Internet of Things (IoT)

Speakers

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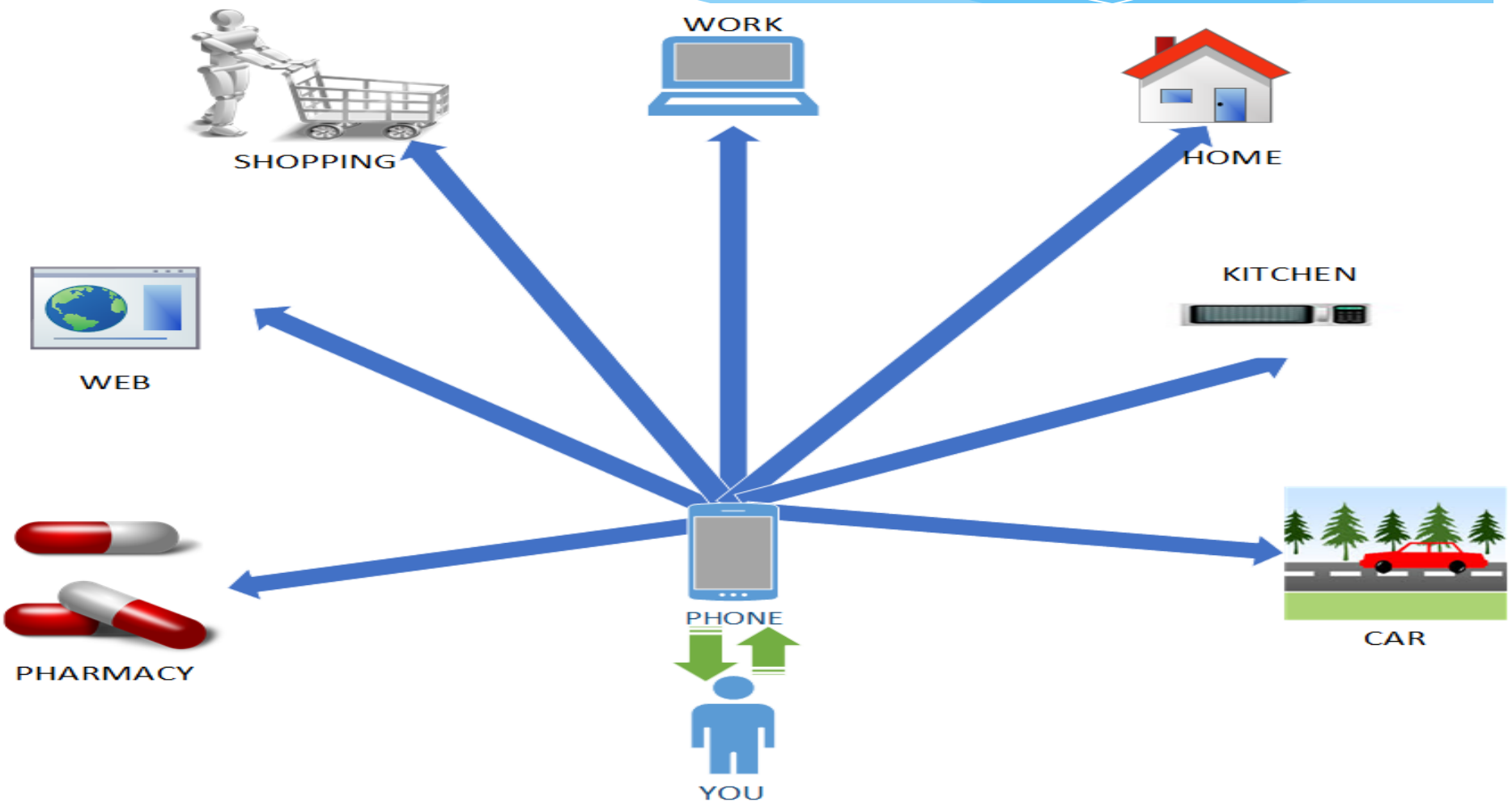
Introduction

- Internet of Things was first coined by Kevin Ashton in 1999.
- Internet of Things is a network of devices, “things” or objects embedded with sensors, software and electronics.
- Cisco estimates IoT could generate a revenue of $19 Trillion.

