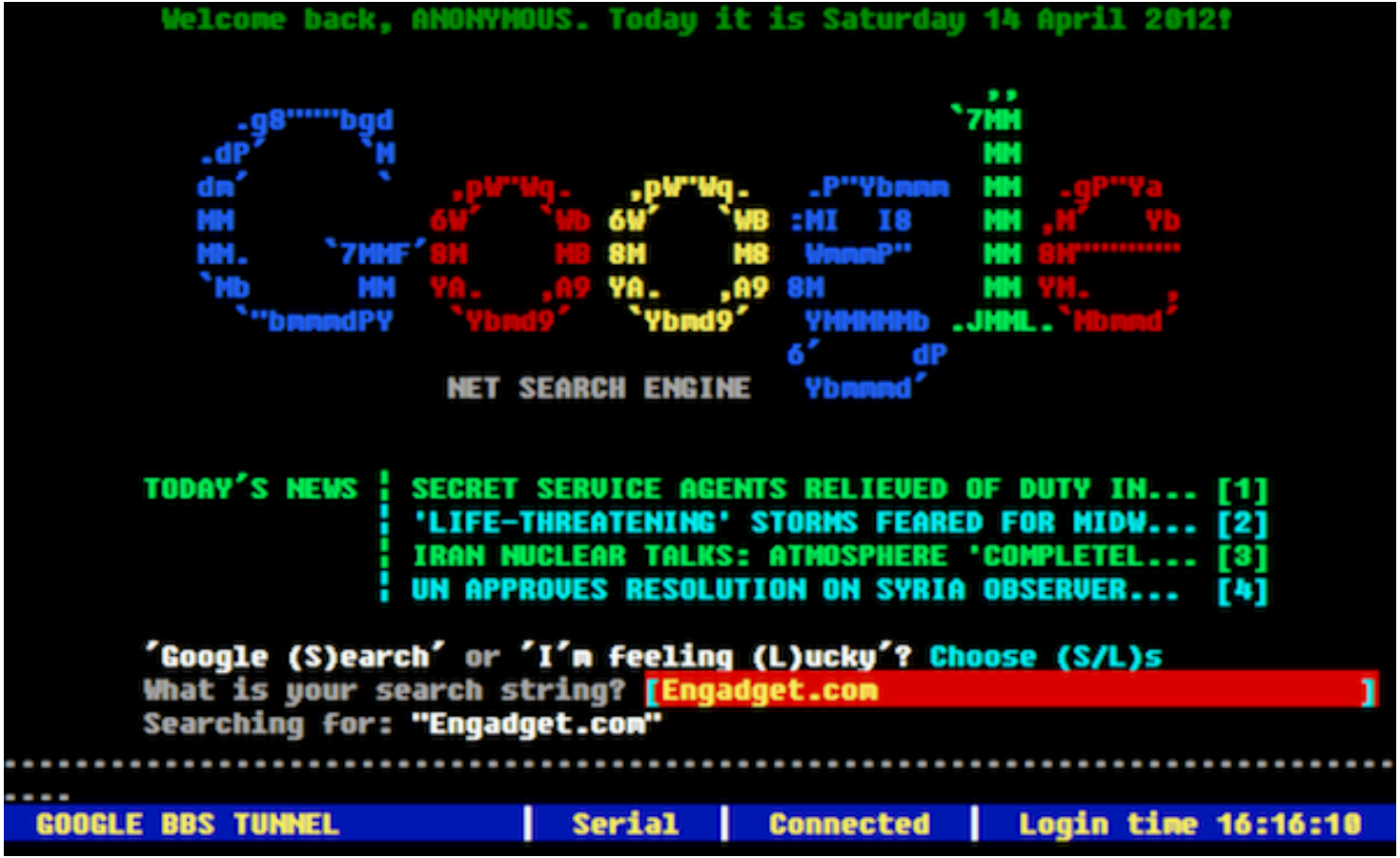
The Future of IoT

Zach Shelby
VP Marketing, IoT
Feb 3rd, 2015

Internet of (really nerdy) People – 1980s



ARM

Internet of (content silo) People – 1990s

ARM

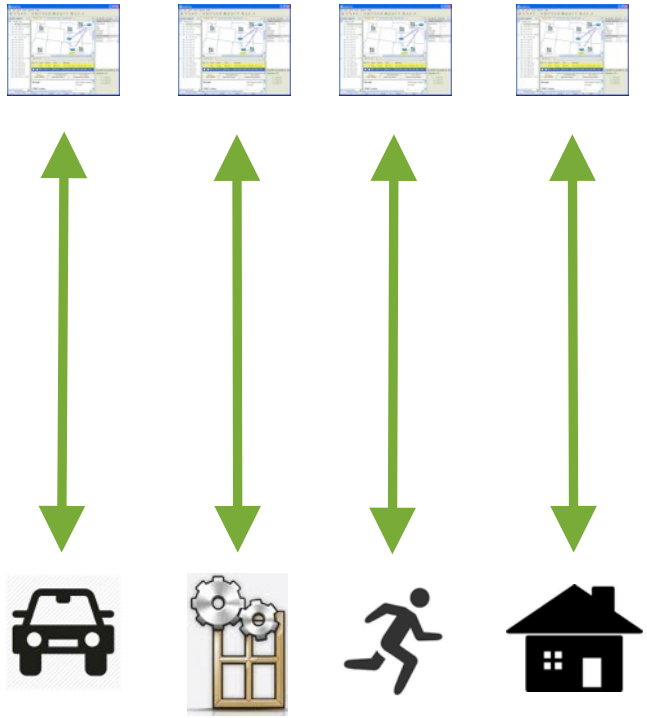
Internet of (Web) People – 2000s

ARM

Internet of (really nerdy) Things – 1960s-1990s

ARM

Internet of (content silo) Things – 2000s

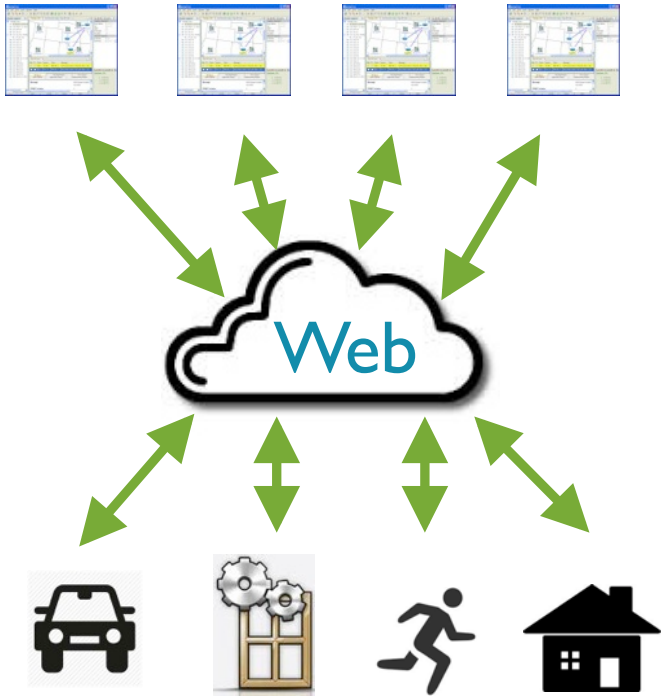


My Service

My Thing

ARM

Internet of (Web) Things – 2010s



Services

The Web

Things

ARM

By 2018, 50% of the IoT solutions will be provided by
Companies which are less than 3 years old

