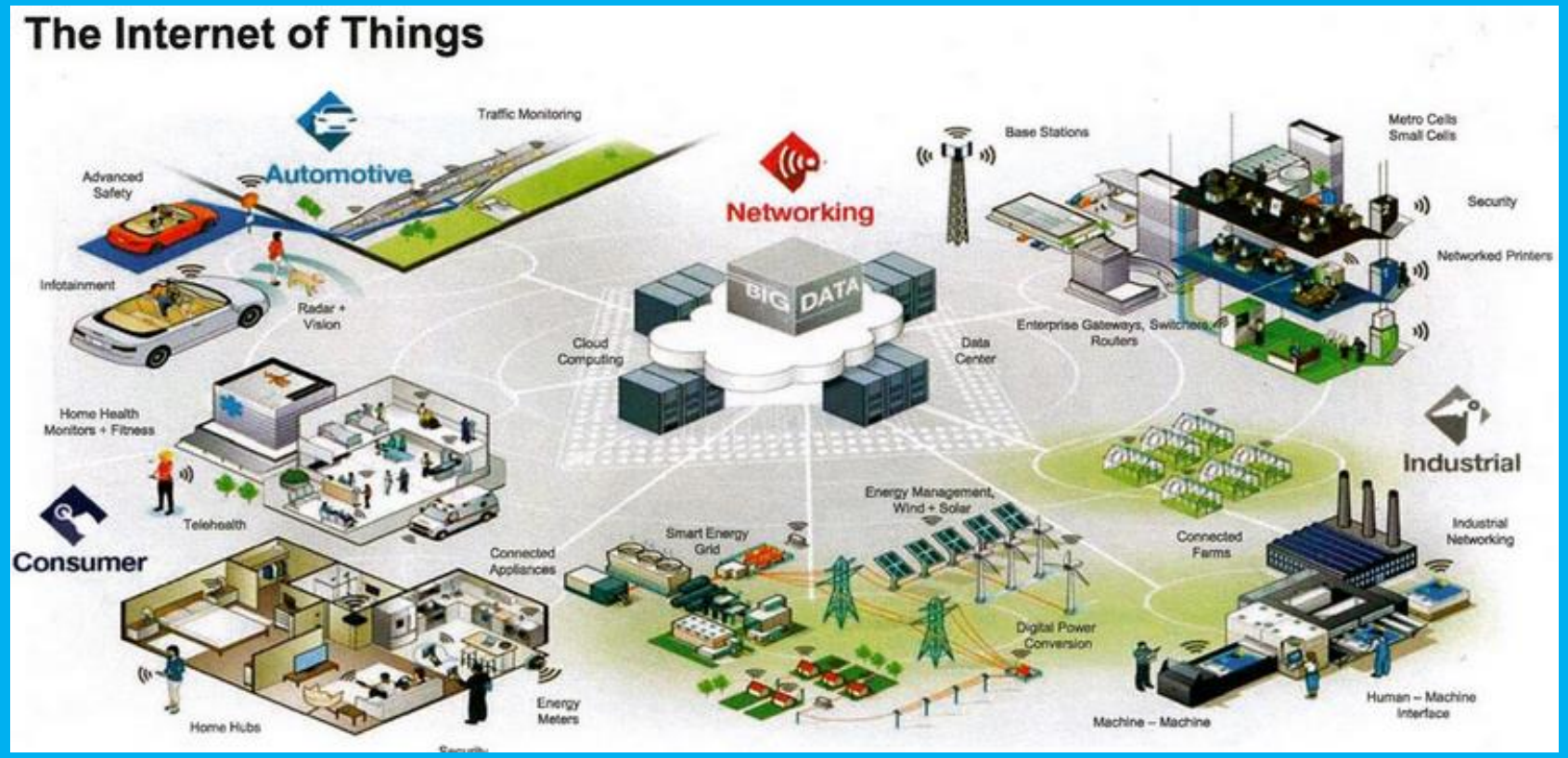
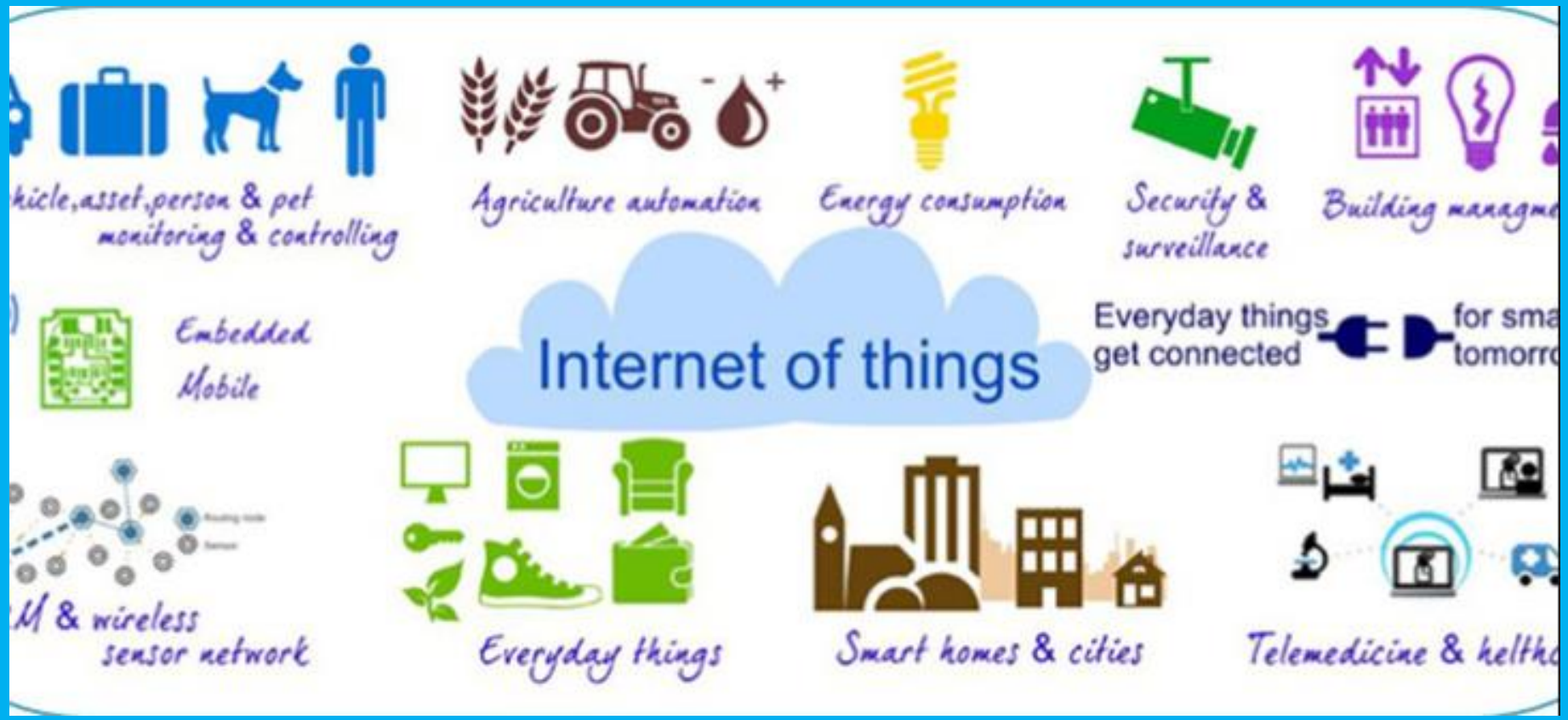
Presentation On Internet of Things (IoT) for Smart Factory / Farm / City / Everything



