

Developing a Complete Embedded IoT Solution Using Mongoose OS

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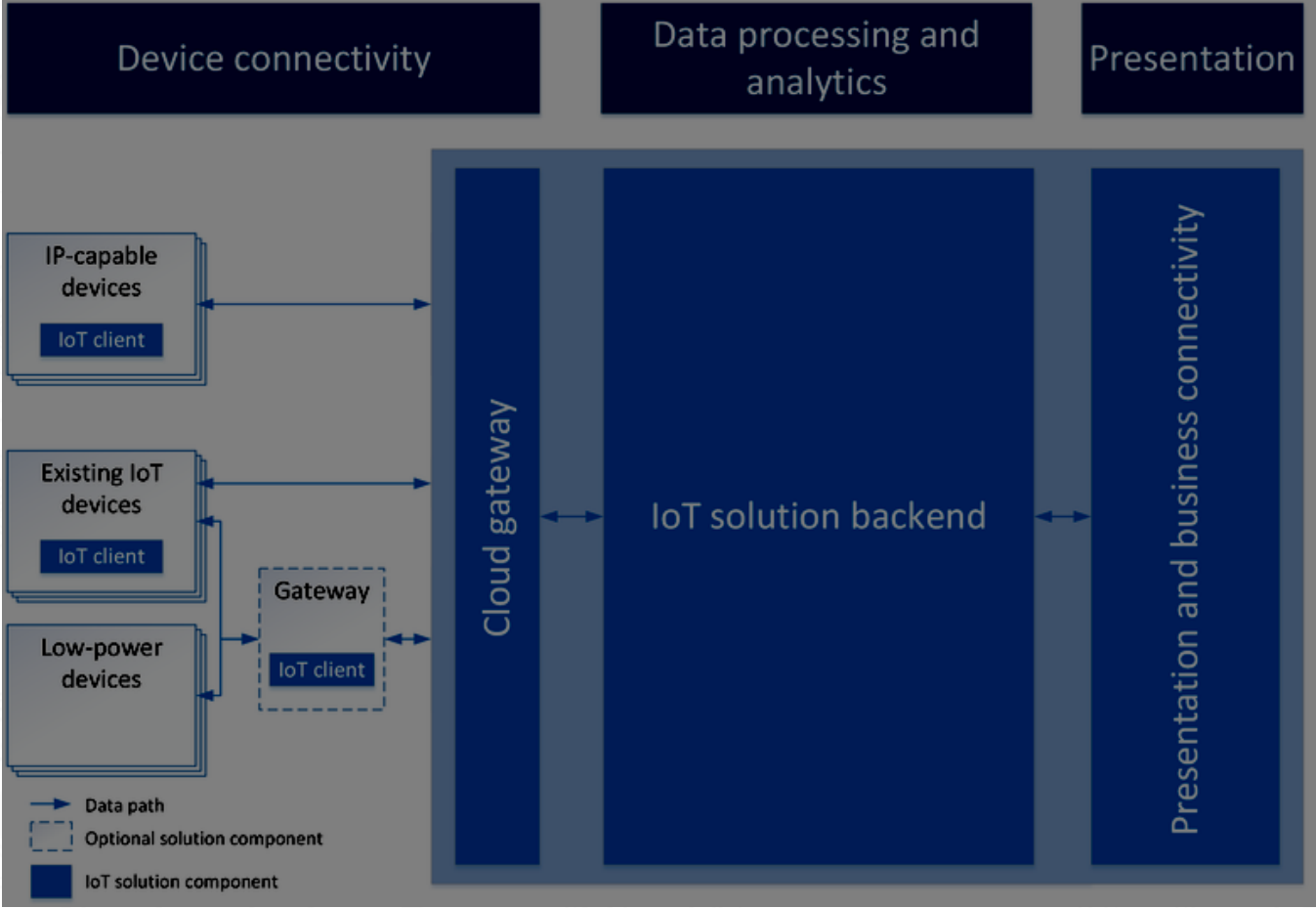
IoT Architecture

IoT - Definition

“The network of physical objects that contain embedded technology to communicate and interact with their internal states or the external environment.”

Source: Gartner

IoT - Reference Architecture





Use Case

Lockers

.Somethings to ponder on

-Is my bank locker safe?

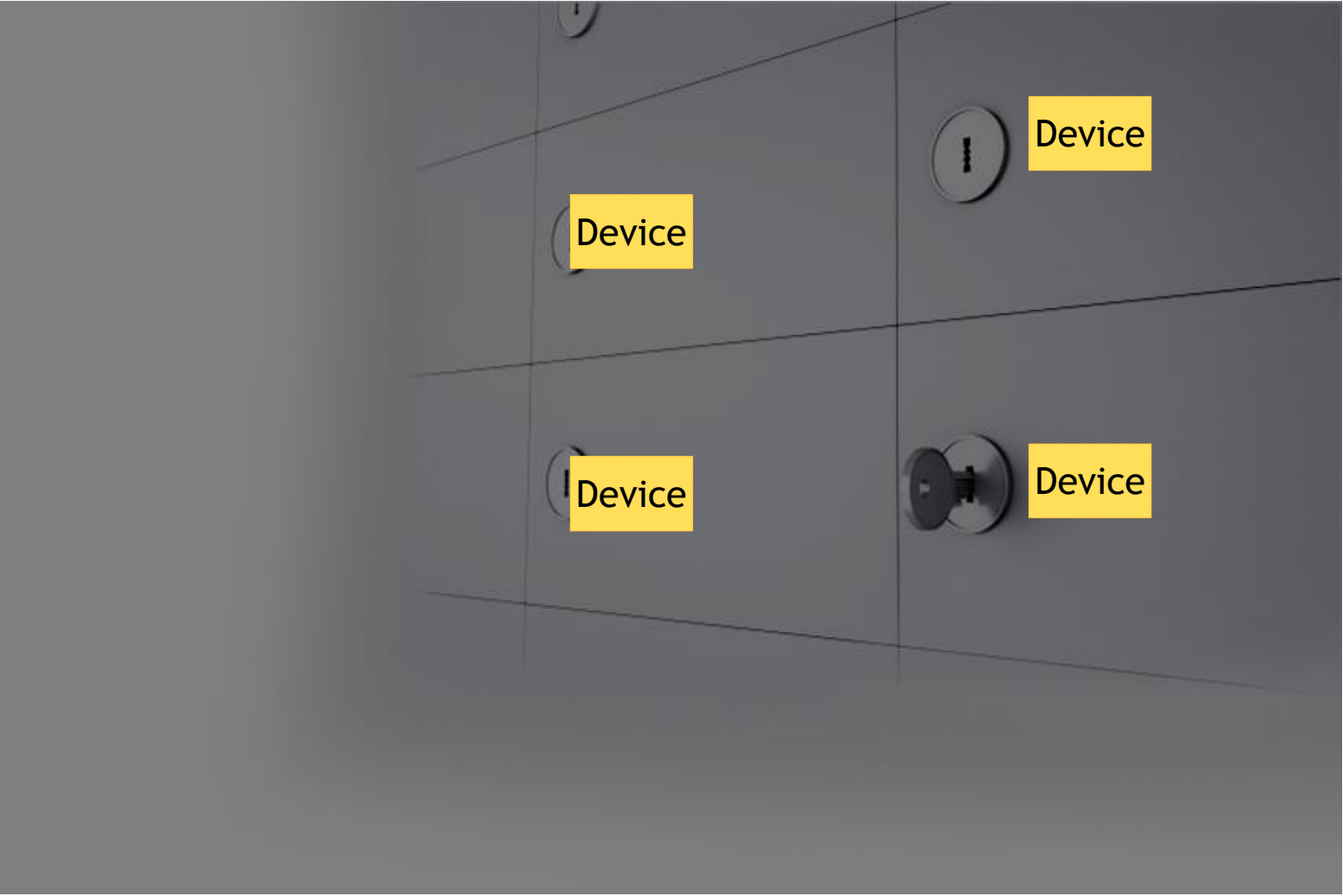
-Is it possible that lockers are accessed without our knowledge?

