TEEP Architecture Draft

https://tools.ietf.org/html/draft-ietf-teep-architecture-00

Mingliang Pei, Hannes Tschofenig, Andrew Atyeo, Dapeng Liu

IETF#102

Document Status

- Submitted WG draft on 07/02/2018
  - Received a good list of comments in mailing list
- It took largely the architecture extracted from the WG approved OTrP draft
- Addressed some comments from the mailing list on OTrP into this draft
- Started to address the feedback from the last WG

Current Document Structure

- Introduction
- Terminology
- Scope and Assumptions
- Use Cases (Payment, Authentication, IoT, Confidential Cloud Computing)
- Architecture
- Agent
- Attestation
- Security Consideration

Changes in v0

- Terminology Unification
  - Secure Boot Module vs. Trusted Firmware
  - Service Provider vs. App Developer
- Added a diagram about “User Experience”
- Started to make Trusted Firmware verification optional
- Made transport support as a requirement
- Made assumption to support multiple TEEs
- Made TA binary distribution by a Client Application a goal

OPEN ISSUES

Trusted Firmware

- Agreement in the group to make trusted firmware functionality optional since it is TrustZone-specific
- Still lots of left-over text in the document present
- Clean-up in next version

Trusted App Distribution

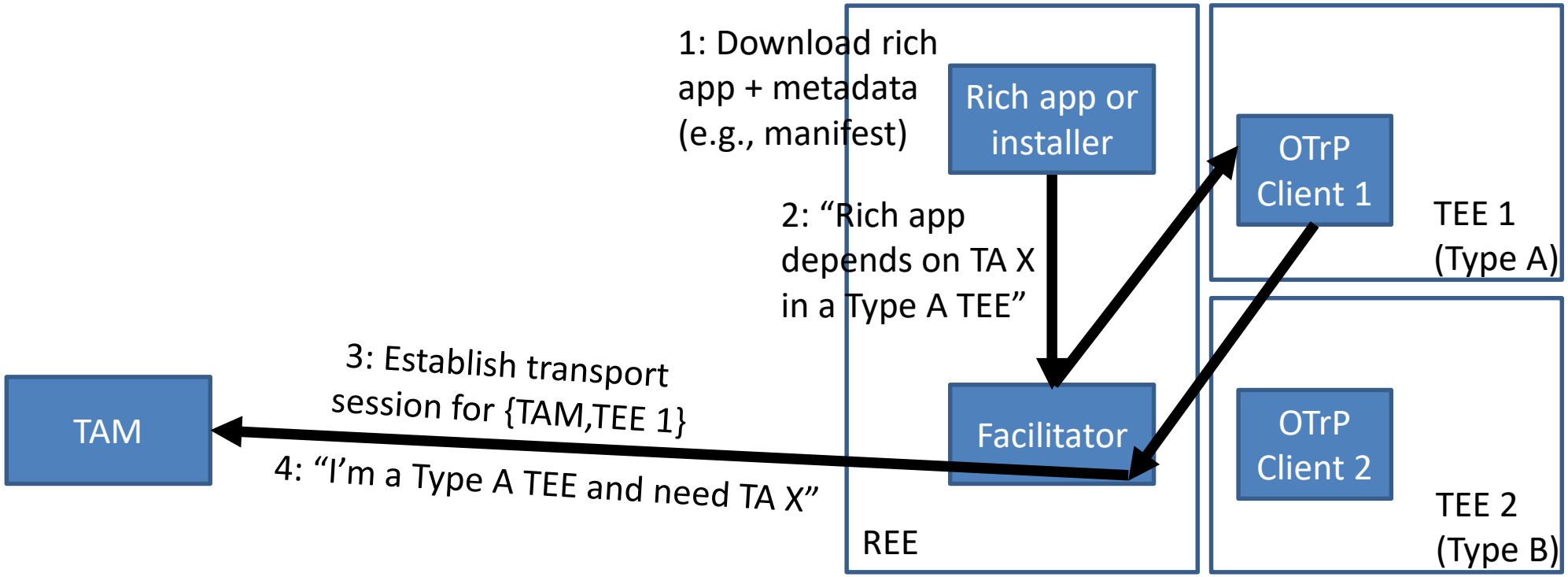
- Two modes:
  - TA binary bundled with the Client Application
  - TA distributed by TAM
- Challenges with first approach is
  - Passing device or TA instance specific data requires real-time interaction with a TAM. This functionality is in use today.
  - Client Application is not authorized to query TEE device state. Who is authorized to update a TA in the future? What would be the Security Domain?

