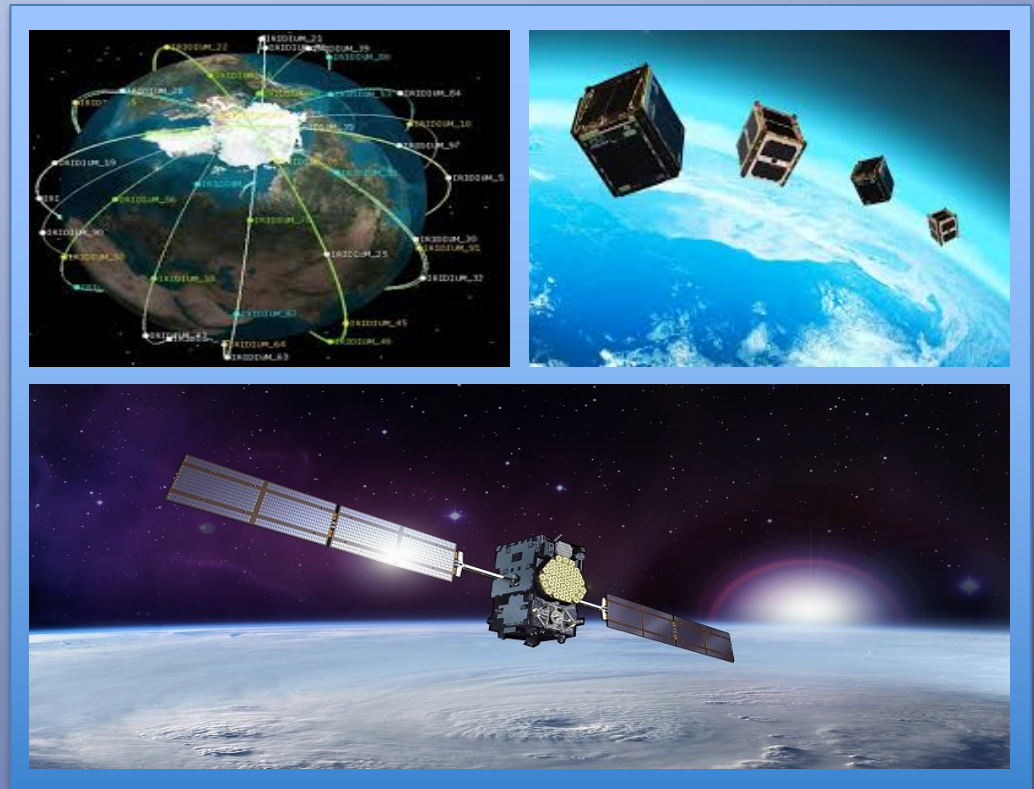


# Internet-of-Things and Internet-of-Space A Unique and Necessary Combination

## *The Internet of Things Meets The Internet of Space*

Orlando, Florida  
February 20th, 2019

*Adam T. Drobot  
Wayne, PA 19087*



Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# Outline

