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# Introduction to IoT

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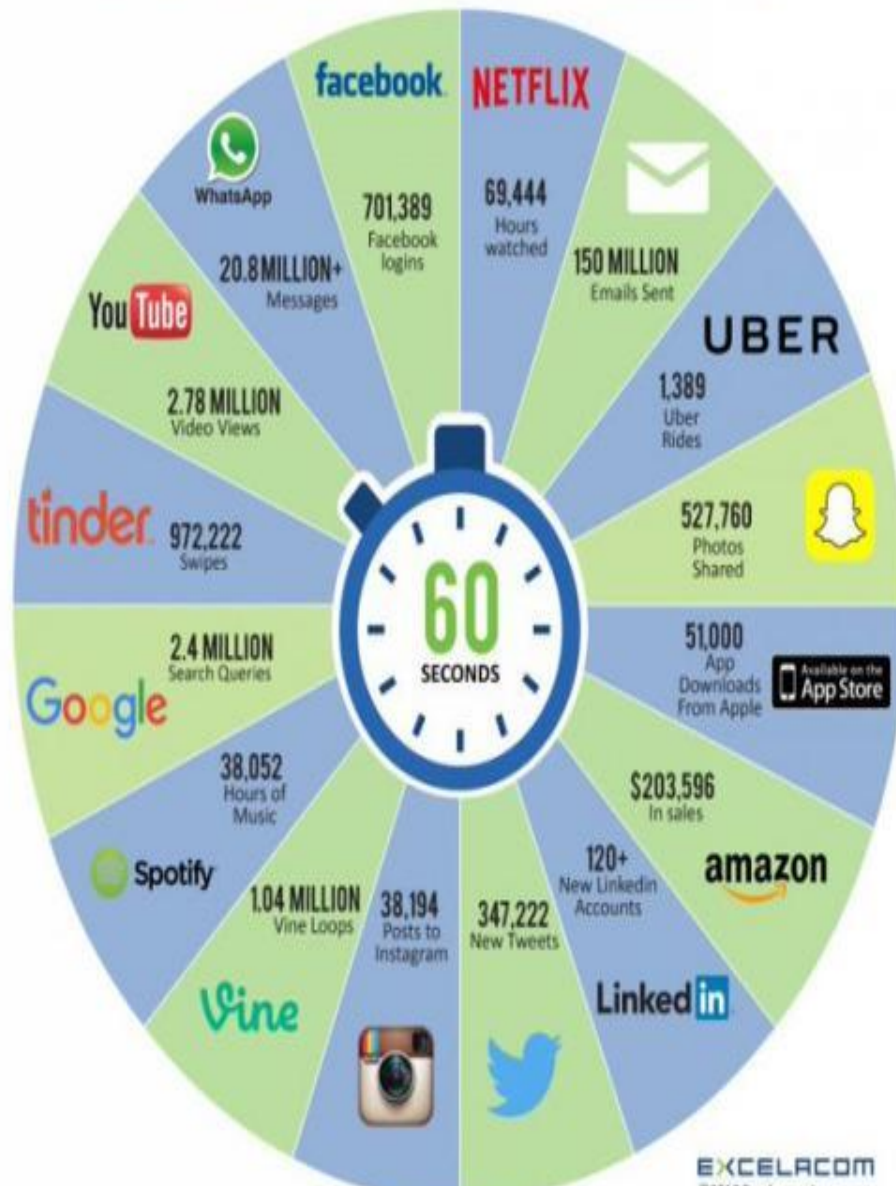
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http://www.mansafalam.com          Video

# 2016 What happens in an INTERNET MINUTE?



- WhatsApp — 20.8 MILLION+ Messages
- facebook — 701,389 Facebook logins
- NETFLIX — 69,444 Hours watched
- 150 MILLION Emails Sent
- YouTube — 2.78 MILLION Video Views
- UBER — 1,389 Uber Rides
- tinder — 972,222 Swipes
- 527,760 Photos Shared (Snapchat)
- Google — 2.4 MILLION Search Queries
- 51,000 App Downloads From Apple — App Store
- Spotify — 38,052 Hours of Music
- $203,596 In sales
- Vine — 1.04 MILLION Vine Loops
- Instagram — 38,194 Posts to Instagram
- 347,222 New Tweets
- 120+ New Linkedin Accounts
- amazon
- Linkedin

60 SECONDS

EXCELACOM

# 2017 What happens in an INTERNET MINUTE?



- WhatsApp — 29.2 MILLION Messages
- facebook — 854,166 Facebook Logins
- NETFLIX — 80,860 Hours Watched
- 156 MILLION Emails Sent
- YouTube — 4.1 MILLION Video Views
- UBER — 3,833 Uber Rides
- bumble — 152,777 Swipes
- 6,944,444 Videos Viewed (Snapchat)
- Google — 3.5 MILLION Search Queries
- 58,520 App Downloads From Apple — App Store
- Spotify — 46,875 Hours of Music
- $265,273 In Sales
- twitch — 11,788 Hours Streamed
- Instagram — 41,666 Posts to Instagram
- 350,000 New Tweets
- 43,672 Hours of Music
- amazon
- P

60 SECONDS

# BIG DATA

Big Data is data that is too large, complex and dynamic for any conventional data tools to capture, store, manage and analyze.

