IoT in a Nutshell

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What is IoT?

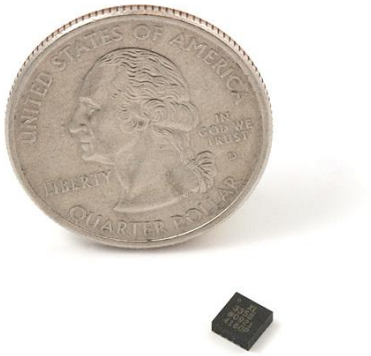
- The **Internet of Things (IoT)** is the network of physical objects—devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity—that enables these objects to collect and exchange data.

The IoT Concept

Driving Forces of IoT

1. Sensor Technology – Tiny, Cheap, Variety
2. Cheap Miniature Computers
3. Low Power Connectivity
4. Capable Mobile Devices
5. Power of the Cloud

1. Sensor Technology



Accelerometer
(4mm diameter)

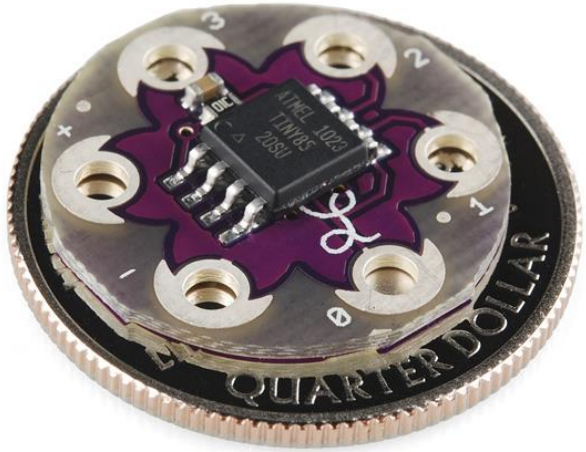
Force Sensor
(0.1N – 10N)

Pulse Sensor
$5

https://www.sparkfun.com/

https://www.adafruit.com/

2. Cheap Mini Computers



Lily Tiny

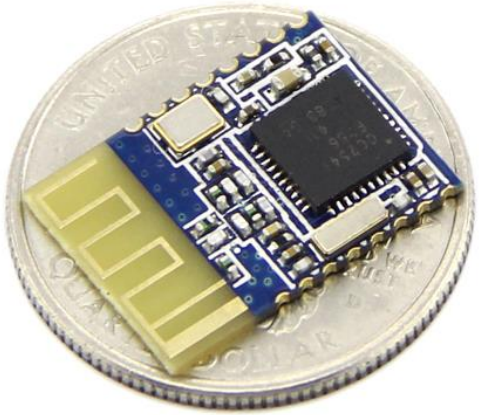
Guess the Price?

Key Parameters

Flash: 8 Kbytes
Pin Count: 8
Max. Operating Freq: 20 MHz
CPU: 8-bit AVR
Max I/O Pins: 6
Ext Interrupts: 6
SPI: 1
I2C: 1

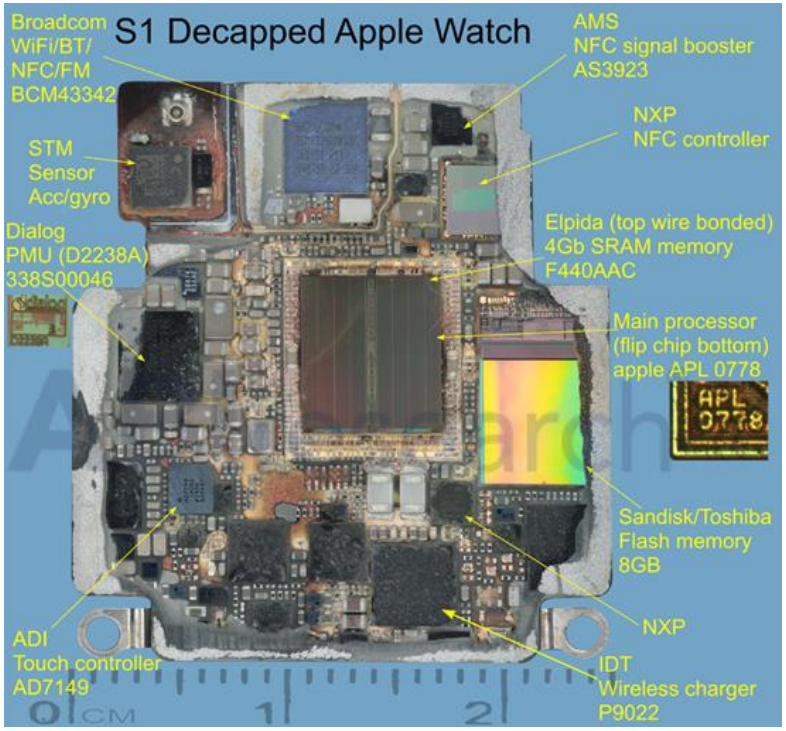
http://www.atmel.com/devices/ATTINY85.aspx?tab=parameters

3. Low Power Connectivity



Bluetooth Smart (4.0)
(Up to 2 years with a
single
Coin-cell battery)