Dr. M.S. Ajmal Deen Ali, M.E., Ph.D (IITM)
Ajlon Technologies (www.ajlontech.com)
Partner to : AlfaTKG Japan, IISc Bangalore & IITM

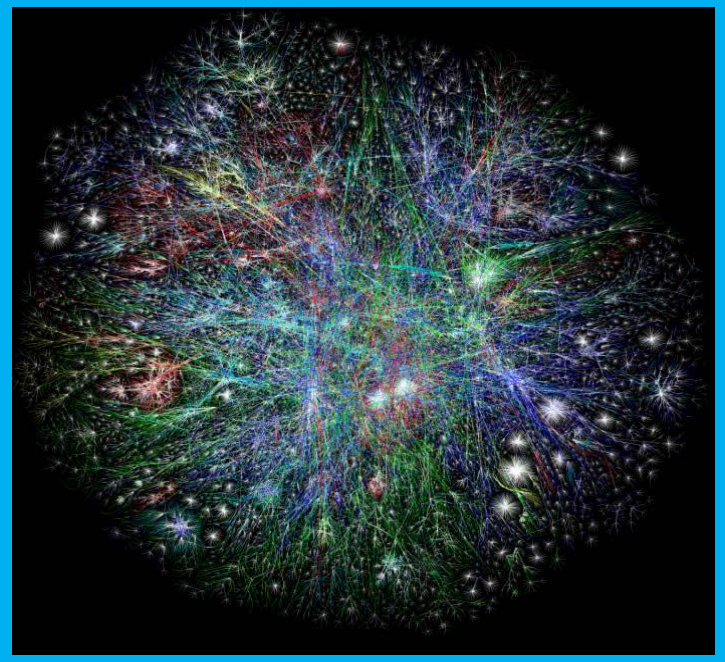
Internet of Things (IoT)



