Draft-richardson-anima-smarkaklink
BRSKI enrollment with smart phones

Or:

How do I bootstrap operator-less Registrars

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Jacques Latour
Abhishek Joshi

* All bad ideas are mine

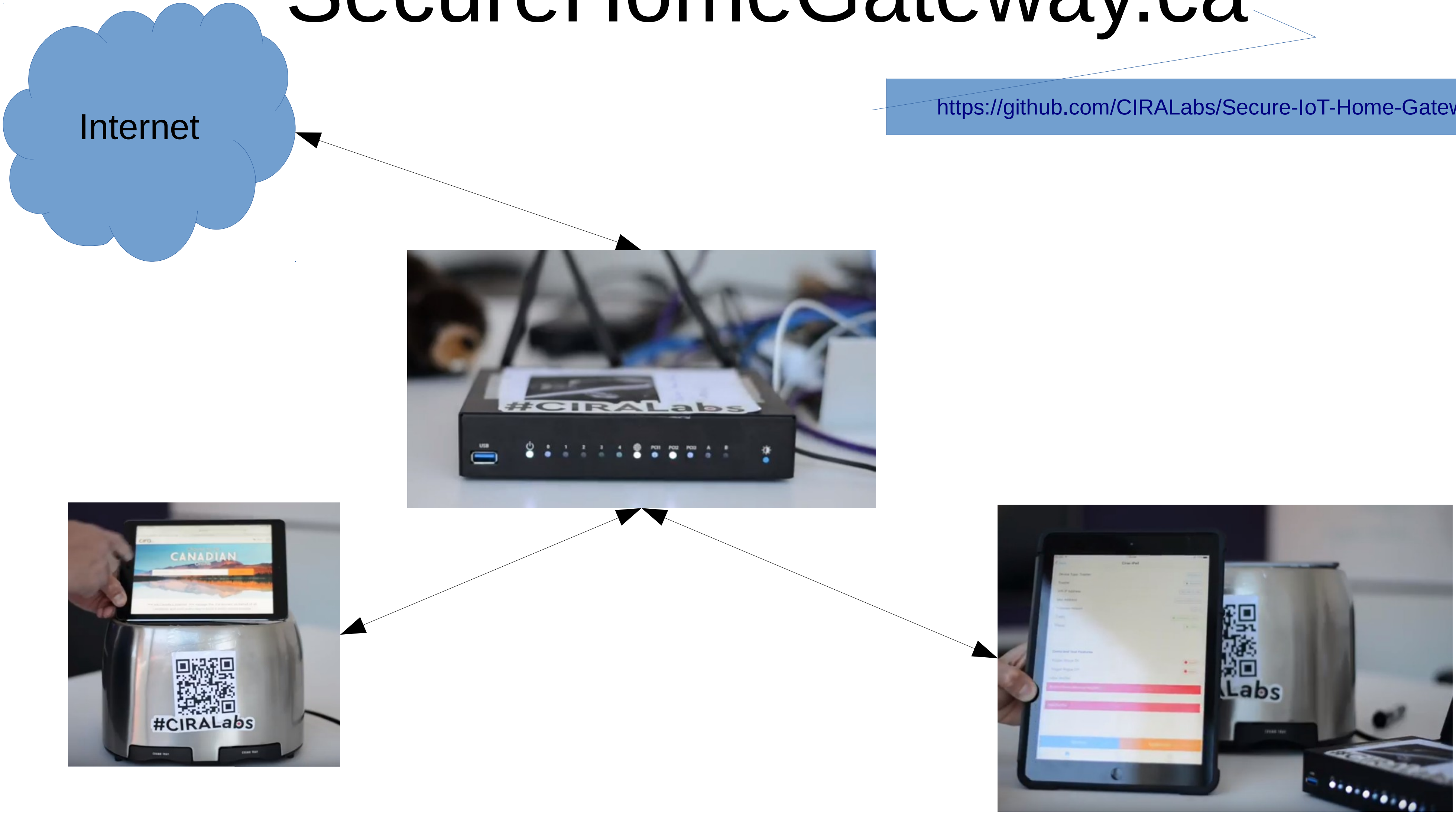
https://www.sandelman.ca/SSW/ietf/anima/smarkaklink/ietf104_smarkaklink/ietf104_smarkaklink.html

Agenda

1) what’s the problem.
2) Rough idea of solution.
    1) Why the name change!
3) Questions.

SecureHomeGateway.ca

https://github.com/CIRALabs/Secure-IoT-Home-Gateway

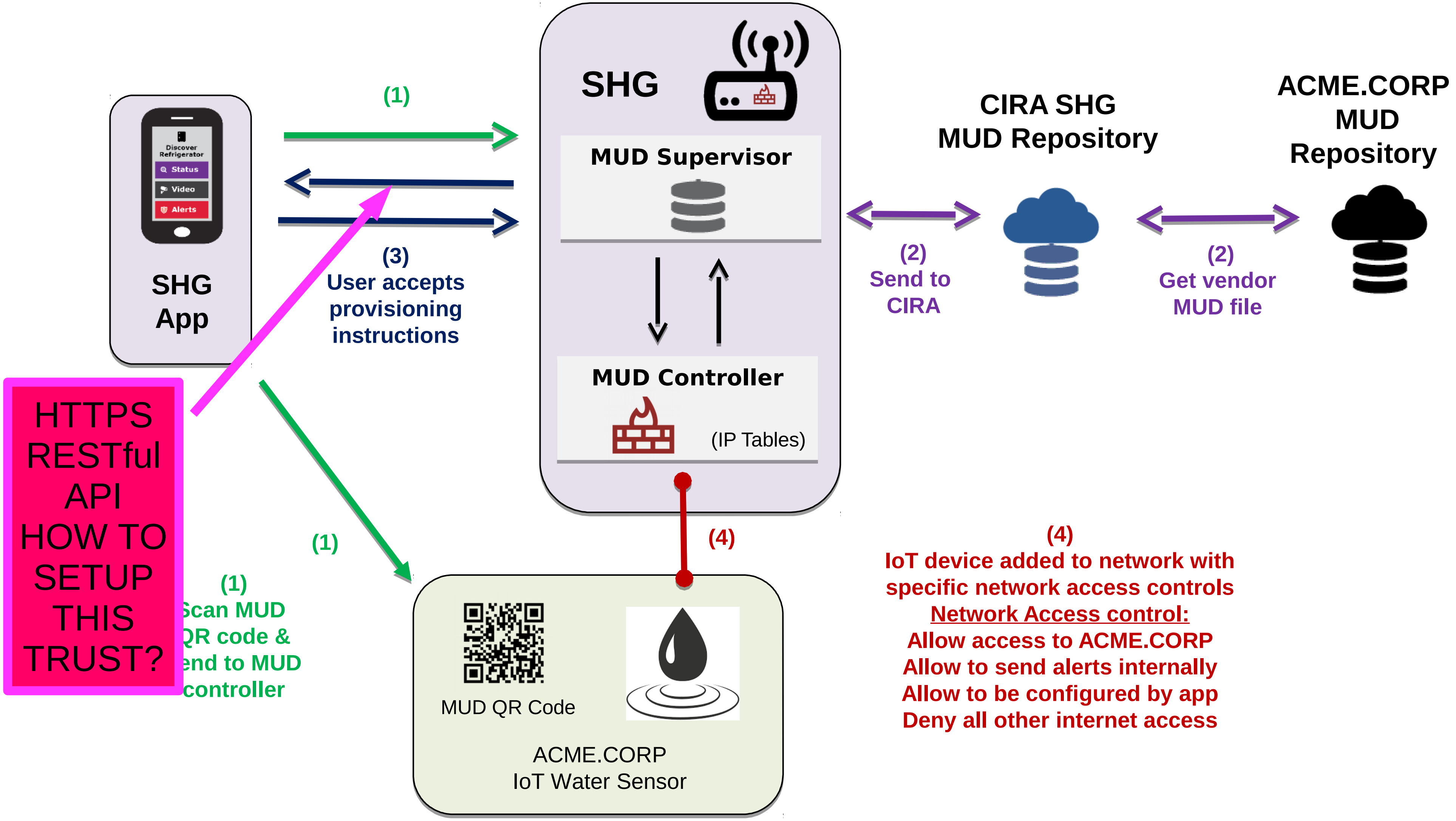


ICANN 2018 DEMO video
https://www.youtube.com/watch?v=LauvEBa4Z4s

RIPE 77 talk
https://ripe77.ripe.net/archives/video/2309
/

ICANN 63 talk
URL unknown

High Level MUD & IoT Device Provisioning Workflow



SHG App

(1)

(3)
User accepts
provisioning
instructions

SHG

MUD Supervisor

MUD Controller

(IP Tables)

(2)
Send to
CIRA

CIRA SHG
MUD Repository

(2)
Get vendor
MUD file

ACME.CORP
MUD
Repository

HTTPS
RESTful
API
HOW TO
SETUP
THIS
TRUST?