4. Capable Mobile Devices

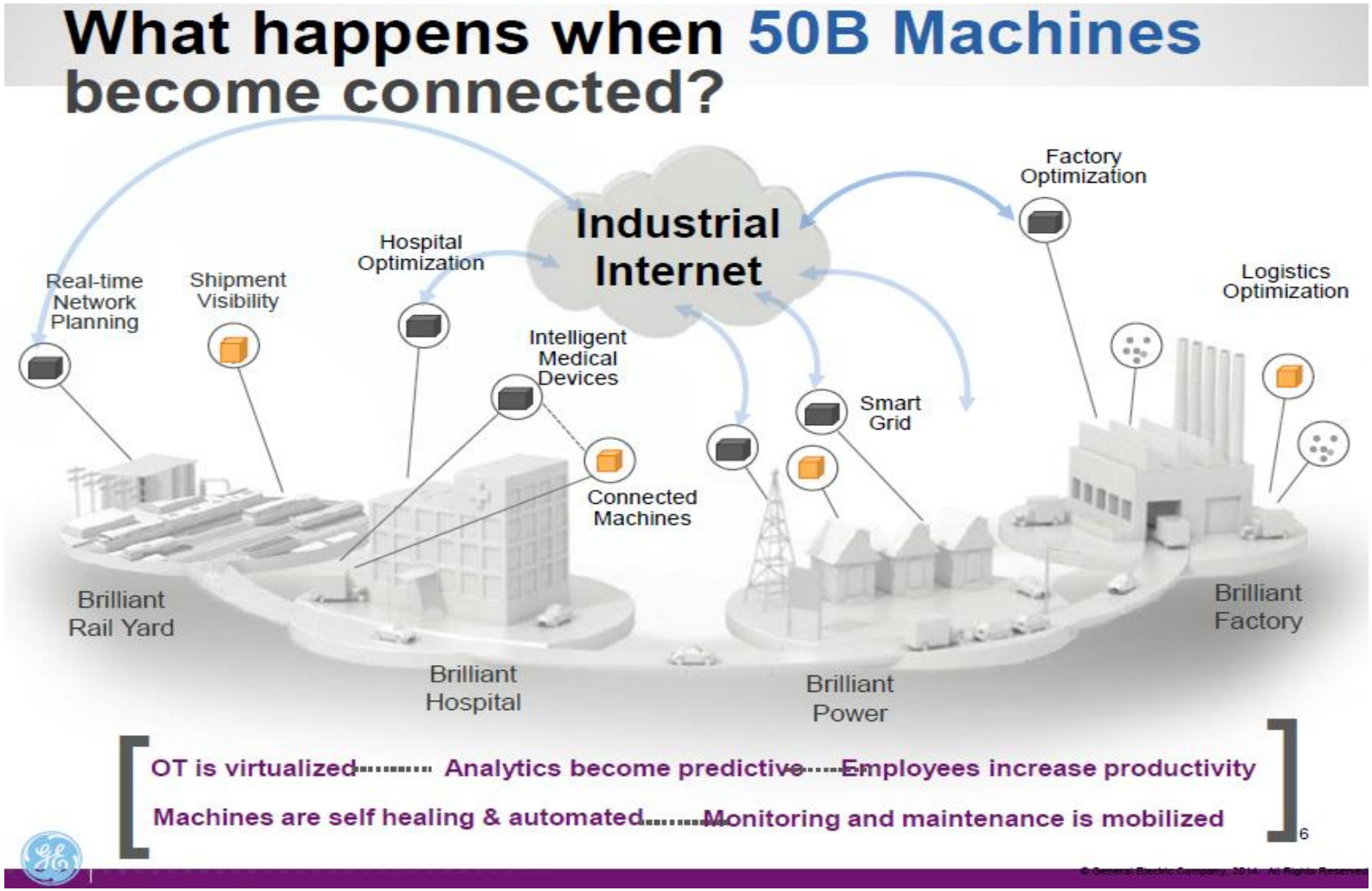


Quad Core 1.5 GHz
128 GB Internal Memory
3 GB RAM
16 MP Camera
2160p@30fps video
WiFI, GPS, BLE

