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and ask questions**

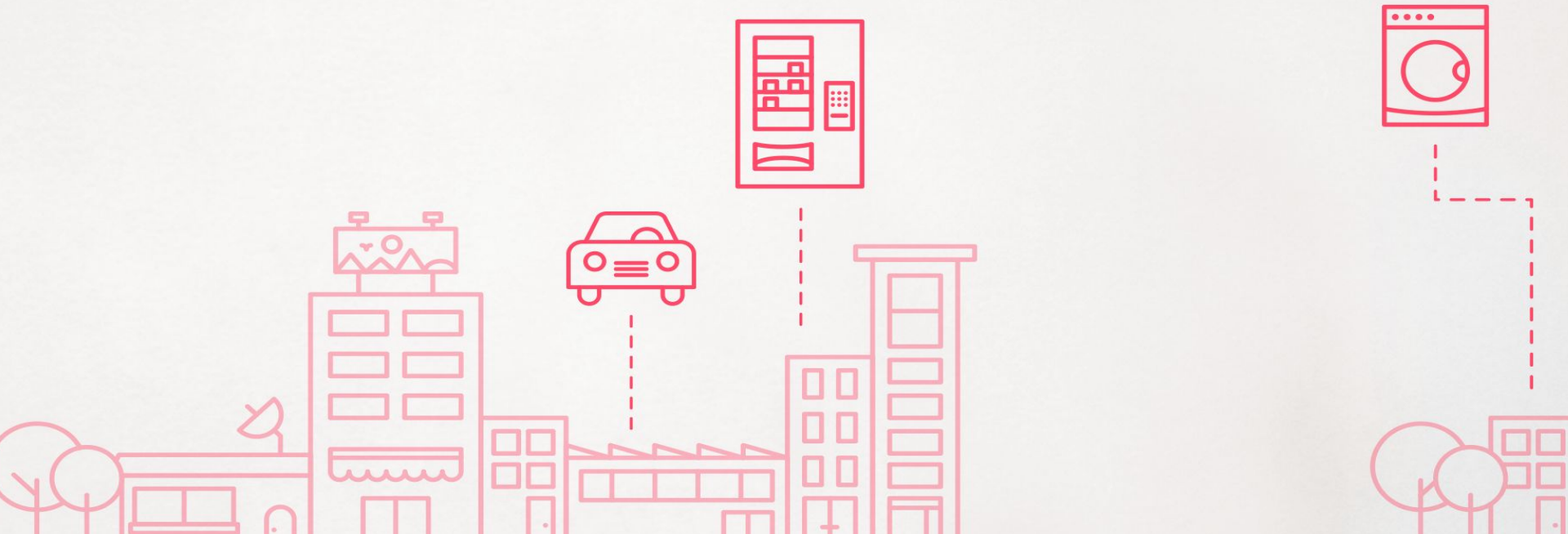


Why we need Event Driven Design

and why RPC won't work

relayr

bring **things** to life



About Me



relayr
bring **things** to life

Paul Hopton Co-Founder & Chief Engineer

@hoptonpaul | <https://github.com/paulhopton> | <https://www.linkedin.com/in/paulhopton>

Boy Scout?



Electrical Engineering





Connecting things with MQTT

What is MQTT

Lightweight Protocol for IoT (and M2M)

