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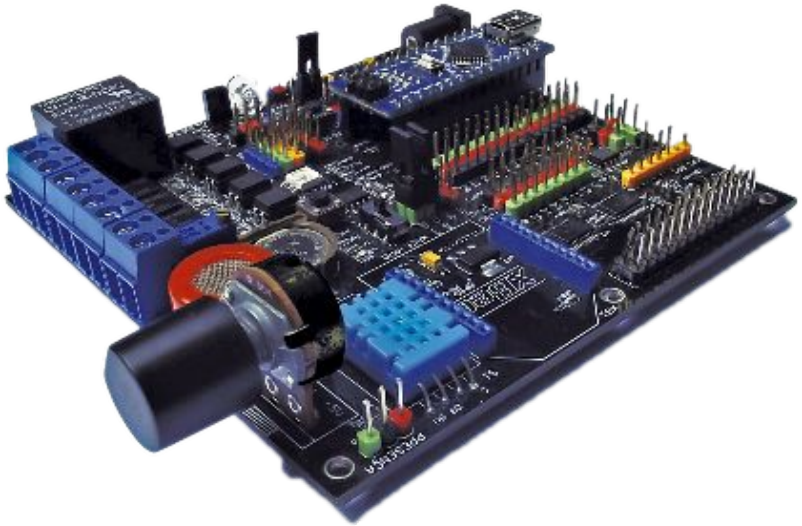
IoT Introduction



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Downloads

https://portalaluno.toolscloud.net/redmine/projects/iotsurfboard/files

- [ ] Apresentação: IoT_Surfing_Class_1_EN.pdf

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Internet History

- December 1969: 4 computers, universities
- 1990: 200.000 computers, big companies
- 2000: 200mi, People
- 2015: 13 billions, 3 devices per person
- 2025: ??, things

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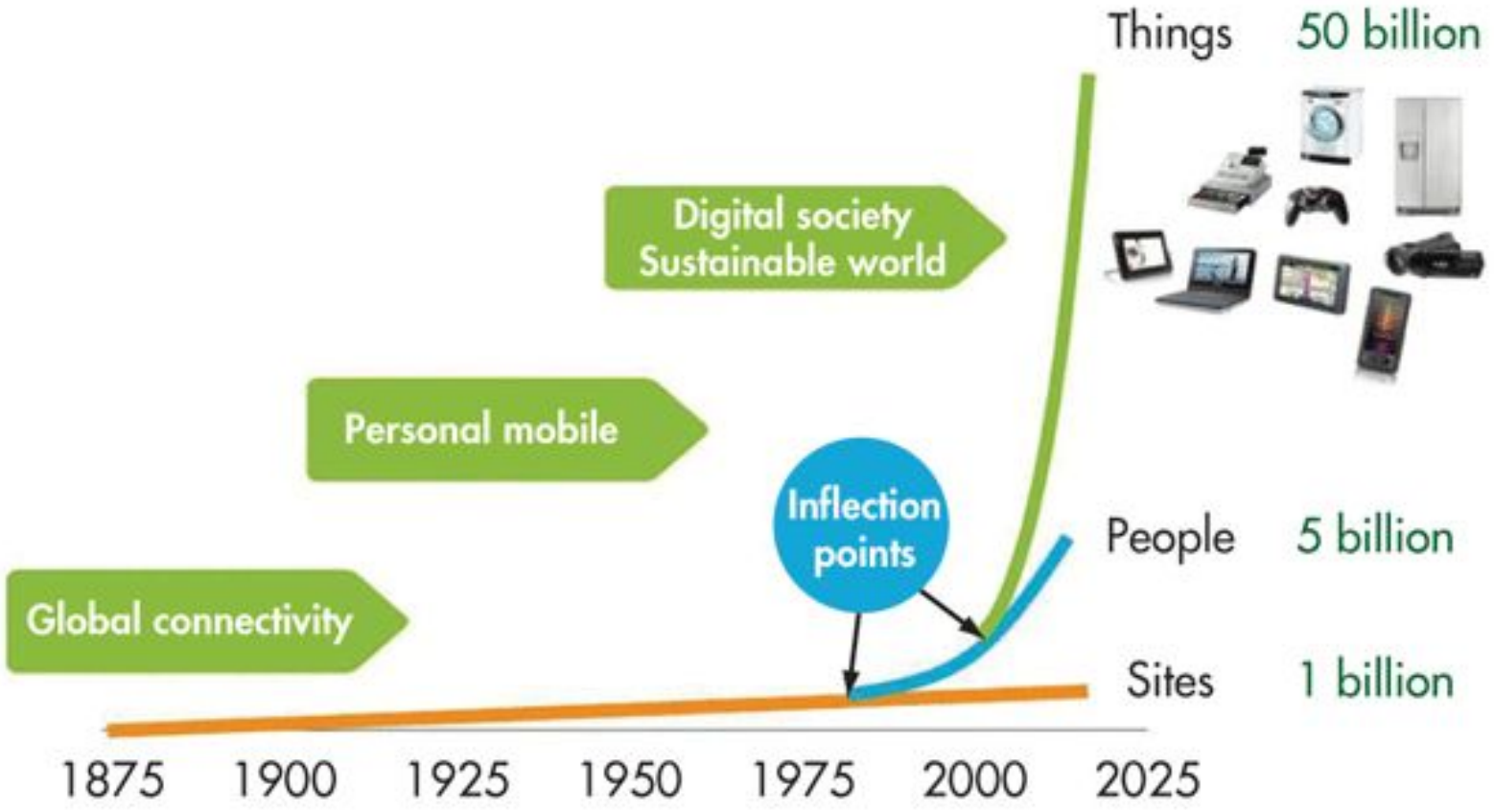
IoT Devices Number in 2025: new lottery!



