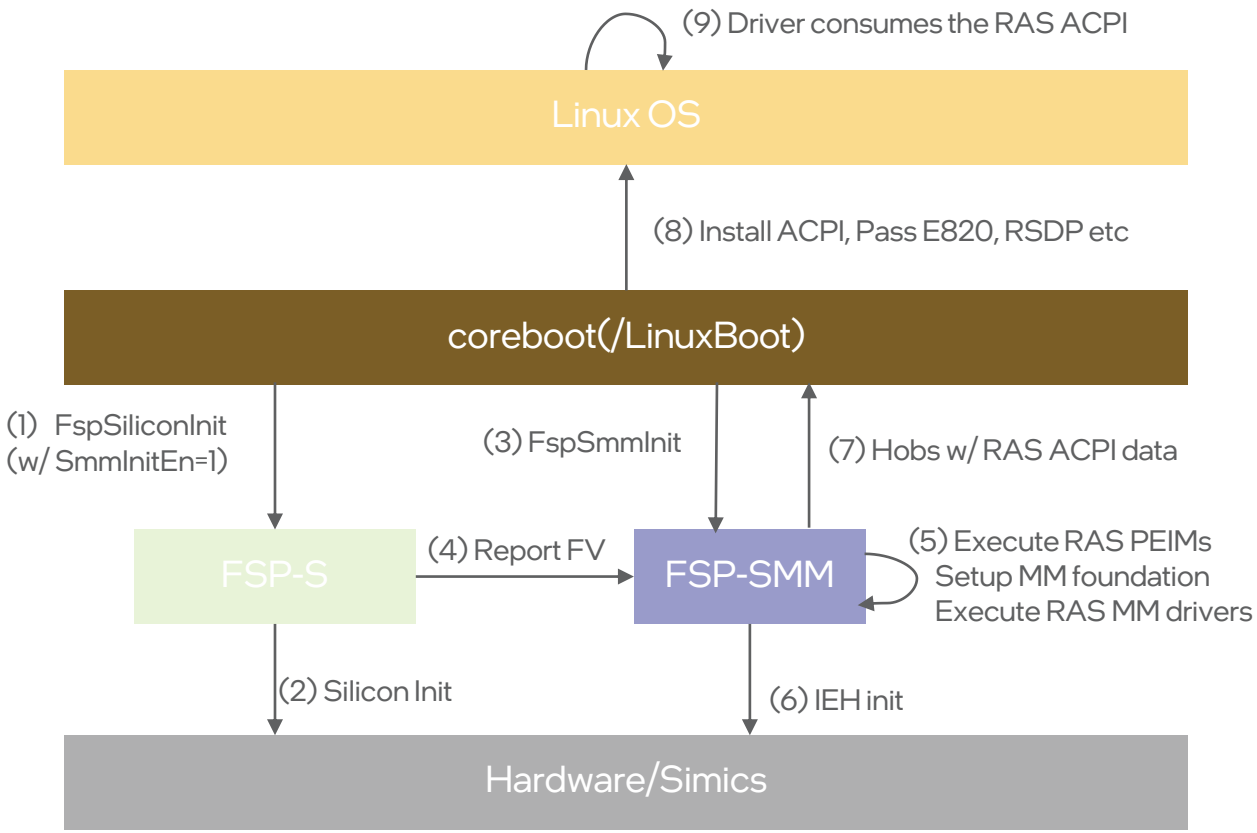


FSP-SMM Modules changes

FV	Status	Build target	Driver name	Description
FSP-S FV	Existed	IA32	SmmAccessPei.inf	Provide access SMM Ram ppi
	Existed	IA32	CpuMpPei.inf	Provide MP service ppi
FSP-SMM FV	New	IA32	SmmControlPei.inf	Provide smi trigger/clear ppi
	New	IA32	CpuMpInfoPei.inf	Provide MP info hob
	New	IA32	StandaloneMmIplPei.inf	Load MMCore to SMM Ram
	New	X64	StandaloneMmCore.inf	Dispatch all MM driver and register all handlers
	New	X64	PiSmmCpuStandaloneSmm.inf	Build CPU SMM enviroment
	New	X64	CpuIo2StandaloneMm.inf	Provide CPU io/memory access protocol
	New	X64	PchSmiDispatcherServer.inf	Install sw smi handler for verify

