SSI Deployment Challenges

KERIA Architecture and SSI Deployment Strategies

April 18, 2023

IIW 36

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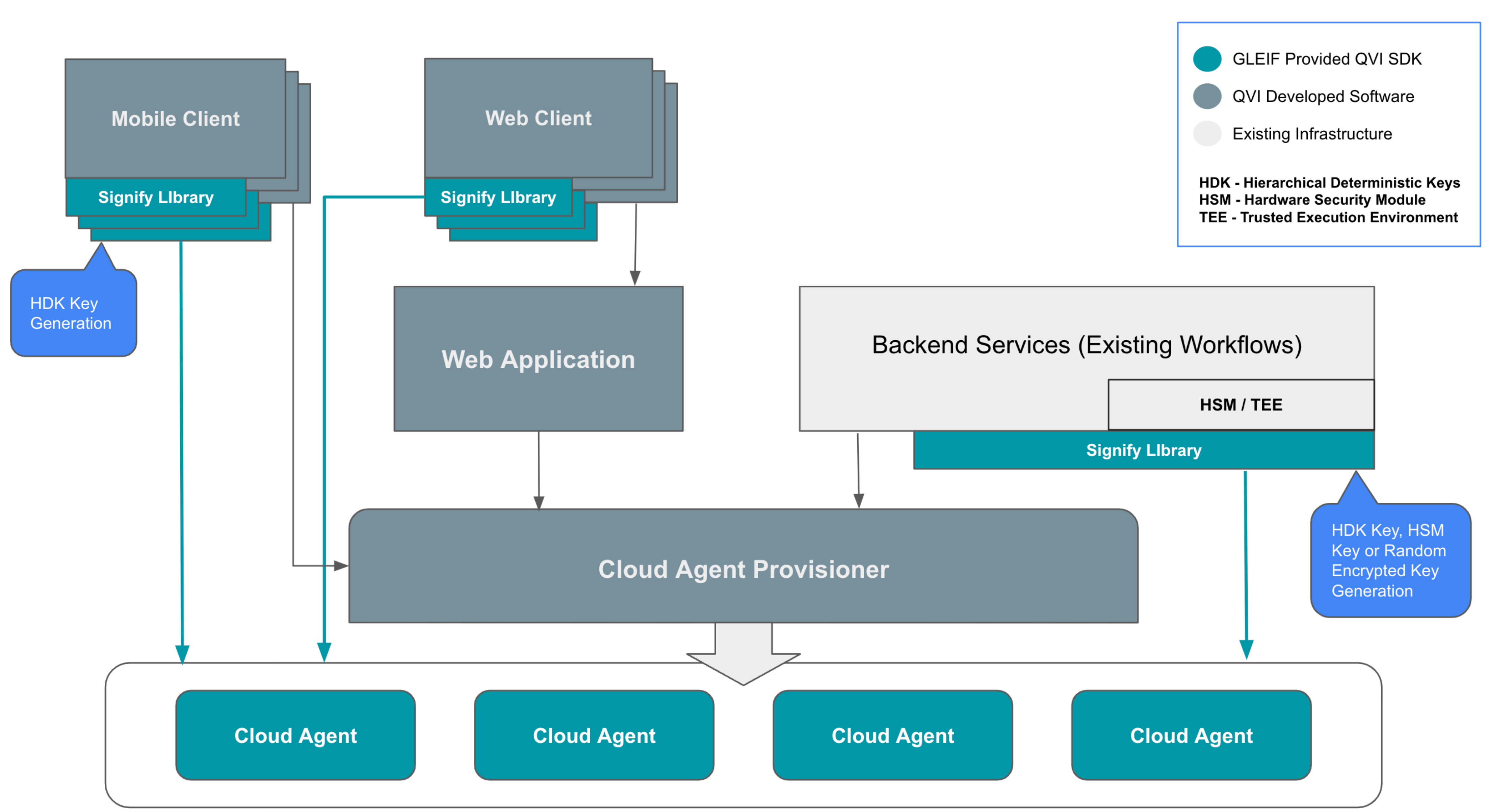
KERIA Overview

