Architecting a Complete IIoT Solution

Guy Vinograd, CEO

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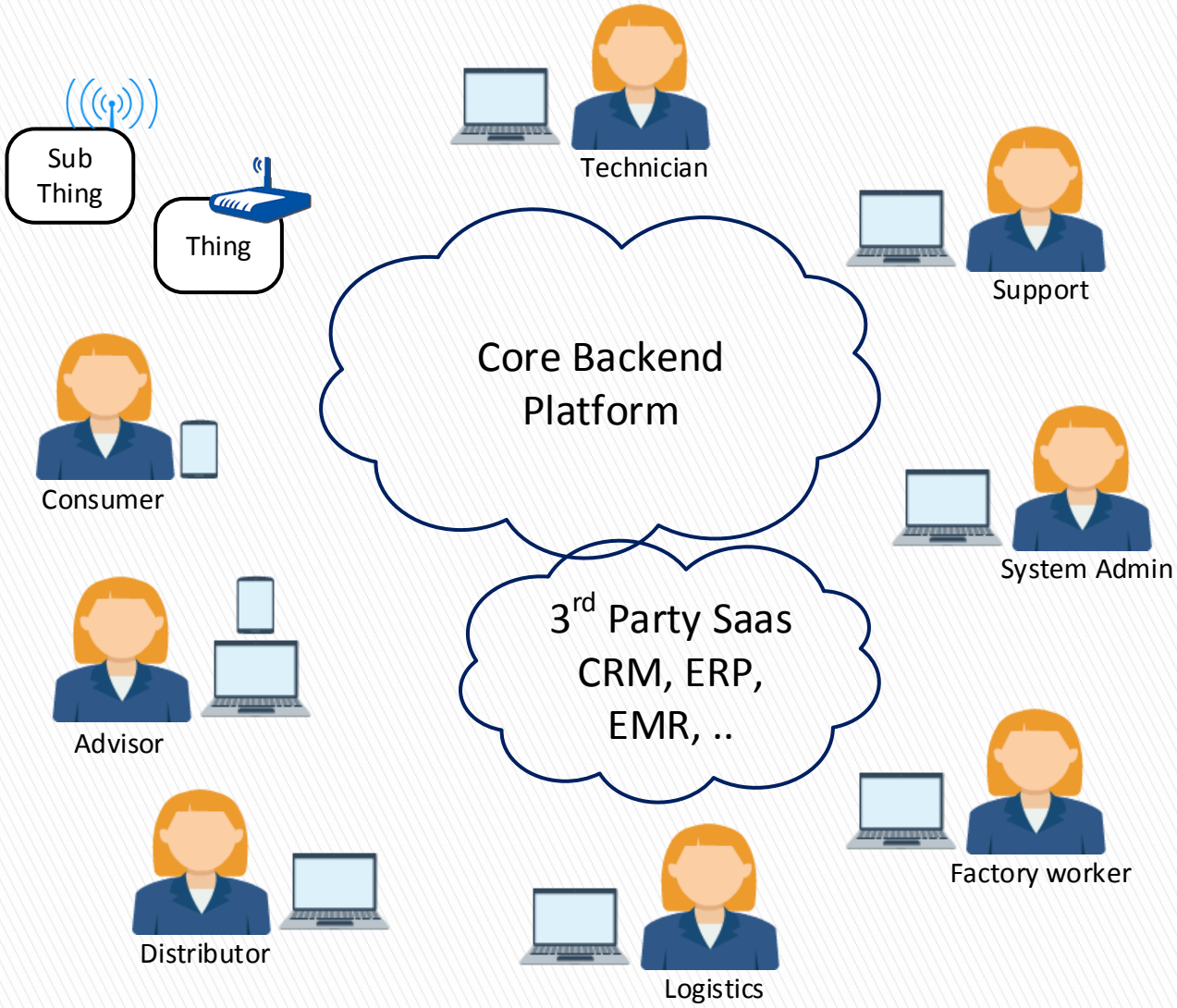
Users and Components of a Typical IoT Solution



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IIoT Design Dilemmas

#1 – Where is the Logic & Data?