The right use of Big Data allows analysts to spot trends and gives niche insights that help create value and innovation much faster than conventional methods.

**57.6% OF ORGANIZATIONS SURVEYED SAY THAT BIG DATA IS A CHALLENGE**

**72.7% CONSIDER DRIVING OPERATIONAL EFFICIENCIES TO BE THE BIGGEST BENEFIT OF A BIG DATA STRATEGY**

**50% SAY THAT BIG DATA HELPS IN BETTER MEETING CONSUMER DEMAND AND FACILITATING GROWTH**

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*The "three V's", i.e the Volume, Variety and Velocity of the data coming in is what creates the challenge.*

## VOLUME

Amount of Big Data stored across the world (in petabytes)

- >3,500 NORTH AMERICA
- >2,000 EUROPE
- >250 CHINA
- >400 JAPAN
- >200 MIDDLE EAST
- >50 INDIA
- >50 LATIN AMERICA

## VARIETY

**PEOPLE TO PEOPLE**
NETIZENS, VIRTUAL COMMUNITIES, SOCIAL NETWORKS, WEB LOGS...

**PEOPLE TO MACHINE**
ARCHIVES, MEDICAL DEVICES, DIGITAL TV, E-COMMERCE, SMART CARDS, BANK CARDS, COMPUTERS, MOBILES...

**MACHINE TO MACHINE**
SENSORS, GPS DEVICES, BAR CODE SCANNERS, SURVEILLANCE CAMERAS, SCIENTIFIC RESEARCH...

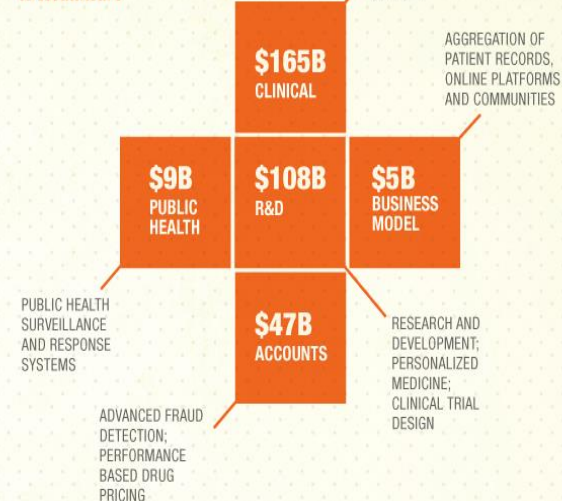## VELOCITY

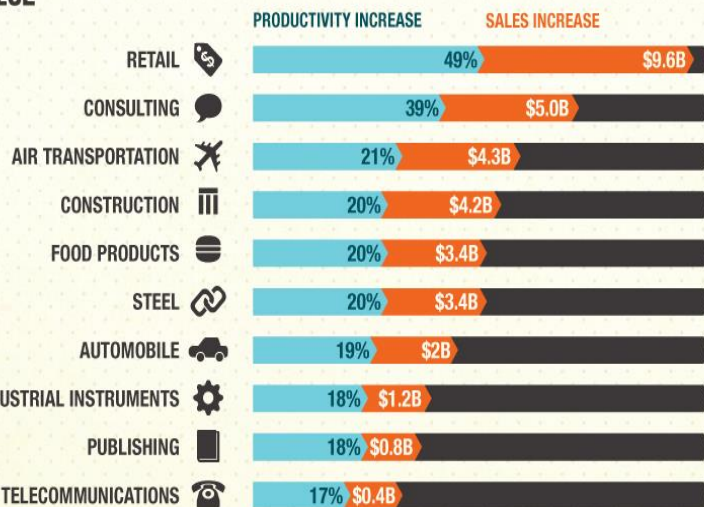**2.9 MILLION** EMAILS SENT EVERY SECOND

**20 HOURS** OF VIDEO UPLOADED EVERY MIN

**50 MILLION** TWEETS PER DAY

## VALUE

| | PRODUCTIVITY INCREASE | SALES INCREASE |
|---|---|---|
| RETAIL | 49% | $9.6B |
| CONSULTING | 39% | $5.0B |
| AIR TRANSPORTATION | 21% | $4.3B |
| CONSTRUCTION | 20% | $4.2B |
| FOOD PRODUCTS | 20% | $3.4B |
| STEEL | 20% | $3.4B |
| AUTOMOBILE | 19% | $2B |
| INDUSTRIAL INSTRUMENTS | 18% | $1.2B |
| PUBLISHING | 18% | $0.8B |
| TELECOMMUNICATIONS | 17% | $0.4B |

