ORACLE

DRTM on AMD Server Platforms

Alec Brown, Jag Raman & Ross Philipson
Oracle Linux
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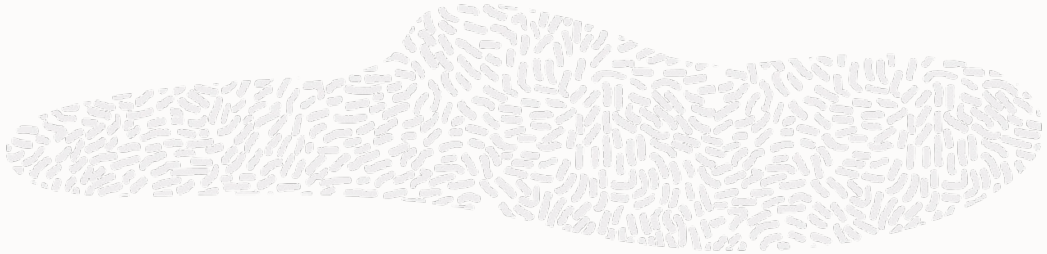
Agenda

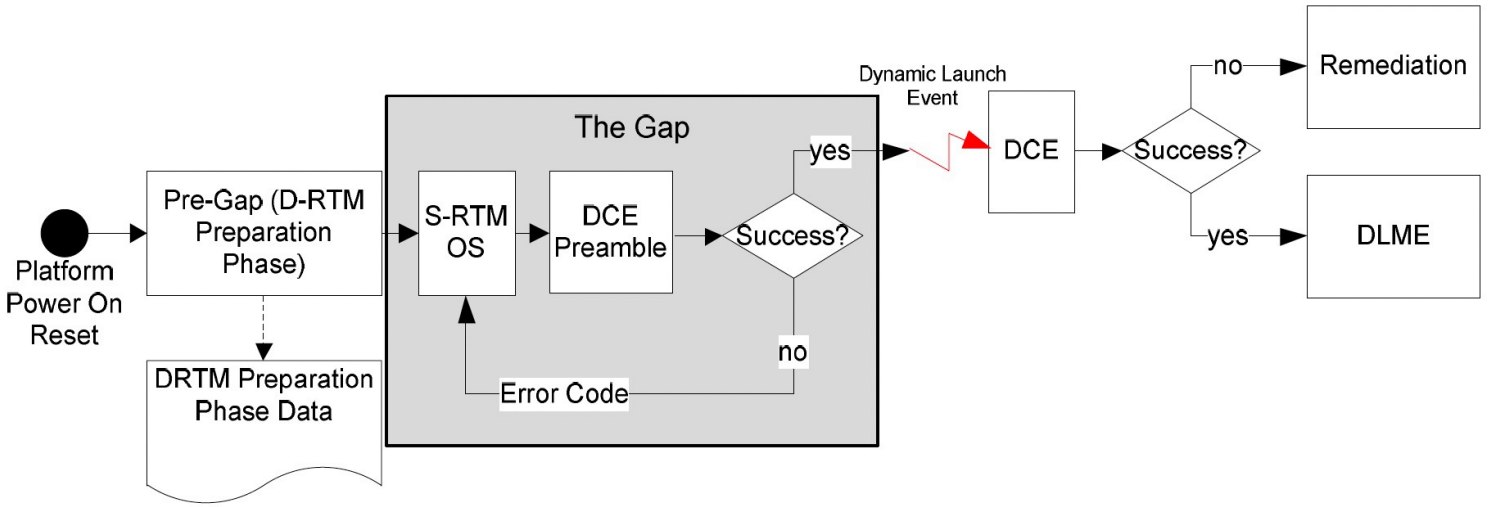


- Dynamic Root of Trust Measurement (DRTM)
- DRTM present status
- DRTM: Intel vs AMD
- DRTM with AMD's ASP
- GRUB
- Secure Kernel Loader (SKL)
- Secure Launch Kernel
- Linux Upstream Status
- Questions

Dynamic Root of Trust Measurement (D-RTM)

TCG Specification

- Trusted Computing Group (**TCG**) defines the broad requirements for D-RTM
- "*A platform-dependent function that initializes the state of the platform and provides a new instance of a root of trust for measurement without rebooting the platform. The initial state establishes a minimal Trusted Computing Base.*"



Nominal Timeline defined by the TCG

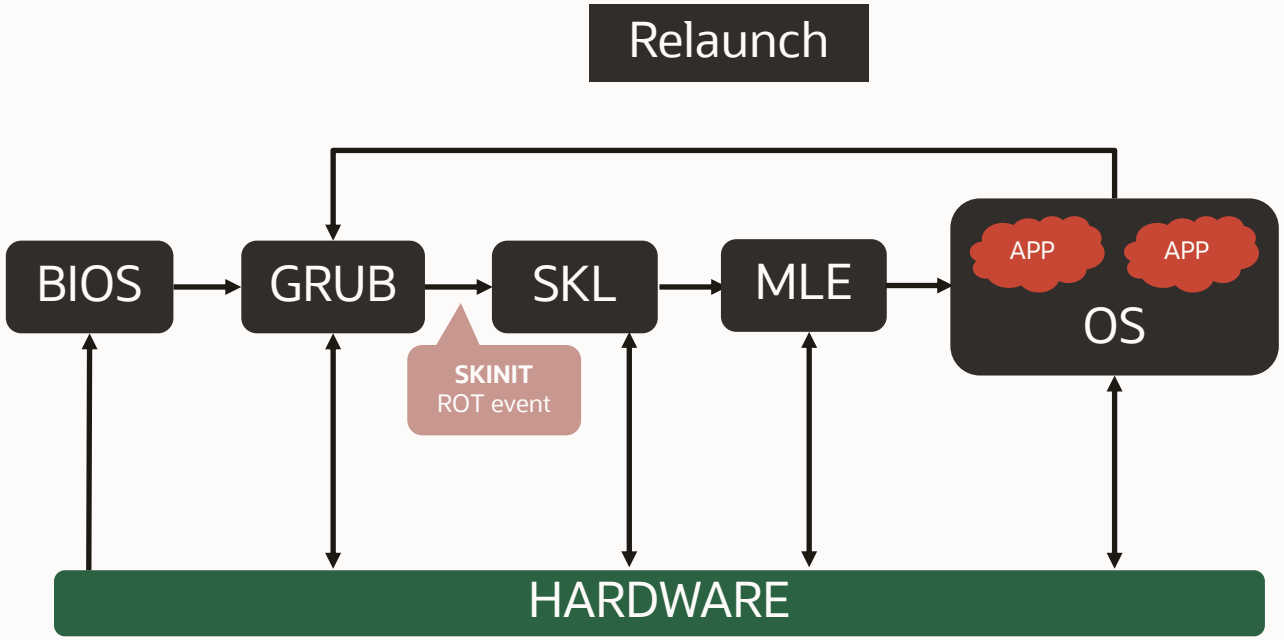
- ***The Gap***, a period in time where we haven't validated the Computed Base.
- Dynamic Launch Event: DRTM starts recording measurements into the PCR after the ***DL Event***
- If successful, DRTM presents the user with a Dynamically Launched Measured Environment (**DLME**).