- Cloud – the ideal
  - Protects IP
  - Data privacy (raw signal = less risk)
  - Lower TCO
  - High availability/durability
  - GDPR, DPA
- Gateway ("fog") – the reality
  - Offline
  - True real time
  - Data BW is large

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#2 – Where is my IoT Gateway

- Cost, Energy, Ease of use, NW availability, Control
- Human-sensor proximity?
- Regulation involved? SLA for real-time response?
- # of sensors per location? Sensor-sensor interactions?
- Sensor maintainability?

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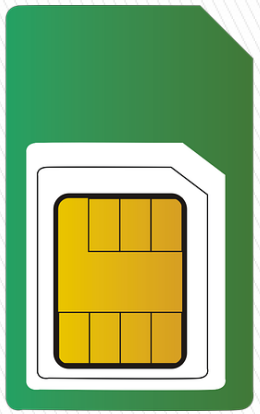
#3 – RF Connectivity of the IoT Gateway



- Availability
- Monthly cost
- Complexity - who is the user? elder? logistics?
- Location - hospital? clinic? business? IT friendliness

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#4 – What are the Messages?

- Questions
  - Message size/velocity
  - NW environment
  - Ability of device processing
    - Encryption

- Too much?
  - Value of each message? Value of the action taken
  - Temporal stream compression. 1/40
  - Offline training of ML - identify the right metrics. Training period

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#5 – What is the Protocol?

MQTT

- OASIS standard protocol (v3.1.1)
- Lightweight, pub-sub, transport protocol that is useful for connected devices
- MQTT is used on oil rigs, connected trucks, and many more sensitive and resource-sensitive scenarios.
- Customers have needed to build, maintain and scale a broker to use MQTT with cloud applications

MQTT vs HTTPS:

- 93x faster throughput
- 11.89x less battery to send
- 170.9x less battery to receive
- 50% less power to keep connected
- 8x less network overhead

Source:
http://stephendnicholas.com/archives/1217

- MQTT cons
  - Cloud costs. Worsened if wifi bad
- MQTT pros
  - 2-way communication is native

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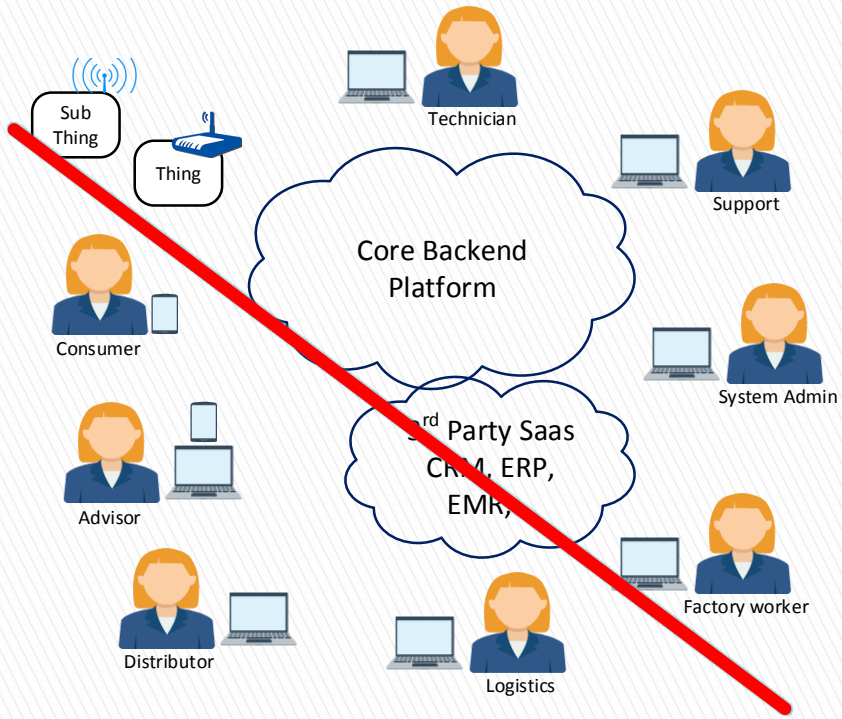
#6 – Mitigating Offline Scenarios