How we got here, where we're headed…

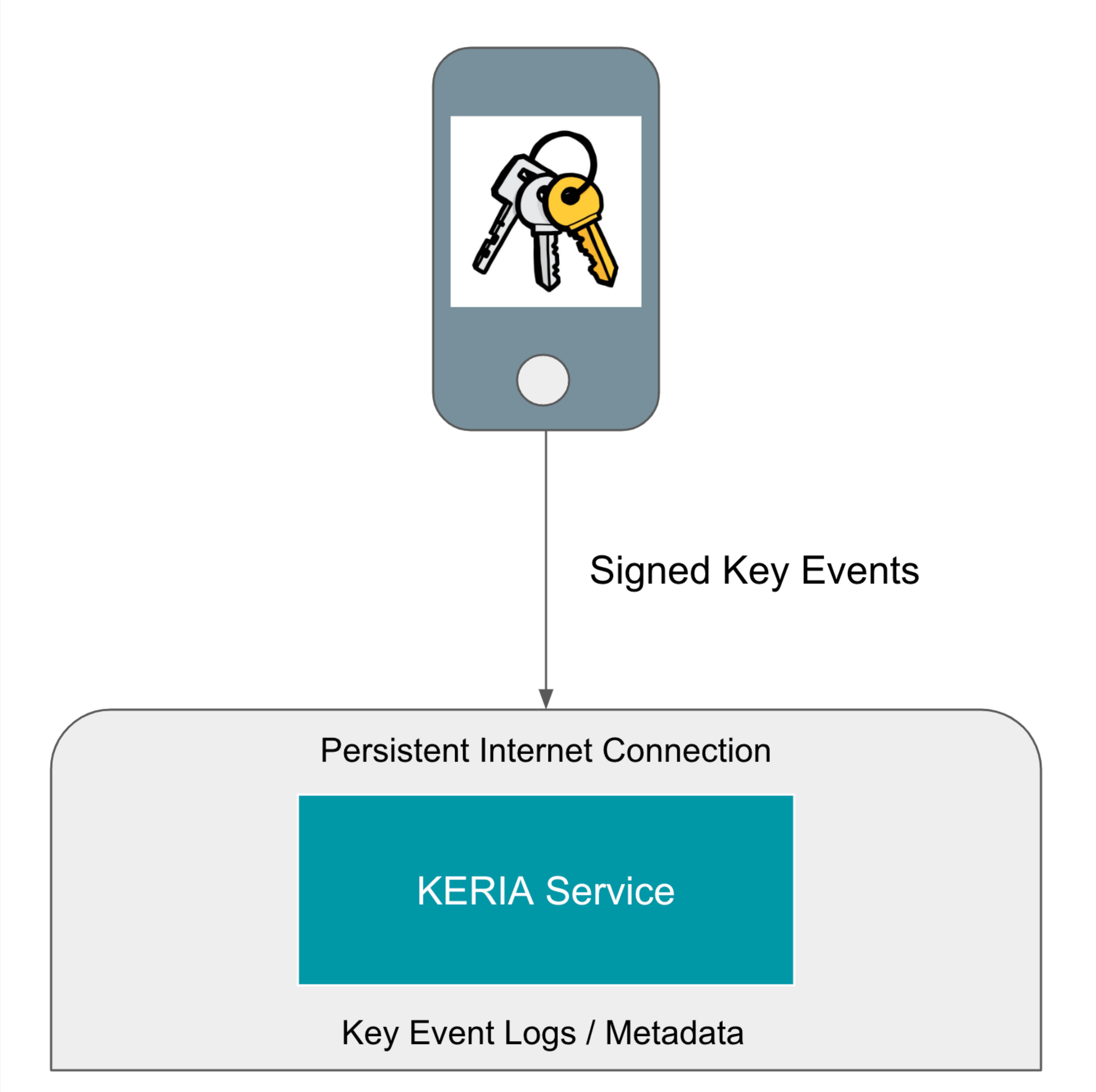
- **KERIpy** – KERI Core Library Reference Implementation
  - CESR Primitives
  - Event Parsing, Generation, Signing
  - Receipts and Witness Implementation
- **KLI** – KERI Command Line Interface
  - Staying put for now
- **KERIpy Agent (KIWI) and the KEEP** – Mark I Agent / Reference UI
  - Not Safe for Children
- **Signify** – Signing at the Edge Client with **Minimally Sufficient KERI**
  - SignifyPy – Signify Reference Implementation In Python
  - Signifide – Rust Implementation, Sits on CESRide
- **KERIA** – Mark II Agent
  - Supports Signify Clients
  - Multi-Tenant Design