Gartner Research, 2013

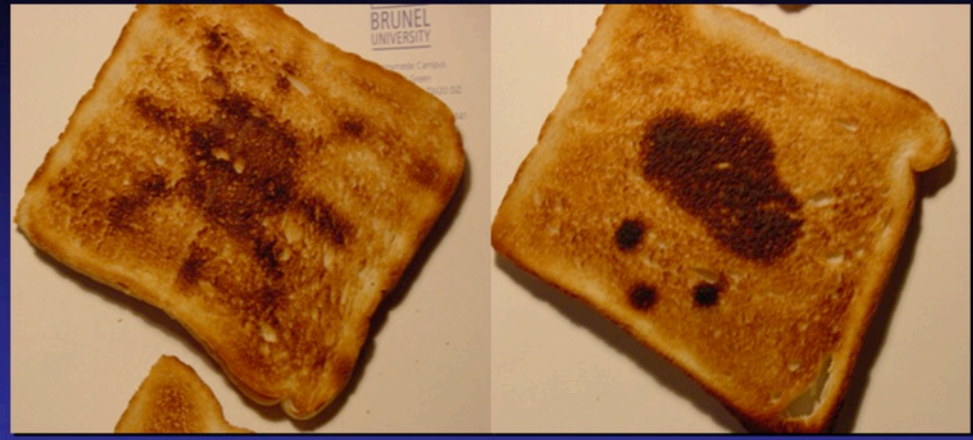
ARM

Innovation circa 2001

This Year's Favorite Product

ARM 2001

Information Delivered on a Plate



ARM 2001

ARM - The Architecture for the Digital World®

From sensors to servers

10 billon

ARM-based chips, last year alone

ARM

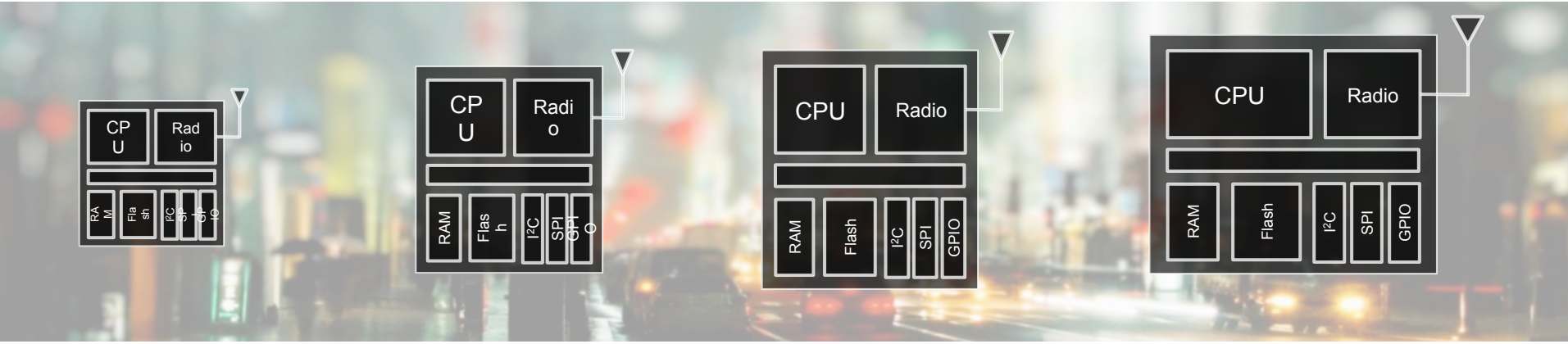
Wide Range of Device Classes

CLASS 0
ULTRA CONSTRAINED

CLASS 1-2
CONSTRAINED

CLASS 3
MAINSTREAM IOT

CLASS 4
RICH NODE / GATEWAY



ARM Cortex-M0+
16K RAM / 64K ROM
Requires gateway
Disposable, Swallowable
RTOS or bare metal

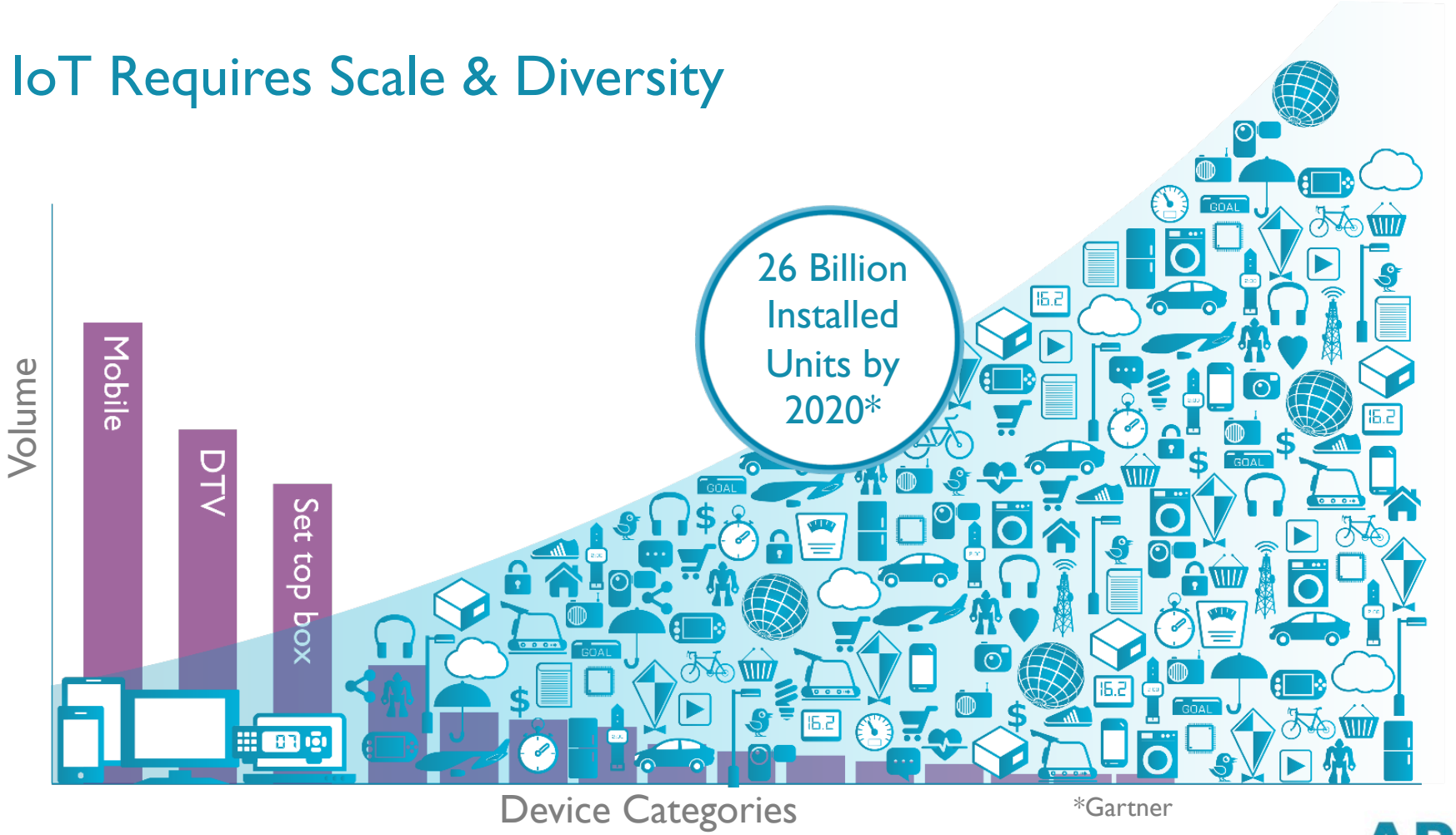
ARM Cortex-M0+/3
32-64K RAM / 128-256K ROM
Direct to Internet via CoAP
End-to-end DTLS security
Remote management
MBED OS support

ARM Cortex-M3/4/7
128K RAM / 512K ROM
Direct to Internet
Low-end 6LoWPAN router
End-to-end DTLS security
Remote management
MBED OS, Java ME

ARM Cortex-A7
64MB RAM / 512MB ROM
High performance node with video processing
Rich UI
MBED Client, Java SE, Linux, Android