Multiple TEEs vs. Single TEE

- The original OTrP assumes that device is equipped only with a single TEE.
- One TEE per device deployment is common today.
- Multiple TEE support was asked. Use case unclear.
- Technical issue: How are messages routed to the correct TEE?
  - TEEP Agent is responsible to get a TEE identifier, and connects to the right TEE
  - It implies that TEEP Agent needs to parse the TAM messages or some header
  - The TEE identifier is better to be verifiable as the actual intent

How are messages routed to the correct TEE?

Example below for heterogeneous TEE types in same device



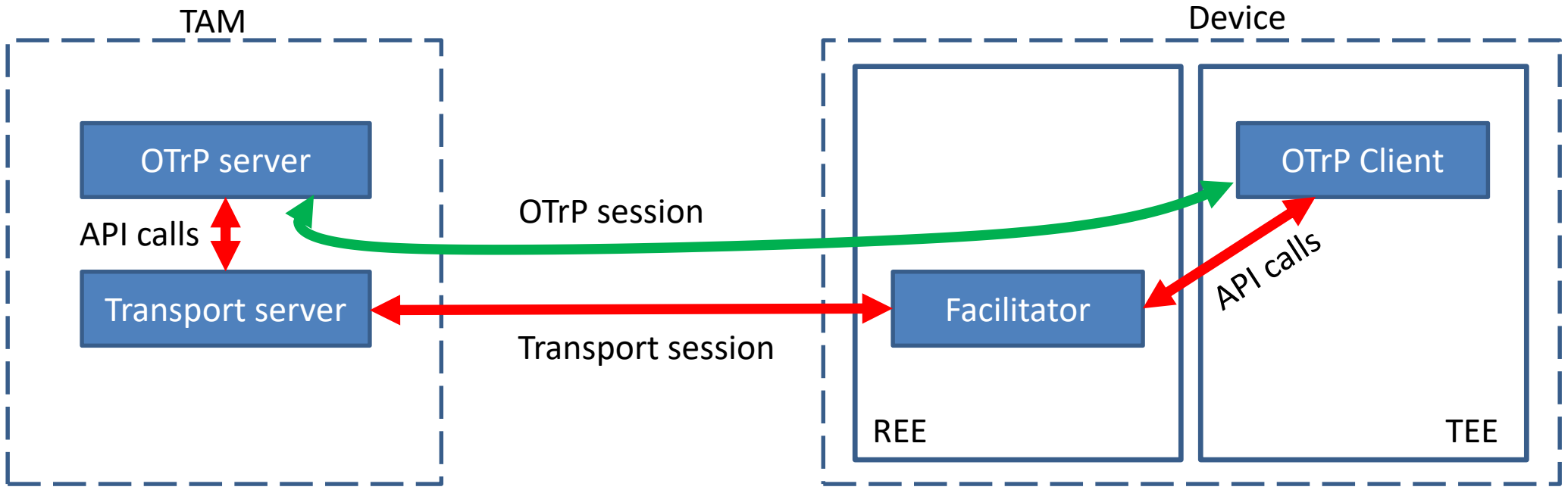
Subsequent messages from TAM are sent in transport session associated with the correct TEE

Every Rich App Talks to TAM?