Internet of Things...

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Some of our Experiences...

- ☐ telemetry equine
- ☐ Smart Sail Boat System
- ☐ Combike: Smart helmet
- ☐ minecraft robot
- ☐ Smart building jHome automation
- ☐ health care: Brain Strap

(non invasive intracranial pressure monitoring)

IoT Concepts

Terminology Evolution: From Academic to Market

- Ubiquitous and Pervasive computing: Academia
- machine to machine (M2M): Companies
- internet of things (IoT): Popular Market
- internet of everything (IoET): Marketing

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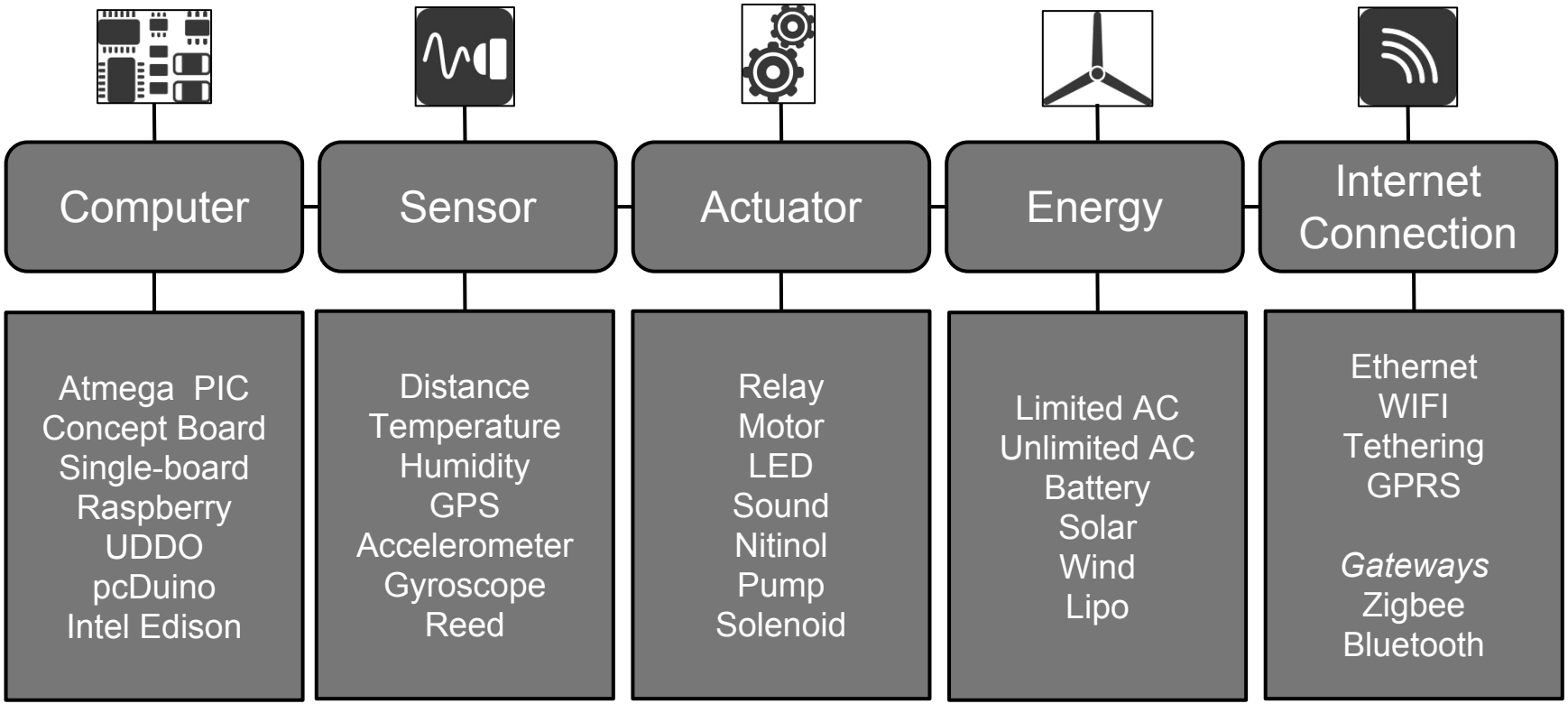

Hardware Architecture

Firmware & Embedded software

- Firmware: runs on microcontrollers mostly without operation system, dedicated code.
- Embedded Software: typically running on single-board computers with operation system.

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server-side & cloud

- Storage and Data Management
- Processing and intelligence
- "smarting" devices
- Devices Management

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IoT 4 Layers: Edge -> Gateway -> Cloud -> Consumer

Edge Device

Microcontrollers
VERY Low Energy
Sensors & Controllers
May not support TCP/IP
May support Real-time

Gateway

Microprocessor or SoC
Low Energy
May support more than TCP/IP
Many responsibilities
Limited Real-time Support

Cloud

BigData
Intelligence
Social Network
Integration

Consumer

MQTT / AMQP / CoAP
REST / WS / API's
Phones / Tablets
Kinect / RealSense

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IoT Devices Samples

Silicon Labs Puck Sensor: Edge Device

- Uses Coin Battery
- Heart Monitor, temperature, humidity, UV sensors
- Bluetooth Low-energy
- Uses Android as Gateway

