Zero-Touch Universal IoT Device Identity

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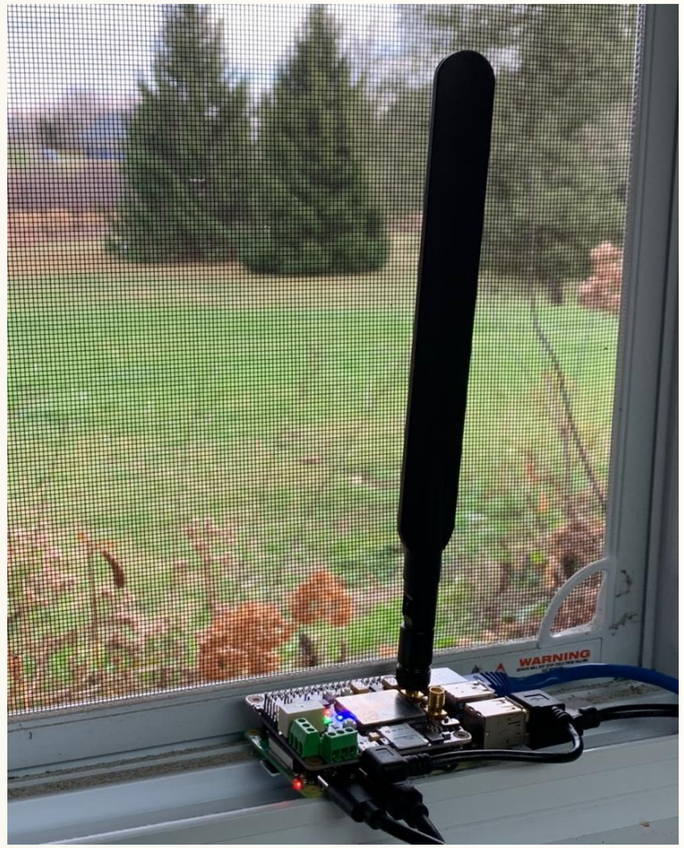
PROOF OF CONCEPT



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WHAT IDENTITY CHALLENGES GET IN THE WAY OF IOT SECURITY?

What can we do with PKI-Based Device Identity?

E2E Message Security

- Signing/encryption over messaging middleware
- Great way to guard against middleware compromise

Transport authentication

- Device certificate for mutual TLS authentication
- Easier to secure than shared secrets, API tokens

Network Authentication

- Device certificate for EAP-TLS authentication
- Allows granular network access, much better than pre-shared keys

WHAT IDENTITY CHALLENGES GET IN THE WAY OF IOT SECURITY?

Interoperability & cost barriers…

Certification Authority

- Creation, operation, maintenance, protection can be costly
- Unapproachable for small businesses
- Introduces an additional namespace to the application/organization
- Often onboard everything to the same CA to avoid identifier collisions

Message security

Proprietary API integration for certificate discovery

Transport and Network Authentication

- Requires distribution of trust anchors (risk of identifier collisions)
- Revocation requires OCSP or distribution of CRL

WHAT IDENTITY CHALLENGES GET IN THE WAY OF IOT SECURITY?

Focus on Network Authentication

What does the ideal state look like?

User purchases a device or secure element with a pre-provisioned universal identity (CA involvement earlier in the supply chain)

Universal identity enables roaming

- Across different access networks (WiFi, 5G, Ethernet)
- Across network providers (rural, municipal, enterprise, telecom)

Client identifier useful for accounting, charge-back

Revocation simpler than OCSP/CRL

FOUNDATIONAL DECISIONS

How important is the namespace?

CSA, Summary Guidance for Identity and Access Management in the IoT-
Step 1a: Define a common namespace for IoT devices

This first step defines the journey.
Many architects just define an entirely new namespace

What if, instead of creating a new namespace, we just use DNS?

(https://downloads.cloudsecurityalliance.org/assets/research/internet-of-things/identity-and-access-management-for-the-iot.pdf)

WHAT IDENTITY CHALLENGES GET IN THE WAY OF IOT SECURITY?

TRUST YOUR EMAIL

Focus on Network Authentication

Two gaps between present state and Universal Identity

1. Absence of a universal namespace for client identities

2. Discoverability of certificates and trust anchors

DANE solves both problems!

CAN WE USE DANE TO SUPPORT EXISTING LIBRARIES?