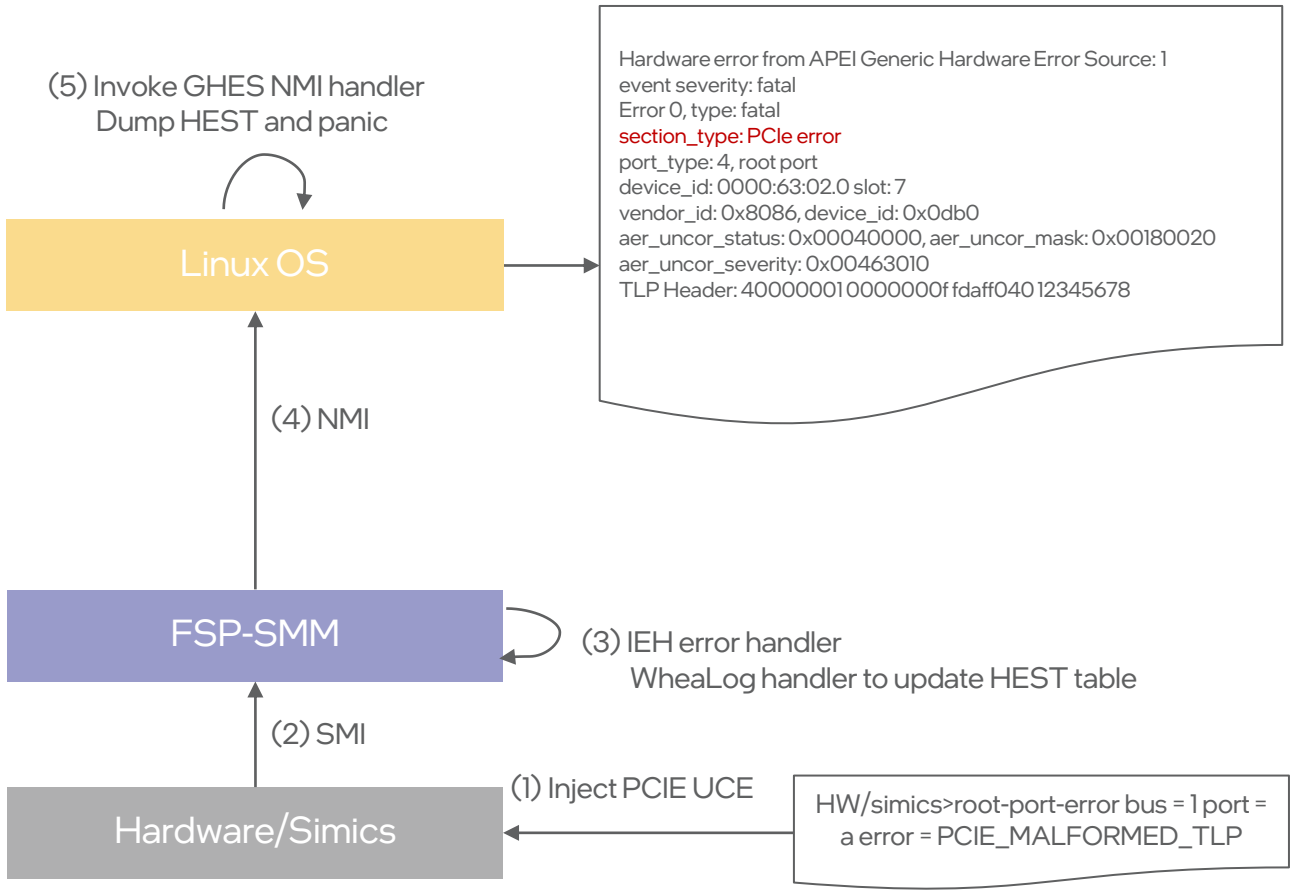
coreboot FSP-SMM (boot) integration

Boot Time

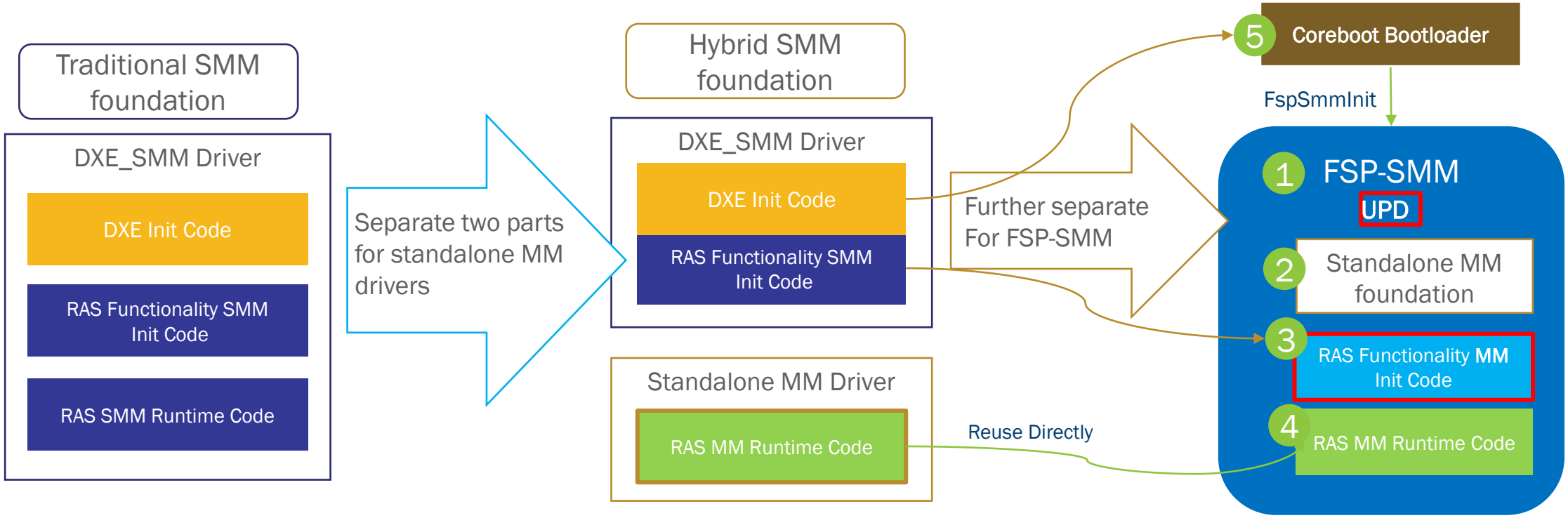


FSP-SMM (runtime) Execution

Runtime



Traditional SMM transition to Stanalone MM



Thanks & QA

- Xeon Server coreboot credits:
  - Meta, Byte Dance, Google, Amazon, Intel
  - 9Elements, SysPro Consulting
  - Wiwynn, Quanta, Inspur
- Reference link:
  - https://github.com/universalscalablefirmware
  - 644852_2.3_Firmware-Support-Package-External-Architecture-Specification
    - FSP 2.4 EAS is coming..