The Internet of Things
Will You Be Ready to Support a Device-Driven Future?

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Agenda

What is the "Internet of Things"?

IoT Domains and Applications

IoT Analytics

IoT Security

Internet of Payments

SHAZAM Support of IOT Payments

What is the "Internet of Things"?

What is "Internet of Things?"

- A network of connected objects that are able to collect and exchange data using embedded sensors

- Can transfer data over a network
  — without any human interaction

- Alternative Names:
  - Internet of Objects
  - Internet of Everything (CISCO, 2011)
  - M2M (Machine-to-Machine)

THE INTERNET OF THINGS

The New "Normal"

- Largest software vendors write only a few of the apps they host
- World's largest music retailer has no music retail store
- World's largest taxi company owns no taxis
- Most popular media company owner creates no content
- Largest accommodation provider owns no real estate
- Largest phone companies own no telecom infrastructure
- Fastest deliverer of worldwide news has no reporters, TV channels or papers
- Largest movie house owns no cinemas / movie theaters

Source: How the IoT is Driving the Next Stage of Digital Transformation – FPOV

IoT History

- Term first coined in 1999 by British technology pioneer, Kevin Ashton
  - *"Information is a great way to reduce waste and increase efficiency, and that's really what the Internet of Things provides"*

- IoT could *"turn the world into data"* that could be used to make better decisions
  - *"We need to empower computers with their own means of gathering information, so they can see, hear and smell the world by themselves"*

IoT Evolution

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion

More connected devices than people

Connected Devices Per Person	0.08	1.84	3.47	6.58
	2003	2010	2015	2020
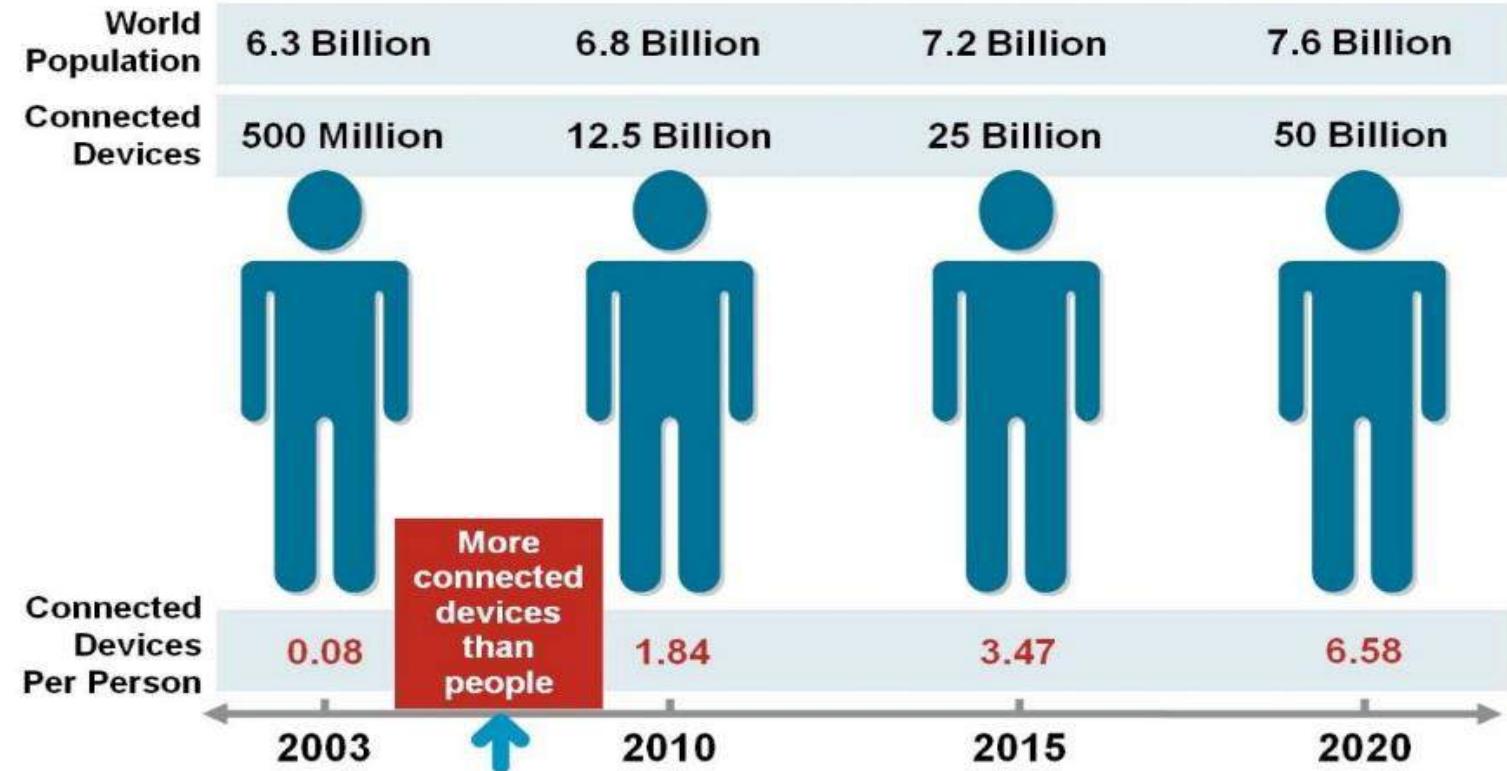
Source: Cisco, IBSG, April 2011

Evolution of the Internet

Pre-internet

- **Human to human**

Internet of content

- **World Wide Web**

Internet of services

- **Web 2.0**

Internet of people

- **Social media**

Internet of Things

- **"Machine to machine"**

IoT Components

- "Things" are…
  - Devices with sensors
  - Connected through a network
  - Identifiable

- "Things" can…
  - Communicate with other devices or applications
  - Execute actions
  - Provide or collect data for analysis

- Data is foundational to the IoT ecosystem

- The IoT ecosystem must be able to:
  - Collect
  - Store
  - Analyze
  - Share

IoT Domains and Applications

IOT Ecosystem

- Connected healthcare
- Connected hospitality
- Connected cities
- Connected homes
- Connected people
- Connected payments
- …and many more

IoT "Why"?

- Better management of assets
- Efficient consumption of resources
- Higher efficiency and convenience for the user
- Cost reduction
- Create innovative products
- Establish new revenue streams
- Reduce / eliminate human error
- Informed decision making

The INTERNET of THINGS

- Anything Any Device
- Anyone Anybody
- Any Service Any Business
- Any Path Any Network
- Any Place Anywhere
- Anytime Any Context
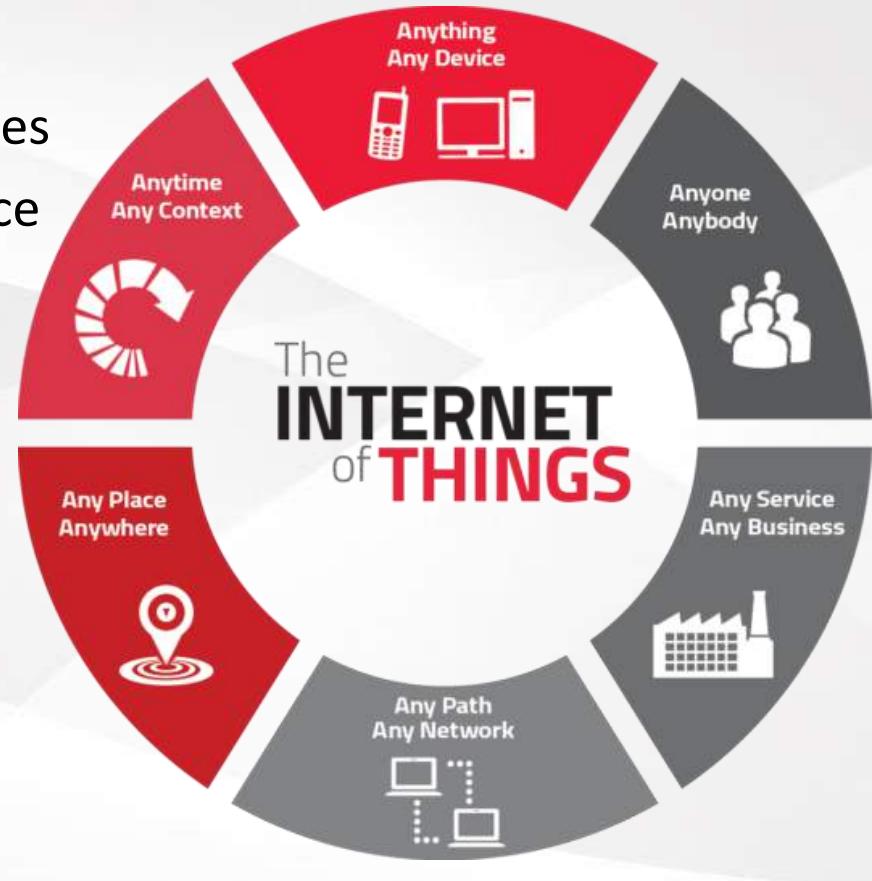
Main Industries as of 2017

