FF-A compliant Secure User Mode partition

Secure User Mode Partition with Partition Manager at EL3.

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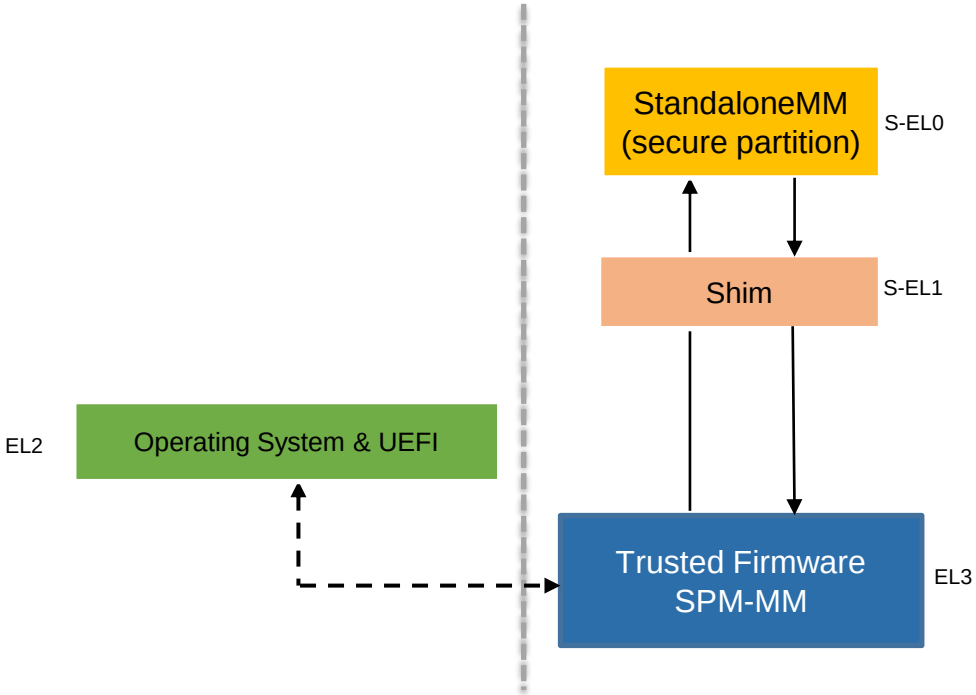
Objective

- Out-of-box secure software solution for ARM platforms that
  - do not support S-EL2 or do not deploy secure hypervisor at S-EL2.
  - do not deploy a secure OS at S-EL1.
- Defines a secure software solution following Firmware Framework Architecture for Armv8-A processors(FF-A).

Existing SPM_MM solution



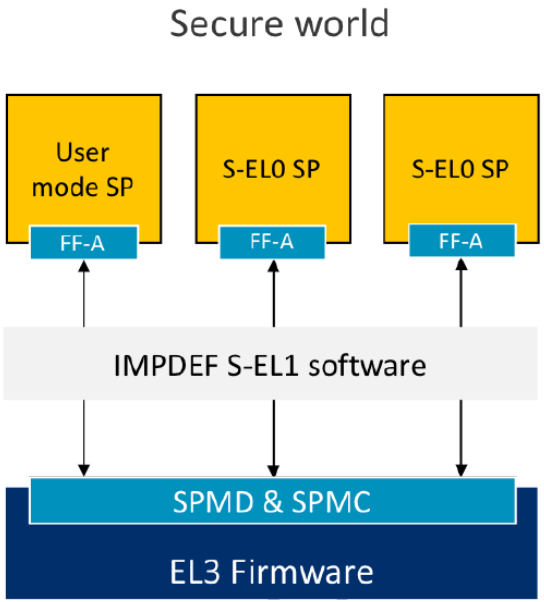
- SPM-MM module in Trusted firmware is Secure partition manager. It manages the context of secure partition and communication between normal world and secure world.
- StandaloneMM is secure partition.
- Normal world firmware and secure partition communicate using SPM_MM SMC Ids.