(1)

(1)
Scan MUD
QR code &
send to MUD
controller

(4)

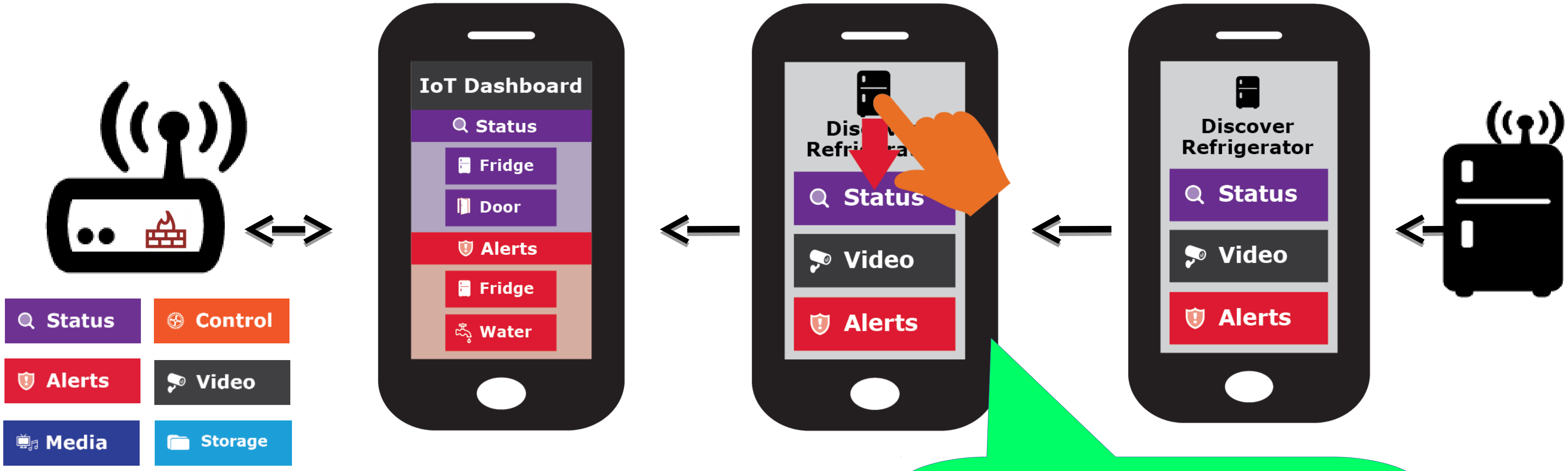
MUD QR Code

ACME.CORP
IoT Water Sensor

(4)
IoT device added to network with
specific network access controls
<u>Network Access control:</u>
Allow access to ACME.CORP
Allow to send alerts internally
Allow to be configured by app
Deny all other internet access

Simple user interface is key to this project: **Swipe UP, DOWN, LEFT and RIGHT**

- Gateway provisioning, device discovery, device provisioning must be as simple as possible, intuitive for non experienced users, available as framework for default open source app.



Tinder for IoT devices

Requirements

Goal

- Enroll a smartphone into PKI/database in Registrar of Home Router
- First administrator can enable additional administrators or other roles with less rights (Role-Based Access control)

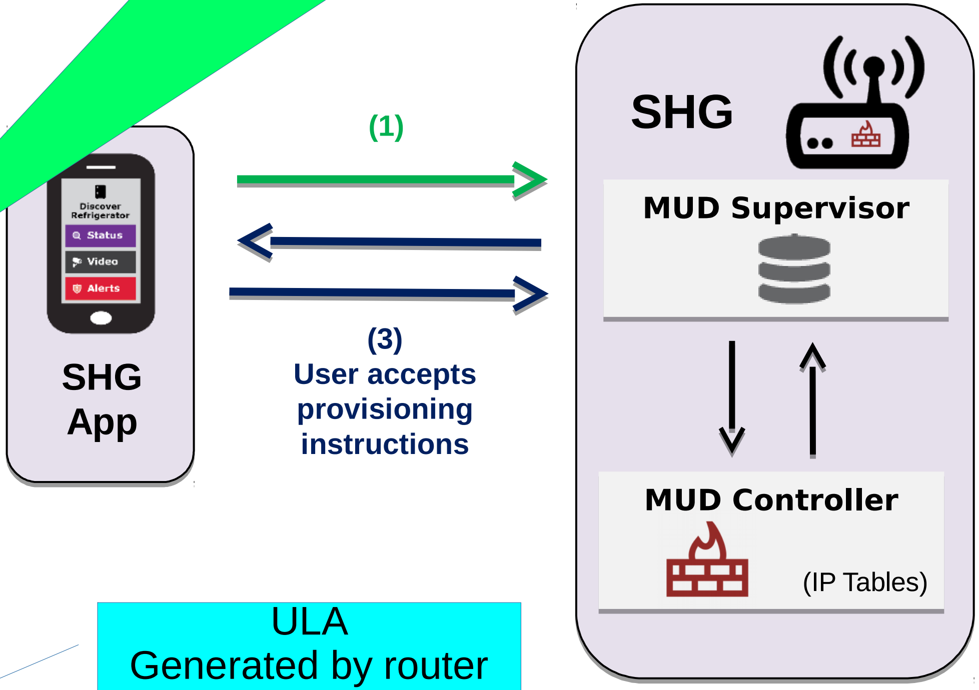
Assumptions

- Router has QR code on sticker attached
- Smartphone has LTE connection, or can move to another WiFI
- *Router might have no Internet until end-user types in PPPoE password.*
  - *Fries & Oskar: Device might NOT have Internet until home is occupied, or might never have Internet.*

Initial bootstrap of app

How do I bootstrap
The first Client Certificate?

- HTTPS connection from app to SHG.
- NO PASSWORDS.
- TLS ClientCertificate (pinned in database, CA part irrelevant)
- TLS ServerCertificate:
  - mud.nc0a8fc4.r.securehomegateway.ca



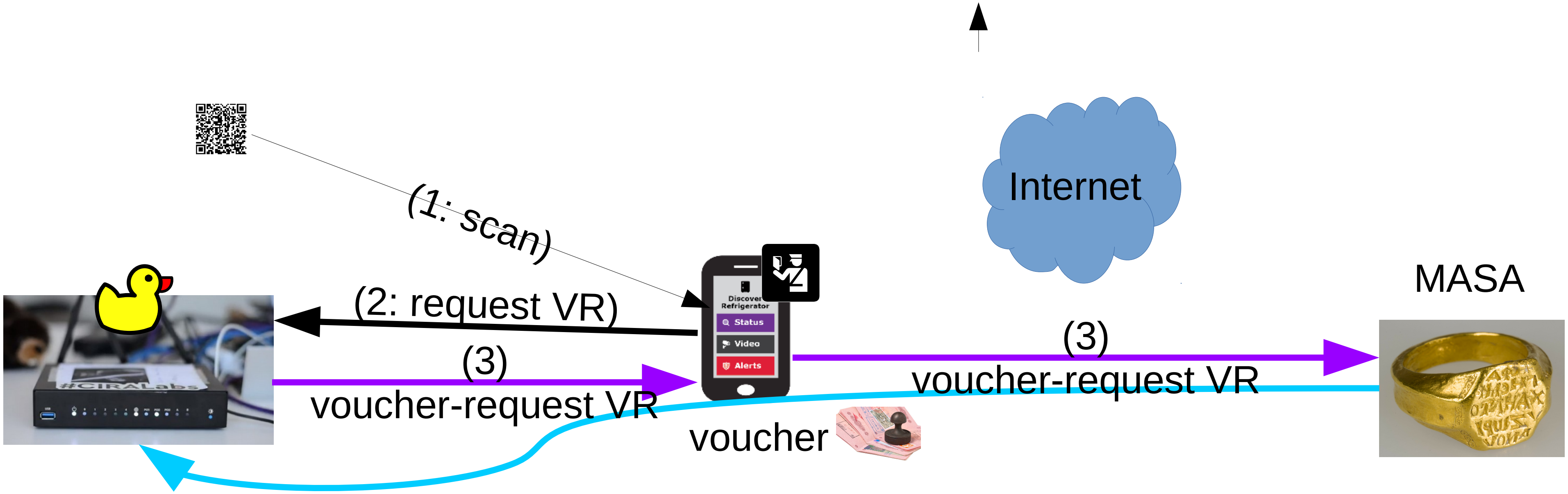
ULA
Generated by router
As per RFC7084
WebPKI certificate
Installed at factory
W/ DNS name

```
%dig +short mud.nc0a8fc4.router.securehomegateway.ca aaaa
fd2a:c0a:8fc4::18e
```