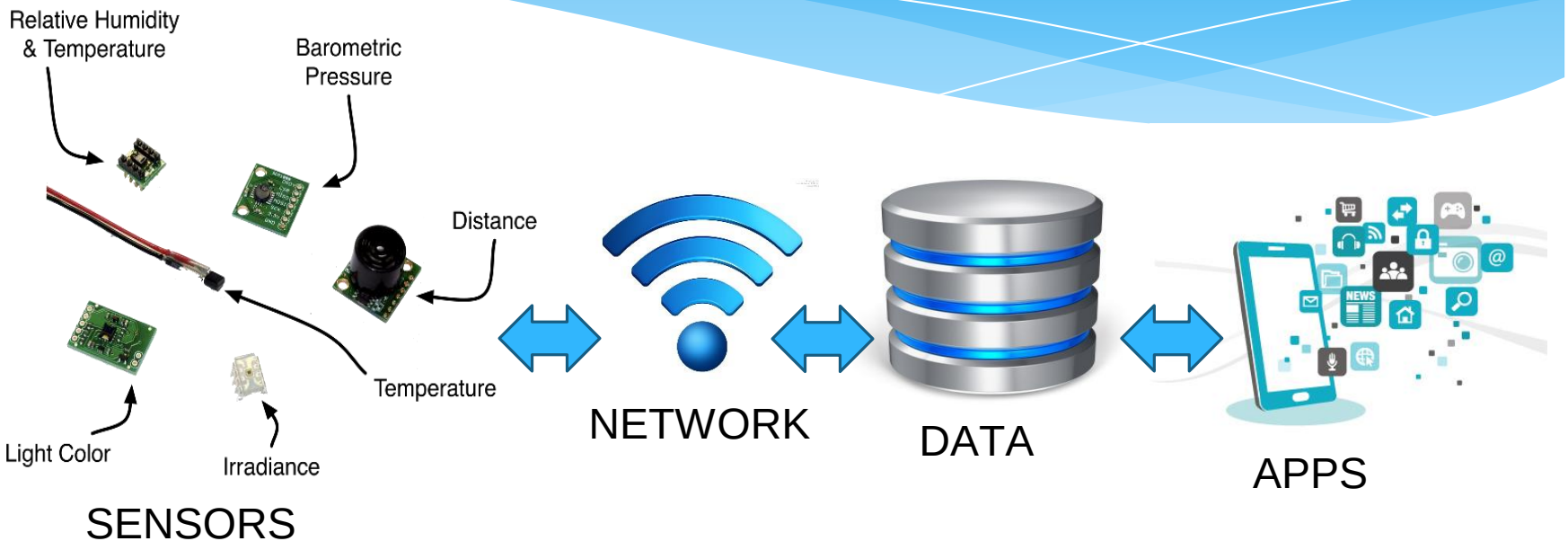
IoT



Applications of IoT

- Smart Cities
- Smart Homes
- Smart Businesses
- Smart Agriculture

How IoT Works



Images: www.google.com/images

Benefits of IoT

* New Operational Efficiencies
* Improved Safety and Security
* Distributed Intelligence and Control
* Faster and Better Decision Making
* New Business Opportunities and Revenue Streams