.Is it possible so how we come to know about it?

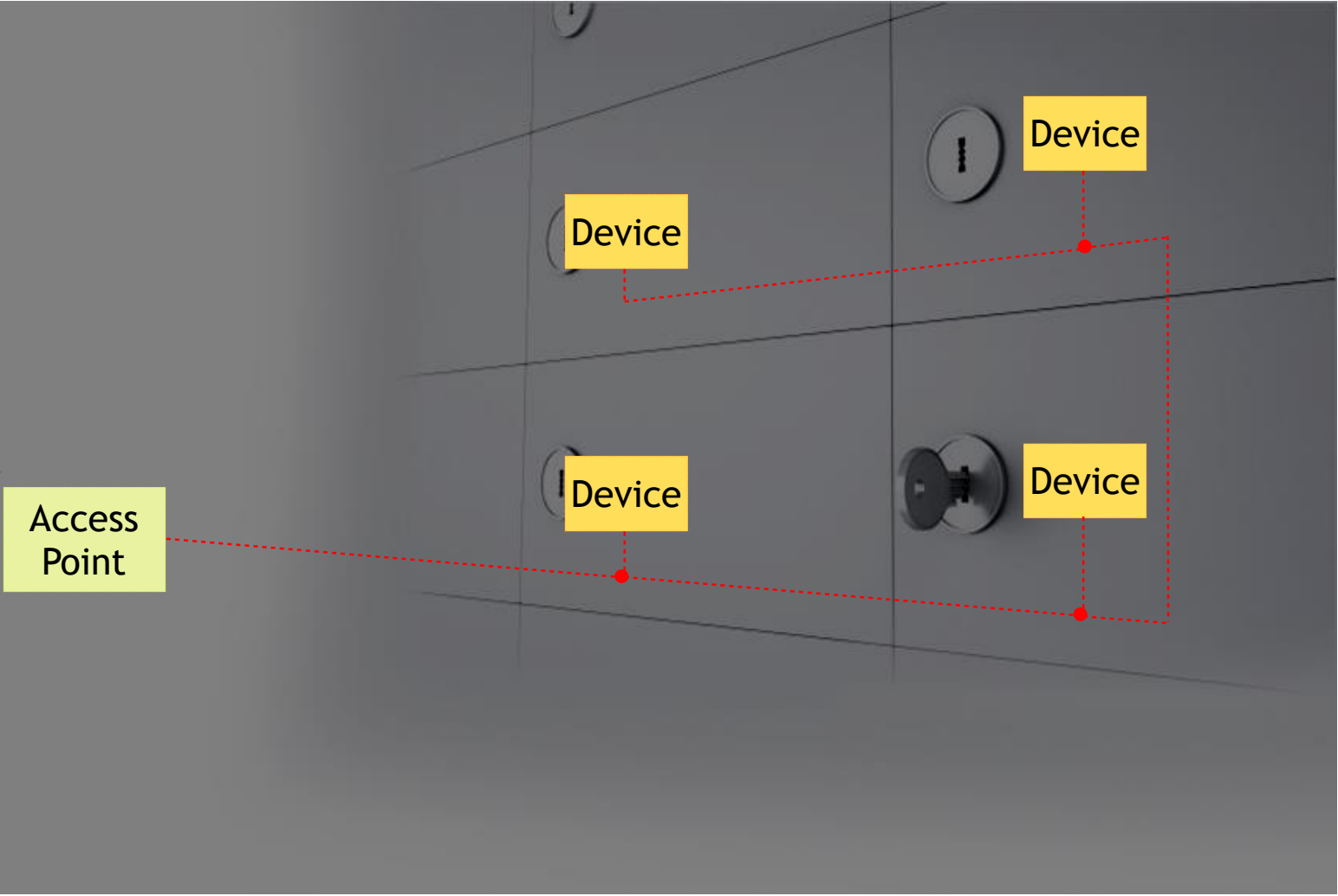
Smart Lockers



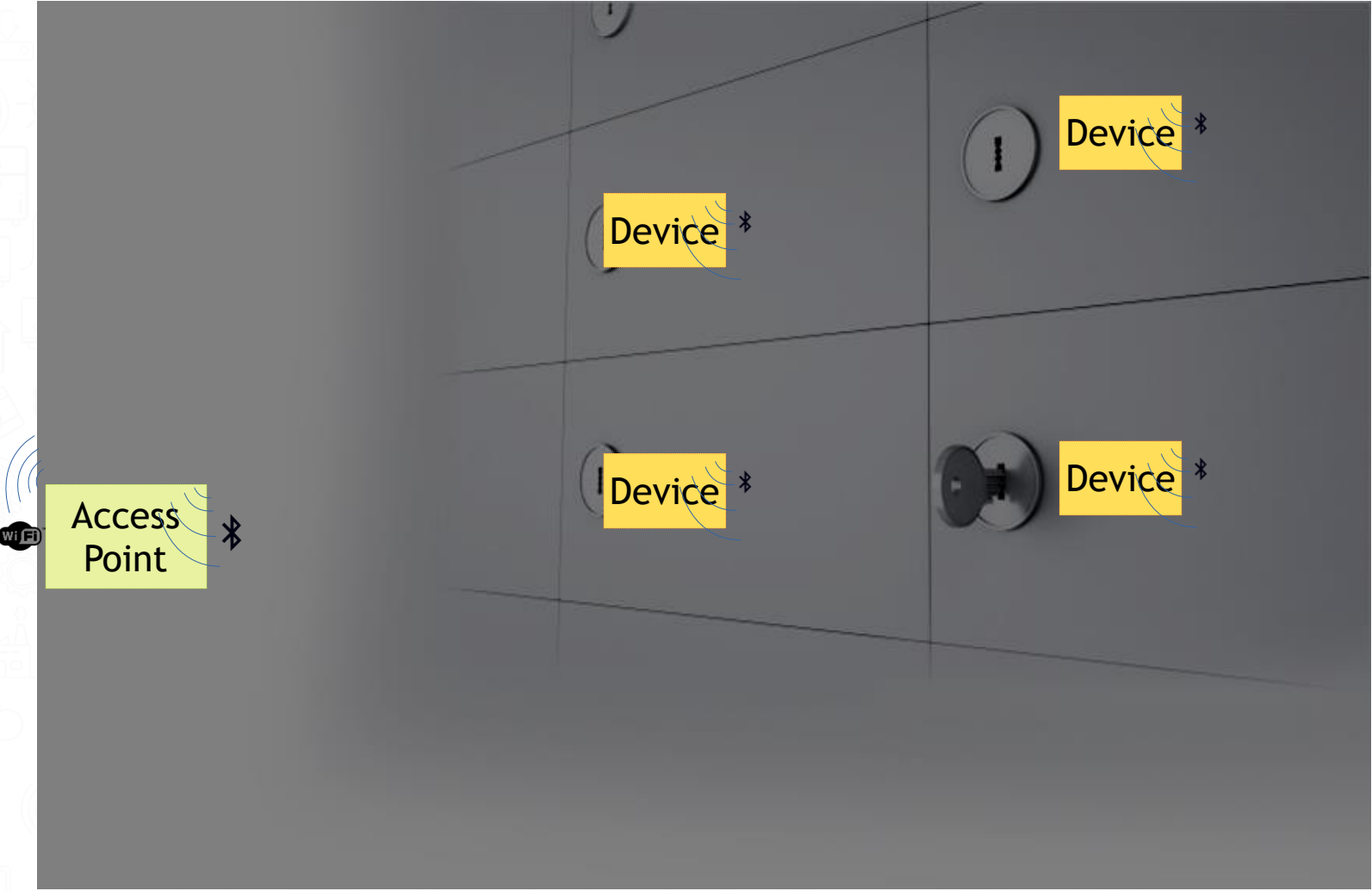
Smart Lockers



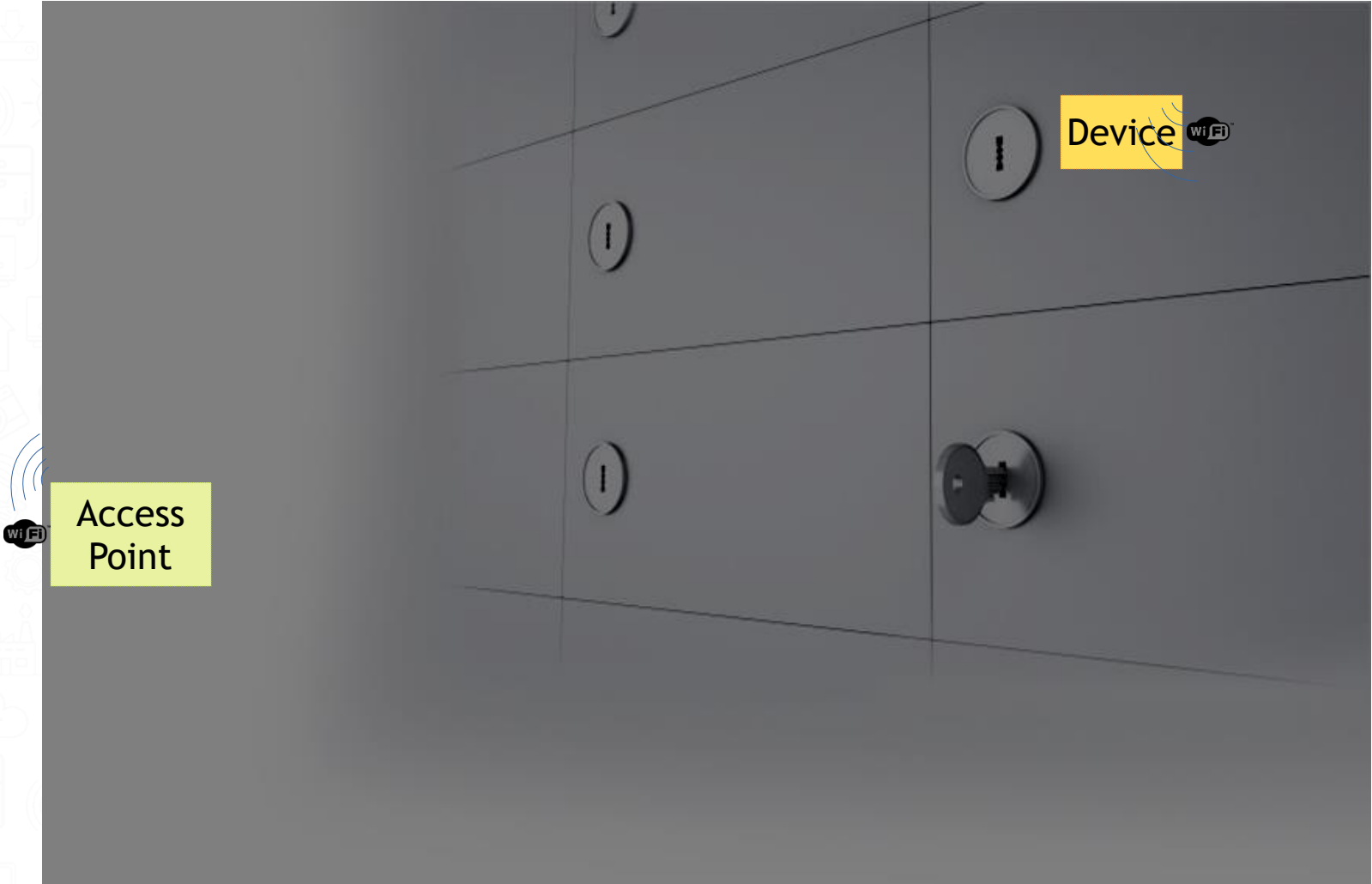
Smart Lockers



Smart Lockers



Smart Lockers



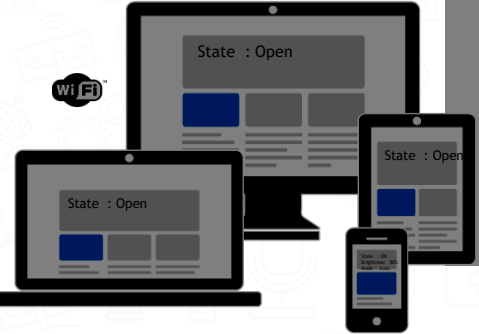
Smart Lockers



Access Point

Device

Node



Smart Lockers - Actors

.Customers :-

-Every time the locker is opened the user gets an SMS / E-Mail

.Control Room :-