Dynamic Root of Trust Measurement (DRTM)

TrenchBoot

- The location of the ROT is dynamic in DRTM; it is flexible, and the security architecture can choose where ROT lies.
- In the AMD platforms, the ROT starts with executing the **SKINIT** instruction.
- For TrenchBoot project on AMD, GRUB launches the DRTM sequence by executing the SKINIT instruction.
- The SKINIT instruction verifies the Signature of the SKL.

TrenchBoot with AMD's HW



SKL: Secure Kernel Loader

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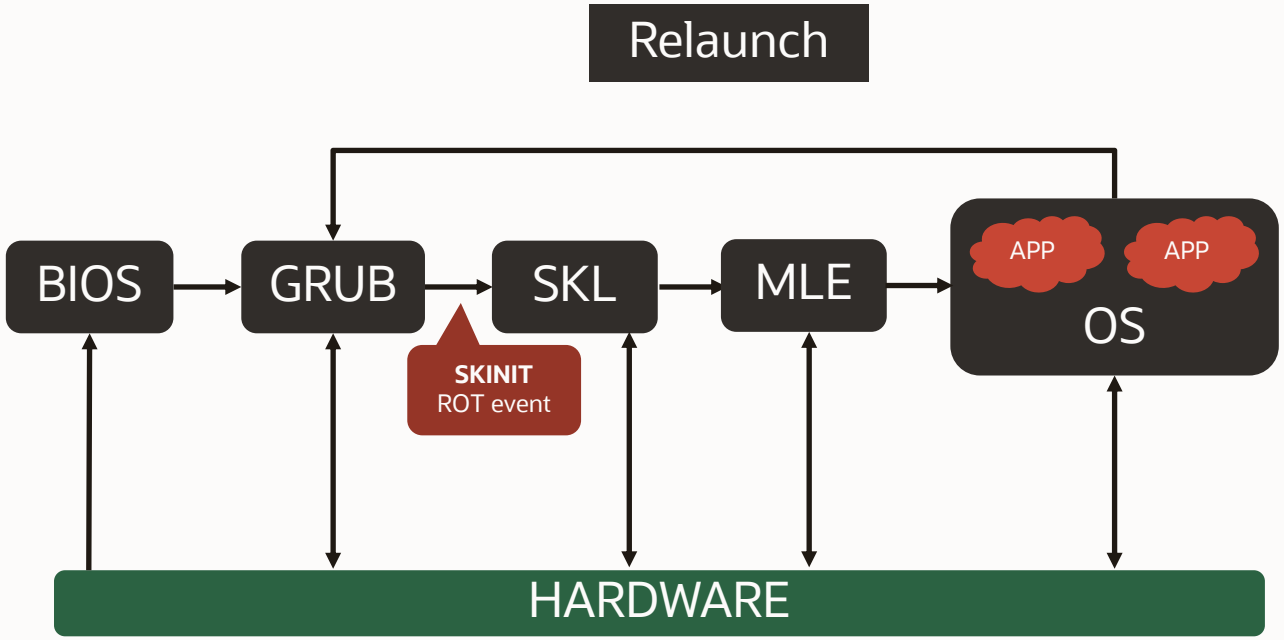

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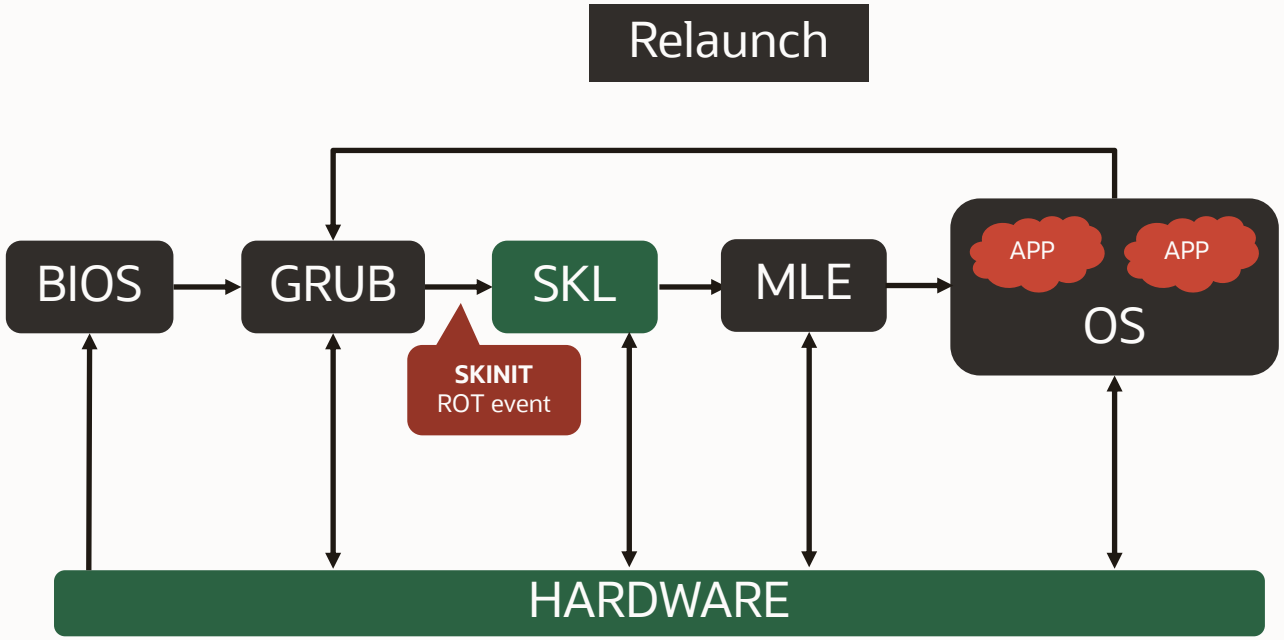

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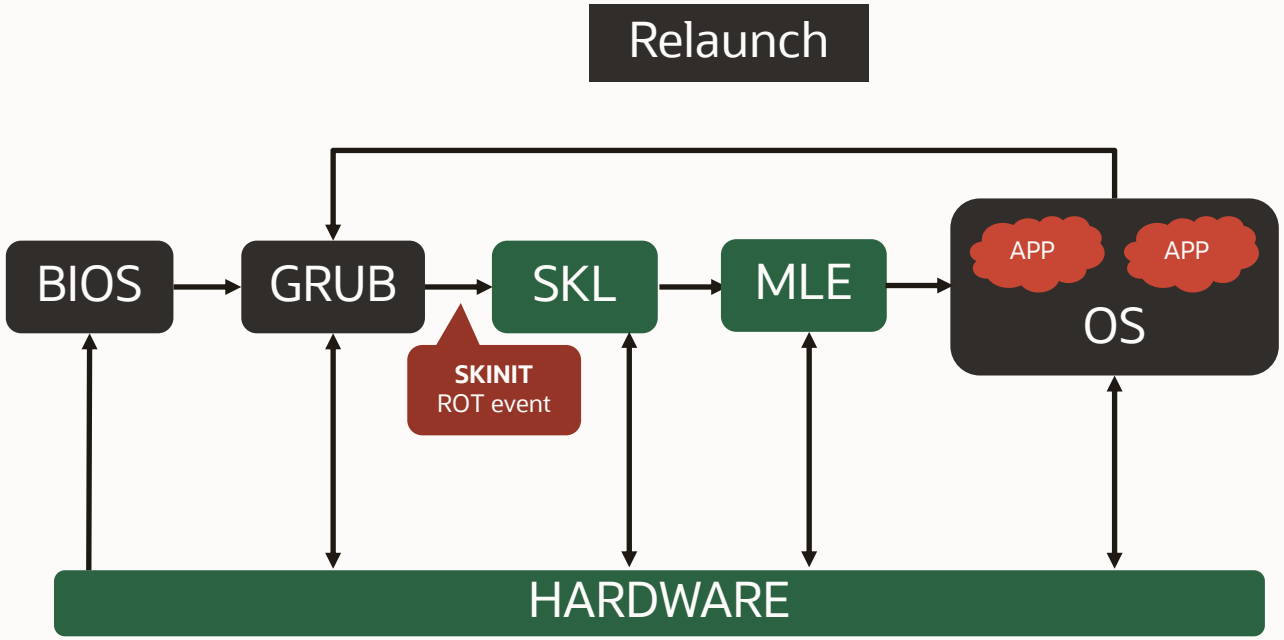