Src: http://www.cisco.com/web/solutions/trends/iot/why.html


GM


JOHN DEERE


BOSCH


Honeywell


Medtronic


Ford


GE

IoT opportunities in consulting

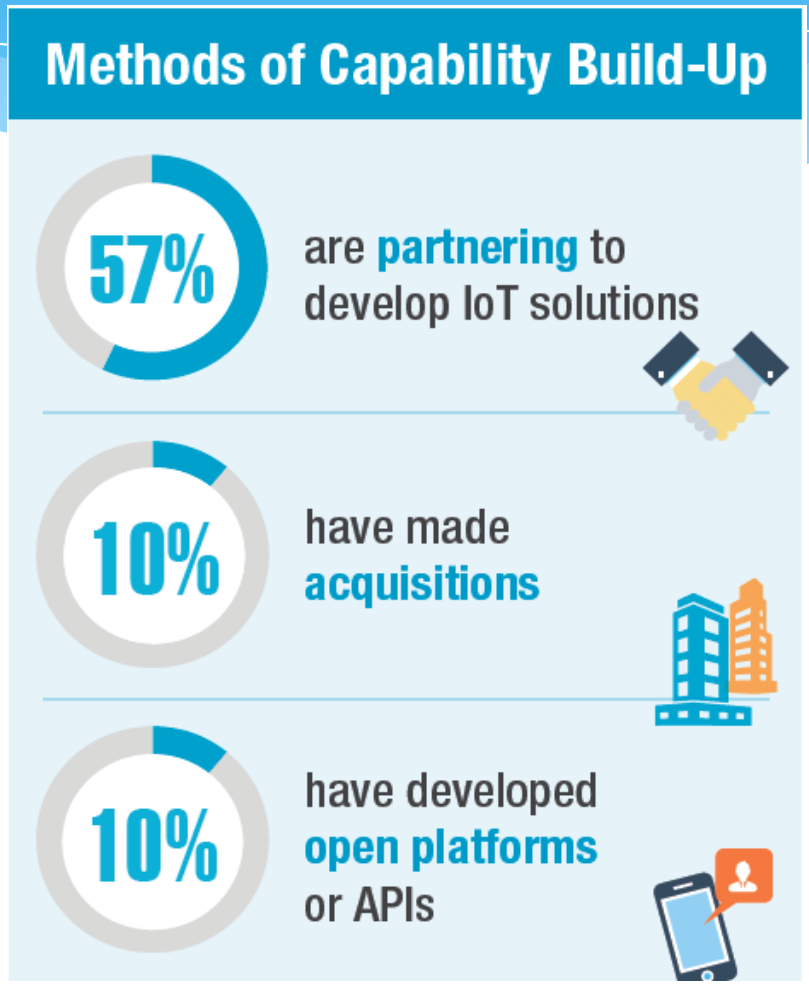
* Many of the companies are still in early days of IoT adoption.

Source: Capgemini

* Many companies do not monetize their IoT solutions.

Source: Capgemini

* Integration of IoT solutions with third party services.
* Many options lie unexplored in IoT



Source: Capgemini

Source: Honeywell

Source: Cardiocom

Why Companies have been slow in adopting IoT

The Internet of Things creates significant Technical Challenges

- Existing IT Infrastructure is not suited to manage rapidly growing volumes of Sensor Data
- Organizations lack Real-Time Data Analytics Technologies critical to drawing insights from IoT
- The IoT magnifies data security and privacy challenges

Source: Capgemini

Organizations Need New Skill Sets across a Range of Functions

- Organizations lack capabilities in Developing and Marketing Internet of Things Services
- Sales Force is not equipped to sell IoT Services
- IoT places new demands on Customer Support Capabilities

Source: Capgemini

Building a Successful IoT Solution

Sales:

- Train members of the sales force on the benefits of IoT solutions
- Encourage the promotion of IoT solutions
- Change from a product-oriented to a service-oriented mindset

Product Management:

- Recruit employees with experience in service businesses
- Push for the adoption of IoT solutions by focusing on ease-of-use during development

Customer Support:

- Create teams specifically for IoT support

Source: Capgemini

IoT Hardware

Arduino

- Sensors :
  - Temperature
  - Humidity
  - Touch
  - Range
  - Sound
  - LED
  - Bluetooth

IoT Hardware

Raspberry

- Raspberry pi1 and pi2
- Raspberry model A+
- Raspberry model B+

IoT Hardware

Texas Instruments

- Microcontroller (MCUs)
  - Low Power MCU
  - Performance MCUs
  - Wireless MCUs

IoT Hardware

Intel

- Pentium Pro
- Edison platform - DIY/hobbyist projects, education and prototyping.

IoT Hardware

Freescale

- Manufactures chips such as MCUs and sensors.
- Single Chip Modules, which is ultra small in size and designed to function as a computer chip.