GLEIF SDK Development Efforts



Signing at the Edge

Where are the keys?



Supported Key Types

- **Salty Keys – Hierarchical Deterministic Keychain**
  - 21 Character Passcode Entered by User
  - Stretch into Seed using Argon2id
  - Combined with a “path” to create Ed25519 hierarchical deterministic key chain
  - Passcode never leaves the client
  - Full key hierarchy can be regenerated if needed
  - Agent stores “path” and “tier”, Controller remembers passcode
  - No key material on Agent, generated on the fly every time

- **Randy Keys – Randomly generated, encrypted and stored on agent**
  - 21 Character Passcode Entered by User
  - Stretch into Seed using Argon2id
  - Ed25519 key pairs and X25519 encryption keys generated
  - All signing and rotation keys generated using random algorithm on client only
  - Private keys, next public keys encrypted on client and stored on Agent

Supported Key Types (continued)

- **Group AID – Distributed Multisig Group**
  - Multisig Group AID for Signify Client
  - Local AID from Signify from one of the other types

- **HSM / TEE Integration**
  - Apple Secure Enclave for example
  - Support for additional crypto algorithms are needed
    - secp256k1 for example

Agent Role and OOBIs

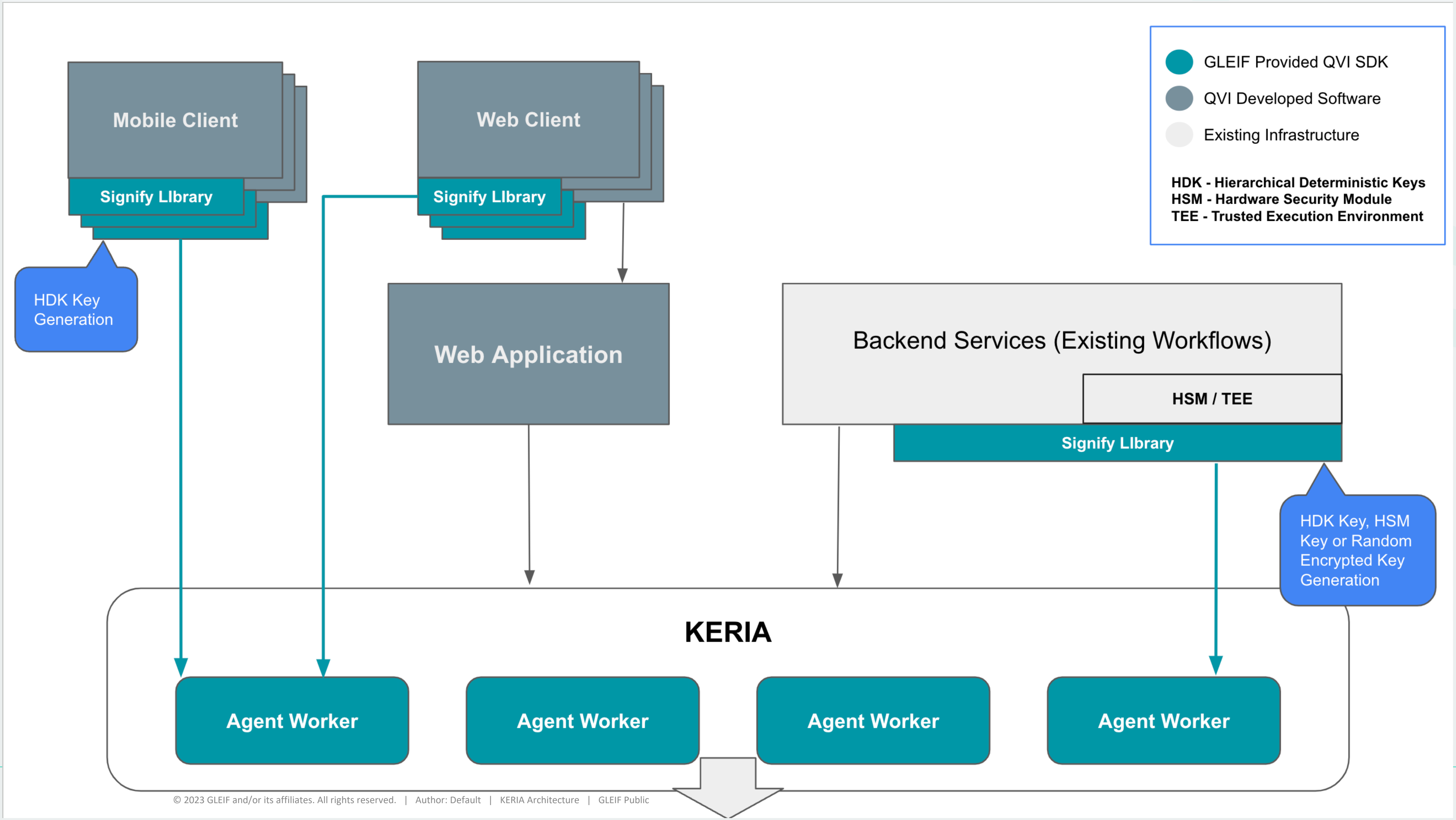
Agent Roles / OOBIS

- **New *agent* role added to supported roles**
  - Receives events directly to Agent
  - Provides persistent internet presence
  - Requires change to Multisig OOBI support.

- **New OOBI type for multisig group identifiers**
  - Multisig group communication must go to each member of the group
  - Endpoints must be extended to allow for groups of endpoints as a list, one for each member
  - OOBI exchange for a group will be an indexed list of endpoints associated with the members
