Linaro Connect

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Deploying and managing Confidential Virtual Machines on Arm platforms

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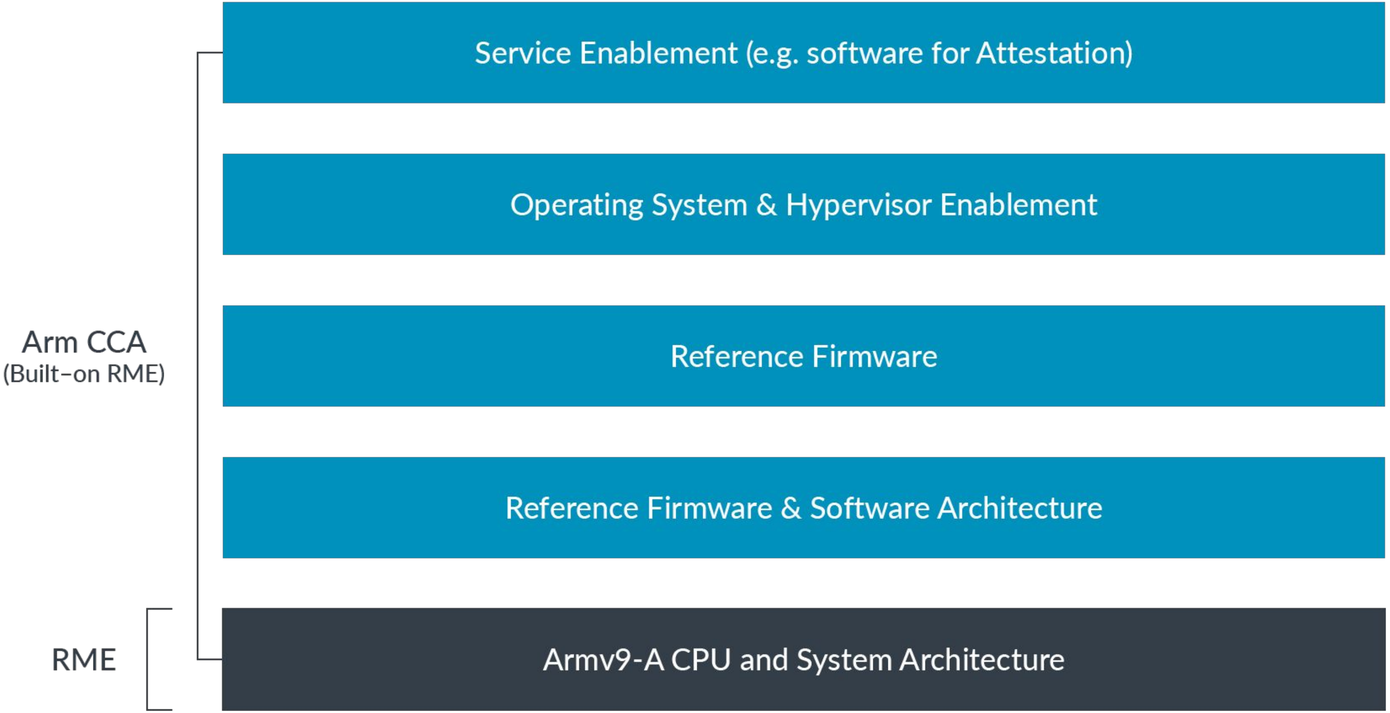
Confidential Computing

data at rest

data in transit

data in use

Confidential Computing stack on Arm



Service Enablement (e.g. software for Attestation)

