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THE ONLINE SCHOOL OF ANALYTICS

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ASHISH GUPTA



## ASHISH GUPTA

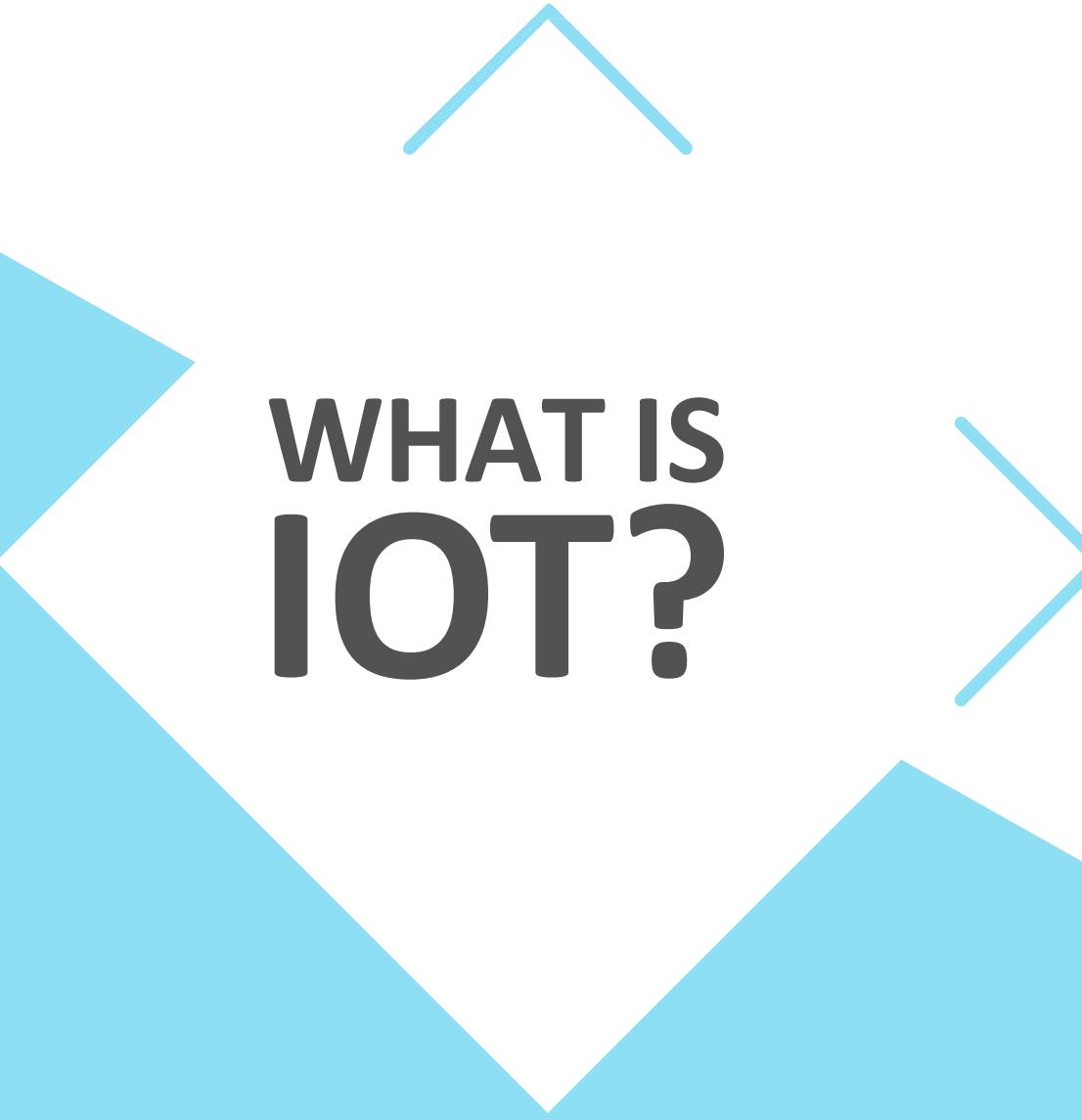
Has been tinkering with connected mobile devices, firmware, systems and product design over 12 years with big and small product / semiconductor companies



# AGENDA

- What is IOT?
- IOT cases
  - Asset Monitoring, Production, Predictive Maintenance, New Products
- A look inside an IOT application
- IOT Eco-system, Challenges, Pathfinder
- IOT Careers
- 2018 Round up





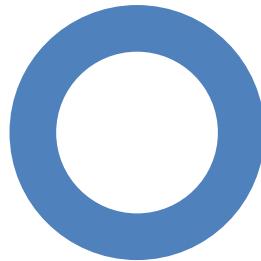
# WHAT IS IOT?

IOT stands for “Internet of things”.

It refers to an ecosystem of **connected devices** that are accessible through the Internet.

# RISE OF THE INTERNET

Late 70s :  
PC Era



*Apple II*  
*IBM PC*  
*Win-Tel*

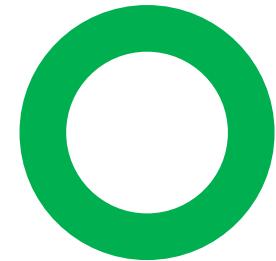
90s – 00s : beginnings  
and rise Email, WWW,  
Yahoo, Google



1991 First  
website CERN

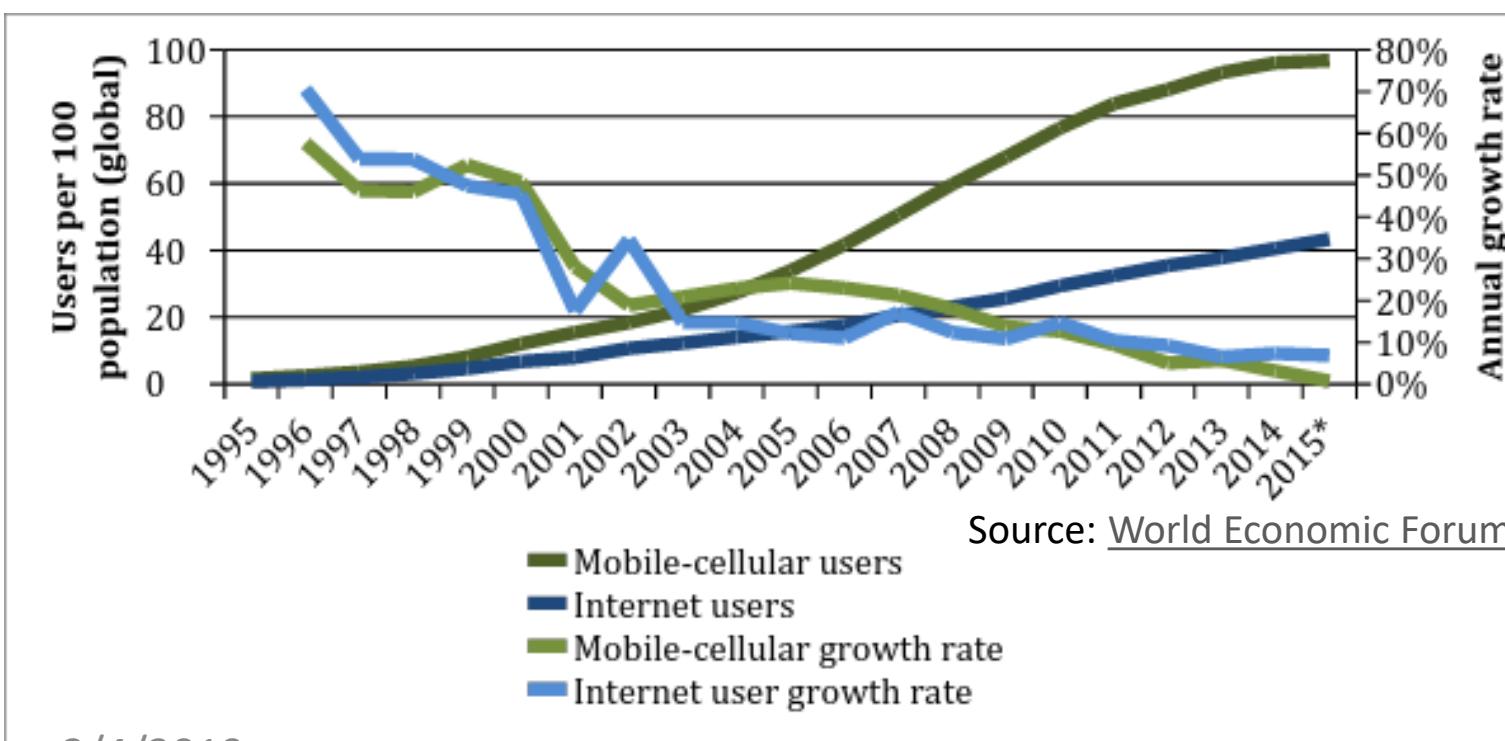
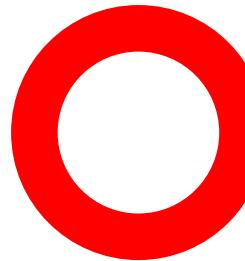
1993 WWW is  
free  
Early 2000s : Dot com  
bubble/bus. E-  
commerce, Social  
Media