5. Power of the Cloud

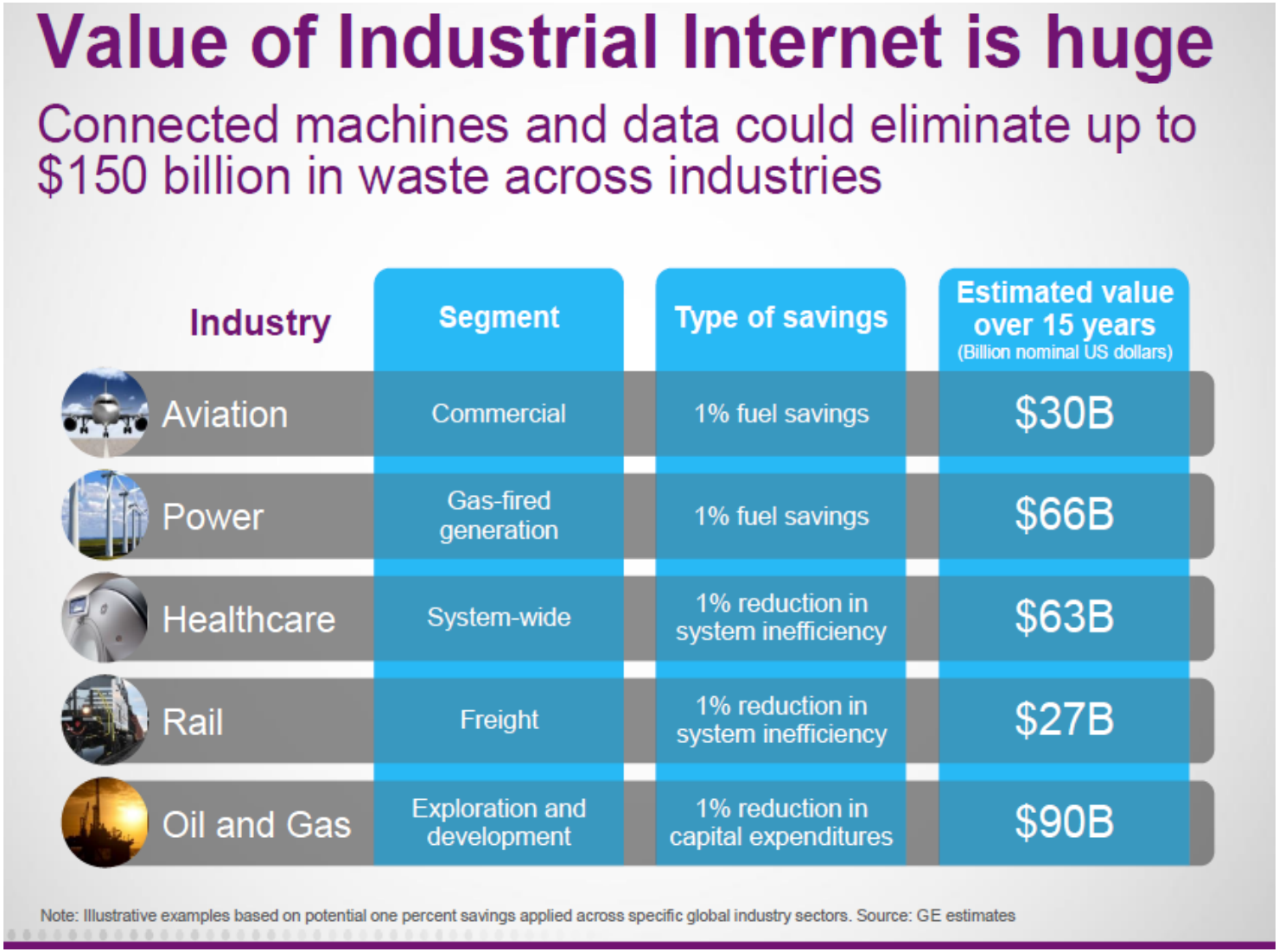
amazon web services™

The Future of IoT



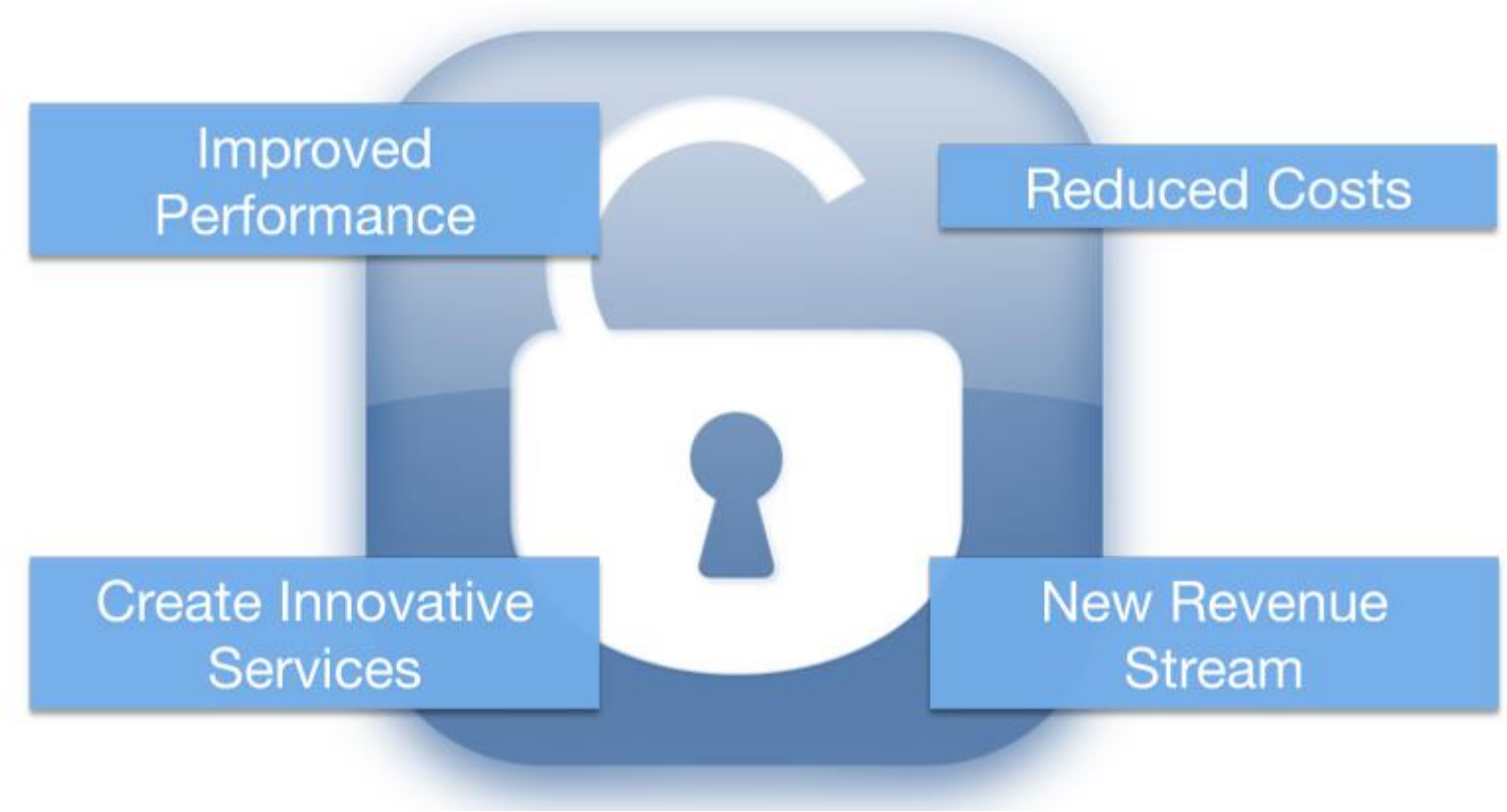
"The Sky's not the limit. It's only the beginning with IoT."

The Potential of IoT



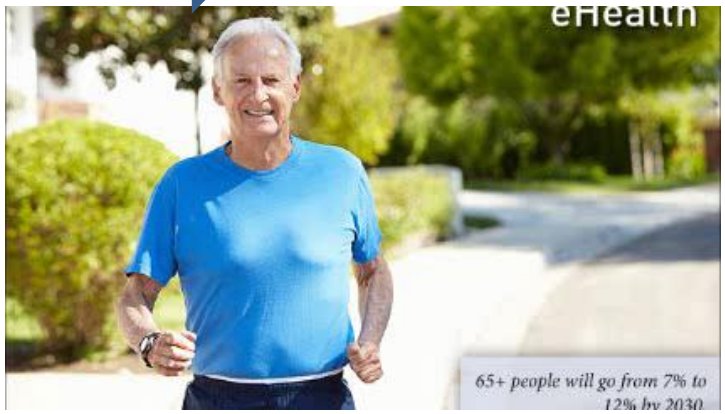
GE's estimates on potential of just ONE percent savings applied using IoT across global industry sectors.

Unlock the Massive potential of IoT



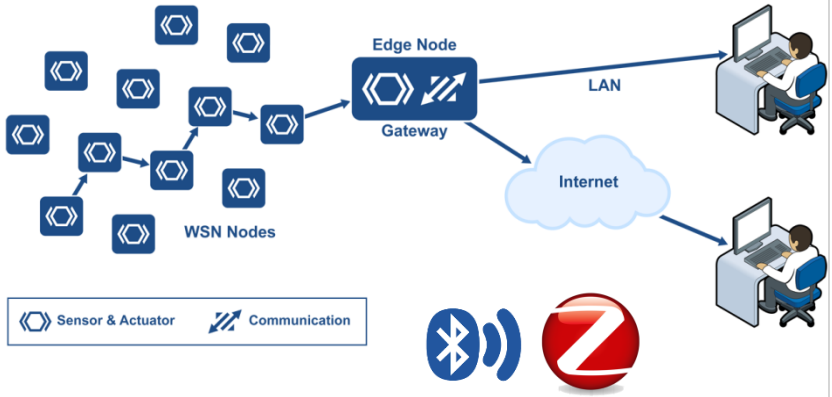
ABCD's of IoT

Applications



Big Data Analytics

Connectivity and Communication



Devices – that are smart!

