CIRA Labs
Secure Home Gateway Project

ICANN IDS Bangkok

Jacques Latour

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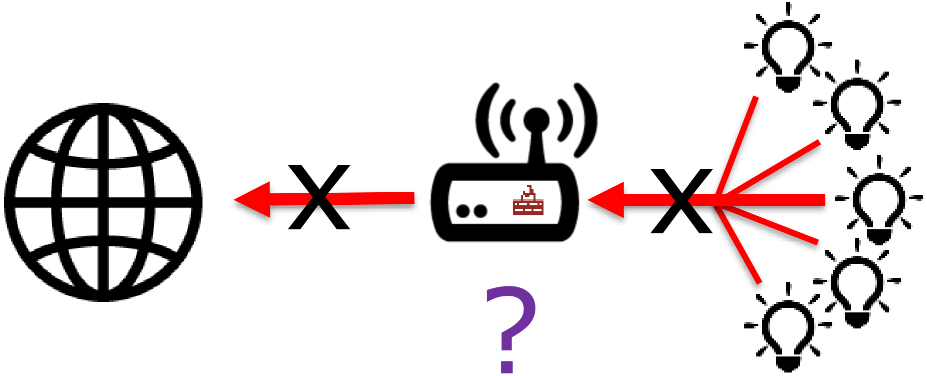
Project Evolution – From Idea in late 2016

MIRAI Dyn Attack October 2016

In the home Gateway

Need security access controls

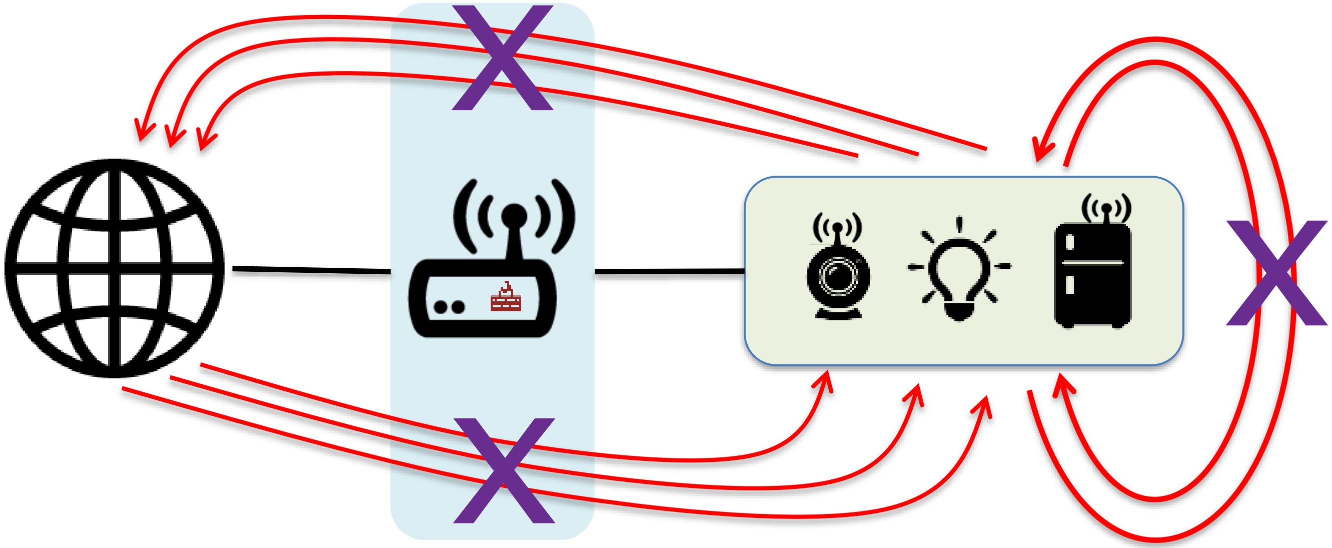
Has to be easy to use



Developing a new framework to prevent lightbulbs from killing the internet!