- Dave Thaler: The document seems to assume that every rich app that needs a TA, also needs to have code to talk to a TAM.
  - I agree that's one possible implementation but the architecture should not require that.
  - An alternative implementation would be where the REE OS (e.g., the app store installer) contains code for communicating with TAM(s) using data in (for example) the rich app's manifest, and the rich app has no need to run until the TA is already installed. The installer/communicator is a rich app of a sort, but it's a different one from the client app that depends on the TA.
- In my opinion, the arch doc should not require that it's the same app, but should certainly allow it to be.

OTrP Roles & Terminology

- The term “Agent” is confusing since as used in the doc, the Agent does not understand OTrP, just transport: “facilitator”? “connector”?
- Facilitator might be in rich app or app installer or whatever else



Service Provider Terminology

- Service Provider: An entity that wishes to supply Trusted Applications to remote devices.
- The architecture document also says:
  - A Device Administrator or Service Provider of the device needs to determine security-relevant information of a device before provisioning the TA to the device with a TEE.
  - A TEE in a device needs to determine whether a Device Administrator or a Service Provider that wants to manage an TA in the device is authorized to manage applications in the TEE.
- Dave Thaler: If the Device Admin is responsible for controlling what apps run in the TEE on an IoT class device (e.g., in a factory), is the Device Administrator just another type of SP, or are those terms disjoint?

Keys

(Not present in SGX)

Used for attestation

Used for Software signing

Key Entity Name	Location	Issuer	Checked Against	Cardinality
1. TFW key pair and certificate	Device secure storage	FW CA	A white list of FW root CA trusted by TAMs	1 per device
2. TEE key pair and certificate	Device TEE	TEE CA under a root CA	A white list of TEE root CA trusted by TAMs	1 per device
3. TAM key pair and certificate	TAM provider	TAM CA under a root CA	A white list of TAM root CA embedded in TEE	1 or multiple can be used by a TAM
4. SP key pair and certificate	SP	SP signer CA	A SP uses a TAM. TA is signed by a SP signer. TEE delegates trust of TA to TAM. SP signer is associated with a SD as the owner.	1 or multiple can be used by a TAM

Root of Trust vs. Trust Anchor

- Attempt to differentiate the certificates usage with different terminology.
- David Wheeler proposed terminology for the two terms.
- Andrew proposed to remove trust anchor term and to use terms like “TAM root CA certificate store”.

Root of Trust vs. Trust Anchor (cont.)

- **Trust Anchor**: A trust anchor is public asymmetric key, preferably contained in a certificate that represents a trusted entity to a device. This public key may be used by the holder of the corresponding private key to sign other certificates, thereby communicating the signed certificate may also be trusted. The trust anchor is usually embedded in a device or configured by a TAM and used by the device to validate the trust of a remote entity by verifying that entity's certificate is signed by a trust anchor. Trust anchors must be stored in a way that prevents or strongly resists modification by unauthorized software and hardware adversaries. An example of a trust anchor is the public key of a TAM or SP which is "pinned" or securely stored inside the device, and that trust anchor is used like a CA certificate to validate the trust in other keys/certificates. A trust anchor may be viewed by both trusted and untrusted entities on the device, But may only be modified or deleted by a trusted entity.

- **Root-of-Trust Key:** A device-unique key generated at device manufacturing or at TEE provisioning, which is securely stored and only accessible to the TEE. The Root-of-Trust Key is used for attestation signing which proves the signed message originated or was approved by the TEE, and may be trusted to the same degree as the TEE.

Security Domain Concept

- Currently one level security domain hierarchy assumed.
- Purpose of the domain is for isolation of resources. TA in one SD cannot access resources of a TA in another SD.
- Up to TEE's implementation of isolation and access control.
- Definition of security domain not available and use cases unclear.
- Implication of SD concept is in the message exchange that requires messages to create and delete security domains.