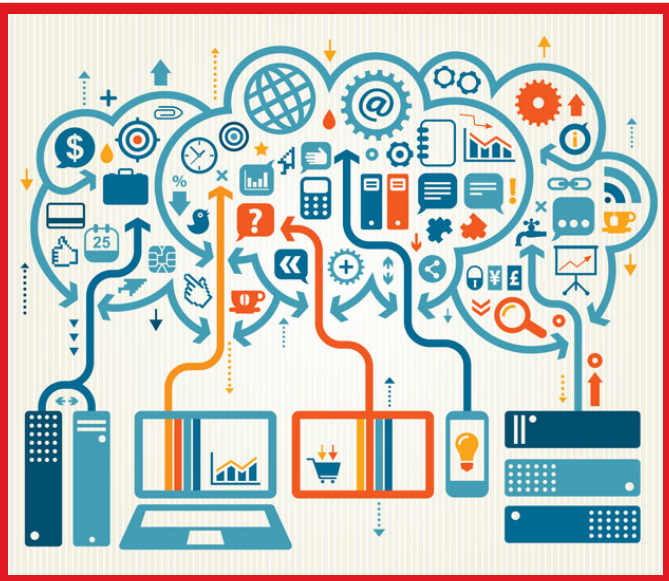


The Internet of Things (IoT) and The IT Pro: What You Need to Future-Proof Your Career

Robin O'Neill
Senior Director, WDLABS at Western Digital

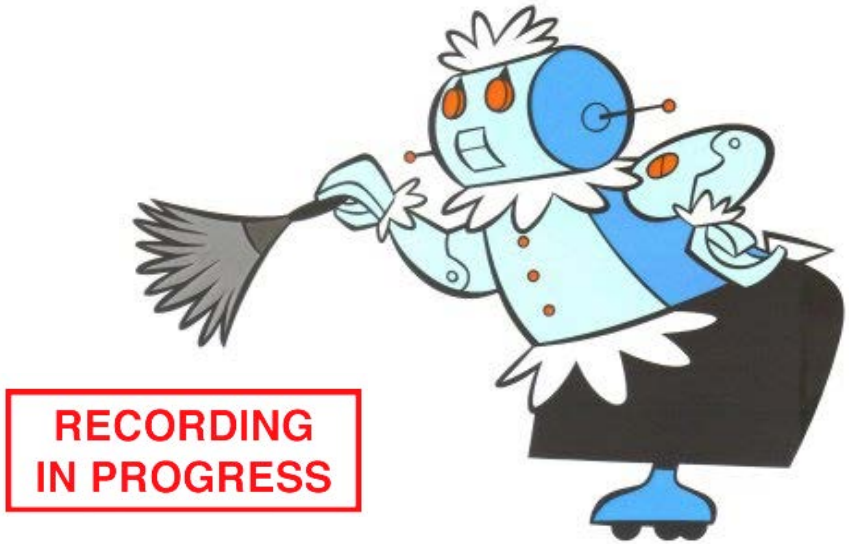
James Stanger, PhD
Senior Director, Products - CompTIA

29 April, 2015

CompTIA

A Little Housekeeping

- ✓ Contact information will be provided at the end of the webinar.
- ✓ You are muted by default, please ask all questions in the Q&A section.
- ✓ This webinar is being recorded.
- ✓ Webinar presentation slides and recording link will be available tomorrow.
- ✓ Please complete **brief survey** at the completion of the webinar.
- ★ (1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: *After the webinar, CompTIA will email verified attendees a participation confirmation along with instructions on how to add the credit to your certification account.*



@CompTIA

#IoT

#FutureProof

#CompTIAWebinar

#CompTIAcertified

Agenda

You're going to learn about the Internet of Things (IoT), including the implications in regards to storage, networking, and security.

Essential **skills you need** to thrive in the world as a producer of **IoT**

A clear understanding of **today's IoT technologies**

Knowledge of the **storage, networking, and sensor technologies** that power the IT

A clear view of the **security implications** of IoT?

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Creating a Security Framework: Your Host

James Stanger

Senior Director, Products

Responsible for determining CompTIA's product roadmap

Authority in:

- open source
- security
- web technologies
- blogging

CompTIA

IoT: Our Guest

Robin O'Neill

Senior Director, WDLABS

at *Western Digital*

Over 30 years in Storage & System Software!

- First SMP Computer System
- First NUMA Computer System
- First Decoupled Loop Pipelining Computer System
- First Symmetric Clustered File System
- Storage & IO System SW Architecture
- UNIX/Linux kernel & Windows kernel development
- Has worked at WD, HP, Polyserve, and Intel

CompTIA is …

The voice of the world's information technology (IT) industry.

- Non-profit: IT Trade Association advancing the global interests of IT professionals and IT channel organizations
- Philanthropy: Creating IT Futures
- Advocacy: TechAmerica
- Provide industry leading credentials and certification:

CompTIA A+

CompTIA Network+

CompTIA Security+

CompTIA CERTMASTER

CompTIA ADVANCED SECURITY PRACTITIONER CASP

Shameless plug… visit **certification.CompTIA.org … check out a free trial of CertMaster!**

CompTIA Certifications – a quick overview

Certs in red – ANSI/ISO certified/US Government 8570

CompTIA Best Practices Certification

IT Fundamentals
CyberSecure

CompTIA Professional Certification

A+
CDIA+
Cloud+
CTT+
Linux+
Mobility+
Network+
Project+
Security+
Server+
Storage+

CompTIA Mastery Certification

CompTIA Advanced Security Practitioner (CASP)

CompTIA Specialty Certification

Cloud Essentials
Mobile App Security+

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

A skills-based look at the CompTIA roadmap

We certify essential skills for the entire IT department / "ecosystem"	
Job role	***Certification***
Help Desk / IT Support Technician / Field Technician	A+
Operating system support	Server+, Linux+
Network technician	Network+
IT / cloud architect	Cloud Essentials, Cloud+
Systems analyst / mobility engineer	Mobility+
Mobile app developer	Mobile App Security+
Security engineer / IA technician	Security+, CASP
Any employee	CyberSecure (Forthcoming)
Project manager	Project+

Overview of IoT

IoT at the high level

Some definition(s)

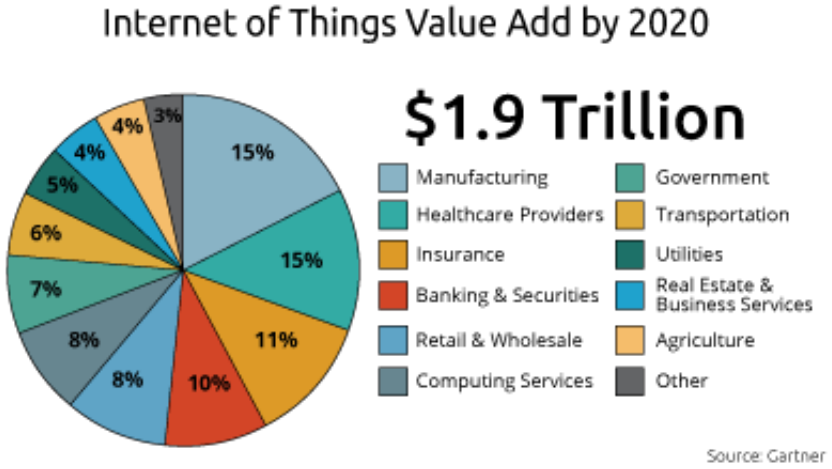
- "A global system of interconnected computer networks, sensors, actuators, and devices"
- Machine-to-machine interaction
- From network-enabled devices to network-enabled lives
- Wearable tech
- "Internet of Everything"

50,000,000,000 connected devices by 2020 – and 12 billion of those will be mobile

Terms

- Sensors, context awareness, and analytics
- Lenses
- In-memory computing
- Mobile workforce – *and at play, too*
- Analytics
- Data volume
- Tiered networking – data hubs, micro-controllers, M2M networks
- Gateways

Additional terms?