ARM

IoT Requires Scale & Diversity



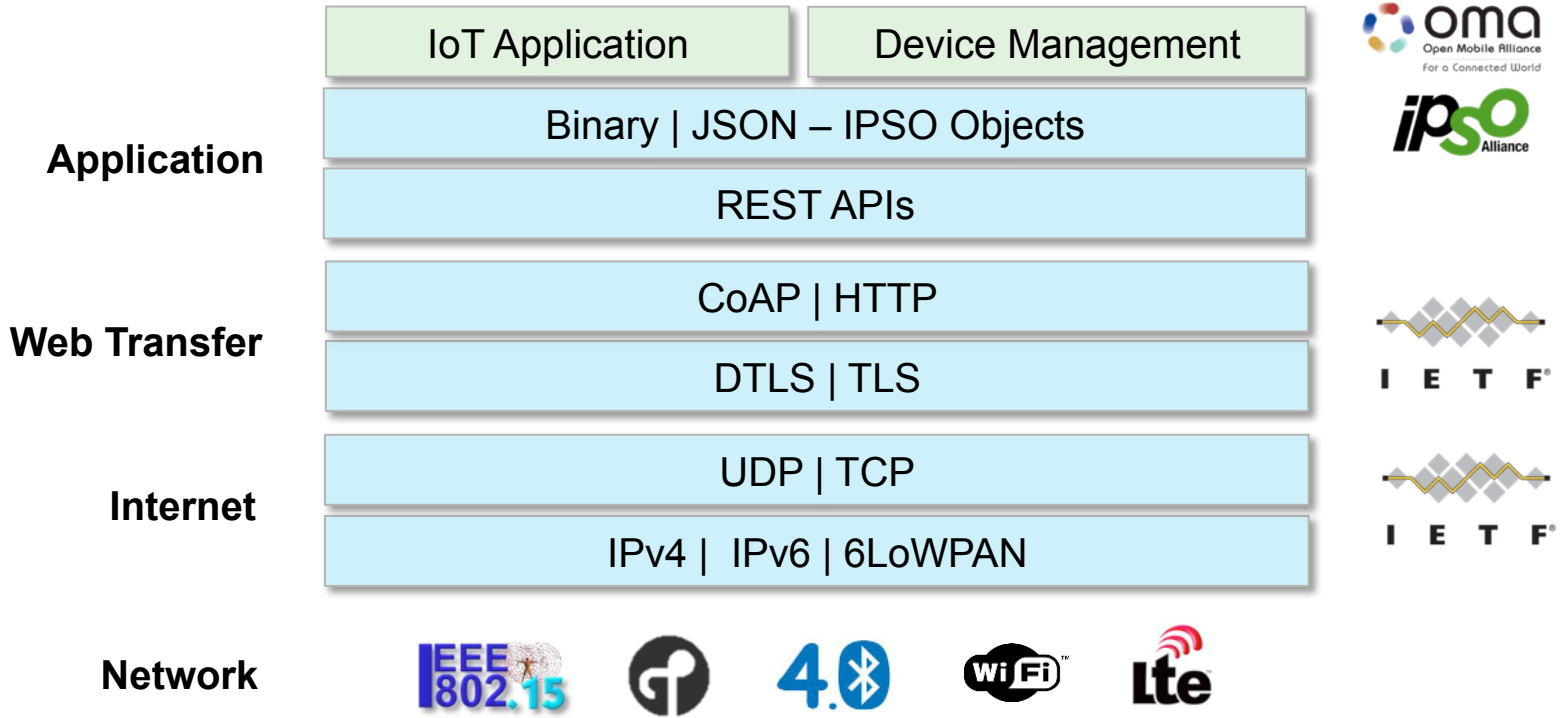
Two Key Goals for 2015

1. Create a global software ecosystem, with security!

2. Get open standards to lots of devices and services

ARM

The I in IoT: Web (and IP) Protocols to the Edge



ARM

THREAD

6LoWPAN Made Easy!

IoT connectivity for home automation

Access Point

- Low-power
- Mesh network
- IP to the edge

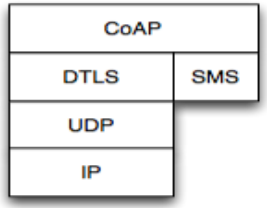
- Wide range of devices robust & easy to deploy infrastructure sharing
- Mature end-to-end security

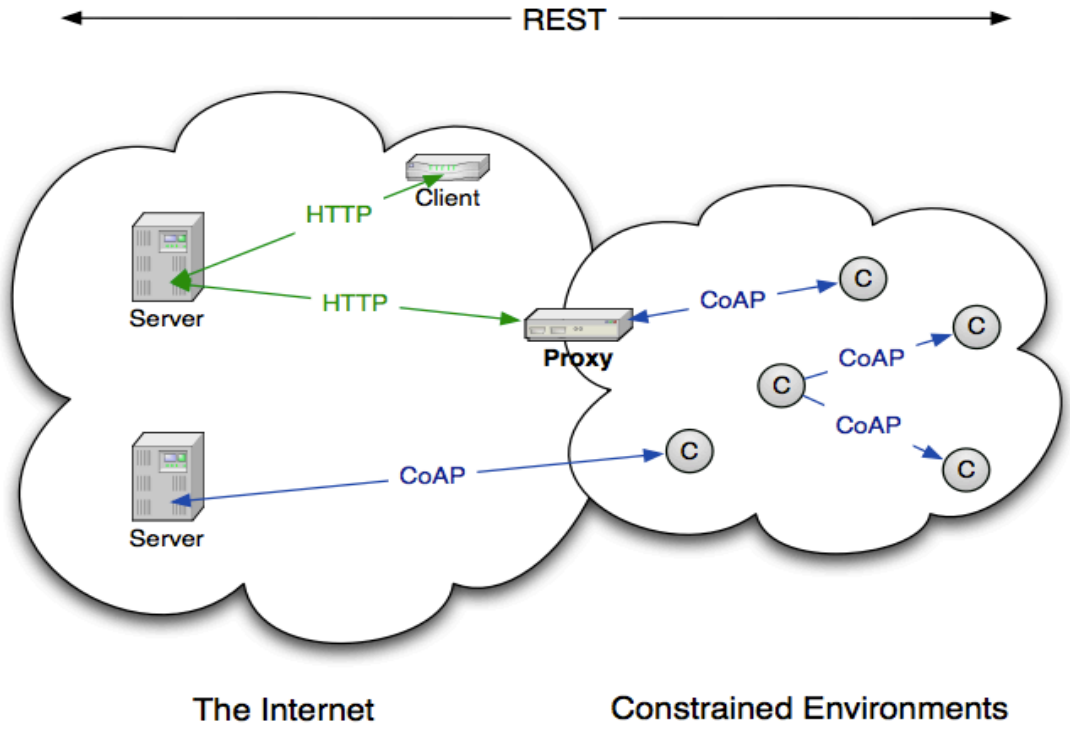
ARM BIGASS FANS No Equal freescale nest SAMSUNG SILICON LABS Yale

ARM

CoAP - The Web of Things Protocol

- Open IETF Standard (RFC7252)
- Compact 4-byte Header
- UDP, SMS, (TCP) Support
- Strong DTLS Security
- Asynchronous Subscription
- Built-in Discovery
- http://coap.technology