Secure Home Gateway (SHG) Goals

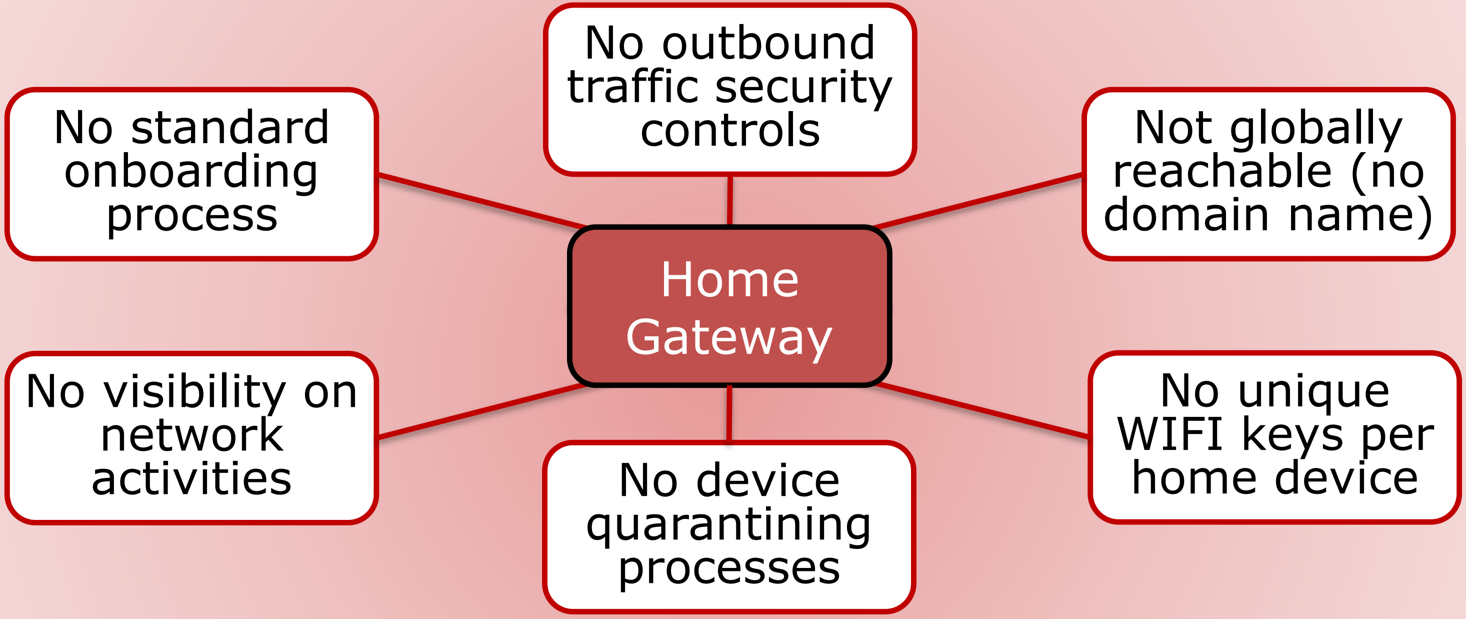
Protect the internet from IoT devices **attacks**



Protect IoT devices from internal **attacks**

Protect IoT devices from internet **attacks**

The many problems of today's Home Gateway



Home Gateway

No standard onboarding process

No outbound traffic security controls

Not globally reachable (no domain name)