Kevin Ashton coined the term "IoT" back in 1999

IoT across segments

- The end user: Wearable tech
- Monitoring and management: Taking SCADA to the next level
  - Environmental infrastructure
  - Energy
  - Grid (e.g., power, infrastructure)
- Smart Cities
- Medical and healthcare systems
- Building and home automation
- Transportation: Planes, trains and automobiles

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

What are the IoT “killer apps”

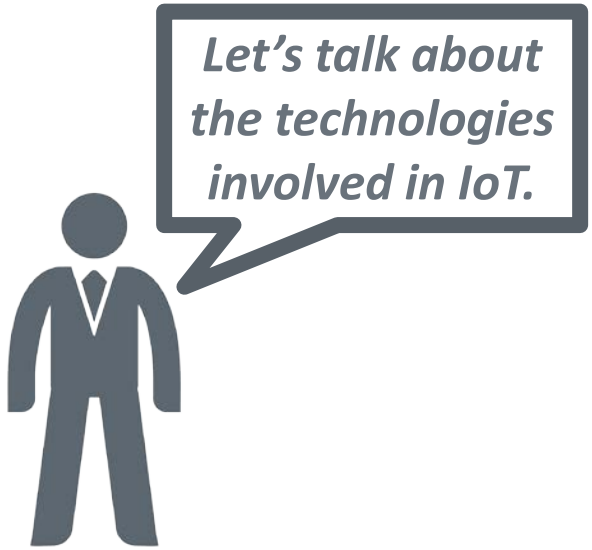
What is going to compel the user & business to really embrace IoT?

- Convenience?
  - Netflix predictions?
  - Devices will inform you about imminent failures and will self-heal?
- Safety/Liability?
- Health and Fitness?

Is there a specific device or set of devices?

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Major IoT technologies



Storage

Device-level = Flash

Gateways & Hubs = Flash/HDD

Cloud = HDD Datacenters

Networking

Device: Wireless Mesh

Edge: Gateways & Hubs

Cloud: Internet

Analytics

Edge Data

Big Data

Programming

Embedded Devices

Edge Gateways & Hubs

Edge & Cloud Analytics

Where does the data go?

- Local Data Hubs
- Regional Datacenters
- Cloud Datacenters

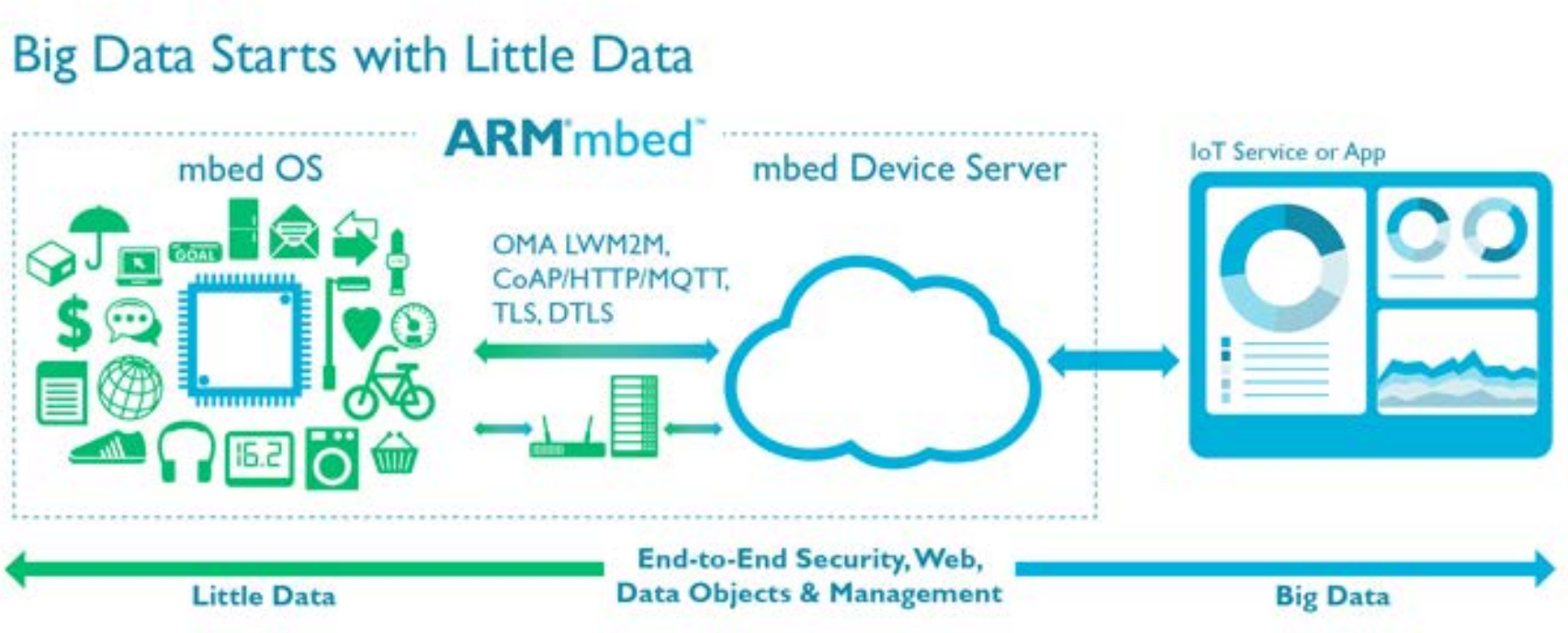
How are databases changing

- Today: Relational (Oracle, etc.)
- Tomorrow: Non-Relational (MongoDB, Informix)

Where does the Web fit in?

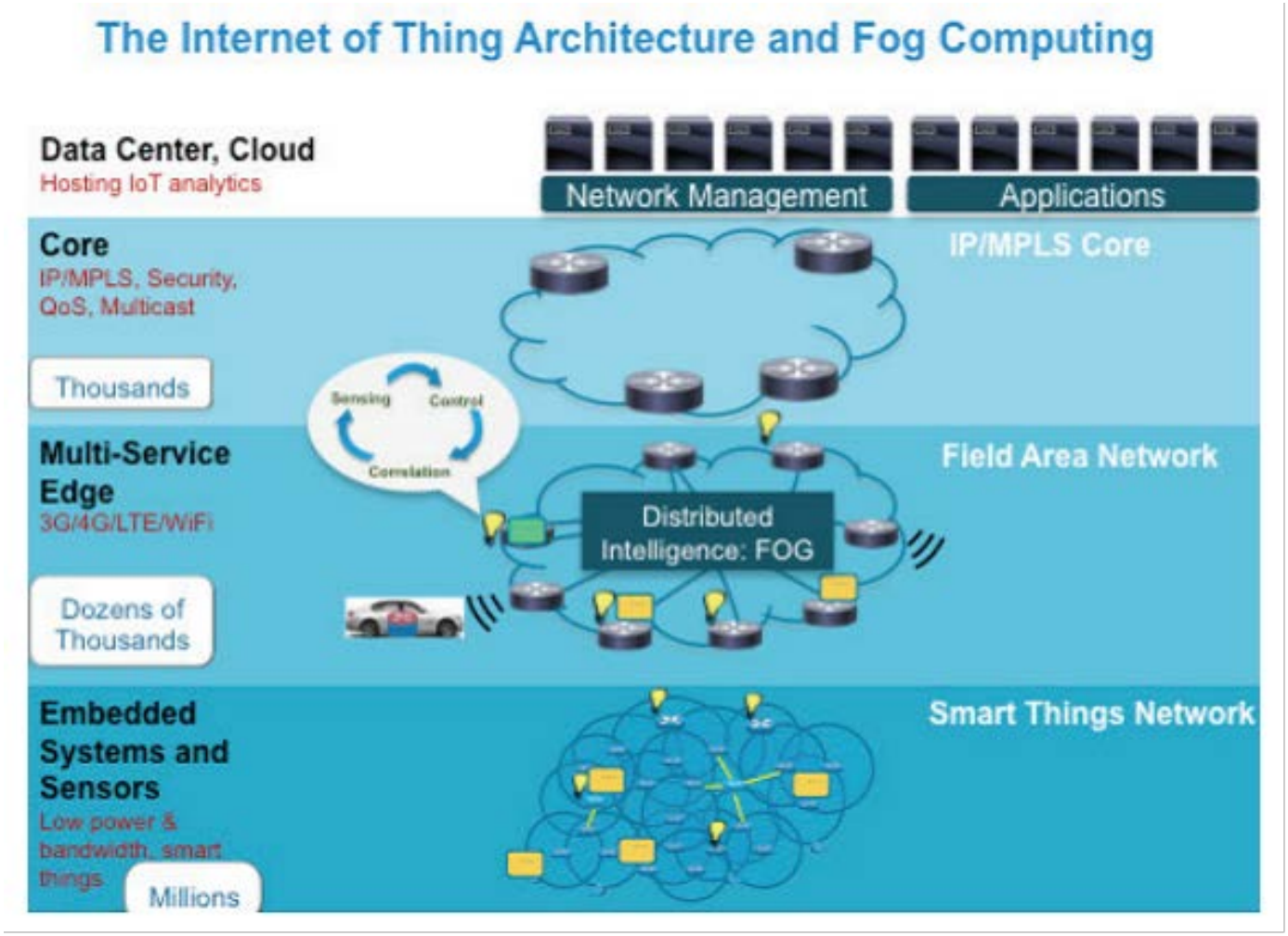
Perspectives on IoT – Each company has its own view of the IOT