1 Manufacturing ($178 billion)

2 Transportation ($78 billion)

3 Utilities ($69 billion)

Fastest growing industries

Consumer | Healthcare | Retail | Insurance | Cross-industry
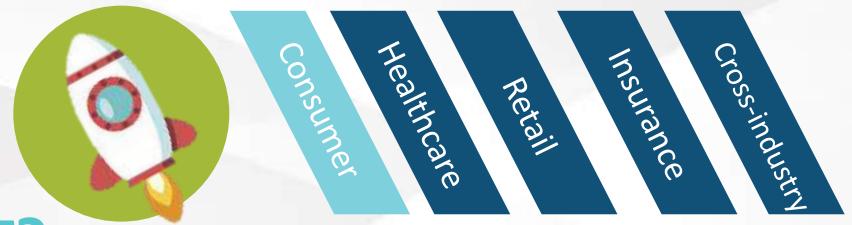
What can be done with IoT?

- Smart cities
- Smart buildings
- Pollution detection
- Detection of explosive & hazardous gases in industry
- Traffic congestion monitoring
- Balancing power and internet bandwidth loads

Source: IDC IOT spend forecast, January 2017

# IoT Devices - Wearables

...but also these...

Wearables are not just these...

...and these...

- Head-worn
- Straps
- Shirts
- Wrist-worn
- Clips
- Shoe-worn / Foot pods

Apps

AND MORE...

Eyewear
2 million

Wristbands
54 million

Tokens,
clip-ons &
jewellery
2 million

Footwear
8 million

Hearables
11 million

Attachable
cameras
21 million

Smartwatches
86 million

Source: CCS Insight

THE
CONNECTED HOME

CURRENTLY AVAILABLE ●
IN PILOT ●

SOLAR PANELS ⊕

SMART WATER HEATERS ⊕

SMART PLUGS ⊕

CONTACT SENSORS ⊕

CONNECTED THERMOSTAT ⊕

CONNECTED BOILERS ⊕

SMART METERS ⊕

ELECTRIC VEHICLE CHARGING POINTS ⊕

SMART SPRINKLERS ⊕

18c

KW

19°

The connected car:

Live agent assistance

Vehicle monitoring & controls

Location-based services

Communication

Information / entertainment

IoT Analytics

Maslow's Hierarchy of Needs

"If the only tool you have is a hammer, you are likely to perceive everything as a nail."

    - Abraham Maslow

Self-actualization
- Realizing personal potential
- Self-fulfillment, morality, acceptance
- Seeking personal growth

Esteem
- Self-esteem
- Confidence & achievement
- Prestige & respect

Social
- Family & friendship
- Love & relationships

Safety
- Security, safety
- Law & order
- Stability & "out of danger"

Physiological
- Air, food, drink
- Shelter, sleep
- Sex / procreate
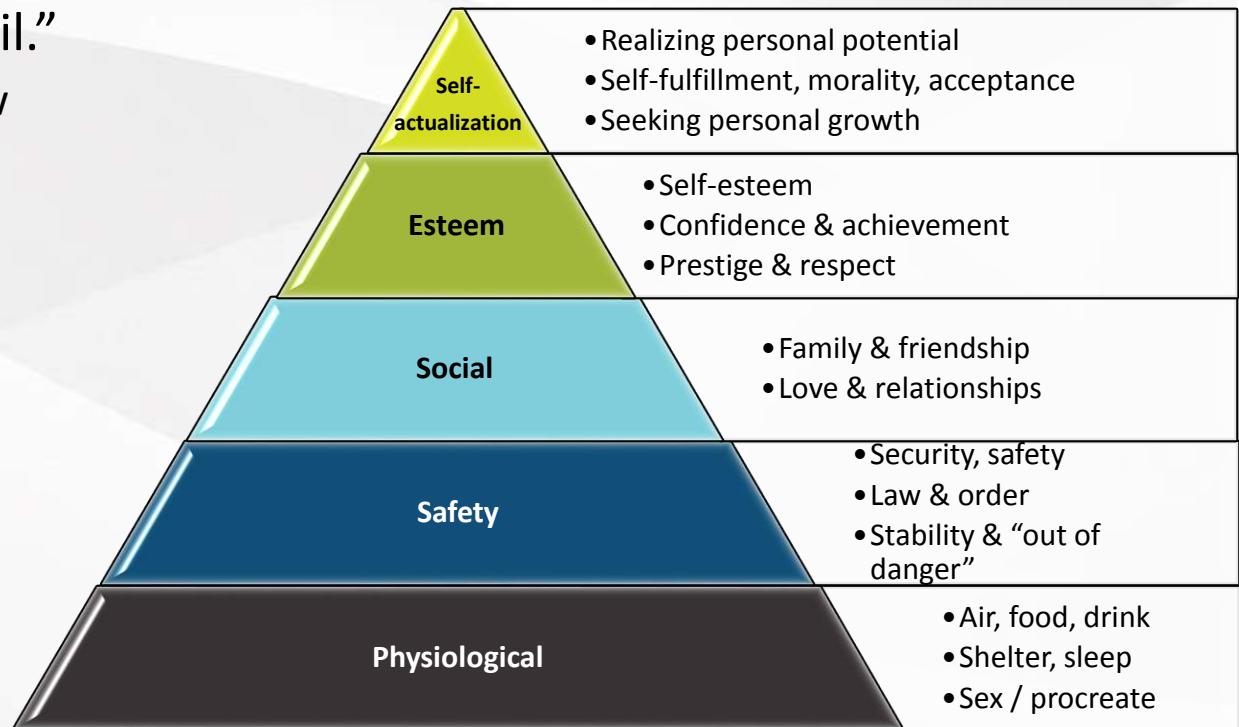
Maslow's Hierarchy of Needs (revised)