Focus on Network Authentication

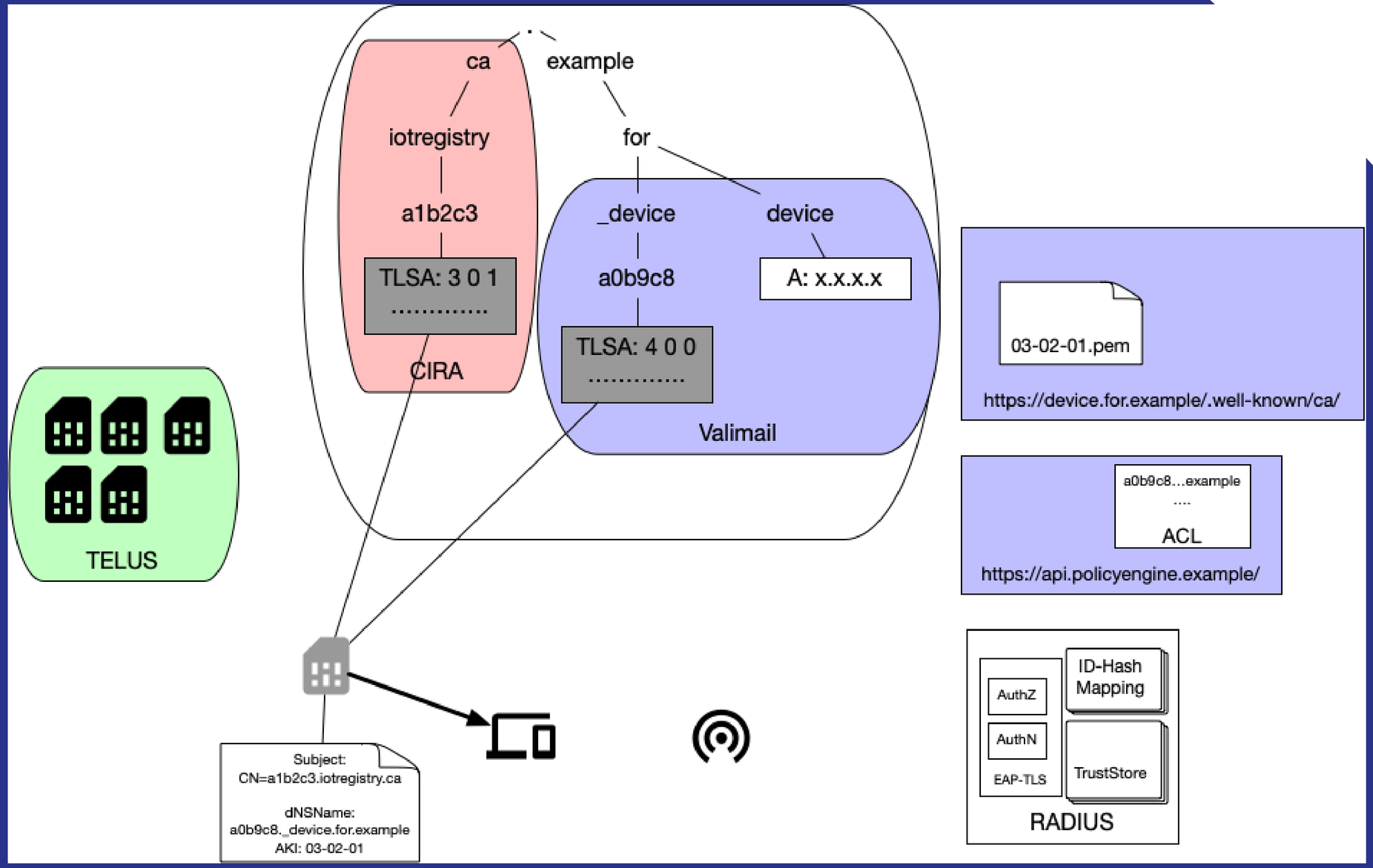
What's a good first step for moving to DNS-bound client identity?