  - Communication must be enhanced to support multicasting to group members
  - *http://example.com/oobi/<GROUP AID>/member/<INDEX>/<MEMBER AID>*

Multi-Tenant Design

Multi-tenancy



Mobile Client
Signify LIbrary
Web Client
Signify LIbrary
HDK Key Generation
Web Application
Backend Services (Existing Workflows)
HSM / TEE
Signify LIbrary
HDK Key, HSM Key or Random Encrypted Key Generation
KERIA
Agent Worker
Agent Worker
Agent Worker
Agent Worker
● GLEIF Provided QVI SDK
● QVI Developed Software
○ Existing Infrastructure
HDK - Hierarchical Deterministic Keys
HSM - Hardware Security Module
TEE - Trusted Execution Environment

Multi-tenancy (continued)

- **Ports and Endpoints**
  - 3 separate network interfaces exposed
    1. Boot Interface
    2. Agent Administrative Interface
    3. KERI Protocol Interface (to the rest of the world)

- **Configuration Options**
  - Network interfaces for each interface and port
  - Turn boot interface on or off
  - Preconfigured with existing (possibly static) agent/controller pairs
  - Typical KERI configuration providing witnesses, schema etc. to all Agents

Discussion

How Can I Help?

- **Repositories**
  - **KERIA** – http://github.com/WebOfTrust/KERIA
    - Python
    - Agent Service
    - Porting existing APIs, Docker, CI, Documentation, etc.
  - **SignifyPy** – http://github.com/WebOfTrust/signifypy
    - Python
    - Signify Client
    - Creating API client side classes, HSM integration, documentation, etc.
  - **Signifide** – http://github.com/WebOfTrust/signifide
    - Rust
    - Signify Client
    - FFI, WASM Bindings, API client side classes, CI, documentation, etc.

Plea for Help!

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