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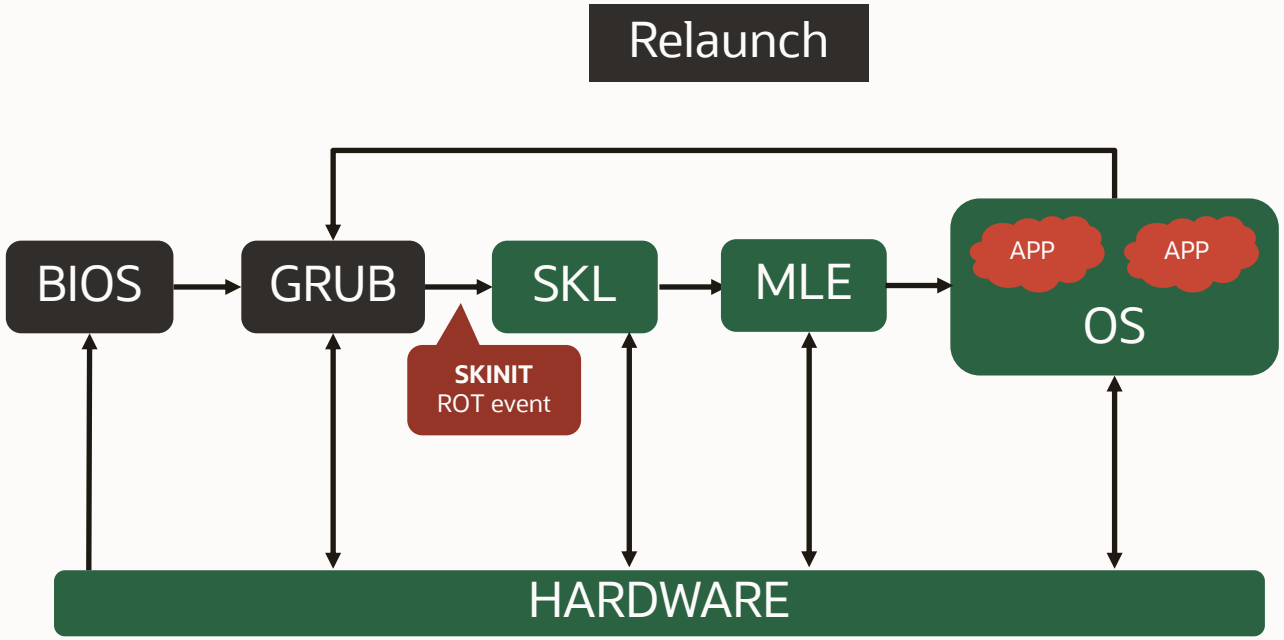

SKL: Secure Kernel Loader

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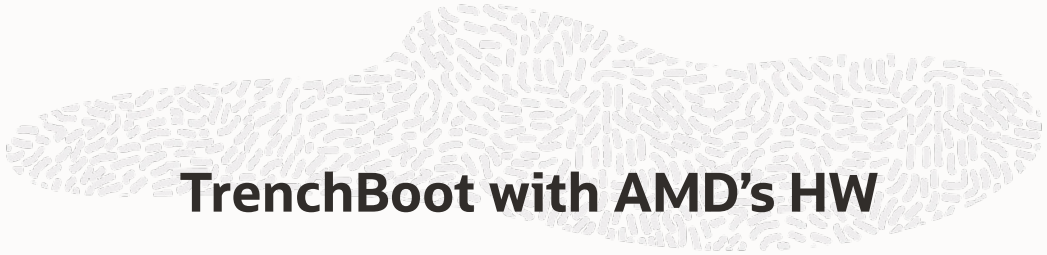
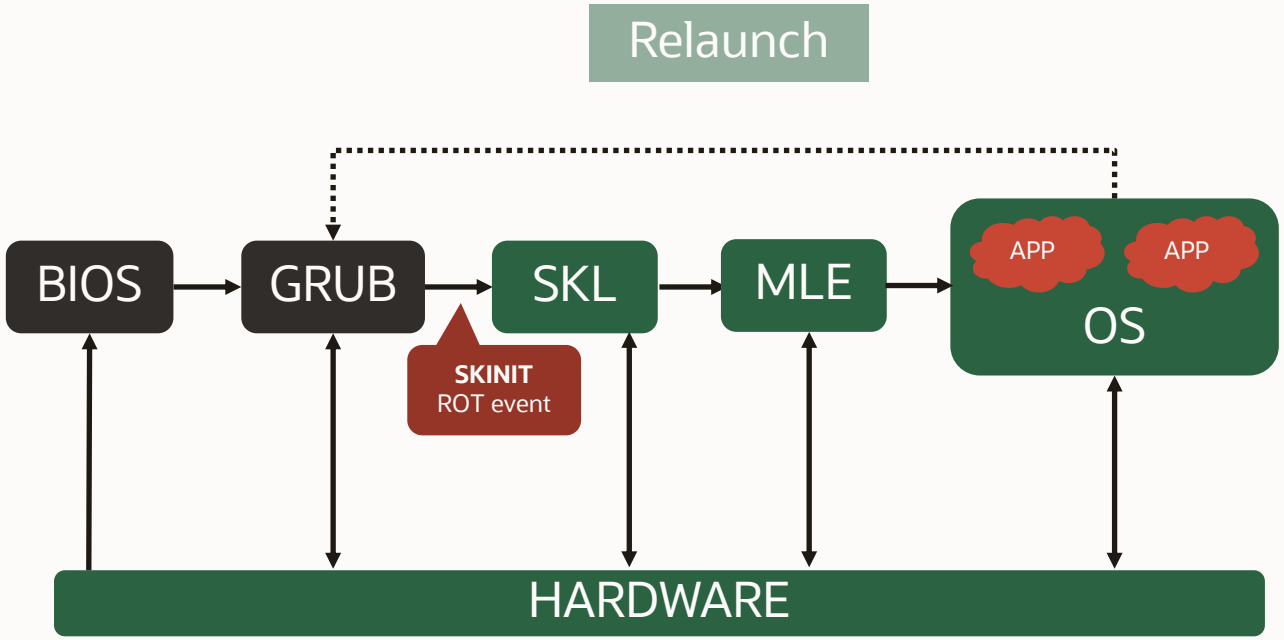
DRTM present status

- DRTM comprises two phases: **Power-On** and **Relaunch**.
- The Power-on phase interfaces with AMD's **ASP** hardware; it authenticates and measures software modules.
- The Relaunch phase involves saving and restoring the user state and vectoring back to the GRUB. **Ross Philipson** is working on it.
- The Power-on phase is now available.