2007-8: Mobile  
internet picks up



*Social Media*  
*Photos*

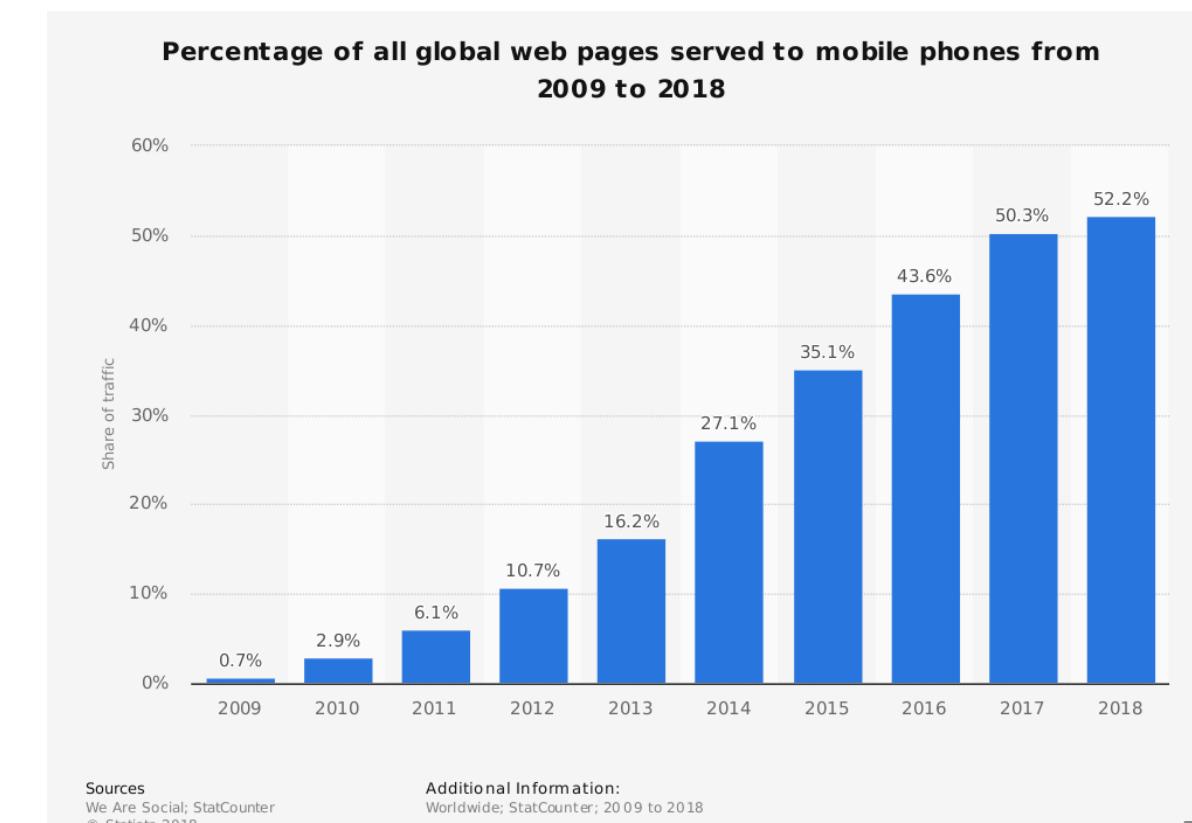
2014: Rise of the  
Internet of  
things



2/4/2019

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5

## NUMBERS

\$14.2

TRILLION

Is what world economy will make from IoT Domain by 2030.