Firmware Framework For ARMv8-A (FF-A)

- Standardize communication among normal world and secure world images.
- Partition manager, manages resources for all partitions and ensures inter partition isolation at run time.
- Partition manifest, captures configuration details of partitions.
- Extensive application binary interfaces for discovery of partitions, direct/indirect message communications, memory management operations, CPU cycle management operations.

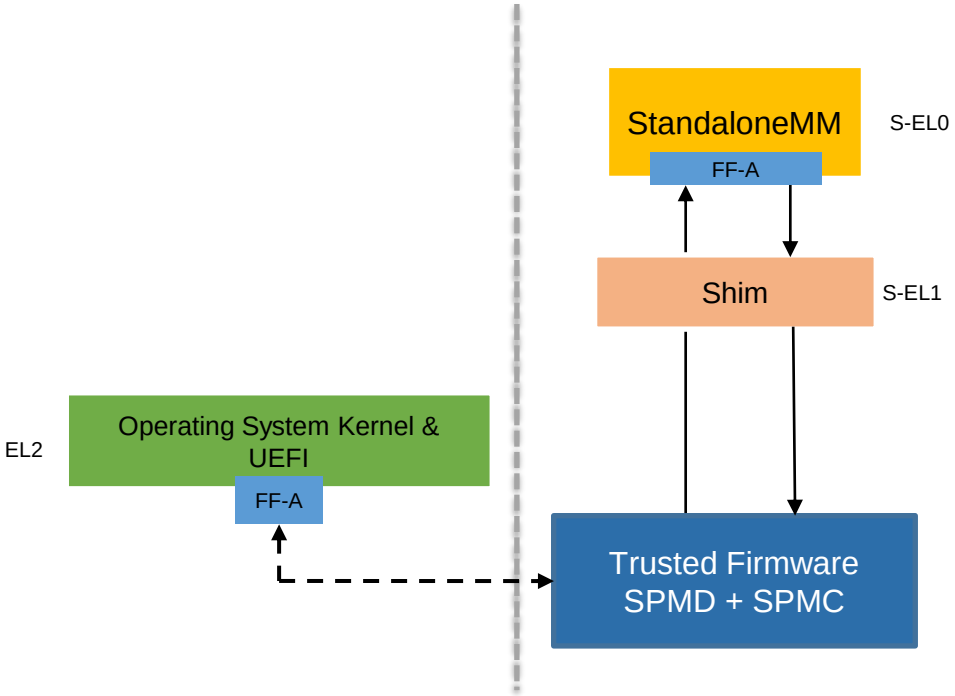
Firmware Framework For ARMv8-A (FF-A)

- FF-A model



- FF-A spec. splits the Secure Partition Manager(SPM) into two components Dispatcher(SPMD) and Core(SPMC).
- SPMC component initializes partitions, manages all partition resources and ensures isolation amongst them.
- FF-A spec. allows SPMC to be implemented at any of the exception level: EL3, S-EL2, S-EL1, and inclusion of SPMC to the appropriate exception level is done based on the platform architecture.

S-EL0 Partition with SPMC+SPMD at EL3



Updated following modules with FF-A support:

- SPMD at EL3 Trusted Firmware
- EDK2 MM_Communicate
- StandaloneMM

Introduced module:

- SPMC at EL3

For better code reuse reorganized existing spm-mm module and use some part of common code.