-Based on the access time the control room gets the SOS to take appropriate access

.Insurance Providers :-

-Upon subscribing to the required nodes the insurance providers get the intimation of theft or closure of the locker facility

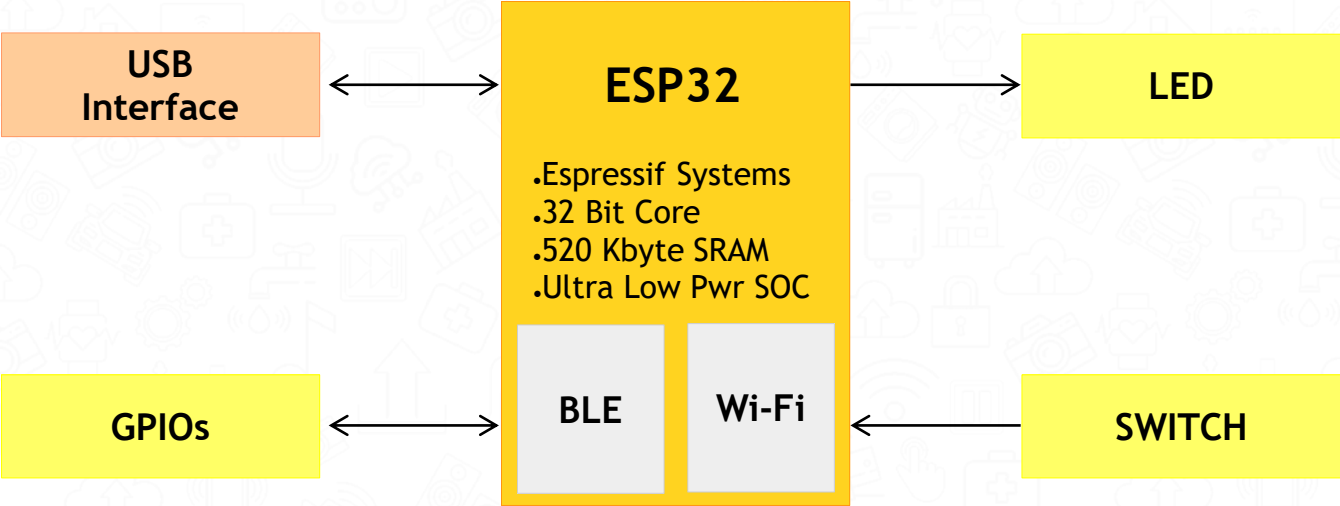
IoT Hardware / Software Selection

- Security requirements
- Ease of development
- Data acquisition, processing and storage requirements
- Connectivity requirements
- Power requirements
- Physical device design
- Cost requirements