Growth needs

Deficiency needs
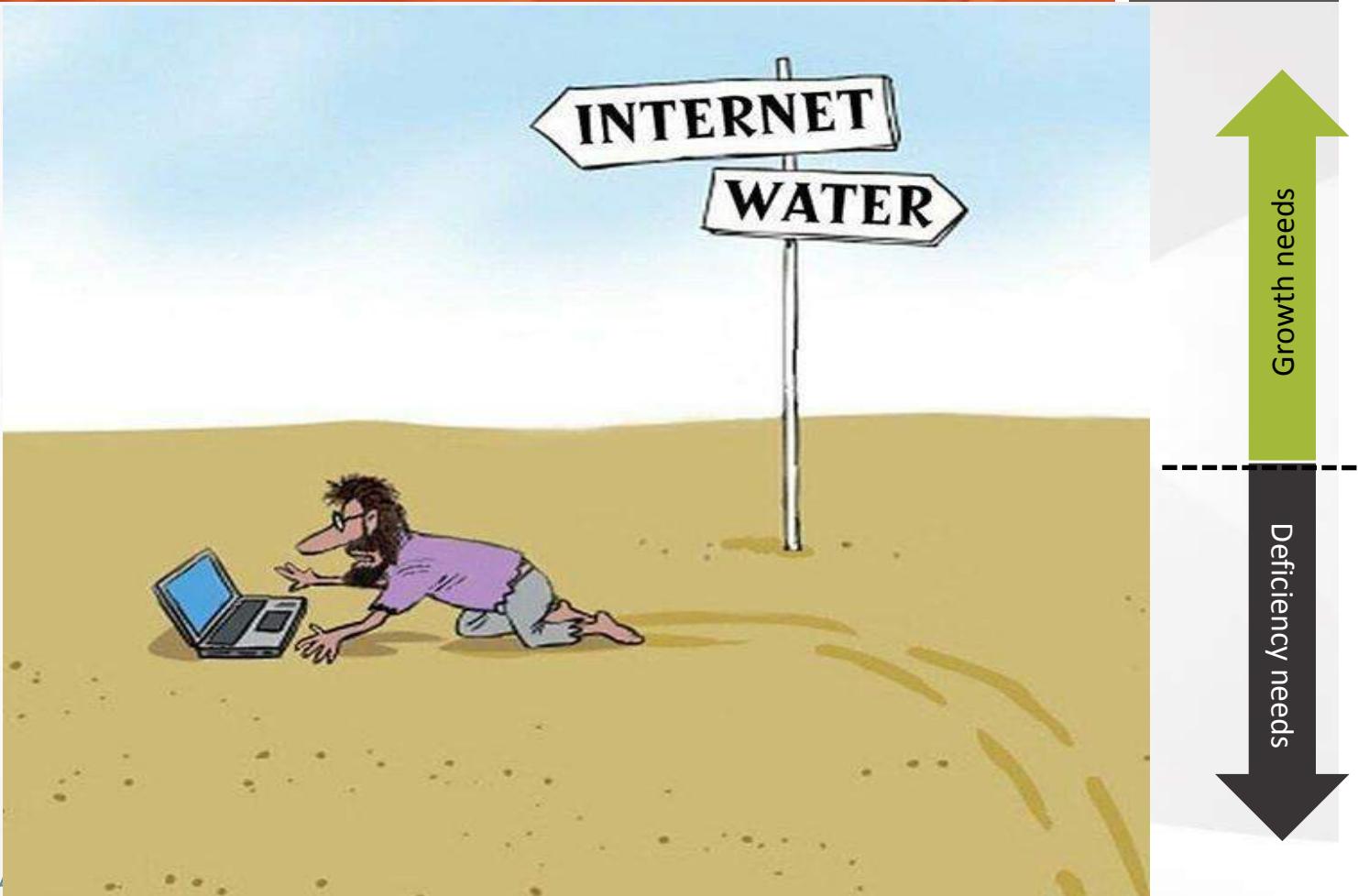
Value Creation by Making Sense of Data

Benefit to Humanity

More Important

Less Important

- **Wisdom** — Evaluated understanding
- **Understanding** — Appreciation of WHY
- **Knowledge** — Answers to HOW questions.
- **Information** — Answers to WHO WHAT WHERE WHEN questions
- **Data** — Symbols
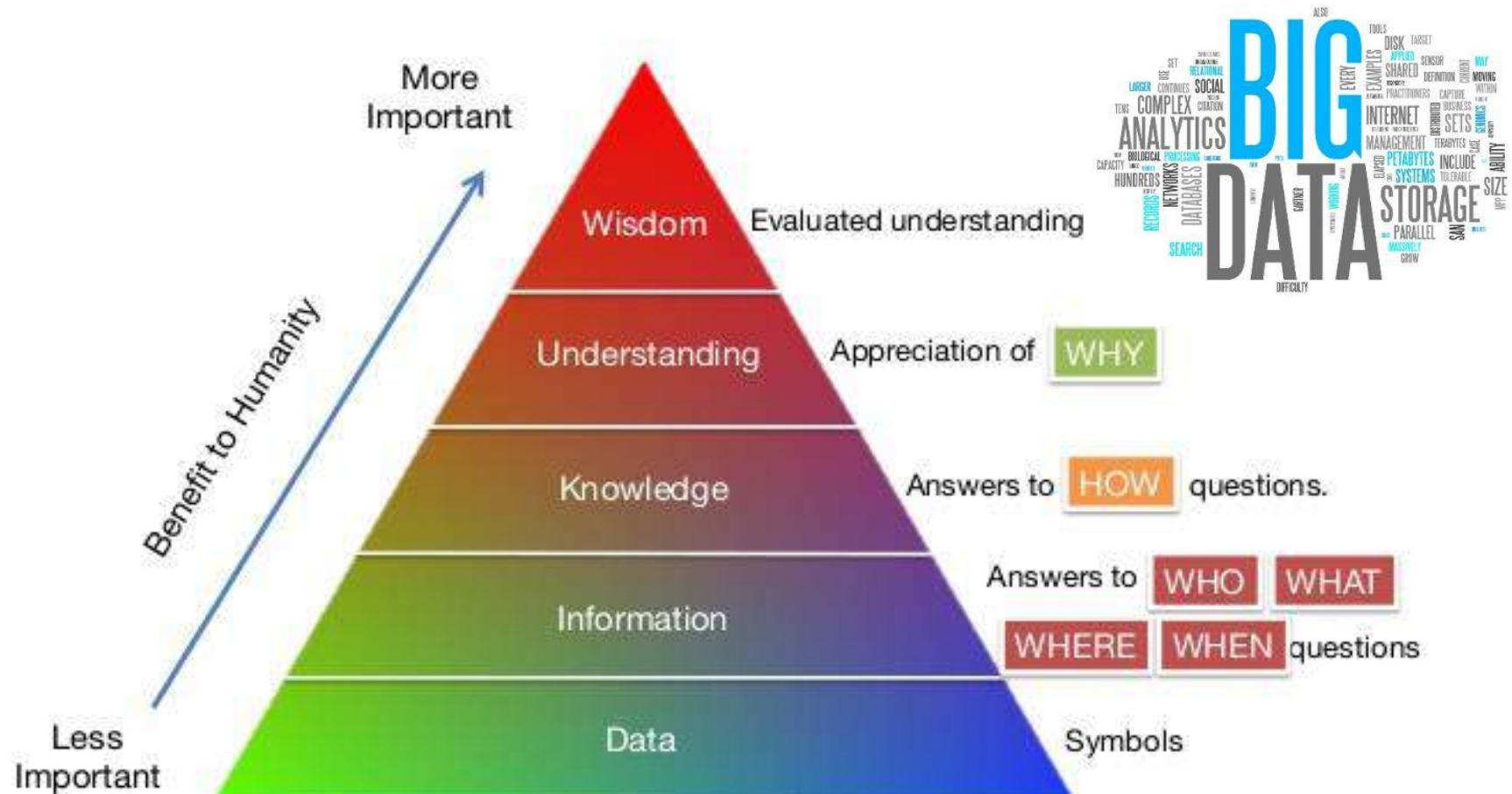
The Value of IoT Analytics

- Analysts project by 2025, data from connected devices will yield insights driving potential economic value of as much as $11 trillion

Descriptive Analytics
- What happened?

Diagnostic Analytics
- Why did it happen?

Predictive Analytics
- What will happen?

Prescriptive Analytics
- How can we make it happen?