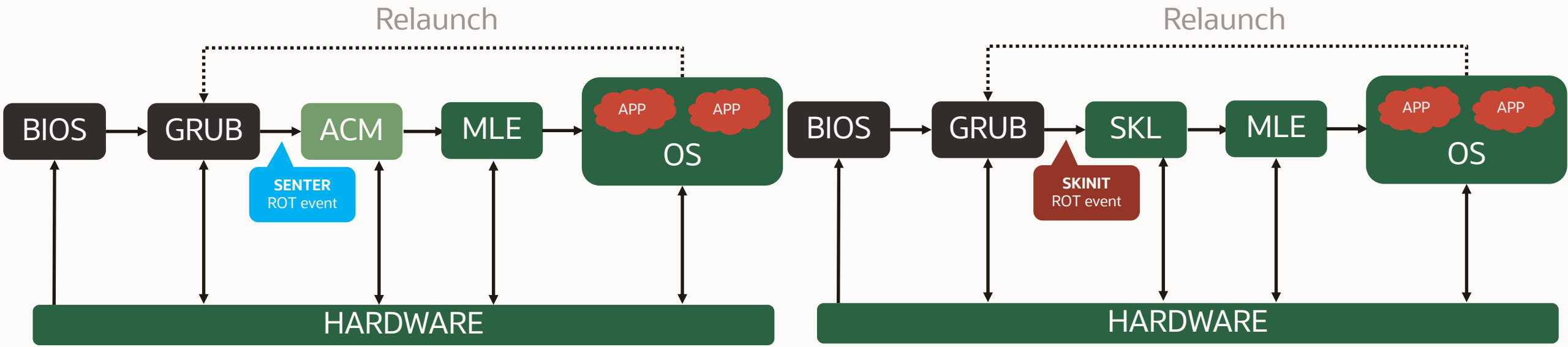




SKL: Secure Kernel Loader

MLE: Measured Launch Environment

DRTM: Intel vs AMD

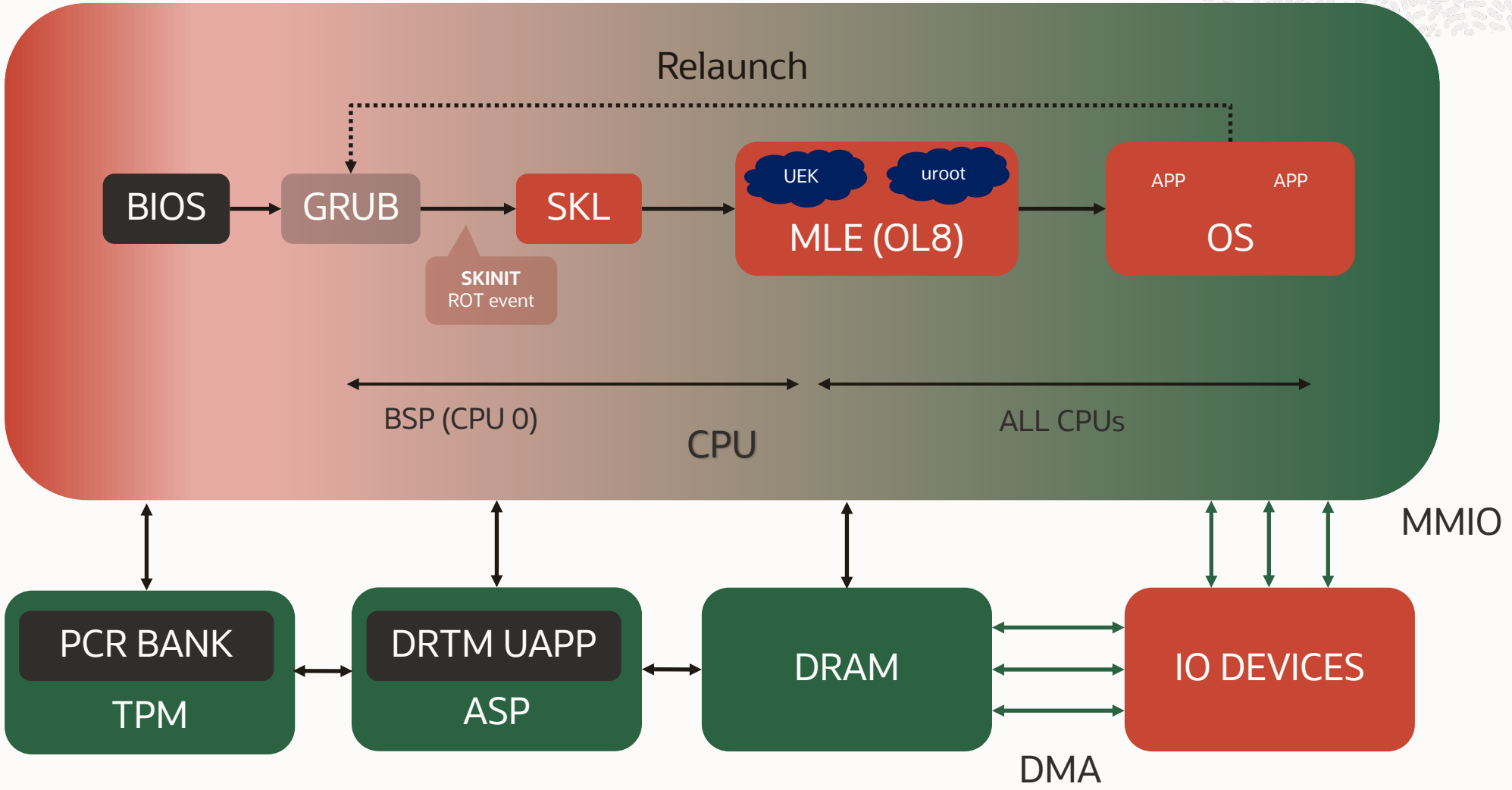


ACM: Authenticated Code Module

SKL: Secure Kernel Loader