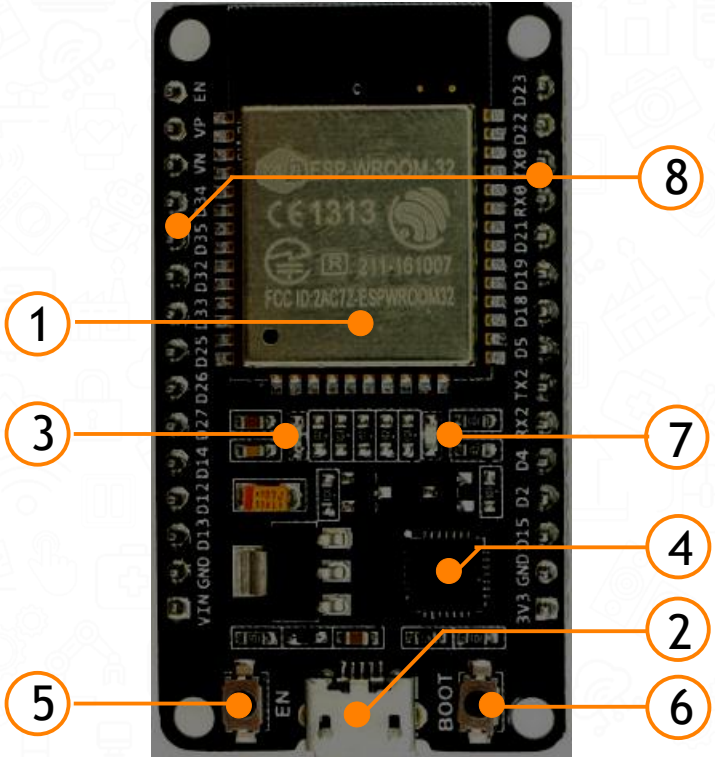
NodeMCU ESP32



NodeMCU ESP32 - Architecture



NodeMCU ESP32 - Peripherals



- 1 ESP32 Module
- 2 USB Interface
- 3 Power LED
- 4 Serial-USB Converter Chip
- 5 Reset Key
- 6 Boot Key
- 7 User LED
- 8 GPIOs

NodeMCU ESP32 - Development Support



Arduino

Espressif IoT Development Framework

NodeMCU Lua

Mongoose OS

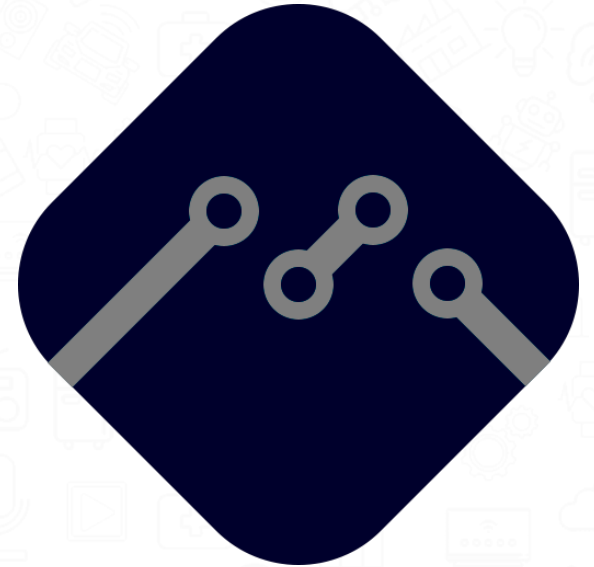
MicroPython, etc.,



Introduction to Mongoose OS

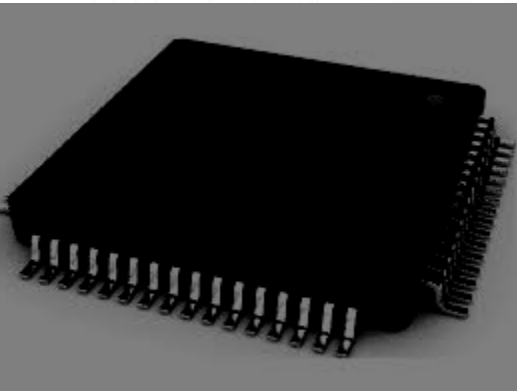
Introduction to Mongoose OS (MOS)

- An Open source OS for IoT
- Started as embedded web server. Expanded to an IoT OS
- Dual License, GPL or Commercial
- Development in C / C++ / JS
- Tool chain support on Windows, Linux, MacOS



MOS - Supported MCUs

- .STMicro : STM32 F4, L4, F7
- .TI : CC3200, CC3220
- .Espressif : ESP32, ESP8266

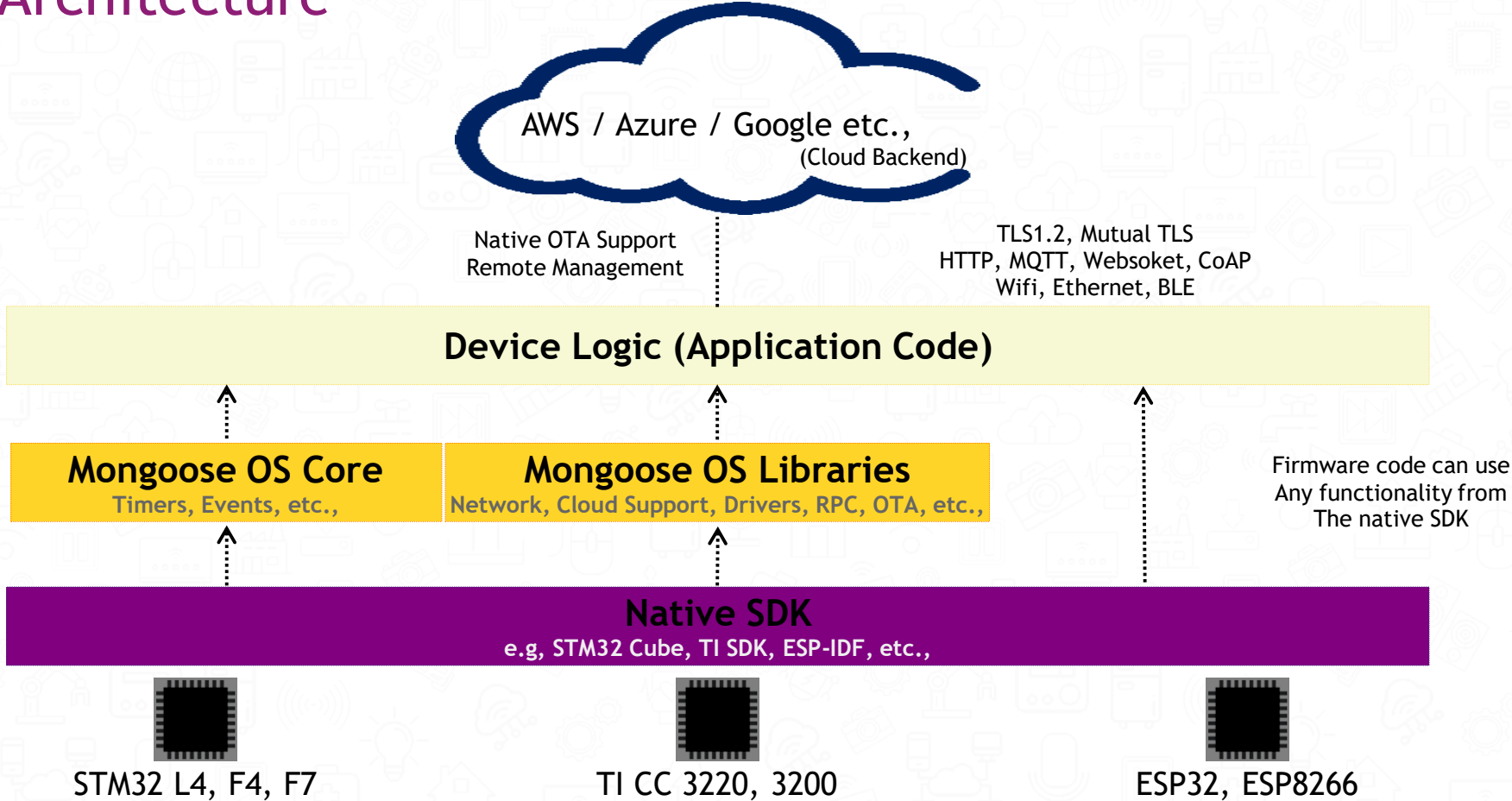


MOS - IoT Cloud Integration

- Amazon AWS IoT
- Microsoft Azure IoT
- Google IoT Core
- IBM Watson IoT
- Private MQTT / Rest Backends