EAP-TLS deployed with CA-issued client IDs

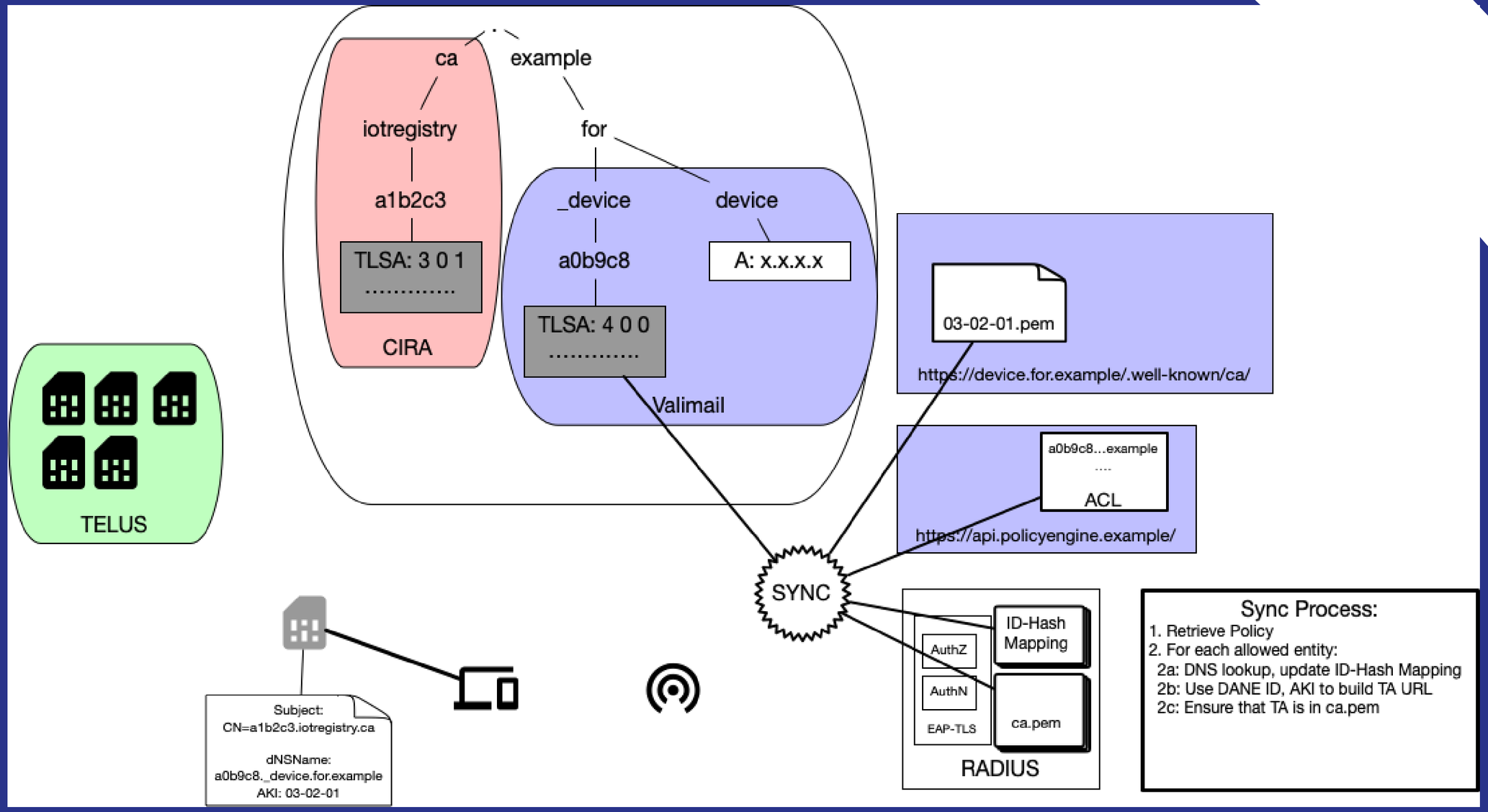
Can we dynamically manage CA certificates in RADIUS

…while enforcing DNS name bindings?

