Internet of Things 2020

CURRENT STATE AND THE FUTURE

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Disclaimer

The views expressed in this presentation are mine and do not necessarily represent my employers position.

Recap

WHAT'S IoT AND WHAT'S ITS VALUE

What are the Things

Sensors - Industrial, smart cities, smart homes, meteorology, infrastructure monitoring, machinery condition/location, medical, fitness, sports, energy usage, environmental water flows, water storage levels, tag readers, …

Actuators – motors, pneumatics, solenoids, hydraulics, …

Displays – marketing, control systems (SCADA), traffic management, …

Controller – PLC's, DCS, temperature, position, …

Robots – industrial, transportation, medical, warehouse, cleaning, …

Autonomous Vehicles – drones, cars, trucks, mining, ports, trains, …

Where are the Things

Energy Market

Manufacturing

Construction

Smart Cities

Agriculture

Marketing

Mining

Medical

Transportation

Warehousing

Supply Chains

Military

Emergency Services

Building Management

SMART Homes

Infrastructure

Age Care

Safety

Satellites

Research

Value of IoT

The value of IoT consists of both value creation and value destruction:

- IoT is a set of technologies that can be used to solve business and consumer problems.
- Many devices are either not secure or have significant weaknesses.
- Sensors and devices can provide large volumes of data to enable efficiency improvement.
- Large scale implementation of devices may result in a rapidly increasing technology waste.

Challenges

There are many challenges with implementing IoT. These are what I see as the big 4.

- Cybersecurity
- Communications Technology
- Desire to change
- Skills shortages

Trends

TECHNOLOGIES AND INDUSTRIES

Trends Before Corona (BC)

Technologies

Edge Compute

CUBESat's

Autonomous Vehicles

Drones

Robotics

Industries

Wearables

Smart Cities

Agriculture

Building Management

Utilities

Manufacturing

Transport & Logistics

EVOLVING IOT TECHNOLOGIES

Technologies

Edge Compute

Edge compute moves processing closer to the devices.

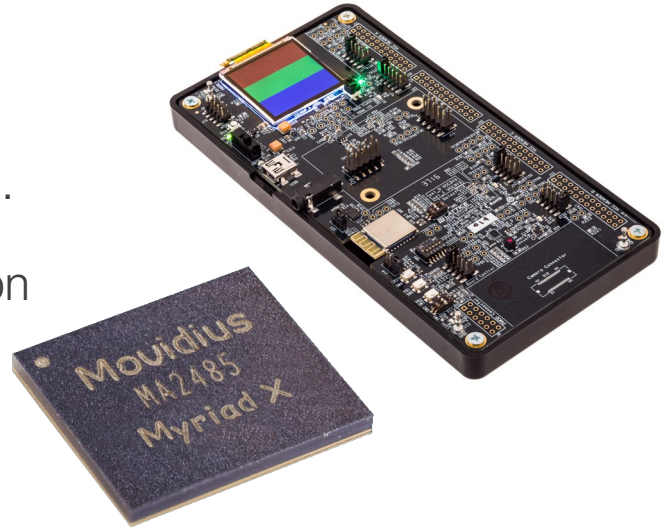
Types of Edge Compute

- Microcontrollers
- Microprocessors
- AI Accelerators
- FPGA's

ASIC's

Benefits and Limitations

- Faster response times.
- Greater privacy by processing sensitive information at the edge.
- Reduced communications bandwidth.
- Increased resilience to communication dropout.
- High cost on end devices



CubeSAT's

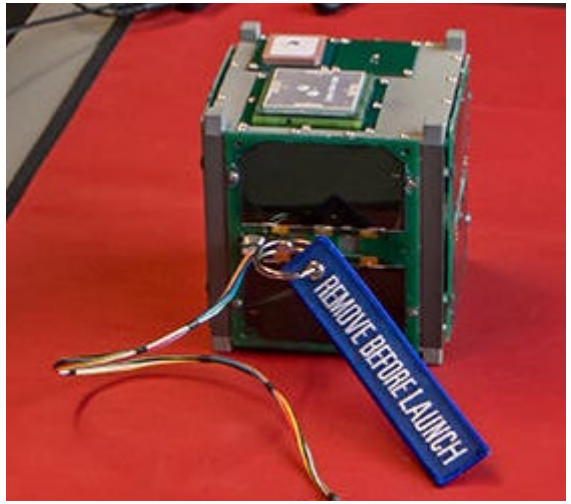
The Internet of Space Things includes a multitude of sensors and communications devices in space. One of these devices, the CubeSat, is a small (~10cm^3) satellite that operates in low earth orbit. CubeSAT's are used for:

Some Uses

- Agriculture monitoring
- Environmental monitoring
- Communications
- Scientific Research
- Minerals Exploration

Benefits and Limitations

- Low cost to build and launch
- Operates in low orbit
- Faster to build, test and deploy
- Lots of satellites pollute space and make earth bound astronomy difficult.



Autonomous Vehicles

Autonomous vehicles are capable of autonomously moving from one place to another.

Some Uses

- Trucks for transportation
- Agricultural machinery
- Driverless cars
- Driverless trains

Benefits and Limitations

- They don't fatigue or sleep
- Higher efficiency than human drivers
- Supplements difficult to find large vehicle drivers
- Require highly technical people to maintain and repair
- Currently struggle in unknown areas

Drones

A drone or Unmanned Aerial Vehicle (UAV) is an aircraft with a human pilot onboard.