ARM's View – The Device

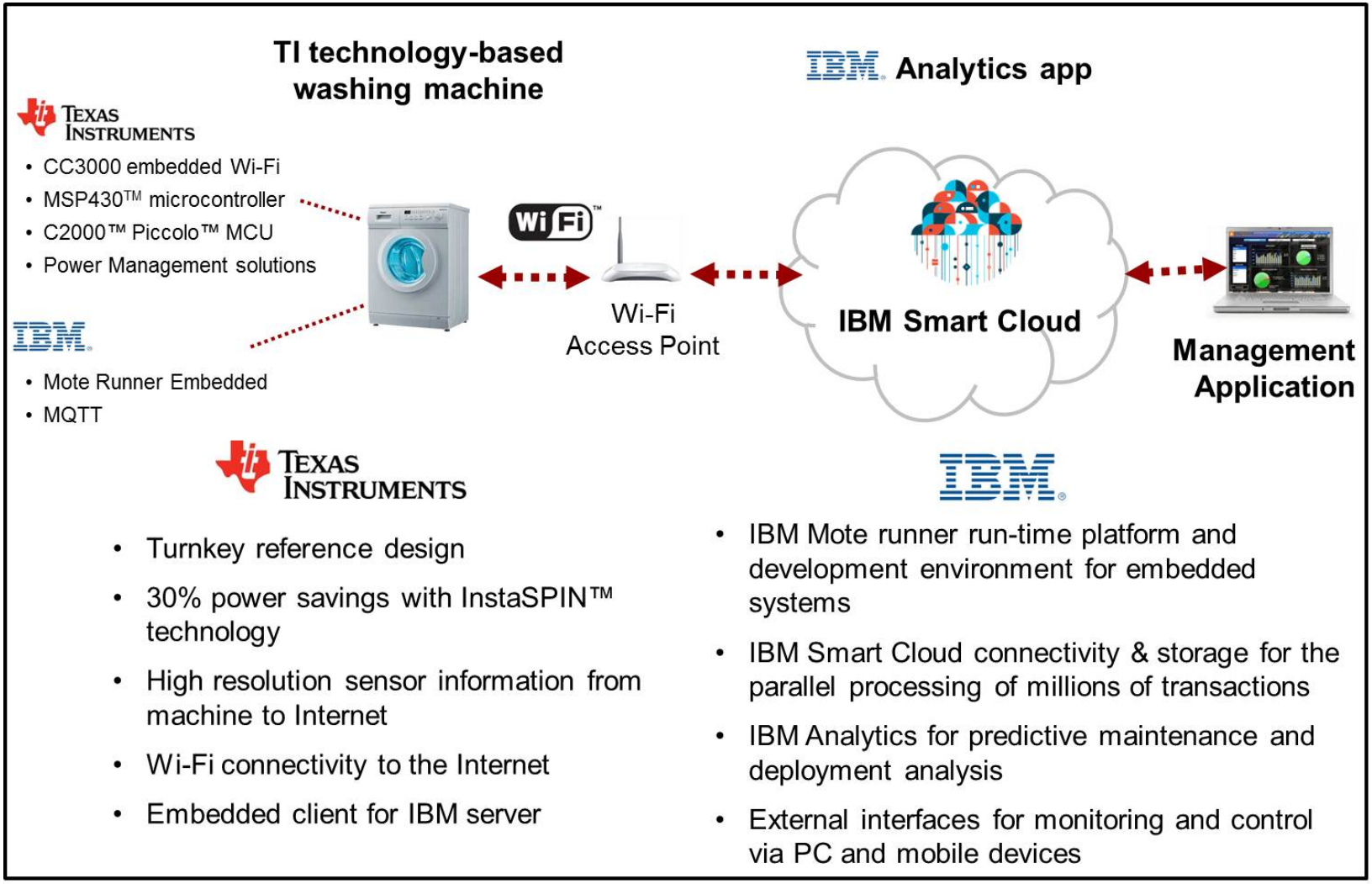


PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Cisco's View – The Network



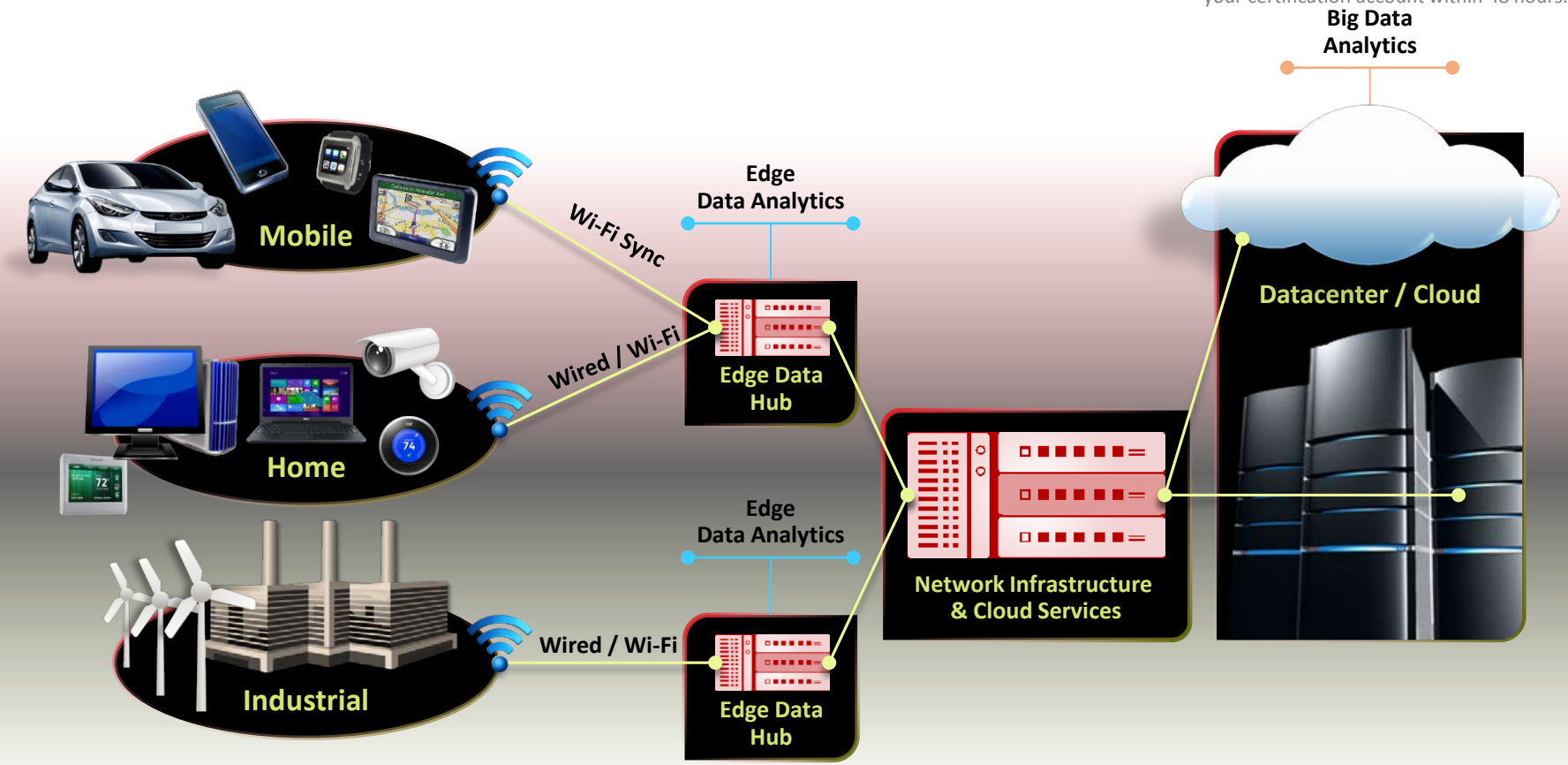
IBM's View – The Cloud



WD's View – The Data

INTERNET of THINGS (IOT)

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.



IOT Gold Rush

IOT Infrastructure

- Sensors
- Micro-controllers
- M2M networks
- Gateways
- Data Hubs

Data Analytics

- Compelling Insights, Predictions, Decisions
- Home Intelligence
- Business Intelligence
- Industrial Intelligence
- Data = Value
  - Compelling reasons to store & retain data previously discarded

An IOT Thesis – Data is Like Water

Cloud
"Big Data"

Regional Cloud
"Regional Data"

Edge
"Private Data"

IOT → Connectivity → Explosion of Data Sources

- Sensors, M2M, Lenses, Cellular, Fitness/Health Monitoring, Environmental, Industrial