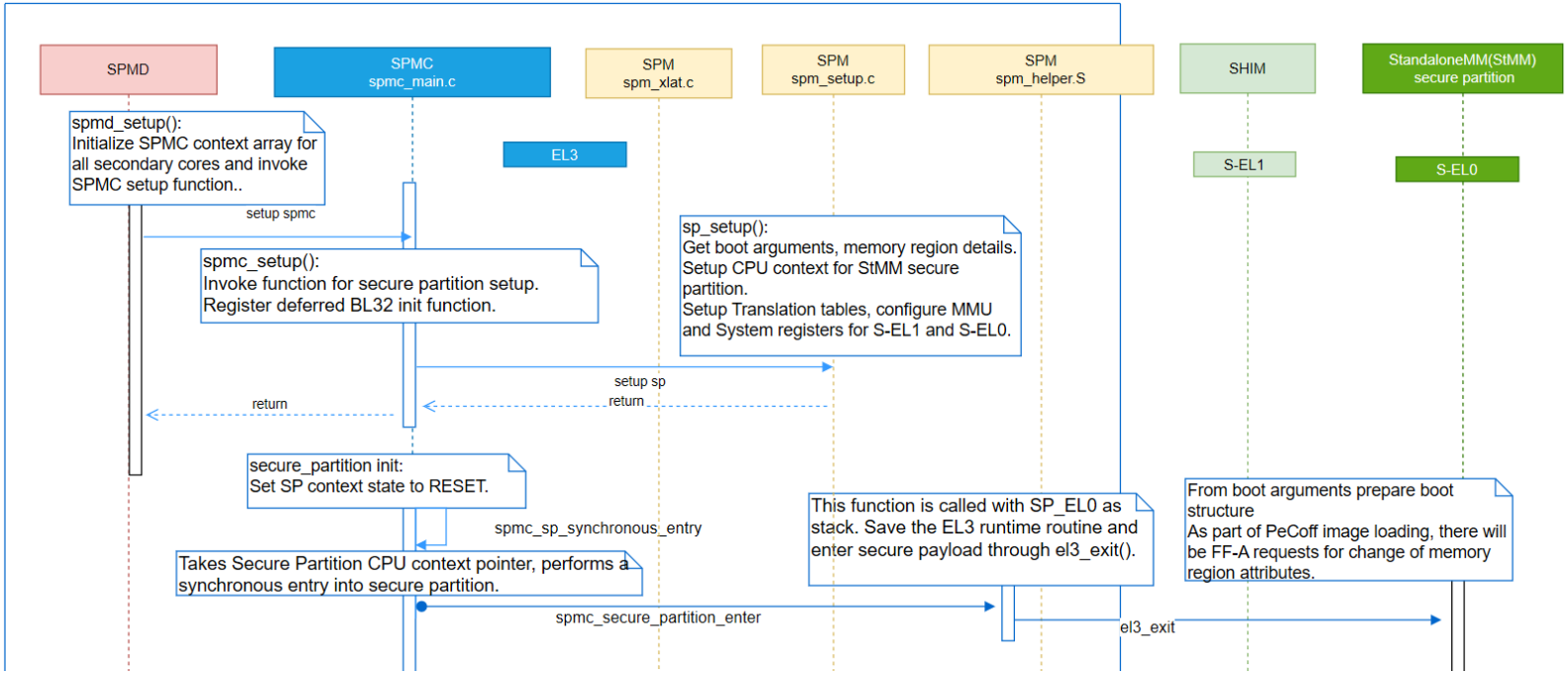
S-EL0 Partition with SPMC+SPMD at EL3

- MM_Communicate allows the normal world components to communicate with secure world via spec defined SMCs.
- StandaloneMM , loaded by EL3 firmware, executes as Secure Partition in S-EL0 on ARM AArch64 platforms.
- Changes, in StandaloneMM and MM_Communicate for FF-A support, are of similar type.
    - FF-A support for handling direct message communication, SPM version checking, error responses.
    - Build time option for user to choose either existing MM interface or FF-A interface for communication between normal world and secure world images.