Roles are a changin’

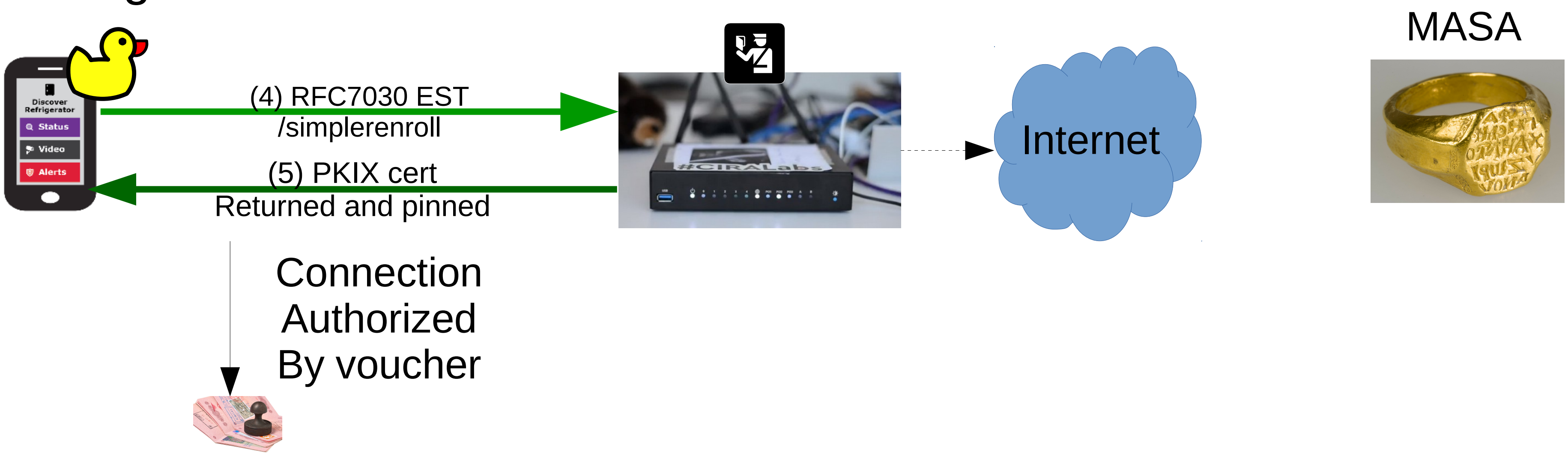
Sorta seems like a registrar

- Consider new (adolescent) router to be a Pledge at first.
- Consider Smartphone to be a new type of Join Proxy at first
- Change roles later on.



Smartphone becomes client!

- Smartphone now becomes the EST client
- Router now becomes a registrar
- Smartphone uses authorized TLS connection as secure transport for enrollment of new identity. As first device, becomes administrator, configures the device.



MASA

(4) RFC7030 EST
/simplerenroll

(5) PKIX cert
Returned and pinned

Internet

Connection
Authorized
By voucher

SmartPledge -> Smarkaklink

- “SmartPledge” name was trying to be some kind of portmanteau of smartphone pledge
  - But, smartphone is not always the pledge, the router is.
- Smartphone has multiple roles

- SmarKaklink invokes sound of wine glasses clinking.
- Redrew images according to BRSKI left(pledge) to right (MASA) view.

Some notes

- Smartphone, as pseudo-registrar can still access audit-log from MASA!

- Smartphone identity is pseudonymous, but MASA still logs it, so smartphone can recognize “itself”
- Opportunity for further enrollment provided via OAUTH2 interaction between MASA and Smartphone

What about this QR code?
Who else uses QR code?

- WiFi Alliance DPP
  - Released in summer
  - Crypto done by Dan Harkins.
  - Uses Public Key privated on QR code
  - Runs over new management frames in 802.11, **presently** inaccessible on current smartphone Oses.
    - We are writing code today.

- EAP-NOOB
  - Been around for awhile.
  - Requires dynamic QR code ... or
    - Maybe leverage many LEDs on front of router?
  - Not interested in AAA back-end, it would have to be co-located in phone.

smarkaklink-01

- Leverages DPP QR code format
  - Want to leverage all of the crypto with the goal of “upgrading” to DPP when smartphone APIs become available.
    - (Extends DPP QR code, despite WiFi Alliance not providing “IANA Considerations”)
- Tweaks BRSKI to include a /requestvoucherrequest to avoid need for Registrar to contact MASA directly.

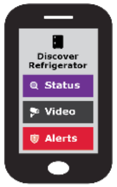
Time Sequence Diagram

Time Sequence Diagram

AR

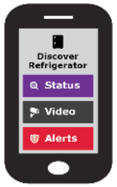
Time Sequence Diagram

AR



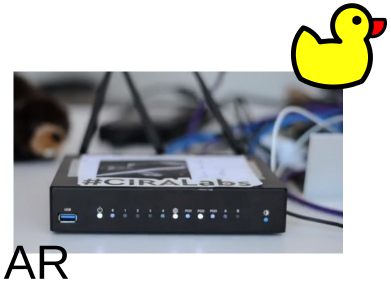
Time Sequence Diagram

AR

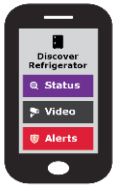


MASA

Time Sequence Diagram



AR



MASA

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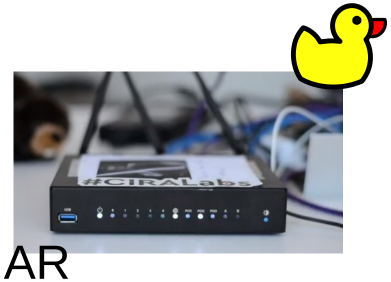

AR

MASA

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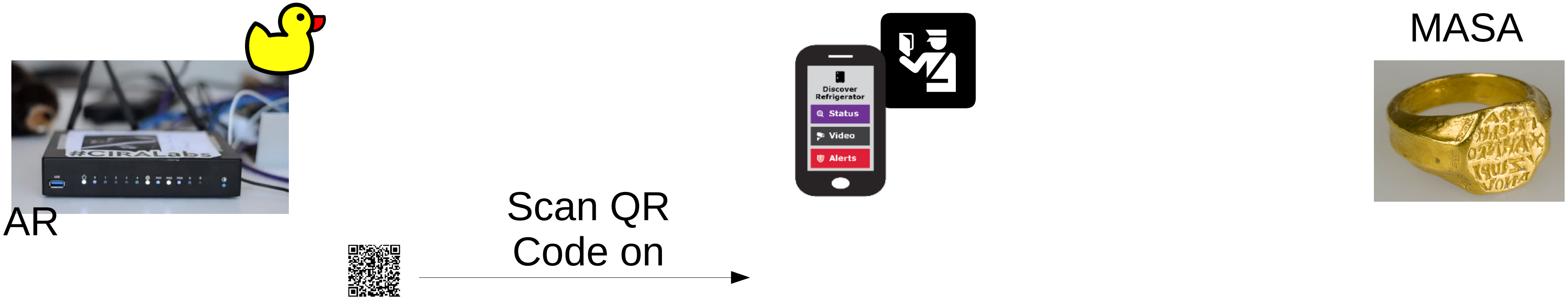
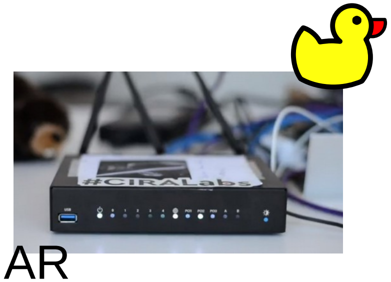