MLE: Measured Launch Environment

DRTM with AMD's ASP



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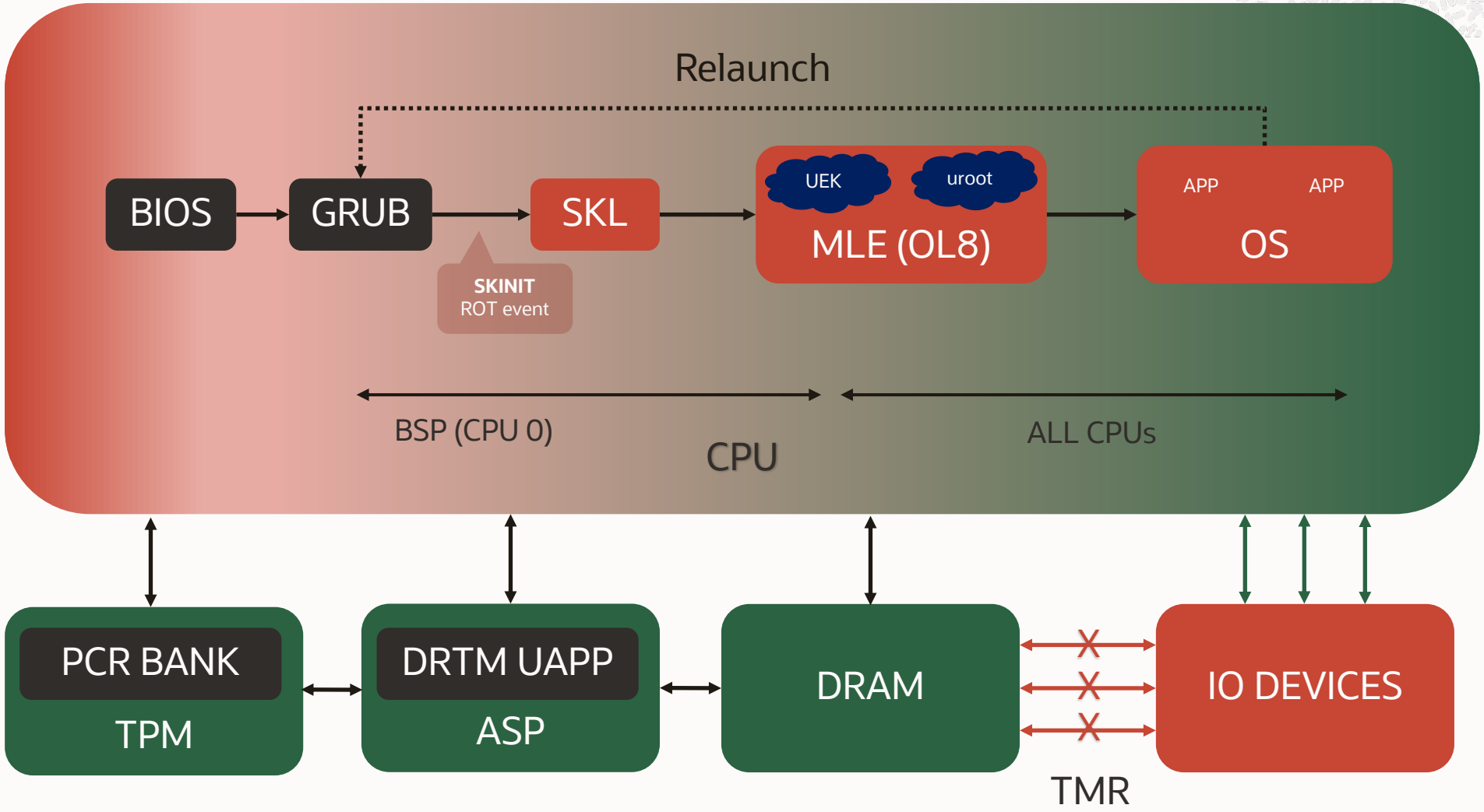

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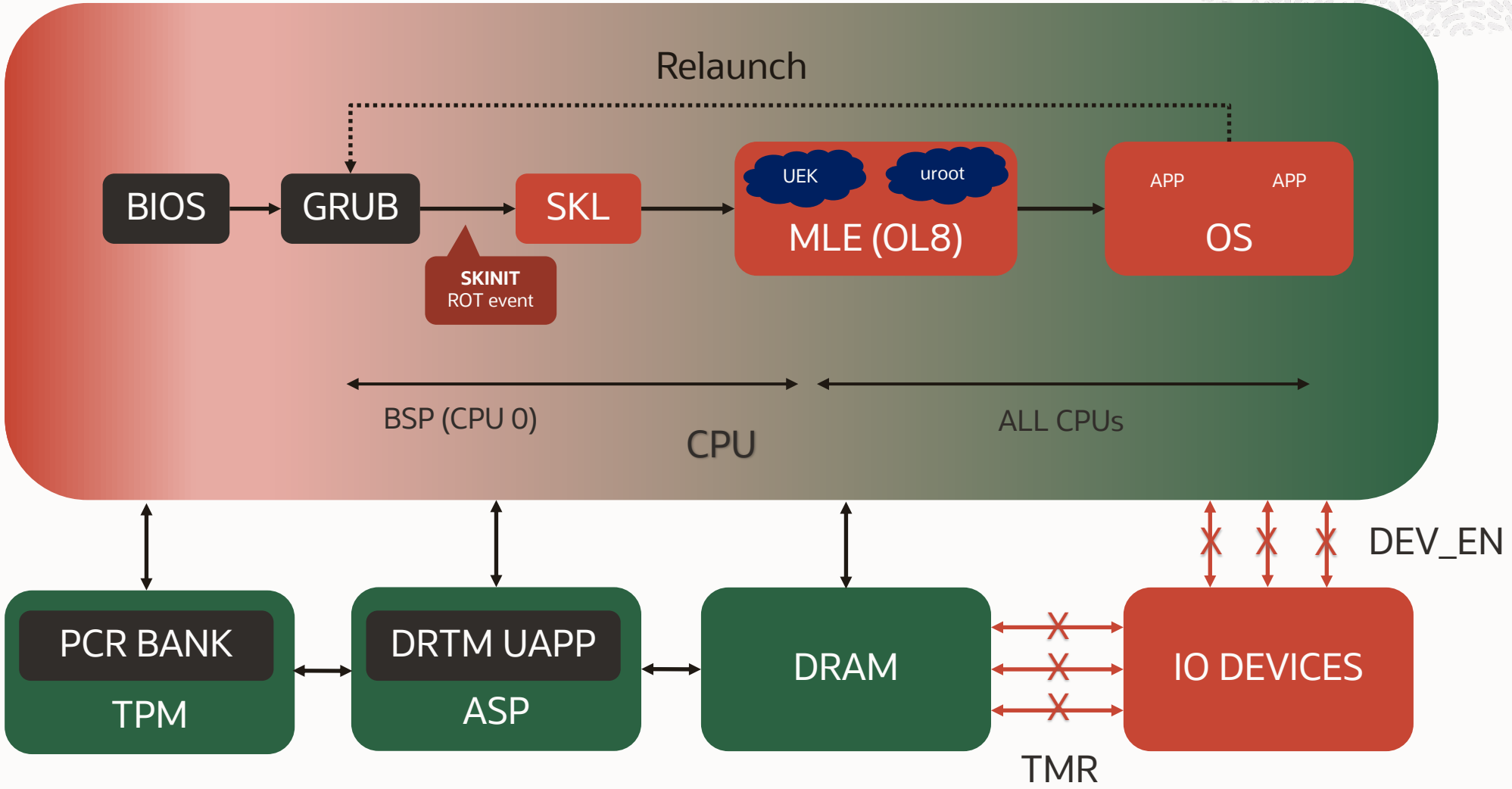