Outline

1. What’s Internet of Things (IoT)
2. State of the Art of IoT
3. Challenges and Limitation of IoT
4. Future of IoT

Starting from the Internet



- Internet appears everywhere in the world
- but it is still a connection between people and people

What is the Internet of Things?

- Internet connects all people, so it is called “the Internet of People”
- IoT connects all things, so it is called “the Internet of Things”

What's the Internet of Things

- Definition

  (1) The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects, usually the network will be wireless and self-configuring, such as household appliances.

  ------Wikipedia

  (2) By embedding short-range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communication between people and things, and between things themselves.

  ------WSIS 2005

What’s the Internet of Things

- Definition

  (3) The term "Internet of Things" has come to describe a number of technologies and research disciplines that enable the Internet to reach out into the real world of physical objects.

  ------IoT 2008

  (4) “Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts”.

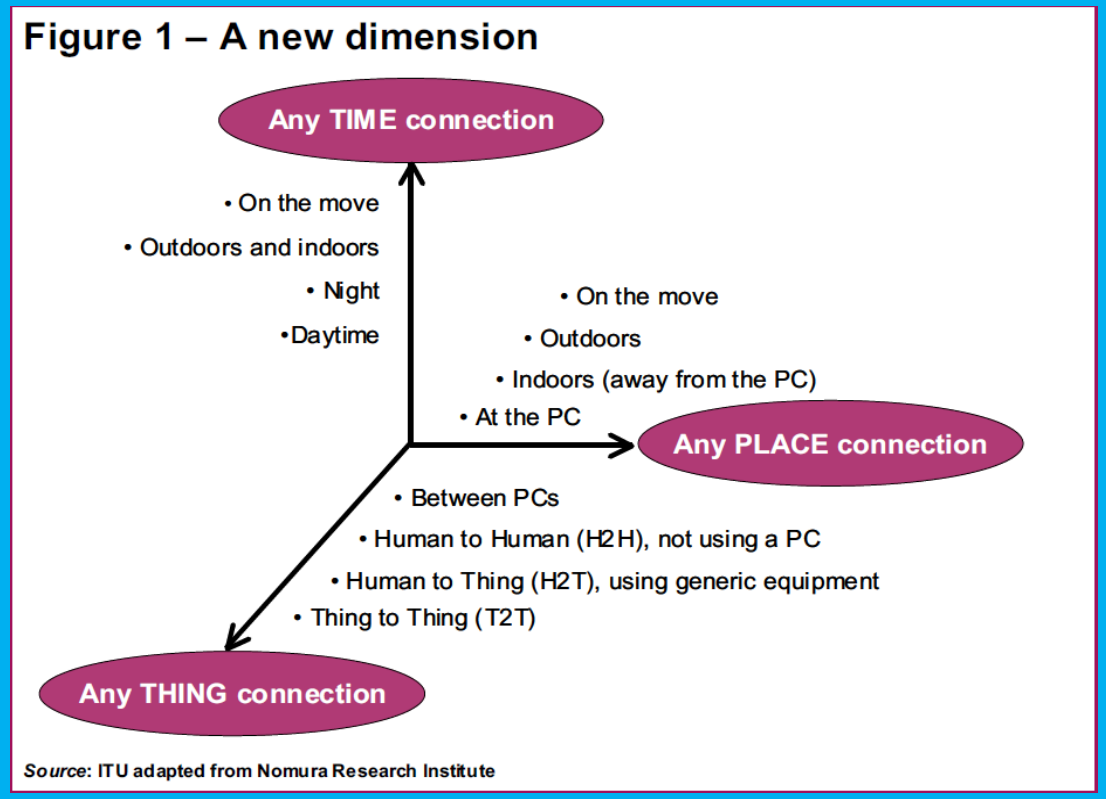
  -------IoT in 2020

What's the Internet of Things

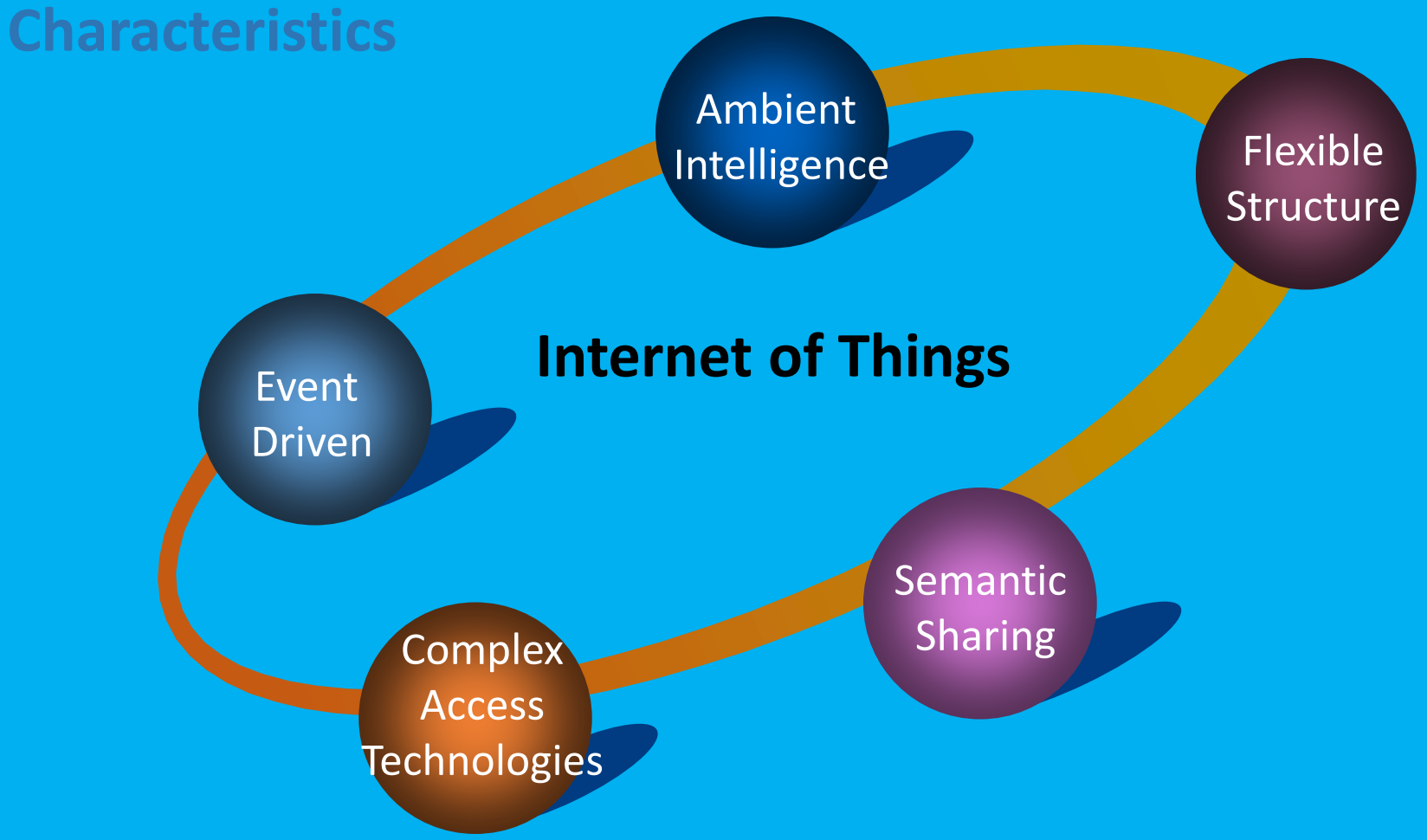
- History
  - 1997, "The Internet of Things" is the seventh in the series of ITU Internet Reports originally launched in 1997 under the title "Challenges to the Network".
  - 1999, Auto-ID Center founded in MIT
  - 2003, EPC Global founded in MIT
  - 2005, Four important technologies of the internet of things was proposed in WSIS conference.
  - 2008, First international conference of internet of things: The IOT 2008 was held at Zurich.