accenture  
2/4/2019

\$6

TRILLION

IoT budget projection for the next 5 years

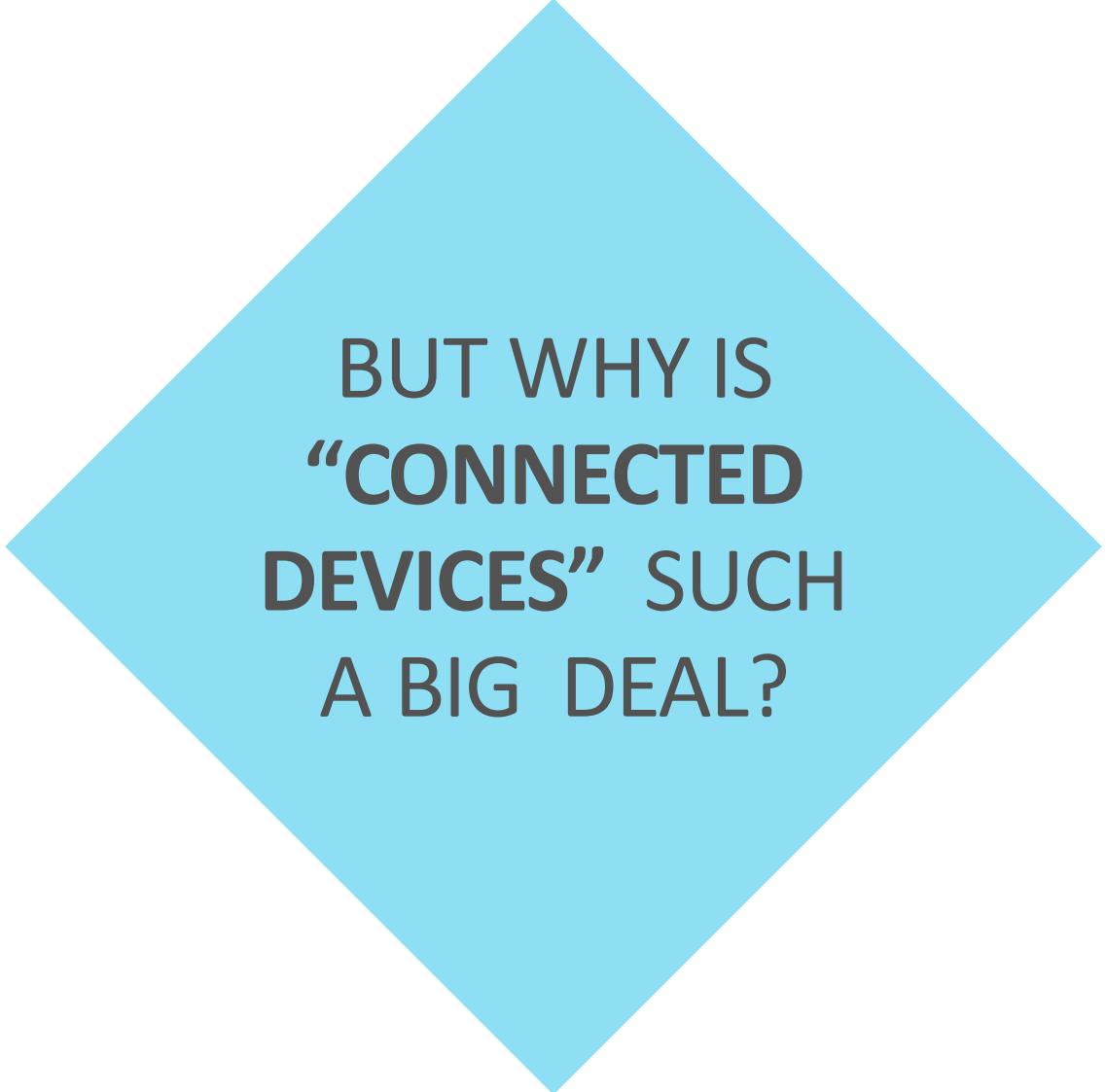
BUSINESS INSIDER

50

BILLION

Devices will be connected to the Internet by 2020

Gartner



**BUT WHY IS  
“CONNECTED  
DEVICES” SUCH  
A BIG DEAL?**



## BETTER WHISKY DRINKING EXPERIENCE



The problem: Concerns around counterfeiting, as well as seal tampering

The solution: With patent-pending OpenSense technology, each bottle of whisky has a unique identifier, which helps users know if it's been tampered with in any way. It is also a way for the company to increase personalized communication to their consumers

## ARROW – DIGITIZING SHIRTS



The problem: The need to carry around paper business cards and resumes

The solution: With the use of an NFC chip, the Smart Shirt lets you activate a number of functions on your phone by just tapping it to the cuff. You can open and share your LinkedIn profile or business e-card in a matter of seconds, rather than having to carry them around on paper all the time to share with business partners and clients

## SMART TRACTOR



## INTERNET OF COWS



## HELPING YOU KEEP YOUR TEETH CLEAN BREATHOMETER MINT



The problem: Lack of insight into how effective your teeth cleaning practices are

The solution: Mint is an oral hygiene device that uses IOT technology to analyze the bacteria and sulfur levels in your mouth and broadcast them to your smartphone. The device also provides you with personalized tips based on your dental history

## FLASH GLUCOSE MONITORING



## CONSUMER GOODS - WHIRPOOL



The problem: Lack of after-sales insight about usage and wear and tear of products

The solution: To gain valuable insights about their products and how they are used, sensors on Whirlpool products keep monitoring them after they've been sold, and this data shows how they are using, and how the machines are responding. This helps the company make changes to future products to suit customer needs.

## CAR INSURANCE – BAJAJ ALLIANCE



The problem: Young people being priced out of car insurance, due to the perception that they are 'high-risk' drivers

The solution: By collecting data from millions of drivers, insurance companies can get a more accurate sense of how people in a certain age group drive, and price insurance more fairly for them as a result.

## SMART CITIES – COMPTOLOGY



The problem: Excessive waste in metro cities, which isn't recycled properly

The solution: Compology, a San Francisco based startup has introduced WasteOS, a smart waste collection system that can cut collection costs by almost 40%. Through the use of IOT sensors, waste collection agencies are able to run their fleets on the most efficient route, and identify when waste may need to be collected ahead of time.

## SMART RETAIL – CHAI POINT



The problem: Lack of a streamlined system or standardization for the production of tea beverages

The solution: Chai Point has diversified from simply being a tea-selling franchise, and has created a system which integrates IOT and AI, for clients. With this, they can keep a track of how many cups of tea have been made, they can alter the water and milk amounts, and even get insights on when to refill the containers.

## IBACO ICE CREAMS



- 25-30% inventory loss due to power outage
- Simple IOT implementation by Nimble wireless

## ROLLS ROYCE ENGINES



- Sensors fitted inside the engine track engine health and fuel use to diagnose potential faults
- Engine performance analysis is done mid-flight, enabling proactive maintenance.
- By an estimate, a 1% reduction in fuel usage translates to US\$250,000/plane/year

# HARLEY-DAVIDSON



- Operating costs dropped by \$200 million, downtime reduced.
- The company was also able to reduce its build-to-order cycle by a factor of 36
- TAT for custom bike reduced from 180 days to 2 weeks

# SIGTUPLE



- Low cost digitisation of images of a slide under a microscope
- Started with smartphone as camera, now building auto scan capabilities
- AI and ML for image analysis and reports – Haematology reports