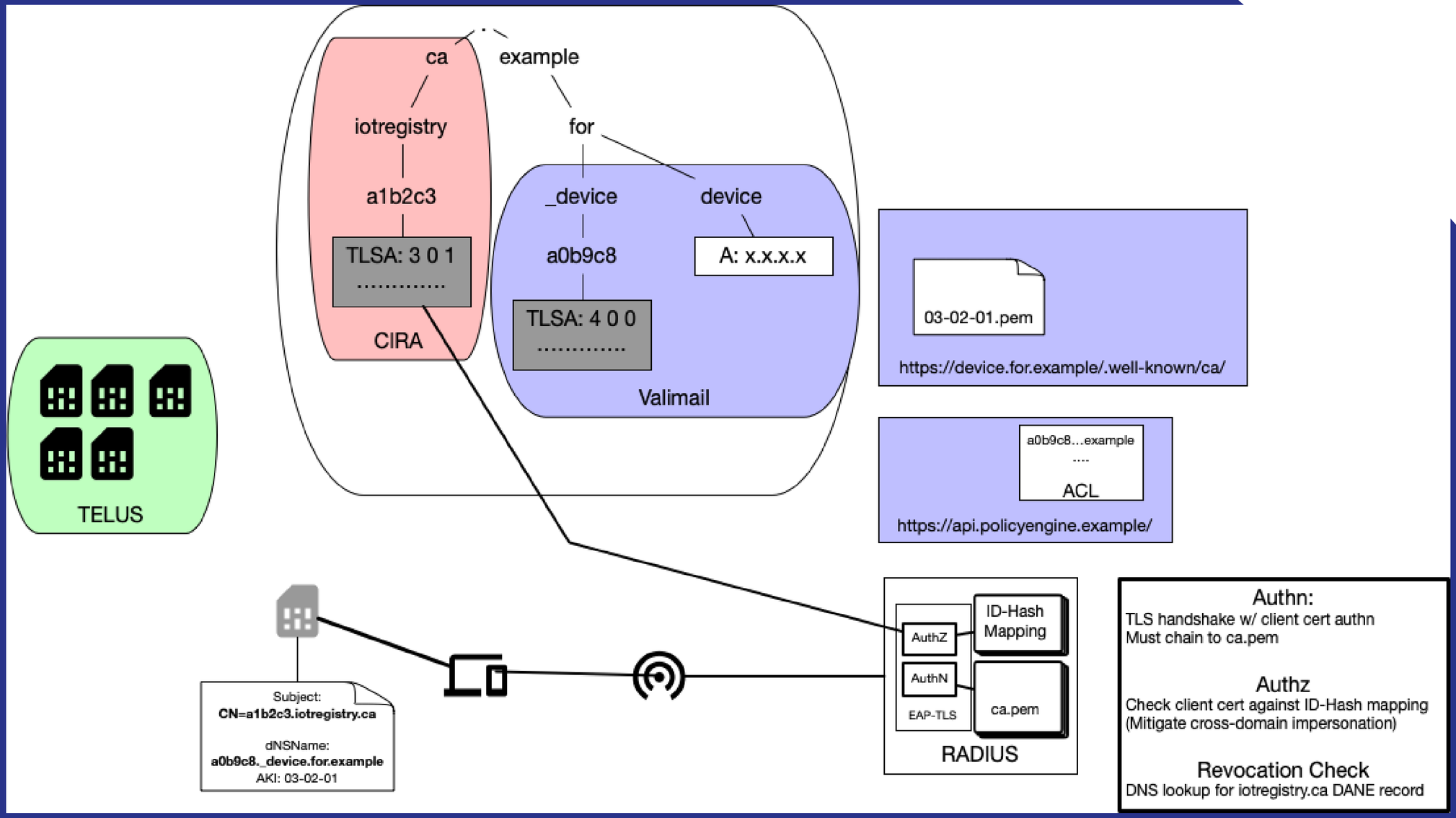
IDENTITY ISSUANCE



TRUST STORE SYNC



AUTHENTICATION / AUTHORIZATION



When vapor gets real ;-)

TRUST YOUR EMAIL

Quick DEMO!

well, kind of ☺, maybe

The CIRA IoT Registry Overview + (Mostly Update)