What's the Internet of Things

From any time ,any place connectivity for anyone, we will now have connectivity for anything!



What's the Internet of Things



Why Internet of Things

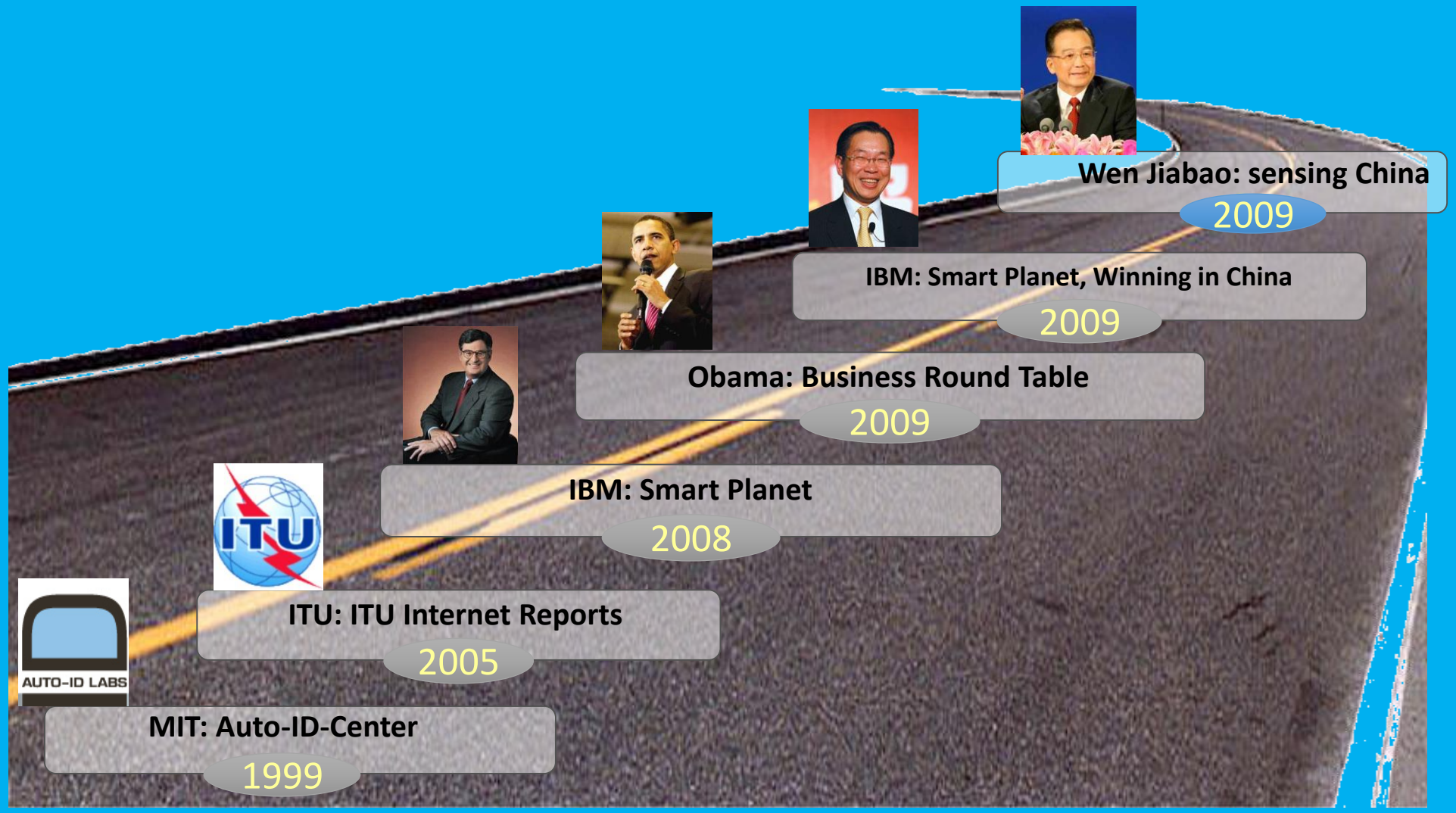
- Dynamic control of industry and daily life
- Improve the resource utilization ratio
- Better relationship between human and nature
- Forming an intellectual entity by integrating human society and physical systems

Why Internet of Things (ii)