MASA

AR

Scan QR Code on

Time Sequence Diagram



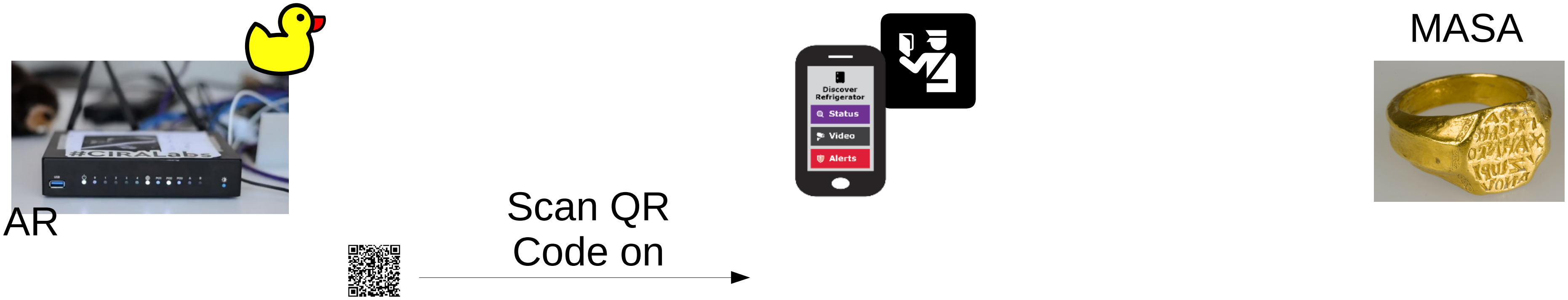
AR

MASA

Scan QR Code on

Generate Self-signed

Time Sequence Diagram



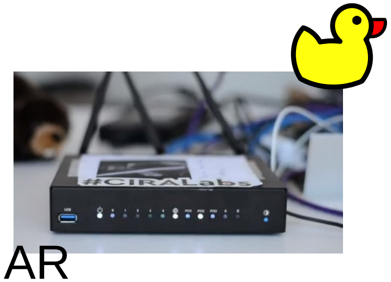
MASA

AR

Scan QR Code on

Generate Self-signed
Use as ClientCertificate

Time Sequence Diagram



AR

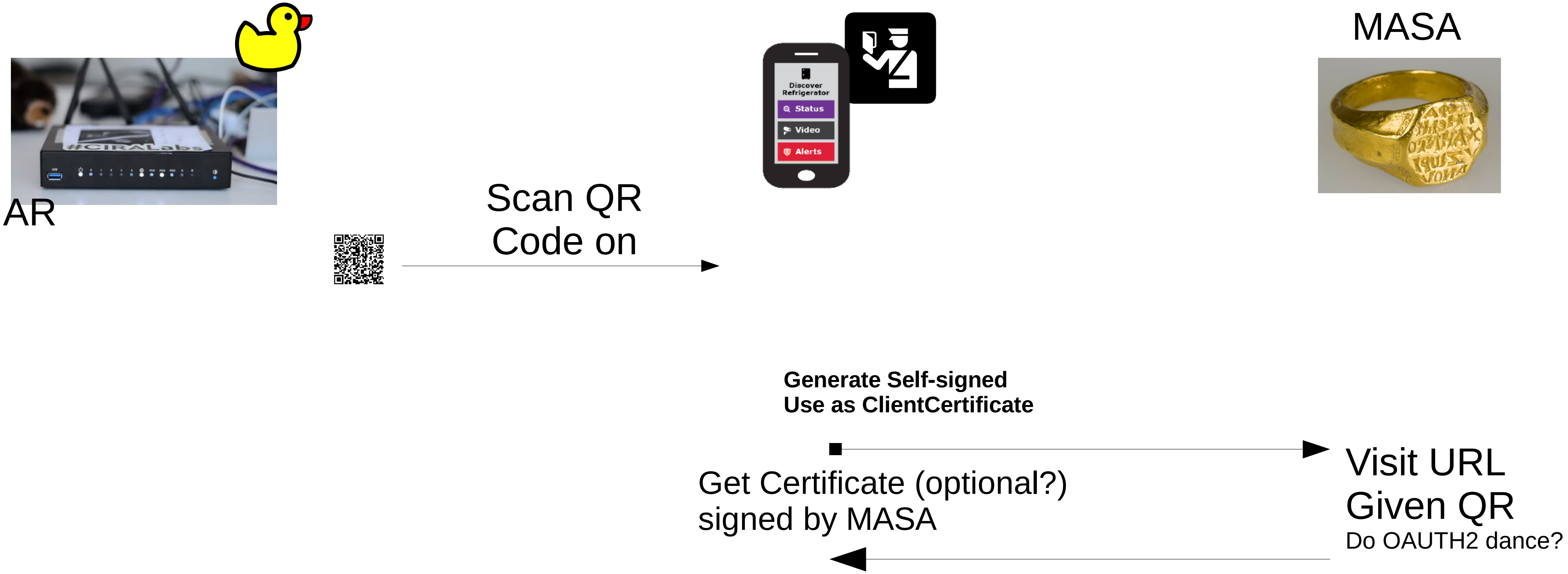
MASA

Scan QR Code on

Generate Self-signed
Use as ClientCertificate

Visit URL Given QR
Do OAUTH2 dance?