Operating System & Hypervisor Enablement

Reference Firmware

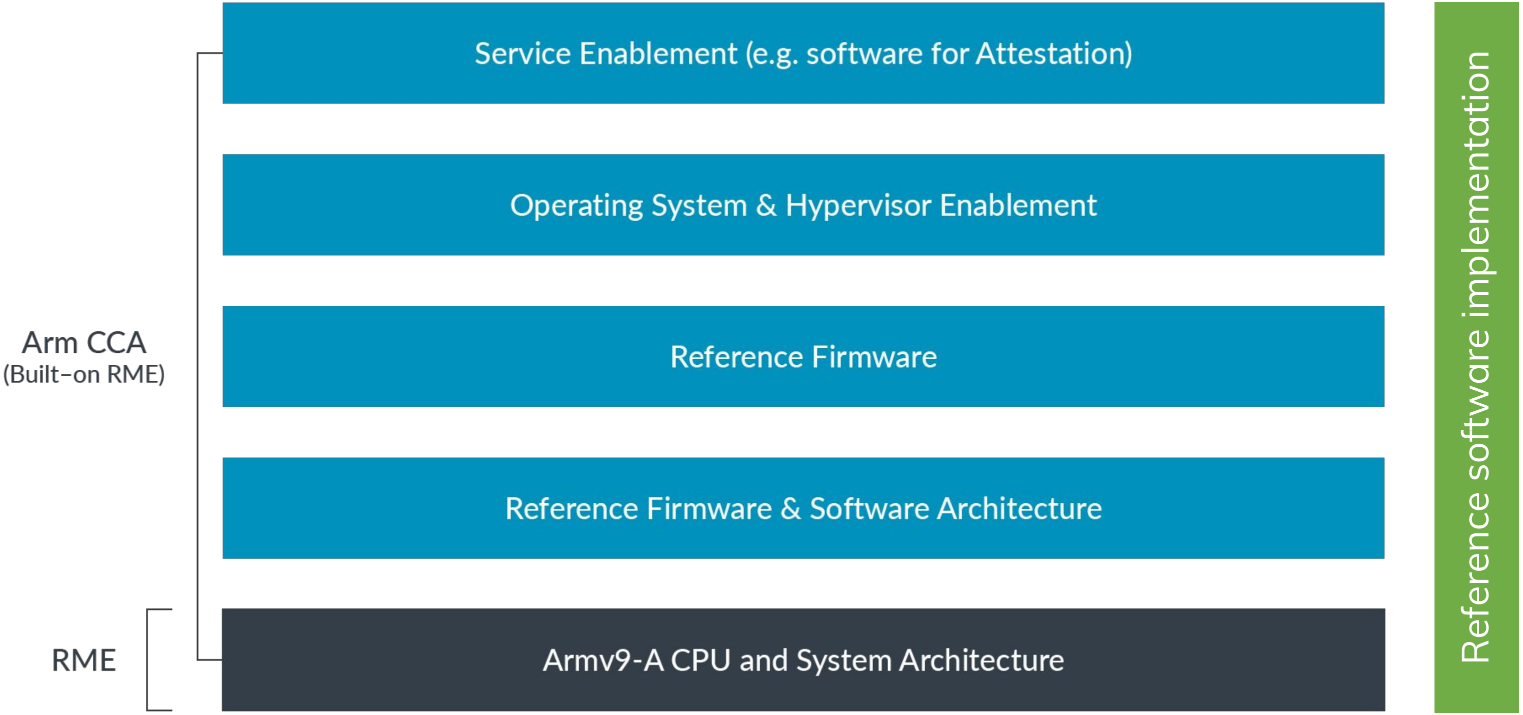
Reference Firmware & Software Architecture

Armv9-A CPU and System Architecture

Arm CCA
(Built-on RME)

RME

Confidential Computing stack on Arm



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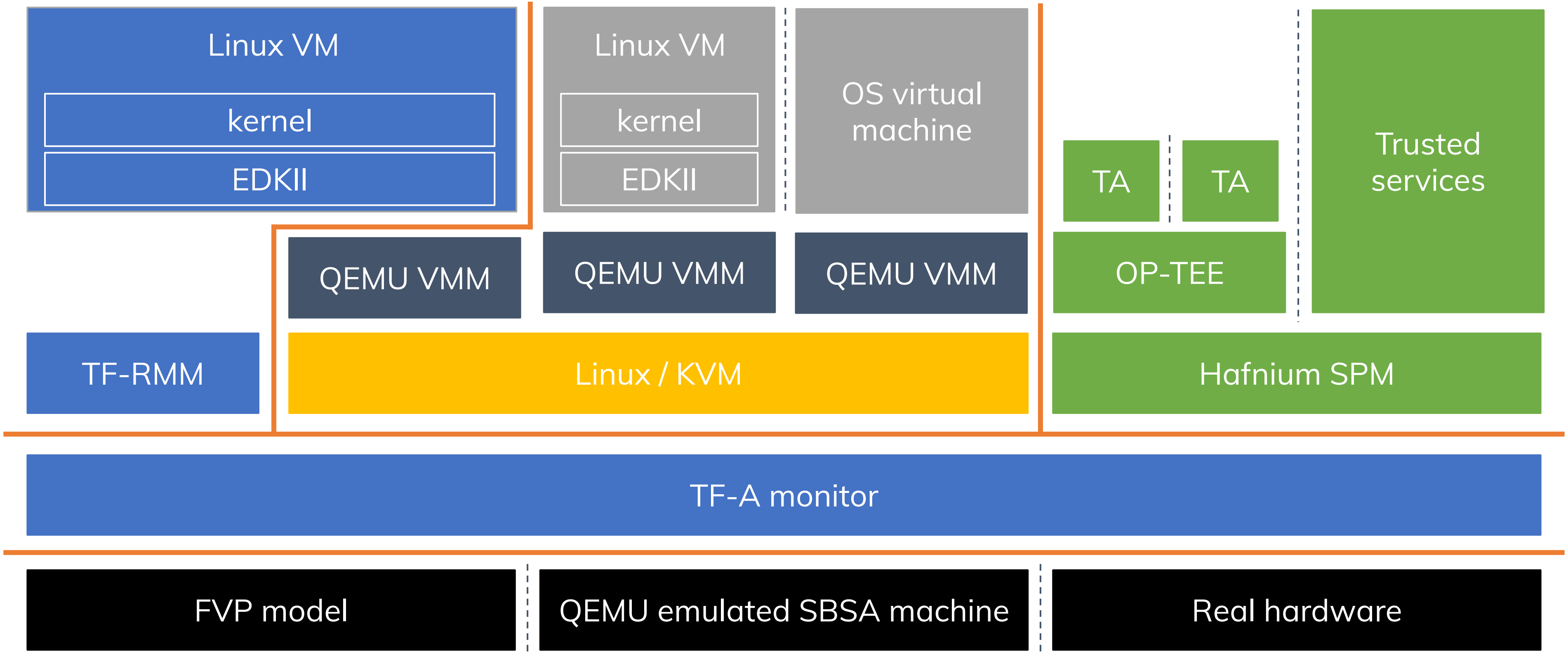
Reference software implementation