No visibility on network activities

No device quarantining processes

No unique WIFI keys per home device

No Standard Home Network Security Framework

IoT Device Security Landscape

Many are Vulnerable

Software is out of date

Cloud architecture dependencies

Full access to the ENTIRE Internet

Some are Unsupported

Focus: Time to market Not to build correctly

Many standards being developed

Lack of secure testing and design

Require active monitoring

Contribute to DDoS attacks

Steal private information

Steal WIFI credentials

Send spam

Compromise your network

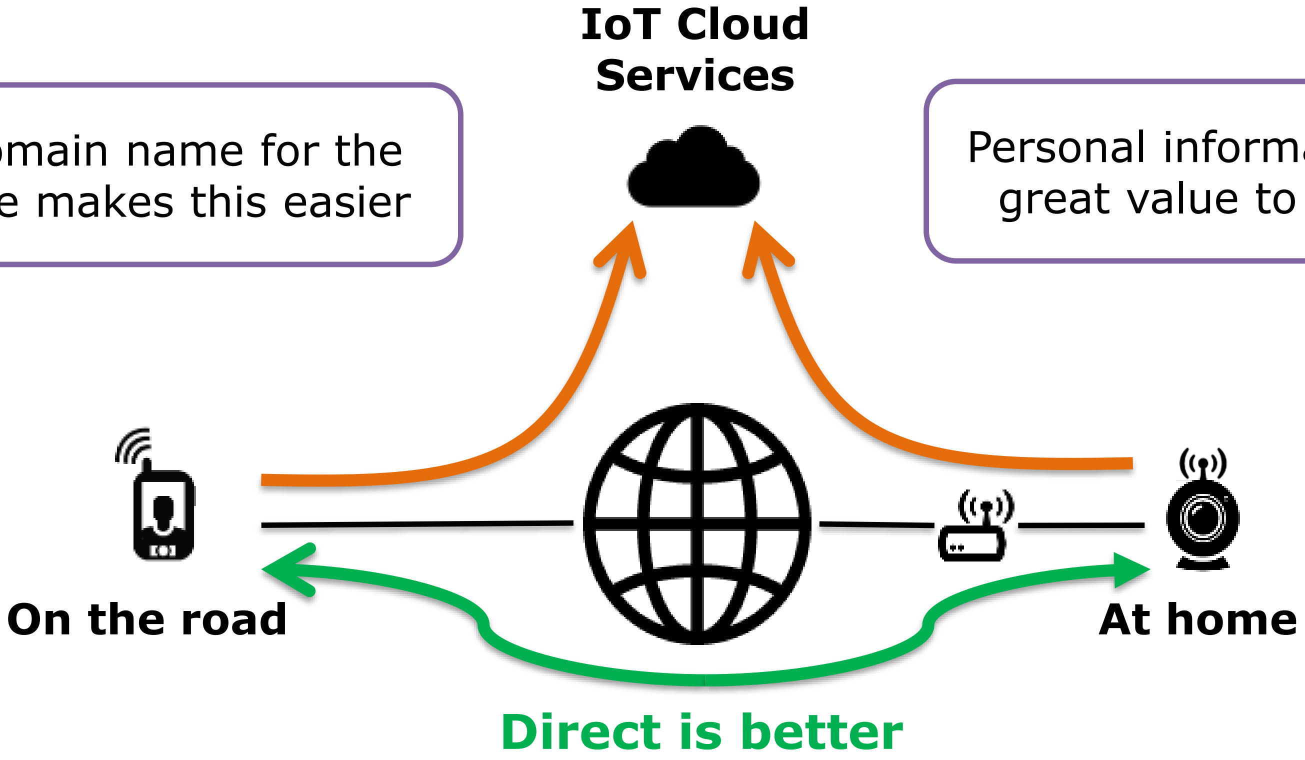
Record video and voice

Distribute malware

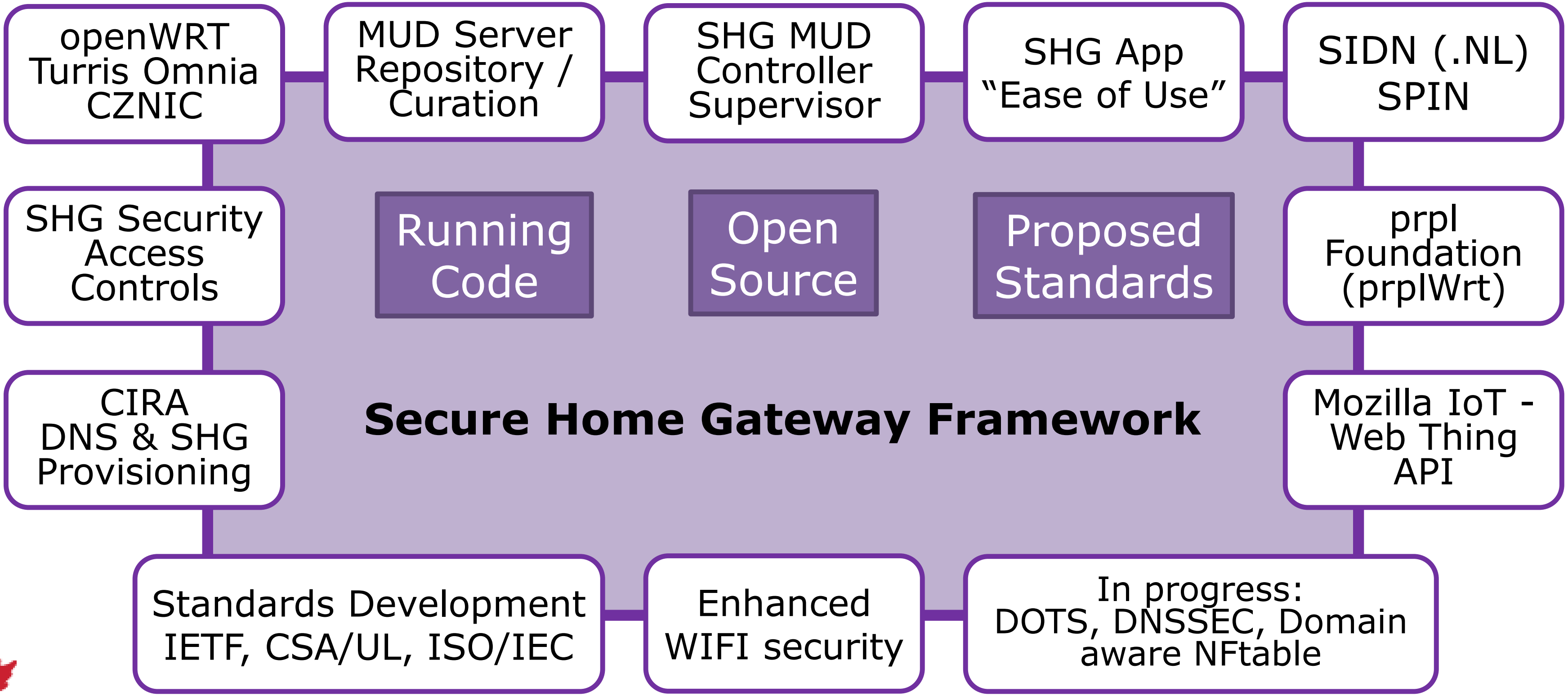
IoT vendors are creating dependency on cloud architecture