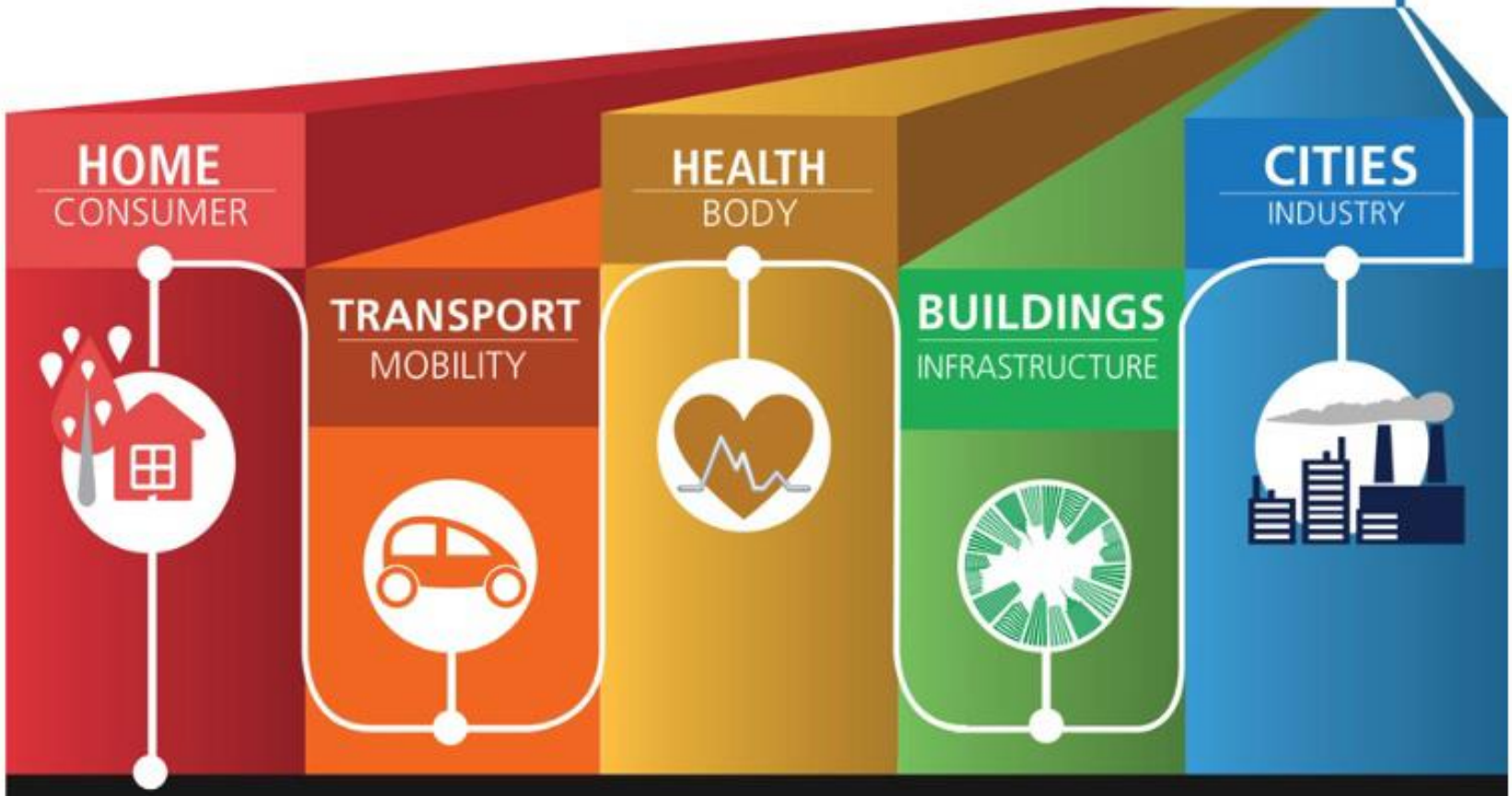
Photos – Libelium, Google Image Search

Few Applications of IoT

- ✓ Building and Home automation
- ✓ Manufacturing
- ✓ Medical and Healthcare systems
- ✓ Media
- ✓ Environmental monitoring
- ✓ Infrastructure management
- ✓ Energy management
- ✓ Transportation
- ✓ Better quality of life for elderly
- ✓ … … …

You name it, and you will have it in IoT!

TO ➡ DIVERSE APPLICATIONS



Light bulbs
Security
Pet Feeding
Irrigation Controller
Smoke Alarm
Refrigerator
Infotainment
Washer / Dryer
Stove
Energy Monitoring

Traffic routing
Telematics
Package Monitoring
Smart Parking
Insurance Adjustments
Supply Chain
Shipping
Public Transport
Airlines
Trains

Patient Care
Elderly Monitoring
Remote Diagnostic
Equipment Monitoring
Hospital Hygiene
Bio Wearables
Food sensors

HVAC
Security
Lighting
Electrical
Transit
Emergency Alerts
Structural Integrity
Occupancy
Energy Credits

Electrical Distribution
Maintenance
Surveillance
Signage
Utilities / Smart Grid
Emergency Services
Waste Management

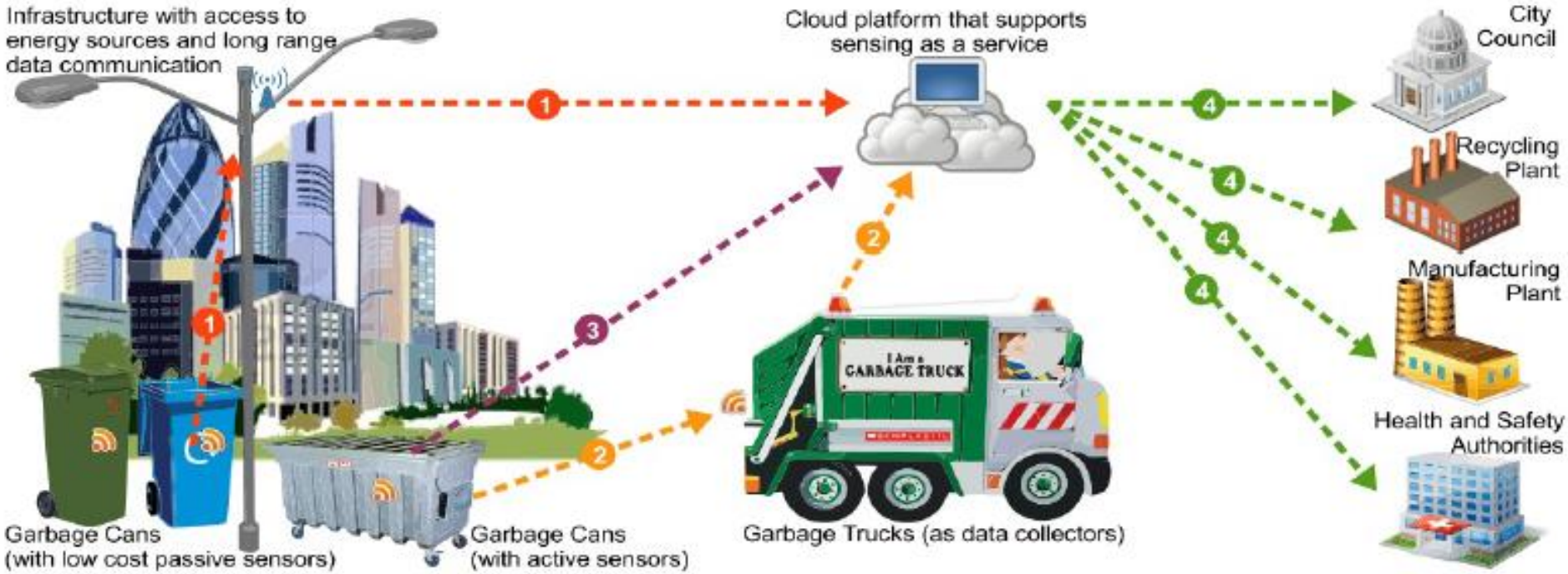
Smart Parking

Create **USD 41Billion** by providing visibility into the availability of parking spaces across the city.

Residents can identify and reserve the closest available space, traffic wardens can identify non-compliant usage, and municipalities can introduce demand-based pricing.