REMOTE  
CONNECTED  
OPERATIONS

PRODUCTION  
OPTIMIZATION

ASSET  
TRACKING  
MANAGEMENT

PREDICTIVE  
MAINTENANCE

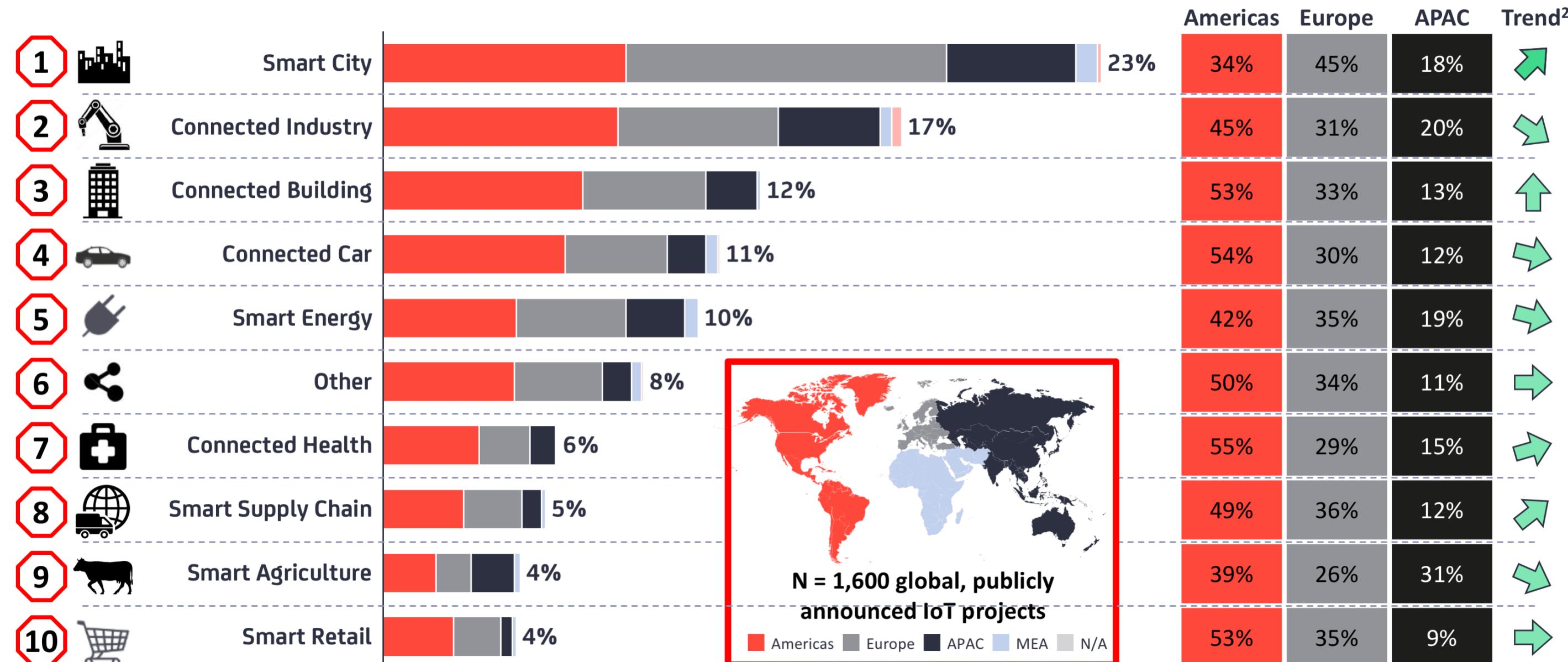
NEW  
PRODUCTS  
SERVICES



## IoT Segment

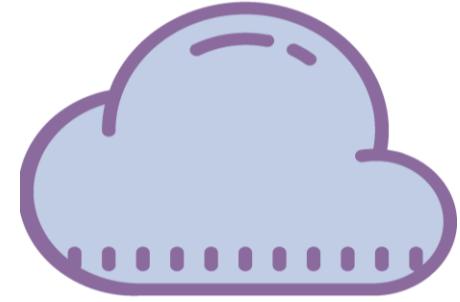
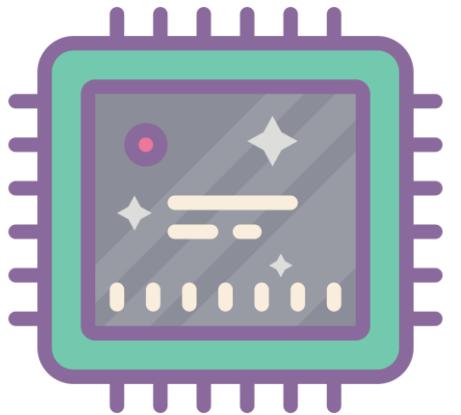
The Top 10 IoT Segments in 2018  
(based on 1,600 real IoT projects)

## Details



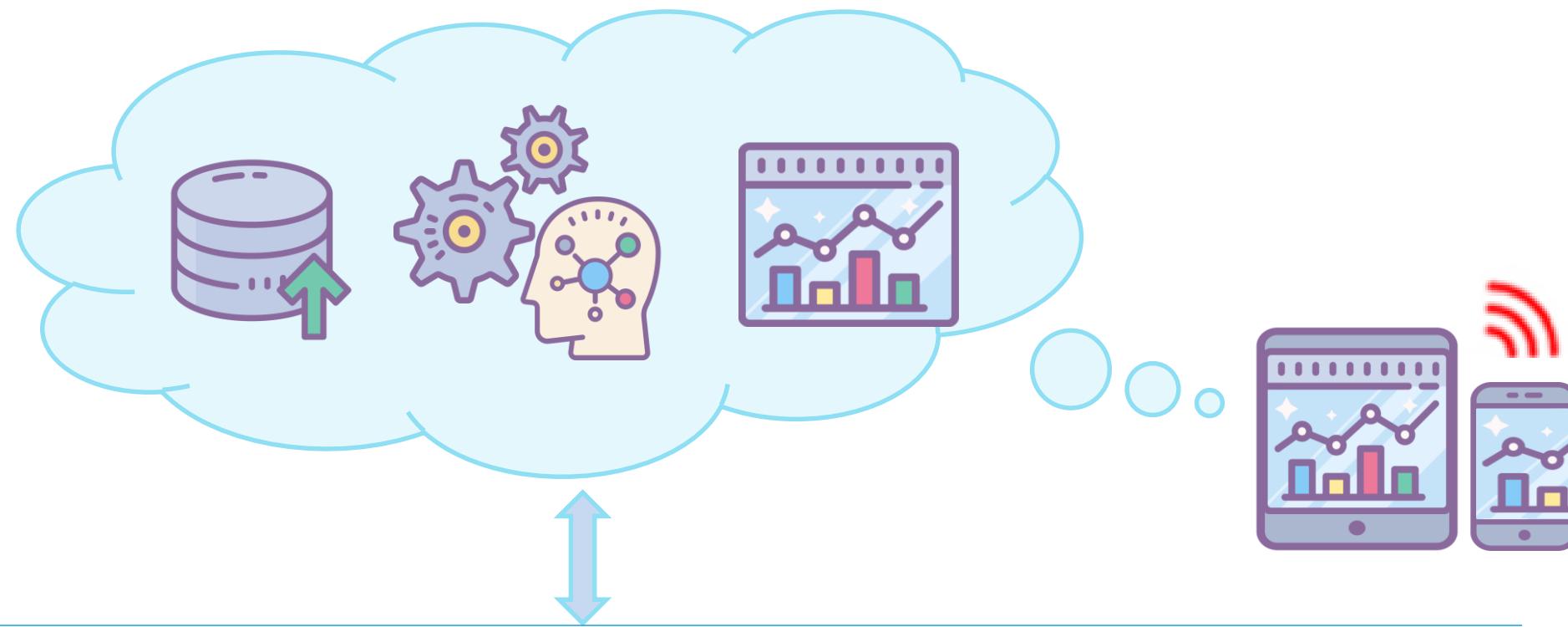
1. Based on 1,600 publicly known enterprise IoT projects (Not including consumer IoT projects e.g., Wearables, Smart Home). 2. Trend based on comparison with % of projects in the 2016 IoT Analytics Enterprise IoT Projects List. A downward arrow means the relative share of all projects has declined, not the overall number of projects. 3. Not including Consumer Smart Home Solutions. Source: IoT Analytics 2018 Global overview of 1,600 enterprise IoT use cases (Jan 2018)

BUT WHY  
“NOW”?

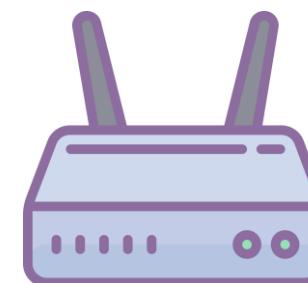


# IOT TECHNOLOGY LAYERS

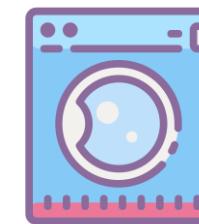
Layer 3: “Cloud”

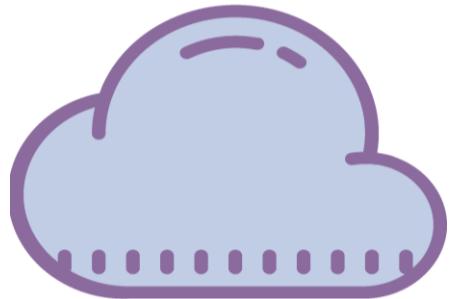
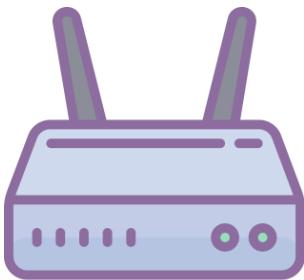


Layer 2 “Gateway”

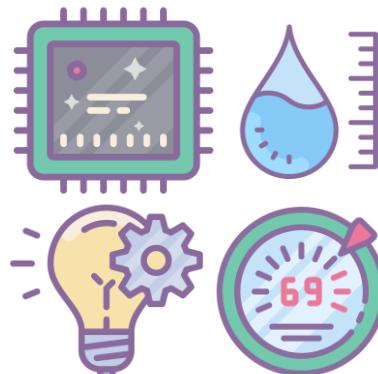


Layer 1 “Things”