MOS - Architecture



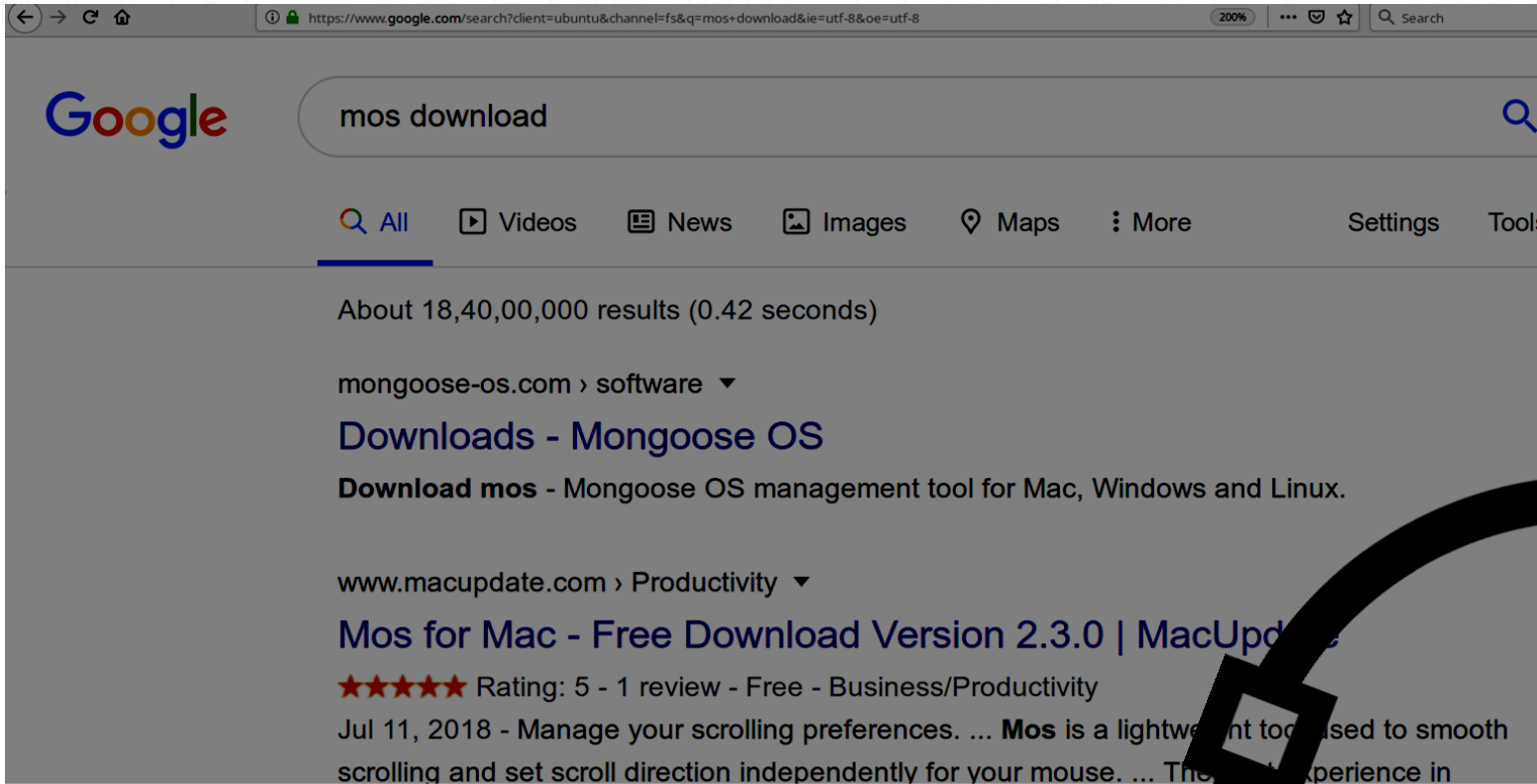


MOS - Development Setup

MOS - Development Setup

- .Download and Install MOS
- .Understanding MOS User Interface
- .Application (Blinky)
- .mos.yml
- .Building the firmware
- .Flashing the firmware
- .The output

MOS - Download



A screenshot of a Google search page for 'mos download'. The browser address bar shows the search URL. The search results show two entries. The first entry is from 'mongoose-os.com' and is titled 'Downloads - Mongoose OS'. The second entry is from 'www.macupdate.com' and is titled 'Mos for Mac - Free Download Version 2.3.0 | MacUpdate'. The second entry includes a 5-star rating and a brief description of the software.

https://www.google.com/search?client=ubuntu&channel=fs&q=mos+download&ie=utf-8&oe=utf-8

Google

mos download

All Videos News Images Maps More Settings Tools

About 18,40,00,000 results (0.42 seconds)

mongoose-os.com › software ▾

Downloads - Mongoose OS

Download mos - Mongoose OS management tool for Mac, Windows and Linux.

www.macupdate.com › Productivity ▾

Mos for Mac - Free Download Version 2.3.0 | MacUpdate

★★★★★ Rating: 5 - 1 review - Free - Business/Productivity

Jul 11, 2018 - Manage your scrolling preferences. ... **Mos** is a lightweight tool used to smooth scrolling and set scroll direction independently for your mouse. ... The ... experience in

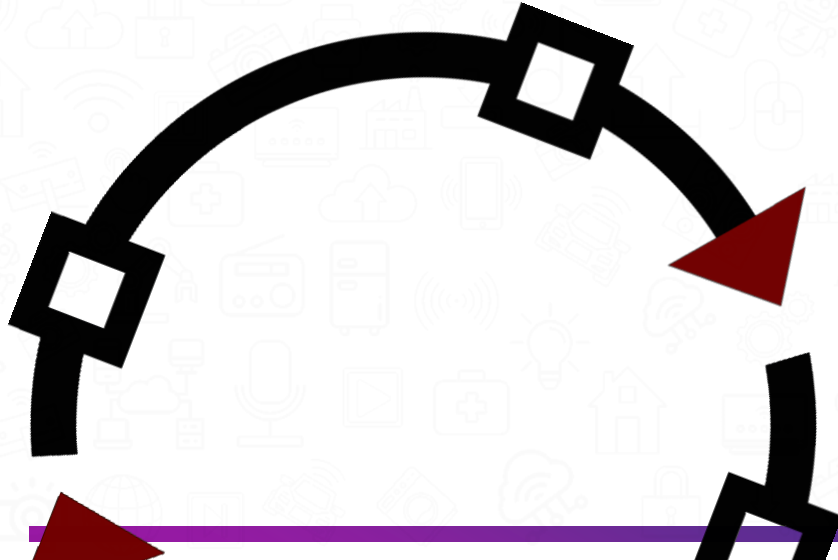
MOS - Application

mos clone <https://github.com/mongoose-os-apps/demo-js> app1

MOS - Application - Blinky

mos build

mos flash





AWS Overview

AWS

- Amazon Web Services
- Secure cloud services platform
- Offers to
 - Compute power
 - Database storage
 - Content delivery
 - and other functionality to help businesses scale and grow