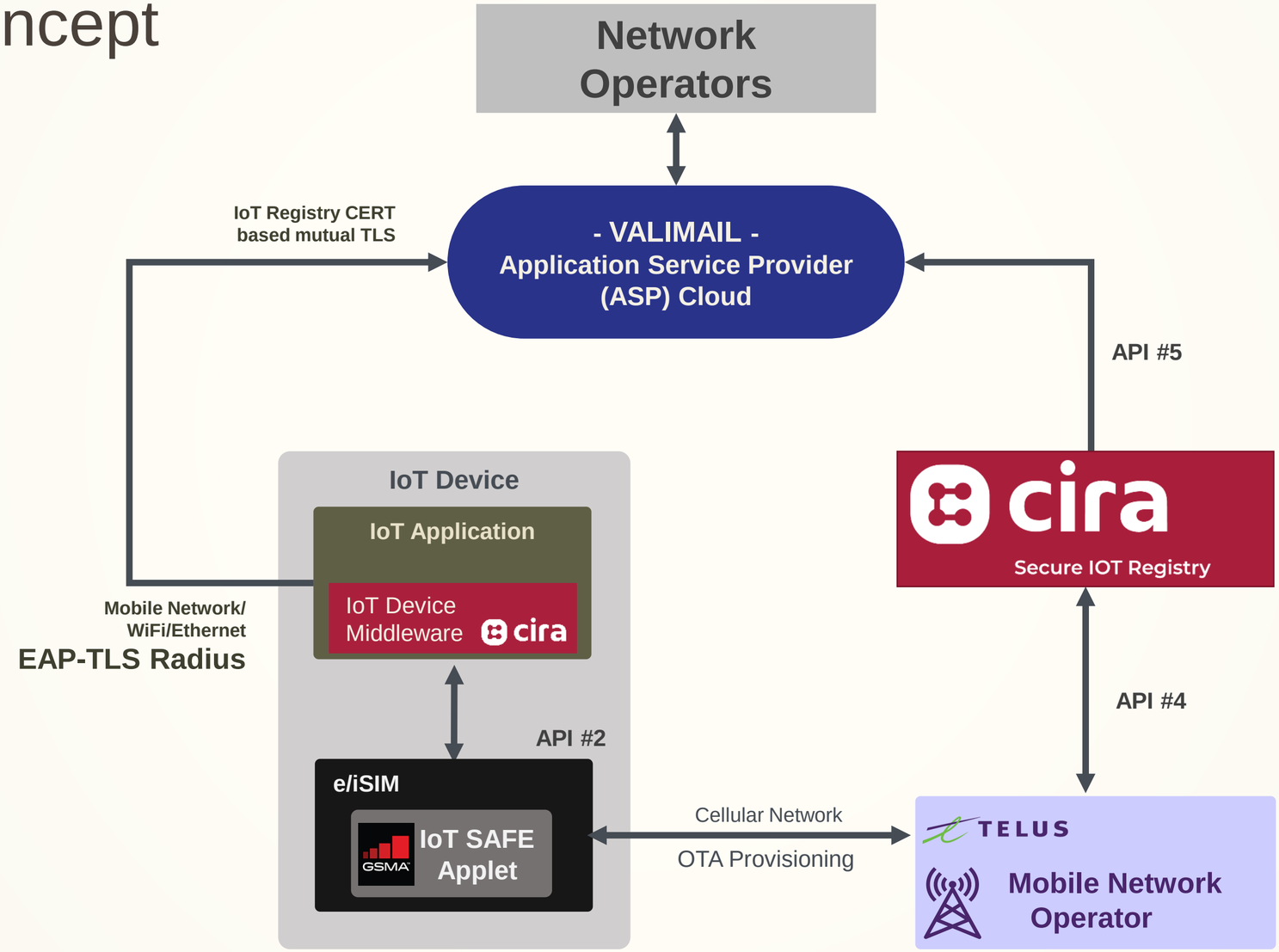
ICANN69 – vTechDay

https://69.schedule.icann.org/meetings/sMAzQxxMpvoRQckC2

ICANN71 – DNSSEC & Security Workshop

https://71.schedule.icann.org/meetings/3q22SHqif9XF5nFqG

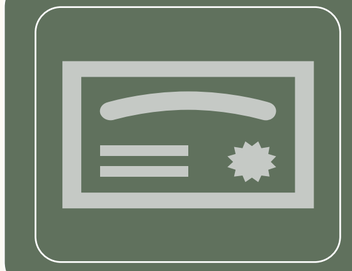
Proof of Concept



IOTSAFE PROVISIONING

After provisioning, the IoT SAFE applet on the eSIM will have

A public/private keypair



A certificate generated and signed by the IoT Registry CA

Credentials: connection data we want to be stored in the IoT SAFE applet

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USE CASE

It’s alive!