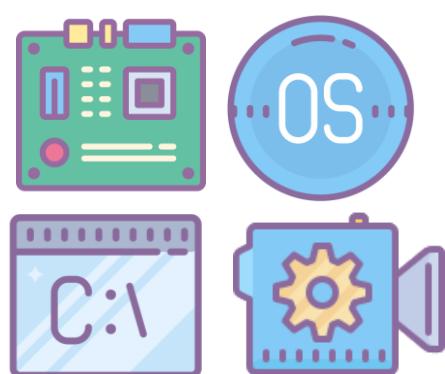




KNOWLEDGE OF  
SMALL  
HARDWARE  
DEVICES,  
SENSORS  
ACTUATORS



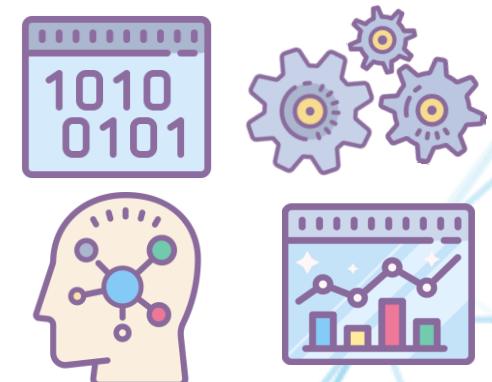
KNOWLEDGE OF  
GATEWAY  
DEVICE  
PLATFORMS &  
OPERATING  
SYSTEM



FAMILIARITY  
WITH CLOUD



ANALYTICS AND  
MACHINE  
LEARNING ON IOT  
DATA



# IOT ECOSYSTEM

## Technology – IOT Devices and Platforms



## Telecom Service Providers



## Startups

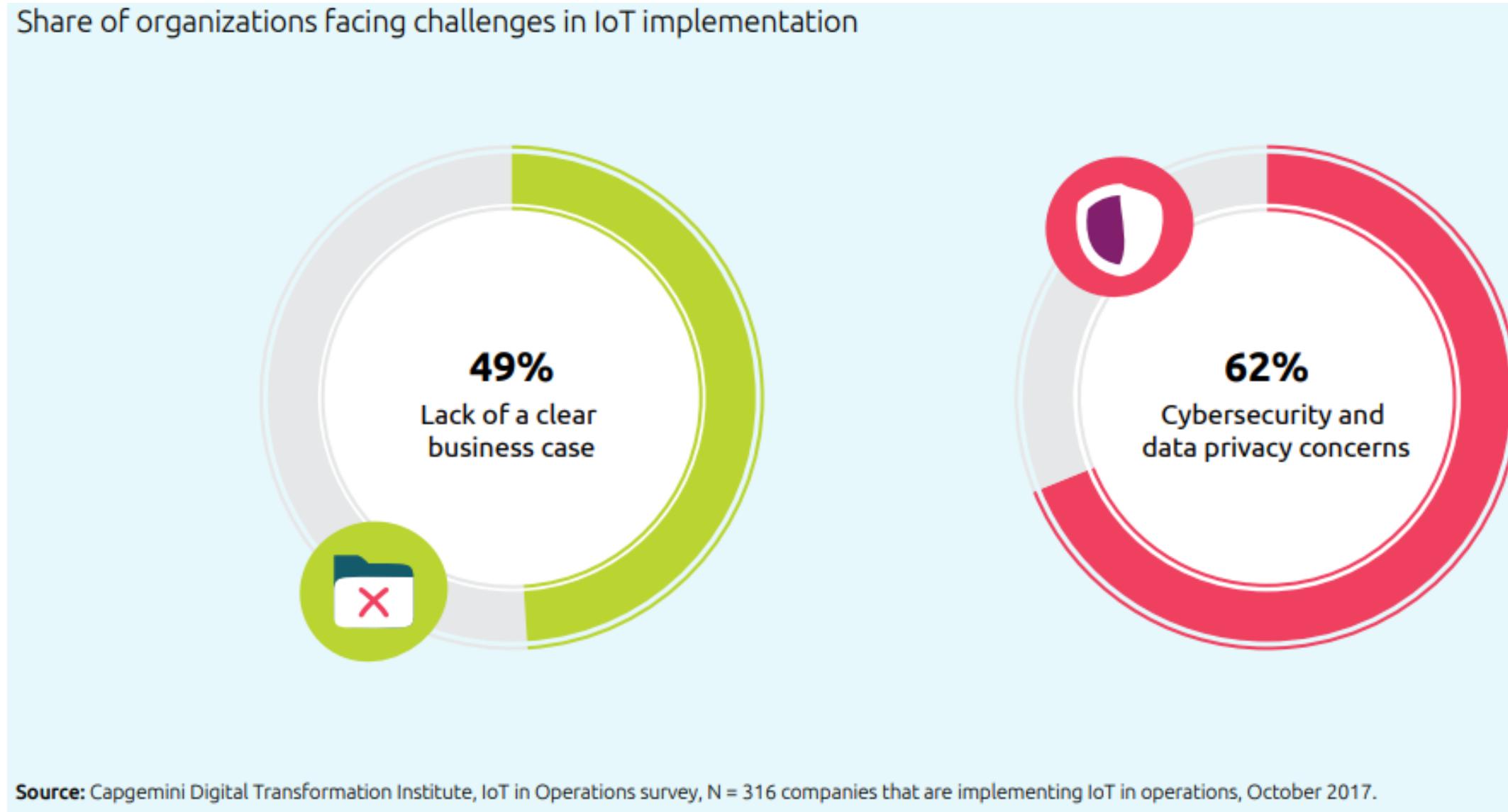


NYMBLE

## Businesses



## CHALLENGE: MOVING BEYOND PILOTS



### Other factors such as :

- Lack of standardization or rather too many competing standards,
- Inability to leverage IOT data

## SECURITY CASE: MIRAI BOTNET



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## SECURITY CASE: MIRAI BOTNET

### DDoS Attack:

Incoming traffic flooding the victim originates from many different sources – potentially hundreds of thousands or more.

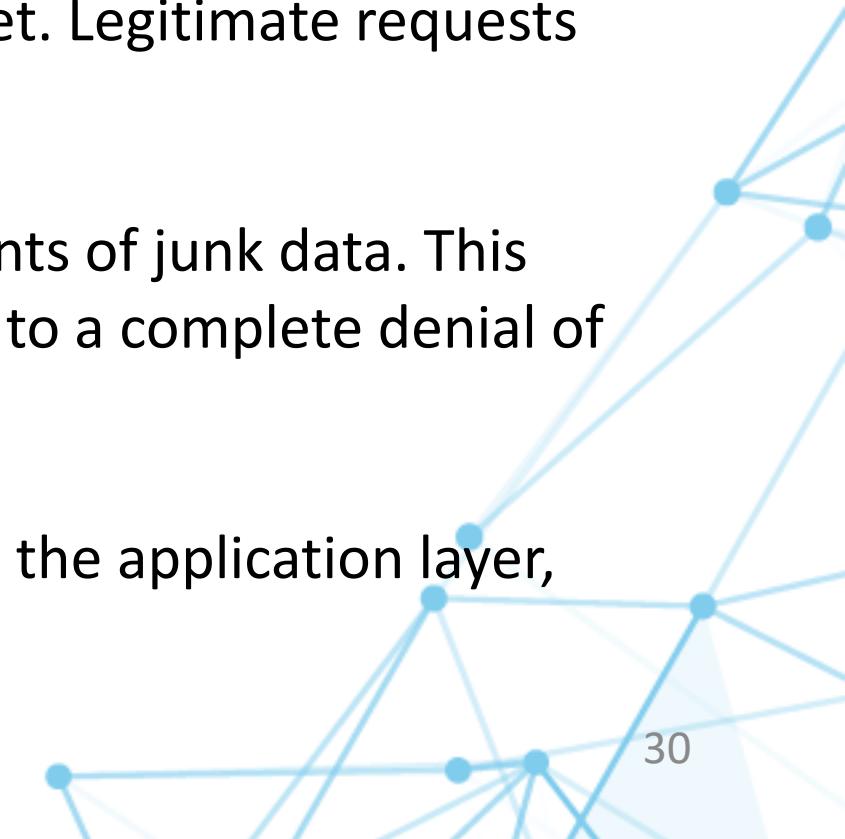
This effectively makes it impossible to stop the attack simply by blocking a single IP address; plus, it is very difficult to distinguish legitimate user traffic from attack traffic when spread across so many points of origin.