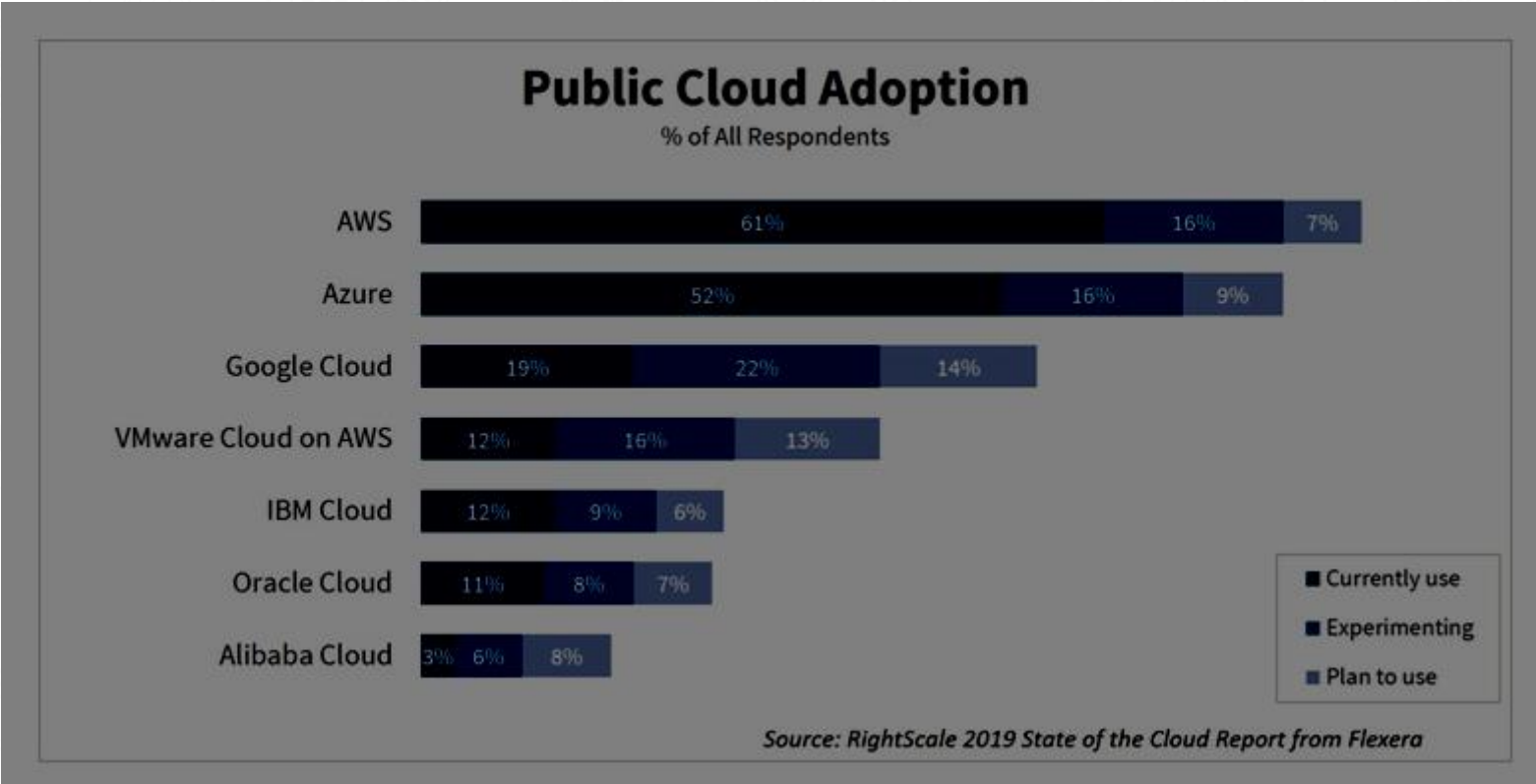


AWS - Why?



Source: Gartner (July 2019)

AWS - Why?



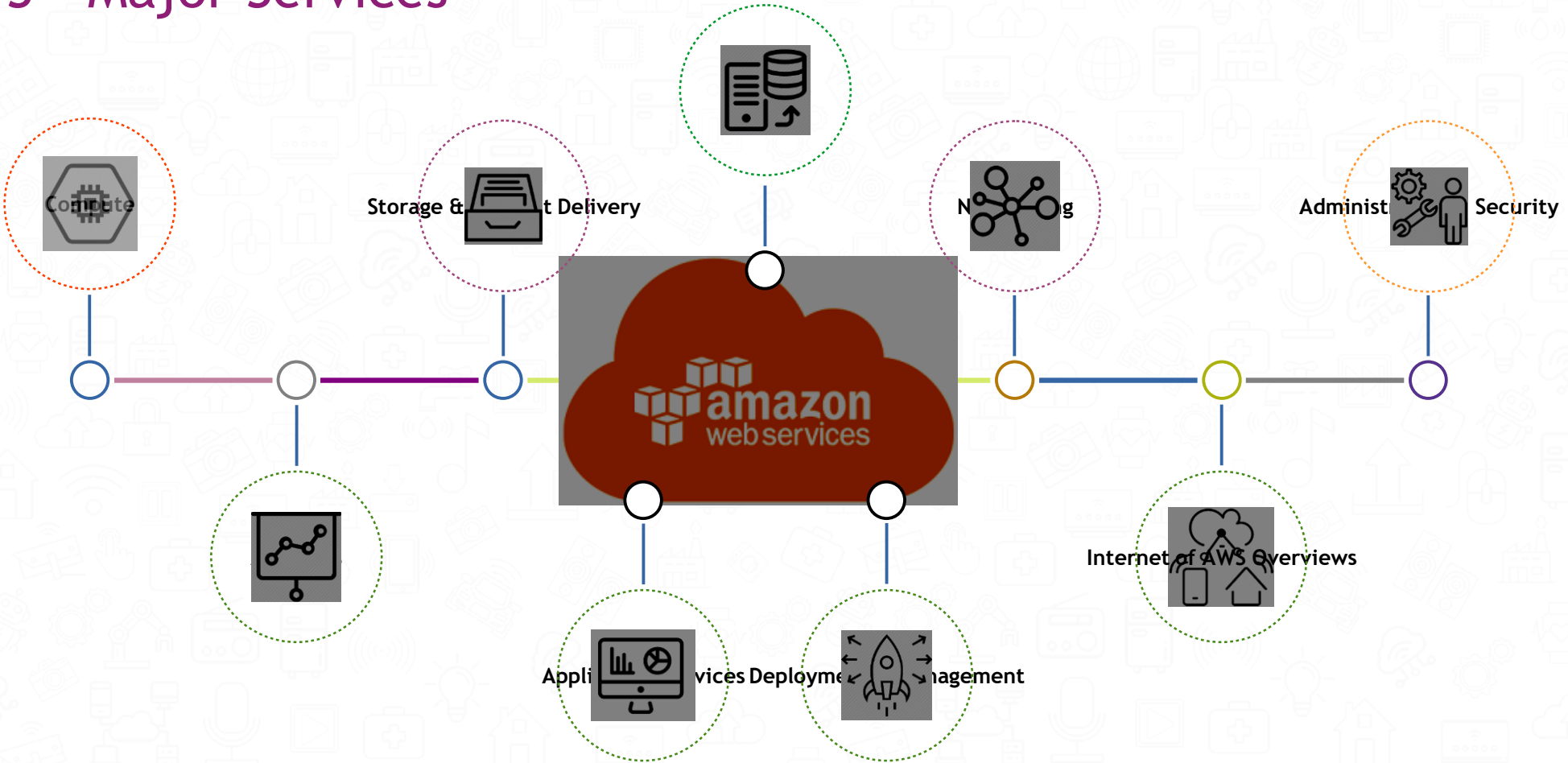
AWS - Features

- A Platform for Virtually Every Use Case
- Deep Features and getting deeper by the day
- Security Recognized as Stronger than On-premises
- Deep Visibility into Compliance and Governance

AWS - Reason to Choose

- Flexible, Scalable and Reliable
- Good Pricing, and interesting free tiers!
- Good presence, with at least 25 geographic locations
- Customization
- Security
- and many more ...