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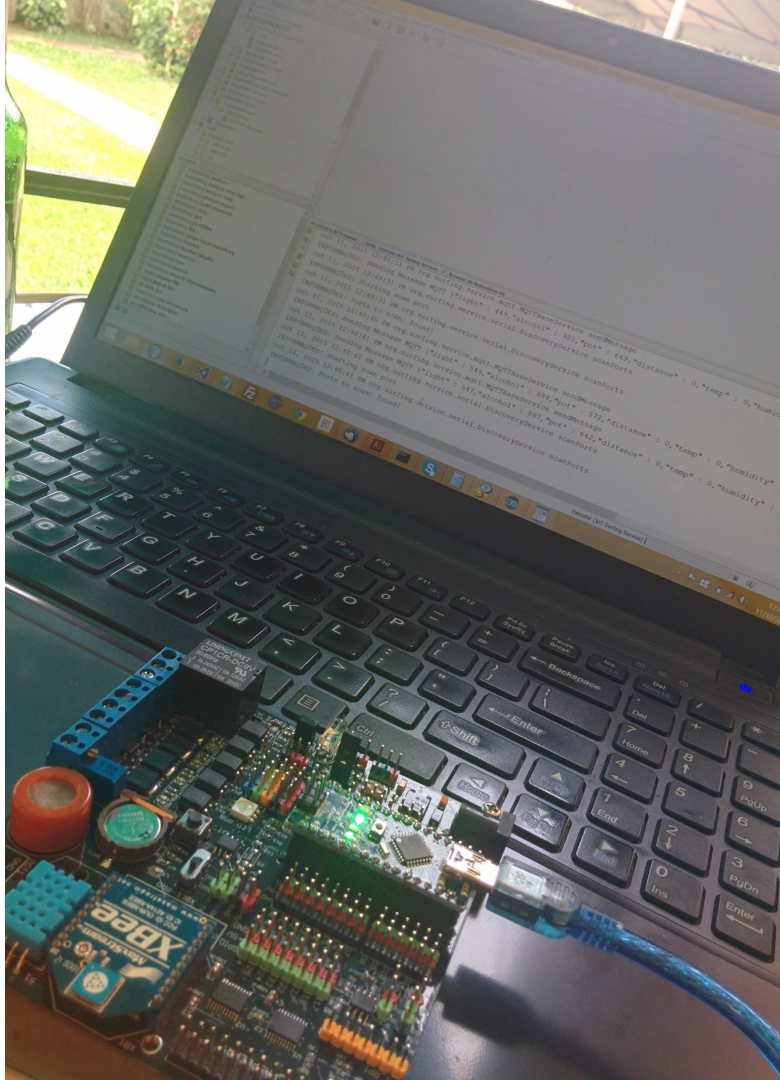
IoT Surfboard: edge device

- Very **low energy** consumption
- **Arduino** Compatible
- Many **Sensors** and **Actuators**