Common attacks include the following:

**Traffic attacks:** Send a huge volume of TCP, UDP and ICPM packets to the target. Legitimate requests get lost and these attacks may be accompanied by malware exploitation.

**Bandwidth attacks:** This DDos attack overloads the target with massive amounts of junk data. This results in a loss of network bandwidth and equipment resources and can lead to a complete denial of service.

**Application attacks:** Application-layer data messages can deplete resources in the application layer, leaving the target's system services unavailable.



## SECURITY CASE: MIRAI BOTNET

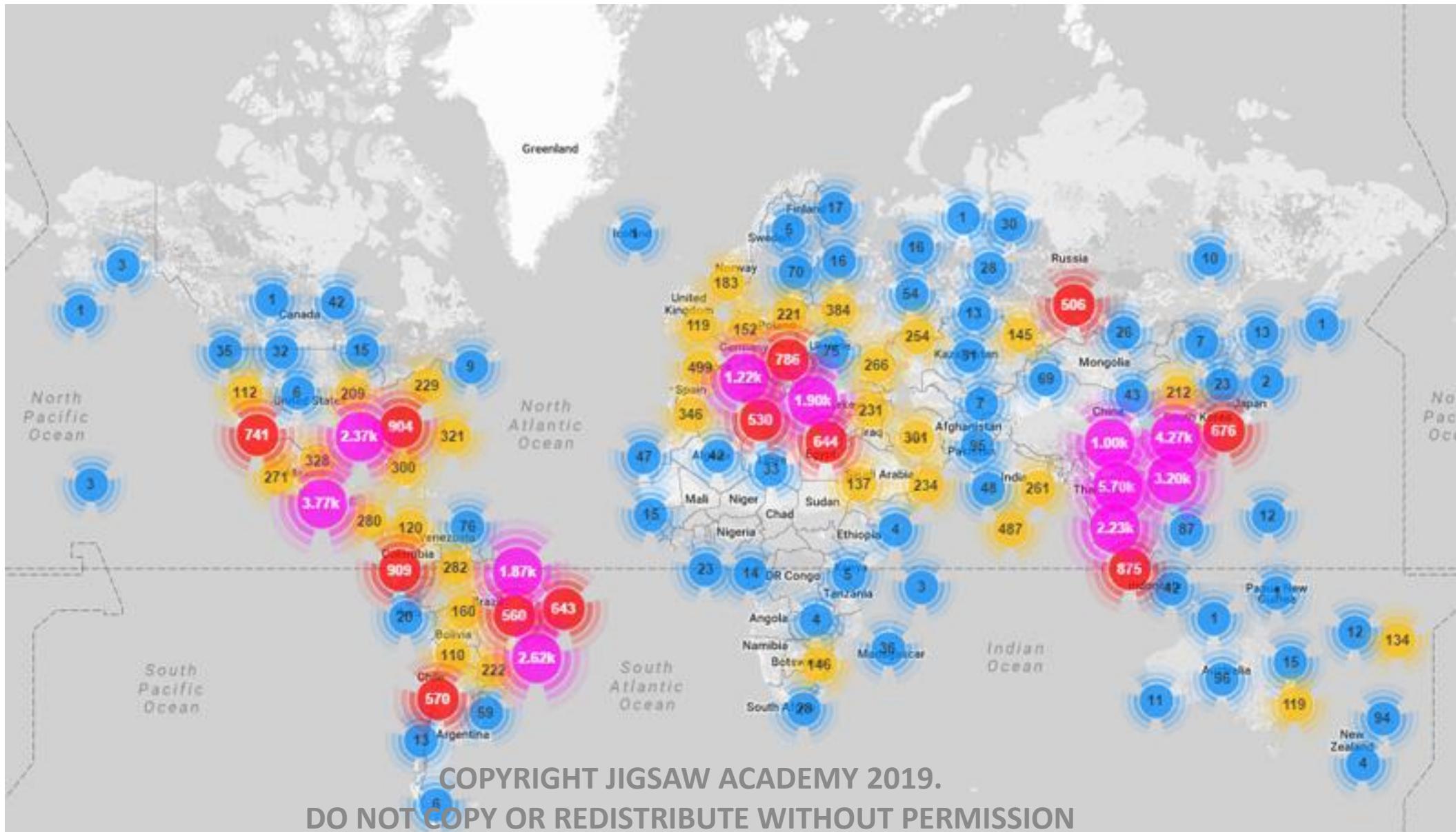
- October of 2016, the largest DDoS attack ever - launched on service provider Dyn using an IoT botnet.
- This lead to huge portions of the internet going down, including Twitter, the Guardian, Netflix, Reddit, and CNN.



- Investigation of the attack uncovered 49,657 unique IPs which hosted Mirai-infected devices. As previously reported, these were mostly CCTV cameras—a popular of DDoS botnet herders. Other victimized devices included DVRs and routers.

## SECURITY CASE: MIRAI BOTNET

- Overall, IP addresses of Mirai-infected devices were spotted in 164 countries. As evidenced by the map below, the botnet IPs are highly dispersed, appearing even in such remote locations as Montenegro, Tajikistan and Somalia.



## SECURITY CASE: MIRAI BOTNET

### Lessons

- Devices that cannot have their software, passwords, or firmware updated should never be implemented.
- Changing the default username and password should be mandatory for the installation of any device on the Internet.
- Passwords for IoT devices should be unique per device, especially when they are connected to the Internet.
- Always patch IoT devices with the latest software and firmware updates to mitigate vulnerabilities.