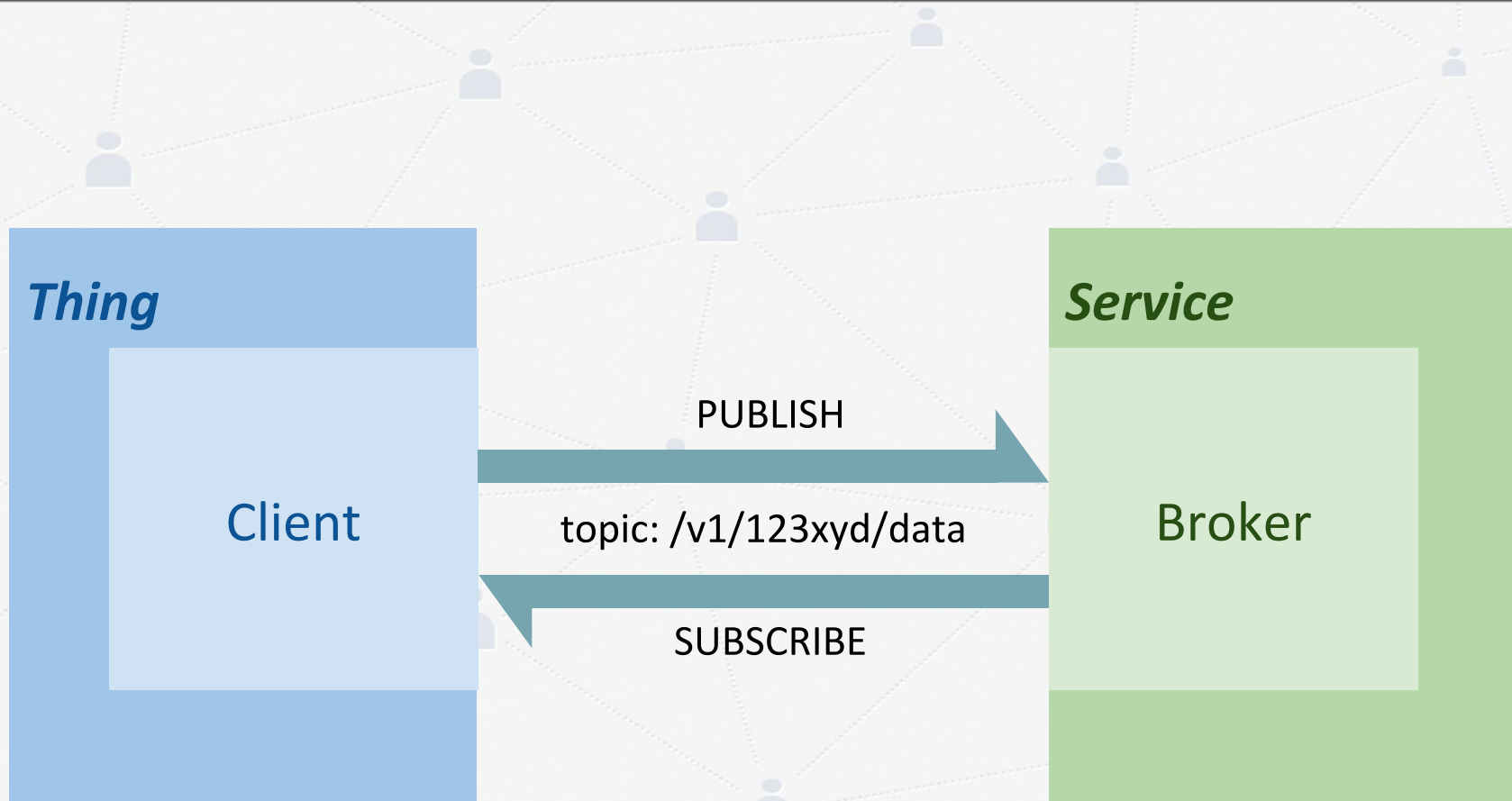
Resilient in poor network conditions

Low Power

Simple Broker

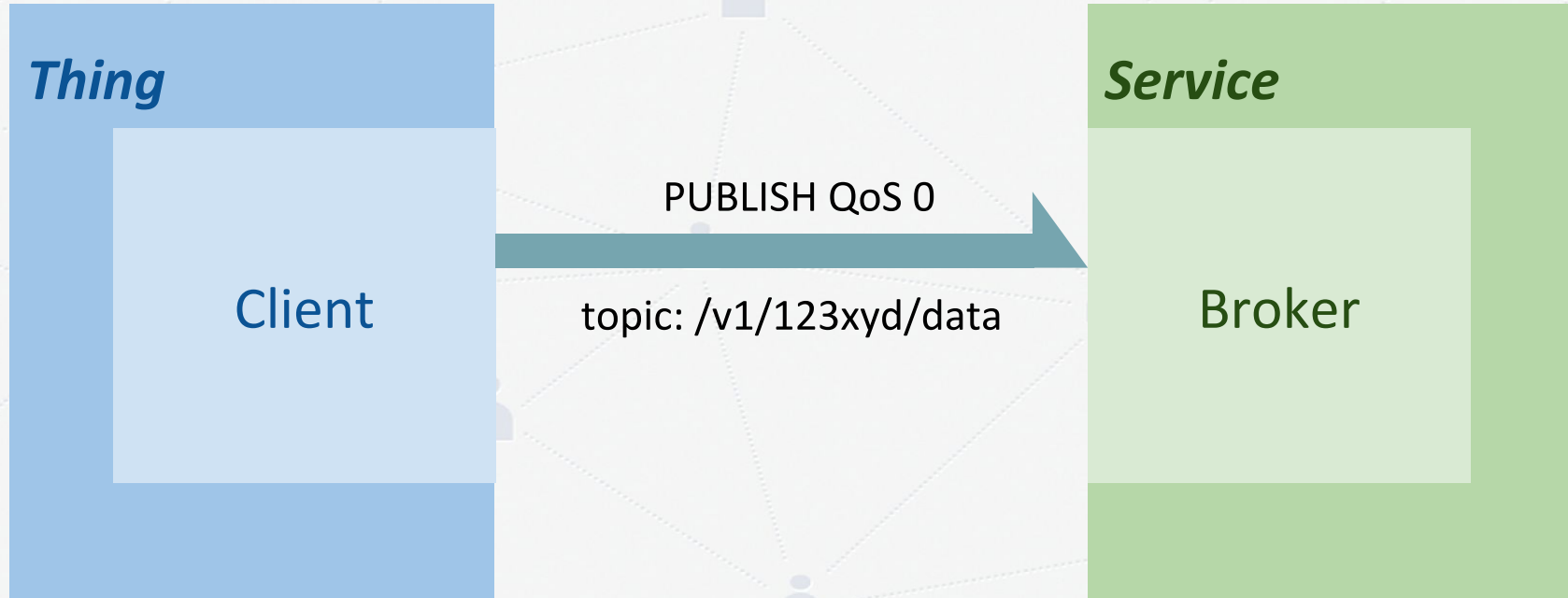
Publish to / Subscribe from topics

MQTT Communication Basics



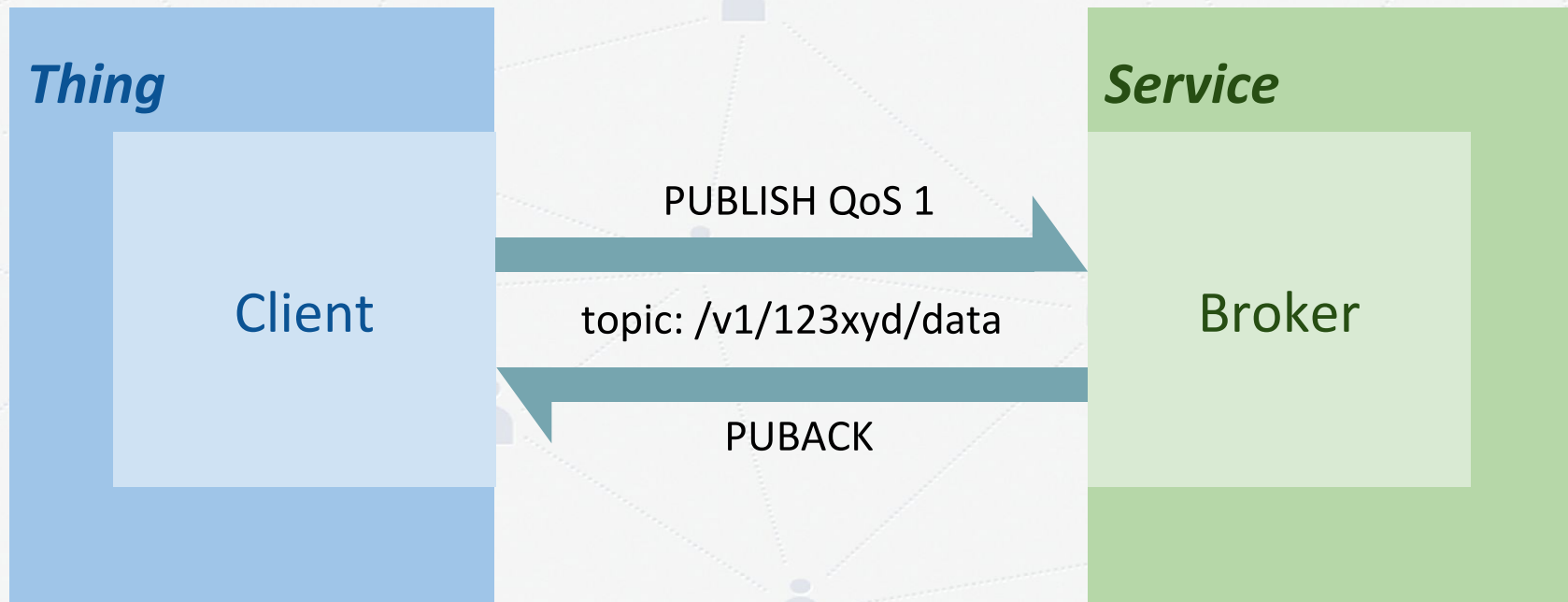
MQTT Communication Basics

QoS 0 = at most once (fire and forget)



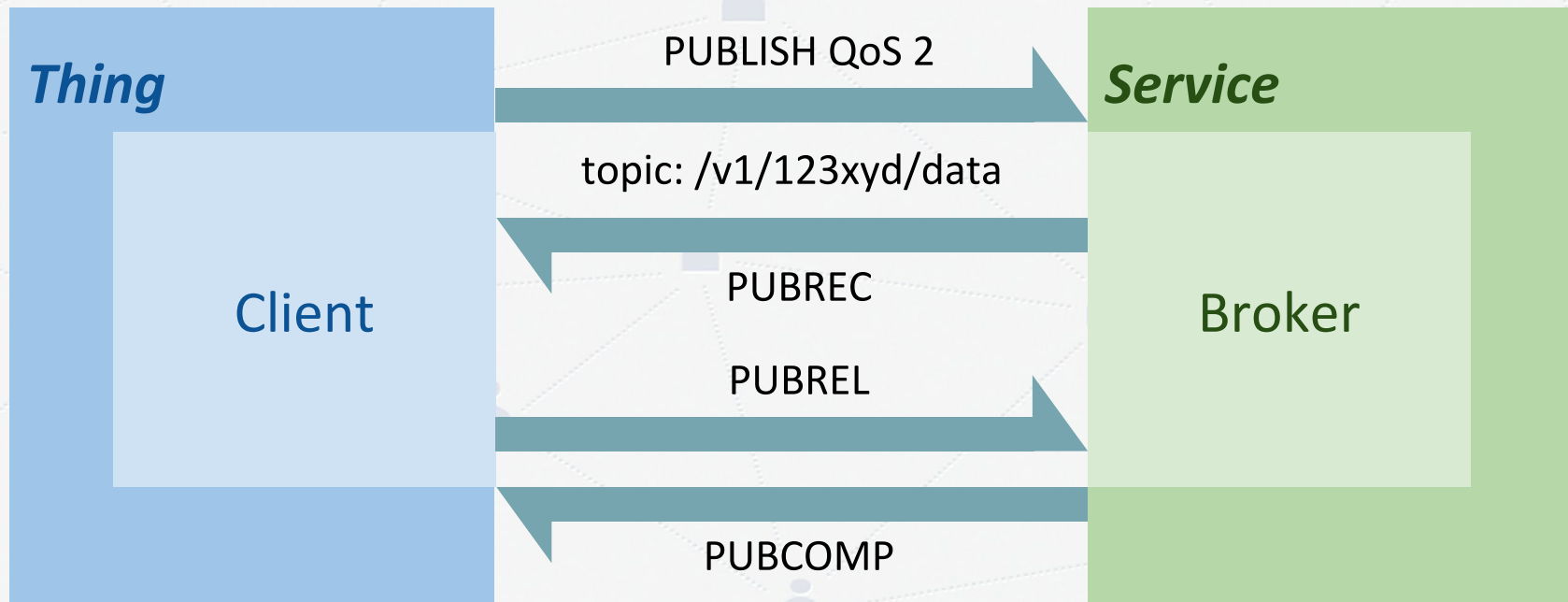
MQTT Communication Basics

QoS 1 = at least once



MQTT Communication Basics

QoS 2 = exactly once



The background features a network diagram. The top portion is a dark grey band containing several dark grey person icons connected by thin, light grey dashed lines. The bottom portion is a light grey area containing many light grey person icons connected by thin, light grey dashed lines, forming a larger, more complex network.