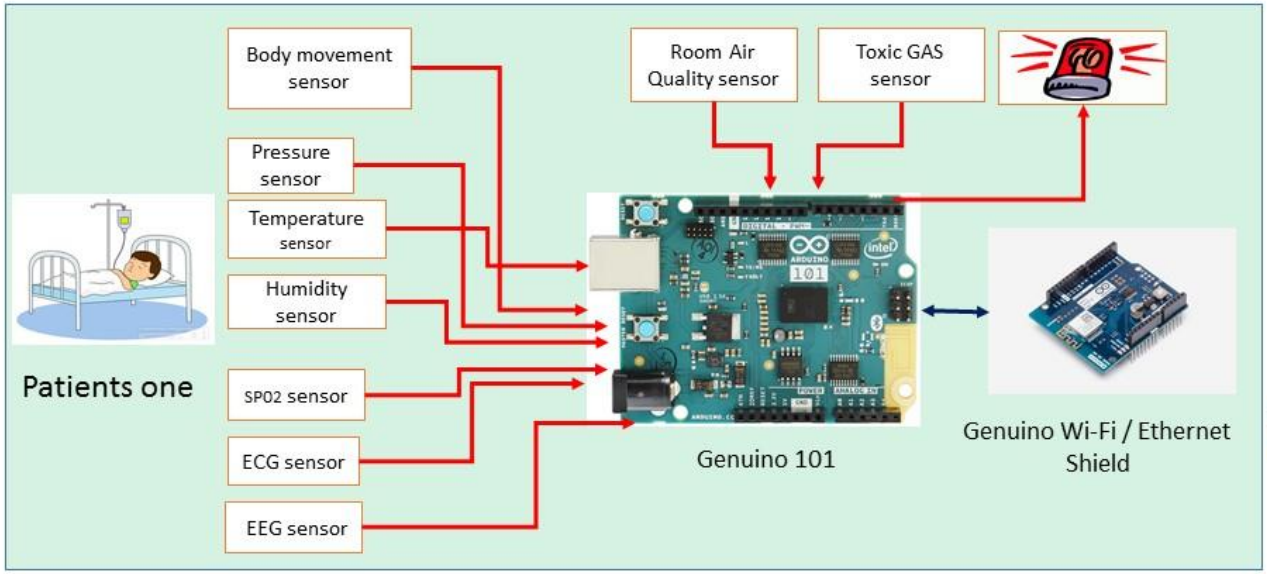
[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]

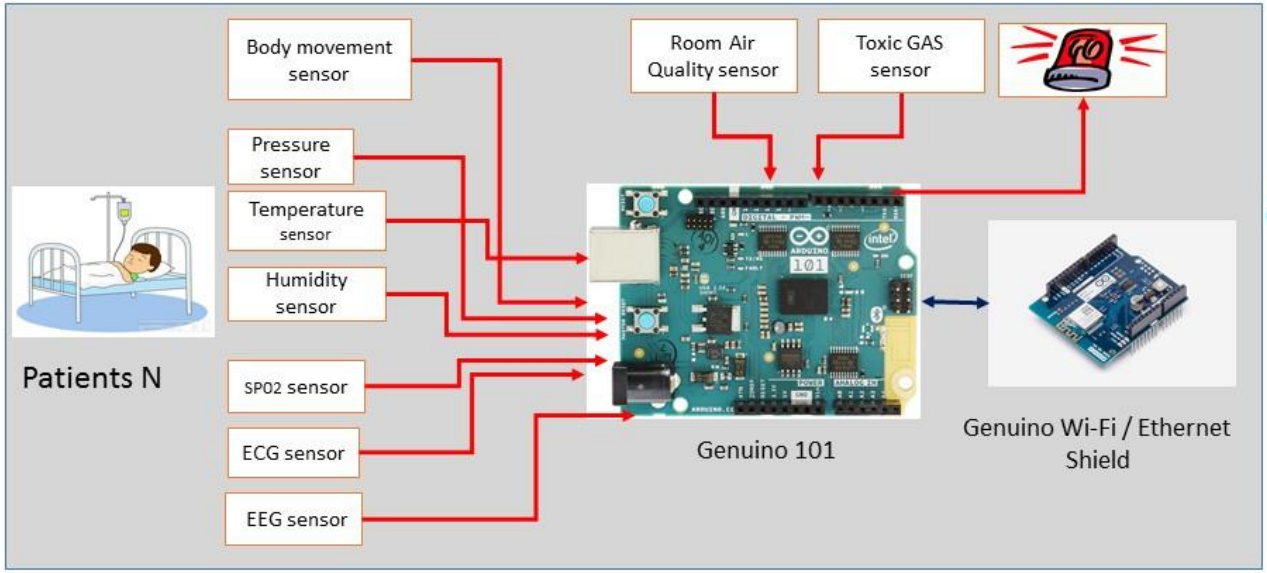
Efficient Waste Management in Smart Cities Supported by the Sensing-as-a-Service

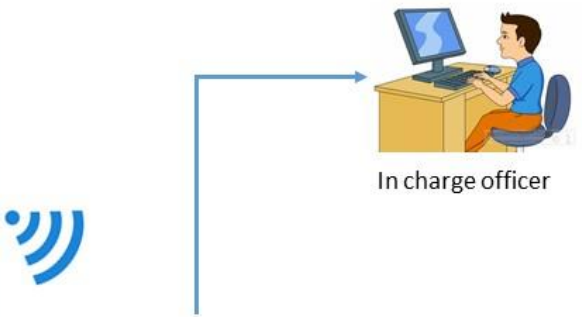


[Source: "Sensing as a Service Model for Smart Cities Supported by Internet of Things", Charith Perera et. al., Transactions on Emerging Telecommunications Technology, 2014]

Real Time Patient Monitoring System based on Internet of things







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Shrimp Farm Monitoring System based on Internet of Things