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## CASE STUDY - Healthcare

*$300 billion is the potential annual value to Healthcare*

- **$165B** CLINICAL
- **$9B** PUBLIC HEALTH
- **$108B** R&D
- **$5B** BUSINESS MODEL
- **$47B** ACCOUNTS

TRANSPARENCY IN CLINICAL DATA AND CLINICAL DECISION SUPPORT

AGGREGATION OF PATIENT RECORDS, ONLINE PLATFORMS AND COMMUNITIES

RESEARCH AND DEVELOPMENT; PERSONALIZED MEDICINE; CLINICAL TRIAL DESIGN

ADVANCED FRAUD DETECTION; PERFORMANCE BASED DRUG PRICING

PUBLIC HEALTH SURVEILLANCE AND RESPONSE SYSTEMS

**40% PROJECTED GROWTH IN GLOBAL DATA CREATED PER YEAR**

1010

$$$

**5% PROJECTED GROWTH IN GLOBAL IT SPENDING PER YEAR**

*The estimated size of the digital universe in 2011 was 1.8 zettabytes. It is predicted that between 2009 and 2020, this will grow 44 fold to 35 zettabytes per year. A well defined data management strategy is essential to successfully utilize Big Data.*

Sources - [1] Reaping the Rewards of Big Data - Wipro Report [2] Big Data: The Next Frontier for Innovation, Competition and Productivity - McKinsey Global Institute Report [3] comScore, Radicati Group [4] Measuring the Business Impacts of Effective Data - study by University of Texas, Austin [5] US Department of Labour.

## DO BUSINESS BETTER

**WIPRO** Applying Thought
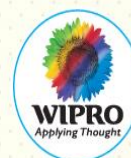
# What is the "Internet of Things"?

- IoT is a conceptual framework

- It's about enabling connectivity and embedded intelligence in devices

- Some of these devices are connected today, but **MANY** are not…

- Not strictly machine-to-machine (M2M) – also machine-to-people, people-to-machine, machine-to-objects, people-to-objects