## SECURITY CASE: JEEP CHEROKEE



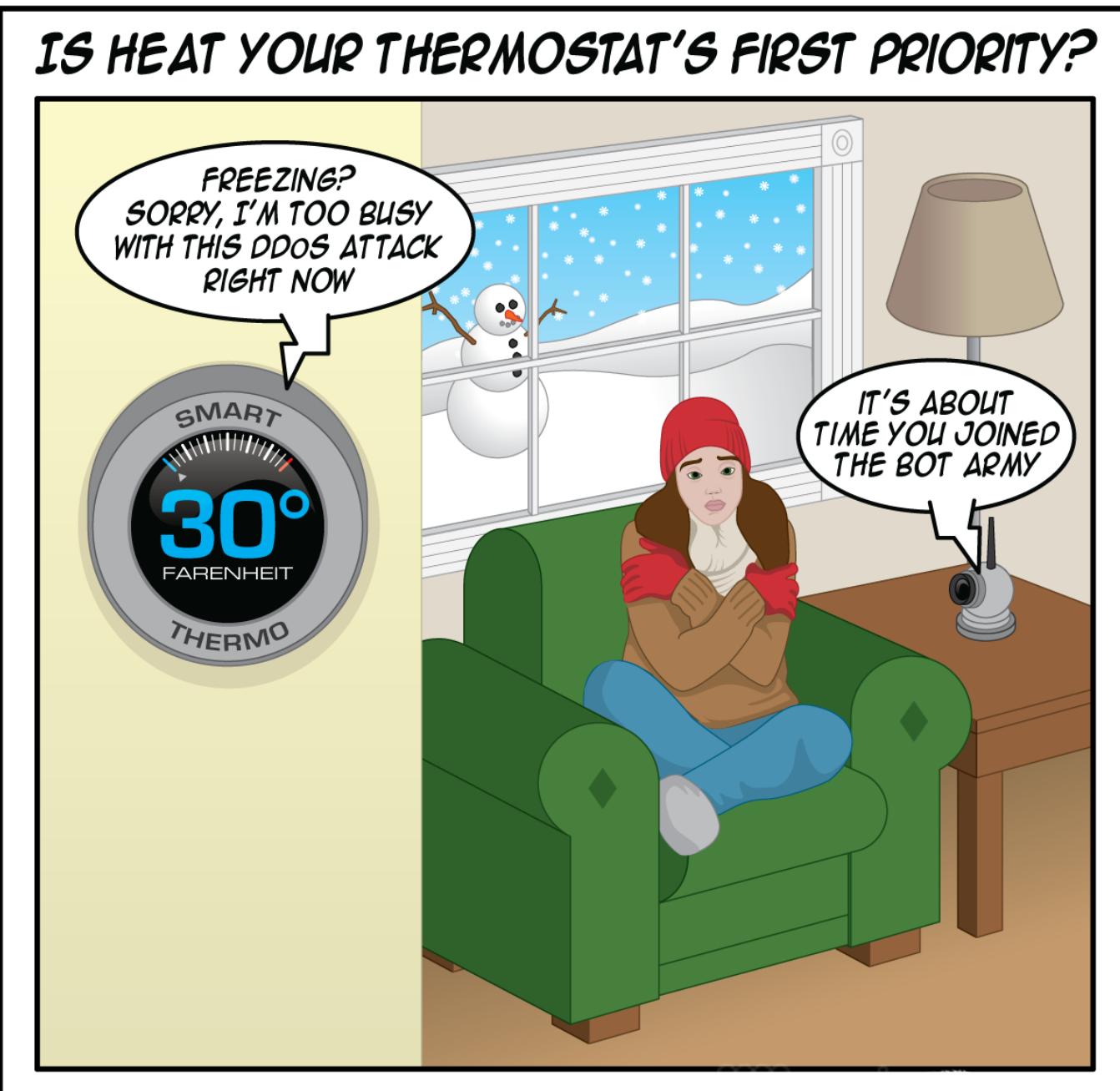
2015: Cybersecurity researchers Charlie Miller and Chris Valasek, exploited a firmware update vulnerability, they hijacked the vehicle over the Sprint cellular network and discovered they could make it speed up, slow down and even veer off the road.

Thankfully, their work helped Chrysler create a security update to fix the flaw that gave them remote access to the Jeep's guts

2016: Further, unprecedented tricks like causing acceleration and slamming on the car's brakes or turning the vehicle's steering wheel at any speed

Only possible with a laptop directly plugged into the Jeep's CAN network via a port under its dashboard.

## SECURITY CASE: Thermostats



But in 2016, hackers put the freeze on the citizens of Lappeenranta, Finland when they managed to hack the environmental control systems in two apartment buildings via thermostats.

In their attempt to fight off the attack, the environmental systems were rebooted – and subsequently stuck in an endless loop that left residents in the cold for nearly a week.

Source:<https://blog.radware.com/security/2018/05/7-craziest-iot-device-hacks/>

# IOT PATHFINDER

Big Vision

Identify a small project

BUILD BUSINESS CASE

Get top management sponsor

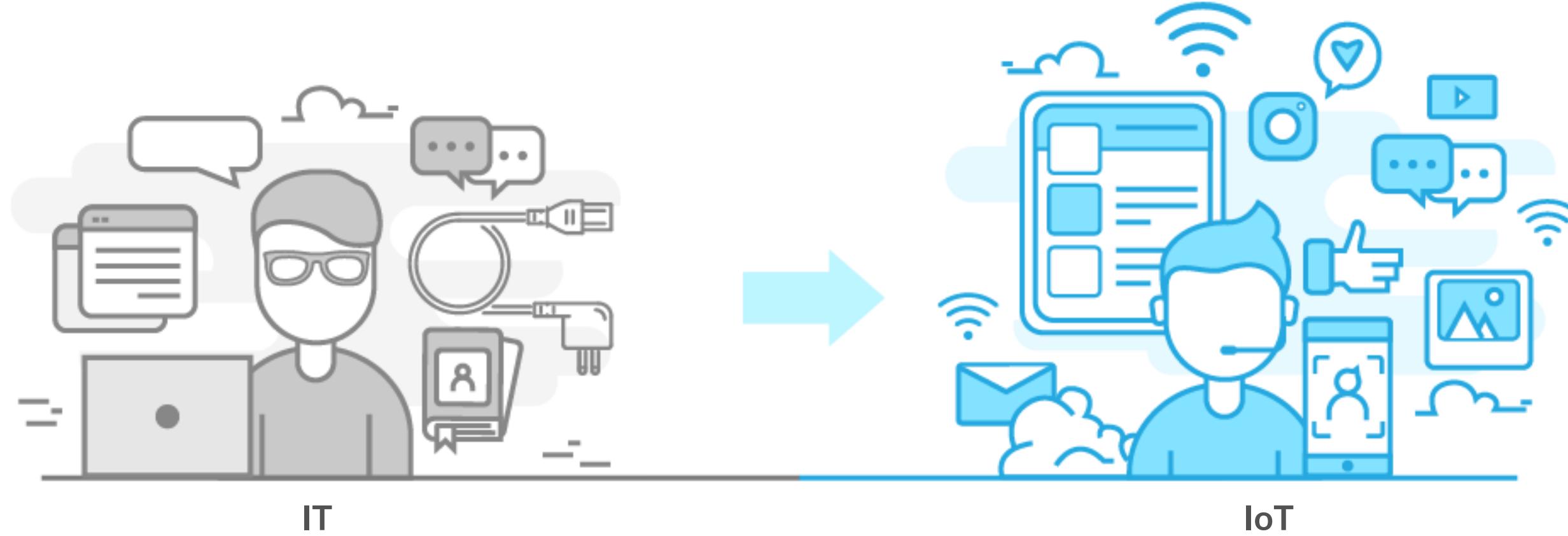
Hire the right talent

Build a virtual team (IT + Ops)