Hindsight

Insight

Foresight
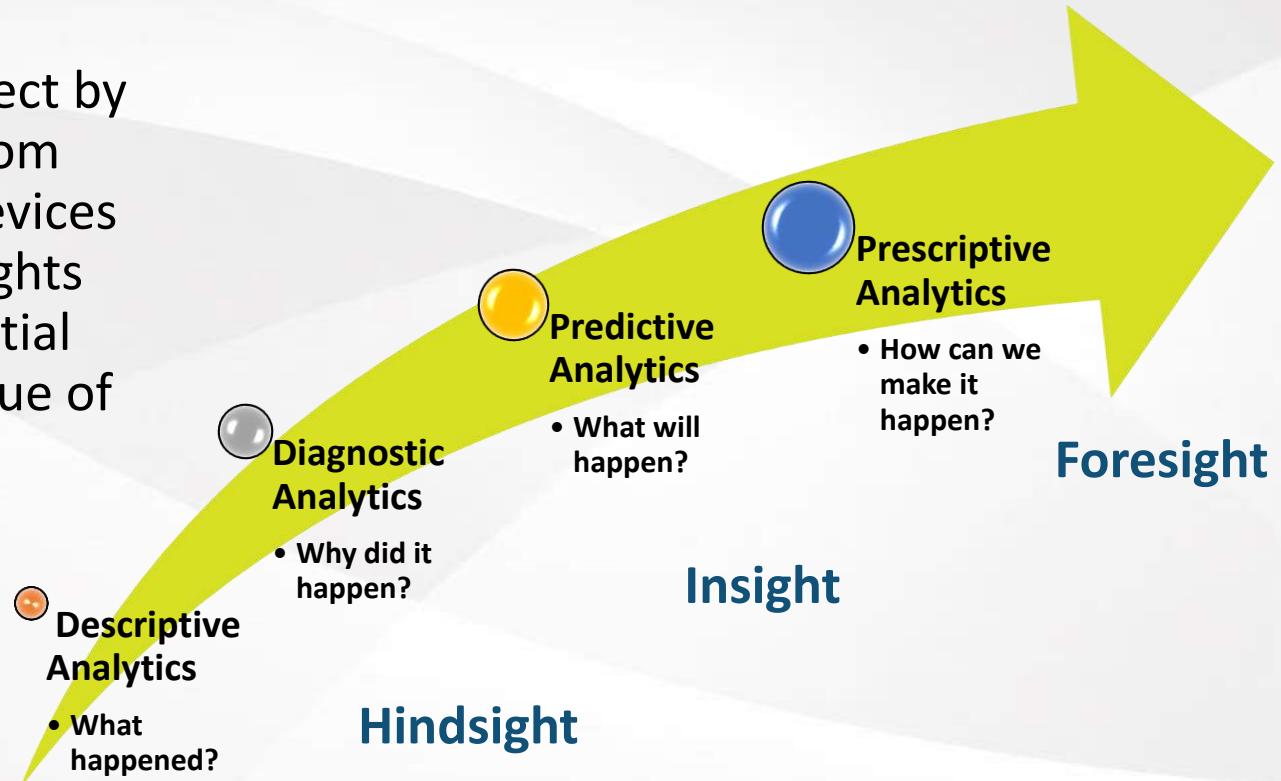
Source: McKinsey & Company

Analytics in the IoT Ecosystem

- IoT devices
  - Identification
  - Addressability
  - Sensing
 - Actionable
  - "Intelligence"
  - Miniaturization

- IoT analytics
  - Interpret data to provide insight
  - Lead to automated actions
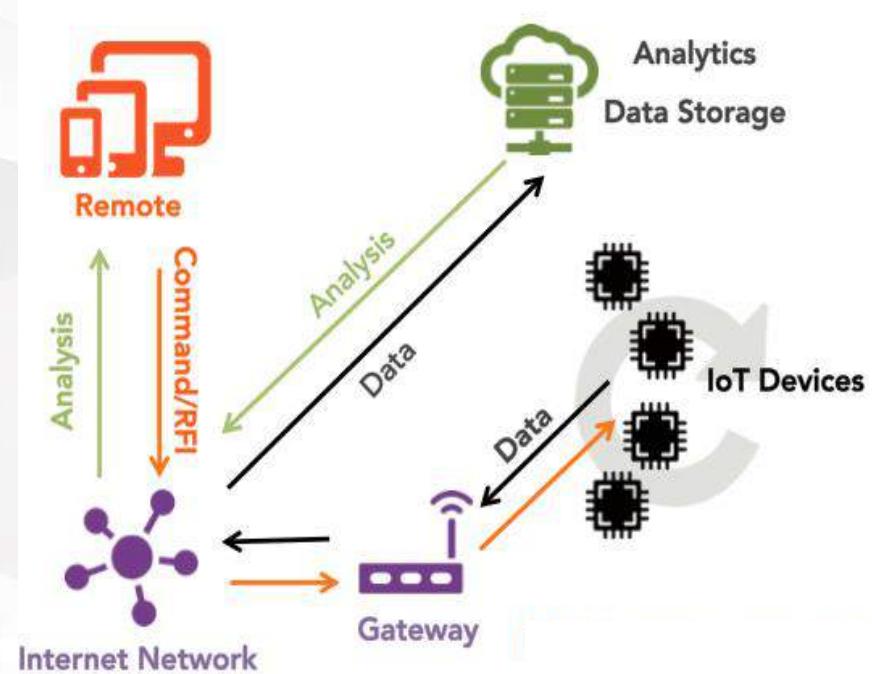
Source: Business Insider

The Analytics Continuum
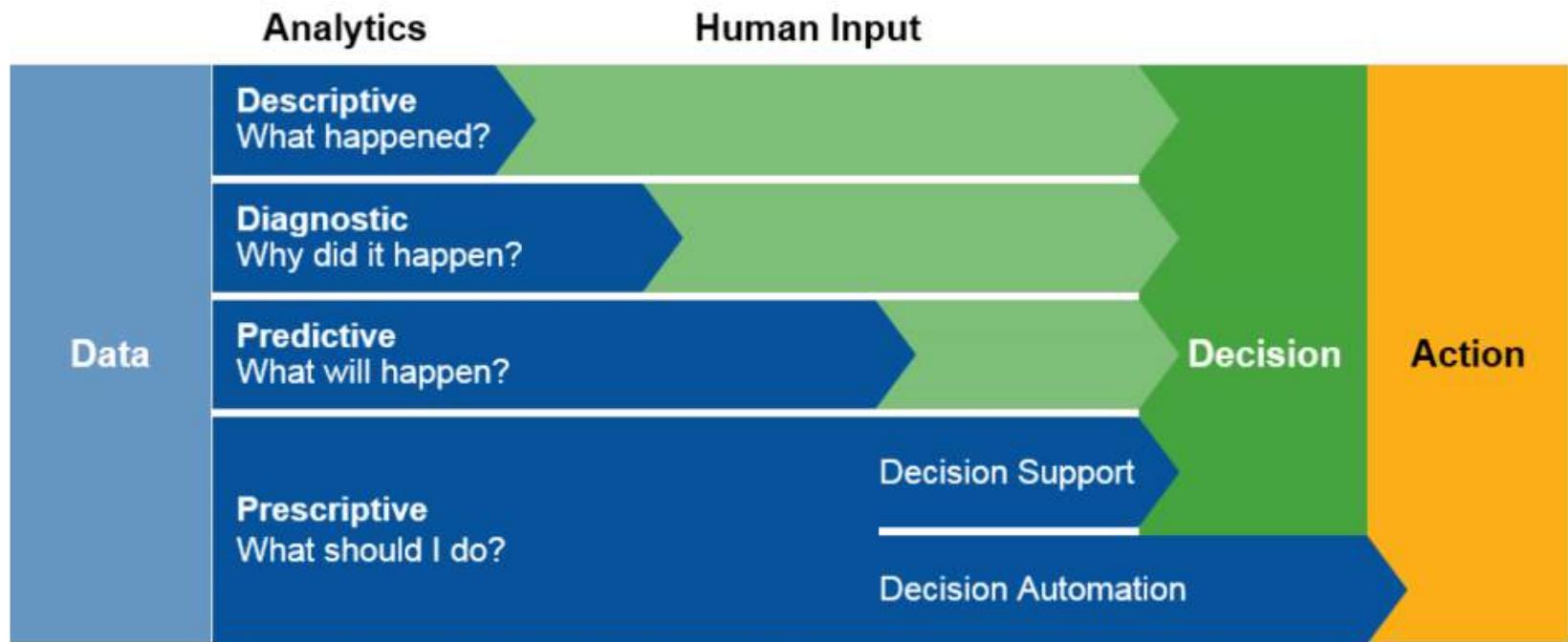
Source: Gartner (May 2015)

IoT Sensors in Finance

- Smart home — Google "Nest" home automation & analytics
  - FIs assess home value based on condition of home during loan origination process
  - Improved risk management for assessing insurance premiums

- Manufacturing / agriculture sensors
  - Influences investing and lending decisions by FIs

- Sensors attached to cars
  - Driving habits, car maintenance impacting insurance assessment / premiums

IoT analytics in a smart city

# IoT Security "Security of Things"

# IoT Security Challenges

- Lack of standards & interoperability

- Unprotected "things"