- Creates the ability to collect data from a broad range of devices

- Data can be accessed via the cloud and analyzed using "big data" techniques

*IoT can be used to provide unique value propositions and create complex information systems which are greater than the sum of the individual components*
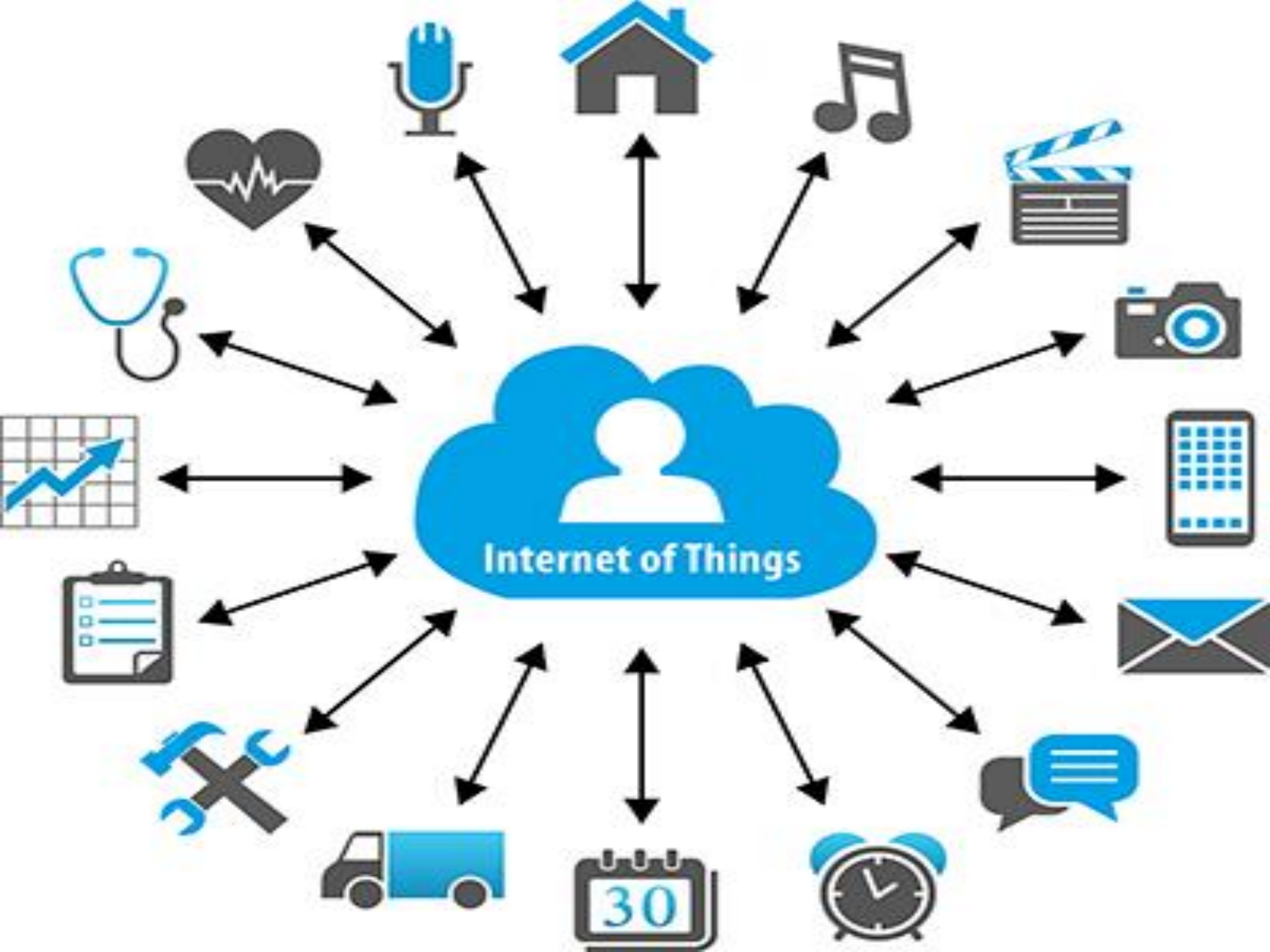
Internet of Things