Shrimp farm monitoring system for Bangladesh based on internet of things

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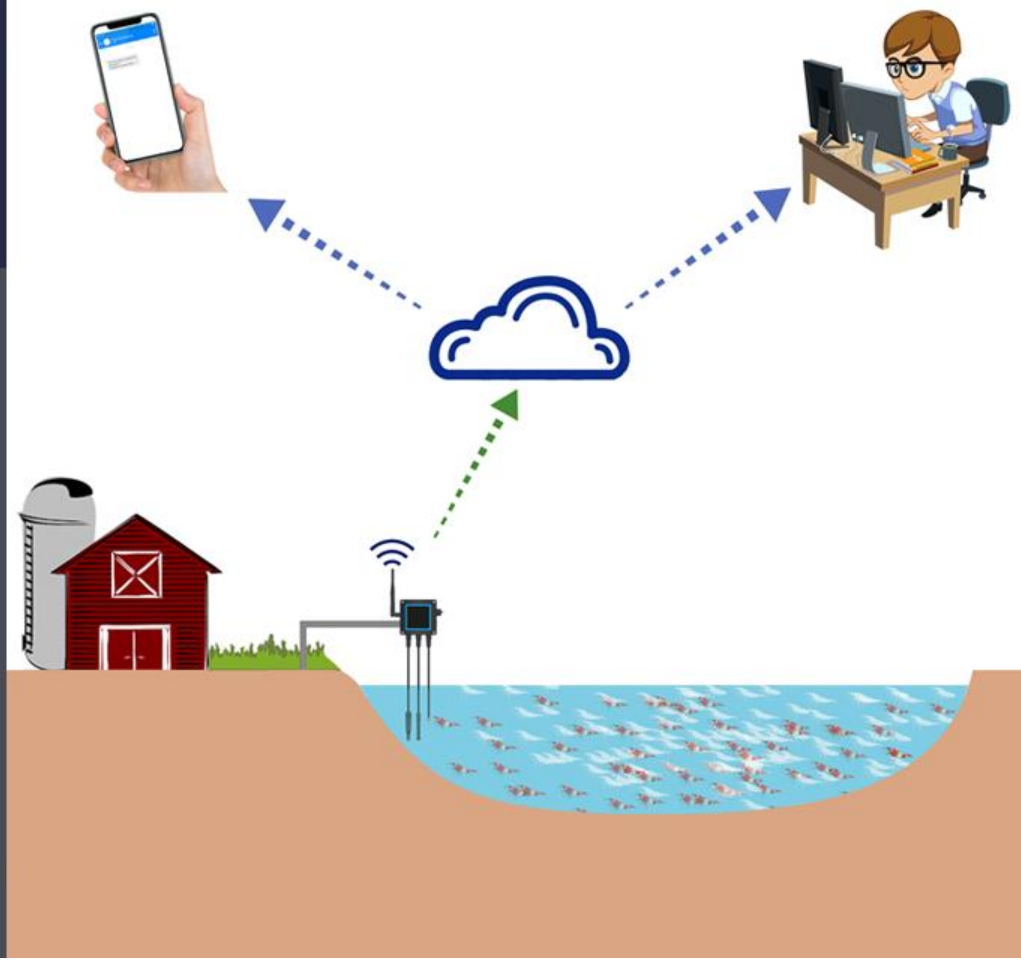
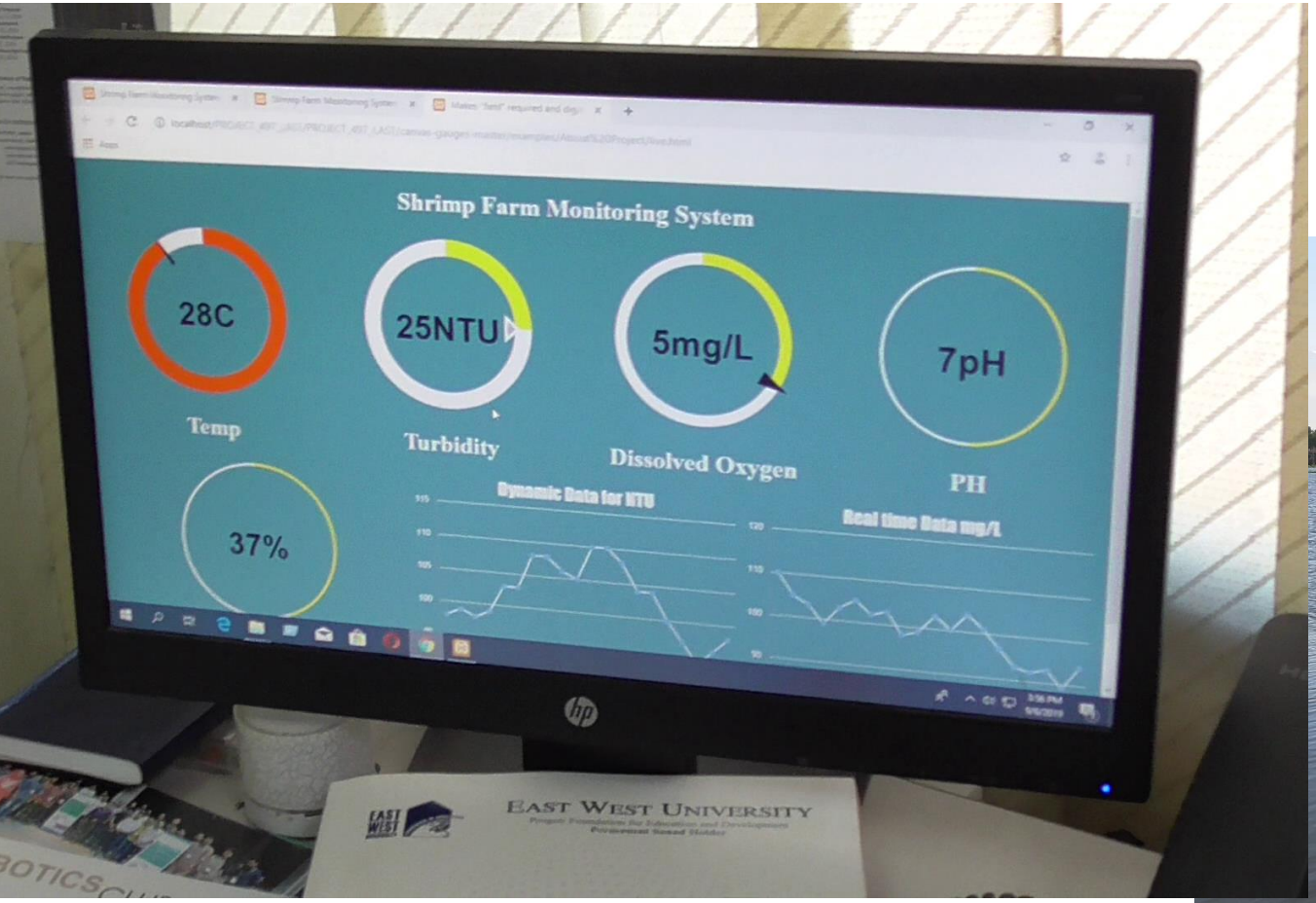


Shrimp Farm Monitoring System based on Internet of Things



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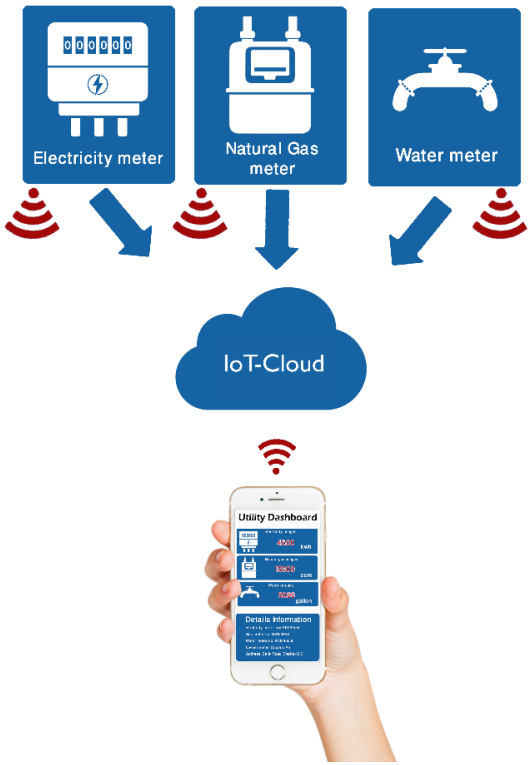
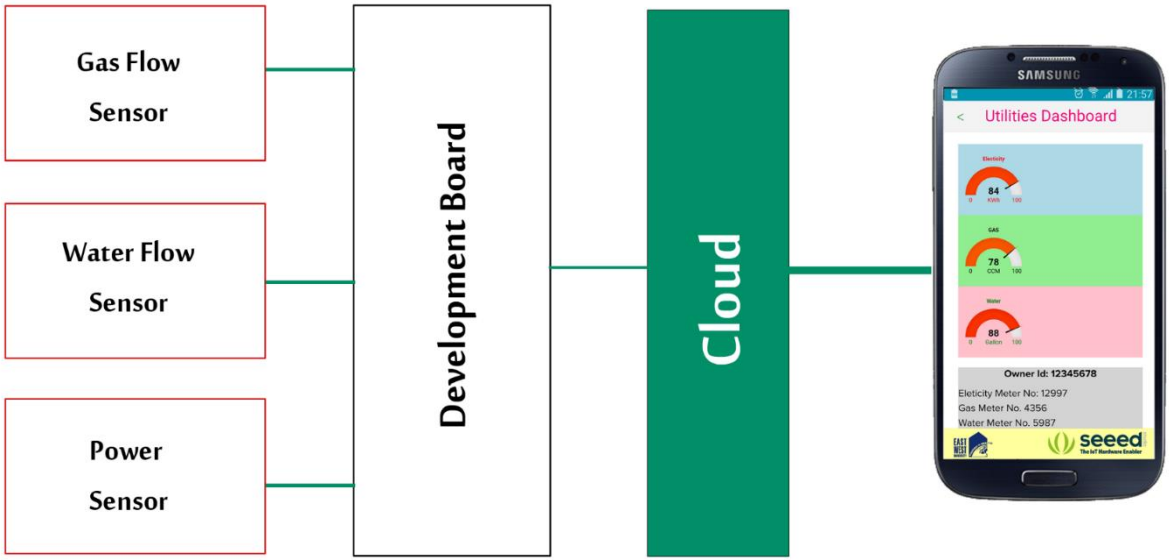
Our Works