Project objectives

Provide a comprehensive set of software and emulated hardware that supports Confidential Computing on Arm:

- QEMU support for Arm’s Realm Management Extension (RME).
- Provide a low level stack (TF-A, TF-RMM, EDK2) that conforms to the Arm's Confidential Compute Architecture (CCA) specification.
- Provide user space components that can start and support a Realm Virtual Machine.
- Provide a user space environment capable of attesting the platform.

Low level reference software stack



CCA low level software reference stack

Arm developed a CCA stack that runs on their FVP model.

With the release of QEMU 8.1, Linaro ported that stack to QEMU:

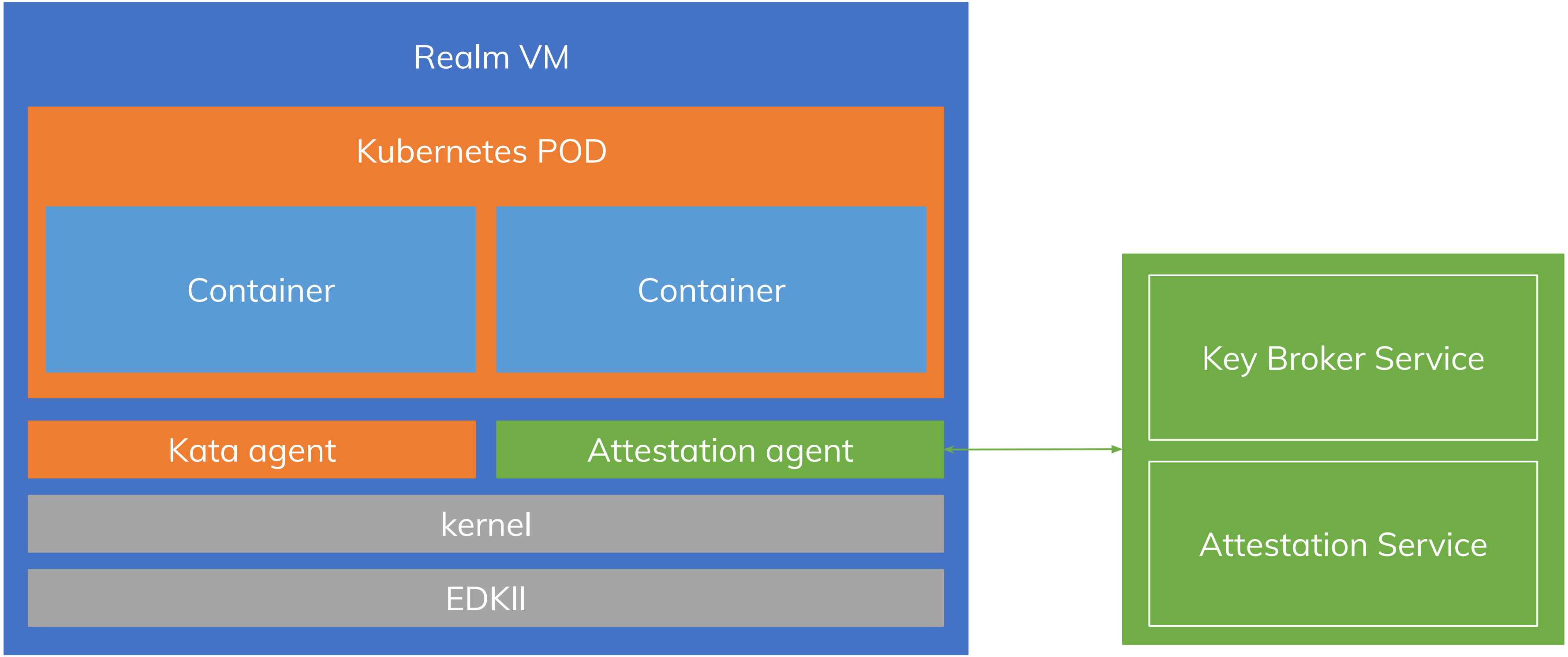
- Patches for TF-A, TF-RMM and EDK2 are available on CodeLinaro (cca/v2 branch).
- Patches for the Linux kernel and kvmtool are hosted by Arm (cca/v2 branch).
- The solution is currently for the QEMU virt machine type with buildroot.
  - QEMU as a system emulator with RME support and as a VMM launching Realms.