IETF

ARM

Project Kona

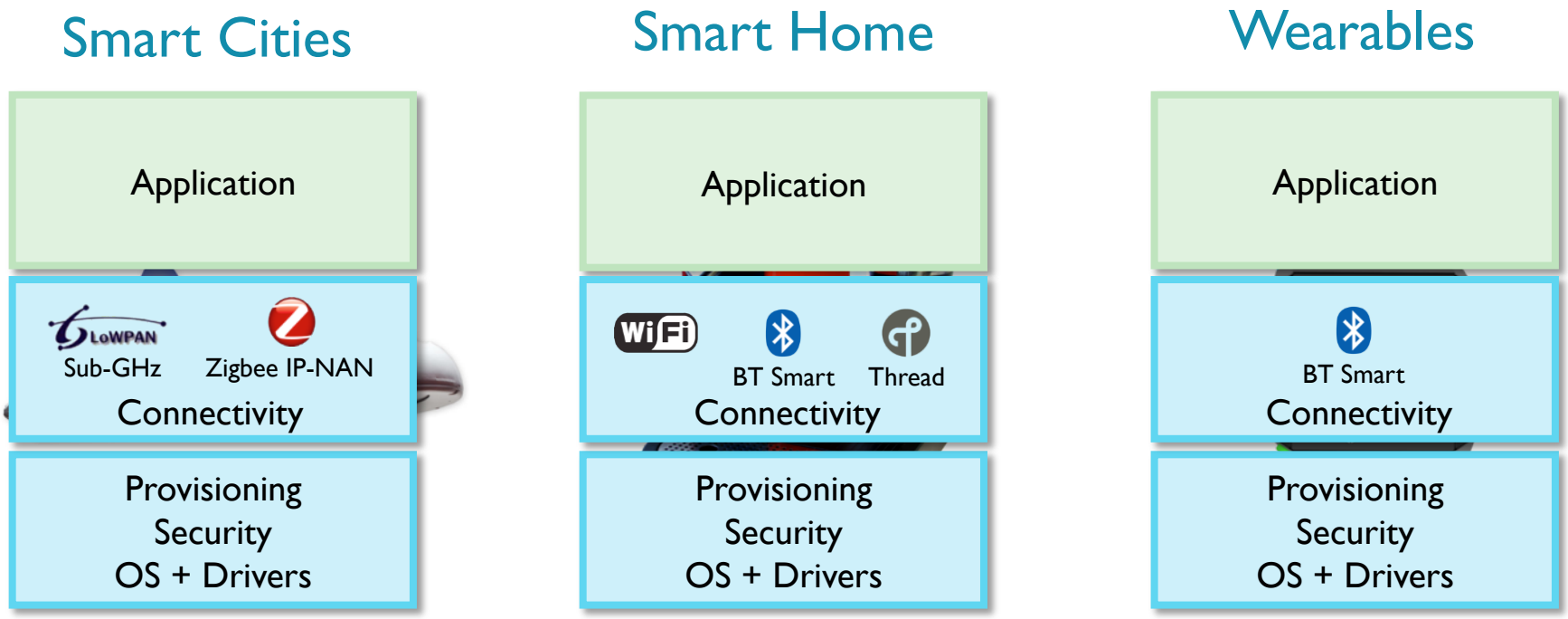
- ARM and Oracle are bringing CoAP support to OpenJDK
- Project Kona
  - Java APIs and protocols for IoT
  - Embedded devices in particular
- CoAP contribution from ARM is planned for next week ☺
- Project Lead: Riaz Aimandi (Oracle)
- Lead Committer: Szymon Sasin (ARM)

A Keynote Challenge!

- Write a CoAP client to interact with me in real time
  - Discover my question
  - GET the question
  - PUT your answer (and your name!)
- Server location: coap://192.168.80.121
- Hint: Californium is great for Java Nerds
- Hint: Copper is awesome, but cheating!
- Free mbed IoT development board for first to finish