Smart Metering

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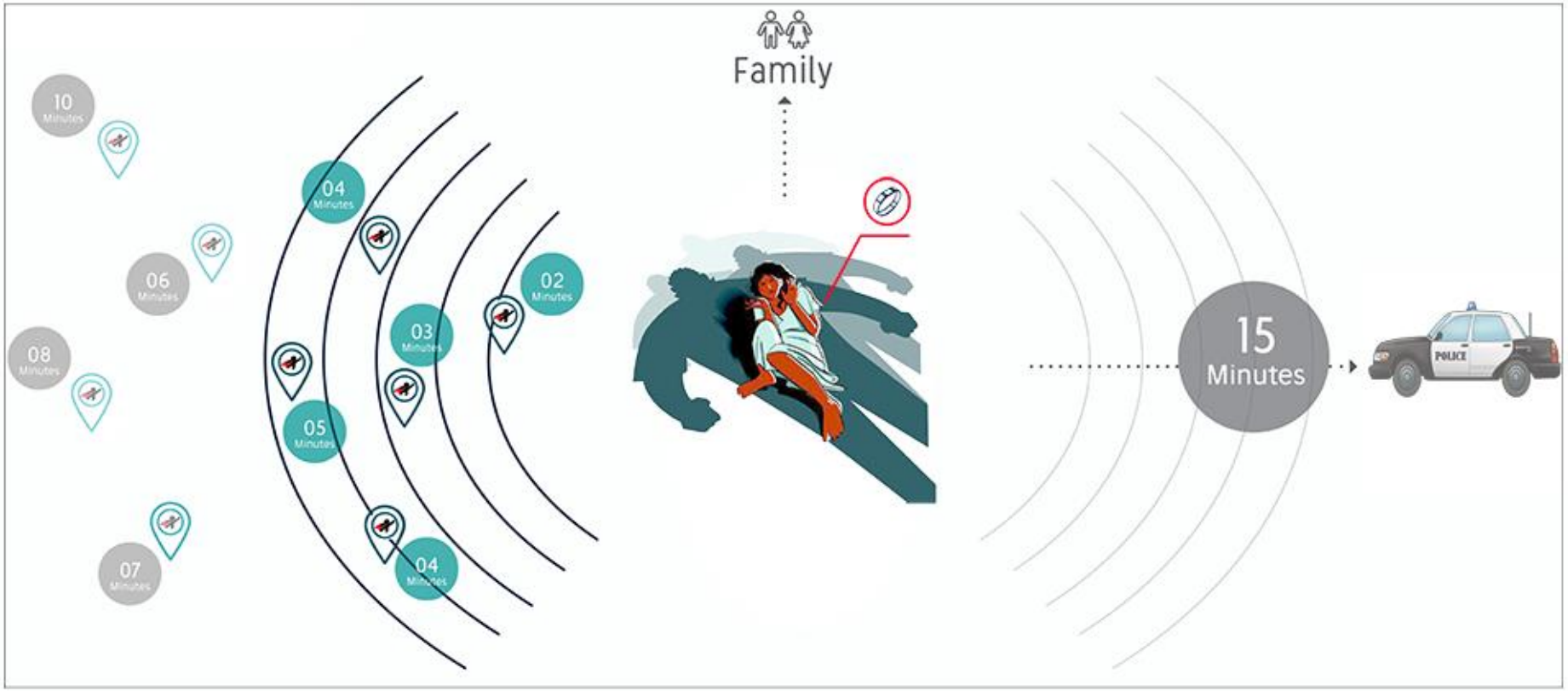
Development of Wearable Emergency Response System for Women



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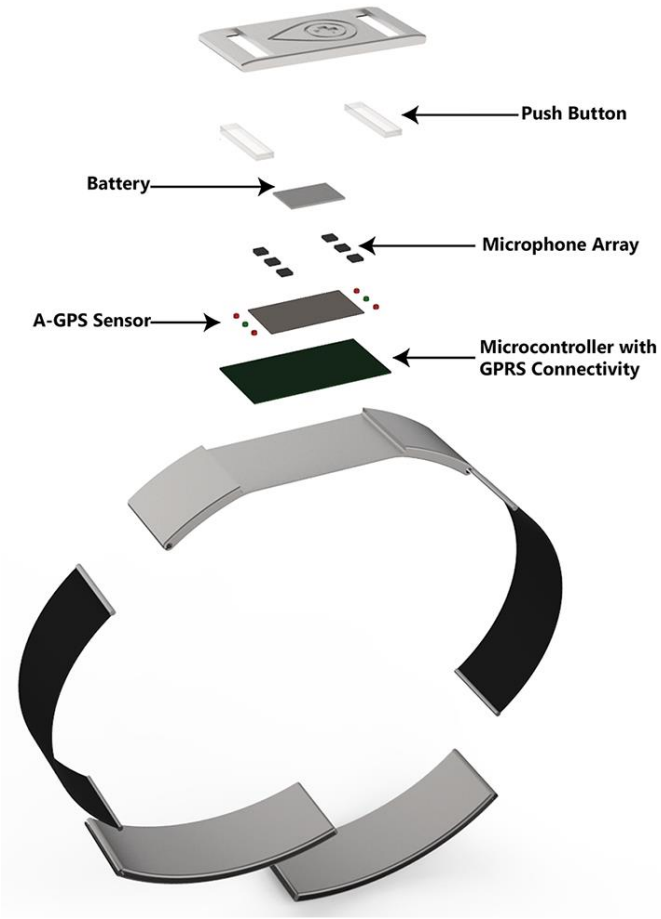