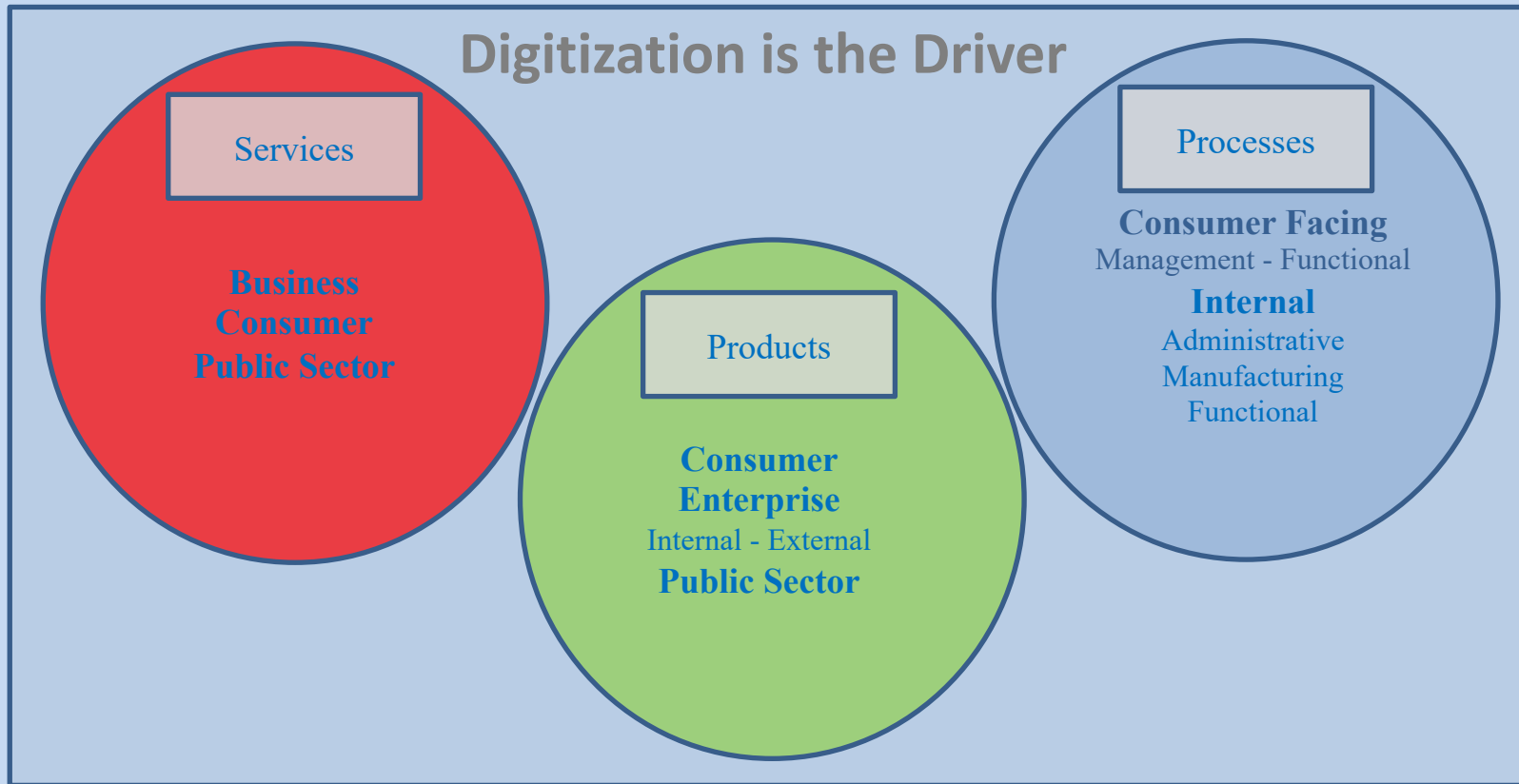
- *Internet of Things and the Internet of Space*
  - *A bit about:*
    - *IoT*
    - *IoS*
    - *Applications*
  - *Summary and Discussion*

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things



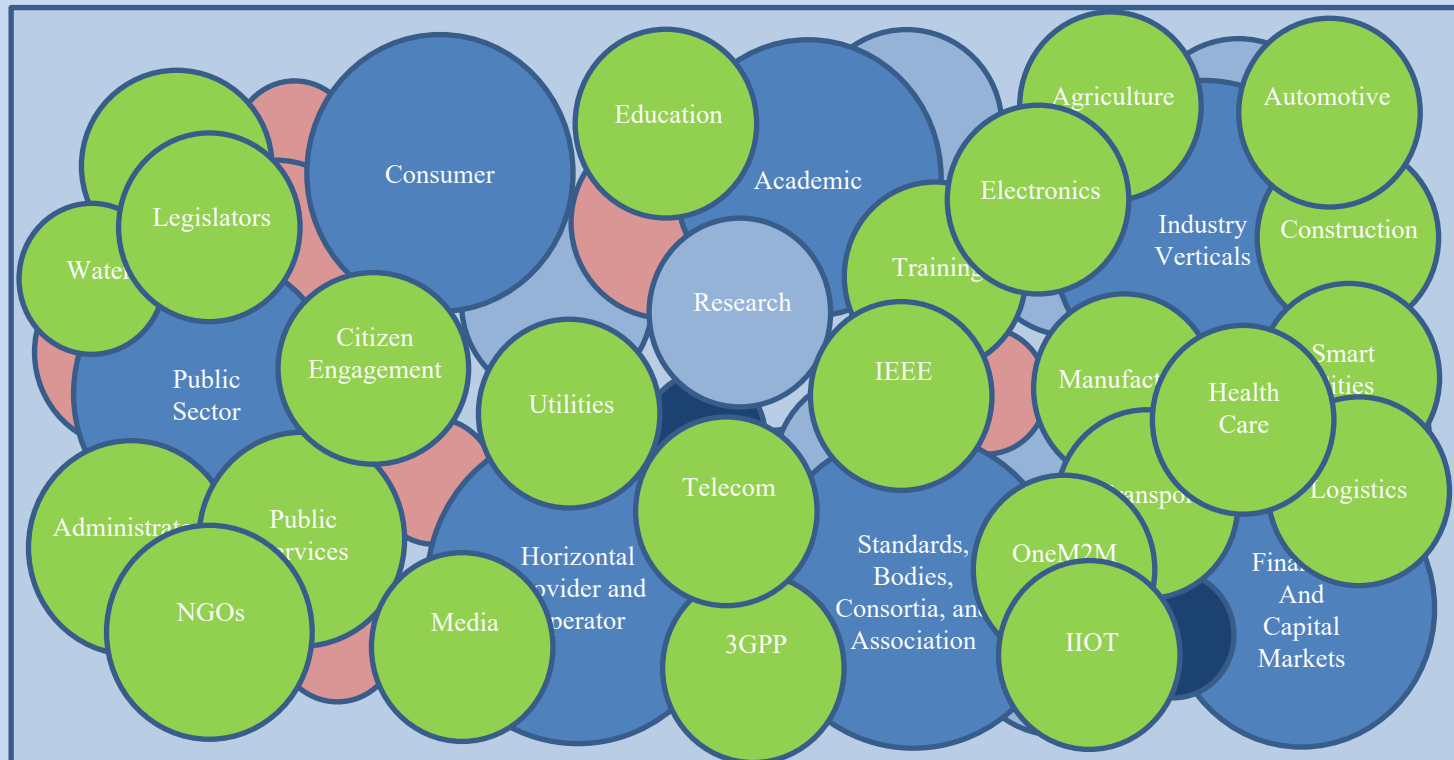
Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