- "Mirai" DDoS attack of Oct 16, 2017

- Unprotected connectivity

- Unprotected data in motion or at rest

- Remember the "car hacks"?
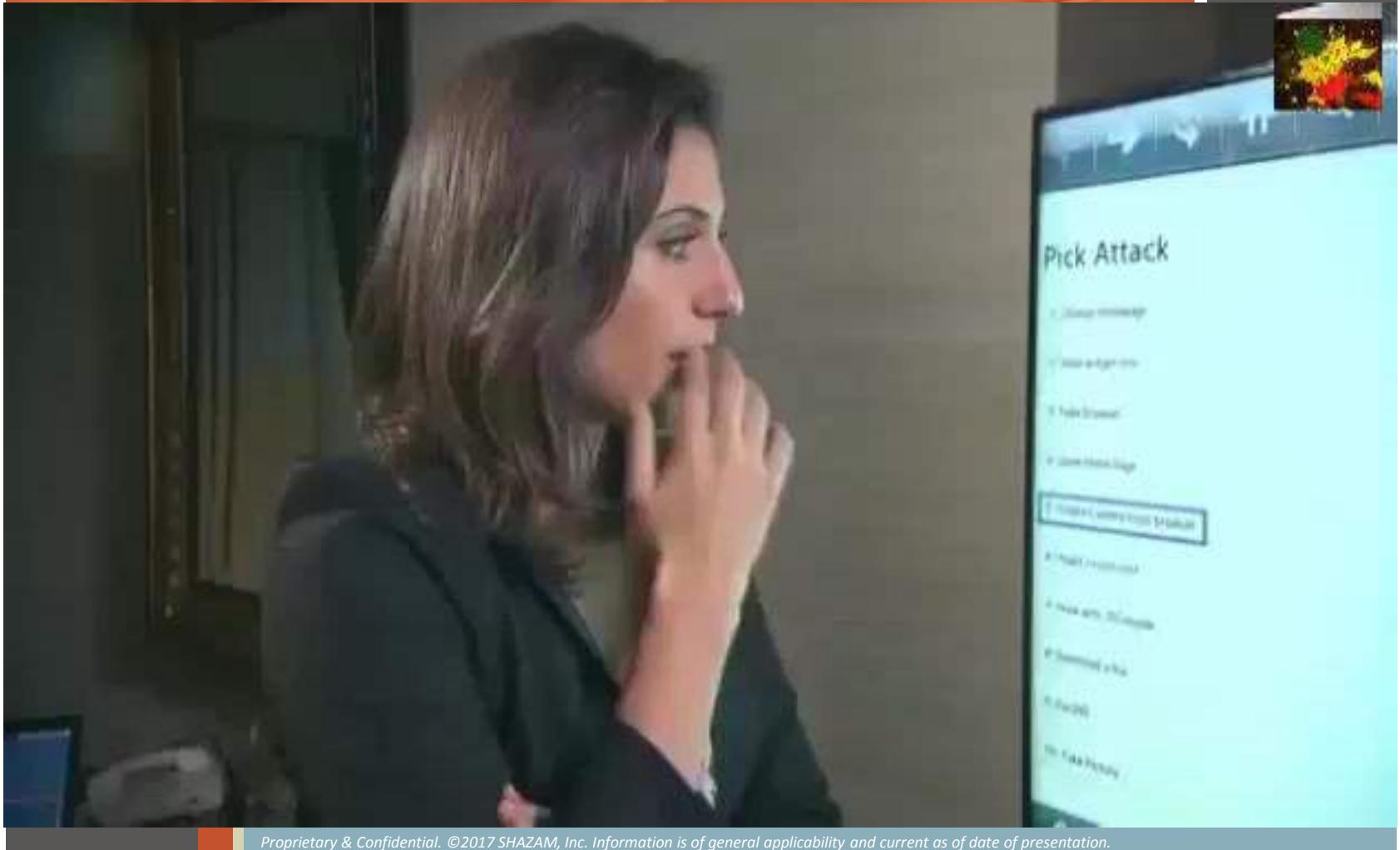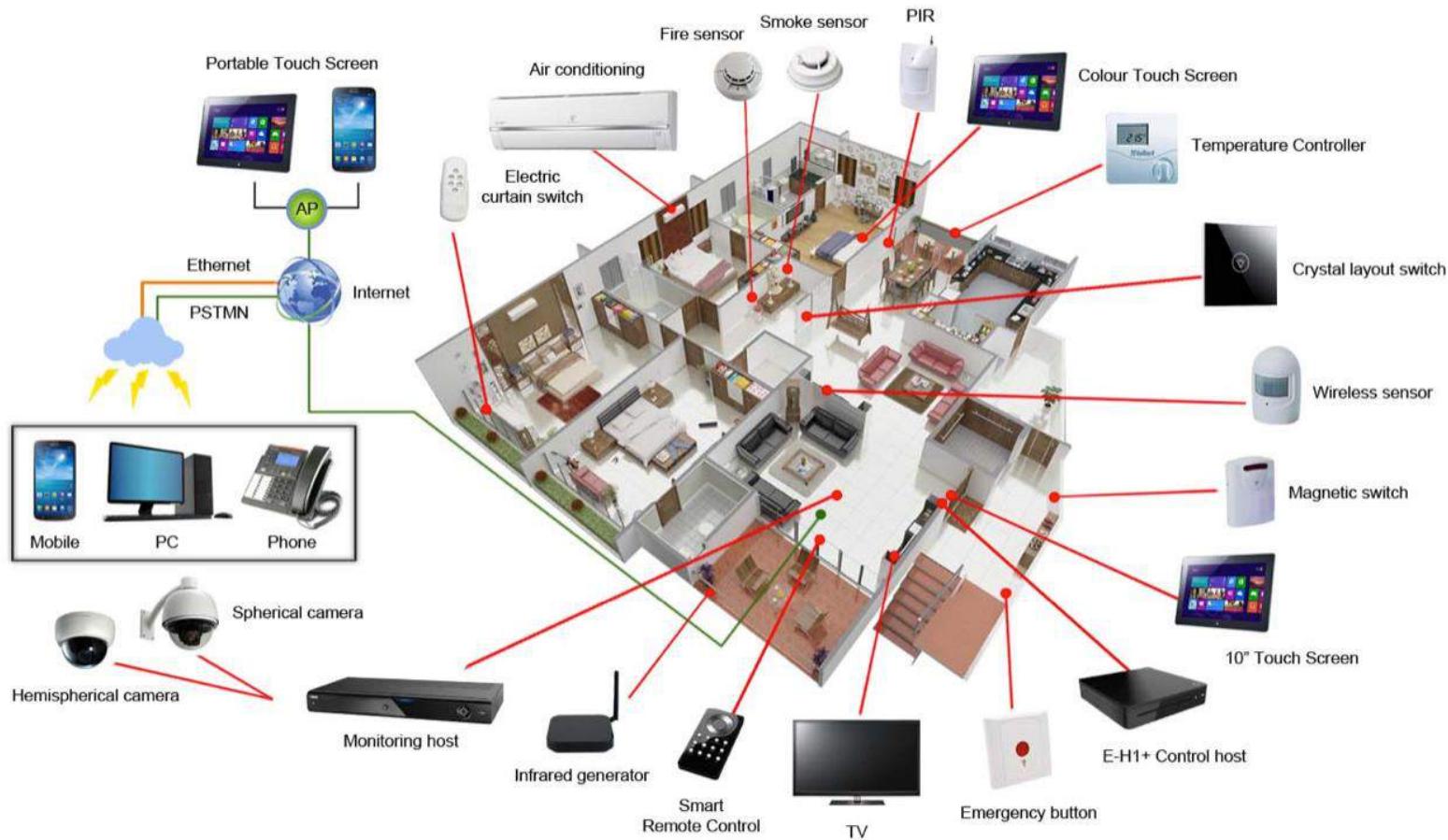
IoT Security Challenges– "How to Hack" Resources

- Web sites
- Blogs & forums
- Botnets
- Software tools
- Scripts
- Vulnerabilities
- Specialized search engines …
- Shodan
  - Coined as the world's most dangerous online search engine
  - Catalogs cyber assets or internet connected devices