Time Sequence Diagram



AR

MASA

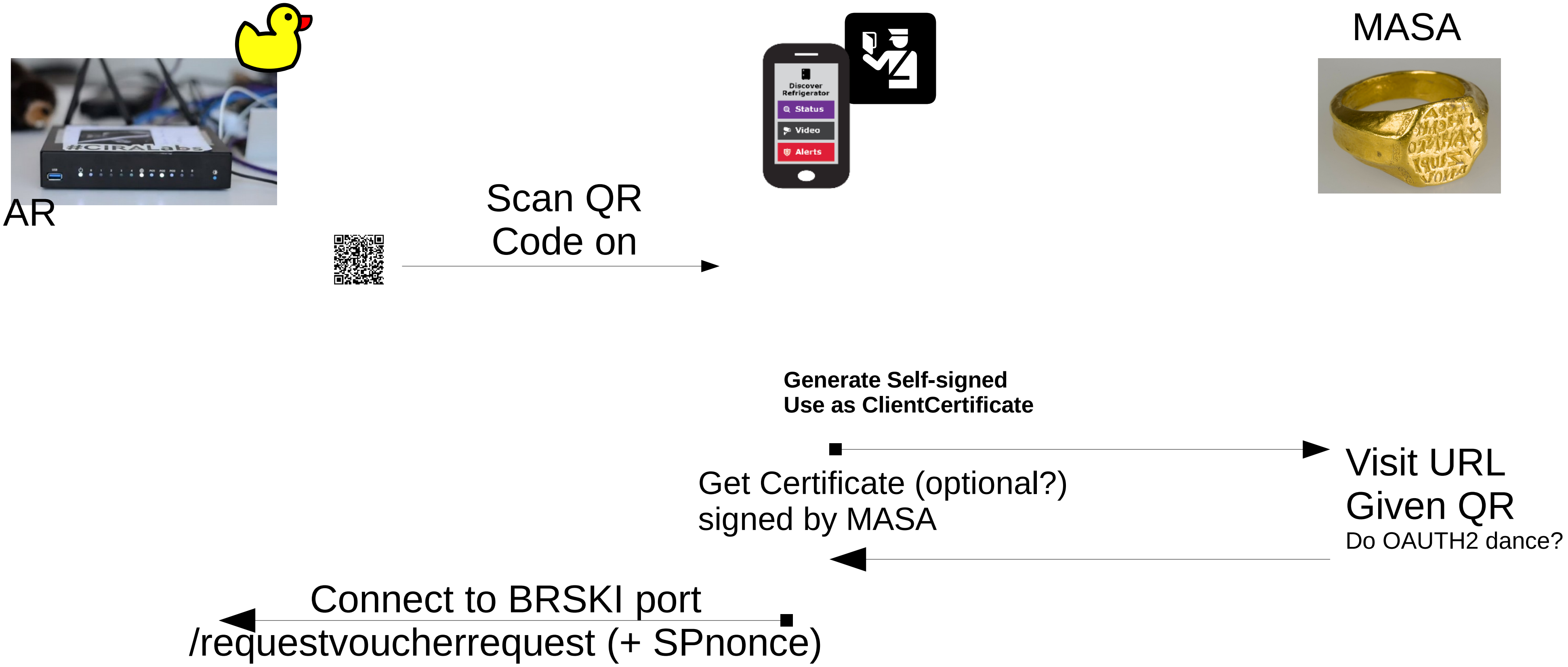
Scan QR Code on

Generate Self-signed
Use as ClientCertificate

Visit URL
Given QR
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

Time Sequence Diagram



AR

MASA

Scan QR
Code on

Generate Self-signed
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Visit URL
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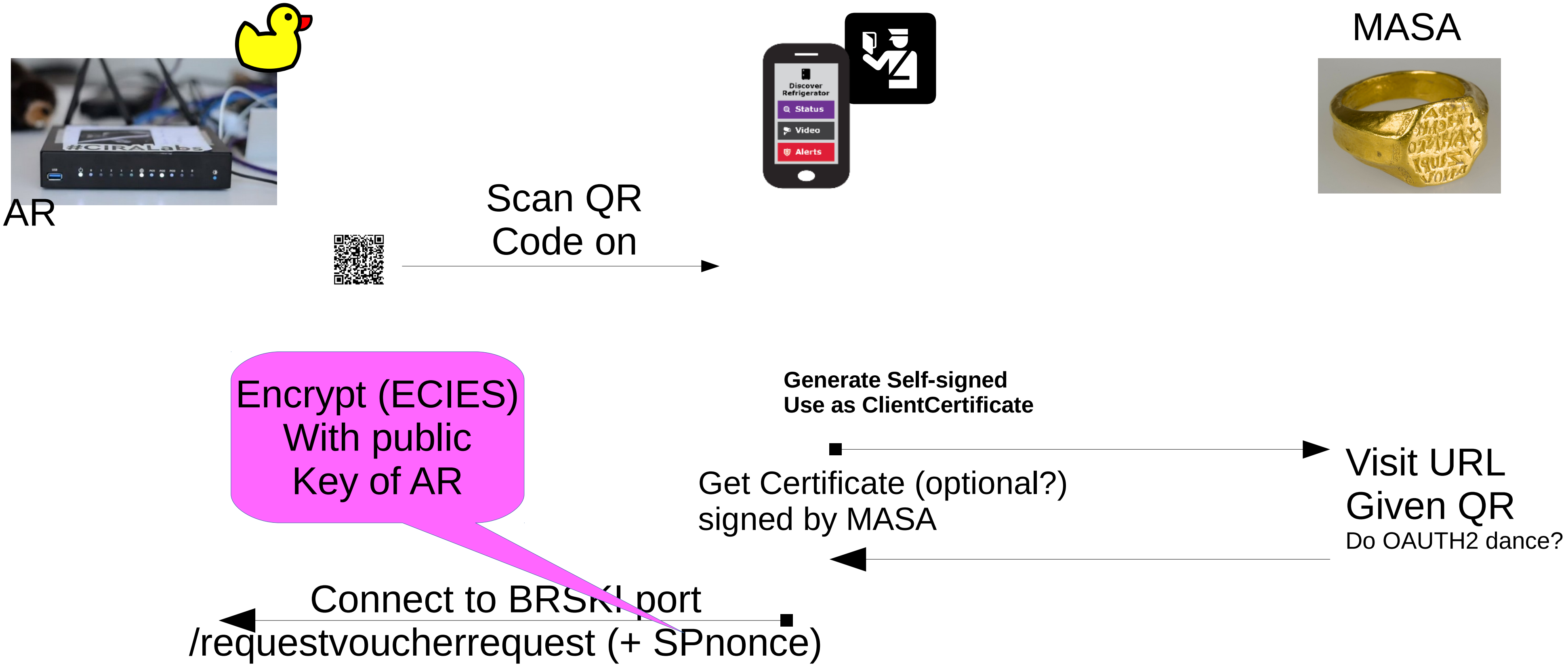
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Time Sequence Diagram



AR

MASA

Scan QR
Code on

Generate Self-signed
Use as ClientCertificate

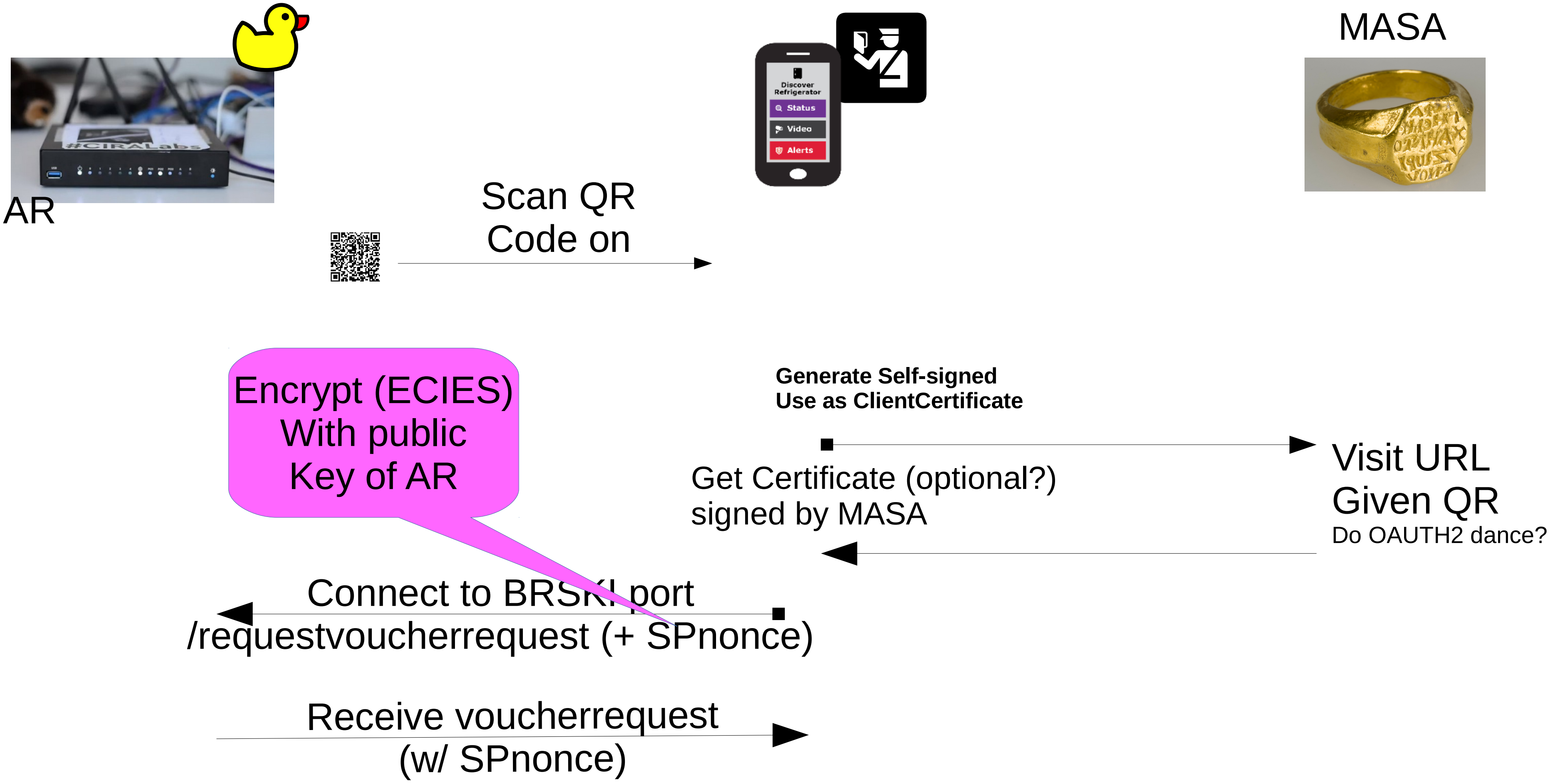
Visit URL
Given QR
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

Encrypt (ECIES)
With public
Key of AR

Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Time Sequence Diagram



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Do OAUTH2 dance?