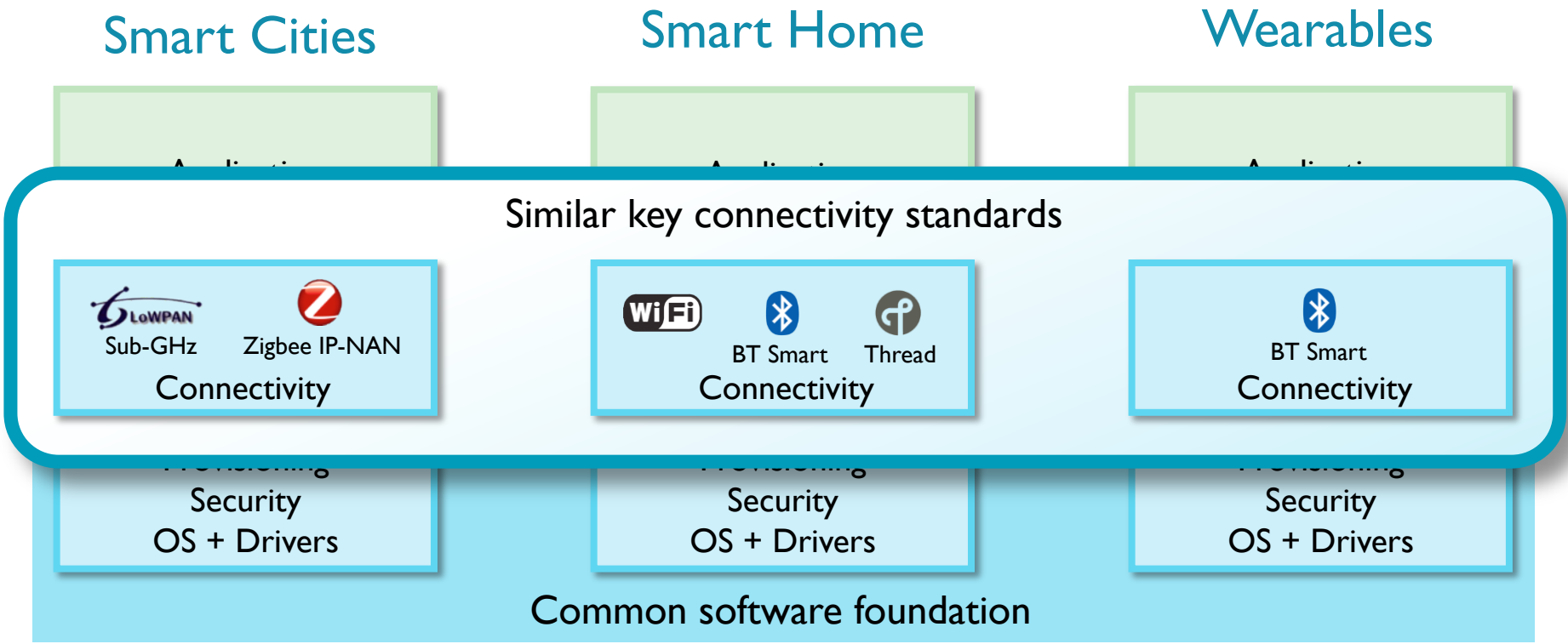
ARM

Common OS and Connectivity Across Markets

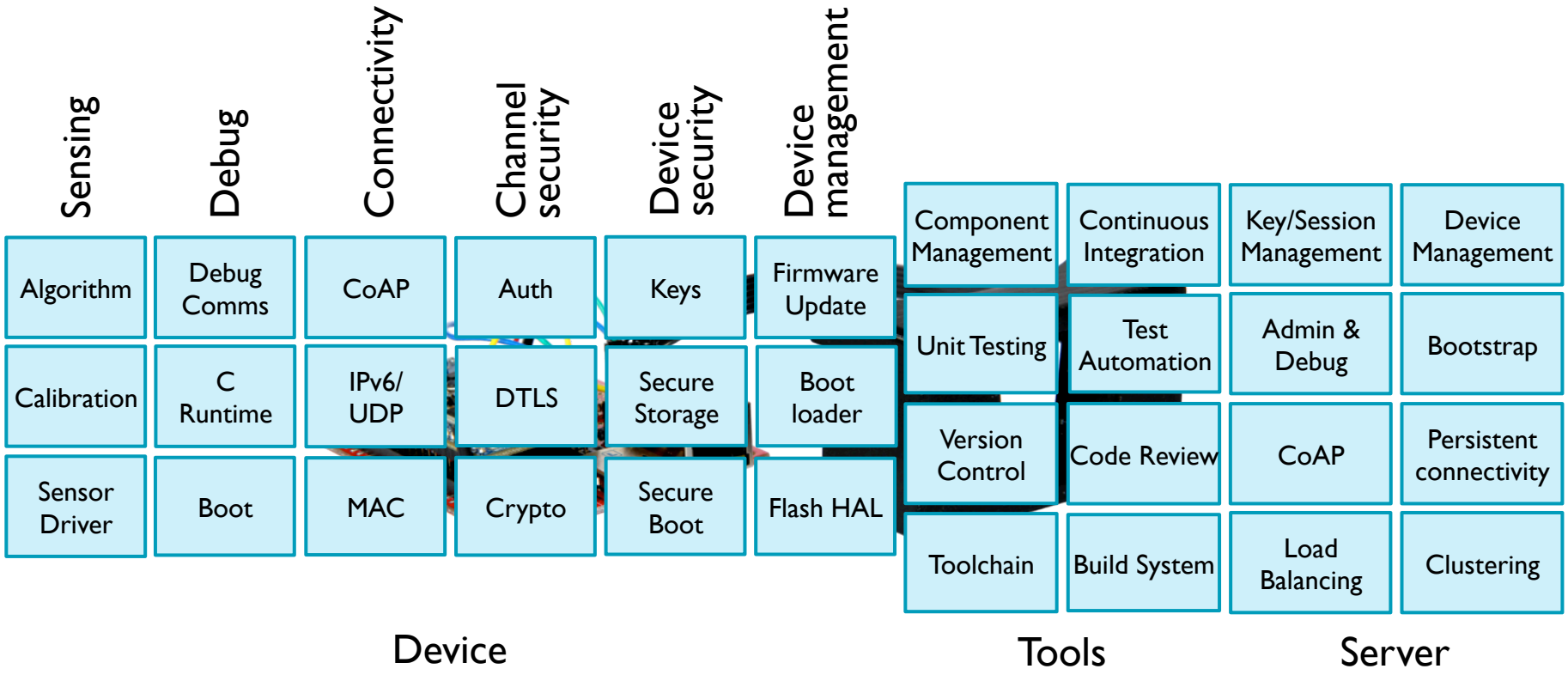


ARM

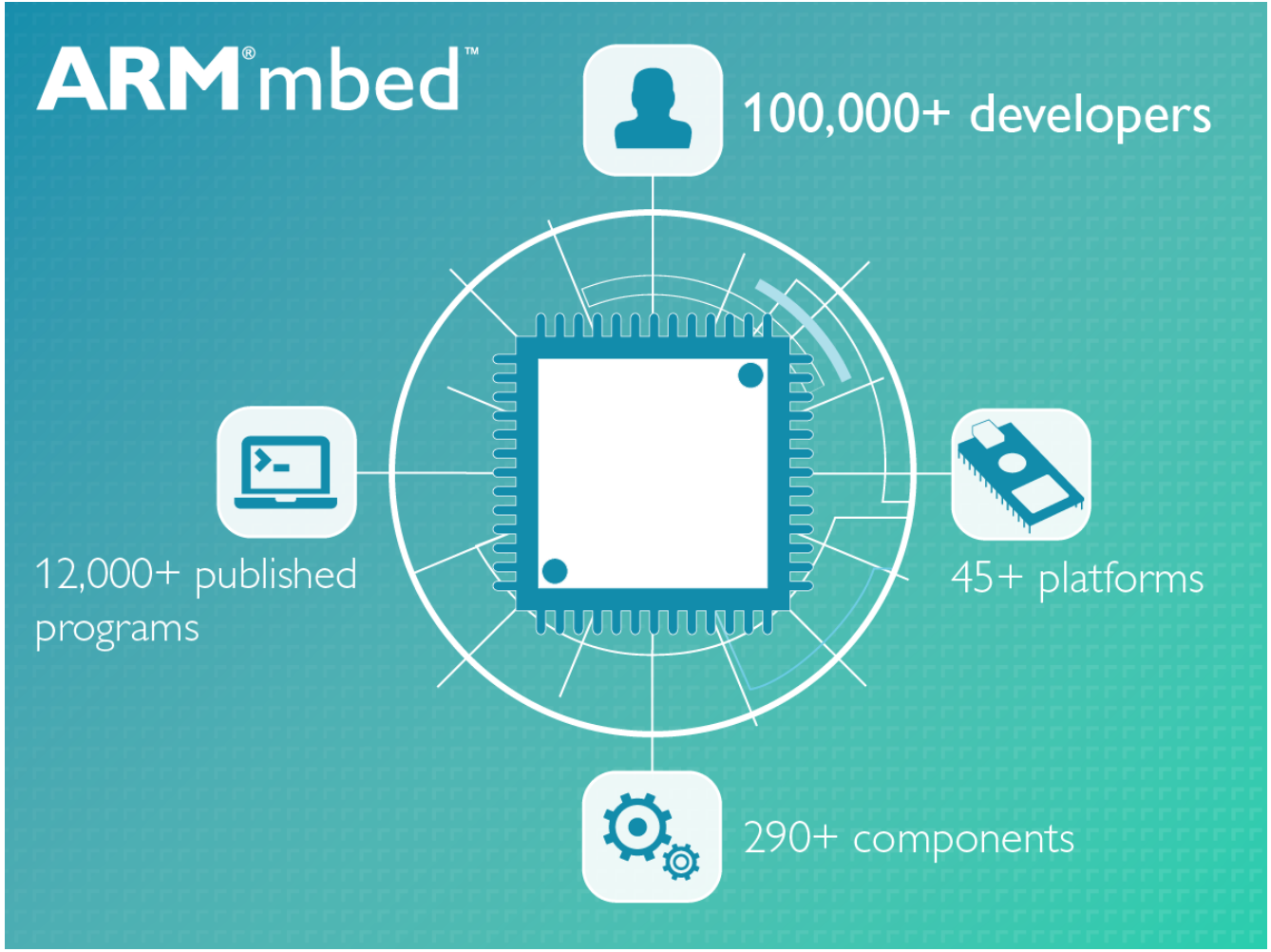
Common OS and Connectivity Across Markets



ARM


Sensing
Debug
Connectivity
Channel security
Device security
Device management
Algorithm
Debug Comms
CoAP
Auth
Keys
Firmware Update
Calibration
C Runtime
IPv6/ UDP
DTLS
Secure Storage
Boot loader
Sensor Driver
Boot
MAC
Crypto
Secure Boot
Flash HAL
Component Management
Continuous Integration
Key/Session Management
Device Management
Unit Testing
Test Automation
Admin & Debug
Bootstrap
Version Control
Code Review
CoAP
Persistent connectivity
Toolchain
Build System
Load Balancing
Clustering
Device
Tools
Server

ARM


ARM® mbed™
100,000+ developers
12,000+ published programs
45+ platforms
290+ components

ARM

ARM® mbed™ IoT Device Platform

mbed Device Server

Software that enables services to manage mbed Enabled things.

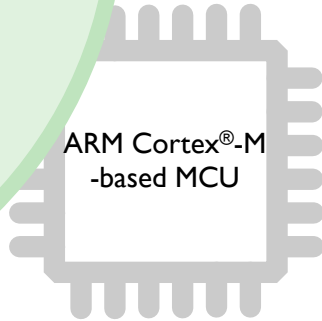
mbed Ecosystem

Developers and partners making use of mbed technology

ARM® mbed™ mbed Web Services

mbed OS

Free operating system for low-power devices. Just add App.