no response is also a response

Advantages / Disadvantages

Light-weight

Low Power

no complicated Mime-types

no enums of errors

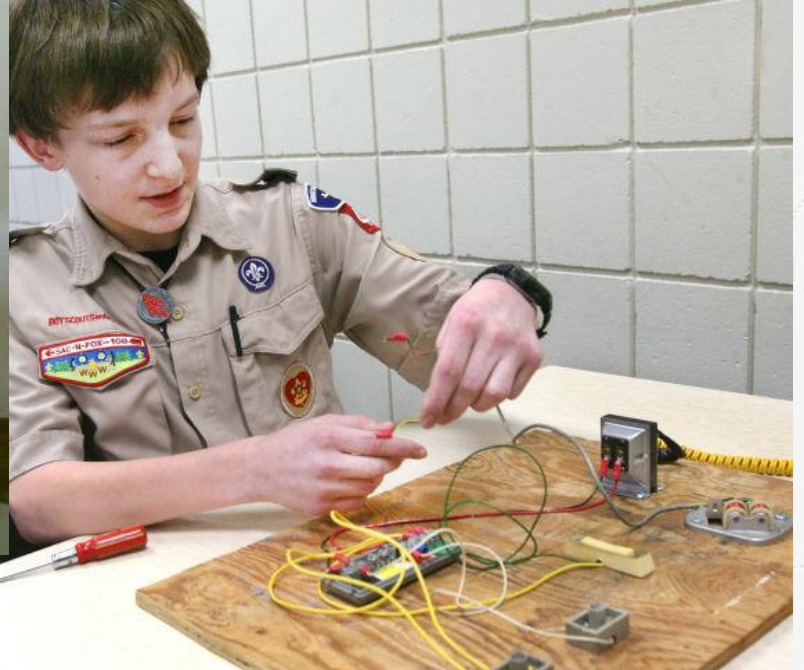
no fuss

No Feedback

No Feedback

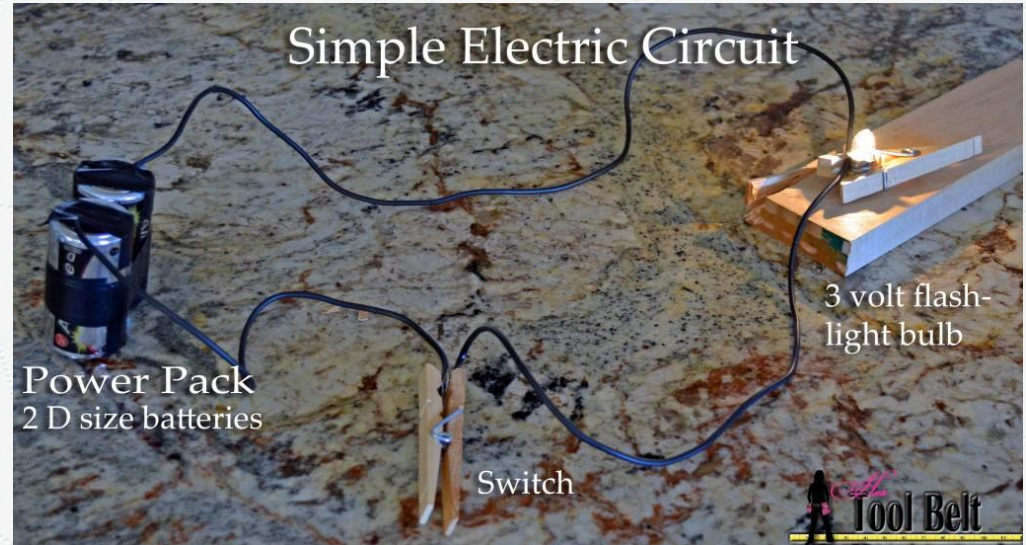
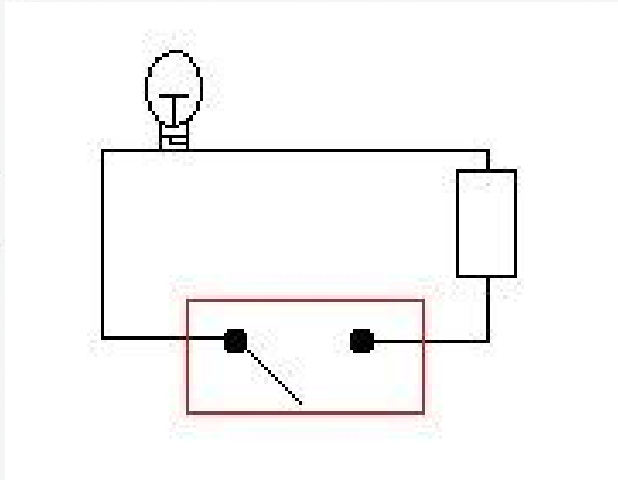
No Feedback

Keep it Simple

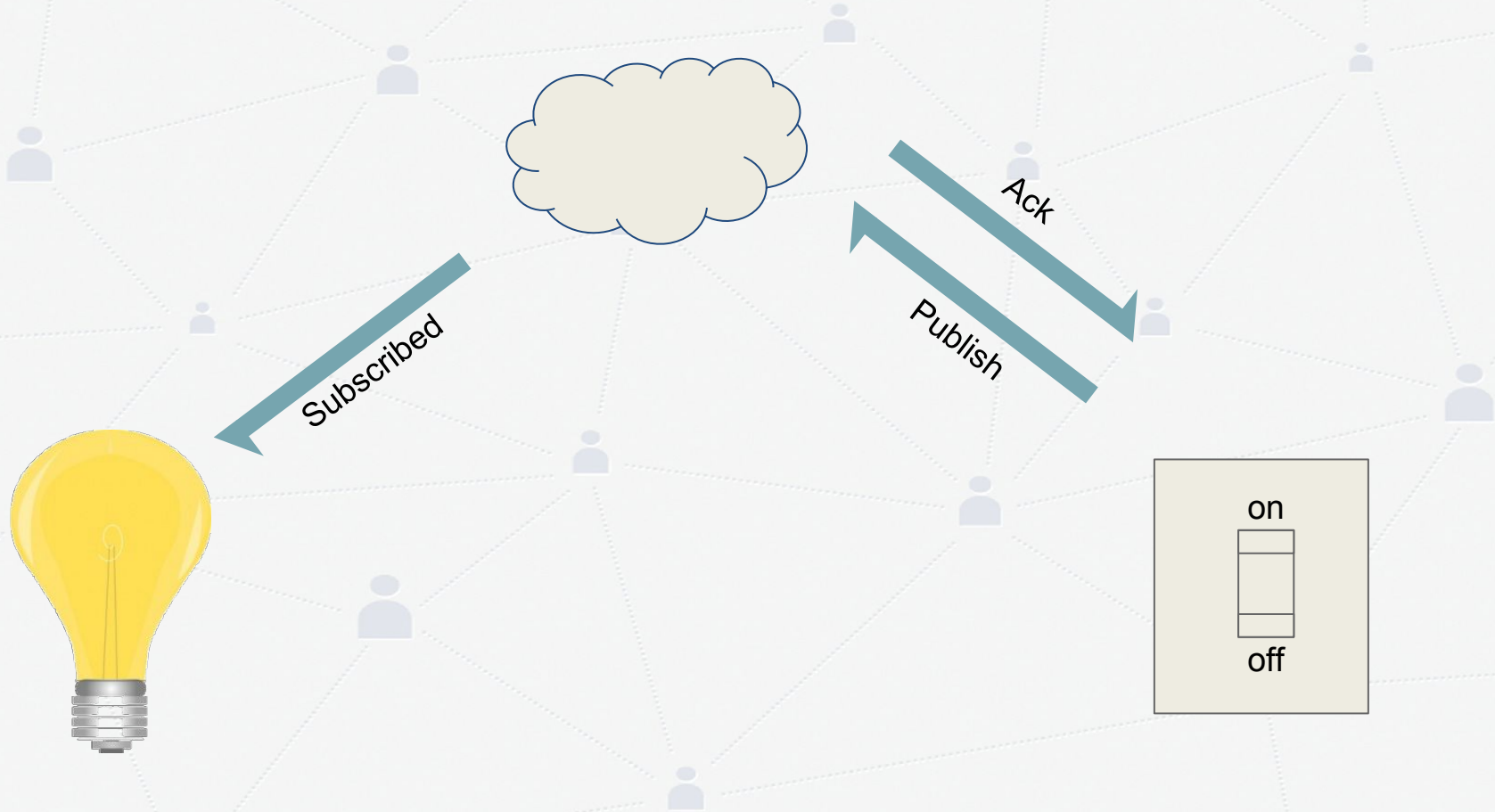


A light bulb

Switch	Bulb
1	1
0	0



IoT Lightbulb



States

Switch	Internet	Broker	Internet	Light
0	0	0	0	0
1	0	0	0	0
1	1	1	1	0
1	1	1	1	1

■ ■ ■

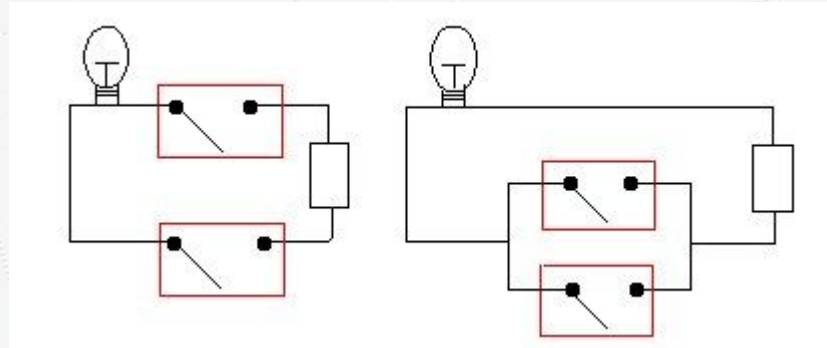
1	1	0	1	0
1	0	1	1	0
0	1	1	1	0
1	1	1	0	0

The background of the slide features a network diagram. At the top, a dark grey horizontal band contains several black silhouettes of people connected by thin, dashed white lines. Below this band, the main area is a light grey background with a larger network of smaller, light blue person icons connected by thin, dashed white lines. The overall theme is connectivity and communication.