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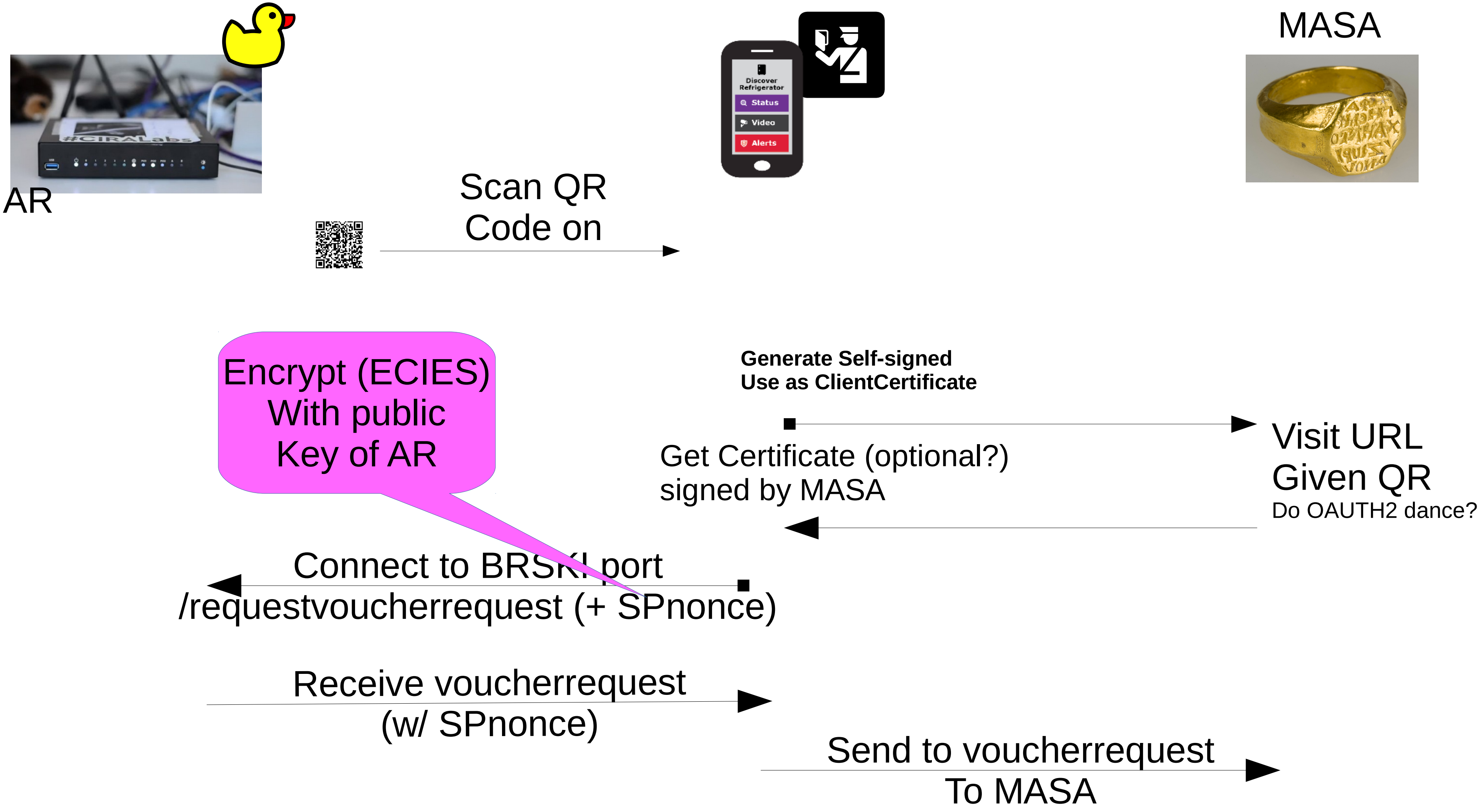
Connect to BRSKI port /requestvoucherrequest (+ SPnonce)

Receive voucherrequest (w/ SPnonce)

Time Sequence Diagram



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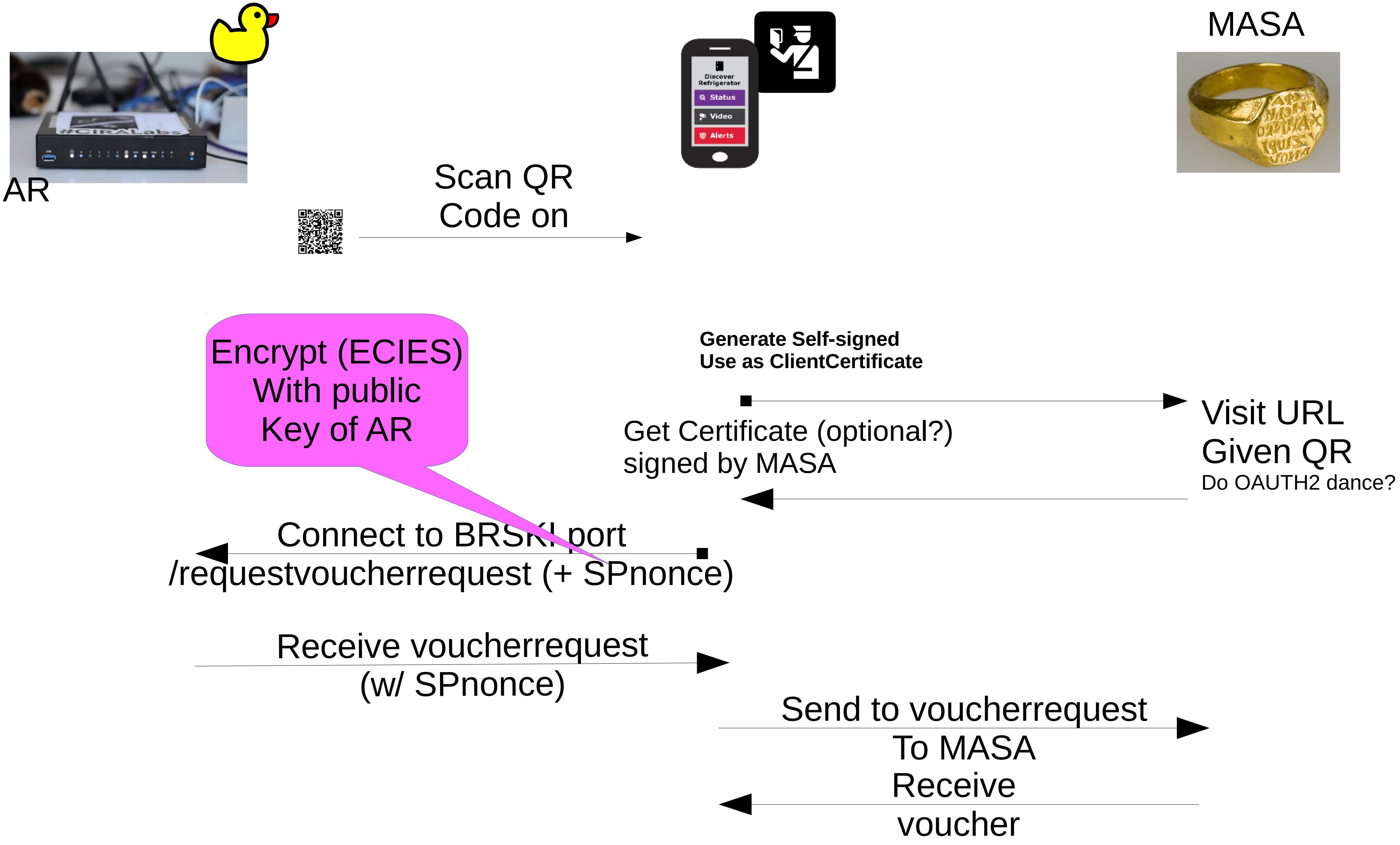
Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Receive voucherrequest
(w/ SPnonce)