AWS - Major Services



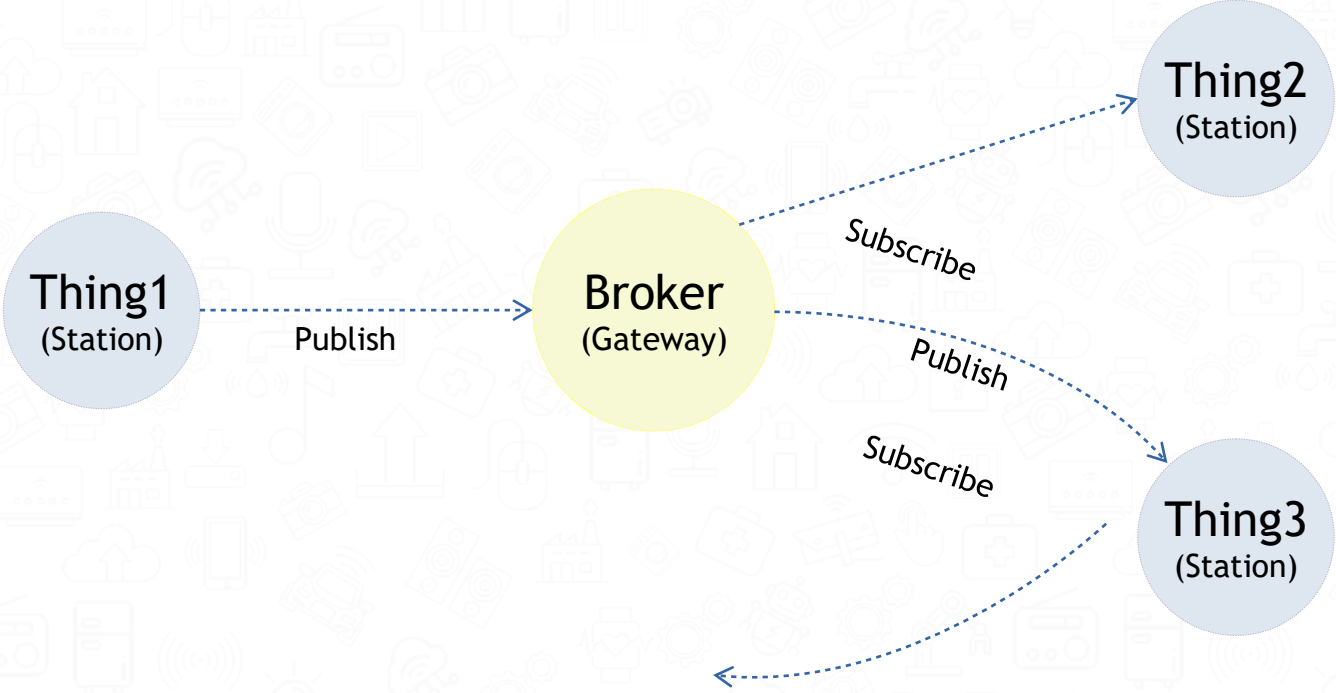


MQTT Overview

MQTT - What?

- Machine-to-Machine(M2M) and IoT connectivity protocol
- Lightweight messaging protocol which works with a server-based publish subscribe mechanism
- Runs on the top of TCP/IP protocol suite
- Lighter than HTTP 1.1 and HTTP/2 protocols
- Popular among IoT, M2M, Embedded Projects

MQTT - How?



MQTT - Why?

- One-to-many distribution
- Ideal for constrained networks
- Supports QoS (3 Levels)
- For lower footprint and low power devices
- Simple implementation with set of commands to CONNECT, PUBLISH, SUBSCRIBE and DISCONNECT.
- Supports “Will” on abnormal disconnection