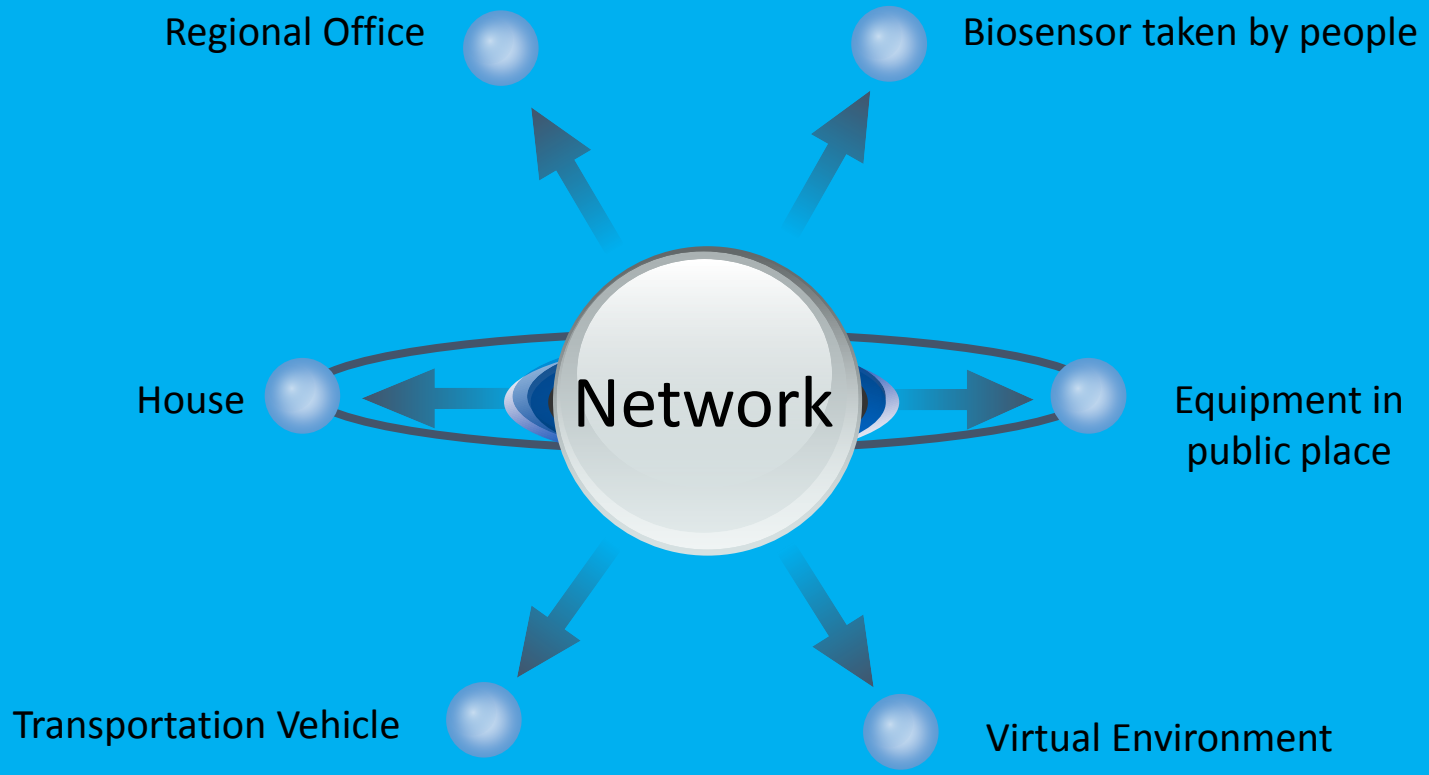
- Flexible configuration, P&P…
- Universal transport & internetworking
- Accessibility & Usability?
- Acts as technologies integrator