Send to voucherrequest
To MASA

Time Sequence Diagram



AR

MASA

Scan QR Code on

Encrypt (ECIES) With public Key of AR

Generate Self-signed
Use as ClientCertificate

Visit URL Given QR
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

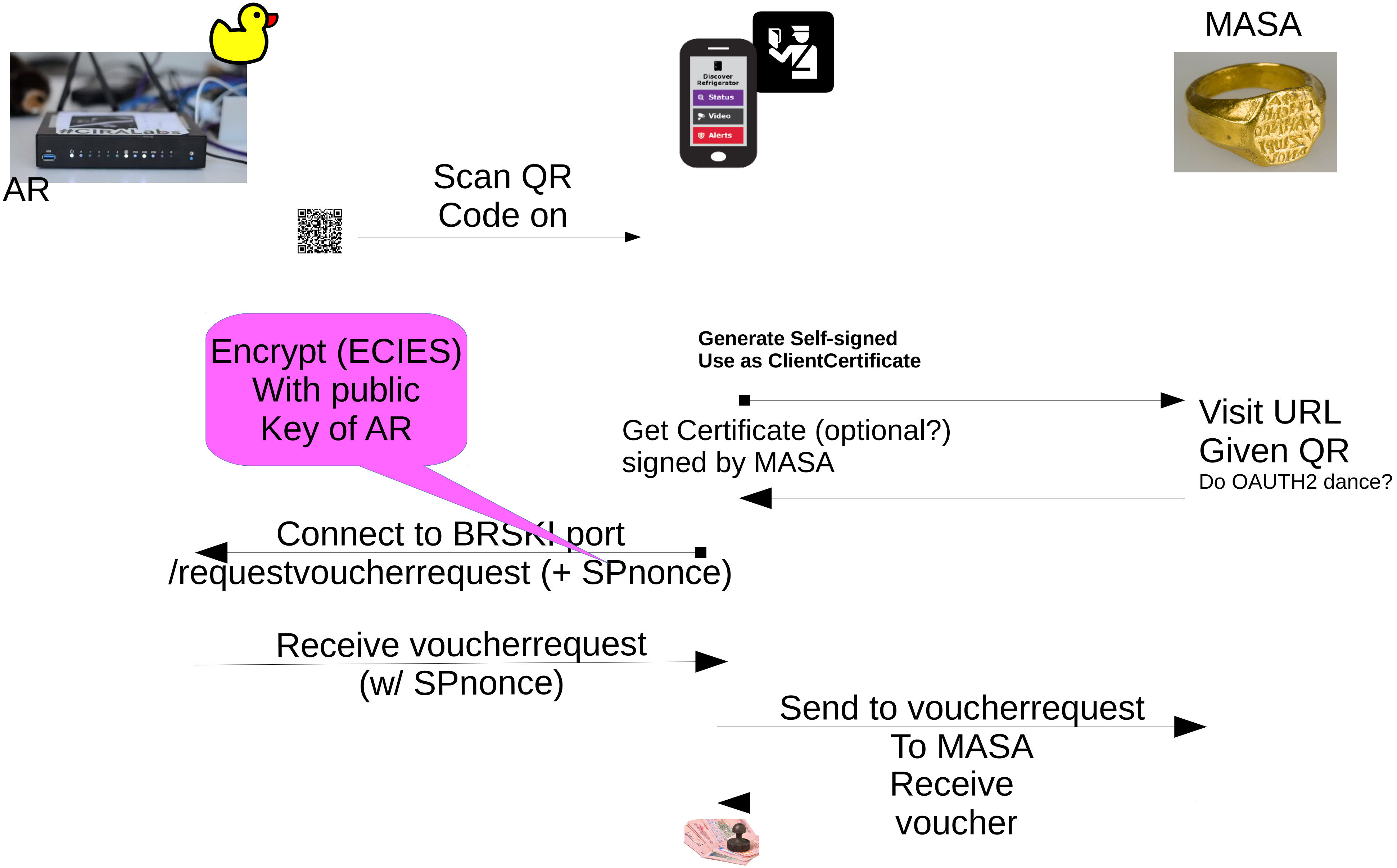
Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Receive voucherrequest
(w/ SPnonce)

Send to voucherrequest
To MASA

Receive
voucher

Time Sequence Diagram



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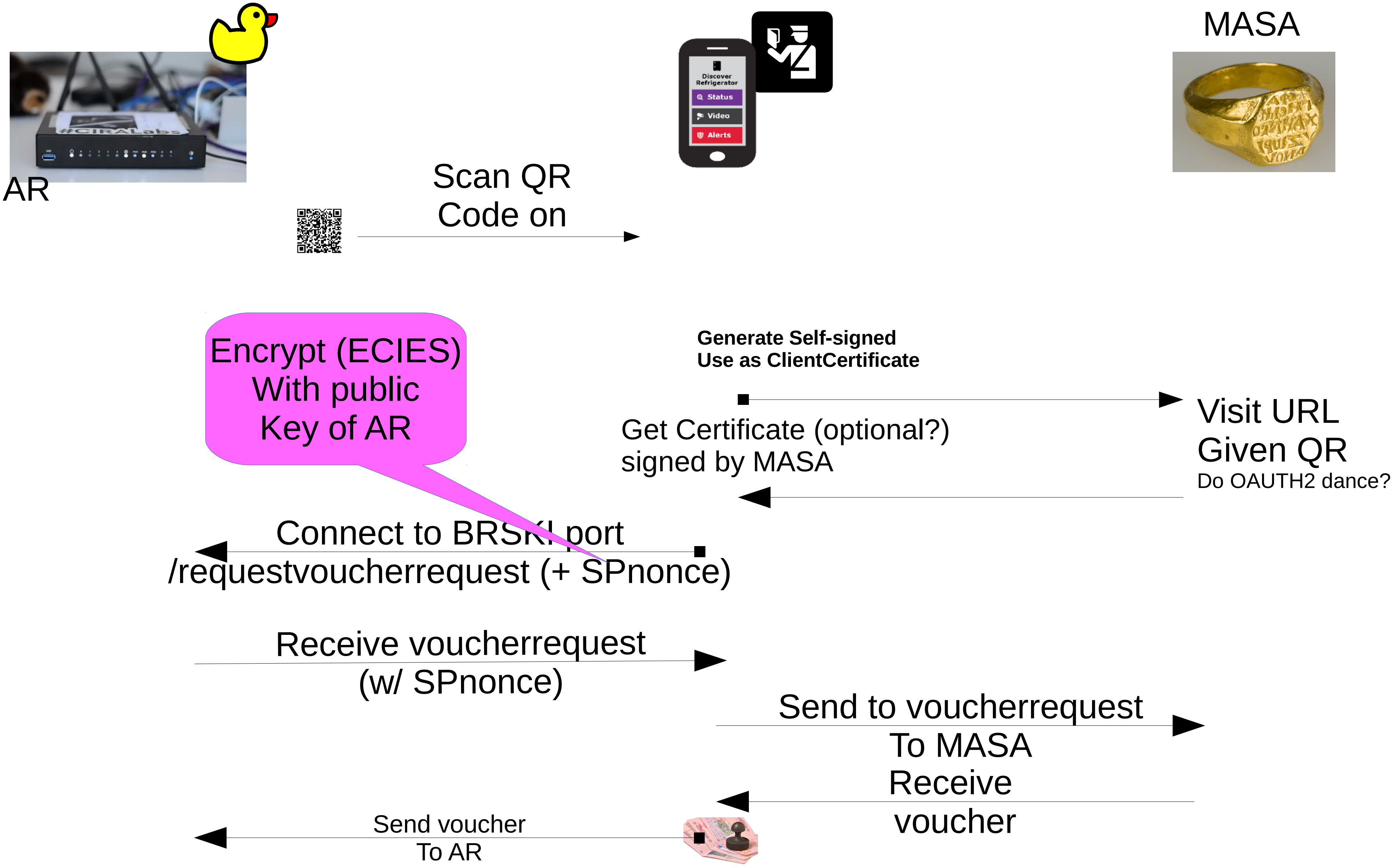
Receive voucherrequest
(w/ SPnonce)

Send to voucherrequest
To MASA

Receive
voucher

Time Sequence Diagram



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(w/ SPnonce)

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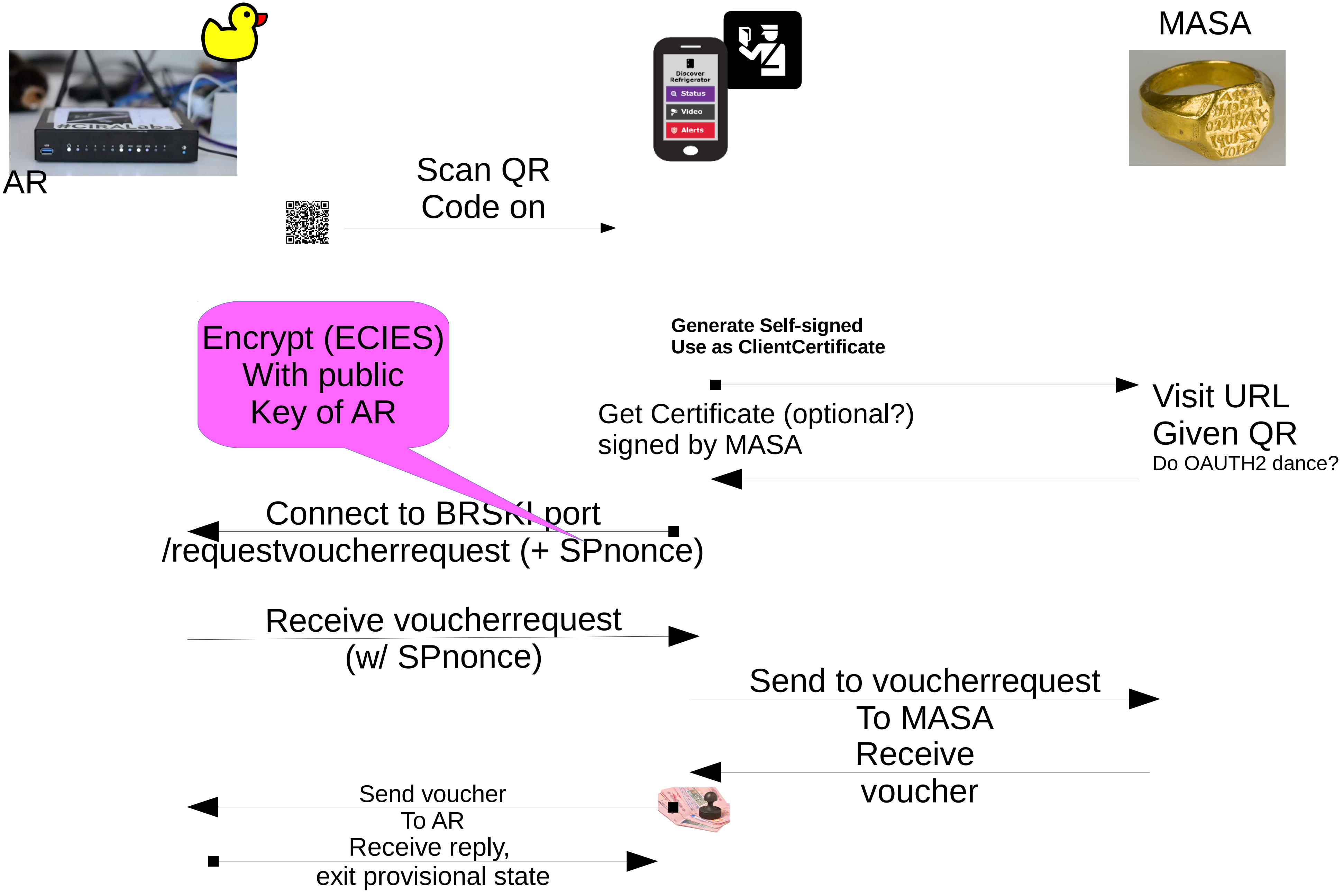
To MASA