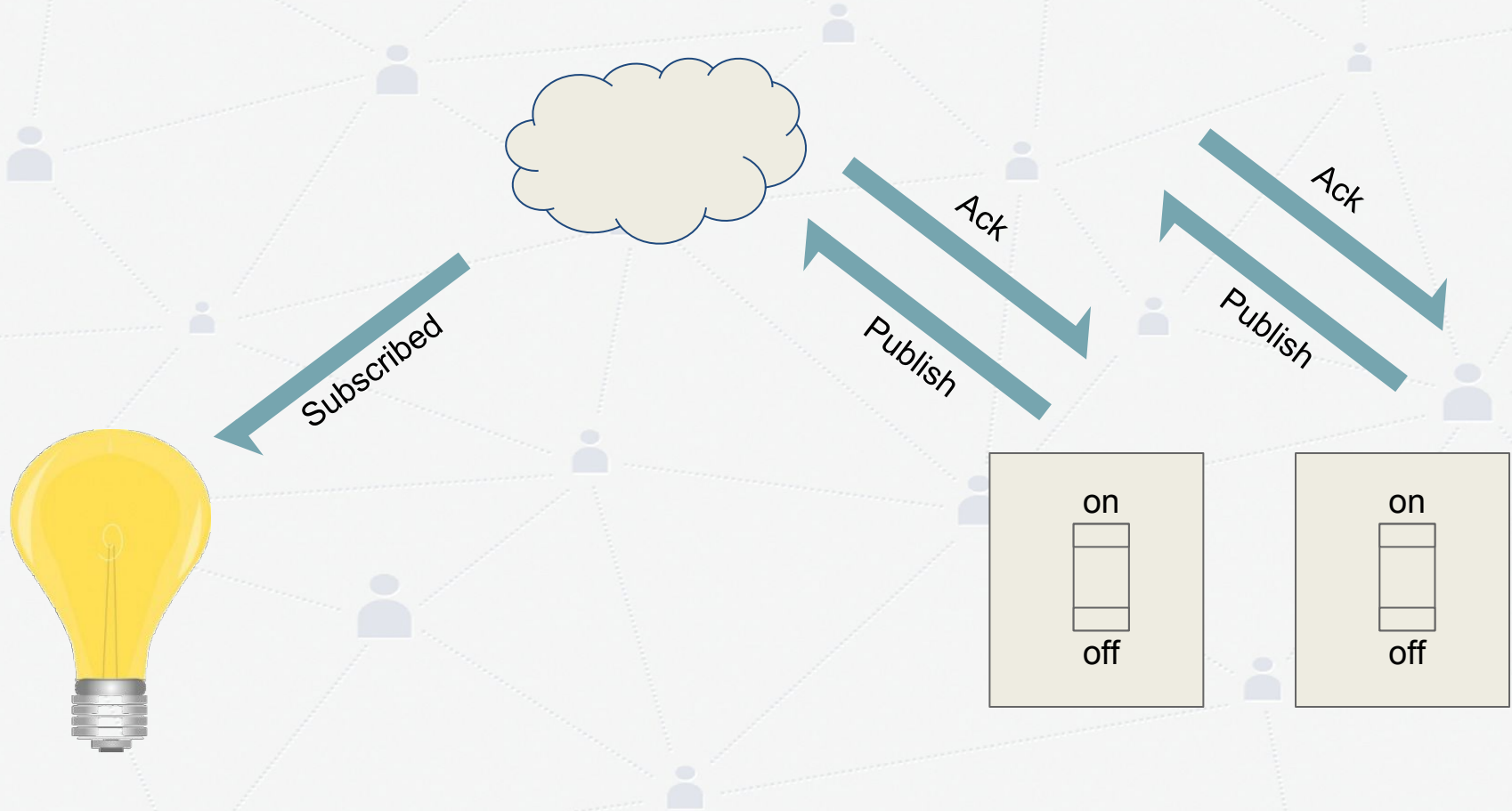
Double Trouble

Staircase Lights (two way switch)

Switch A up	Switch A down	Switch B up	Switch B down	Light
1	0	1	0	1
1	0	0	1	0
0	1	1	0	0
0	1	1	0	1



IoT Lighbulb



Error States

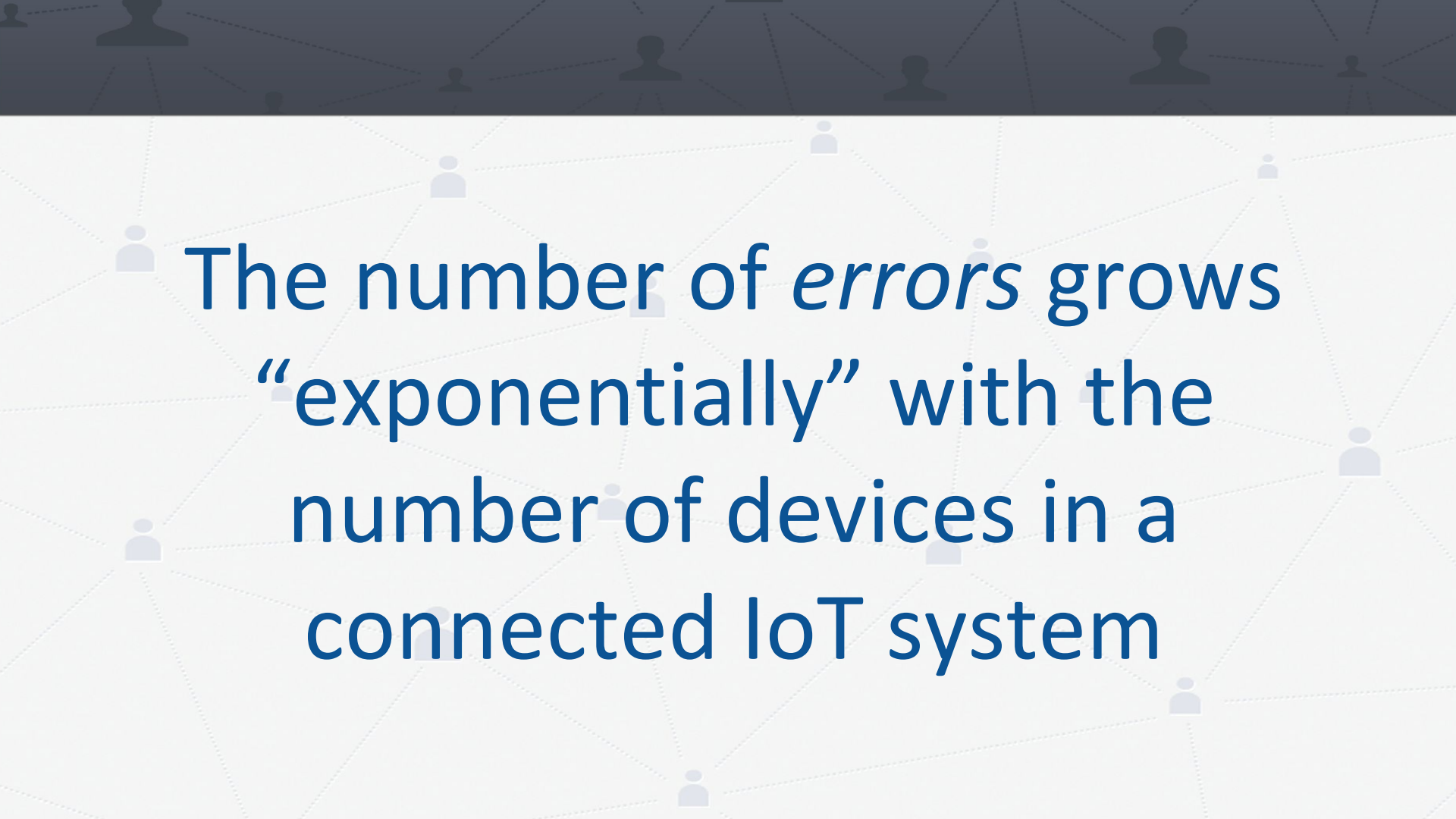
T_{oo}

Long

;

Didn't

Write



The number of *errors* grows
“exponentially” with the
number of devices in a
connected IoT system

Smart building



Mitko



- Building as a development platform
- Data Center in a container
- Big Data Generator
- Intelligent Building
- Ability to Learn