Data + Analytics = Value

- Compelling Insights, Predictions, Decisions
- Compelling reasons to store & retain data previously ignored/discarded
- Business, Commercial, Healthcare, Industrial, SMB, Home

Ponds + Lakes + Oceans

- Move the analytics to the data, not the data to the analytics
- Local Data Privacy > Cloud Data Privacy (Anthem, Target, Google)

Some IOT Segments

- Smart Buildings
- Energy
- Consumer & Home
- Healthcare & Life Sciences
- Industrial
- Transportation
- Retail
- Security / Public Safety
- IT & Networks

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Surveillance

Lenses are becoming Ubiquitous

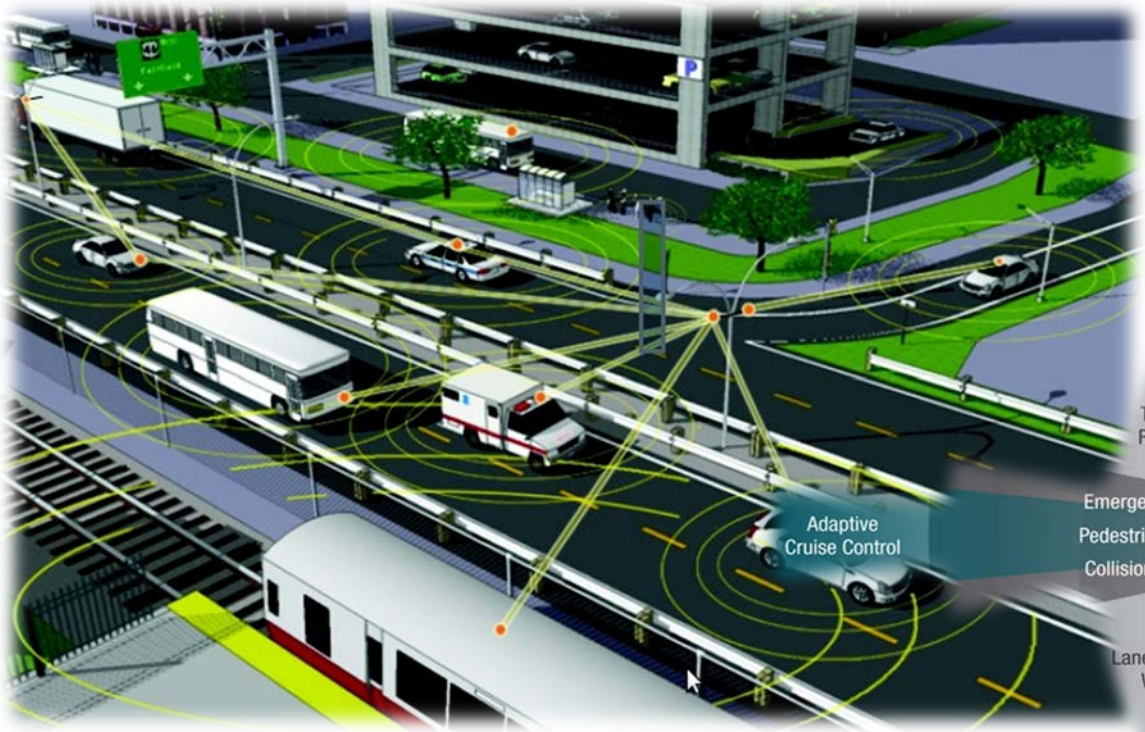
Expansion Driven by Liability Protection

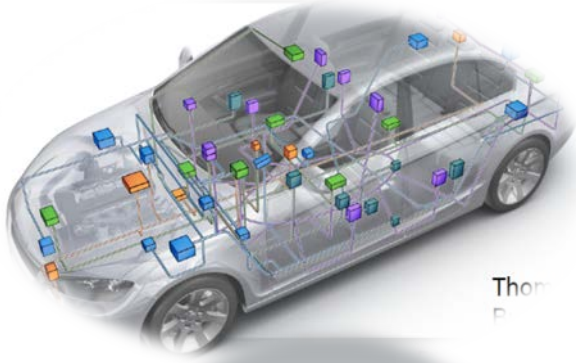
Cars start to use Ethernet (for cameras)