So, at this point, we’ve got a device with a known & verifiable identity, thanks to it’s public key being stored in the Domain Name System

This is called “DANE” – DNS-Based Authentication of Named Entities

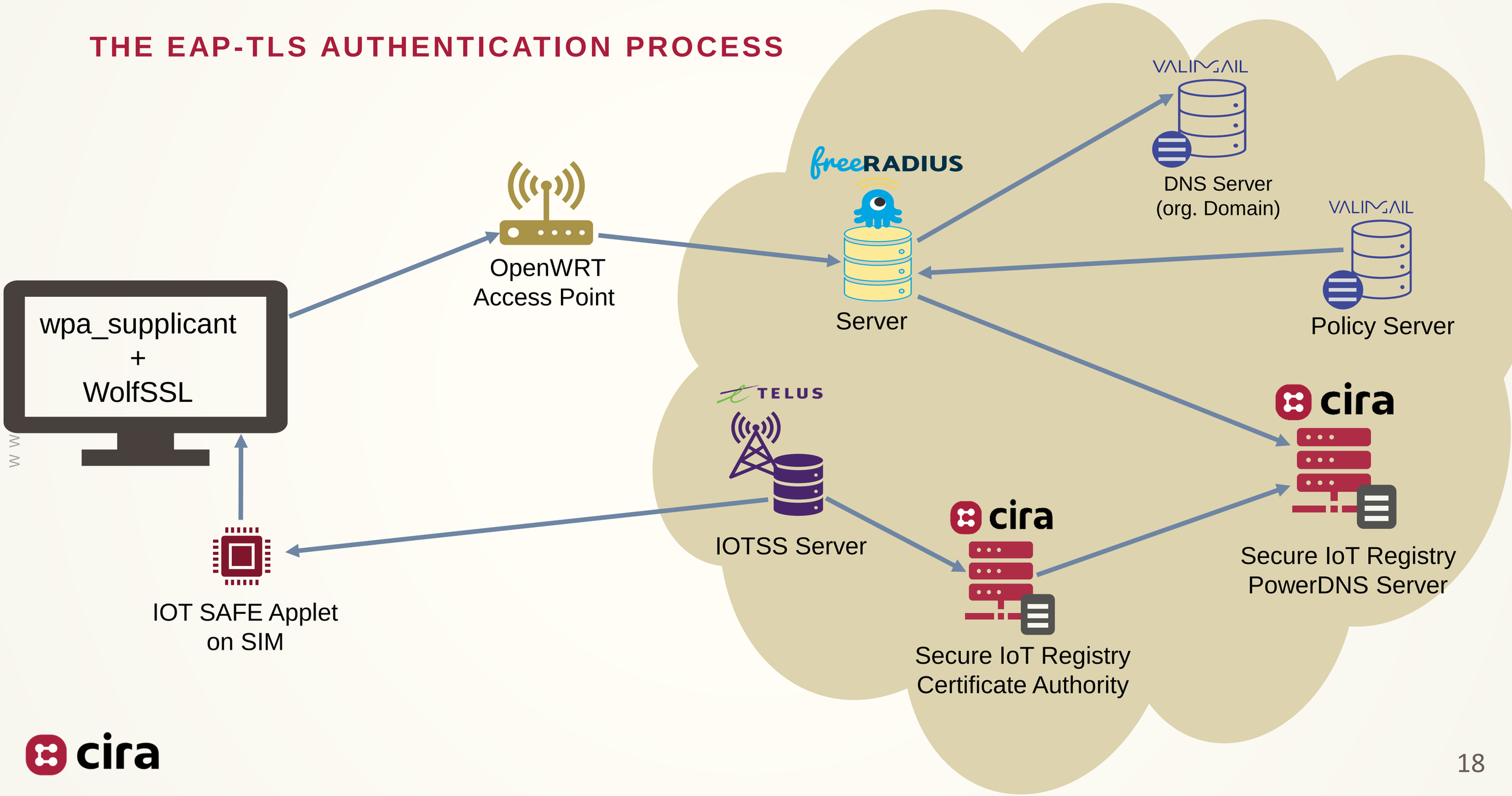
So, what can we do with this system?

A little of this, a little of that...

The secret formula!

The solution we've put together includes
IoT SAFE
CIRA Secure IoT Registry
DNSSEC
DANE
EAP-TLS
wpa_supplicant
WolfSSL
OpenWrt Router
FreeRADIUS
Valimail Custom Policy Server

THE EAP-TLS AUTHENTICATION PROCESS



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DANE EVERYWHERE SIMPLIFIES YOUR LIFE ☺

The future with DANE Everywhere
e.g. when EAP-TLS supports DANE, the pattern gets even simpler

DANE & IoT SAFE
a good match

Call to action
join the DANCE (IETF working group)

Q&A

DANCE - DANE Authentication for Network Clients Everywhere

Thank You

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https://www.cira.ca/labs