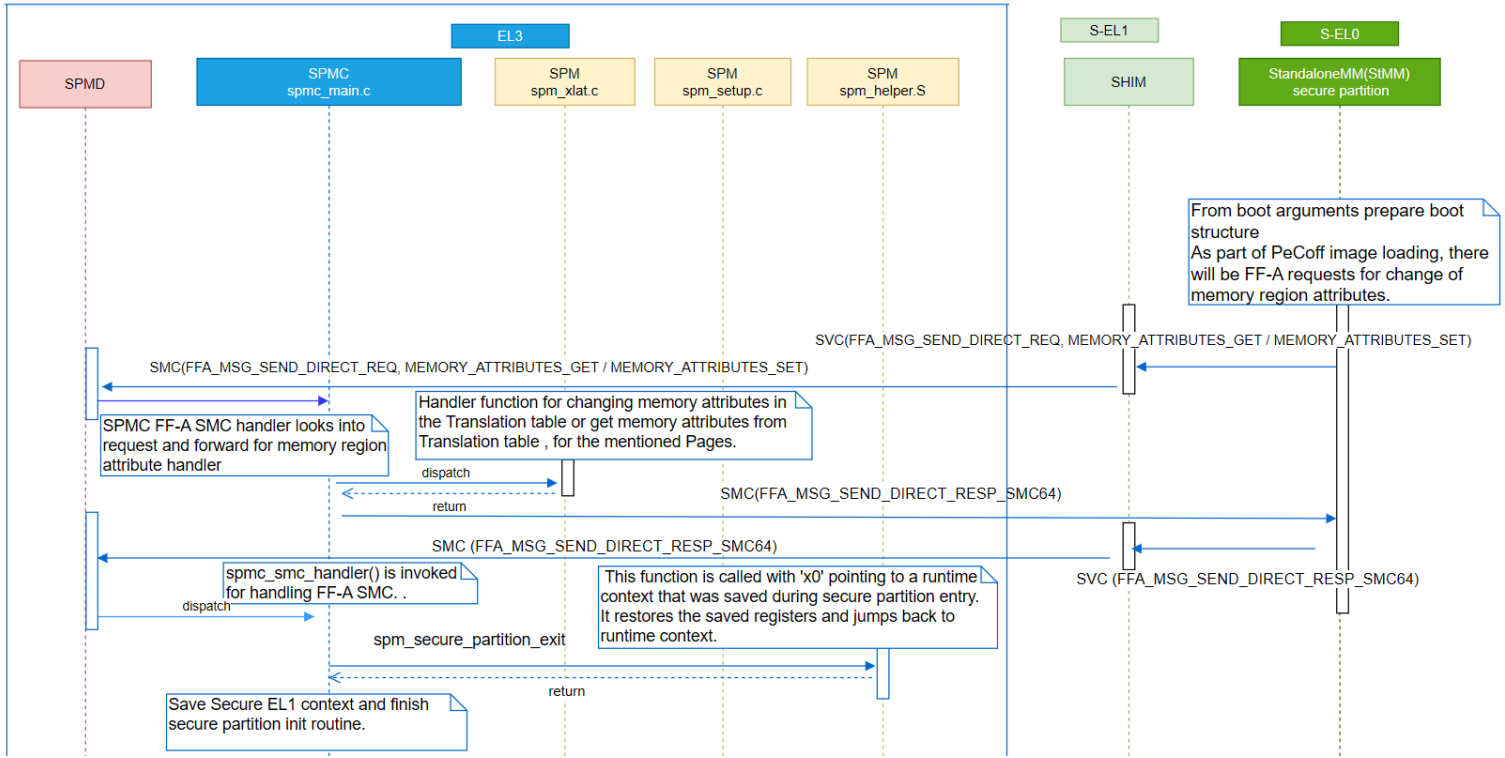
S-EL0 Partition with SPMC+SPMD at EL3

- SPMD module is the gateway for handling any FF-A SMC from normal and secure world partitions and forwarding it to the SPMC.
- Since SPMC co-exist in EL3, SPMD doesn’t need to handle any exception level change for SPMC, but just a function call.
- SPMC initializes and manages secure partition.
- SPMC gathers memory region details, prepares memory mapping , translation table and execution context for S-EL0 partition.
- During handling of FF-A requests, SPMC does the job of save/restore execution context and jump to respective exception level.