IoT Security Solutions

- Secure
  - IoT devices — at time of design
  - Connectivity between IoT devices
  - Data from sensors

- Create multiple hurdles for attackers

- Layered security
  - Multi-factor authentication to access services
  - Rendering data unusable to unauthorized entities
  - Identity management of "things" — devices, sensors, people

- Proliferate compromised data to IoT analytics to counter-act threats:
  - Reactive with diagnostics
  - Proactive through predictive and prescriptive analytics

- Standards

You can't secure it unless you understand how it works

Internet of Payments

IoT Ways To Pay

Mobile phone / tablet applications

Connected Car

Smart Refrigerator

IoT Ways To Pay

Wearable

eCommerce checkout

Voice Activated

Many, many other devices…
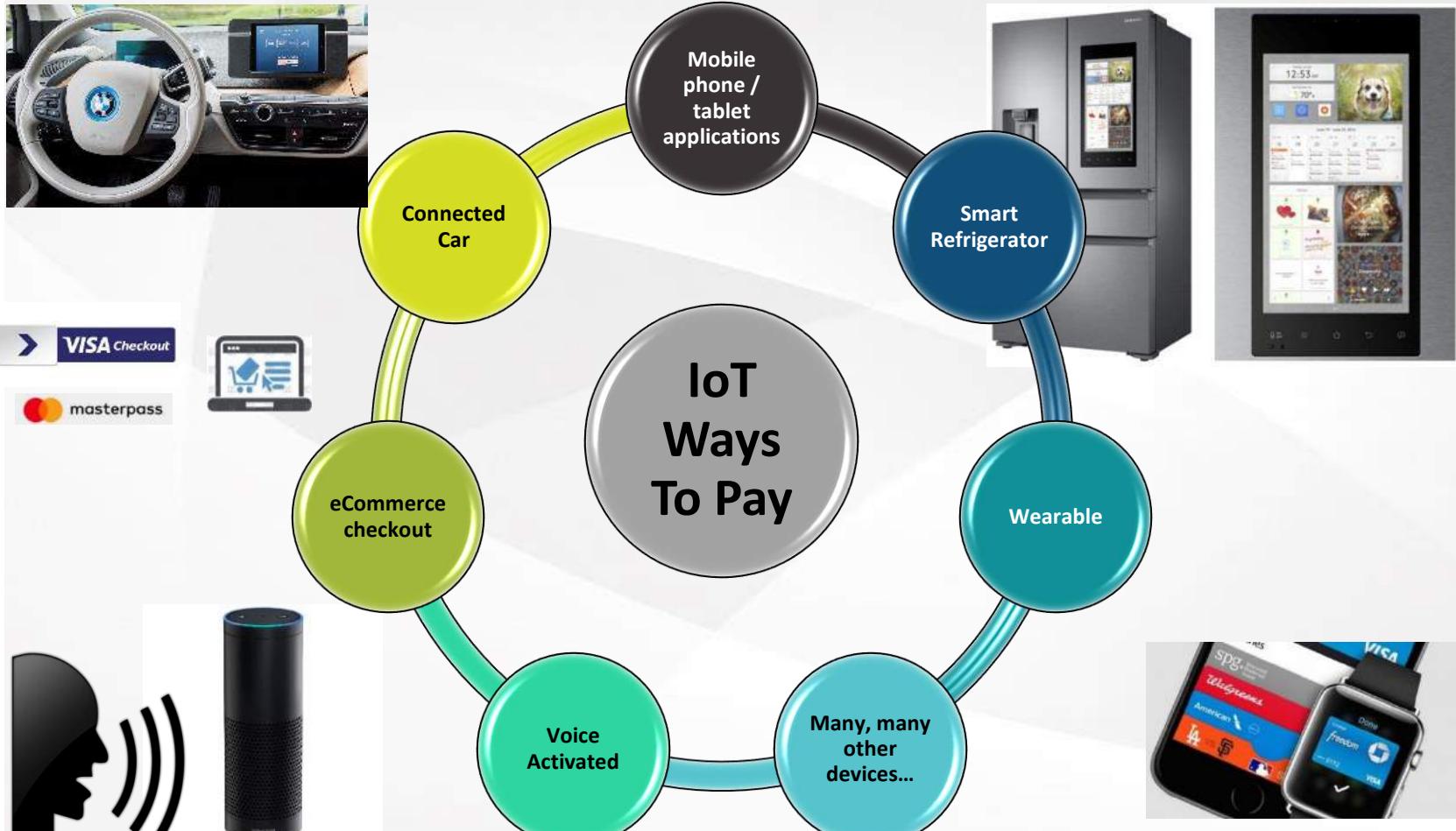
Physical to Digital Payments

| Mag stripe | EMV® | Mail order | Contactless | Mobile contactless | Card on file | Web payments | Mobile wallets | "Internet of Things" |

← Physical ——————————————————— **Digital →**
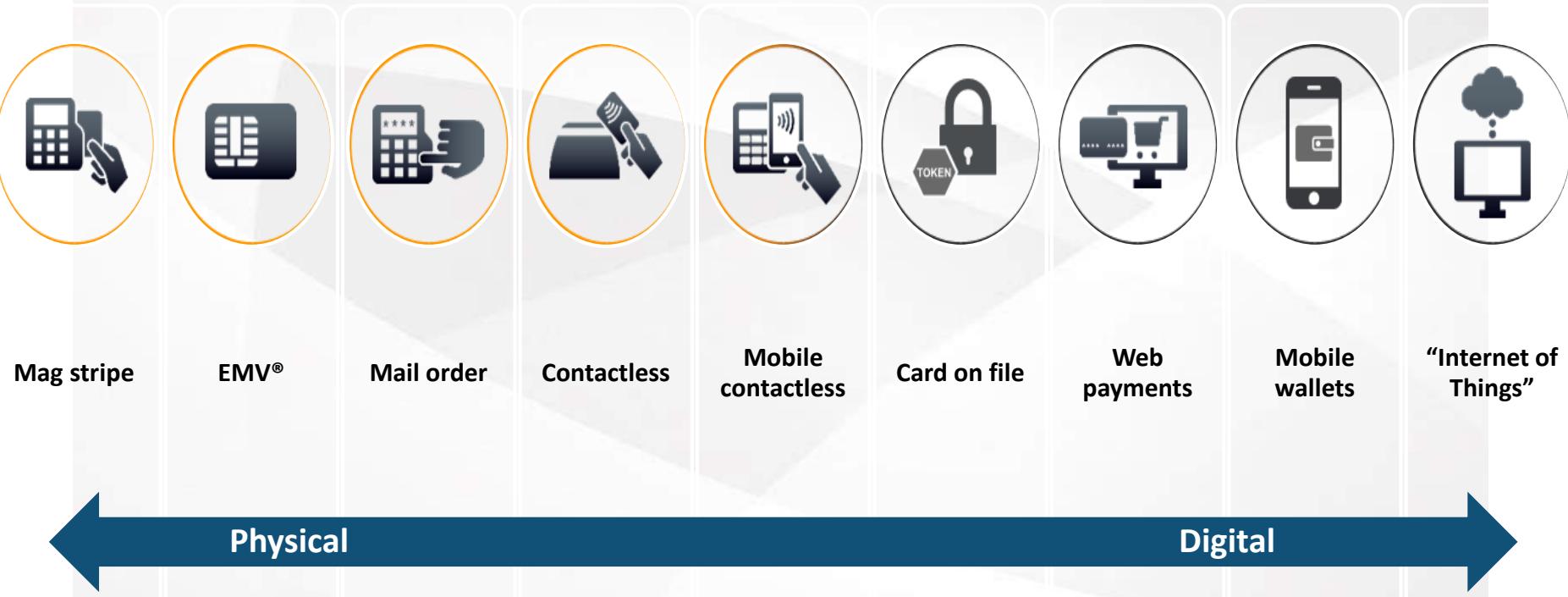
VISA Ready Program for IoT