- Unexpected - will surely happen
  - Thing 2 Cloud
  - Users
- Expected
  - Sub-thing 2 Thing 2 Cloud
  - Factory 2 Cloud



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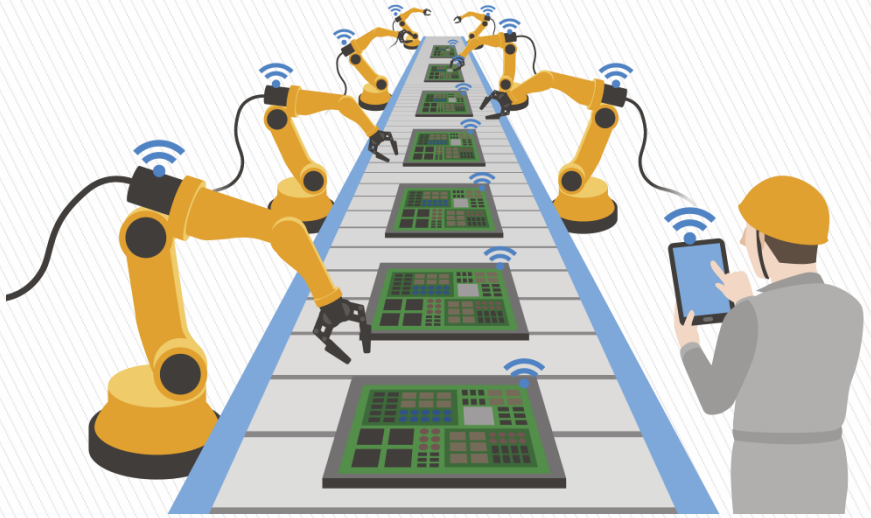
#7 – Manufacturing Considerations?

- Device certificate installation
  - Just-in-Time registration



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#8 – Cloud Vendor Selection

- Market share
- Evolving – MQTT, certificate mgmt
- Vendor locking – Lambda/Greengrass/Shadow
- Cost - Recent Big 4 Price Comparison (7/2018)
- Regulation – IBM lags

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#9 – How to Secure the Solution?

- What's IoT security?
- Breach prevention – everything
  - Read-only device – more secure
  - Mutual authentication
- Privacy - let your users control data
- Trust - create customer confidence

ISO

HIPAA
Health Insurance Portability and Accountability Act

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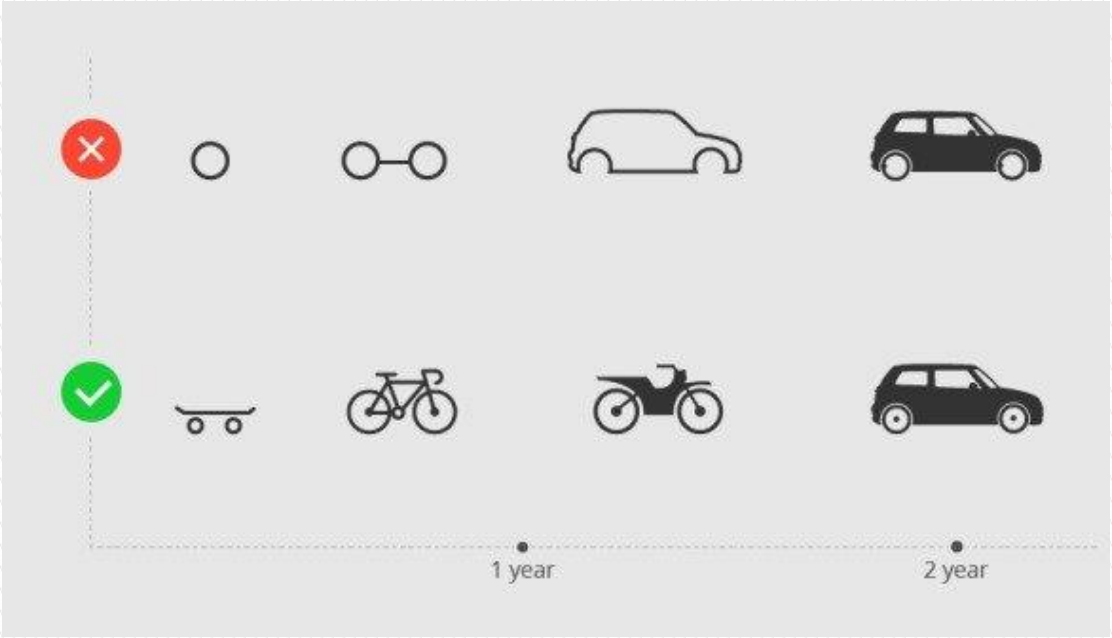
#10 – What's in v1.0?