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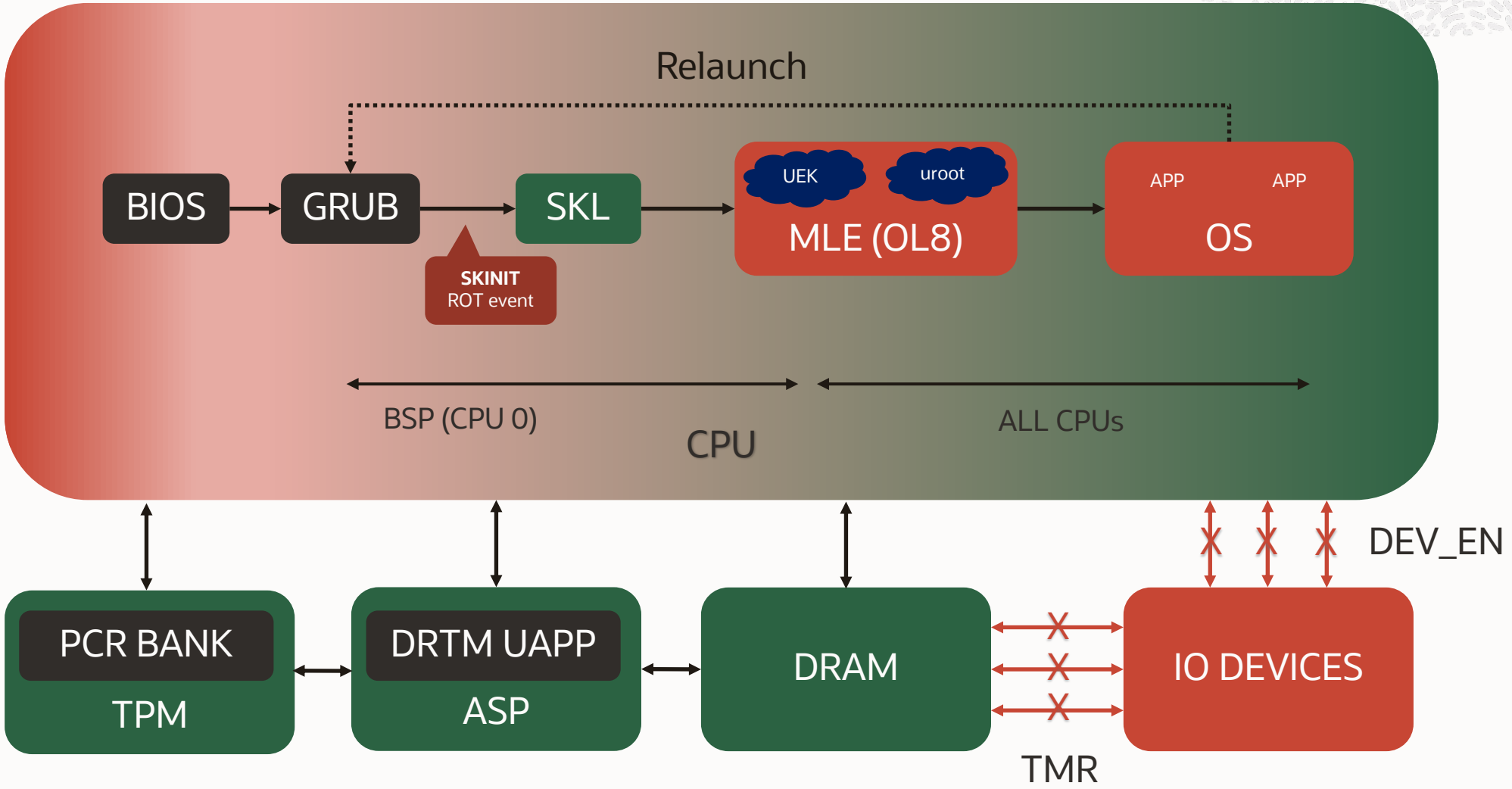

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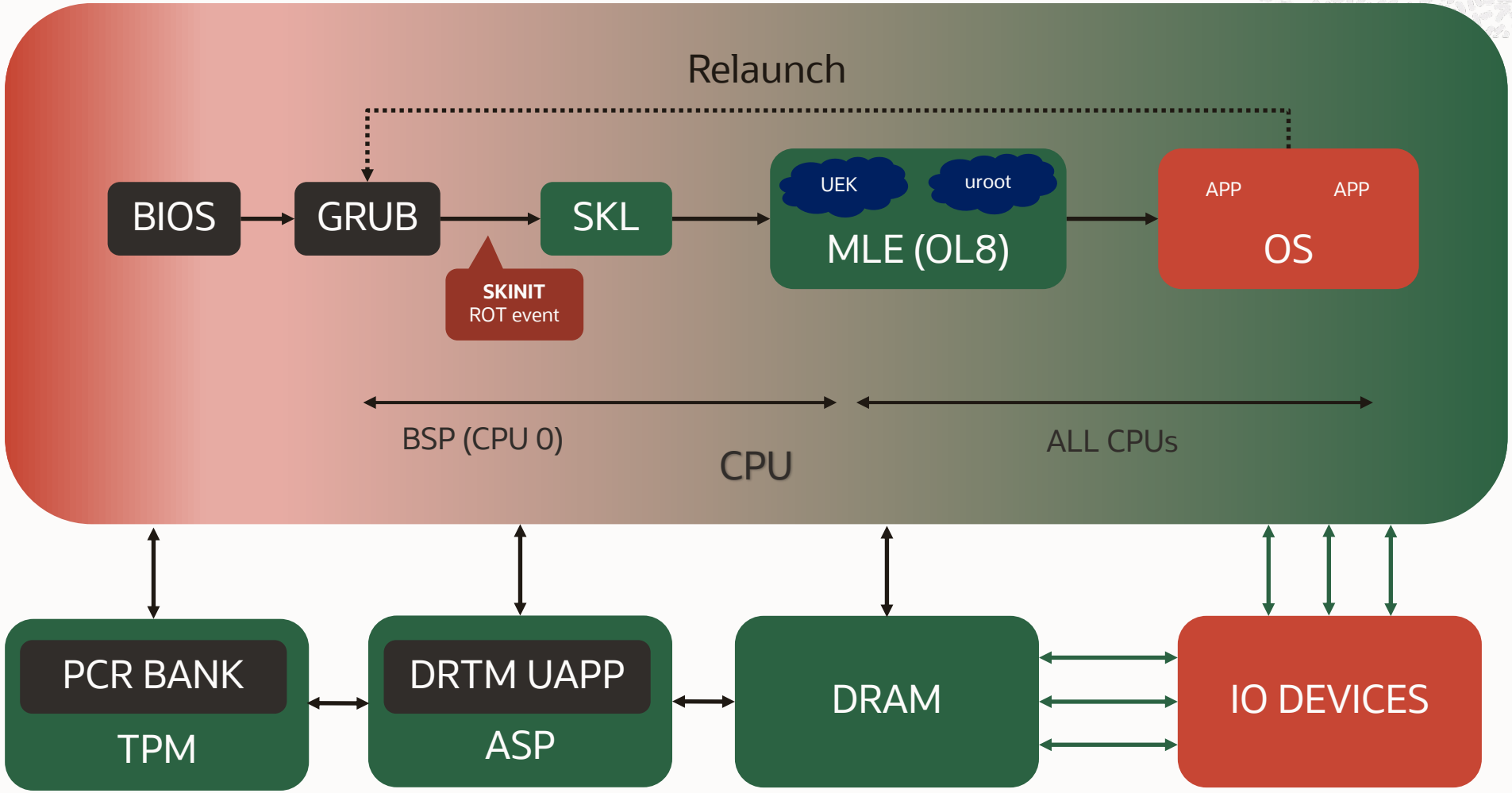