A domain name for the home makes this easier

Personal information is of great value to vendors



Project Evolution –> To a Secure Home Gateway (SHG) Prototype



openWRT
Turris Omnia
CZNIC

MUD Server
Repository /
Curation

SHG MUD
Controller
Supervisor

SHG App
“Ease of Use”

SIDN (.NL)
SPIN

SHG Security
Access
Controls

Running
Code

Open
Source

Proposed
Standards

prpl
Foundation
(prplWrt)

CIRA
DNS & SHG
Provisioning

Secure Home Gateway Framework

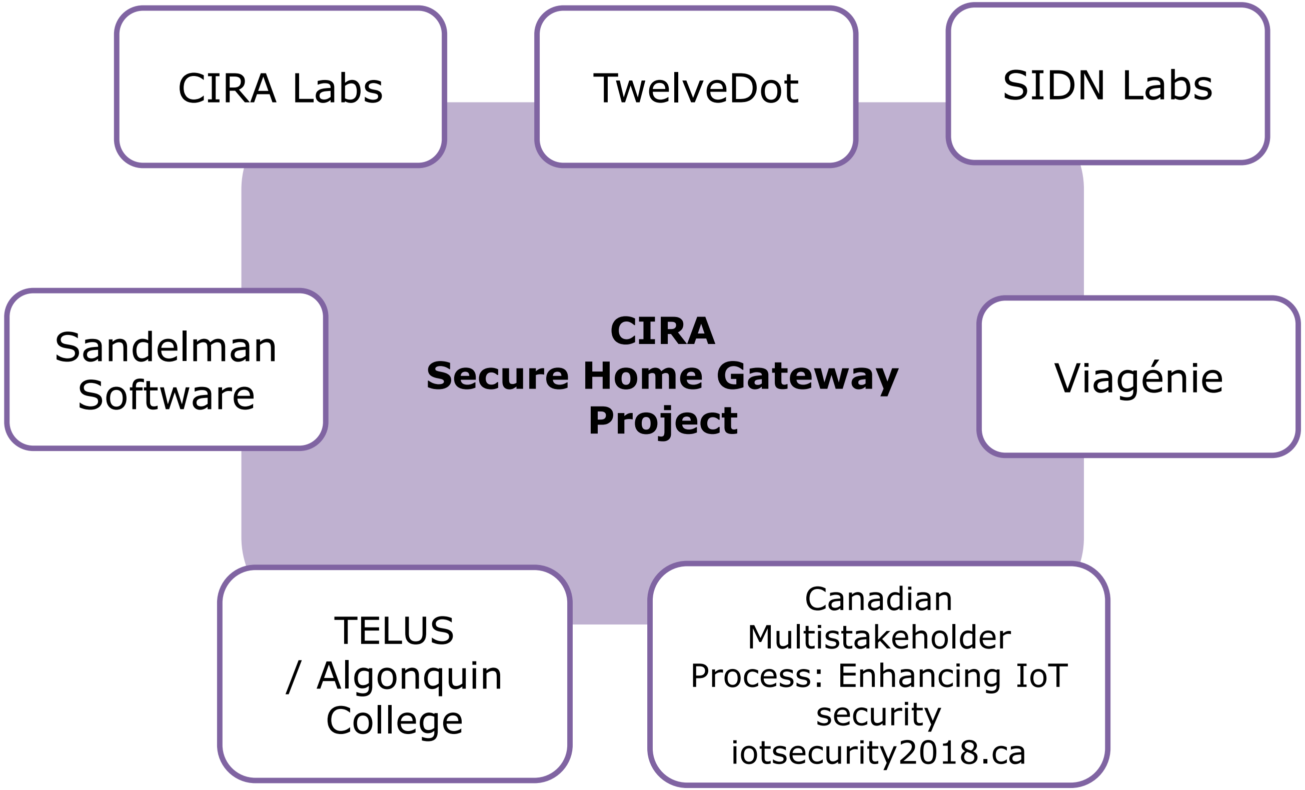
Mozilla IoT -
Web Thing
API

Standards Development
IETF, CSA/UL, ISO/IEC

Enhanced
WIFI security

In progress:
DOTS, DNSSEC, Domain
aware NFtable

We put a team together to work on the idea



CIRA Labs

TwelveDot

SIDN Labs

Sandelman Software

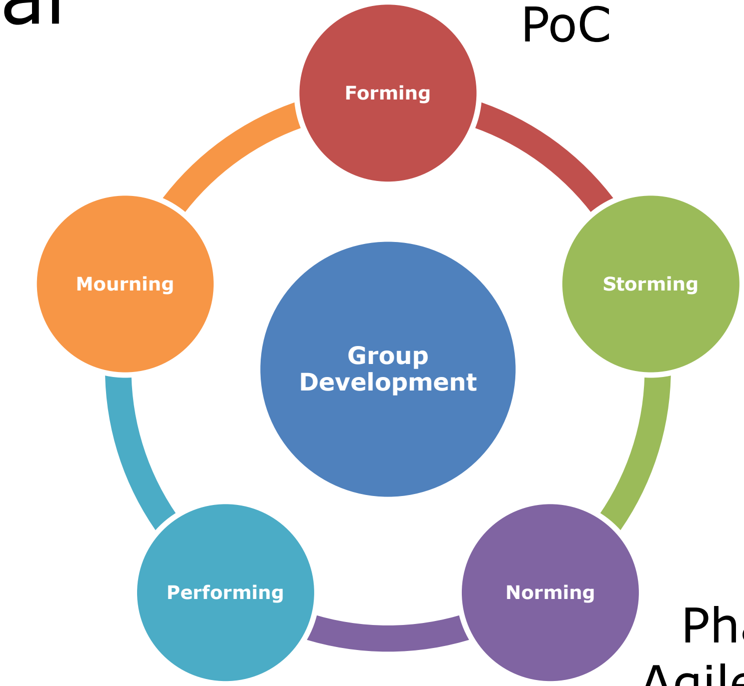
CIRA
Secure Home Gateway Project

Viagénie

TELUS / Algonquin College

Canadian Multistakeholder Process: Enhancing IoT security
iotsecurity2018.ca

Let’s look at the solution we have so far



Phase 1
PoC

Phase 2
Explore
Prototype

Phase 3
Agile Focus
Standards

Criteria #1: “Has to be easy to use”