- **zigbee, Infrared, bluetooth, 2G/3G or wifi Communication**

(power consumption may vary depending on the chosen communication)



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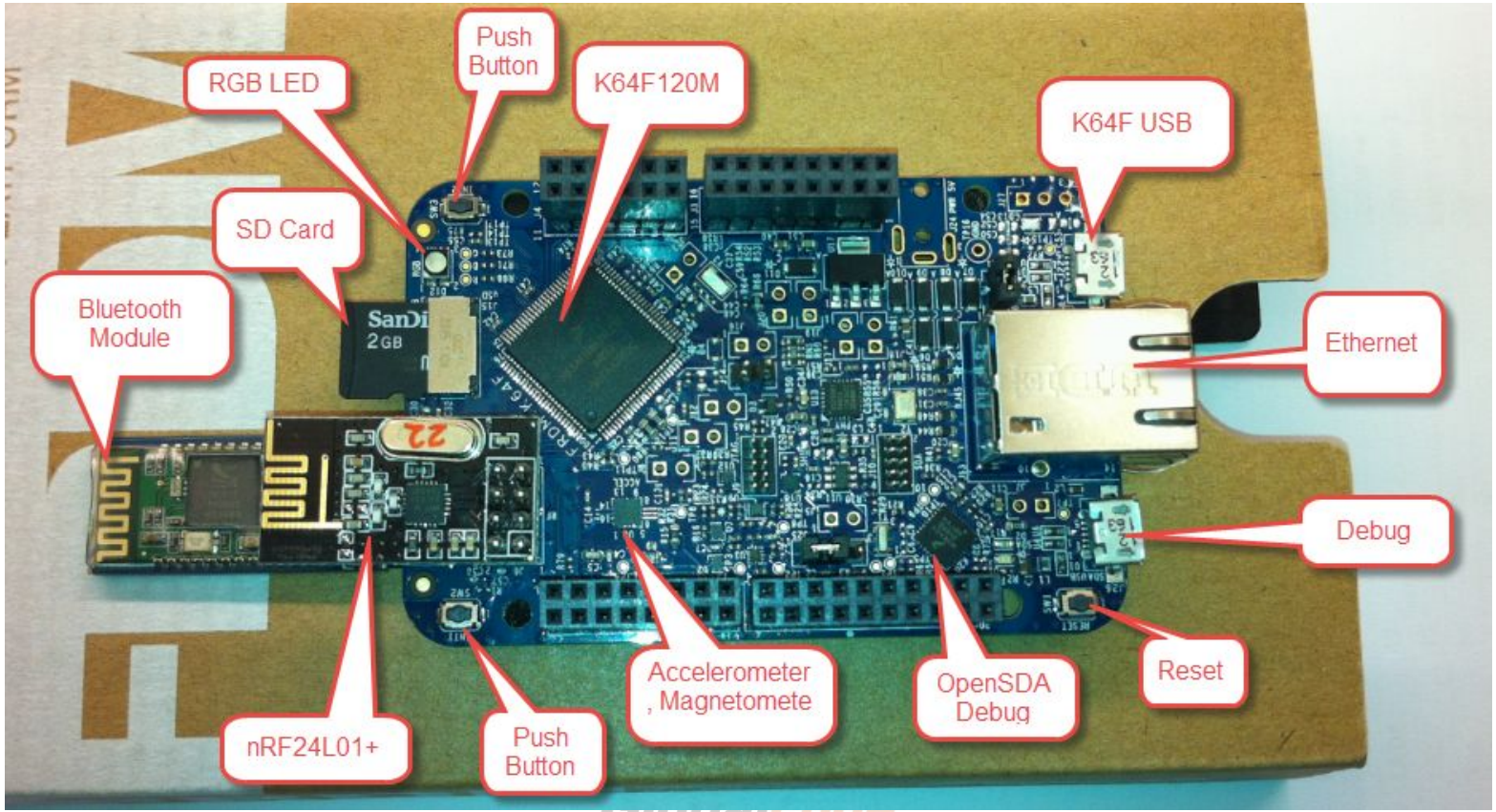
GEMALTO CONCEPT BOARD COMPACT GATEWAY