# Internet of Things Hierarchy
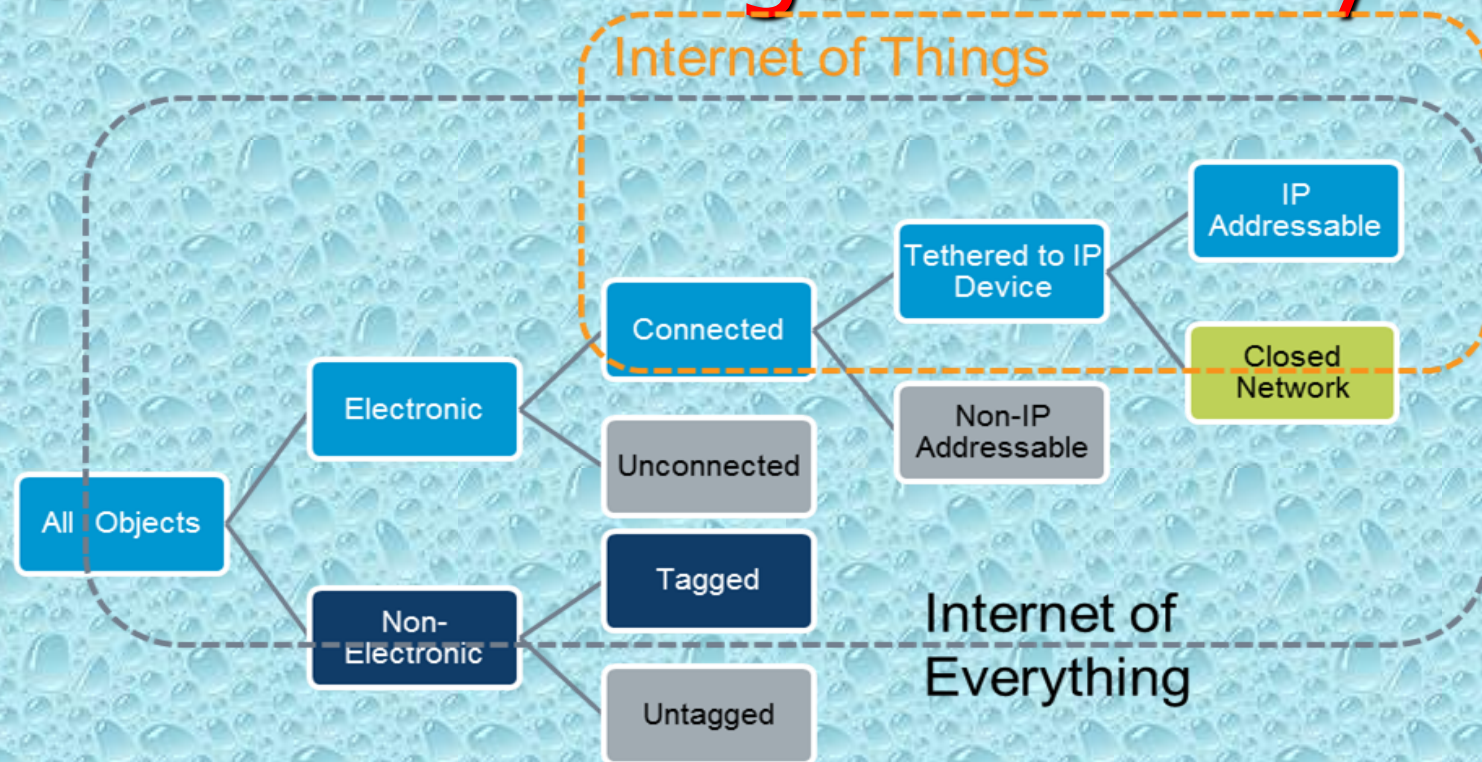


- **Unconnected Objects:** Desk, chair, soda can, fire hydrant, animal collar, shipping pallet, buildings, etc.

- **Unconnected Electronic Devices:** Calculator, streetlight, vending machine, coffee maker, blood pressure monitor, etc.

- **Connected/Tethered Electronic Devices:** Audio headset, printer, computer monitor, DVD player, licensed mobile radio unit, etc.

- **IP-addressable Devices:** Tablet PC, smartphone, Infotainment head unit, smart meter, EV charging station, home health hub, etc.

# IoT Application Segments

**Automotive**
- Infotainment
- Under-the-hood

**Communications**
- Consumer CPE
- Enterprise CPE
- Last-mile Access
- Backbone
- Mobile Handsets and Infrastructure

**Information Technology**
- Desktop
- Server
- Portable Computing
  (Netbook, Notebook & Tablet)

**Medical**
- Consumer Medical
- Imaging
- Other Medical

**Industrial**
- Building Automation
- Commercial Transportation
- Retail Electronics
- Industrial Automation
- Lighting
- Power & Energy
- Security
- Test & Measurement
- Other Industrial & Commercial

**Consumer**
- Home Appliance
- Home Automation
- Home Consumer Electronics
- PC Peripherals & Office Equipment
- Portable CE
- Smart Toys
- Sports & Fitness
- Other Consumer

**Military & Aerospace**
- Commercial aerospace
- Military equipment

# IoT Technologies

## Wired

- Ethernet, Coax, Fiber, etc. considered as a single category

## WPAN

- ANT+
- *Bluetooth* ® – Classic & Smart Ready
- *Bluetooth* ® Smart

## W-Mesh

- ZigBee PRO
- ZigBee RF4CE
- ZigBee Multi-Protocol
- EnOcean
- ISA100.11a
- WirelessHART
- Z-Wave
- Other 802.15.4