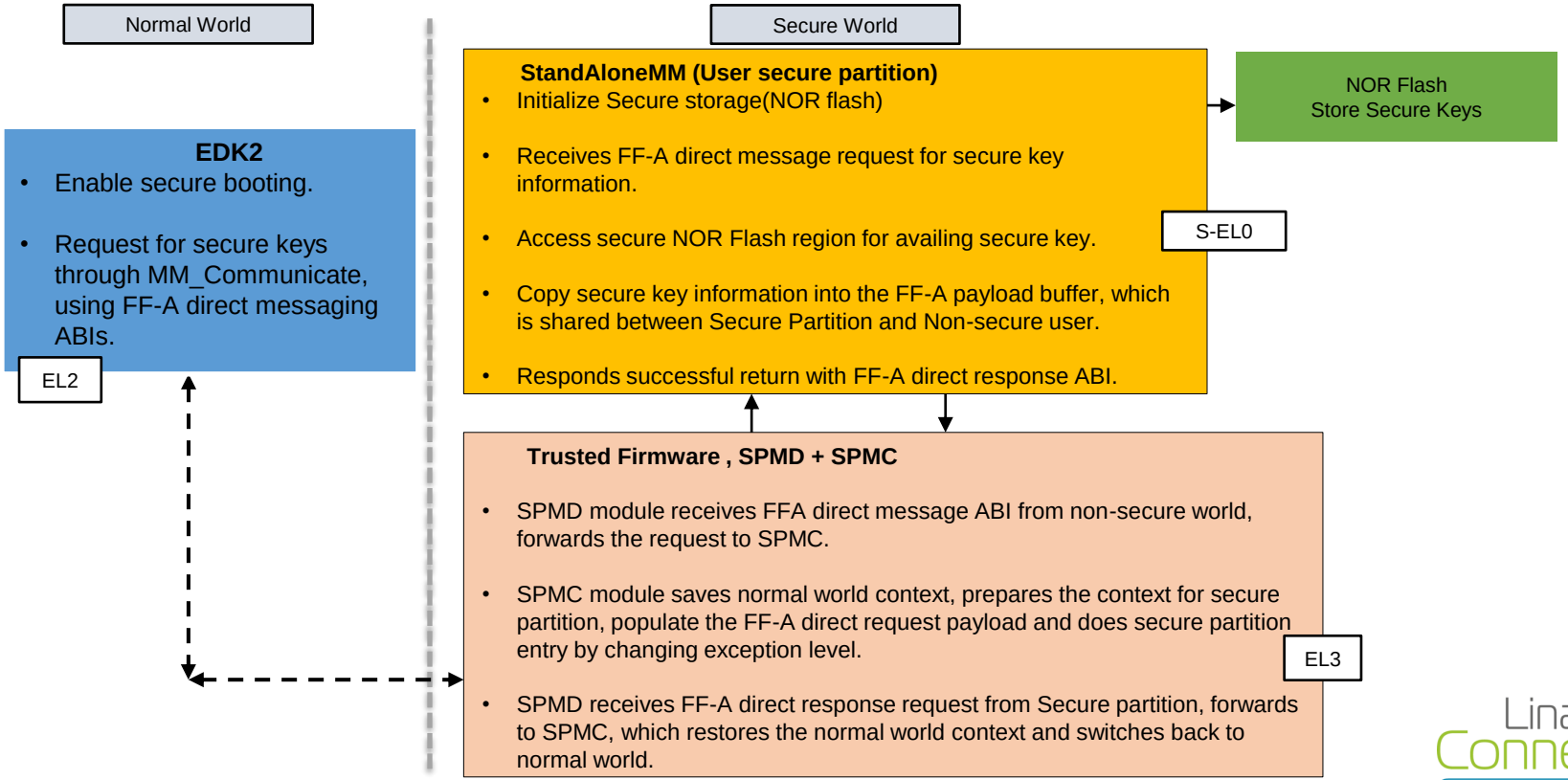
SPMD, SPMC, & Secure Partition Setup



SPMD, SPMC, & Secure Partition Setup Continued…

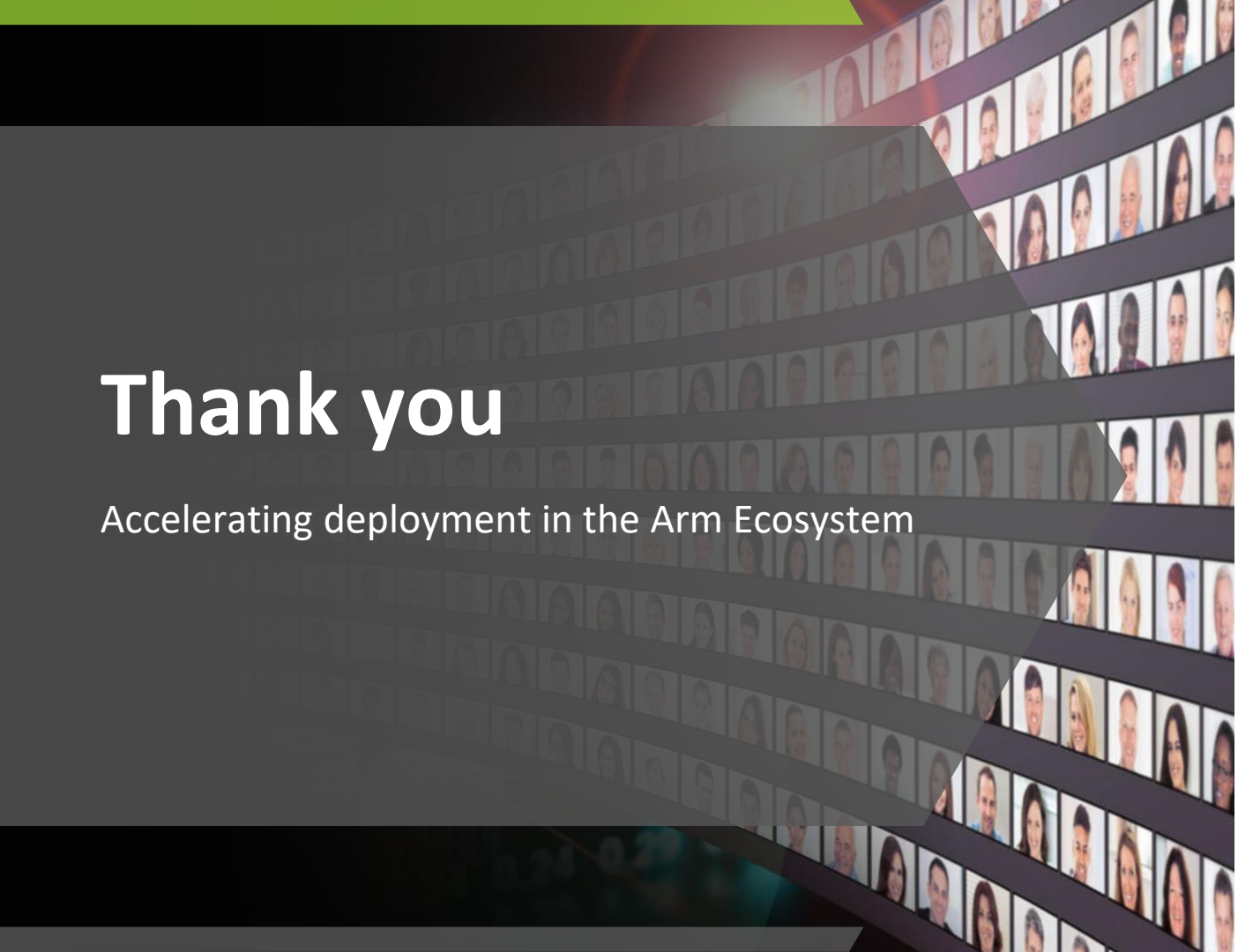


UEFI Secure boot



Current status

- StandaloneMM FF-A interface support has been added by upstream community and merged into EDK2.
- FF-A support is added in MM_Communicate for interaction from Normal world.
- In TrustedFirmware changes are made in SPMD, SPM_MM to accommodate new FF-A module SPMC.
- At present only direct messaging ABIs are implemented for communication between normal world and secure world partitions.
- UEFI secure boot is one key user scenario, which is covered with current implementation.
- Next immediate objective is to get the solutions merged into respective codebases.



Thank you

Accelerating deployment in the Arm Ecosystem

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