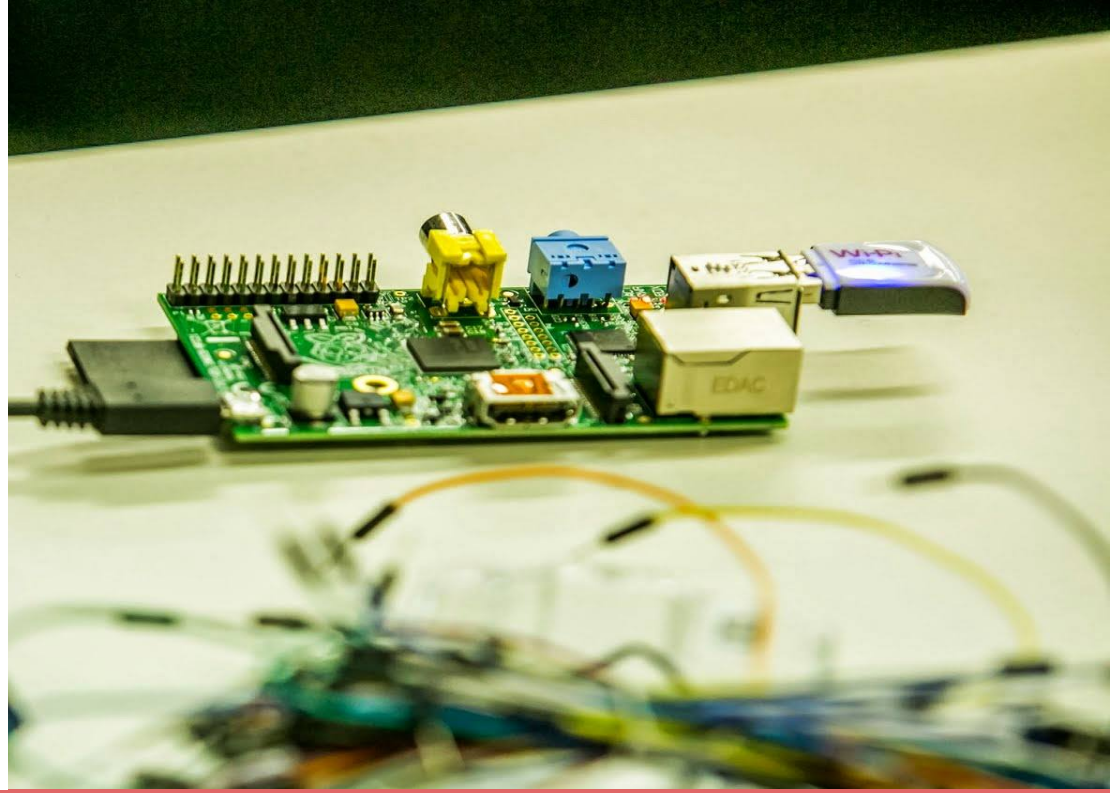
- ☐ EHS6 - **Java ME 3.2** Support
- ★ **Minimal** Operation System
- ☐ 2MB RAM 2G and 3G
- ★ **Arduino** Pinout **Compatible**