General Architecture

Open Berlin



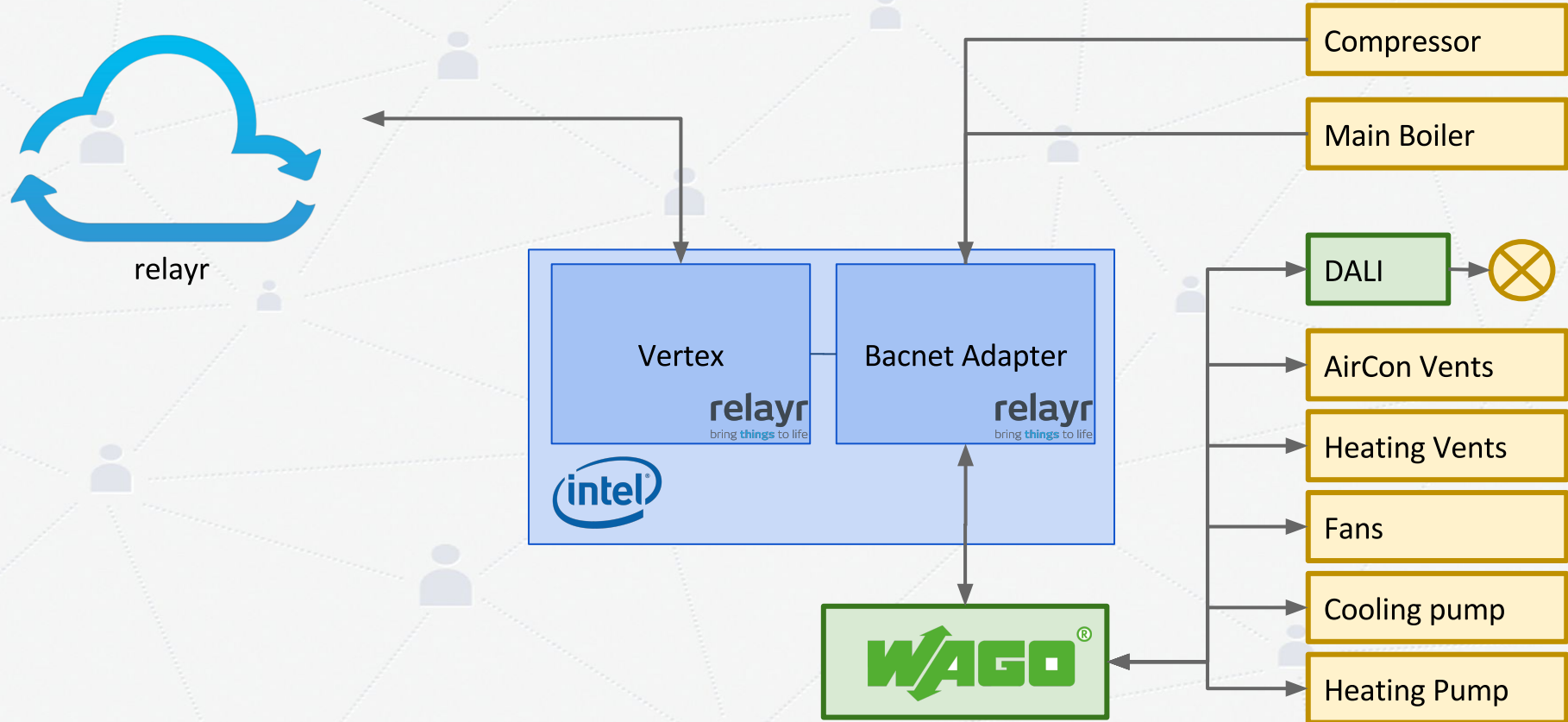
Fog Gateway



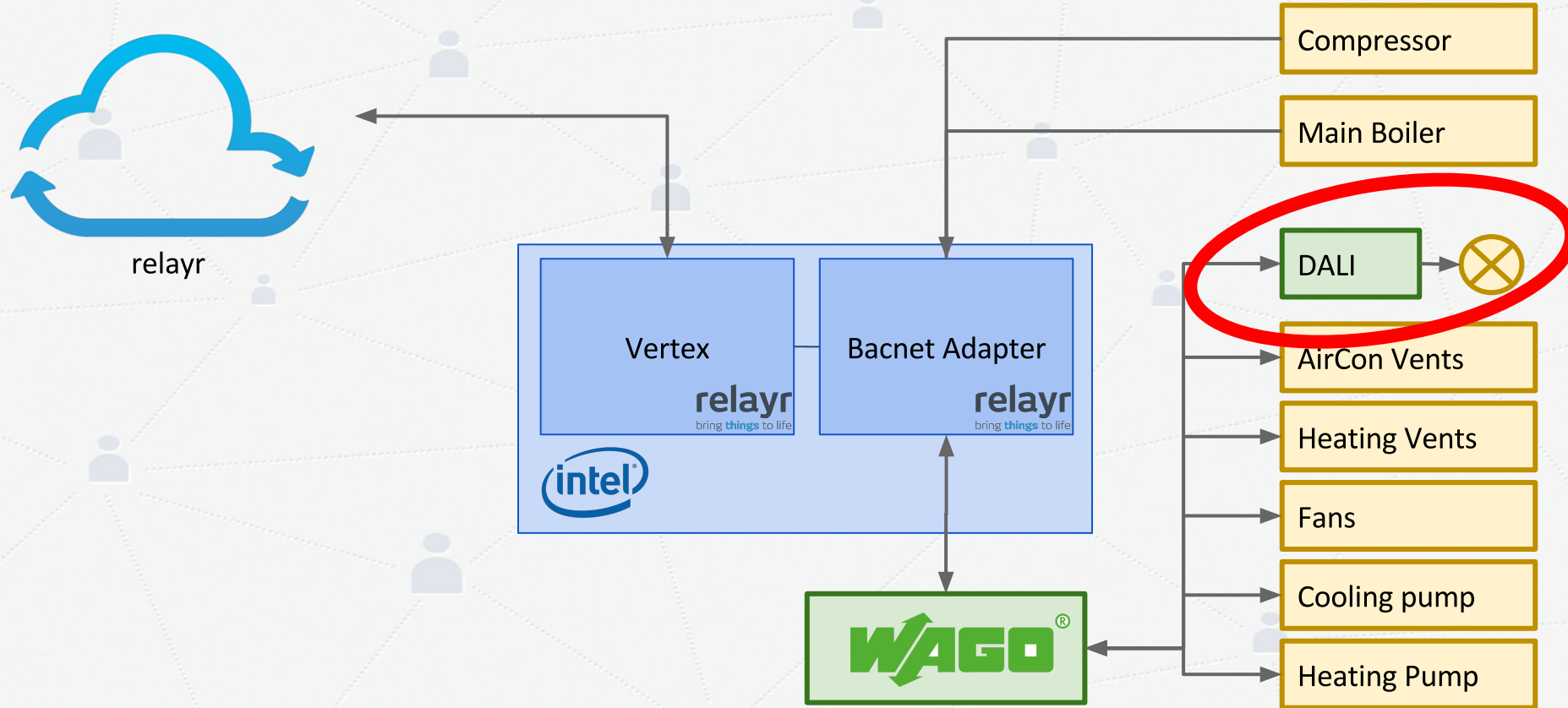
IoT Cloud



Connecting the BMS



Connecting the BMS



Adding Sensors for HVAC



BOSCH

150 WiFi enabled Modules

readings for:

Temperature

Humidity

Barometric pressure

Luminosity



relayr

bring **things** to life

50 Ethernet enabled Modules

readings for:

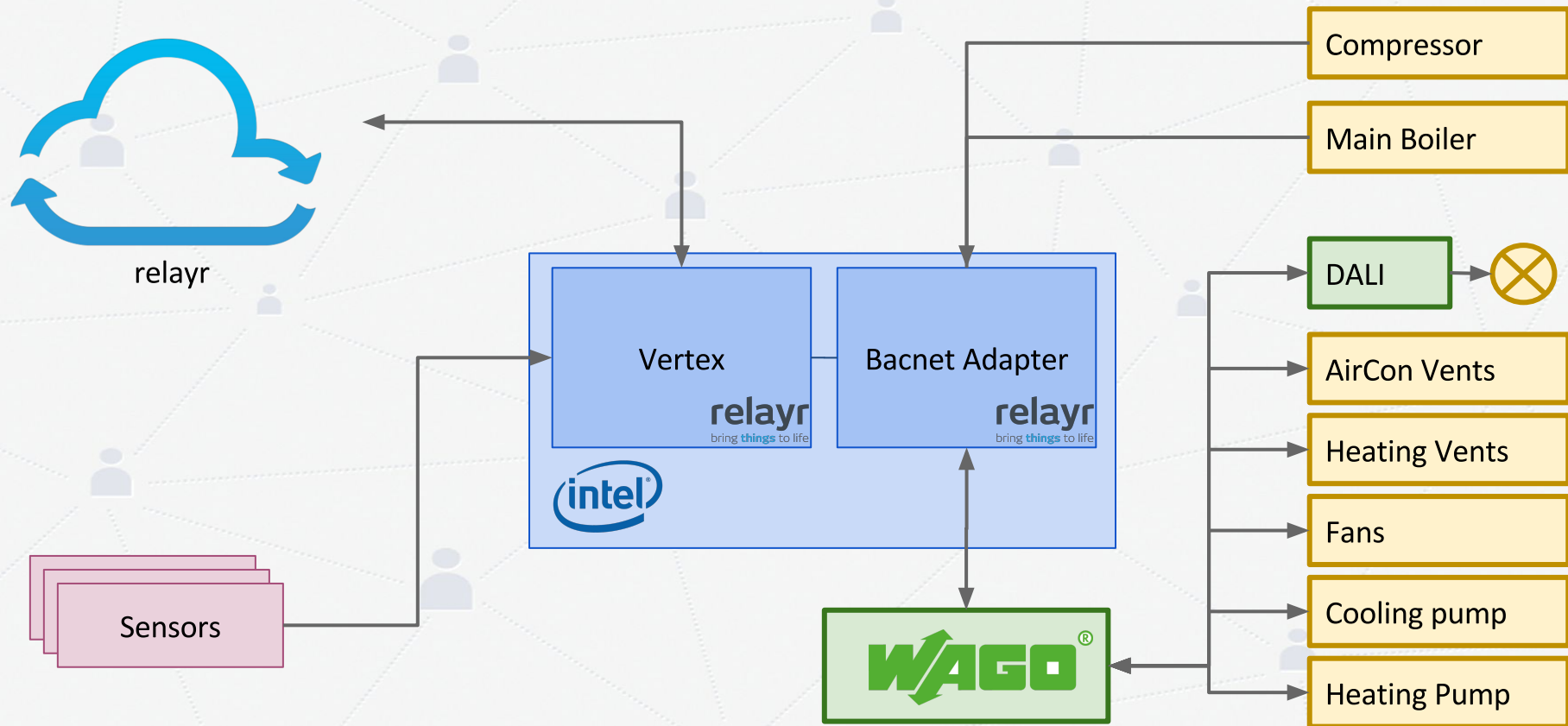
Temperature

Humidity

Luminosity

Sound levels

Adding the Sensors



Enriching the data for presence



Meraki

Measuring all probes from APs

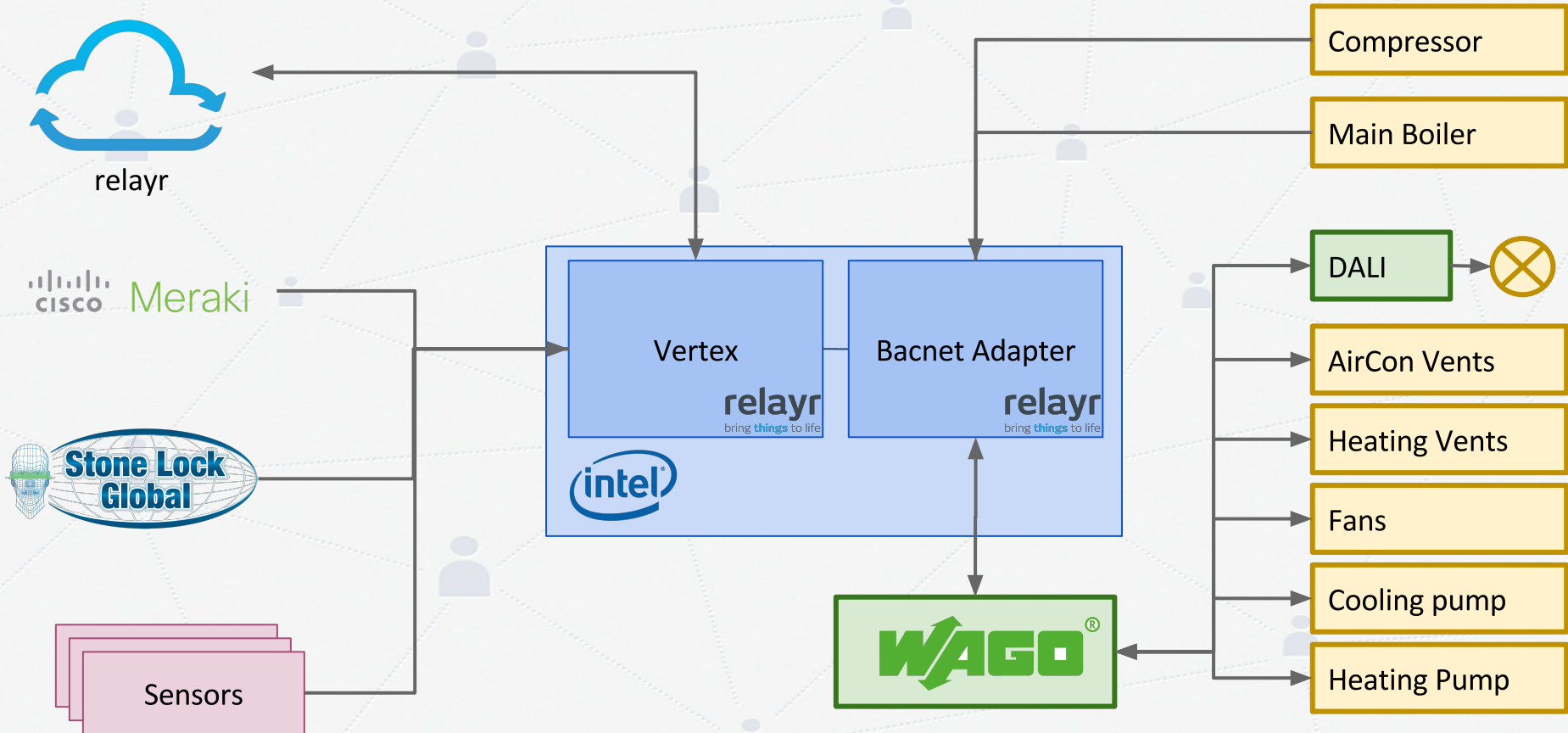
Detection
Identification
movement
Presence



20 Facial recognition Door Locks

no more name badges

Enriching the Data



Adding users to the picture

Measuring Sentiment from Users

Temperature

Heart Rate

Blood Sugar

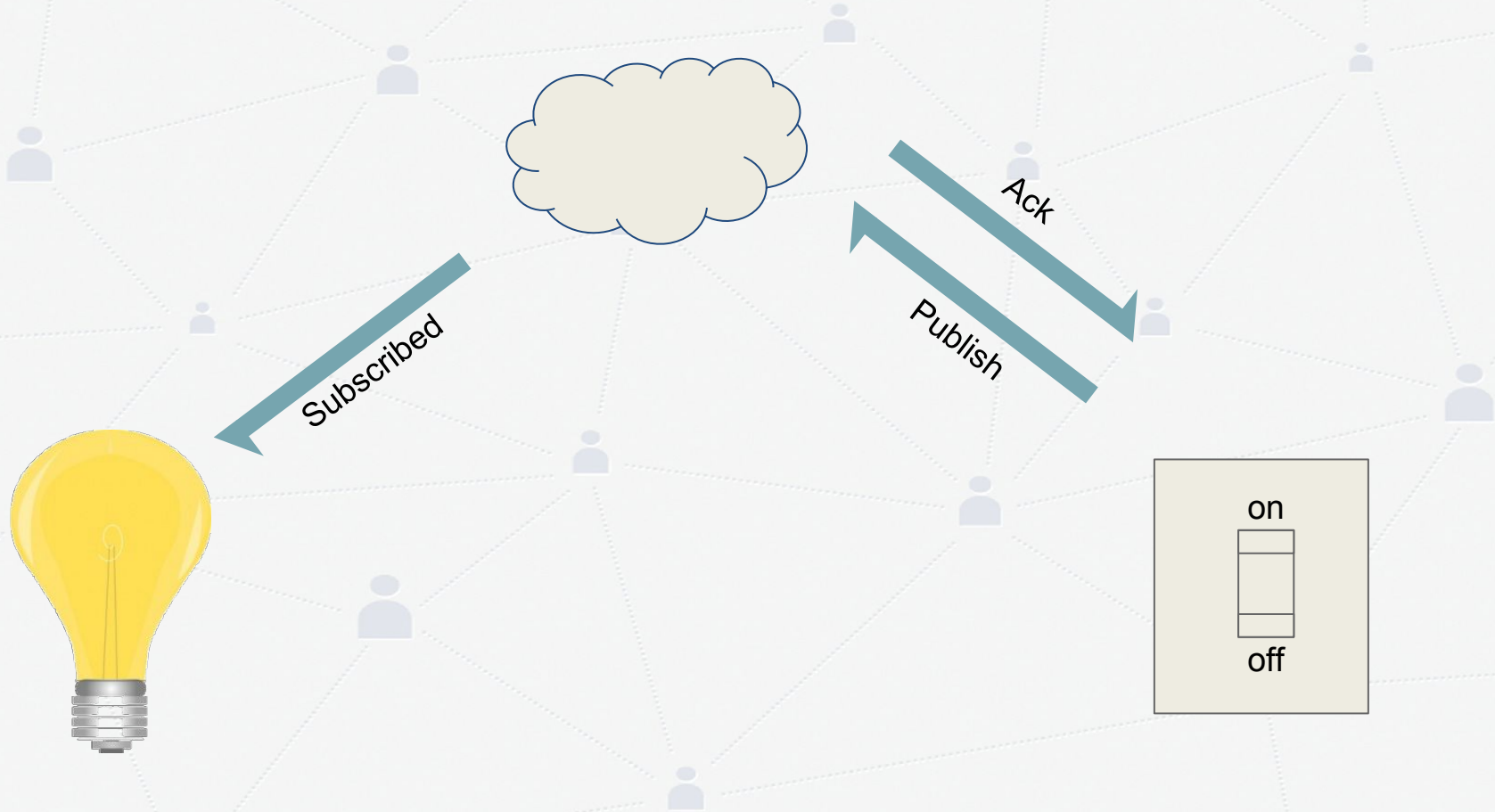


What do these rules do?

The background of the slide features a network diagram. It consists of numerous light blue person icons connected by thin, dotted lines, forming a complex web across the entire slide. The icons are stylized, showing a head and shoulders. The lines are light gray and vary in length, creating a sense of interconnectedness.