Some Uses

- Defence
- Agriculture
- Delivery of goods/medicines
- Law enforcement
- Search and Rescue
- Media/Films/Photography

Benefits and Limitations

- Low cost
- Autonomous or remotely operated
- Bypasses traffic and difficult terrain
- Local laws may limit use
- Safety considerations
- Weather may impact small drones

Robots

The Internet-of-Robotic-Things (IoRT) brings together autonomous robotic systems with the Internet of Things (IoT).

Some Uses

- Maintenance in hostile environments
- Defence
- Security
- Search and Rescue
- Space exploration

Benefits and Limitations

- Frees up skilled labour
- Allows skilled people to work remotely where physical presence would otherwise be required
- Allows high functioning tasks in hostile environments (rescue, space, environment monitoring)

INDUSTRIES LEVERAGING IOT

Industries

Wearables

Wearables includes devices that are worn by people for monitoring health, medical conditions, location and performance.

Examples

- Fitness trackers
- Diabetes monitoring and management
- ECG monitor
- Sports medicine
- Safety monitoring

Growth and Barriers

- CAGR ~16% (average)
- Rapidly growing range of sensors
- Increasing competition in the fitness market
- Growth in safety monitoring
- Growth in medical applications

SMART Cities

An urban area that uses IoT sensors to collect data and then use insights gained from that data to manage assets, resources and services efficiently.

Examples

- Waste management
- Environmental monitoring
- Smart lighting
- Traffic and Parking management
- Infrastructure maintenance monitoring

Growth and Barriers

- CAGR ~22% (average)
- Initial investment is high
- Smaller cities have higher success due to scale
- Low cost wireless communication is key to success

SMART Homes

SMART homes are automated for the comfort and safety of the occupant and to reduce energy costs.

Examples

- SMART lighting
- Home assistants
- Climate monitoring and control
- Entertainment control
- Appliance monitoring and control
- Energy efficiency monitoring and control
- Security access control and alarming

Growth and Barriers

- CAGR ~15% (average) – varied from 12% to 30%
- Cyber security and privacy of systems
- Consumer awareness of benefits
- Acceptance of SMART technologies by users
- High cost compared to current technology
- Perception that it requires extensive home changes

Agriculture

Agriculture IoT, also know as Agriculture 4.0 and SMART Agriculture is the monitoring and management of fields, crops and livestock.

Examples

- Crop monitoring
- Soil Management
- Herbicide and Pest control
- Irrigation remote monitoring and control
- Weather monitoring (frosts, rain, etc.)

Growth and Barriers

- CAGR ~15% (average) – varied from 10% to 20%
- Reduce costs and increase yield
- Reduction in herbicide and other chemicals
- Willingness to adopt technology
- Lack of skilled technical recourses for implementation and maintenance.

Building Management

IoT for Building/Facilities Management or SMART Buildings .

Examples

- Environmental and waste management
- Energy efficiency
- Lighting management
- Security and safety monitoring and alarming
- Human movement efficiency

Growth and Barriers

- CAGR ~20% (average) – varied from 10% to 40%
- Reduced management and maintenance costs
- Environmentally friendly buildings
- Employee work comfort and efficient movement
- High cost to retrofit to existing buildings
- Cyber-Security concerns

Utilities

IoT in utilities (water, electricity, sewerage and gas) is extending to the end user with SMART metering and micro-generation and remotely assisted and automated technologies.

Examples

- Power line monitoring and maintenance
- Substation monitoring and control
- Equipment condition monitoring and control
- Realtime metering and demand management
- Micro-generation technologies

Growth and Barriers

- CAGR ~17% (average) – varied from 13% to 25%
- Reduced maintenance and management costs
- Infrastructure projects are very large but infrequent
- Availability of low cost, long range wireless communication technologies and services
- Cyber-security concerns

Manufacturing

Industry 4.0 or Industrial IoT (IIoT) connects the factory to the consumer. Enabling real-time decisions based on demand and providing end-to-end trackability and effectual supply chain management.

Examples

- Lights out manufacturing
- Cloud and Cognitive computing
- Realtime demand based production
- Realtime supply-chain integration
- Advanced Human-Machine interfaces

Growth and Barriers

- CAGR ~20% (average) – varied from 8% to 46%
- High costs to fully integrate
- Unclear benefits
- Changes to business models
- Cyber-Security concerns

Transportation and Logistics

IoT in Transport and Logistics enables the efficient and effective movement of goods and people between locations by providing real-time information and enabling predictive management.

Examples

- Location tracking and tracing in real-time
- Real-time routing under changing conditions
- Demand based supply chain management
- Fleet management
- Predictive maintenance of assets

Growth and Barriers

- CAGR ~5% (average) – varied from 4% to 20%
- Customer desire for trackability
- Reduced cost to operate and run
- High costs to fully integrate
- Cross-border regulatory issues (e.g. radio sensors)
- Cyber-Security concerns

Future

WHERE TO NOW

Projections After Corona (AC)

The current pandemic and global financial crisis has changed life as we know it and will likely never be the same.

Changes

- The crisis has brought digital to the forefront
- Remotely monitor and control over the internet
- Automated supply chains have become a priority
- Safe and efficient working environments

Growth and Barriers

- CAGR – All current projections likely invalid
- Crises often change the way we look at the world.
- Some things may not change like fitness monitoring
- Others have shifted rapidly forward such as remote monitoring and operation.
- The concurrent financial crisis will increase the focus on cost reduction and operational efficiencies.

Thank-you!

QUESTIONS