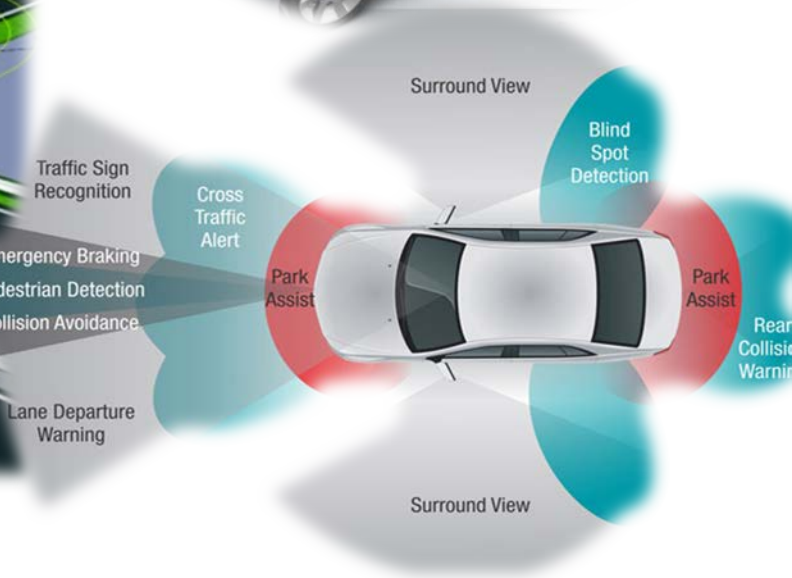
CONNECTED CARS

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

CONNECTED CARS



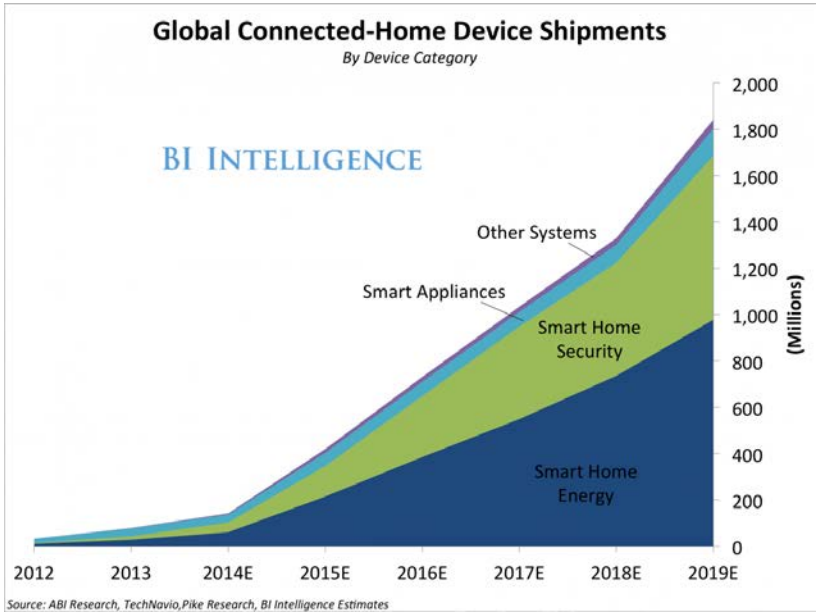


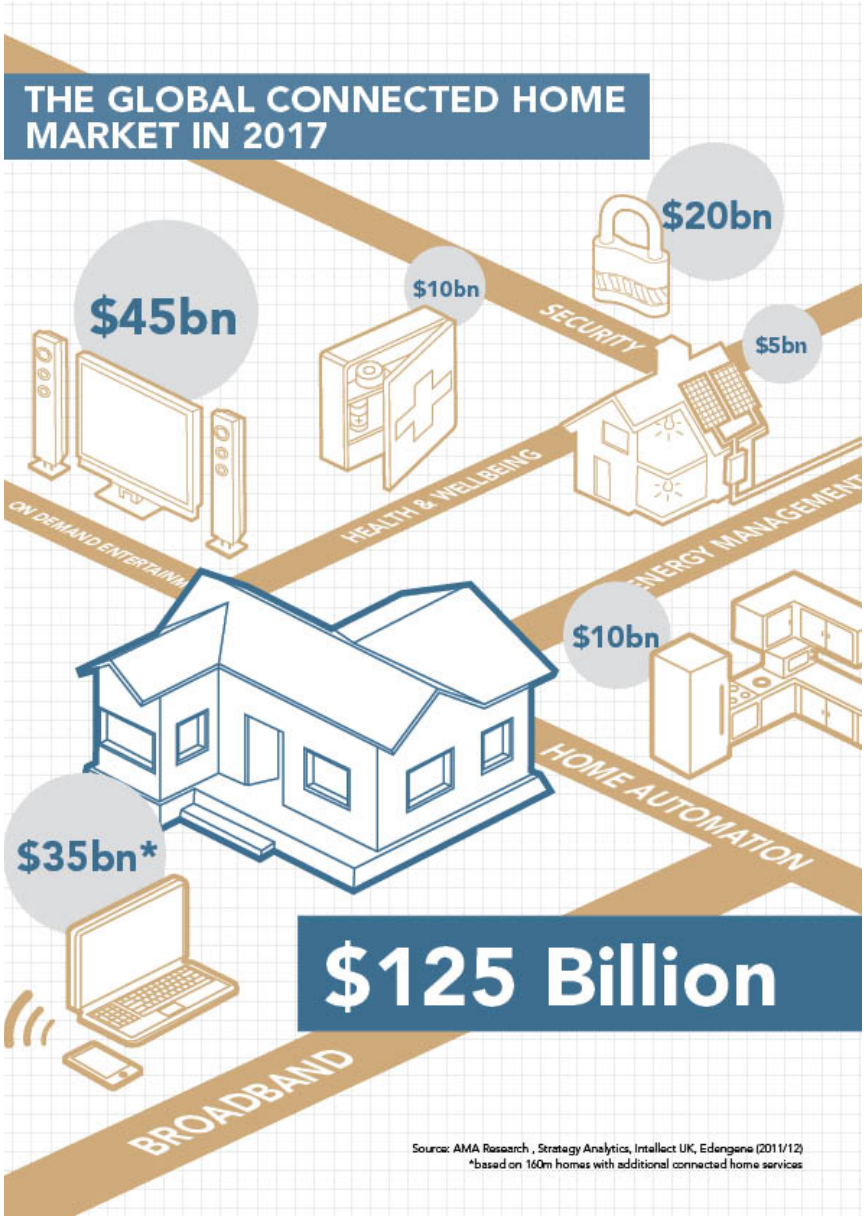


Example: Retail – heat map

Example: Connected Home

- Home Security & Video Analytics
- Home Energy Management
- Home Automation & Remote Control
- Home Entertainment
- Personal Health Monitoring
- Automotive Phone-Home
- Smart Appliances





Example: Industrial APC

Process Levels

- Assembly Control Loops
- Fault Detection & Preventive Maintenance
- Post Assembly Analytics

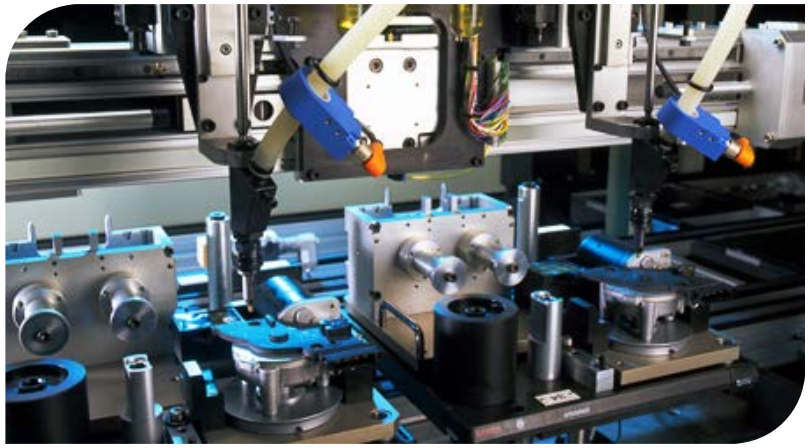
~20 Cells Per Line

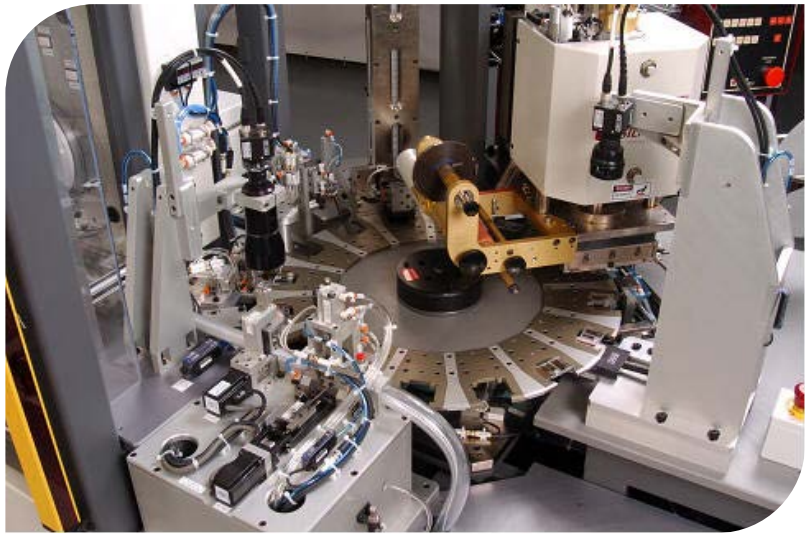
>100GB Per Cell Per Day

Serial # Database for later diagnostic correlation

Future

- Environmental Correlations
- Inter-cell coordination (FF/FB)





PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Example: Air Transportation

Internet of things will create a wide range of opportunities and challenges for airline

"Boeing 787s to create half a terabyte of data per flight, says Virgin Atlantic"

--ComputerWorldUK

What are the implications of the amount of connectivity implied by the IoT?

- *Including security and customer support*

Security and IoT

In this type of connected world, what are the implications of the next mass worm, virus, or botnet?

Technologies

- Encryption – doesn't IoT demand this? But what about overhead?
- How does IoT help security workers today?

Techniques for securing IoT: How does IoT help security workers?

- Analytics and big data
- Sifting through the information

Security and IoT (continued)

What are the security implications of things such as wearable tech?

- How "smart" will devices get at helping you with security?
- What about social engineering?

Attacks – how to prevent and stop? Where is the "off" button?

- DOS / DDOS and how they will happen: The implications for IoT
- Distributed storage of illicit material on your devices

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Some “Wireless Mesh Network” Security Issues

Physical Layer

- RF Jamming (no more network camera video)

Link Layer

- Passive Eavesdropping (“store” and forward-or-not nodes)
- DDOS Jamming (intentional frame collisions)
- MAC Address Spoofing (device impersonation)

Transport/Session Layer

- SYN Attack (TCP “half-open” connections, resource exhaustion)
- De-synchronization (causing retransmission of “missed” frames)
- Session hijacking (TCP ack storm)

Application Layer

- Introduction of Viruses and Worms via TCP/UDP application port interfaces
- Sophisticated Worms & Viruses can spread rapidly in a WMN

Privacy and IoT

With all of this data gathered and analyzed, what can be done with it?

- Predictive analytics
- Typical conclusions

What can companies, governments and organizations ethically do?

What if data gets stolen? What about the right to be forgotten? Will there be a right to be unhacked?

Supporting IoT

What will the service desk and help desk support issues look like?

What will the typical issues look like?

Will techs know about issues before the users notice?

Can these things really take care of themselves?

What will the tech need to know?

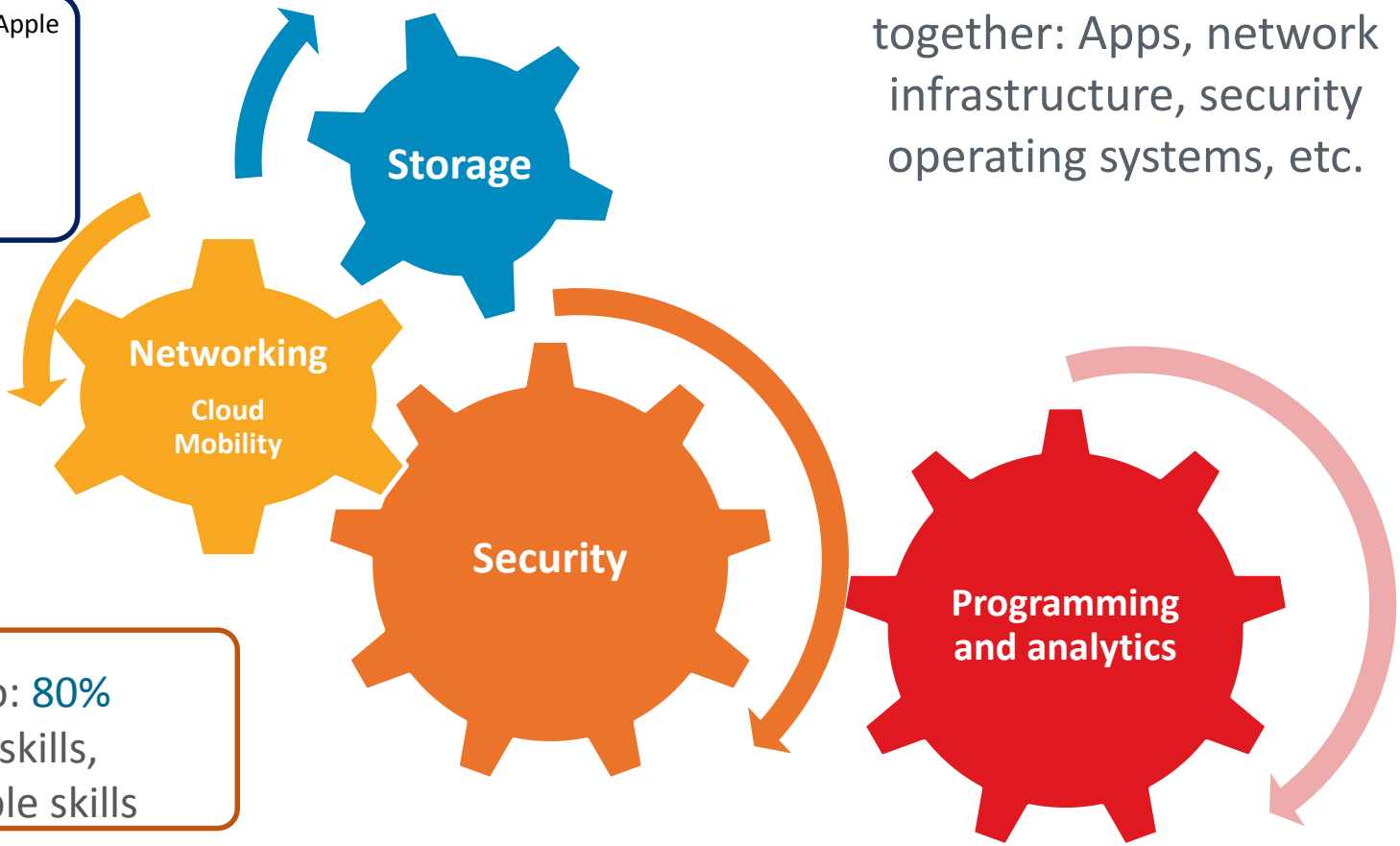
What skills do workers need to support IoT?

Essential IoT skills for today and tomorrow

Robin's workers need:

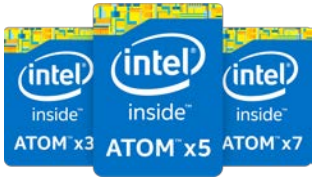
- Mobility – Android and Apple
- Database
- Programming
- Embedded Systems
- Windows, Linux
- Storage

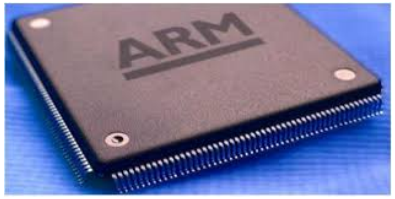
The ability to understand how different systems work together: Apps, network infrastructure, security operating systems, etc.