## A Very Complex Eco-System With Many Stakeholders

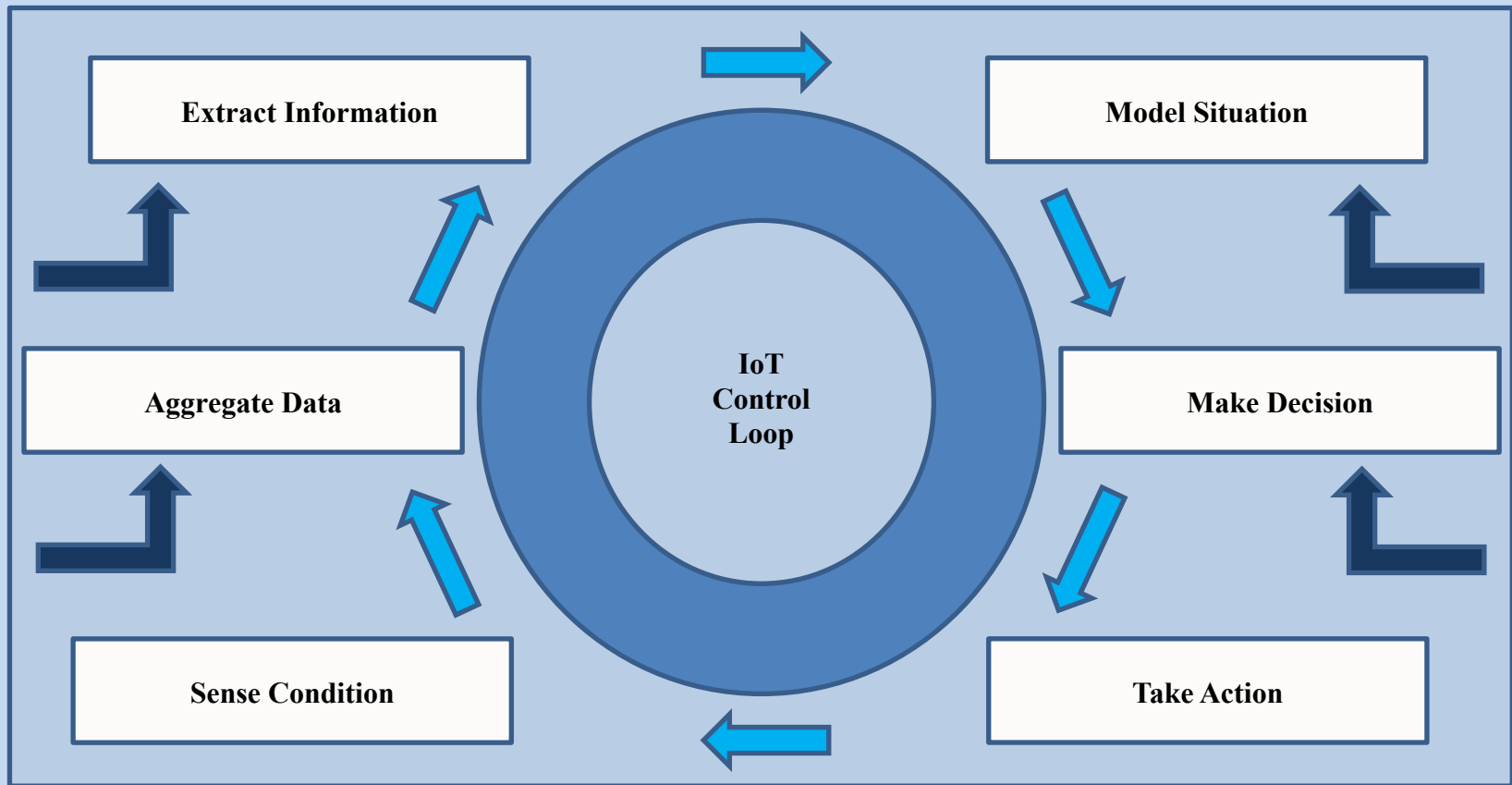


Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

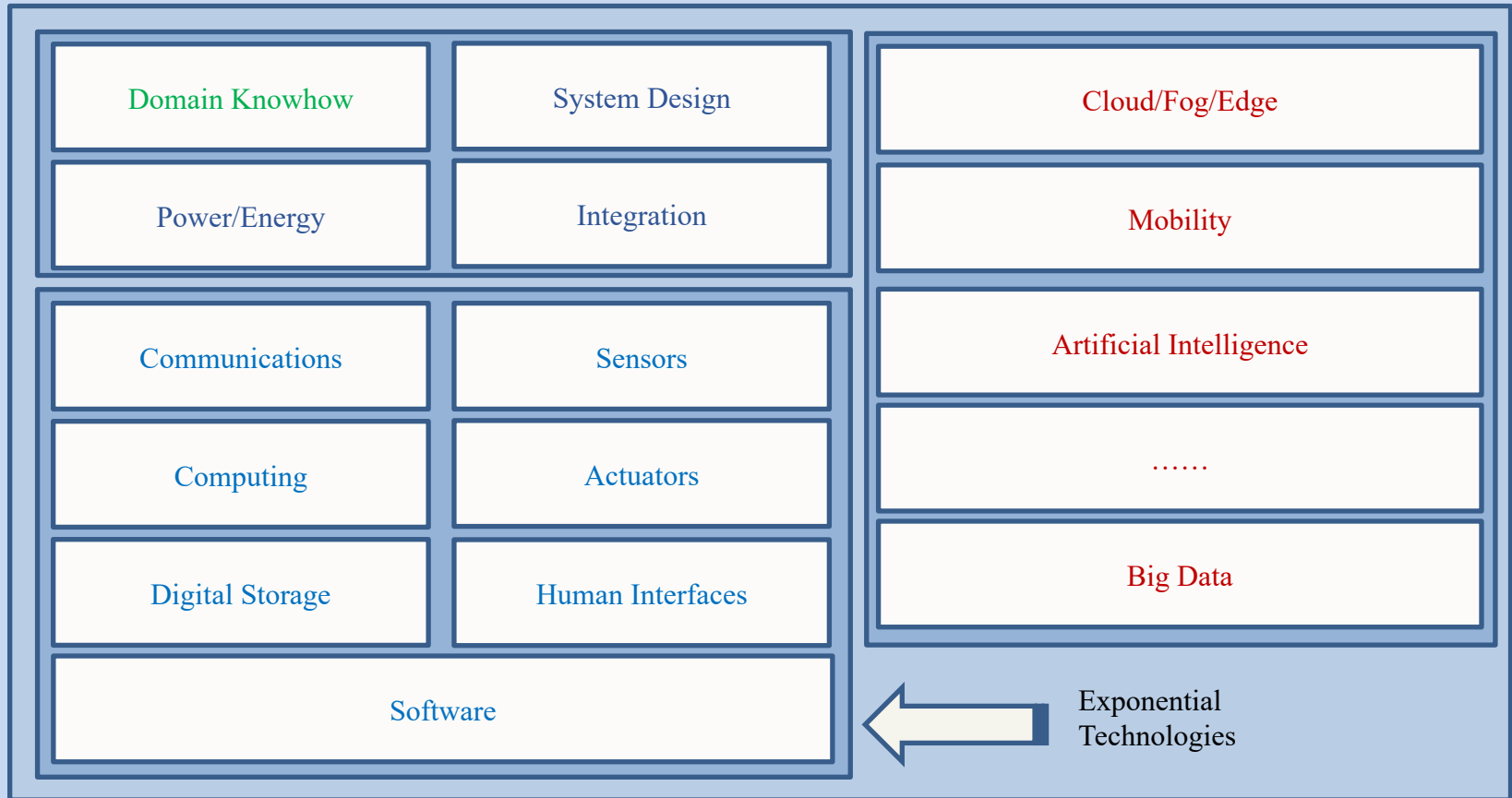


Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

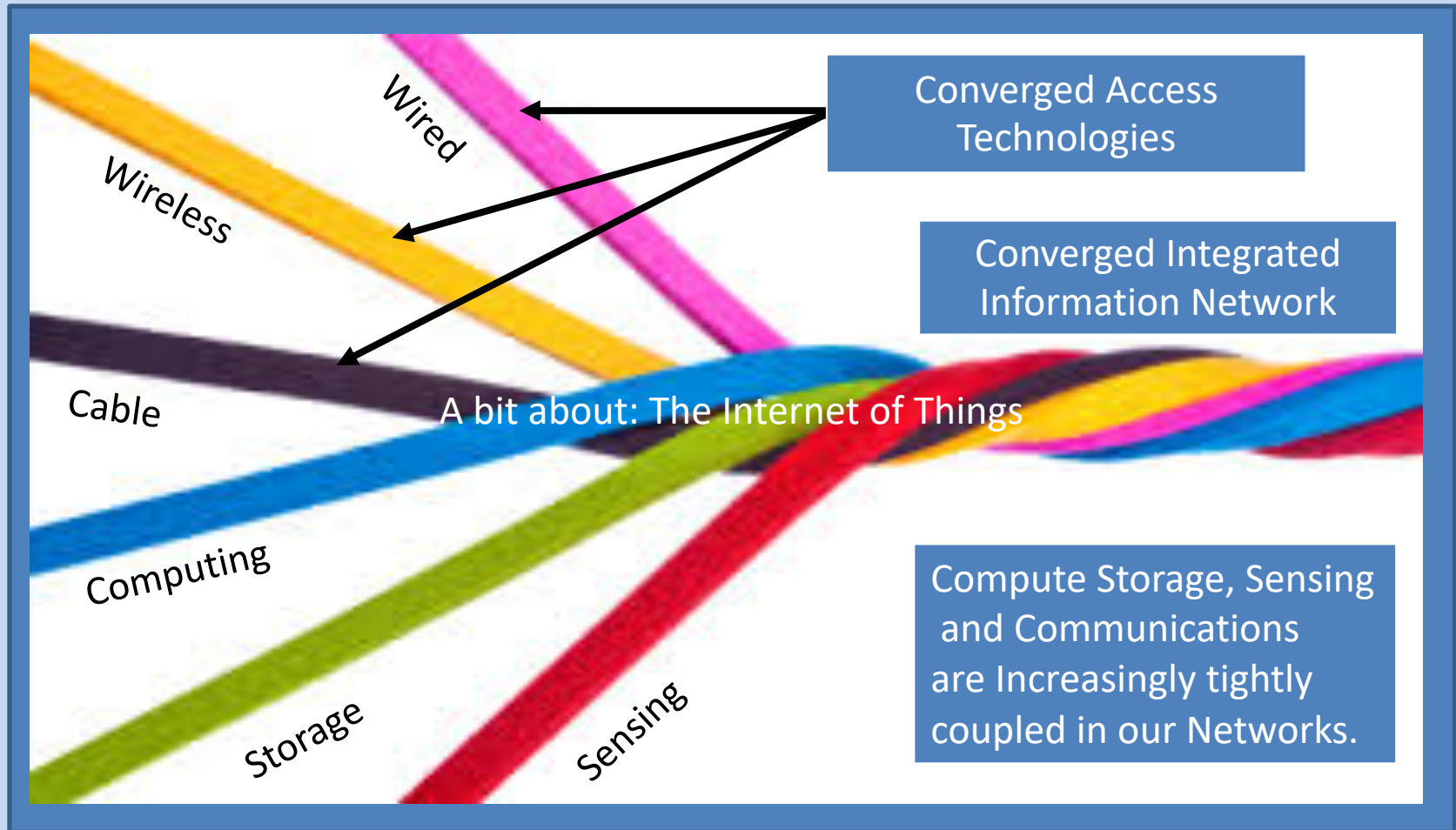


Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

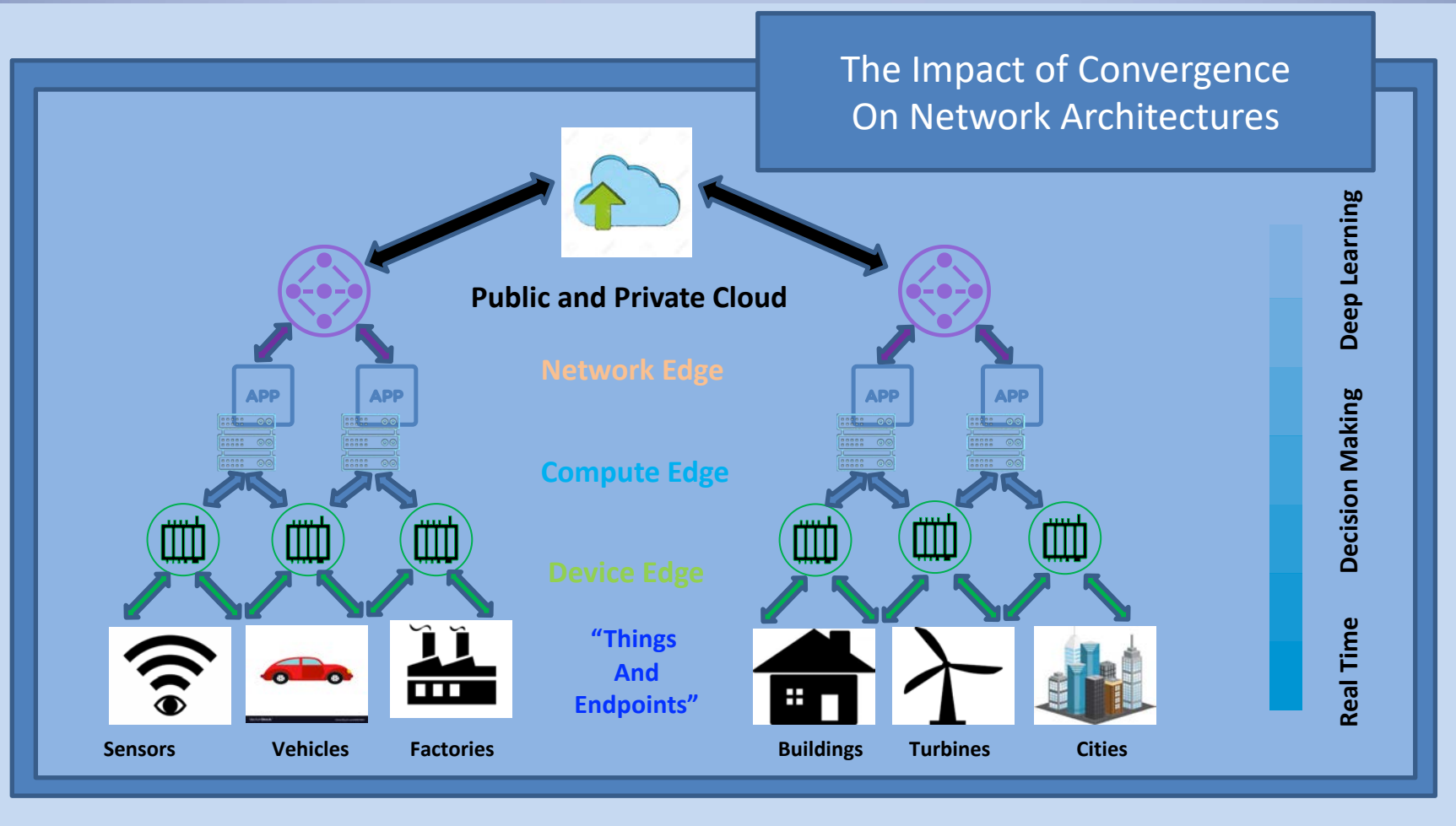


Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things



Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019





# A bit about: The Internet of Things

**Application of IOT in various industries**

**Transport**

- Smart car navigation and infotainment
- Emergency and breakdown call services
- Engine monitoring and telematics based insurance services
- Vehicle asset management

**Commerce**

- Personal navigation devices
- Connected home & connected appliances
- Optimized cash management solutions
- Remote ATM management
- Cash replacement solutions

**Operations**

- Smart metering & grid
- Predictive maintenance
- Connected worker
- Connected manufacturing and Industry 4.0

**Bank**

**Health**

- Assisted living
- Communication and collaboration for medical staff
- Health and wellness apps