- Minimum Viable Product
- Not too thin
- Security
- Logs / Analytics
- Firmware updates



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Dilemmas Demo

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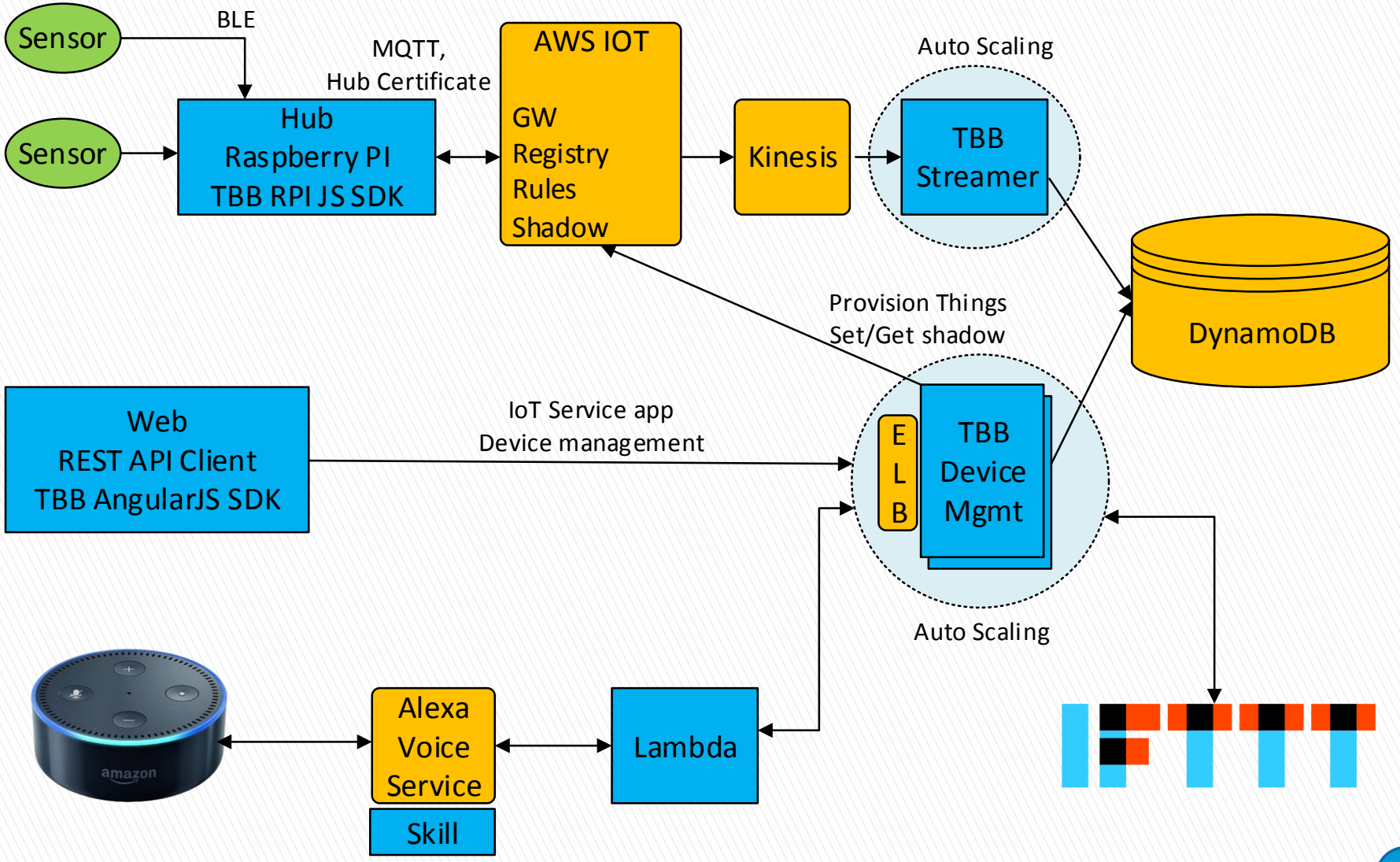
Demo Architecture