Lighting Management
Heating Management
Ventilation and Air Conditioning

IoT Lightbulb



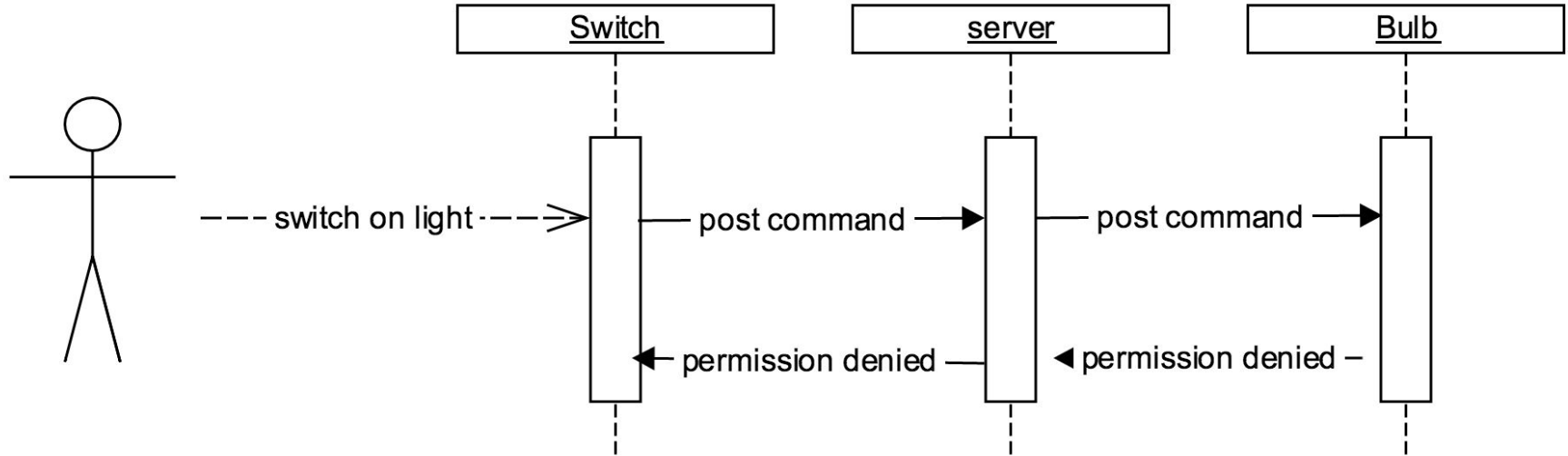
States

Switch	Internet	Broker	Internet	Light
0	0	0	0	0
1	0	0	0	0
1	1	1	1	0
1	1	1	1	1

■ ■ ■

1	1	0	1	0
1	0	1	1	0
0	1	1	1	0
1	1	1	1	0

In an (simple) HTTP World



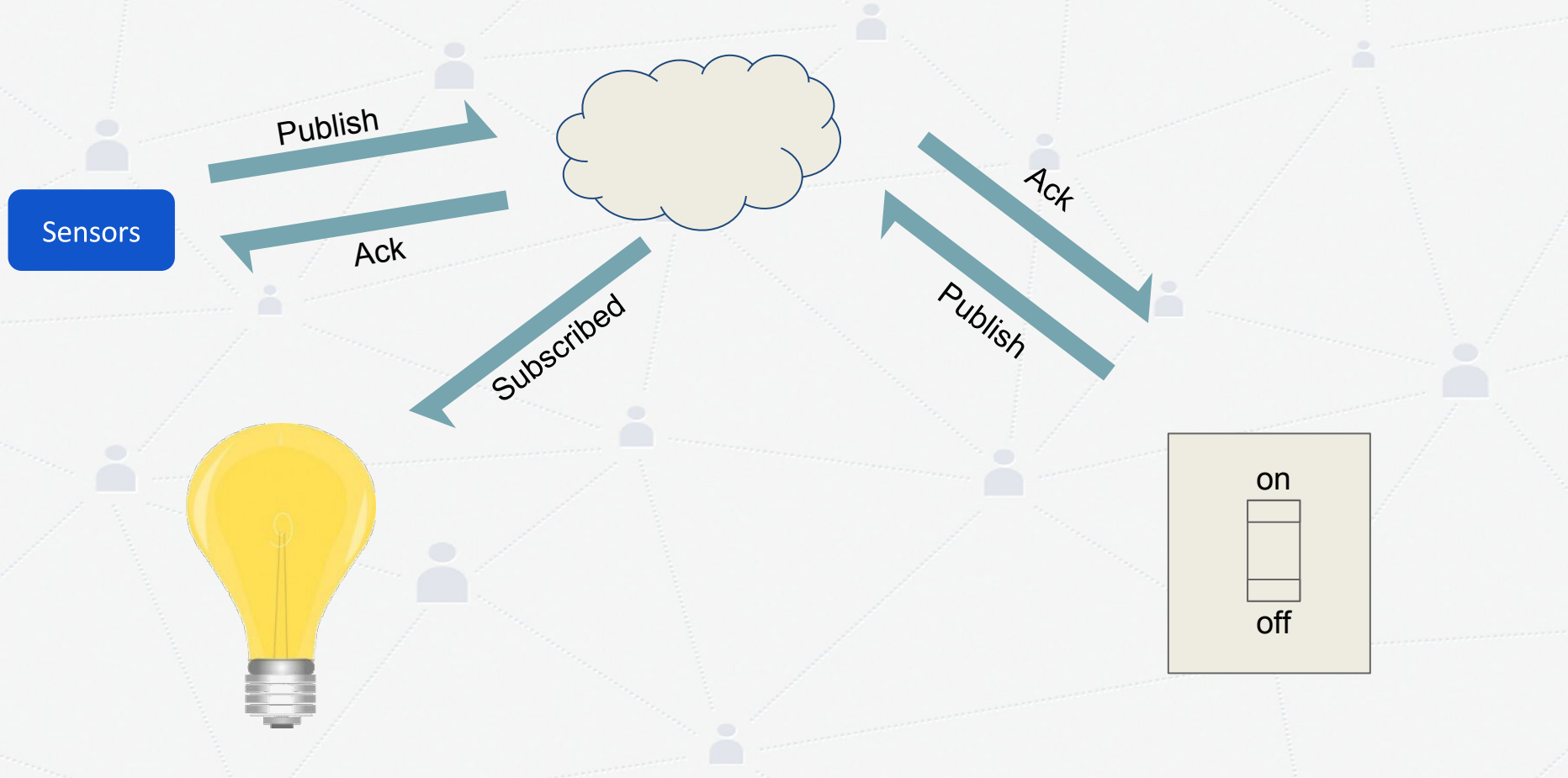
Dumb Clients



How does a light switch handle an error

```
1 import mqtt from 'mqtt';
2
3 var LightSwitch = function(id) {
4     this.id = id;
5 };
6
7 LightSwitch.prototype.switchOn = function() {
8
9     var err = function() {
10         // DO SOMETHING HERE
11     };
12
13     mqtt.publish(err, {
14         state: 1
15     });
16
17 };
18
19 var mySwitch = new LightSwitch(123);
20 mySwitch.switchOn();
```