- VISA Secure Solutions for IoT

- Visa Ready Program support for IoT innovators facilitates payments through tokenization, for example:
  - Pay for groceries via connected watch
  - Pay for gas via connected car
  - Pay for milk via connected refrigerator

- Payment enablement through:
  - Mobile phones / tablets
  - Wearables
  - Connected cars
  - Other connected devices

IoT Analytics: Watson and Visa

- Announced February 2017

- Enabling secure payments:
    - Automobiles
    - Appliances
    - Wearables
    - Up to 20 billion connected devices for payments and e-commerce by 2020

- Access to Visa payments services to all IBM Watson IoT Platform customers and leverage the power of analytics

- Visa Token Service backbone through Visa Ready program

APIs Drive the IOT

- APIs tightly coupled with IoT

- Allow secure exposure of connected devices to:
  - Consumers
  - Go-to-market channels
  - Applications

- Allows secure access to services

- APIs connect "things" like cars, mobile devices, smart homes, medical devices to the services ecosystem

- API management is critical

Payments From Your Connected Car

- Cashless motoring
- Honda & Visa partnership
- Pizza Hut
- Powered through VTS (token services) and Visa Checkout
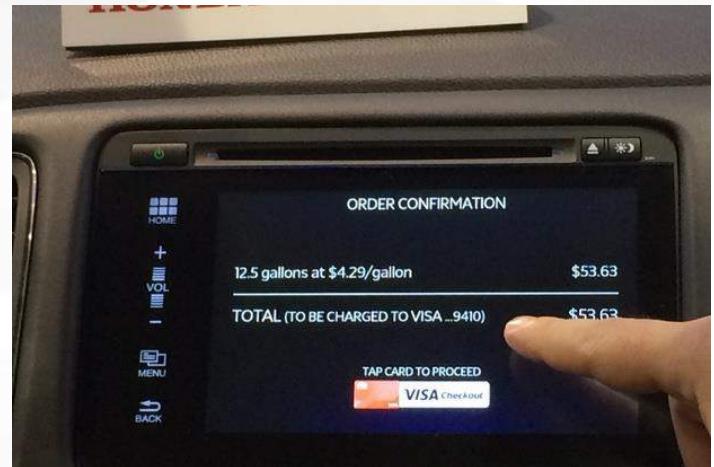
Capital One home banking with *Alexa*

IoT in Banking

- IoT devices present opportunities for FIs to offer / provide:
  - Personalized experience and tailored product offerings
  - Engaging customer rewards
  - Deeper customer relationship
  - Customer cross-selling opportunities
  - Better ways to improve risk management
  - Lending decisions based on real-estate data, spending habits, credit behavior
  - New and improved tellers and kiosks with sensing technology — biometric recognition of customers on branch entry

- Combine in-branch with remote, digital delivery of services
  - Opening accounts
  - Servicing accounts — e.g. usually when there's a problem
  - Consultation — e.g. loans and business services

SHAZAM Support of IoT Payments

SHAZAM'S Support of IoT Payments

- Secure access to SHAZAM EFT and core banking services

- Backbone for payments originating from IoT-enabled devices:
  - Real-time ISO 8583 messaging
  - Batch interfaces
  - Web services APIs

- Security
  - Multi-factor authentication
  - Support for PIN, passcode, biometric-enabled payments
  - Tokens instead of PAN / account numbers
  - Deploying highest standards of encryption and other payment security
  - Empowering cardholders to contribute to their own security (enhanced blocking)

SHAZAM'S Support of IoT Payments

- Forward looking
  - Continued growth in payment and core banking API services portfolio
  - Explore voice-enabled payments / banking
  - 3DS 2.0 — enhanced security for e-commerce payments

# SHAZAM'S Support of IoT Originated Payments

- Support of VISA / MC solutions:
  - Android Pay
  - Samsung Pay
  - Apple Pay
  - Microsoft Wallet
  - VISA's *VISA Checkout*
  - Mastercard *Masterpass*
  - Card On File (COF) Support
  - Secured by **Tokenization**

  Available NOW!

SHAZAM'S Support of IoT Originated Payments

- Security enhanced transaction blocking
  - SHAZAM BOLT$
  - Web services APIs

- Analytics
  - SHAZAM Core Insight
  - SHAZAM Insight with Data Select
  - … more to follow
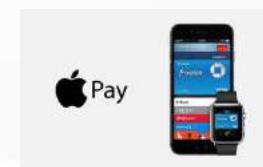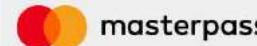
SHAZAM IoT Payment Device Enrollment

Token Activation

Service Consumer
- Integrators
- Mobile providers
- IoT platform
- E-commerce
- Host aggregators

Token Service Provider

1

2

3

5

4

6

8

7

9

VISA **TSP**

MasterCard **MDES**

Issuer

Multi-factor authentication
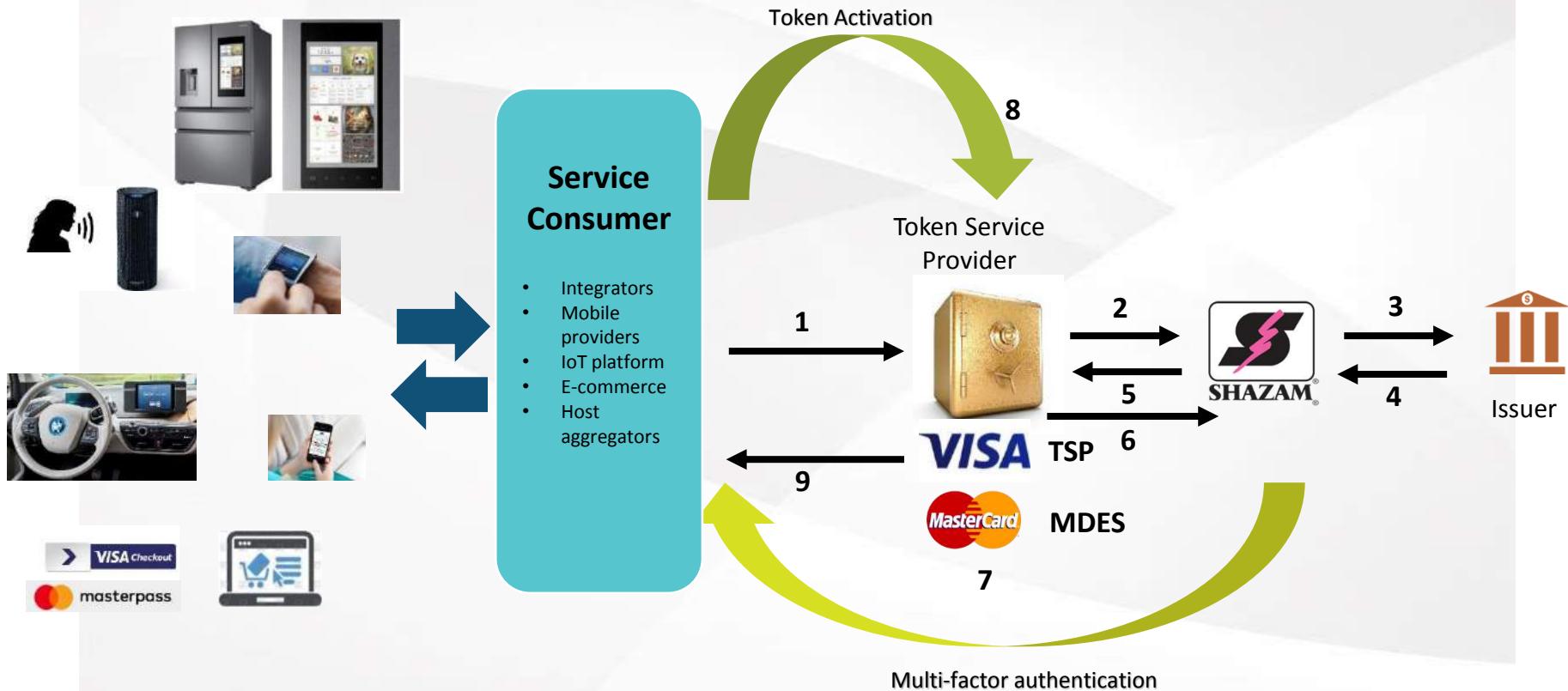
SHAZAM Financial Services Suite

IOT Is Here...And Growing!