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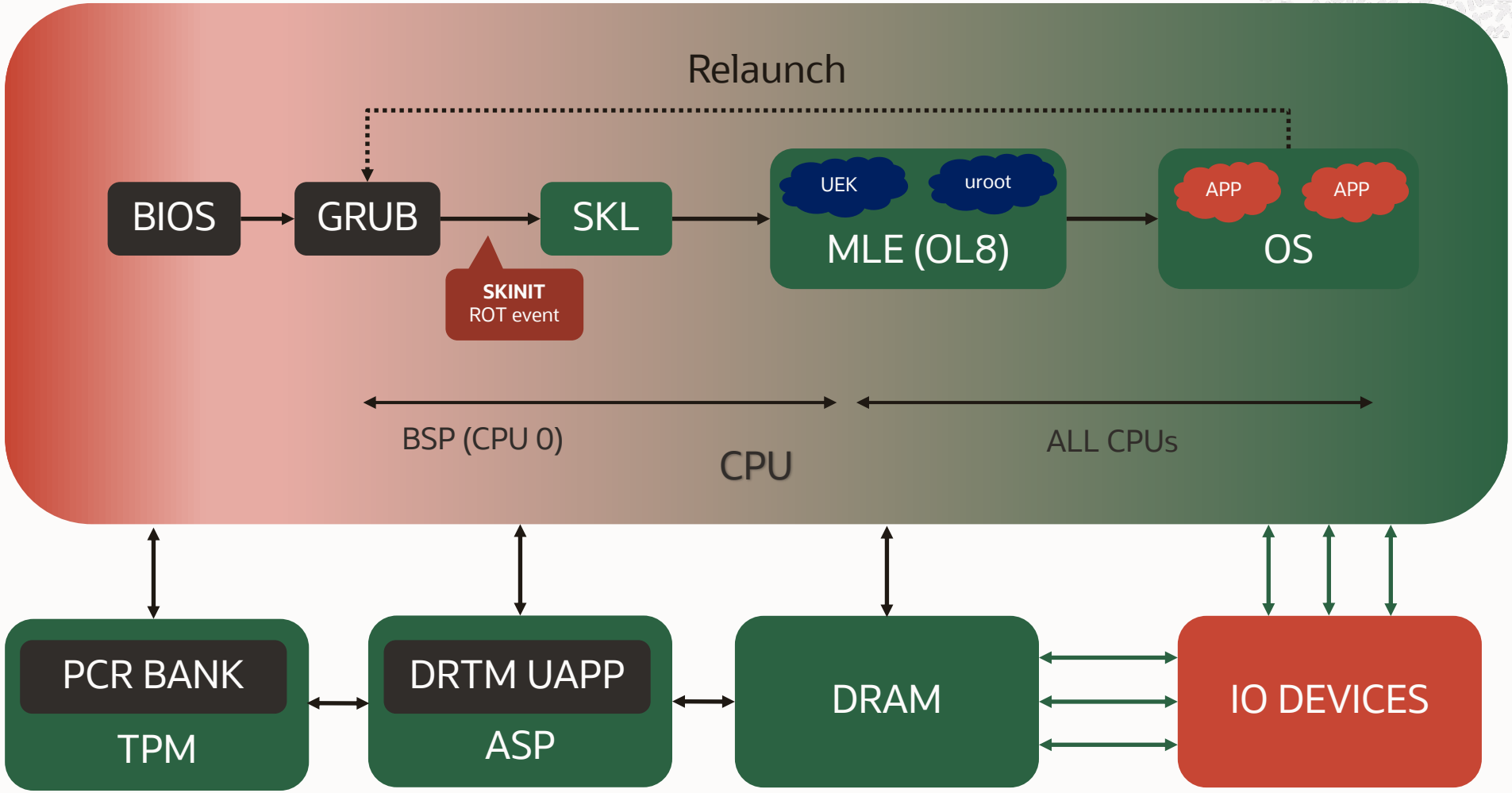
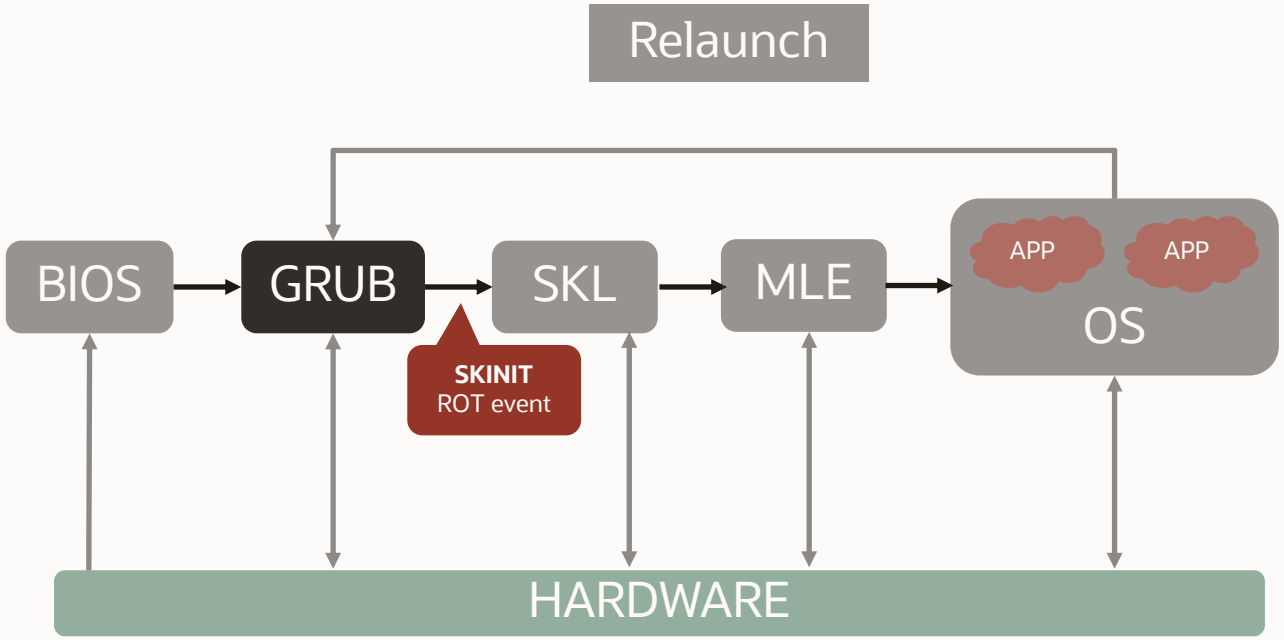