Receive
voucher

Send voucher
To AR

Time Sequence Diagram



AR

MASA

Scan QR
Code on

Encrypt (ECIES)
With public
Key of AR

Generate Self-signed
Use as ClientCertificate

Visit URL
Given QR
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Receive voucherrequest
(w/ SPnonce)

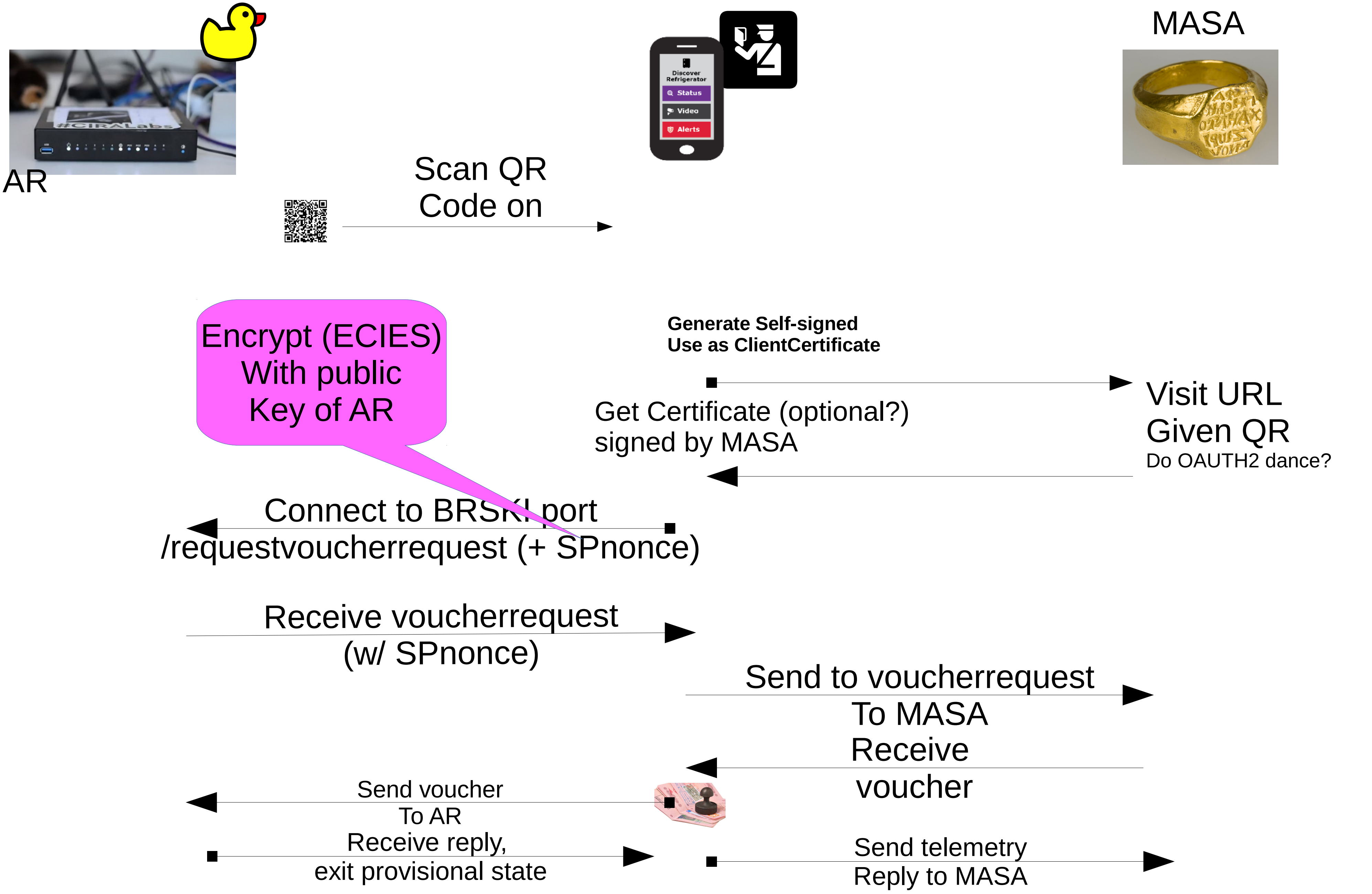
Send to voucherrequest
To MASA

Receive
voucher

Send voucher
To AR

Receive reply,
exit provisional state

Time Sequence Diagram



AR

MASA

Scan QR Code on

Encrypt (ECIES) With public Key of AR

Generate Self-signed
Use as ClientCertificate

Visit URL
Given QR
Do OAUTH2 dance?

Get Certificate (optional?)
signed by MASA

Connect to BRSKI port
/requestvoucherrequest (+ SPnonce)

Receive voucherrequest
(w/ SPnonce)

Send to voucherrequest
To MASA

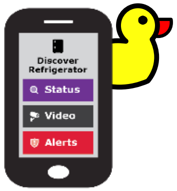
Receive
voucher

Send voucher
To AR

Receive reply,
exit provisional state

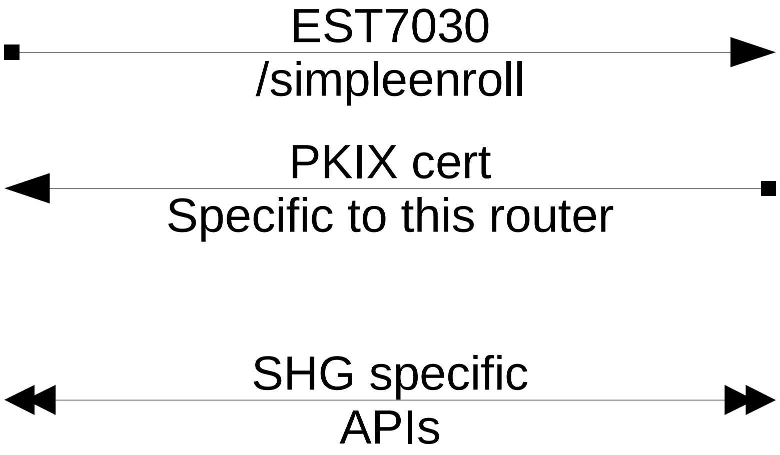
Send telemetry
Reply to MASA

Time Sequence Diagram



Registrar

MASA



EST7030
/simpleenroll

PKIX cert
Specific to this router

SHG specific
APIs

DNSSEC and Advanced Homenet Naming

- Device will come with “coupon” for delegated DNS for home: `allthegoodnames.securehomegateway.ca`

Initially, this was going to
Come in the form of a
QR code

- Delegated DNS will be secured with DNSSEC, and use RFC8078 after initial setup via HTTPS API.

Somehow this could
Be done as part
Of enrollment, resulting in
A single QR code, but
Unclear how.

Questions/Discussion

I’m not sure this belongs in ANIMA,

but if not, where?