## WLAN

- 802.11a/b/g
- 802.11n
- 802.11ac
- 802.11ad
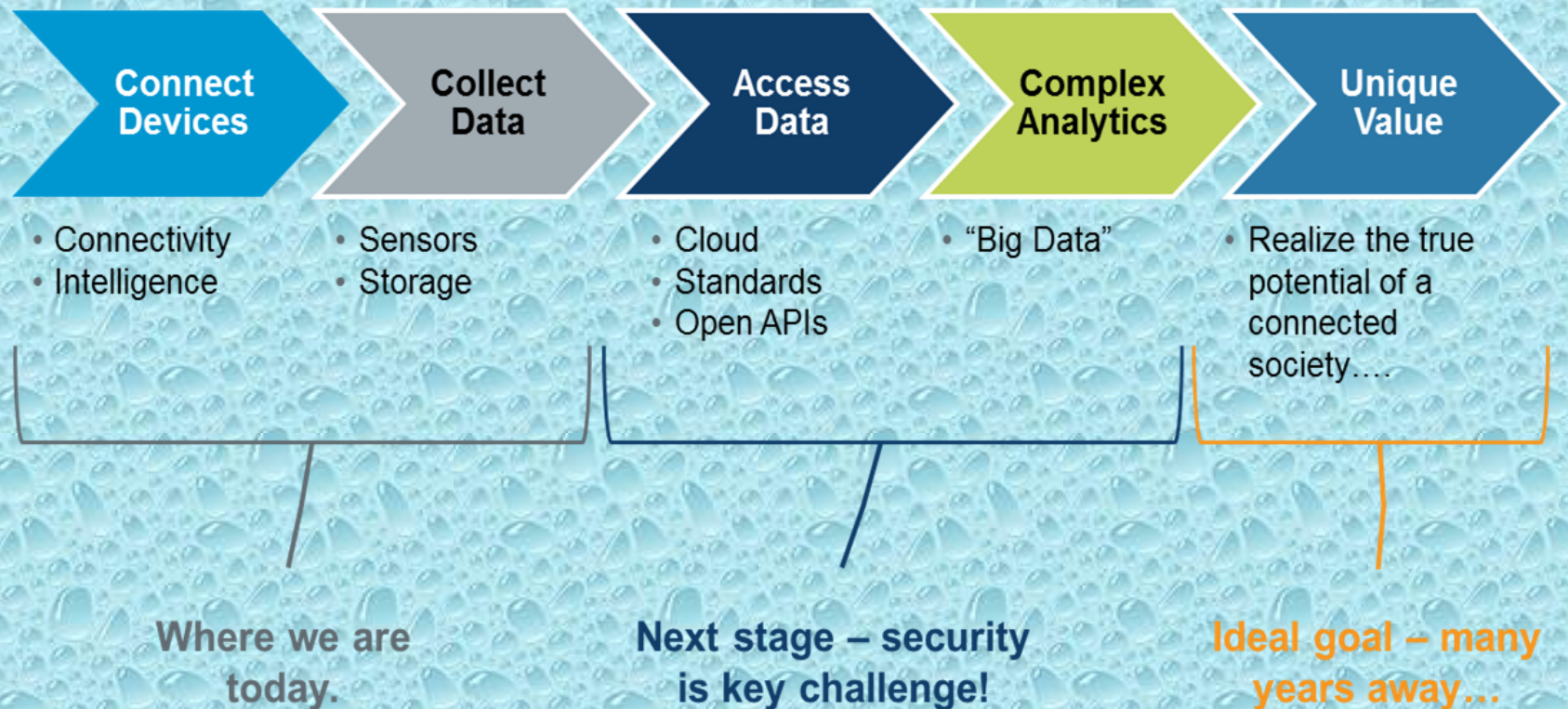- Other 802.11
- DECT ULE
- Other 2.4GHz
- Other Sub-GHz
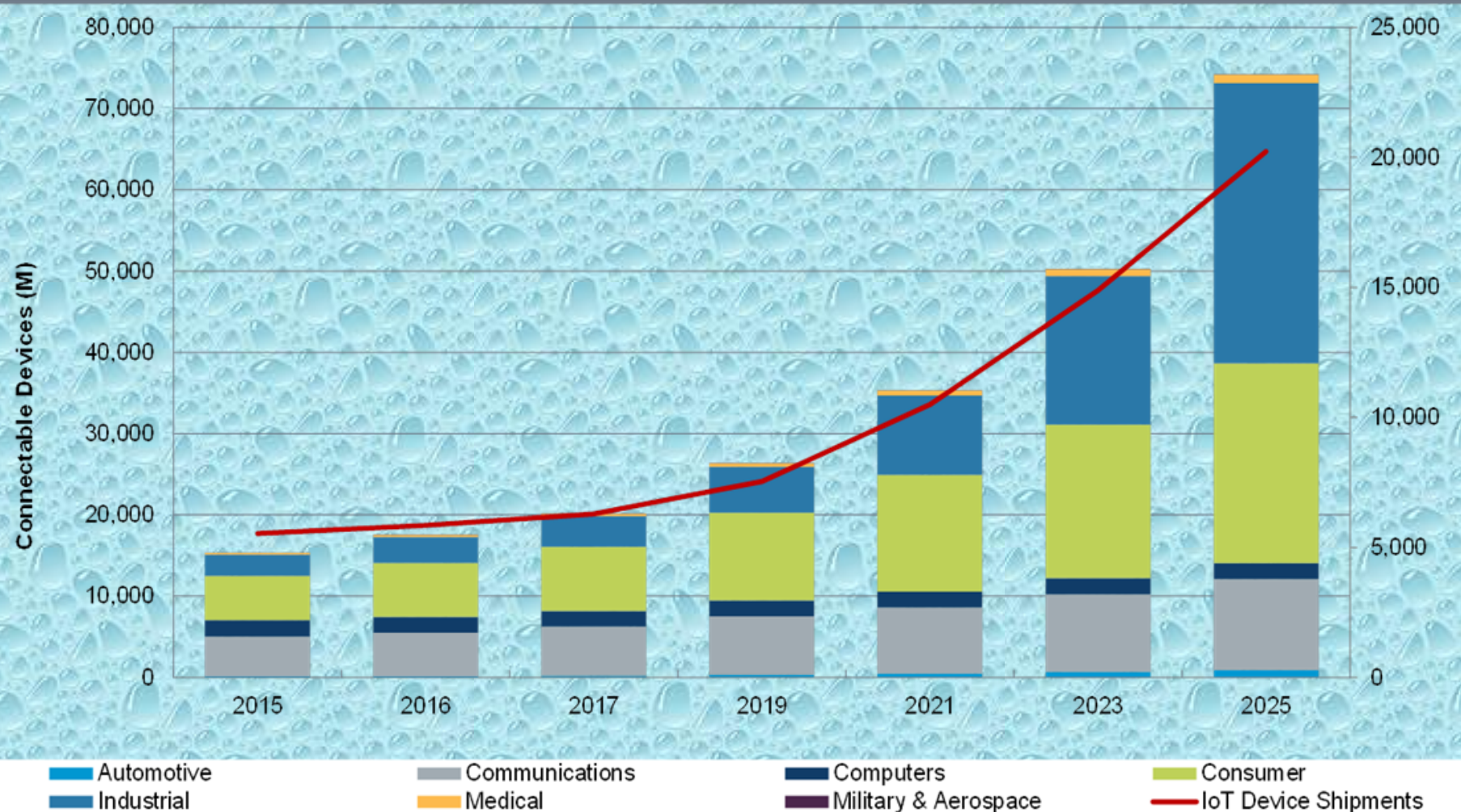
## WWAN