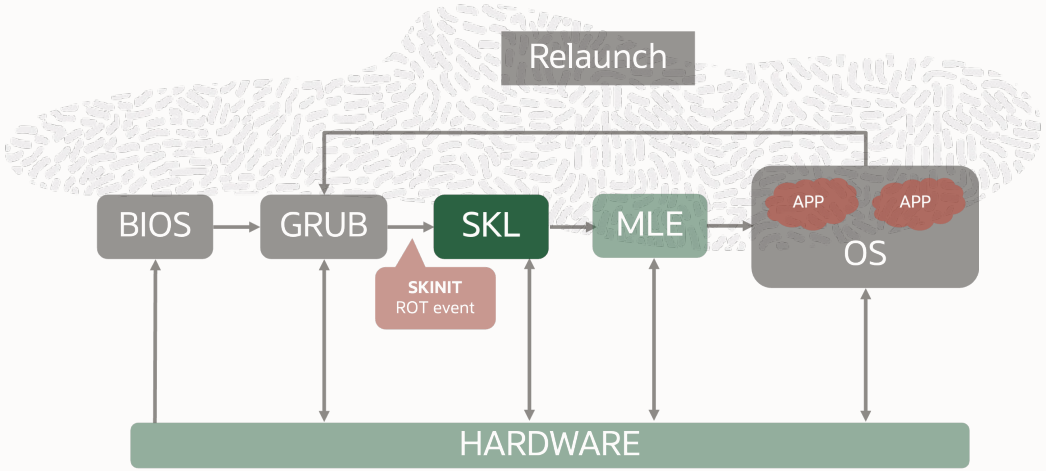
GRUB
AMD: Overview

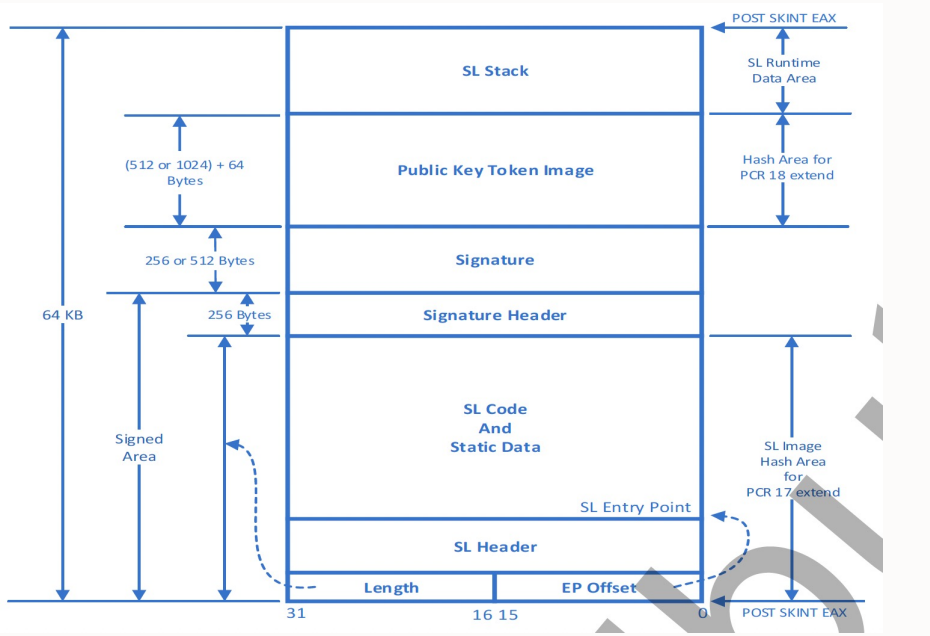
- Check CPU supports SKINIT
- Set ICR, CPU control registers, and fill SKL tags with bootloader data
- Setup DRTM service through ASP
  - DRTM Service Initialization
  - DRTM Get Capability
  - DRTM Setup Trusted Memory Region
- Runs the SKINIT instruction by passing the physical address of the SKL binary to it via the EAX register



Secure Kernel Loader (SKL)

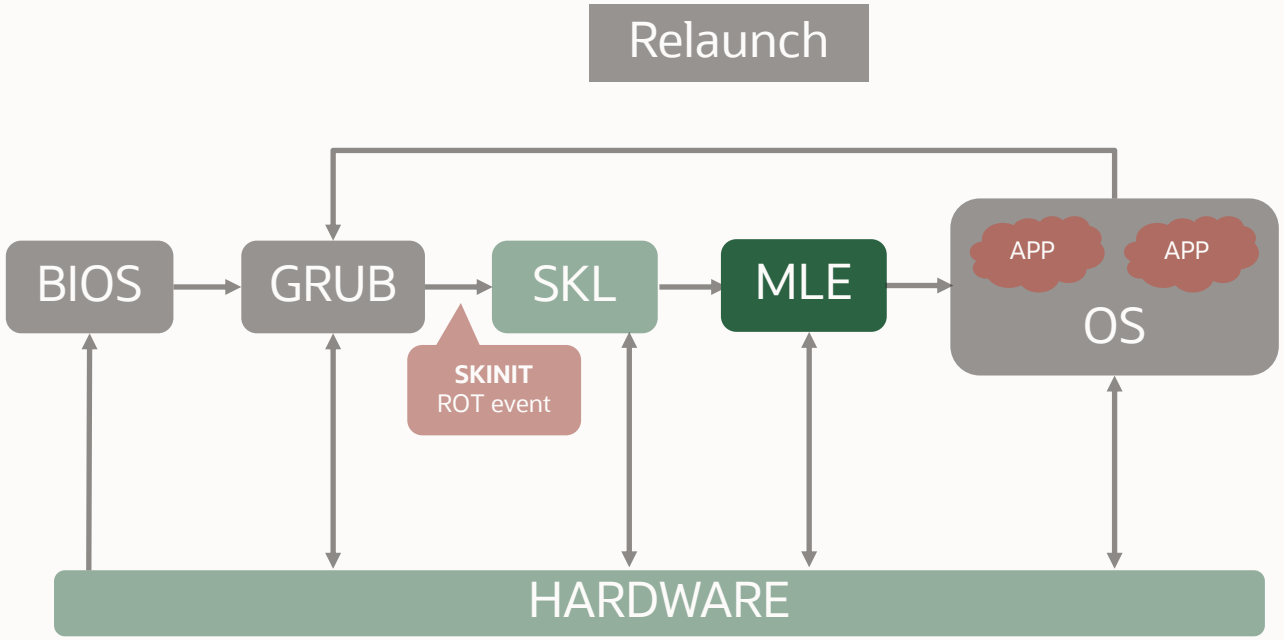
- Executes with SL_DEV protection
- Kicks off the state machine in the DRTM UAPP
- Measures the MLE kernel and extends the measurements to PCRs
- ASP validates the signature embedded in SKL before vectoring into it.
- AMD allows vendors to sign SKL. Oracle developed a tool to sign and package SKL.





Secure Launch Kernel (a.k.a MLE / DLME)

- Runs on the Bootstrap Processor (**BSP**)
- Enables DMA by releasing TMRs
- Locks TPM locality 2 and ends the DRTM state machine in the ASP
- Clears *INIT_REDIRECTION* in VM_CR MSR
- Wakes up the *Application Processors* (**APs**) using the startup IPI
- U-root makes policy decisions
- Two flavors: *Provisioning* & *SecureLaunch*



Linux Upstream Status

- Current Secure Launch patch set for Linux submission is Intel/TXT only.
- Version 7 of the patch set was posted to LKML in November 2023.
- Primarily contained AP startup changes using MWAIT/MONITOR per Thomas Gleixner's suggestion.
- The UEFI/Dynamic Launch stub support was removed in v7 because of substantial changes to the EFI startup code in the setup kernel.
- An effort is underway with the UEFI Linux kernel maintainers to redesign a new solution.
- These changes will be posted to LKML in patch set version 8 in the next few months.

Thank you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