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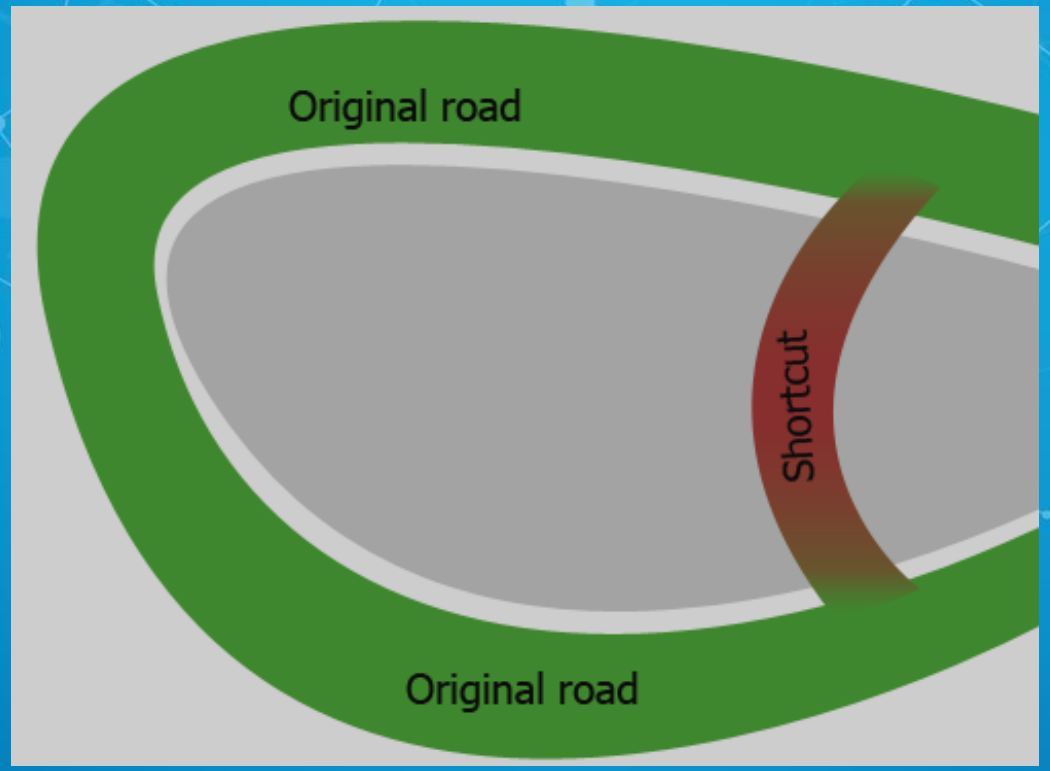
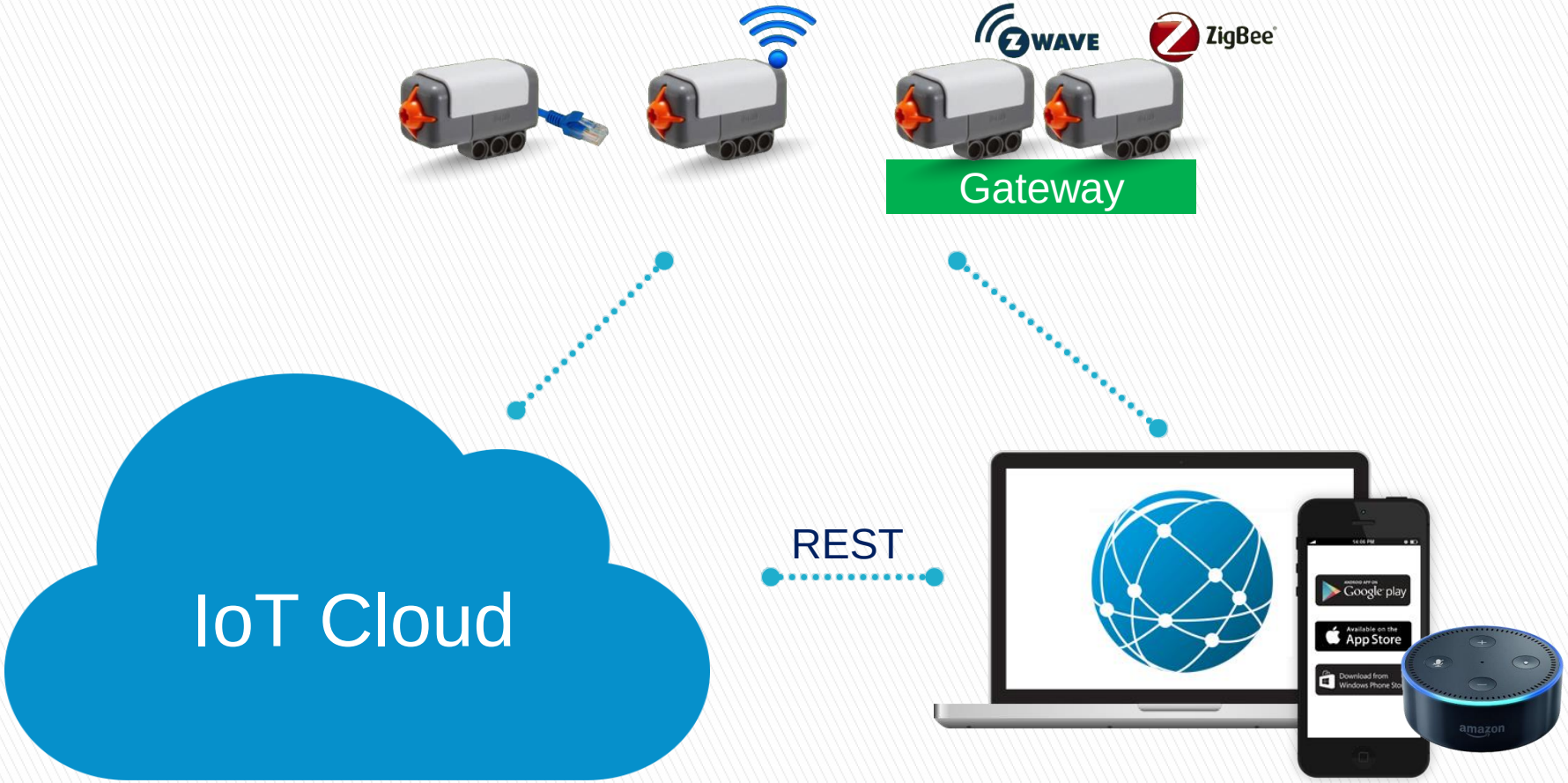
The Shortest Way to Build an IoT Solution