- 2G Cellular
- 3G Cellular
- 4G Cellular

# Internet of Things Evolution

**Internet of Everything (IoE):** represents the open access to data from one or more monitoring and control systems by third-party applications to provide unique, additional value to stakeholders.

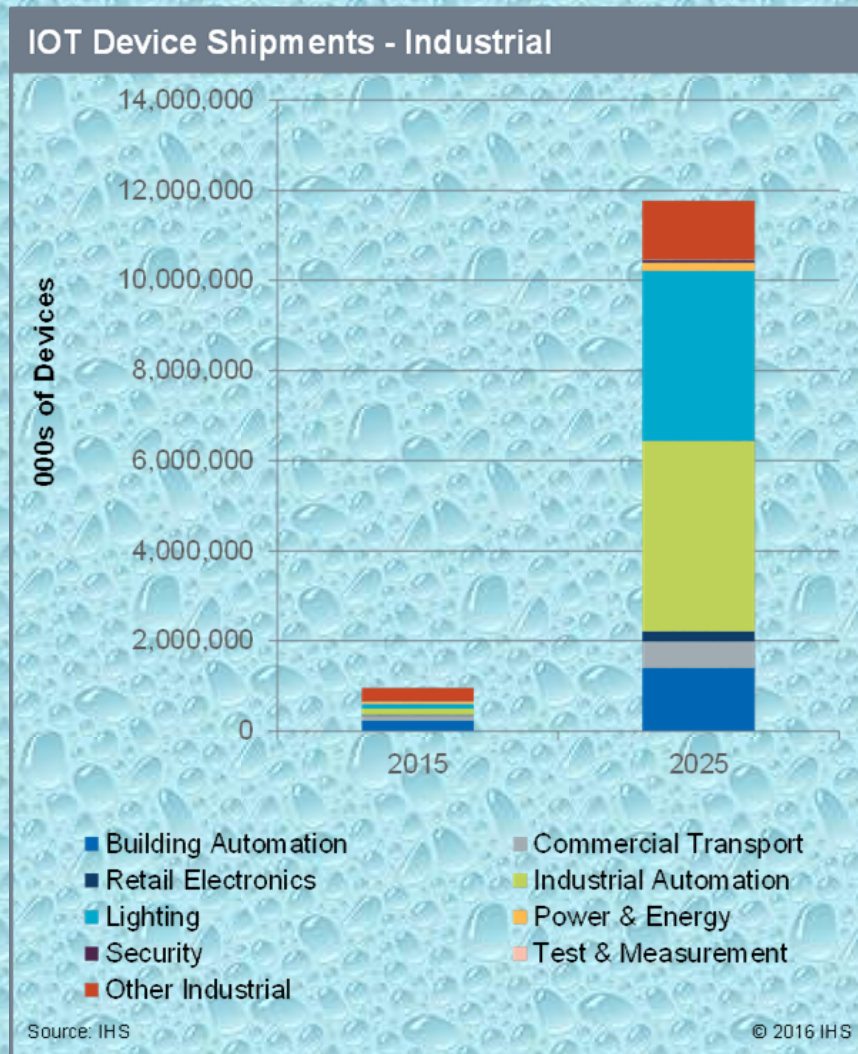| Connect Devices | Collect Data | Access Data | Complex Analytics | Unique Value |
|---|---|---|---|---|
| • Connectivity<br>• Intelligence | • Sensors<br>• Storage | • Cloud<br>• Standards<br>• Open APIs | • "Big Data" | • Realize the true potential of a connected society…. |