Our Tutorial:
https://www.youtube.com/watch?v=_ncdZAhSCNA

Freescale K64F - Java ME 8 Arduino Compatible!



- ★ 256MB - 1GB RAM,
- ★ 700MHz to 1GHz
- ★ 1 - 4 Cores
- ★ GPU, **Audio**, HDMI, **USB**, Ethernet, **Display**, Camera
- ★ External **GPIO**, **SD Card**



Raspberry Pi: Complete Linux gateway!

- ★ Atom Dual-core 500 Mhz
- ★ Quark 100mhz RTOS Viper
- ★ 1GB RAM
- ★ USB, Wifi, BLE
- ★ External GPIO, SD Card
- ★ Arduino Compatible

Intel Edison: Big Gateway!

IoT Protocols:

from the **past** to the **Future**!

Old But Gold...

- SNMP: get / set / trap, Object Identification, UDP Lightweight
- But.. Fragile Security and Low Reliability
- XMPP: near-real-time exchange data, positive decentralized architecture
- but.. Lack of Security and Quality of Service

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REST Protocol

- ☐ Human readable
- ☐ comfort zone to most developers
- ☐ popular but heavy for Edge devices
- ☐ expensive for 2G / 3G
- ☐ Request / Response

MQTT Protocol

- ☐ Machine-to-machine
- ☐ Old School m2m protocol
- ☐ Lightweight
- ☐ Inexpensive / Different QoS
- ☐ Publish / Subscribe

VERY WELL SUPPORTED FOR MOST PROGRAMMING LANGUAGE!

AMQP

- [ ] MQTT Like
- [ ] Message Route system: one message to a route of queues!
- [ ] Header exchange and filters

COAP

- [ ] MQTT + REST kind of "fusion"
- [ ] Fast like MQTT
- [ ] Traditional client-server model
- [ ] GET, PUT, POST, DELETE operations

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IoT Cloud Providers

MQTT Broker

- Mosquitto = Open-source MQTT broker, easy to use and install
- iot.eclipse.org = free / sandbox MQTT development
- CloudMQTT.com = Distributed MQTT Cloud Service
- IBM Bluemix = Bunch of IoT Services including MQTT Broker

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MQTT Client

- PAHO = API's for Java, JavaScript, .NET, ETC.
- MQTT.fx = The best client EVER! Thanks Jens Deters (@Jerady)
- MQTT Lens = Chrome Plug-in
- Mosquitto command-line