Source: IBM and Accenture

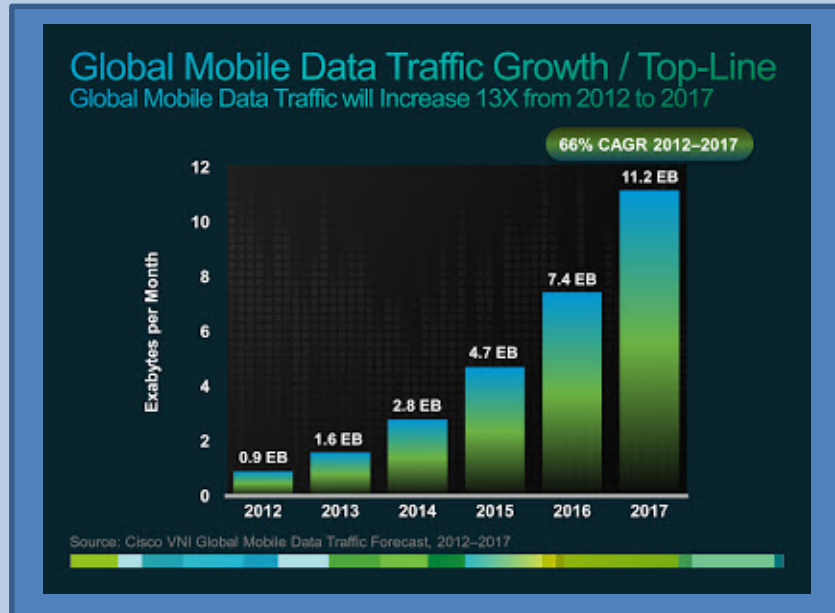
Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

## Growth in Data Traffic



Source: Cisco



Source: Data Age 2025 Study - IDC

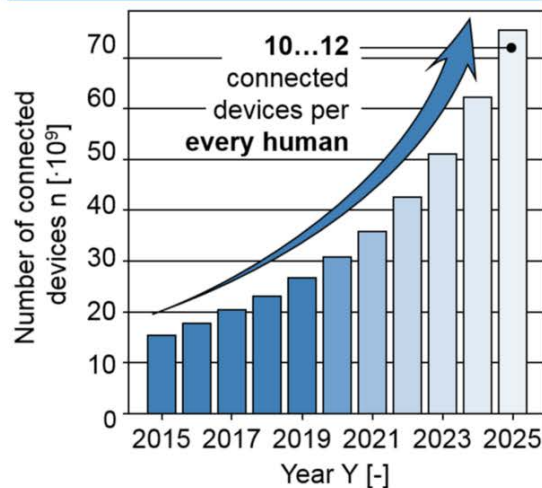
Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019

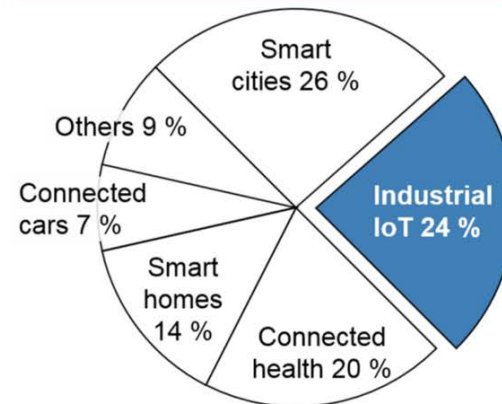


# A bit about: The Internet of Things

Number of connected devices



IoT market segmentation



Total IoT market capitalization in 2020:  
**267 000 000 000 \$**

Exponential growth of the number of the connected devices;  
Industrial sector is the leading driver of the IoT market development

Source: statista.com, bcg.com

Growth and market capitalization of the IIoT market

Image: © WZL | Anton Shirobokov

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

**Trends for 2019:** Gartner defines a strategic technology trend as one with substantial disruptive potential that is beginning to break out of an emerging state into broader impact and use; or as a trend that is rapidly growing with a high degree of volatility, and that will reach a tipping point over the next five years.

Trend No. 1: Artificial Intelligence (AI)

Trend No. 2: Social, Legal and Ethical IoT

Trend No. 3: Infonomics and Data Broking

Trend No. 4: The Shift from Intelligent Edge to Intelligent Mesh

Trend No. 5: IoT Governance

Trend No. 6: Sensor Innovation

Trend No. 7: Trusted Hardware and Operating System

Trend No. 8: Novel IoT User Experiences

Trend No. 9: Silicon Chip Innovation

Trend No. 10: New Wireless Networking Technologies for IoT

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Things

## Important Issues

1. For economic viability IoT is highly dependent on infrastructure – the use of common services available for multiple purposes – power, computing, connectivity, etc. This includes connectivity and now “sensing”.
2. The pattern for wireless connectivity has been built out to maximize population coverage. There are many IoT Application Verticals that require both mobility and Area Coverage. Examples are Agriculture, Mining, Natural Resource Management, Connected Vehicles, Emergency Services, Healthcare, etc.
3. Digitizing the Planet – as a source of knowledge and as a critical resource for responsibly managing what we have.