Work to support QEMU SBSA reference machine type is ongoing.

Support for RME in Linaro's Trusted Reference Stack (TRS) is ongoing. Plans for a CI.

Documentation is available to compile and run the stack, from base system to Realm.

High level reference software stack



CCA high level software reference stack

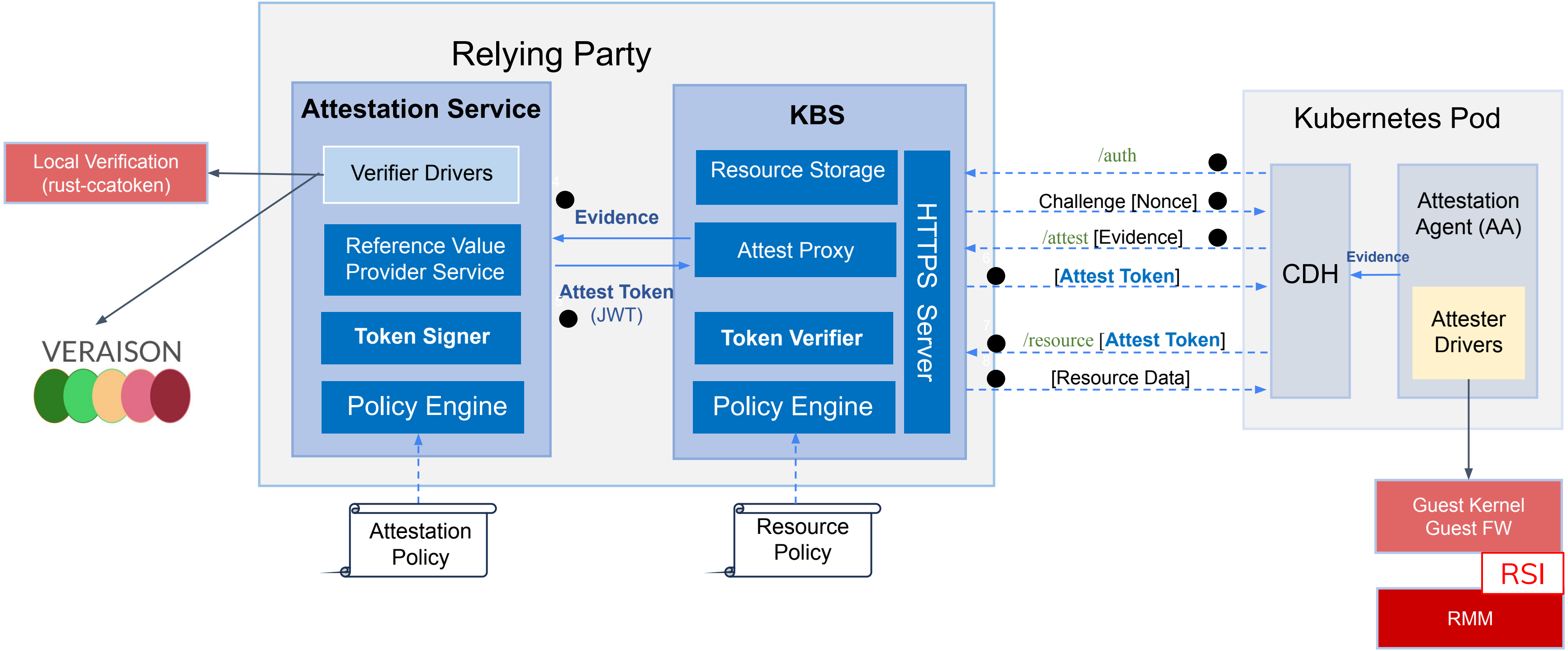
Kata container support: code repo.

