Secure, Efficient, and Open
Standard Internet of Things

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What is the Internet of Things?

Services

The Web

Things

Big Data

Little Data
The Business Case for End-to-End Communication

Source: Ericsson
The Long Tail Drives Big Data Value

Number of IOT Applications

Value per Application

Value of Big Data

Smart meters, Wellness …

Turn on my lights when I arrive home

When did I buy it?
Where did I buy it?
When do I use it?
Where do I use it?
What do I do with it?
Who do I use it with?
Who did I tell about it?
Big Data Starts with Little Data

The future

Open Data and Objects
Smart Everything
Sensors & Actuators
Networks

Internet of Things

Reach

Scale Needs Standards
Sharing Needs Trust
Trust Needs Security

Today

Applications
Mobile internet
Internet / broadband
M2M
SaaS

Fixed Telephony Networks
Mobile Telephony

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From Web Applications to IoT Nodes

Web Object

1000s of bytes

HTTP

TLS / TCP

IP

Web Application

Proxy

100s bytes

Binary Web Object

CoAP

DTLS / UDP

IP

IoT Backhaul

Router

10s of bytes

Binary Web Object

CoAP

DTLS / UDP

6LoWPAN

IoT Node Network
Key Standardization Activities

- **IETF**
  - IPv6 and 6LoWPAN networking
  - Web of Things (REST for IoT, CoAP, Resource Directory etc.)
  - Security (DTLS, TLS, Cipher suites)

- **OMA / IPSO Alliance**
  - OMA Lightweight Device Management (Based on CoAP)
  - IPSO Web Objects

- **ZigBee**
  - ZigBee IP - An open-standard 6LoWPAN stack for Home Area Networks
  - ZigBee IP NAN – 6LoWPAN stack for Sub-GHz large area applications

- **OneM2M**
  - Ongoing work on M2M system standardization (CoAP, HTTP binding)
Growing the IoT Market

- ARM is dedicated to a standards-based IoT with billions of IP and Web based devices

- Sensinode was a pioneer in creating and deploying these key IoT open standards
- Sensinode software enables efficient and secure communication from device to cloud
- 6LoWPAN, ZigBee IP CoAP, TLS, OMA Lightweight etc.
ARM Spans Sensors to Servers

**Infrastructure**
Servers, network infrastructure
ARM Cortex-A processors

**Mobile computing and Gateways**
Cellular modems, SBCs
ARM Cortex-R & Cortex-A

**Sensor nodes**
MCUs, sensors, low power wireless
ARM Cortex-M
1.9 billion ARM Cortex-M devices shipped in 2012 by leading semiconductor companies.

Relative growth in MCU & smartcard:
- ARM 32-bit: 40% CAGR
- 4, 8 & 16-bit: 6% CAGR
- Non-ARM 32-bit: 9% CAGR

ARM Cortex-M devices shipped in 2012 by leading semiconductor companies:
- MCUs
- Radios
- Sensors

32-bit intelligence starting at $0.50

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Partnership Model Drives Innovation
CoAP: The Web of Things Protocol

- Compact 4-byte Header
- UDP, SMS, (TCP)
- DTLS Security
- Subscription
- Discovery

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The 6LoWPAN Compass

Building Area Networks
- ZigBee IP 1.X
- ZigBee IP
- ZigBee NAN
- BT Smart IP
- ISA 100.11A

Home Area Networks

Neighborhood Area Networks

Industrial Control

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IPSO Web Objects

- We need **semantics** to build a Web of Things
- IPSO defines Web Object guidelines (join us!)
- IPSO Application Framework published in 2012
- New IPSO Web Objects will be published soon!
  - Compatible with OMA Lightweight, CoAP and HTTP
  - General purpose IO
  - General sensors, Temperature, Light, Humidity, Actuators
  - Light control, Power control, Set Points
- Great roadmap of Objects for the future including
  - Smart Cities
  - Connected Home
How to Build a Web of Things?

IoT Devices

6LoWPAN, ZigBee IP, CoAP / DTLS

Lightweight M2M, CoAP / DTLS

Cellular

HTTP / TLS

Web Applications

AAA

Backend – Private or Public Cloud

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IoT Products from Device to Cloud

- Java ME
- Java Embedded Suite
- Freescale i.MX
- Freescale K76
- LWM2M: CoAP
- Complex Event Processing
- NanoService
- NSP Edge
- Native Device (mBed)
- Embedded Devices
- Gateway
- Identity Management
- Authentication
- Big Data
- FILTER
- TRANSFORM
- BIG DATA
- Oracle Big Data Connectors
- Oracle Business Intelligence
- Oracle GoldenGate
- Oracle Data Integrator
- HADOOP
- Analyze
- Replicate
The Internet of Things is the next evolution of Web

Market growth driven by standards and time-to-market

Standards, trust and security!

Big Data starts with Little Data!