The Goal



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DIY? The Long, Expensive Way

Device	Cloud-Mobile-Web
Domain experts	Internet product analysis
Engineering	Web-scale SW architecture
Electronics	Mobile, web apps dev
Mechanics	Cloud backend dev
Hydraulics	Cloud devops - scalability, HA, ..
Signal processing	IoT connectivity, device mgmt, FW updates, ..
Algorithms	Billing and “As a service” models
Industrial design	3rd party SaaS integrations
Device regulation	Cloud GDPR, ISO

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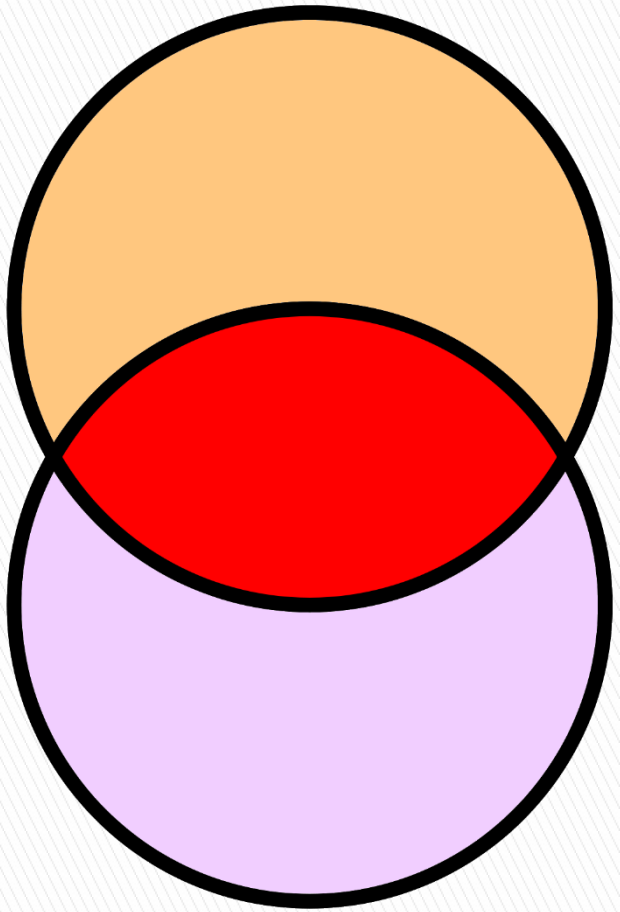
IoT Platforms – Leveraging the Common Denominator

- User management – consumer-advisor-distributor-vendor
- Real time analytics – data analysis, rules, actions, notifications
- Learning – adherence, compliance, usage
- Device management – inventory & certificates, firmware updates, troubleshooting
- Security and privacy - GDPR, auditing
- Million scale



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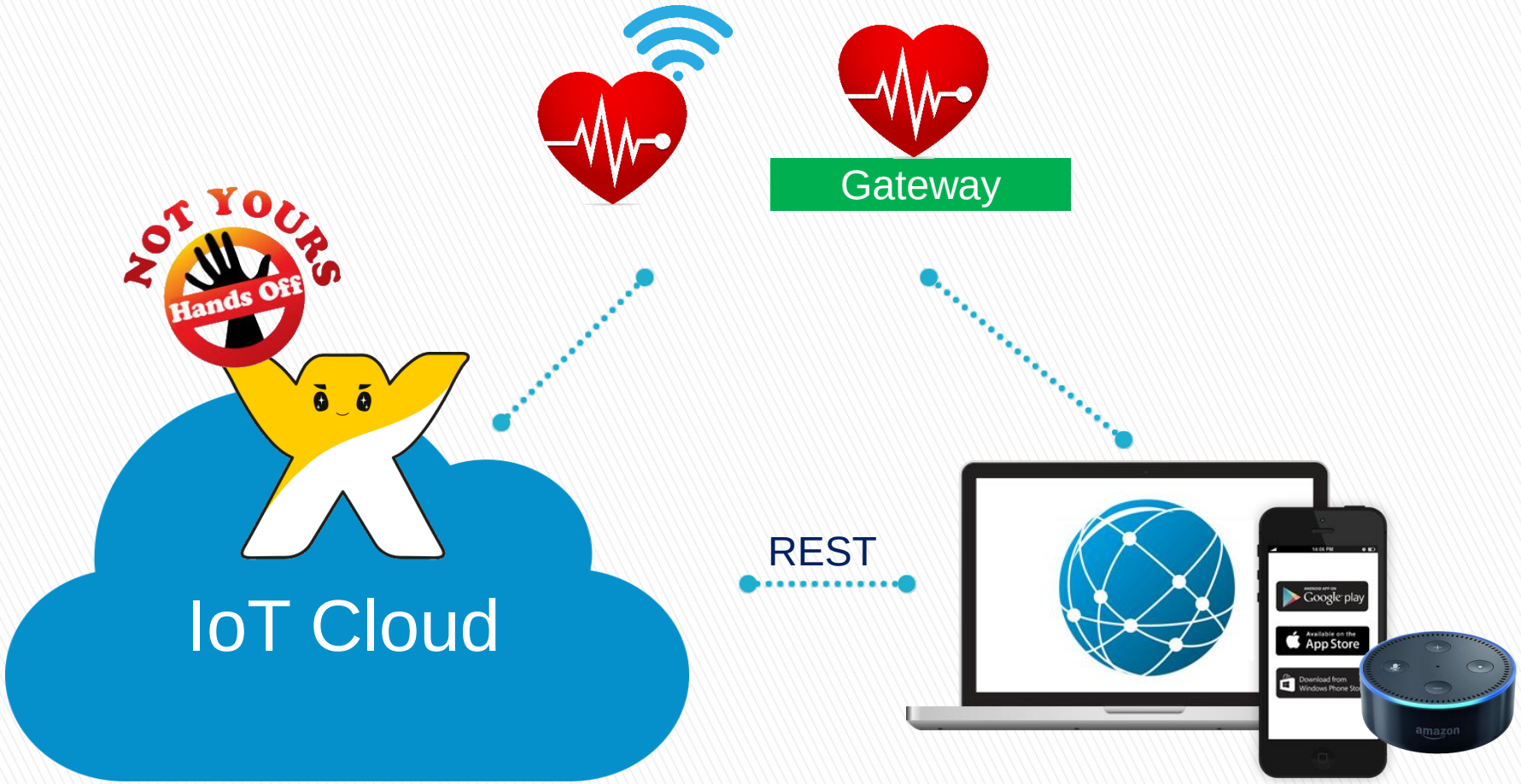
Platforms? Ownable or 3rd Party?