Keep Security Everyone's Priority

- Target a business outcome
- Start with simple but important outcome

## A LOT OF IT / OPERATIONS WORK WILL SHIFT TOWARDS IOT



IOT ENGINEER



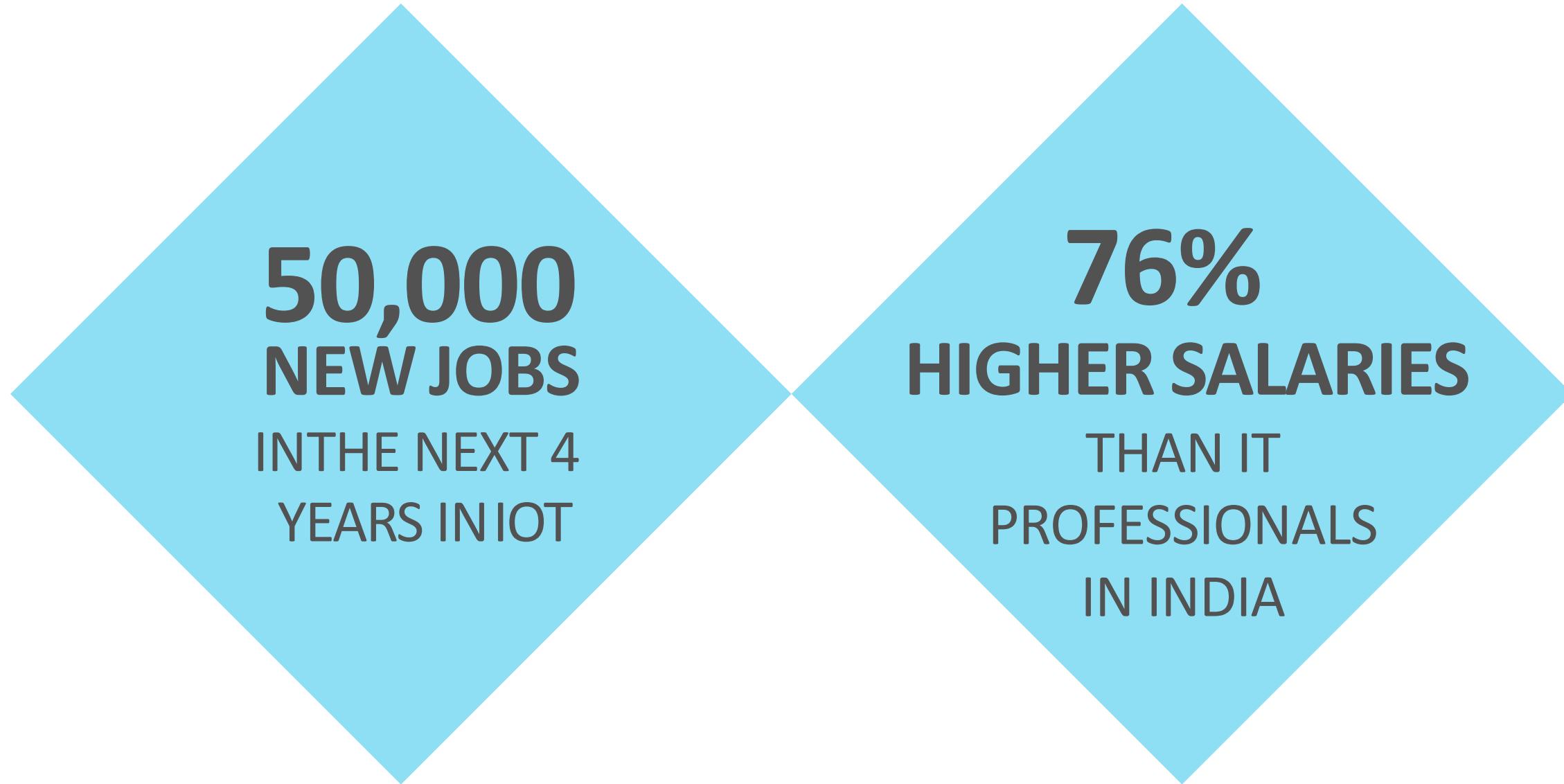
IOT DATA SCIENTIST



IOT PRODUCT MANAGER



IOT ARCHITECT



**50,000  
NEW JOBS  
IN THE NEXT 4  
YEARS IN IOT**

**76%  
HIGHER SALARIES  
THAN IT  
PROFESSIONALS  
IN INDIA**

# THE FULL STACK IOT EXPERT

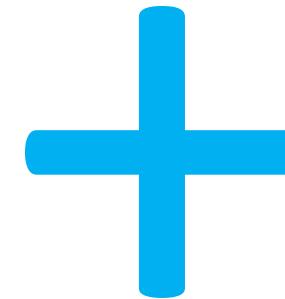
## The Most Comprehensive Approach To Kick Start Your IoT Career

### Certified IoT Professional

This specialization will give you a solid understanding of how to develop and implement your own IoT solutions using Arduino and Raspberry Pi. It also covers the details of how IoT works with the cloud.

No. of Courses: 4

Duration: 18 hours



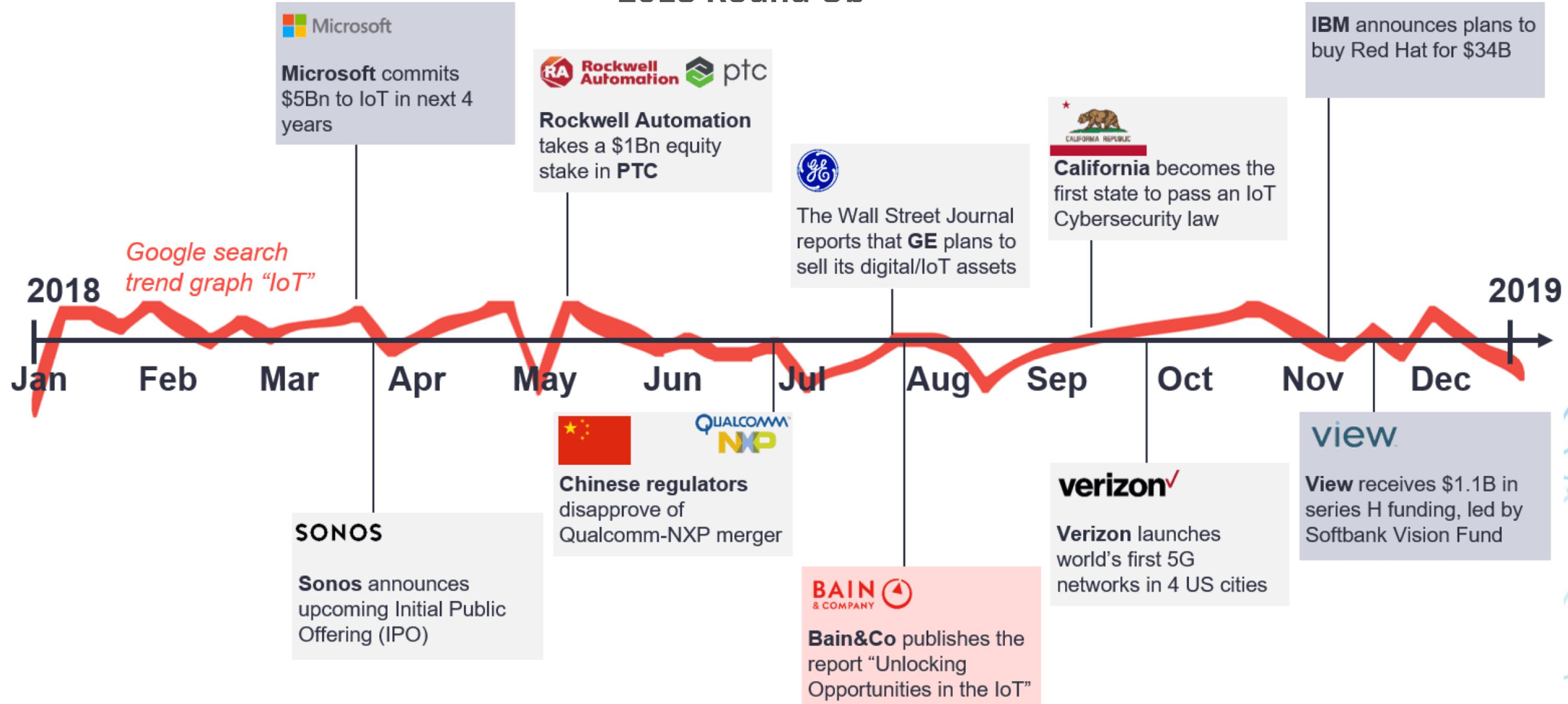
### Certified IoT Analyst

This specialization covers the various dimensions of dealing with data generated from IoT devices, sensors, tags and actuators. You can expand your career to include Data Science for IoT.

No. of Courses: 3

Duration: 23 hours

# 2018 Round Up





101 Applications of



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the Internet of Things

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2/4/2019

# FREE IOT COURSE

## IOT FOR BEGINNERS



4.6 Ratings

[http://jgs.aw/Free\\_IOT](http://jgs.aw/Free_IOT)

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