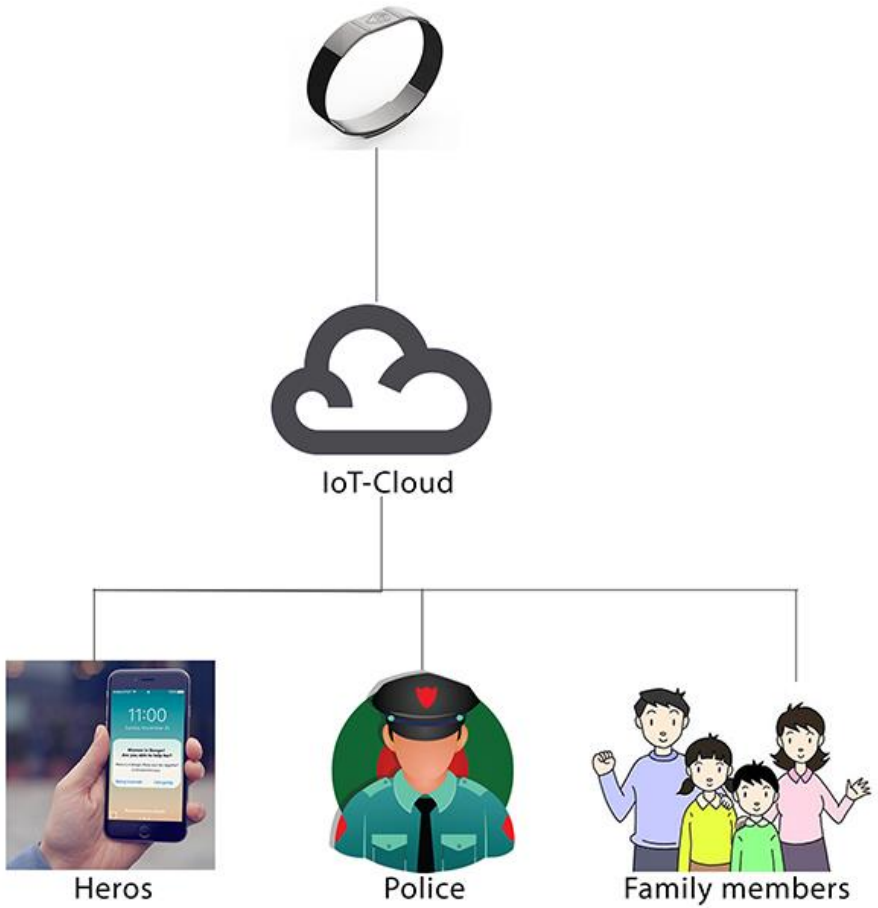

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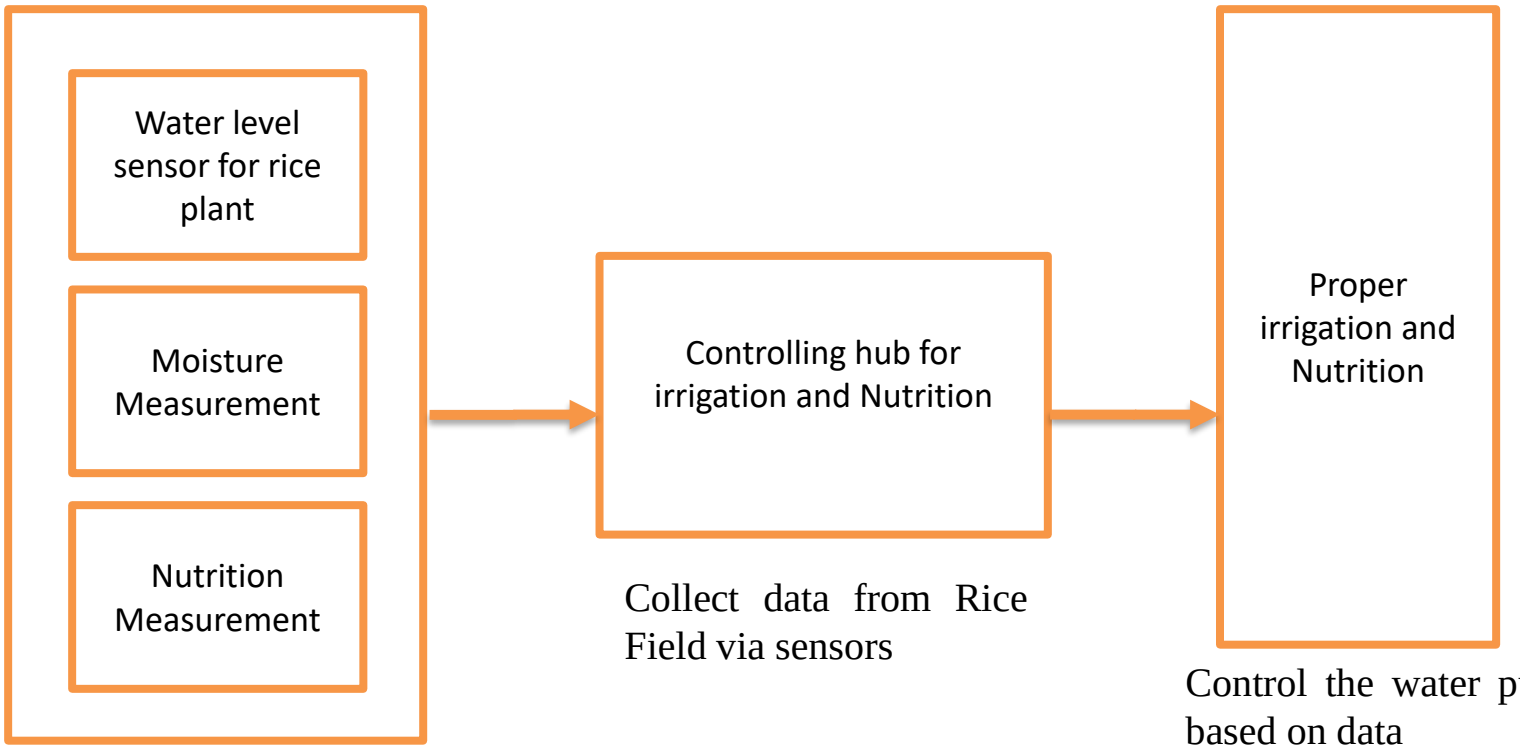
Automated Water and Nutrition Management



Place the sensors in rice field

Collect data from Rice Field via sensors

Control the water pump based on data
Nutrition notification

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Sensors in even the holy cow!

In the world of IoT, even the cows will be connected and monitored. Sensors are implanted in the ears of cattle. This allows farmers to monitor cows' health and track their movements, ensuring a healthier, more plentiful supply of milk and meat for people to consume. On average, each cow generates about **200 MB** of information per year.

IoT in the Research Community

- Mobile Systems (MobiSys, MobiCom)
- Sensor Systems (SenSys, IPSN)
- Real-Time Systems (RTSS, RTAS)
- Human-Computer Interaction (HCI)
- Applications (UbiComp, PerCom)
- ML/Data Mining (ICML, KDD)
- … and more

References

1. www.google.com
2. https://en.wikipedia.org/wiki/Internet_of_Things
3. Cisco whitepaper, "The Internet of Things" - How the Next Evolution of the Internet Is Changing Everything, by Dave Evans, April 2011.
4. GE cloud expo 2014, "Industrial Internet as a Service", by Shyam Varan Nath, Principal Architect.
5. Dr. Mazlan Abbas, MIMOS Berhad, Wisma IEM, Petaling Jaya

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