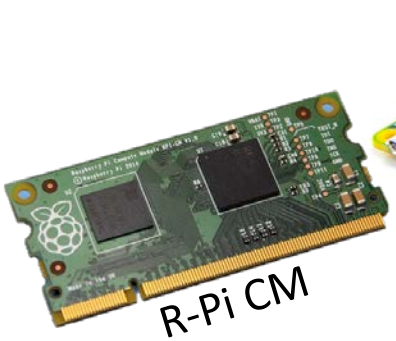


Skills ratio: 80% technical skills, 20% people skills

IOT Embedded Systems – SOCs & SBCs






R-Pi CM

R-Pi 2

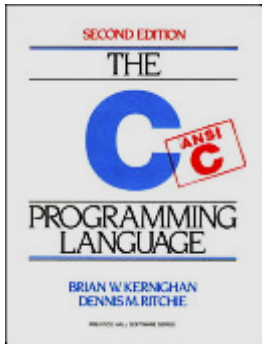
Arduino

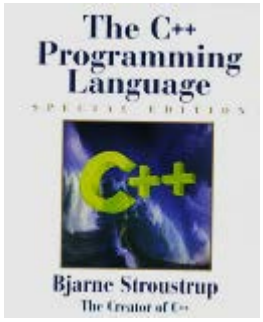

Intel NUC

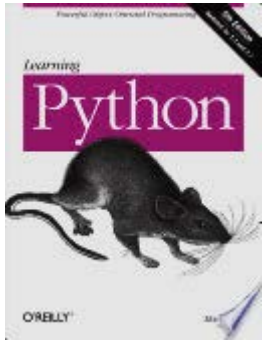
IOT Embedded Development Environments

Containers

Linux

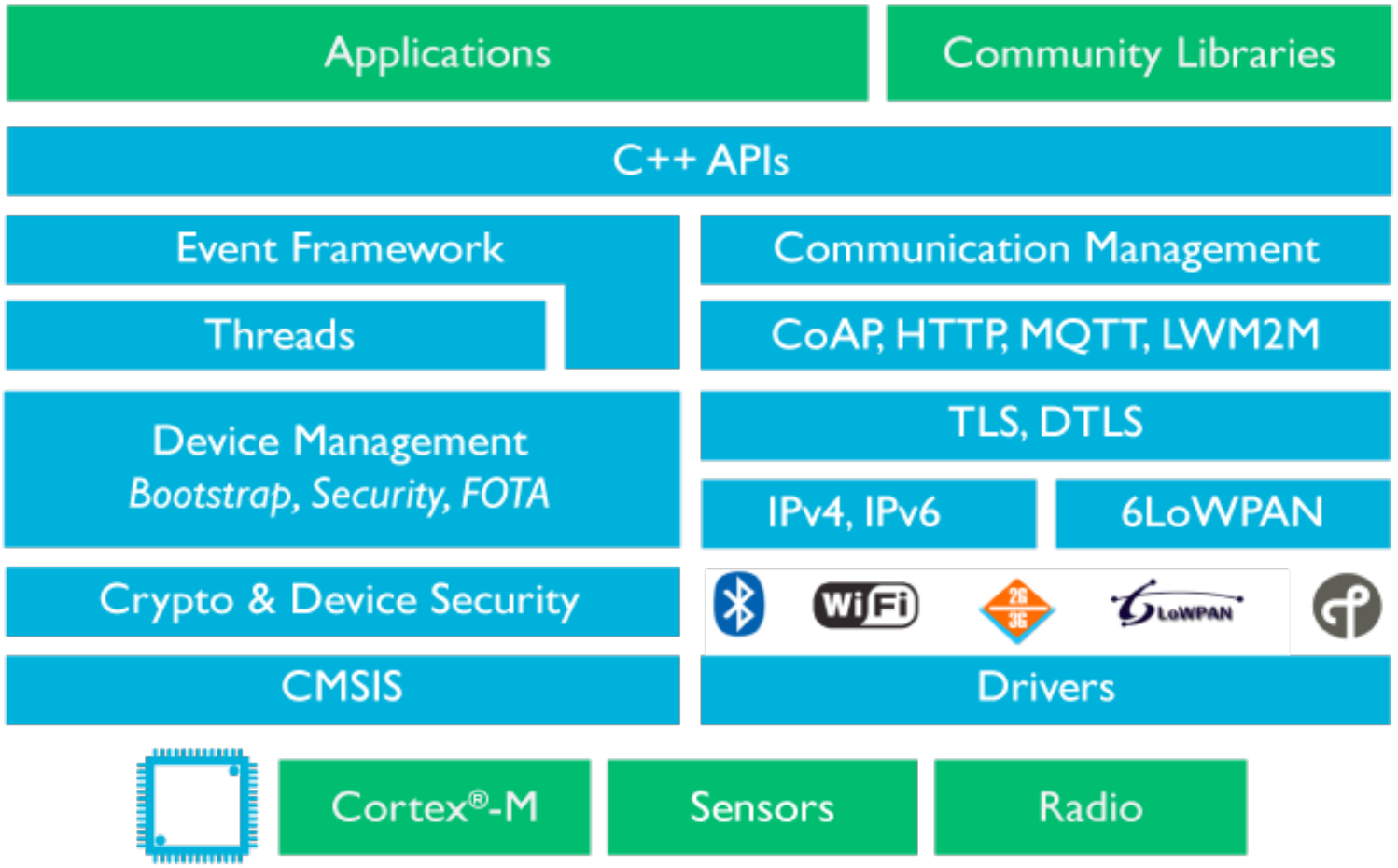




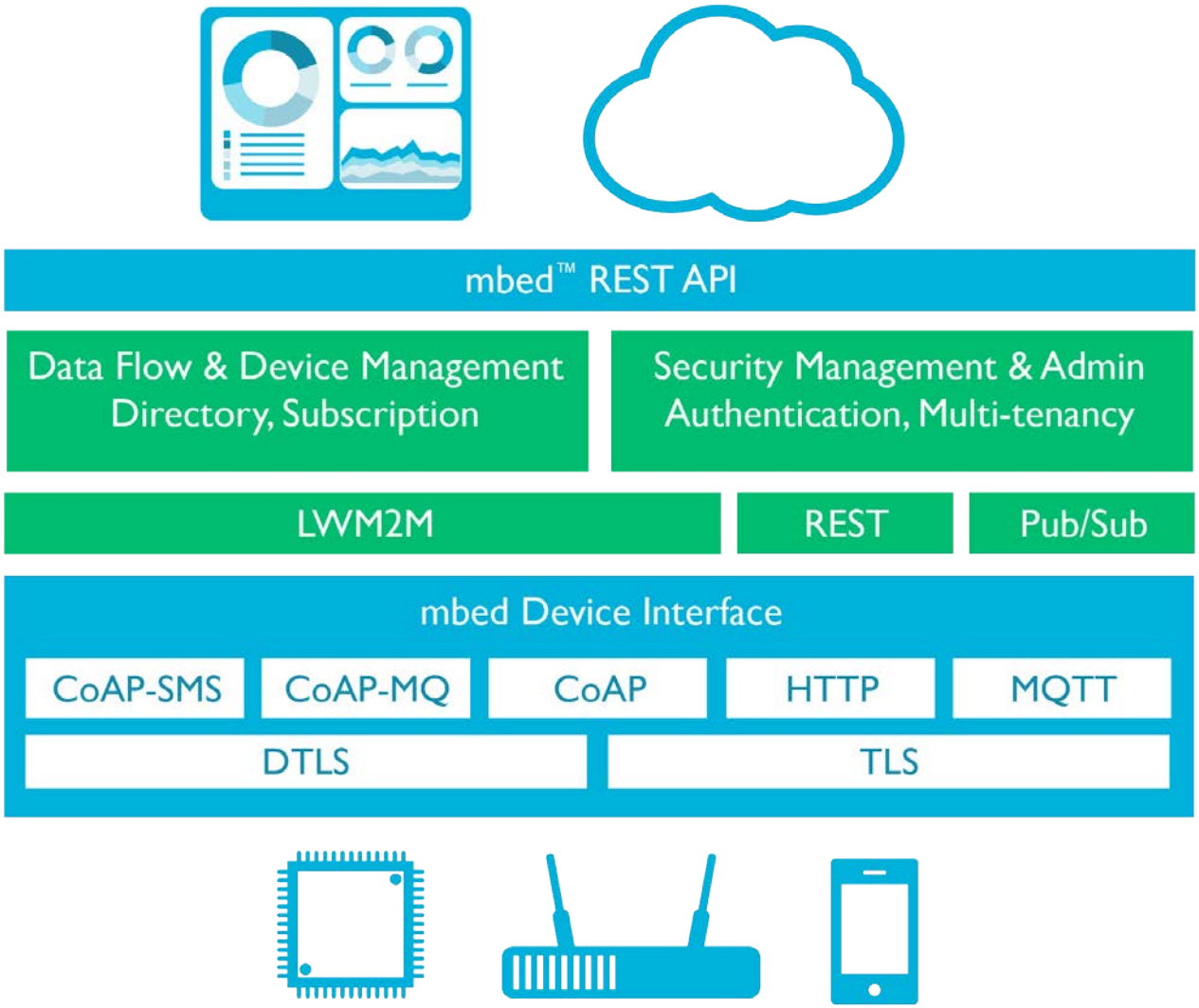


JSON

ARM mbed OS – for IOT Devices

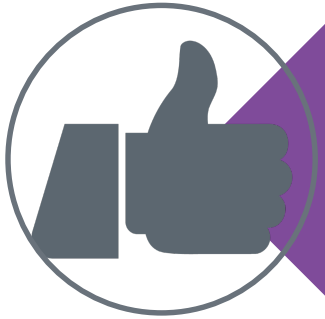


ARM mbed Device Server – for Gateways & Data Hubs



And now for some (seemingly) random "lightning round" questions

Some questions . . .



What excites you the most about IoT in the future?

What scares you the most?

- What it can do?
- What people will do with the data?
- What it won't be able to do?
- Shortage of skilled people?

What is the best way to get "skilled up" for IoT?

Summary

Today, we talked about:

- A hands-on look into Robin's world
- Overview of IoT
  - The primary technologies
  - Storage, sensors, networking – and more
- Implications of IoT
- The new "mobility, and the new "cloud:"
- Practical uses of IoT: From data analytics to security
- Skills we need for tomorrow

QUESTIONS?

James Stanger
jstanger@comptia.org
Skype: stangernet

Robin O'Neill
Robin.oneill@wdc.com

To learn more about our next Webinars, please go to the following URL:
www.CompTIA.org/Events/Webinars

Thank you!

Next Webinar

Conducting a security audit

- You will learn about:
  - The hacker process
  - Prioritizing resources
  - Identifying threats
  - Mapping security processes and technologies to business goals
  - Creating a report

- TBA: July 2015
- We would like your input: What topics would you like to hear about? Tell us your suggestions in the Survey comments!

Additional notes

Getting a bit deeper into IoT: The good, the bad, and the ugly

Storage and IoT – Now & the Future

Hardware & software innovations, barrier and workarounds

What capacities are needed to accommodate IoT?

How does storage work in wearable technology?