Mobile Application

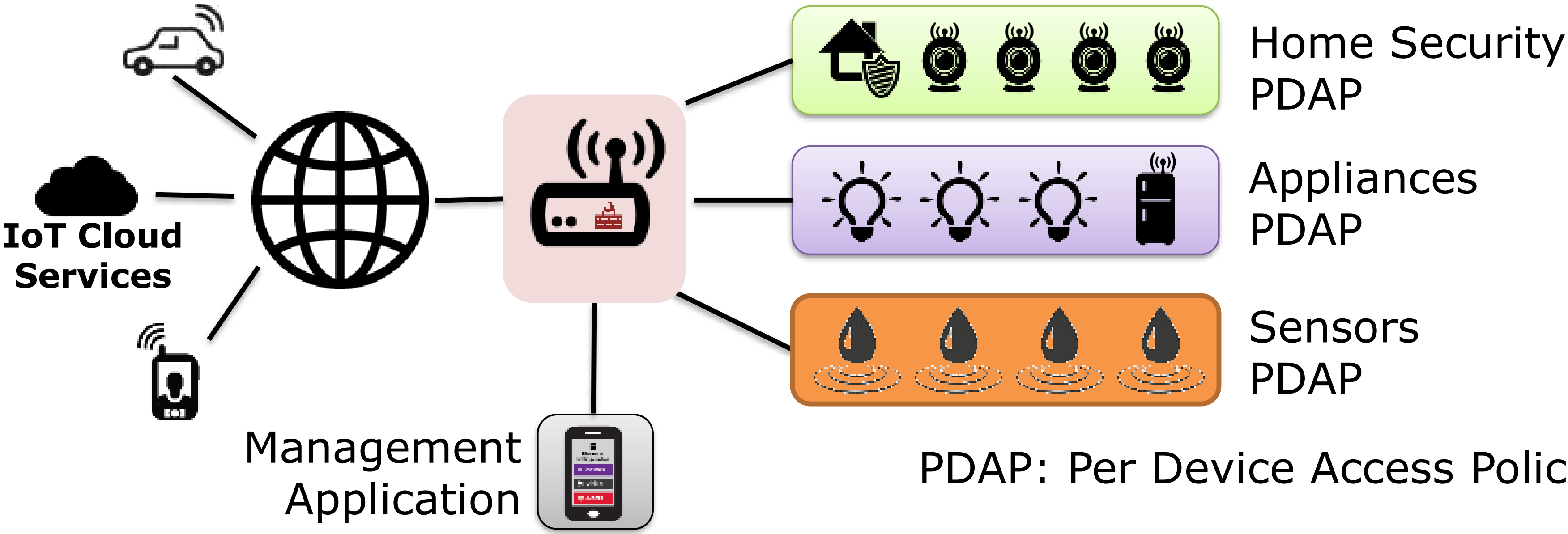
Scan & tap

No passwords

Swipe
Up Down Left Right

Grandma

Criteria #2: Apply enterprise security framework to home networks



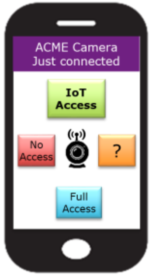
PDAP: Per Device Access Policy

Network Access Controls in the home network

Challenge #1: A solution for Secure Home Gateway Initial Setup

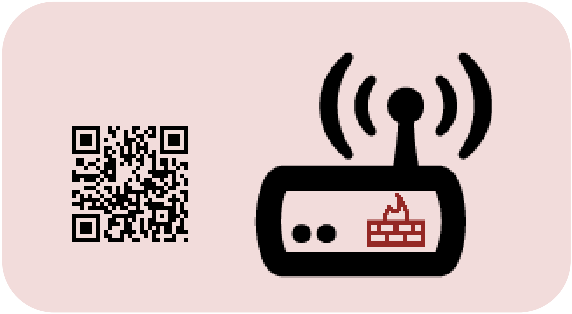
BRSKI enrollment of with disconnected Registrars – smarkaklink
This document details the mechanism used for initial enrollment using a smartphone of a BRSKI Registrar system.