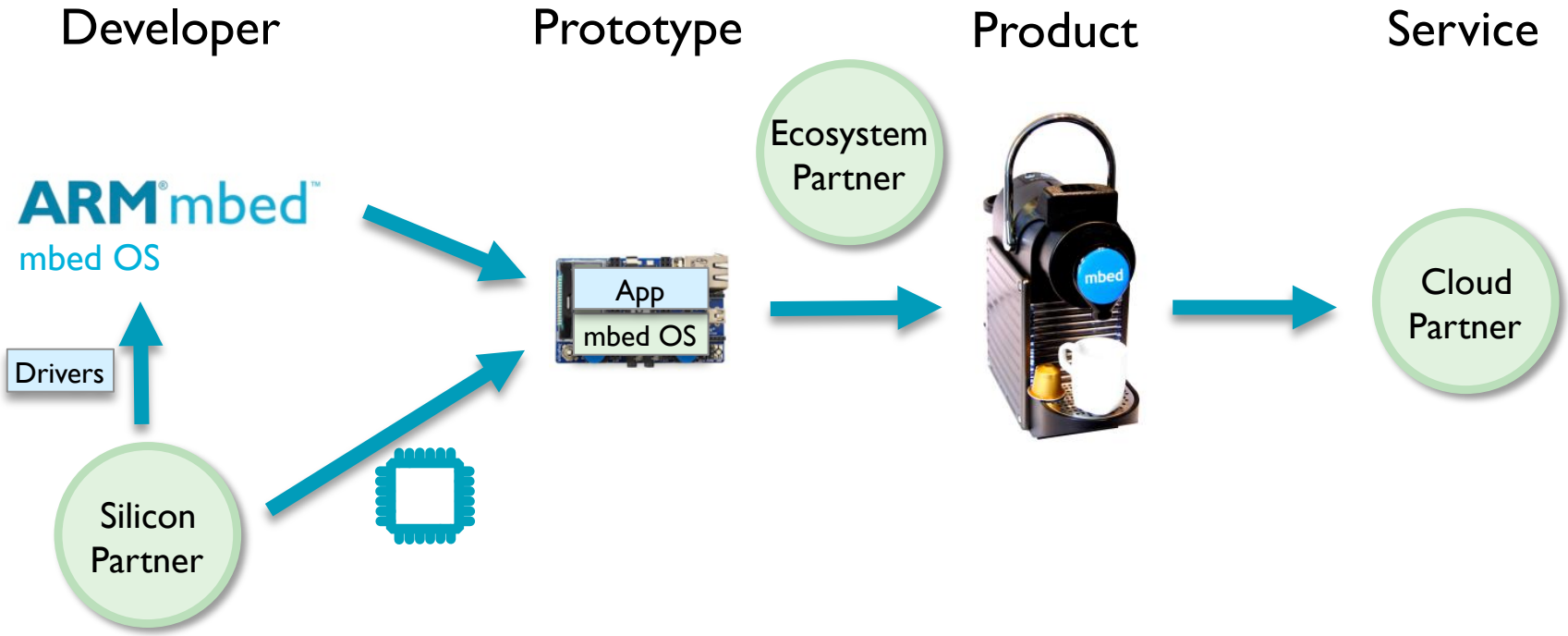


ARM

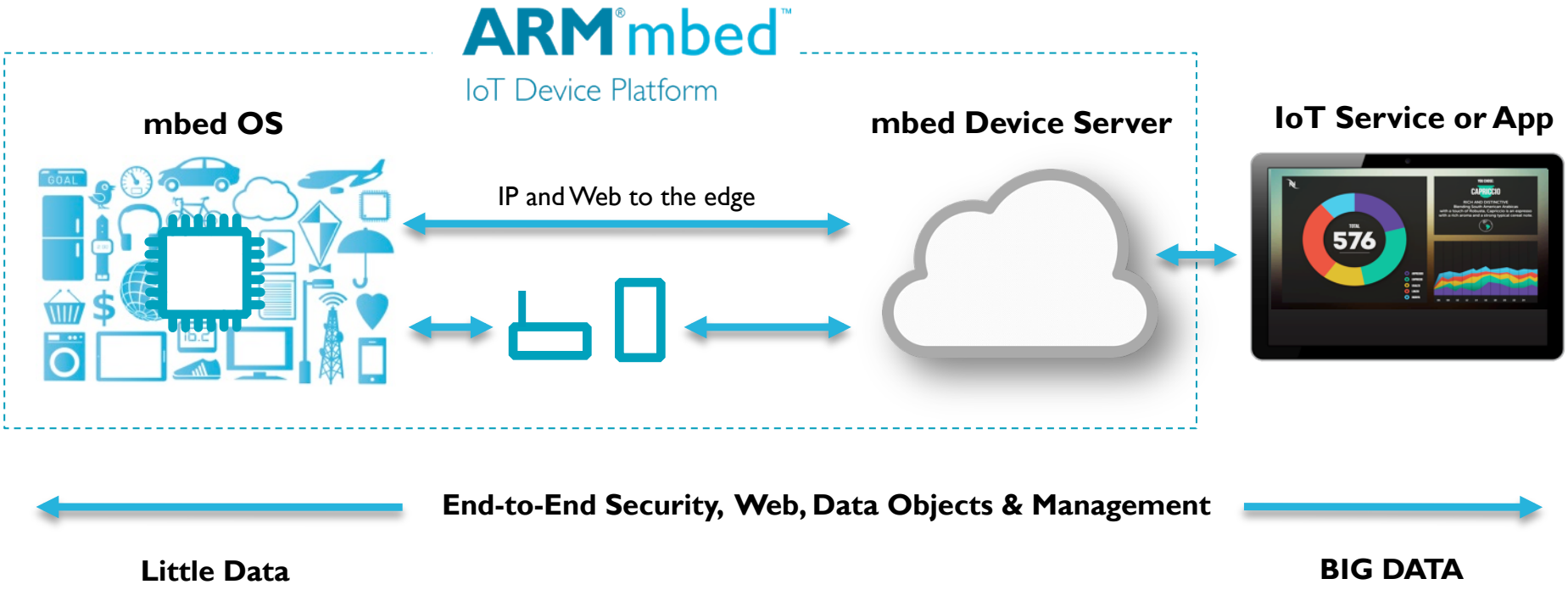
The new mbed Partner Ecosystem: Join Us!