Things Connected: communicated between physical world and information world

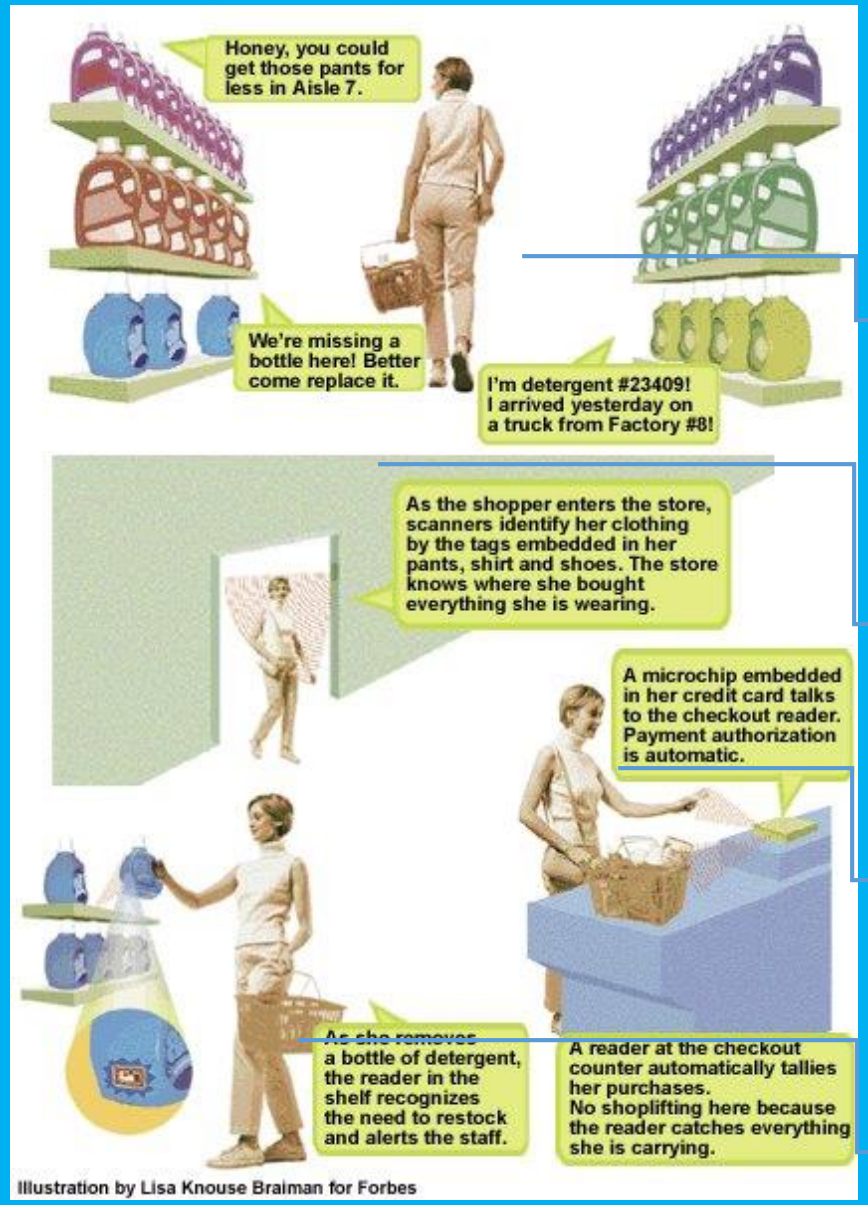
Epoch of IOT


Wen Jiabao: sensing China
2009
IBM: Smart Planet, Winning in China
2009
Obama: Business Round Table
2009
IBM: Smart Planet
2008
ITU
ITU: ITU Internet Reports
2005
AUTO-ID LABS
MIT: Auto-ID-Center
1999

The Application of IoT(1)



The Application of IoT(2)



Scenario: shopping

(2) When shopping in the market, the goods will introduce themselves.

(1) When entering the doors, scanners will identify the tags on her clothing.

(4) When paying for the goods, the microchip of the credit card will communicate with checkout reader.

(3) When moving the goods, the reader will tell the staff to put a new one.

The Application of IoT(3)