- Stateless storage and beyond?
- "Back end" storage?

Where does all the data go?

- Who manages it?
- What do the devices look like?

Who is responsible for securing this data?

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

Networking – innovations and necessary changes

- New networking technologies will be necessary to accommodate all of the data
- Technologies can include:
  - Software Defined Networking (SDN)
  - Innovations in network-attached storage
  - Addressing: IPv4 and IPv6
- Network congestion: Innovations and techniques, including 10G
- What about Internet backbone issues?

Analytics

Imagine the amount of data that will be culled from billions of devices that we use at work and play.

How do you store all of it?

How do you turn all of this data into actionable information?

Techniques and tools

Analytics and "big data"

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

The new “mobility, and the new “cloud:” What will it look like 5 years from now?

The new mobility

What will we see that will make the latest Apple devices look sick?

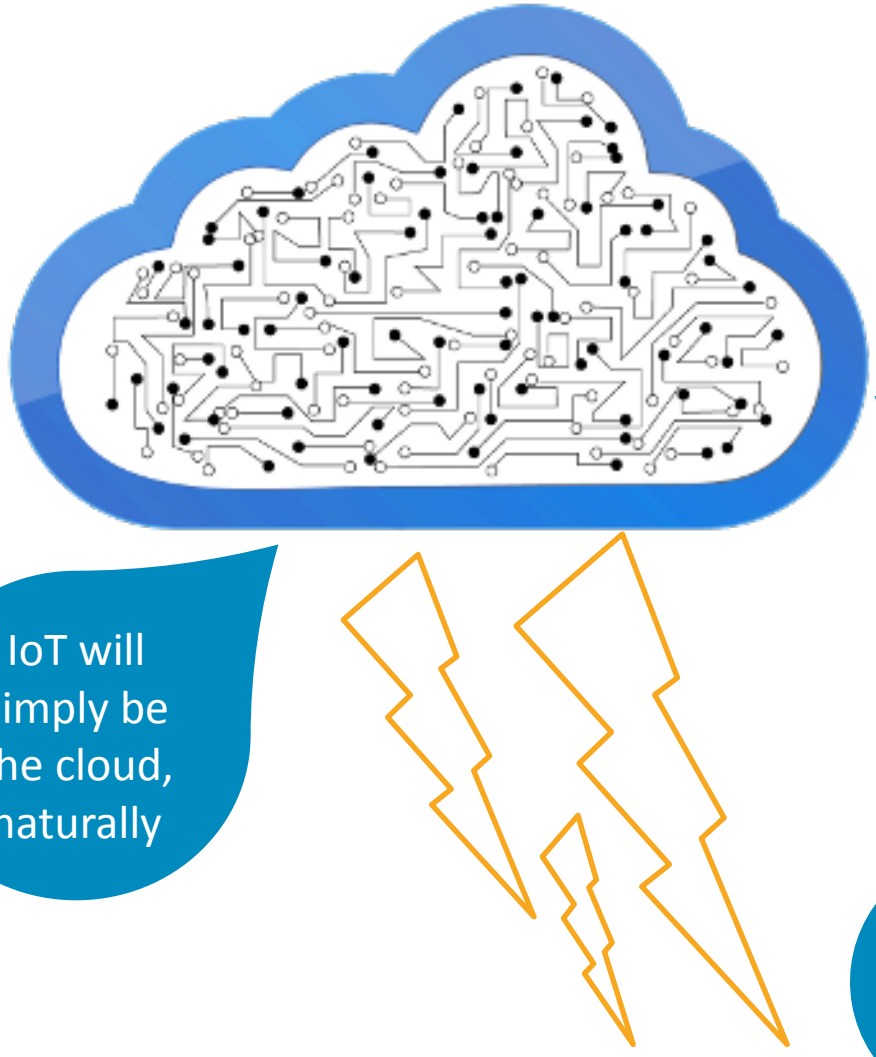
- Mobility and wearable tech
- How sensors will work?

Will devices be able to store locally when network connectivity is down, then transmit when connectivity is restored?

- WiFi?
- Mobile towers
- Additional tech (satellite?)

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.

What will “the cloud” look like in the IoT world?



IoT will simply be the cloud, naturally

How the cloud will be used:

“The cloud” as back-end services

“The cloud” as portable services, including storage

What is happening at Western Digital?

Western Digital®

- Let's talk about the latest news and innovations at Western Digital Labs
  - Storage
  - Networking technologies
  - Analytics
- What additional technologies?

PLEASE NOTE:
(1) CEU credit towards A+, Net+, Sec+, Storage+, and CASP: You will receive a confirmation email along with instructions on how to add the credit to your certification account within 48 hours.