ARM

From Idea to Product

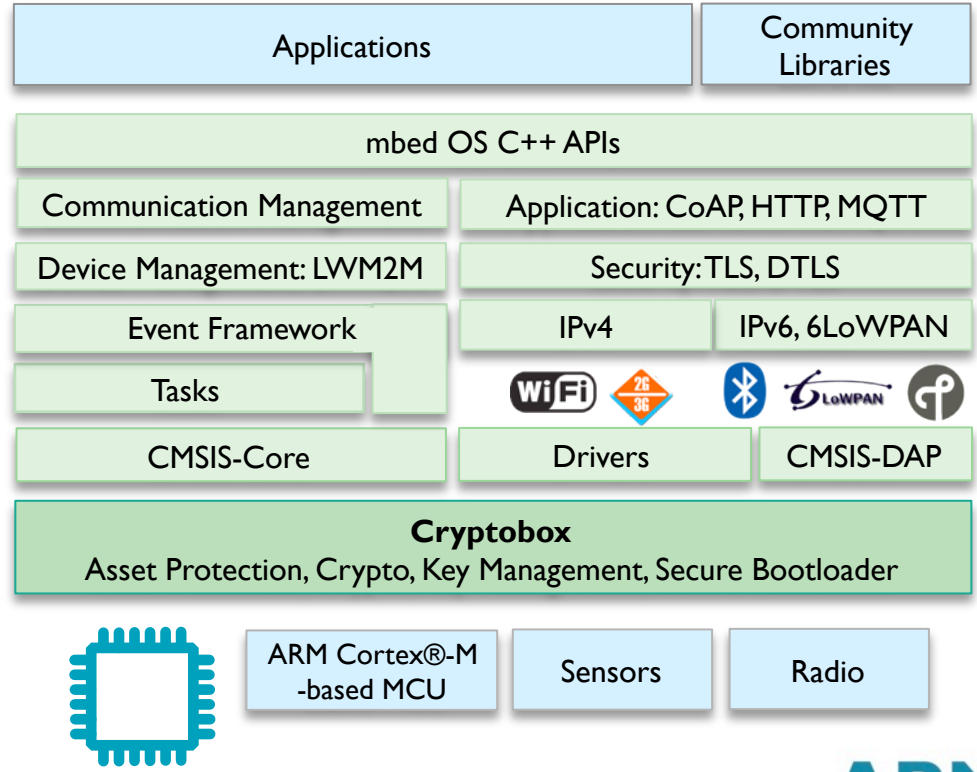


Little Data Enables Big Data

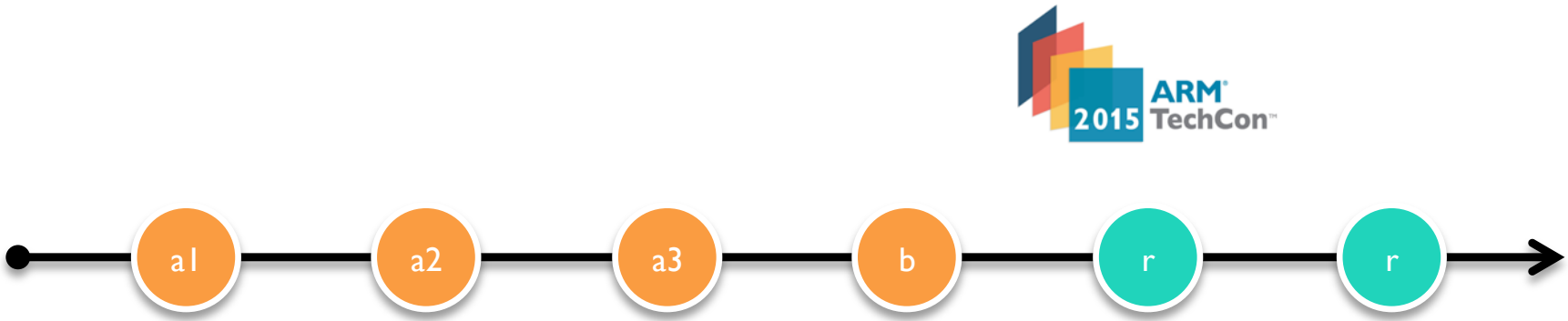


mbed OS Roadmap 2015

- Minimize time-to-market
- Low-power by design
- Complete security solution
- Top connectivity standards
- Built-in device management



mbed OS Release Schedule

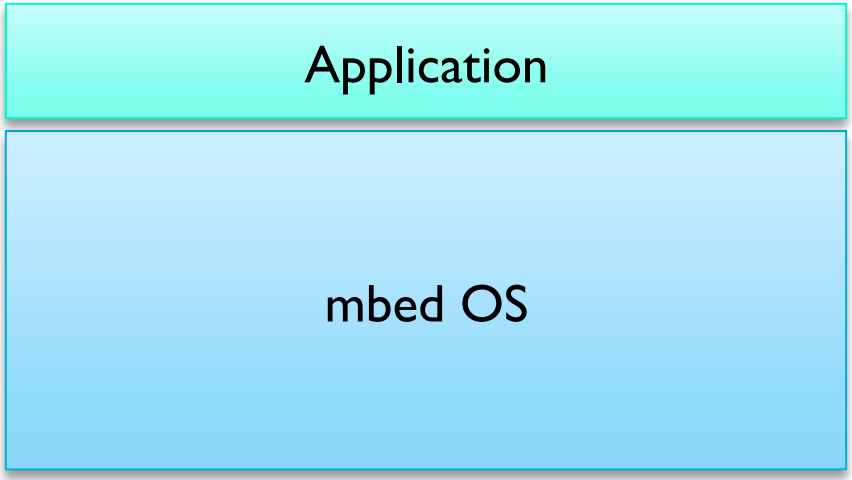


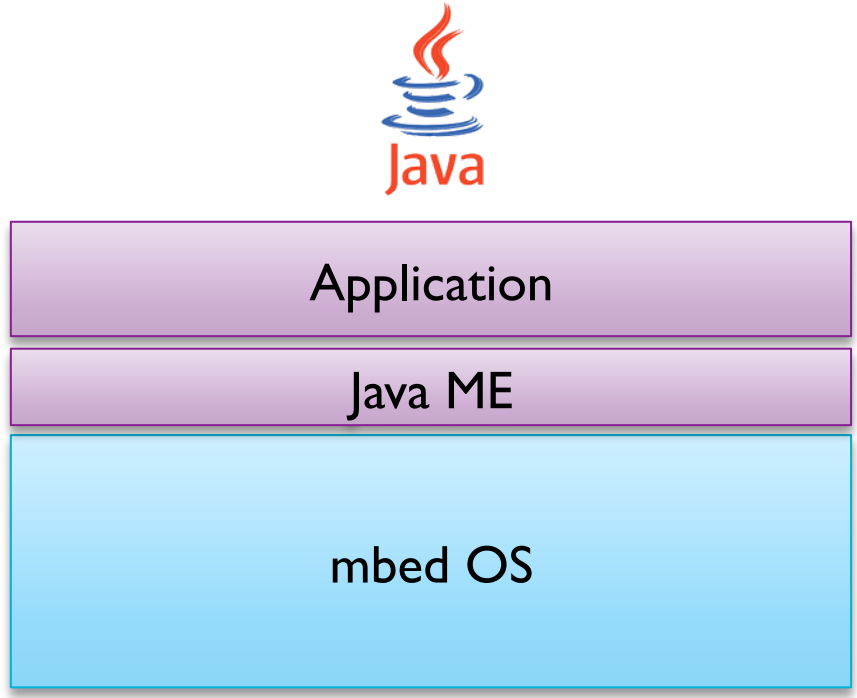
Apache 2.0

ARM

Java on mbed

Native C++





ARM

Embedded software: Scaling with mbed and Java

Drive platform consistency, developer productivity, and software intelligence

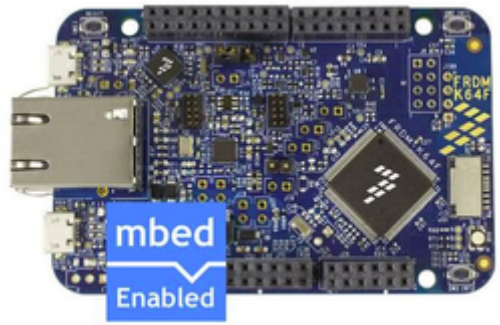
- **Reduce** embedded platform fragmentation and time-to-market
- **Enable** Java Embedded on a growing range of mbed-enabled devices
- **Combine** the strengths of the mbed and Java communities and partners

ARM

Freescale FRDM-K64F

Versatile, simple-to-use ARM Cortex-M4 MCU platform

- Java ME Embedded 8.1 Developer Preview
  - Freescale FRDM-K64F
    - Kinetis K64F, 120 MHz, 256 KB RAM/1 MB Flash, ARM mbed
    - Arduino form-factor and pin-out. Approx. $25 street price
  - Brings Java 8 to Micro-Controllers
    - Optimized Java ME 8 runtime in 190 KB RAM, enabling highly functional Java Embedded applications on single-chip micro-controller systems
    - Java 8 language, core APIs, networking, device I/O, storage, and more
    - Simple installation and development via Java ME SDK 8.1, NetBeans and Eclipse IDEs
    - Complements existing Java ME 8 platforms such as Raspberry Pi, scaling Java ME 8 from large to small
    - Ideal for evaluation and prototyping
- FREE download via Oracle Technology Network (OTN)



ARM

freescale

ARM

mbed Device Server

- Straightforward integration
- Periodic connectivity support
- Complete managed security
- Leading open standards
- Lightweight management

mbed Device Server API

Directory and Subscription

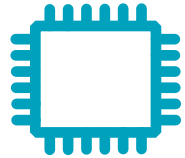
Security, Admin and Multi-tenancy

Device Management and Data Flows - *RESTful and Publish/Subscribe*

mbed Device Interface - *Open Web Standards*

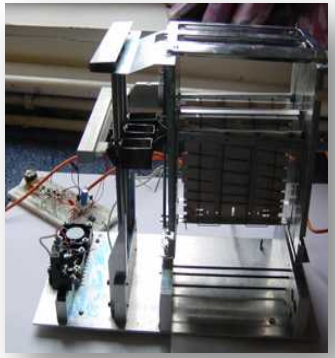
Application Transfer Protocols – *CoAP, HTTP, MQTT*