- Current features:
  - Only supports Kata v2.
  - Only supports QEMU back end.
  - Only supports direct kernel boot with Kata. The UEFI boot disk image has been validated.
  - Only supports ACPI=off in QEMU.

Confidential Containers (CoCo):

- Framework adoption
  - Kubernetes Confidential Computing operator
  - Container image service (service offload, encryption verification).
- Trustee support: code repo.

CoCo and Veraison - Remote Attestation



Attestation tools

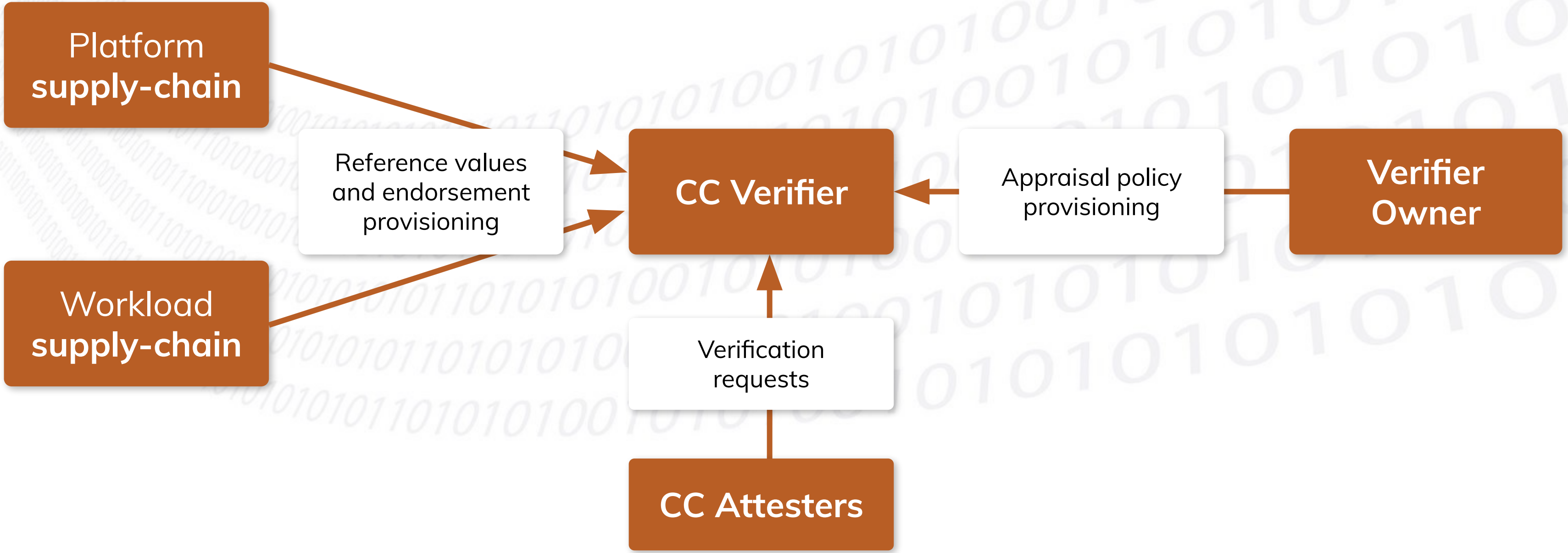
ccatoken crate

- Provides command line tools and APIs to decode and verify CCA attestation tokens.
- Published at https://crates.io/crates/ccatoken.
- Sources at https://github.com/veraison/rust-ccatoken.

realm-token crate

- Tool that calculates the Realm initial and extended measurements, needed for CCA attestation.
  - Sources at https://git.codelinaro.org/linaro/dcap/realm-token.

Remote attestation verification



Platform **supply-chain**

Workload **supply-chain**

Reference values and endorsement provisioning

CC Verifier

Appraisal policy provisioning

Verifier Owner

Verification requests

CC Attesters

Future steps

QEMU support for memory encryption.

QEMU support for SMMU. This is a requirement for device assignment.

Cloud Hypervisor support.

Lightweight firmware support for Arm CCA.

End-to-end demo for CoCo on Arm CCA with Qemu backend.

Integration of Veraison and CoCo Attestation Service (AS) to provide a holistic end to end reference solution for confidential containers on Arm platforms.

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Thank you