**Where we are today.**

**Next stage – security is key challenge!**

**Ideal goal – many years away…**

# Internet of Things Evolution



IoT Devices - Extended Forecast - Installed Base & Shipments

Legend: Automotive, Communications, Computers, Consumer, Industrial, Medical, Military & Aerospace, IoT Device Shipments

Source: IHS

© 2016 IHS

# IoT in Automation & Building Tech



IOT Device Shipments - Industrial

000s of Devices

14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0

2015    2025

- Building Automation
- Retail Electronics
- Lighting
- Security
- Other Industrial
- Commercial Transport
- Industrial Automation
- Power & Energy
- Test & Measurement

Source: IHS

© 2016 IHS

- IHS divides the industrial market for IoT devices into nine categories: building automation, commercial transport, retail electronics, industrial automation, lighting, power & energy, security, test & measurement and other industrial

- Many of the strategies for more efficient manufacturing, building management and commerce include demands for remote communications, monitoring and control

- This trend is driving the growth of integrated intelligence, sensor networks, asset tracking, internet connectivity, M2M communications, and energy measurement & management

# Types of Big Data Analytics

| | Descriptive | Diagnostic | Predictive | Prescriptive |
|---|---|---|---|---|
| **Answers the question...** | What happened? | Why did it happen? | What will happen next? | What should I do? |
| **Level of advancement** | Low | Medium | High | Very high |
| **Incorporates AI and machine learning?** | Not usually | Sometimes | Usually | Always |
| **Level of popularity** | Used by almost all organizations | Used by many organizations | Used by a smaller but growing group of organizations | Not yet widespread |

# End to End Platform Builds

| Business & Data Analysis | Tools & Technologies | DevOps & Cloud Computing | Automation |
|---|---|---|---|

**Advanced Analytics**
- Stanford NLP
- AlchemyAPI — Powering the New Artificial Intelligence Economy
- openNLP
- rapidminer
- Spark MLlib
- Spark R

**Data Visualization**
- tableau SOFTWARE
- TIBCO Jaspersoft
- Libraries – D3.js

**Data Management**
- mongoDB.
- hadoop
- elasticsearch

**Data Integration/ Acquisition**
- Apache Tika
- talend*
- alteryx
- pentaho — A Hitachi Group Company
- Custom Apps

**Cloud Compute**

| Infrastructure as a Service | Data as a Service | Software as a Service |
|---|---|---|

amazon web services

# Big Data Application examples in different Industries:

## Retail/Consumer

- ❖ Merchandizing and market basket analysis
- ❖ Campaign management and customer loyalty programs
- ❖ Supply-chain management and analytics
- ❖ Event- and behavior-based targeting
- ❖ Market and consumer segmentations

## Finances & Frauds Services

- ❖ Compliance and regulatory reporting
- ❖ Risk analysis and management
- ❖ Fraud detection and security analytics
- ❖ Credit risk, scoring and analysis
- ❖ High speed arbitrage trading
- ❖ Trade surveillance
- ❖ Abnormal trading pattern analysis

## Web and Digital media

- ❖ Large-scale clickstream analytics
- ❖ Ad targeting, analysis, forecasting and optimization
- ❖ Abuse and click-fraud prevention
- ❖ Social graph analysis and profile segmentation
- ❖ Campaign management and loyalty programs

## Health & Life Sciences

- ❖ Clinical trials data analysis
- ❖ Disease pattern analysis
- ❖ Campaign and sales program optimization
- ❖ Patient care quality and program analysis
- ❖ Medical device and pharmacy supply-chain management
- ❖ Drug discovery and development analysis

## Telecommunications

- ❖ Revenue assurance and price optimization
- ❖ Customer churn prevention
- ❖ Campaign management and customer loyalty
- ❖ Call detail record (CDR) analysis
- ❖ Network performance and optimization
- ❖ Mobile user location analysis

## Ecommerce & customer service

- ❖ Cross-channel analytics
- ❖ Event analytics
- ❖ Recommendation engines using predictive analytics
- ❖ Right offer at the right time
- ❖ Next best offer or next best action

- Question & Answer