IoT Hardware

Seedstudio

- Iterates to multiple pieces based on user designs
- Mostly based on Arduino and Raspberry
- Also manufactures sensors

IoT Software

Operating Systems:

* Arduino IDE
* Raspberry Pi 2
* Brillo
* BlueMix and Cloud Foundry
* Ignite
* ARTIK

IoT Software (cont'd)

* Arduino IDE
  * Open source, electronic prototyping platform
  * Uses AVR, C, and C++ languages, which means writing functions is seamless
  * External computer required
* Raspberry Pi 2
  * Software built into hardware (mini-computer)
  * Languages: Scratch, C, C++, Java, and Ruby
  * Function can be found online

IoT Software (cont'd)

* Bluemix and Cloud Foundry (IBM IoT Software Platform)
  * Allows you to tap into a growing ecosystem of runtime, frameworks and services
  * Dashboard
  * Commonly used runtimes: Node.js, PHP, Python, Ruby, Go
* Brillo (Google's IoT Software Platoform)
* aDerived from Android (but on a lower layer)
* Can support Wi-Fi, Bluetooth Low Energy, and other Android things
* Weave

IoT Software (cont'd)

* Ignite (Microsoft Iot Software Platform)
  * Microsoft plans to have one app that goes across all devices
  * Devices already in the field will be easier to reconfigure with the new Windows 10 software
* ARTIK (Samsung IoT Software Platform)
  * Open platform which can connect hardware modules through Wi-Fi, Bluetooth, and Zigbee (high-level communication protocols and PAN)
  * Samsung's hardware is Arduino-certified
  * Secure Element

IoT Security

* Largest issue with IoT = security
* Few companies in the Industry have working security platforms
* Security must be integrated in functionality (as opposed to being an add-on)
* Mitigation of threats

IoT Security

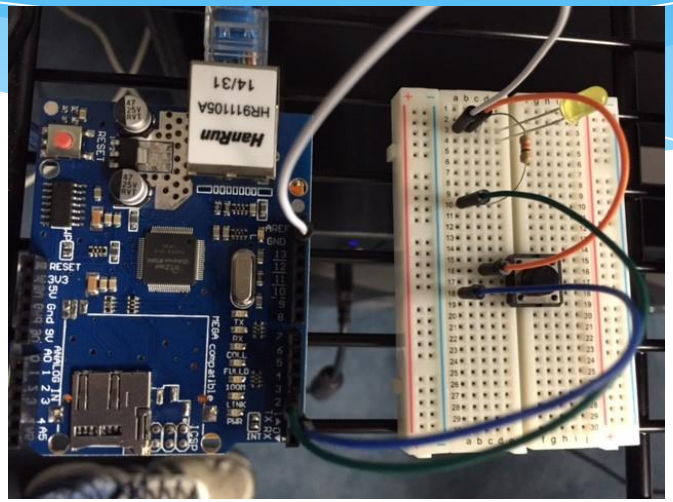
* Data Security
  * Data Encryption
  * SSL (Secure Sockets Layer)
  * Isolate and Segregate Sensitive Data
* System and Server Security
  * Firewalls
  * SSH (Secure Shell)
  * Private Networking
  * VPN (Virtual Private Network)

IoT Examples

pi@raspberrypi: ~

File Edit Tabs Help

```
pi@raspberrypi ~ $ mosquitto_sub -h 192.168.1.249 -t "monitor"
sound_and_led_client connected
```



pi@raspberrypi: ~

File Edit Tabs Help

```
pi@raspberrypi ~ $ mosquitto_sub -h 192.168.1.249 -t "sensor"
270
229
267
263
221
302
564
572
```

pi@raspberrypi: ~

File Edit Tabs Help

```
pi@raspberrypi ~ $ mosquitto_sub -h 192.168.1.249 -t "status"
Press the button to update the sensor reading.
off
off
off
off
off
off
on
on
```

рахмат
danke
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ngiyabonga
teşekkür ederim
Баярлалаа
mersi
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barka
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mahalo
tapadh leat
спасибо
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terima kasih
rahmet
ευχαριστώ
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dhanyavadagalu
shukriya
mercé
мерси
তোমাকে ধন্যবাদ
감사합니다
xièxie
merci