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ThingSpeak

IoT Surfboard

Channel ID: 62673
Author: vsenger
Access: Private

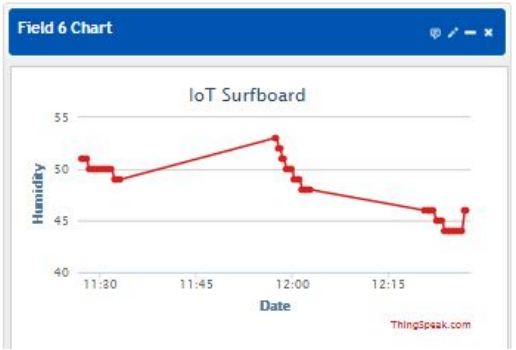
IoT Surfboard Channel

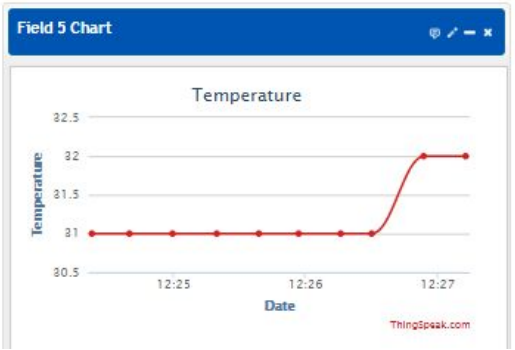
Private View | Public View | Channel Settings | API Keys | Data Import / Export

Add Visualizations | Data Export | MATLAB Analysis | MATLAB Visualization | More Apps

Channel Stats

Created 3 months ago
Updated 2 days ago
413 Entries





data.sparkfun.com
a place to push your data.

Why are you building this?
We want to bring a dose of reality to the Internet of Things hype. data.sparkfun.com is a free, robust service for use with all of your projects. The underlying engine is open source so if you don't want to use our servers you can install phant on the server of your choice.

Wait, this is totally free? What's the catch?
Yep. There are limits, but we wanted to give our users a good, free place to store data and give data scientists more fun things to analyze. Our hope is that you buy a SparkFun widget to connect your next beehive.

How do I use it?

Create a free data stream immediately at data.sparkfun.com — CREATE

Explore all of the public data streams on data.sparkfun.com — EXPLORE

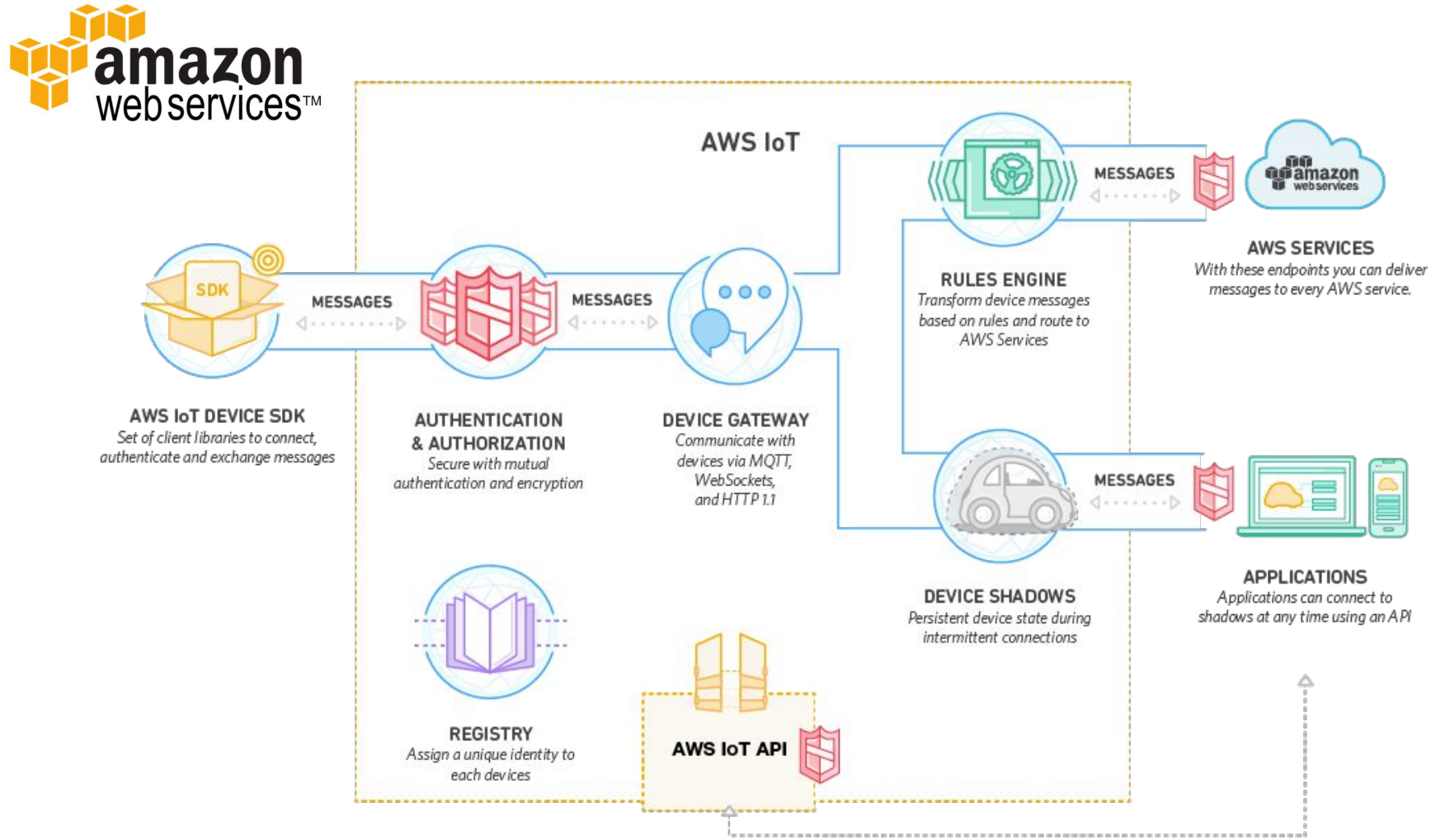
Learn how to create data streams and post data to them. — DOCS