Security Protocols – *DTLS, TLS*



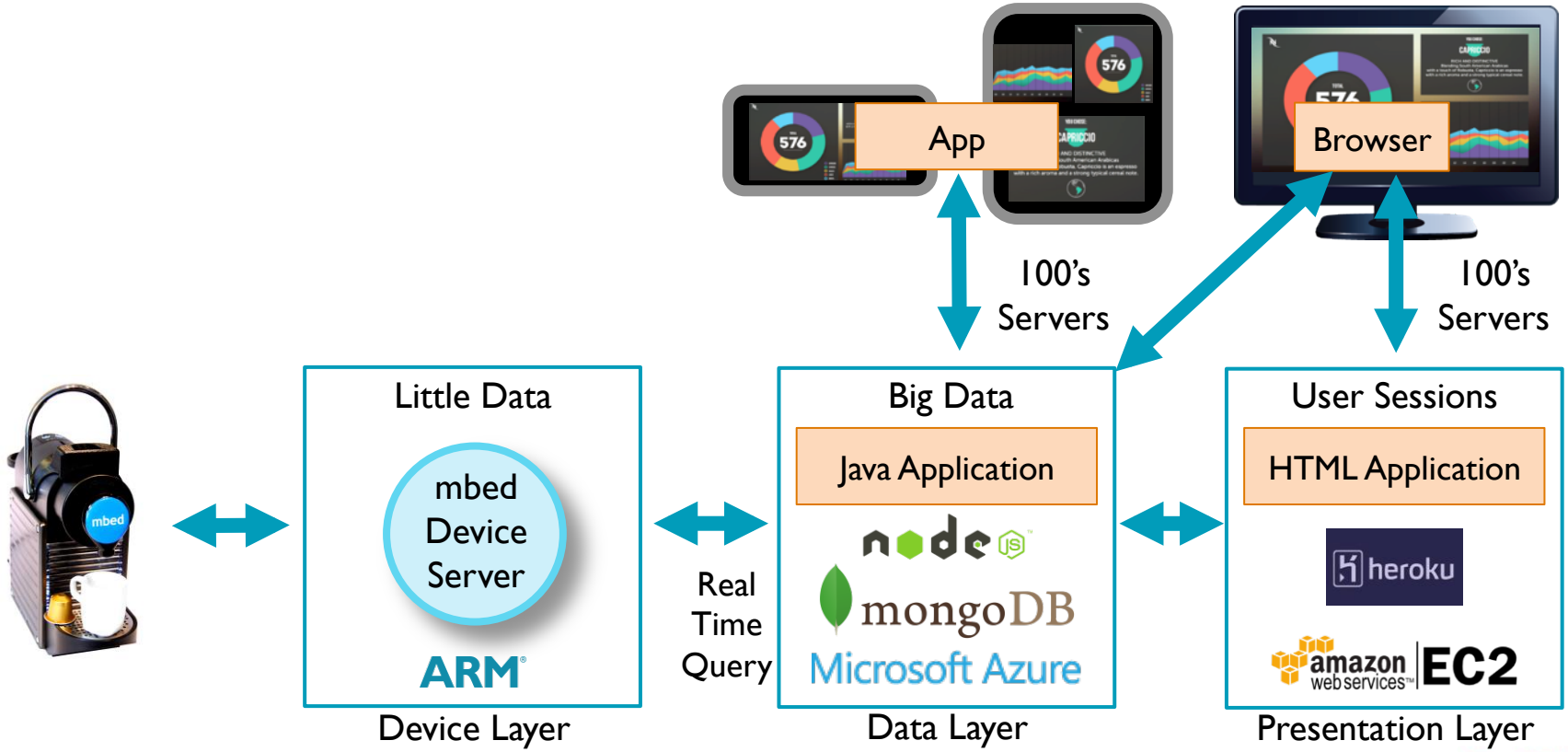
ARM

Toast and Espresso



ARM

Big Data Starts with Little Data



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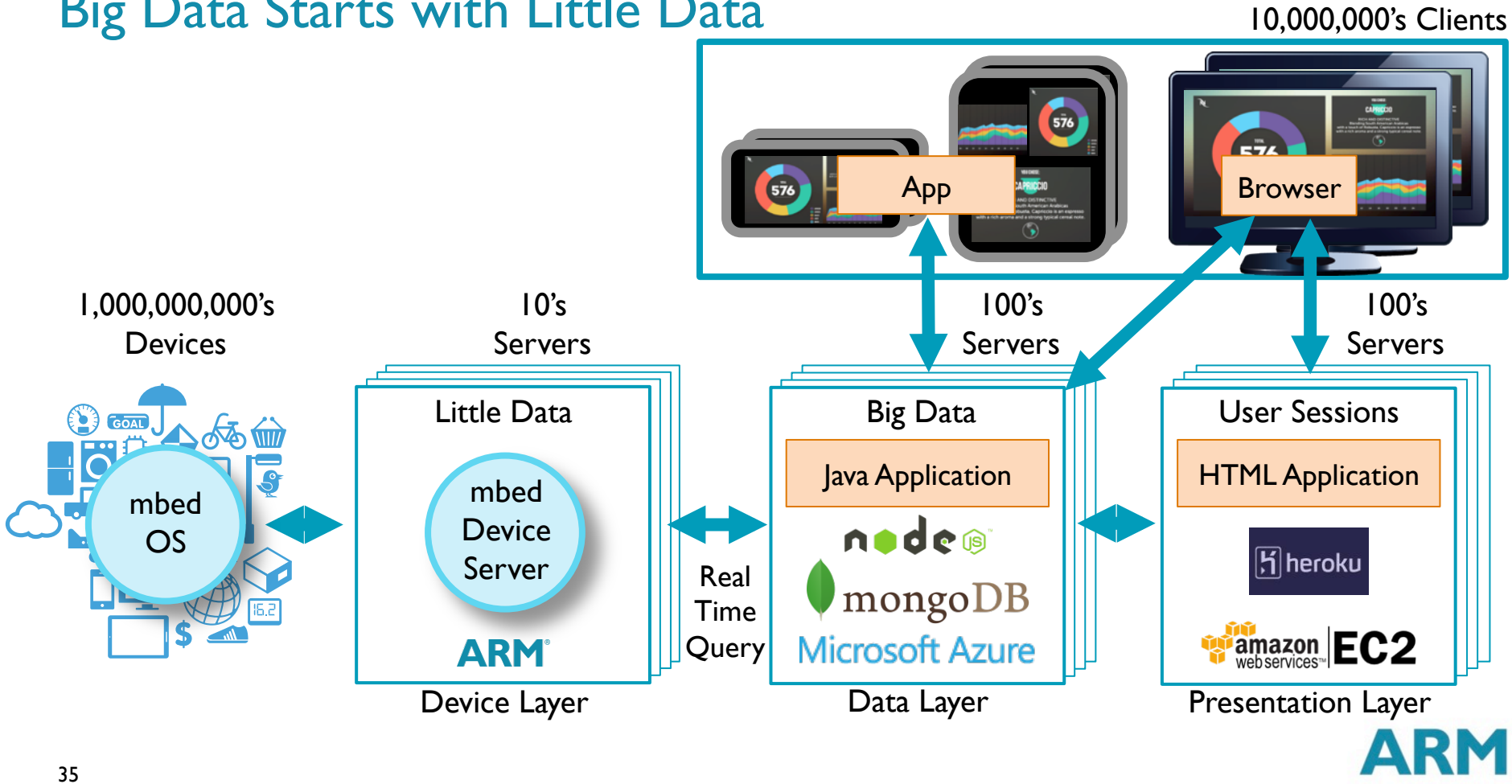

So What Was the Future of IoT?

You

ARM

Learn more!

http://mbed.com
http://coap.technology
http://threadgroup.org
@zach_shelby

ARM