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space



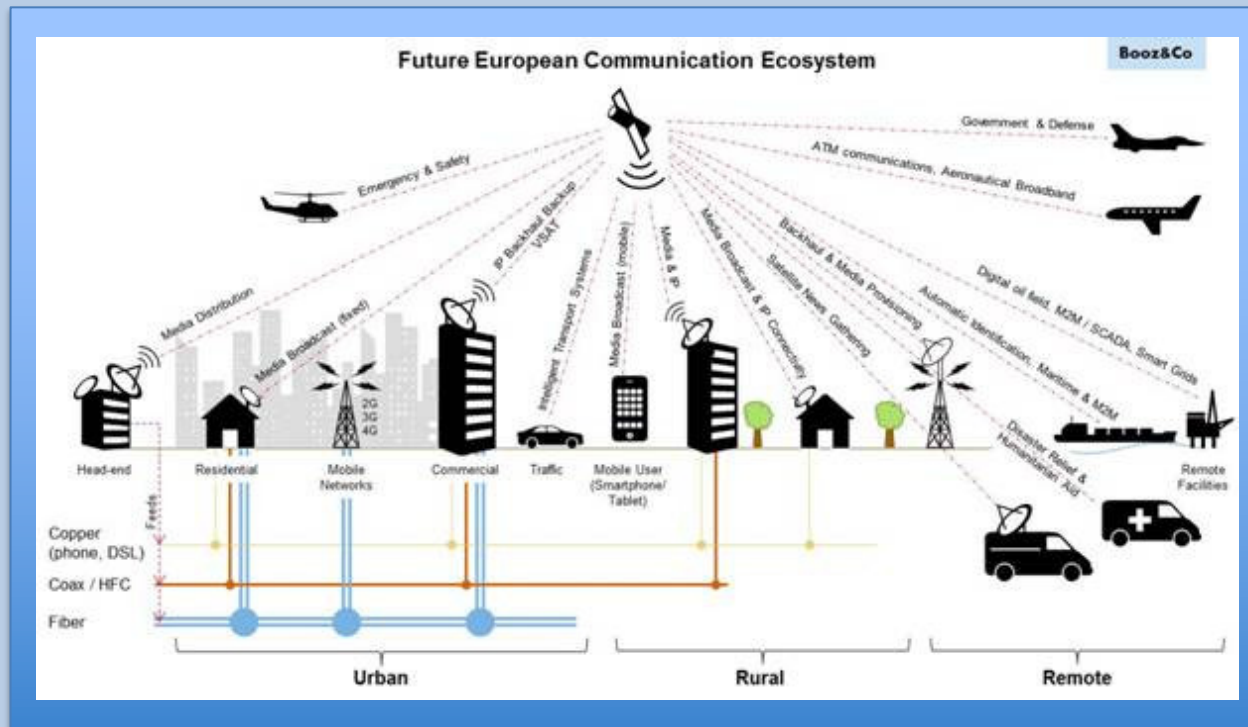
Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space

Source: Sanjay Raman, Robert Weigel and Tim Lee



Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space

## Three Important Functions

- Unique source of sensor data and information
- A Component of the Communications Infrastructure
- An important service for space based assets

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019





# A bit about: The Internet of Space

Why now, and what has changed to make this possible:

- Cost of access to space
- Miniaturization of building block components for space based systems – from mechanical to electronic
- Renaissance in underlying engineering disciplines and sciences and marked improvements in performance

Orlando, Florida  
January 20th, 2019

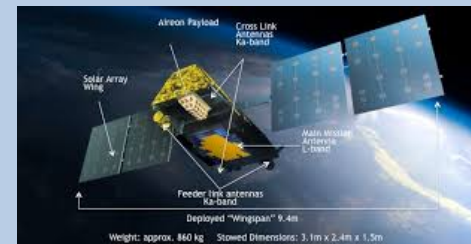
IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space

## Communications

- LEO, MEO, GEO
- Cross-Links
- Ground Infrastructure
- High Bandwidth
- Low Latency
- Precise Footprint



Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space

## Sensors

- Position
- Imagery
- Radar
- Lidar
- Hyper-spectral
- .....
- .....



Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019



# A bit about: The Internet of Space

Questions and Discussion

Orlando, Florida  
January 20th, 2019

IEEE Vertical and Topical Summit at  
RWW2019