IoT Lightbulb

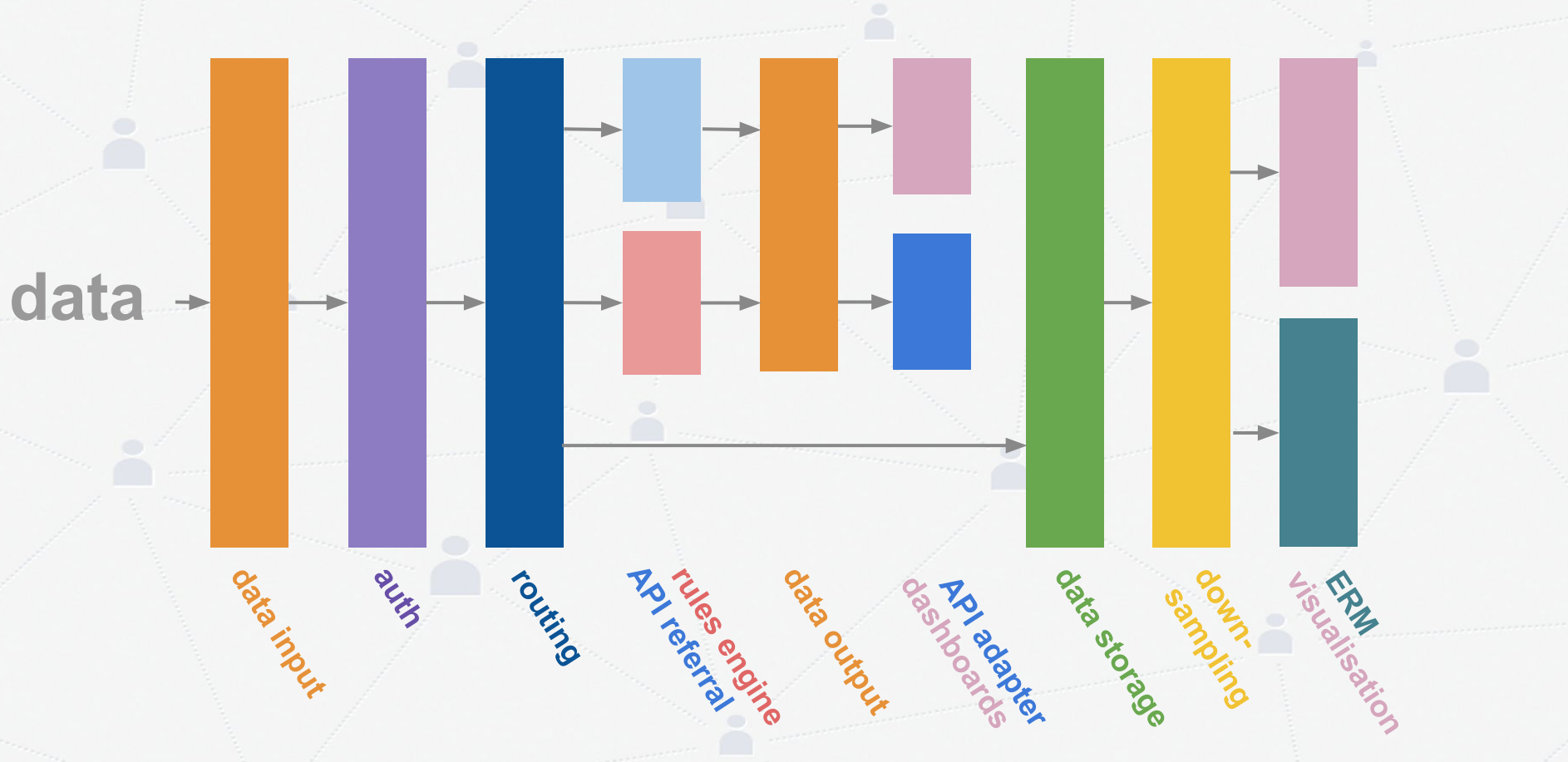


The Intelligence is in the Cloud

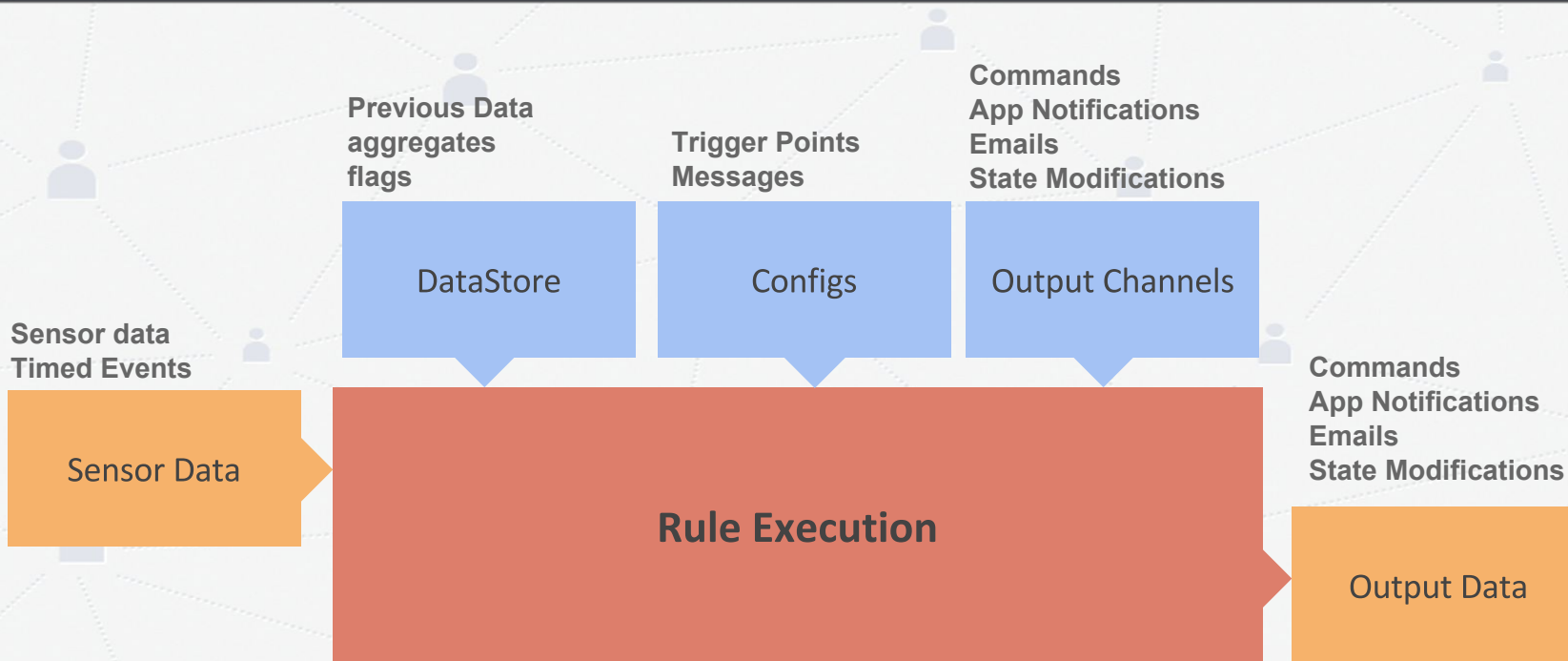


...or a local fog node

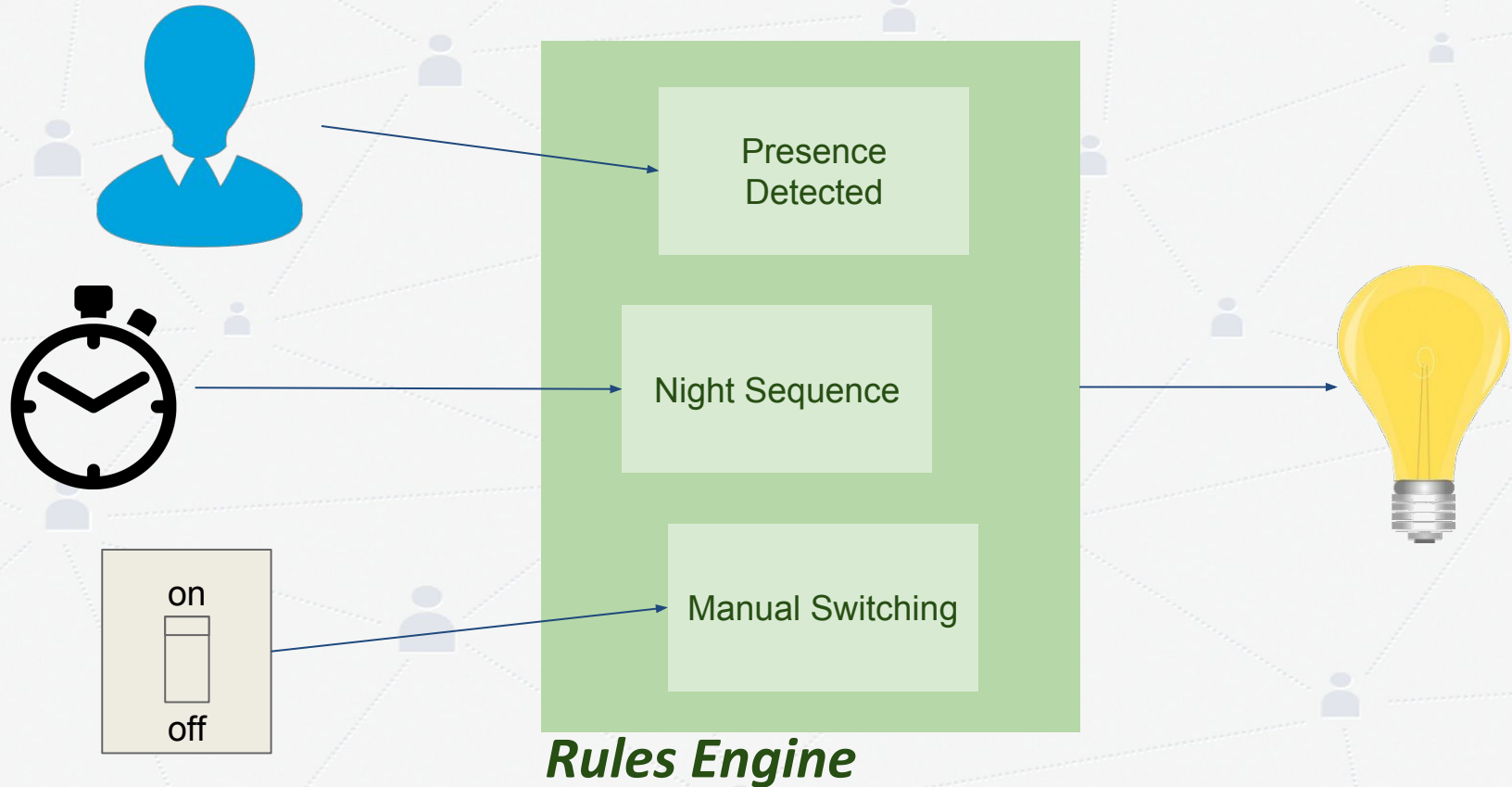
Data Journey



Simple Rules



Multiple Rules



Principle

The background of the slide features a network diagram. It consists of numerous light blue person icons connected by thin, dotted lines, forming a complex web of connections. The top of the slide has a dark grey header bar with the word 'Principle' in white.

Strong disconnect between
cause and action

The background features a network diagram. The top portion is a dark grey horizontal band containing several dark grey person icons connected by thin, light grey dashed lines. The bottom portion is a light grey area containing many light grey person icons connected by thin, light grey dashed lines, forming a larger network structure.

Clients cannot maintain their
own state

The background features a network diagram with stylized human icons connected by dotted lines. A dark grey header bar at the top contains larger, solid icons. The main area is light grey with smaller, semi-transparent icons.

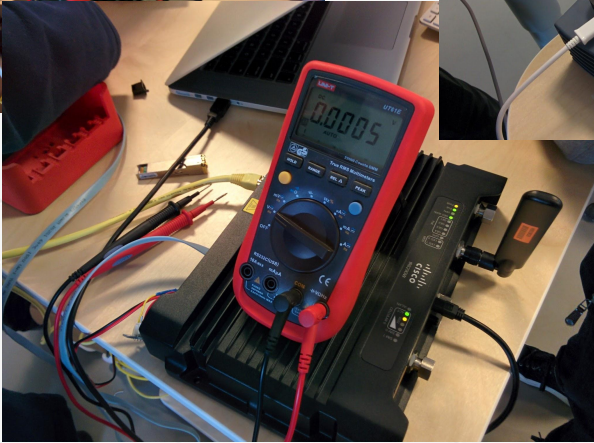
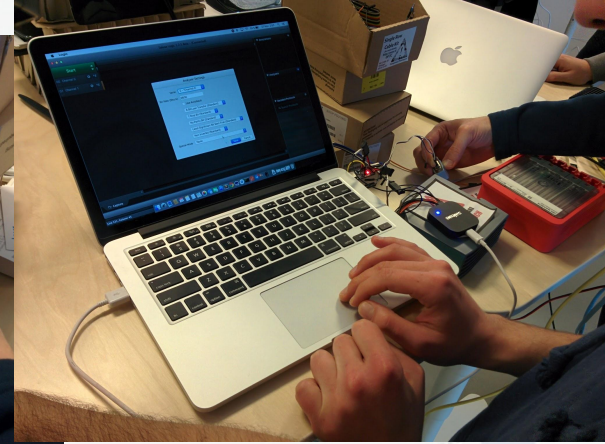
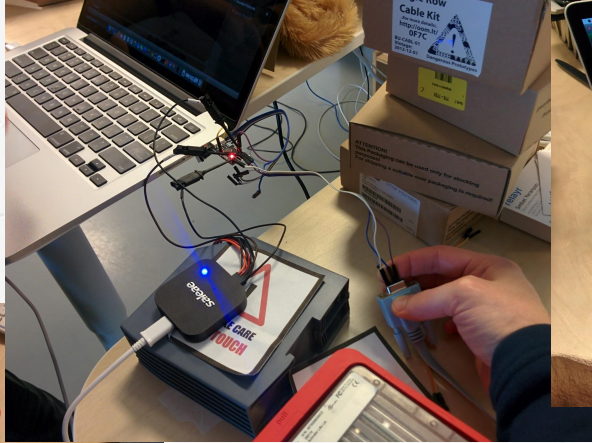
No guarantee on the outcome
of a successfully executed
function

The background features a network of light gray dotted lines connecting various person icons. The icons are dark gray silhouettes of people, some of which are larger and more prominent than others. The overall theme is professional networking or community building.

Thank You!

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