IFTTT Search My Recipes Browse Channels vsenger

Recommended DO Recipes IF Recipes

IBM Bluemix™

Runtimes
Liberty for Java
Node.js
Ruby
"Bring Your Own Buildpack"
Dev Ops
Monitoring and Analytics
Git Hosting
Deployment Automation
Web IDE
Agile Development
Internet Of Things
Historian
MQTT
Data Management Services
SQL Database
JSON Database
Mongo DB
MySQL
PostgreSQL
BLU Data Warehouse
MapReduce
Mobile Services
Push
CloudCode
Mobile App Mgmt
Mobile Quality Assurance
Mobile Data
Twilio
Web & App Application
Data Cache
Session Cache
Elastic MQ
Decision
SSO
Redis
RabbitMQ
Log Analysis


amazon web services™
AWS IoT
SDK
MESSAGES
MESSAGES
MESSAGES
MESSAGES
amazon web services
AWS IoT DEVICE SDK
Set of client libraries to connect, authenticate and exchange messages
AUTHENTICATION & AUTHORIZATION
Secure with mutual authentication and encryption
DEVICE GATEWAY
Communicate with devices via MQTT, WebSockets, and HTTP 1.1
RULES ENGINE
Transform device messages based on rules and route to AWS Services
AWS SERVICES
With these endpoints you can deliver messages to every AWS service.
DEVICE SHADOWS
Persistent device state during intermittent connections
APPLICATIONS
Applications can connect to shadows at any time using an API
REGISTRY
Assign a unique identity to each devices
AWS IoT API

Microsoft Azure IoT services

Producers	Connect Devices	Storage	Analytics	Take Action
	Event Hubs	SQL Database	Machine Learning	Azure Websites
	Service Bus	Table/Blob Storage	Stream Analytics	Power BI
	External Data Sources	DocumentDB	HDInsight	Notification Hubs
		External Data Sources	Data Factory	Mobile Services
				BizTalk Services

Microsoft Azure IoT Services

Resume

- [ ] IoT = Big market, thousands possibilities!
- [ ] Specific devices: Arduino, Raspi, Intel Edison, Surfboard
- [ ] Will bring more hardware developers the same way Internet of people brought more software developers
- [ ] New protocols, patterns, Models and Architectures

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Your **things** connected to the **Internet**!

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