…where the registrar device is new out of the box and is the intended gateway to the Internet (such as a home gateway), but has not yet been configured…

SHG application



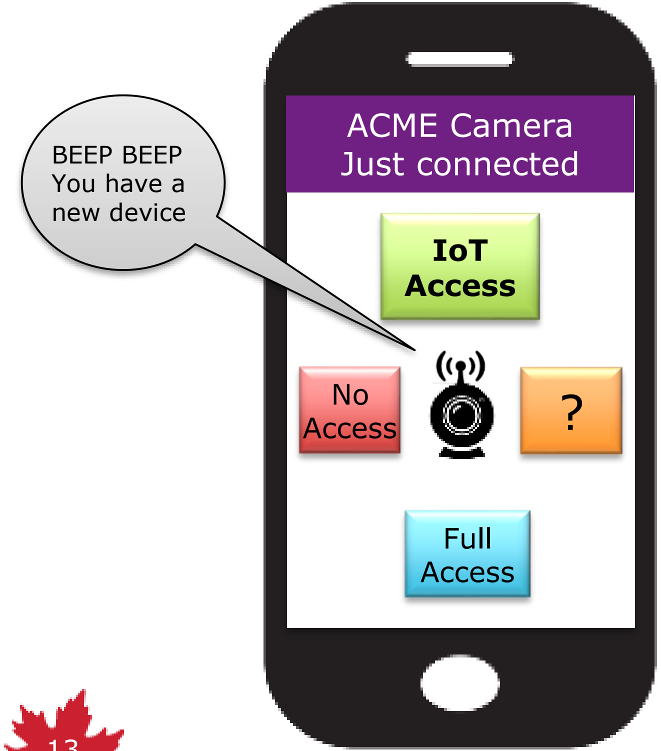
Standard API

kaklink ☺



https://datatracker.ietf.org/doc/draft-richardson-anima-smarkaklink/

Challenge #2: A solution for Home Network Device Onboarding



BEEP BEEP
You have a
new device

ACME Camera
Just connected

IoT Access

No Access

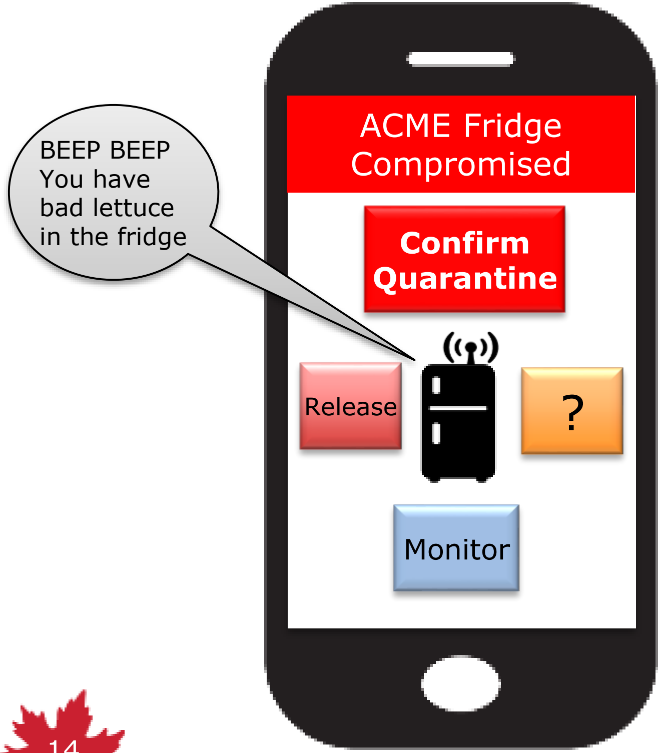
?