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For Manufacturers Ownable Beats 3rd Party

- No Locking – Have the code (450 PaaS gamble)
- Transparent security
  - Devices may need security updates for 2 decades!!
- Cost performance – Pay 1/5 OPEX
- No data sharing and deployment limits
- No IP issues – Own it all
- No Technology limits – Lead your roadmap, algorithms, UI and API

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Thing Building Blocks – **The quickest way to Own your IoT**

Device FW

Device Libraries

FOTA

Device Infra.

Java

Client SDK

Device-Specific Microservices

Sample System

Integration Layer

Email Management

Notification Management

Streaming Layer

Ingestion Service

Raw Telemetry Archiver

Telemetry Analyzer

Telemetry Manager

Smart Ruler

Device Management

Device Config Manager

FOTA Manager

Access Control

User Management

Tenant Management

Audit

TBB Core Libraries

Distributed Scheduler

Encryption

Cloud Abstraction

API Versioning

Cloud Logger

Micro Seed

CI/CD

Cloud Deployment Blocks

AWS

GCP

Azure

Bluemix

On-Prem

Native Cloud Infrastructure

CloudFormation

CloudWatch

AWS IoT

Kinesis

Java

REST API

Client SDK

Device-Specific App

Sample Web

Sample Mobile

Client Core Libraries

BLE

UMS

FOTA

Seed

Client Infrastructure

iOS

React, React Native

Bluetooth Low Energy

Device Simulator

Device Infra

Raspberry PI

TI

MQTT / HTTP

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TBB Powers Leading Manufacturers Today

CONTINUSE BIOMETRICS

CORDIO™

VECTORIOUS Medical Technologies

EarlySense

HERA MED

OB smart

cardiacsense Wearables for Continuous Cardiac Monitoring

LiveMetric

GaitBetter

AposTherapy®

FLIR

CatGenie

UNDISCLOSED

Scentcom Innovative Scent Technology

OzVision

GAASH

FLIR

AYYEKA

fst biometrics

TargetPoint Technologies

Datumate Geomatics Expert Systems

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Architecting a Complete IIoT Solution

Guy Vinograd, CEO

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