50 **Billion**

"Smart Objects"

Rapid Adoption Rate of Digital Infrastructure: 5X Faster Than Electricity and Telephony

World Population

Source: Cisco IBSG, 2011

BILLIONS OF DEVICES — 0, 10, 20, 30, 40, 50

Inflection Point

12.5

25

6.8 7.2 7.6

TIMELINE

2010 2015 2020

And Finally…
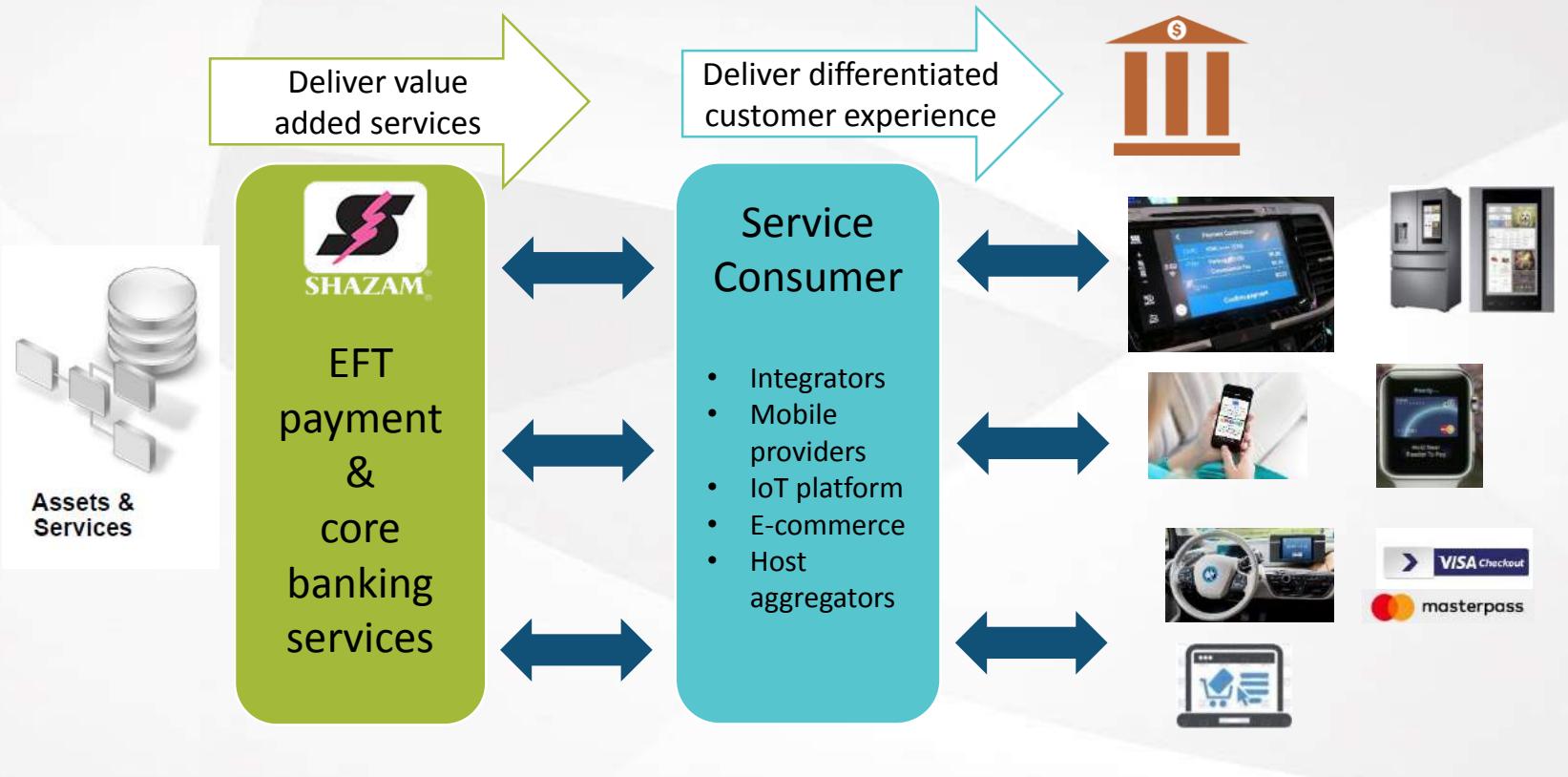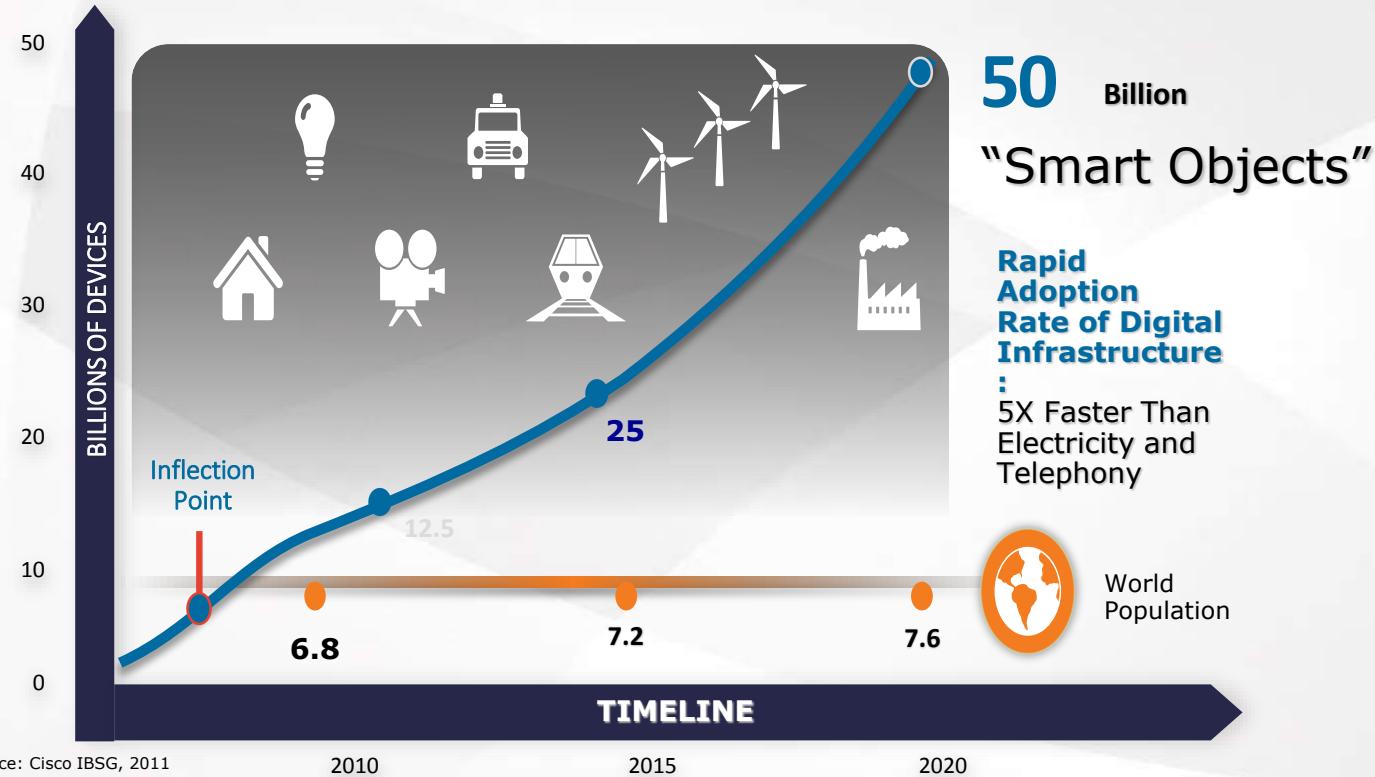
- Wi-Fly
  - Saves embarrassment

- Get up alert
  - Shock to promote movement

- Weight loss
  - Conspires with the refrigerator

- Keep-your-pants-on mode

Samsung's IoT Pantaloons — announced April 1, 2017

Thank You!

QUESTIONS?