Full Access

Grandma (the home admin) has to do something for each new devices

- Unique WIFI keys per IoT device
- By default new devices have <Deny All> policy until granted access
- MUD to the rescue!

Challenge #3: A solution for IoT Device Quarantining

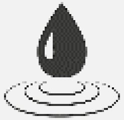


Who do we call?

- The ISP help desk?
- The IoT maker / vendor
- The police?
- The national CSIRT?
- The home gateway vendor?

Need a standard for responding to IoT based cybersecurity events. WIP.

New standard – MUD - Manufacturer Usage Description – RFC8520 – **<YANG Modules>**

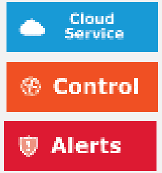


I'm an ACME water sensor

- MUD File at: https://acme.corp/mud/ws1.0.json

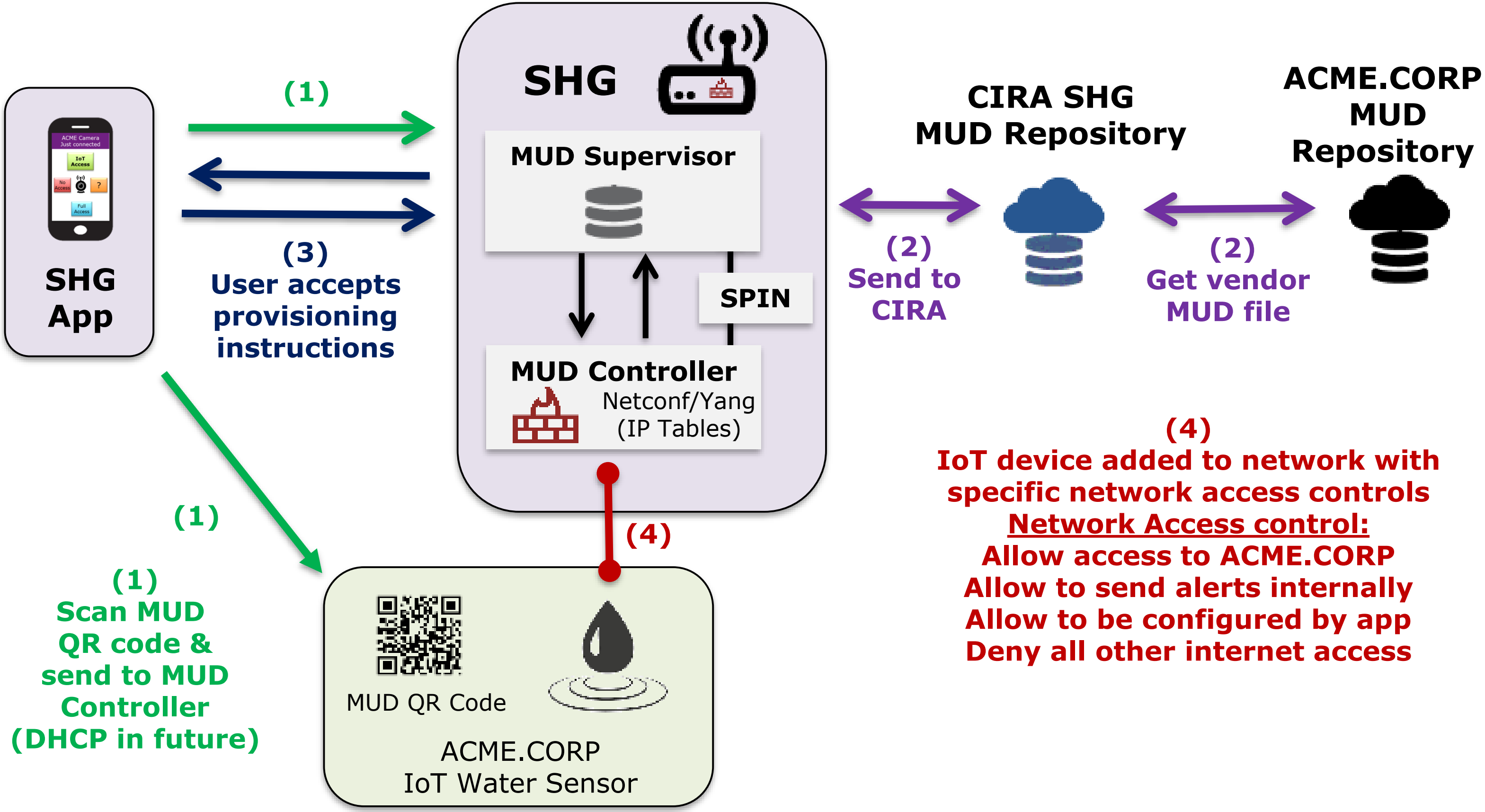
MUD YANG Model:

- I have WIFI & apply the water sensor access policy
- I need to upgrade my firmware at https://acme.corp
- Configure me at https://myip/setup
- Alerts available at https://myip/alerts



It would be nice if the IoT device could advertise it's current firmware version and/or current MUD file URL via WIFI or network connection (DPP, DHCP, LLDP…) in order to setup correct security profile

IoT Device Onboarding Workflow



(3)
User accepts provisioning instructions

(2)
Send to CIRA

(2)
Get vendor MUD file

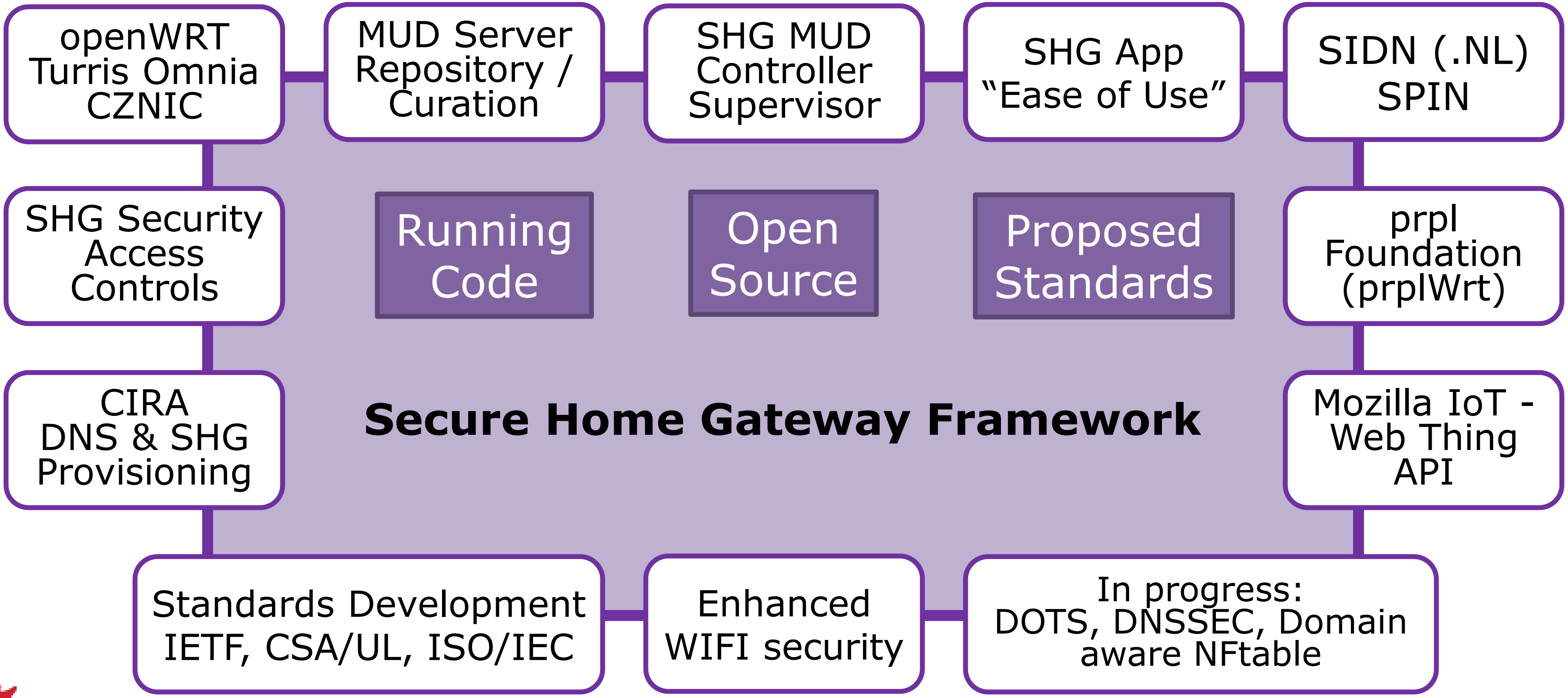
(1)
Scan MUD QR code & send to MUD Controller (DHCP in future)

(4)
IoT device added to network with specific network access controls

Network Access control:

Allow access to ACME.CORP
Allow to send alerts internally
Allow to be configured by app
Deny all other internet access

Recap: Secure Home Gateway (SHG)



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Questions?

https://cira.ca/cira-secure-home-gateway
https://github.com/CIRALabs

We are looking for sponsorship $$$ ☺