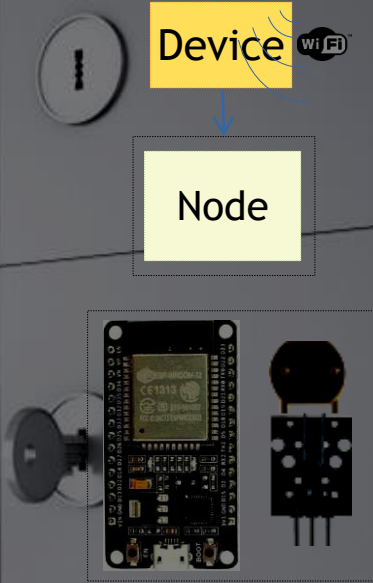
Use Case Implementation

End to end IoT solution using Mongoose OS



Router

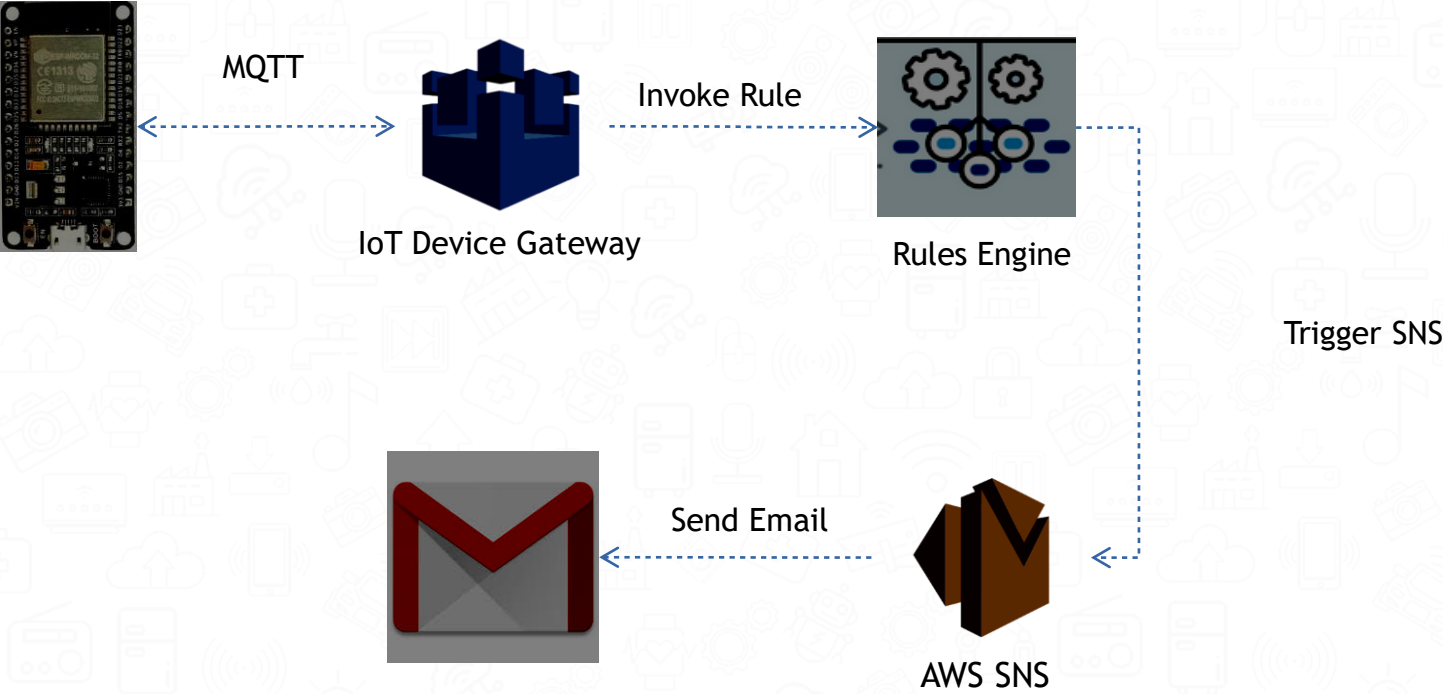
Access Point



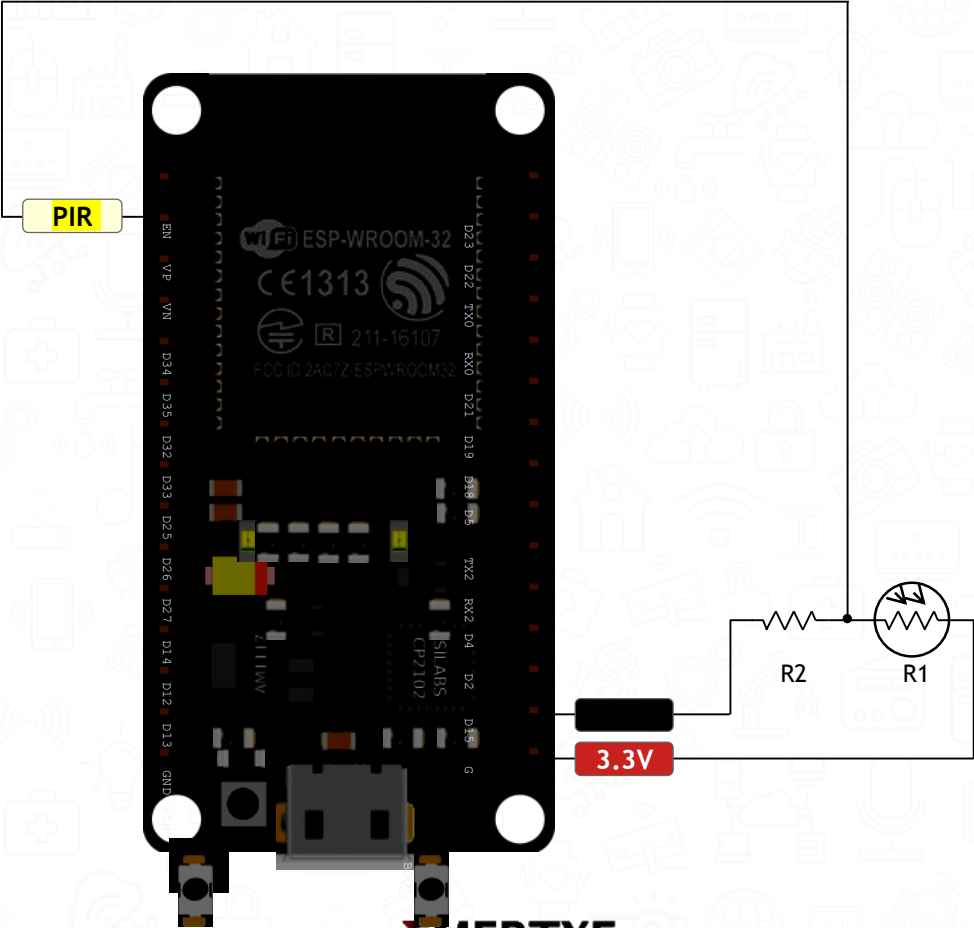
Mongoose OS + AWS IoT Core: Steps

- Create an AWS Account / User
- Install AWS CLI and Setup credentials
- Setup NODEMCU device for AWS using mos
- Build an app using AWS IoT and AWS services

Application Architecture



End to end IoT solution using Mongoose OS



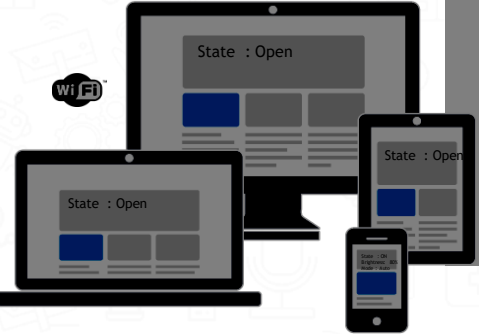
Smart Lockers - Summary

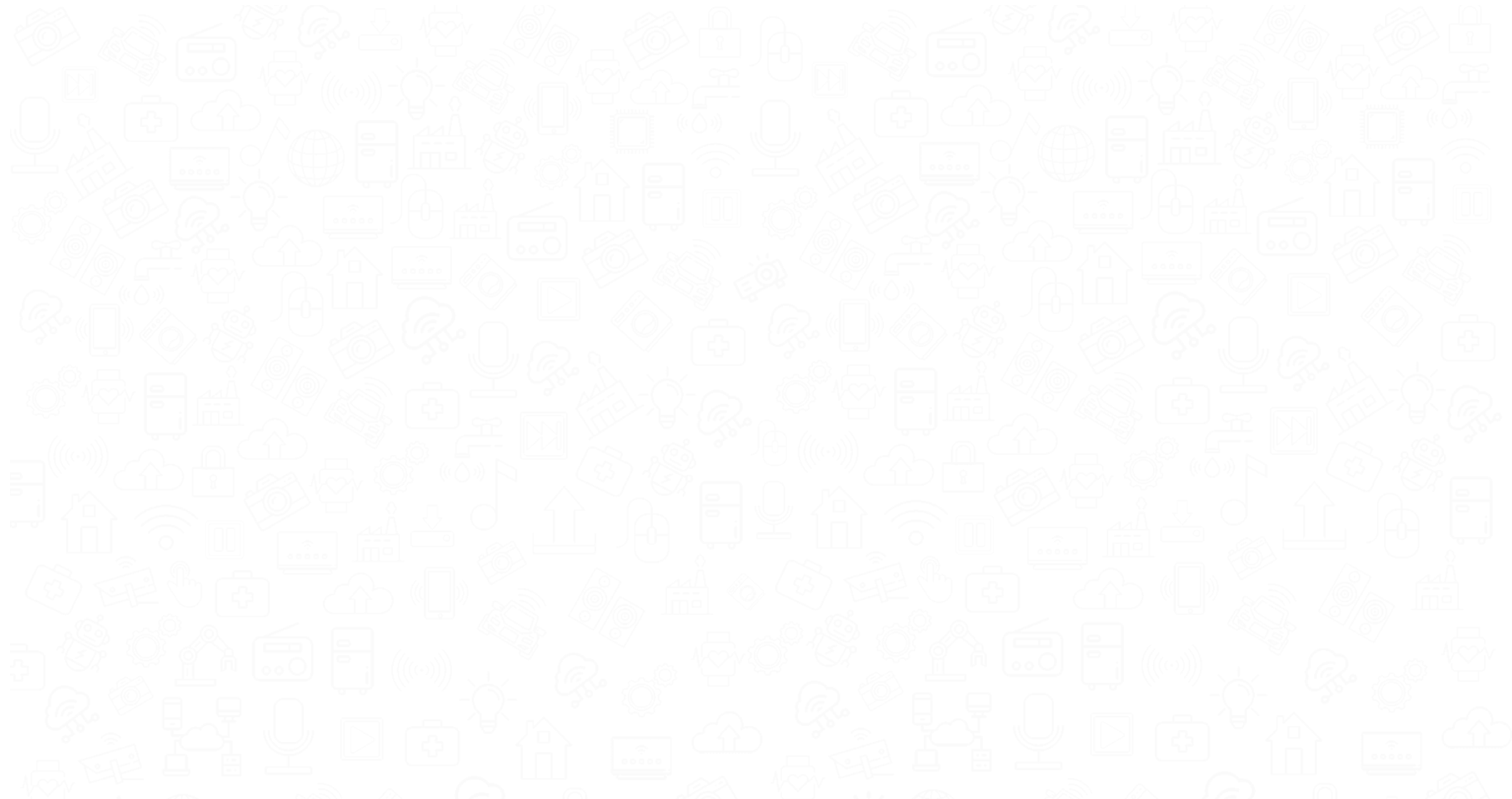


Access Point

Device

Node





Thank You