Scenario: Health Care

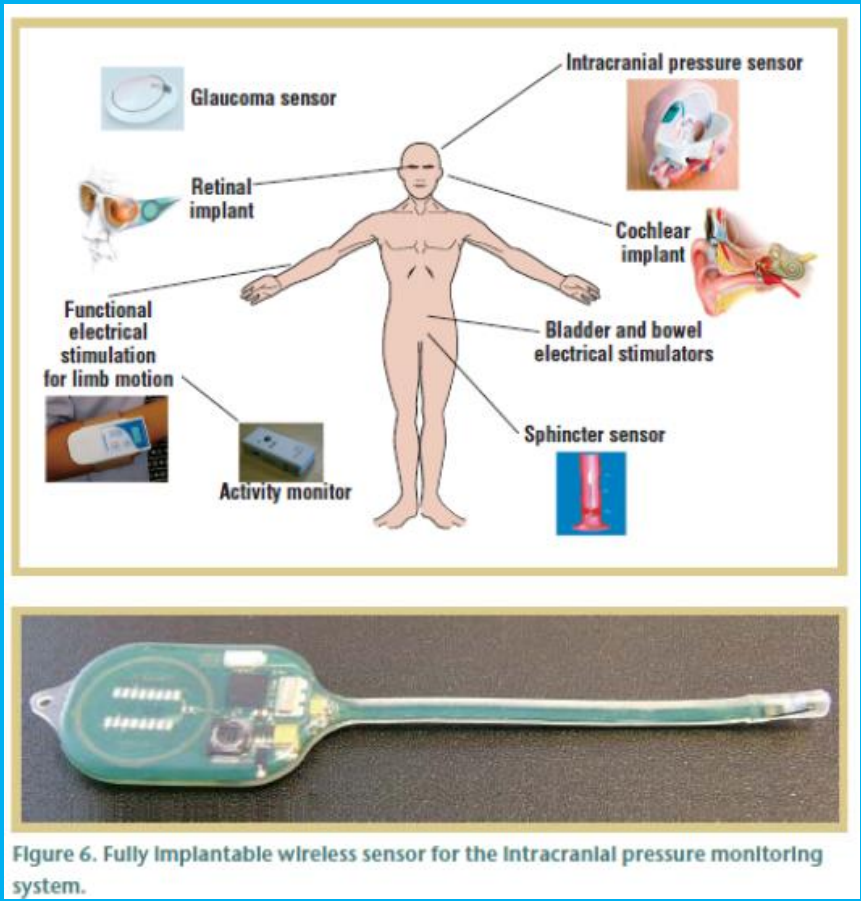


Figure 6. Fully implantable wireless sensor for the intracranial pressure monitoring system.

- Various sensors for various conditions
- Example ICP sensor: Short or long term monitoring of pressure in the brain cavity
- Implanted in the brain cavity and senses the increase of pressure
- Sensor and associated electronics encapsulated in safe and biodegradable material
- External RF reader powers the unit and receives the signal
- Stability over 30 days so far

The Application of IoT(4)

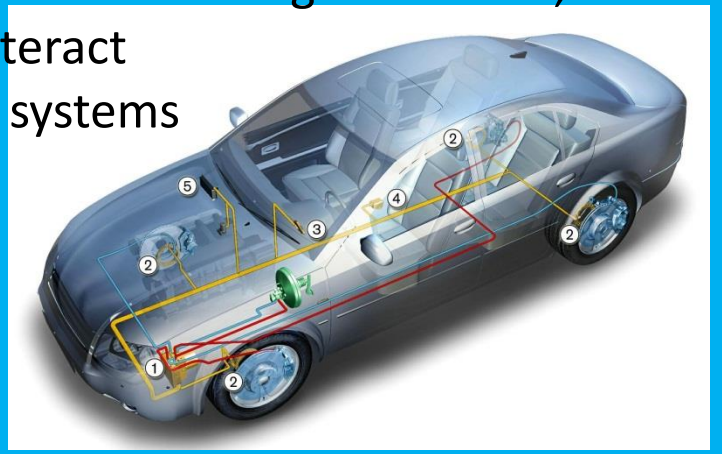
Scenario: Intelligent Home

- Remote monitor for smart house
- Remote control for smart appliance

The Application of IoT(5)

Scenario: Transportation

- A network of sensors set up throughout a vehicle can interact with its surroundings to provide valuable feedback on local roads, weather and traffic conditions to the car driver, enabling adaptive drive systems to respond accordingly
- This may involve automatic activation of braking systems or speed control via fuel management systems. Condition and event detection sensors can activate systems to maintain driver and passenger comfort and safety through the use of airbags and seatbelt pre-tensioning
- Sensors for fatigue and mood monitoring based on driving conditions, driver behaviour and facial indicators can interact to ensure safe driving by activating warning systems or directly controlling the vehicle



The Application of IoT(5)

Scenario: Transportation

- In 2005, 30 – 90 processors per car

  Engine control, Break system, Airbag deployment system

  Windshield wiper, Door locks, Entertainment system

- Cars are sensors and actuators in V2V networks

  Active networked safety alerts

  Autonomous navigation

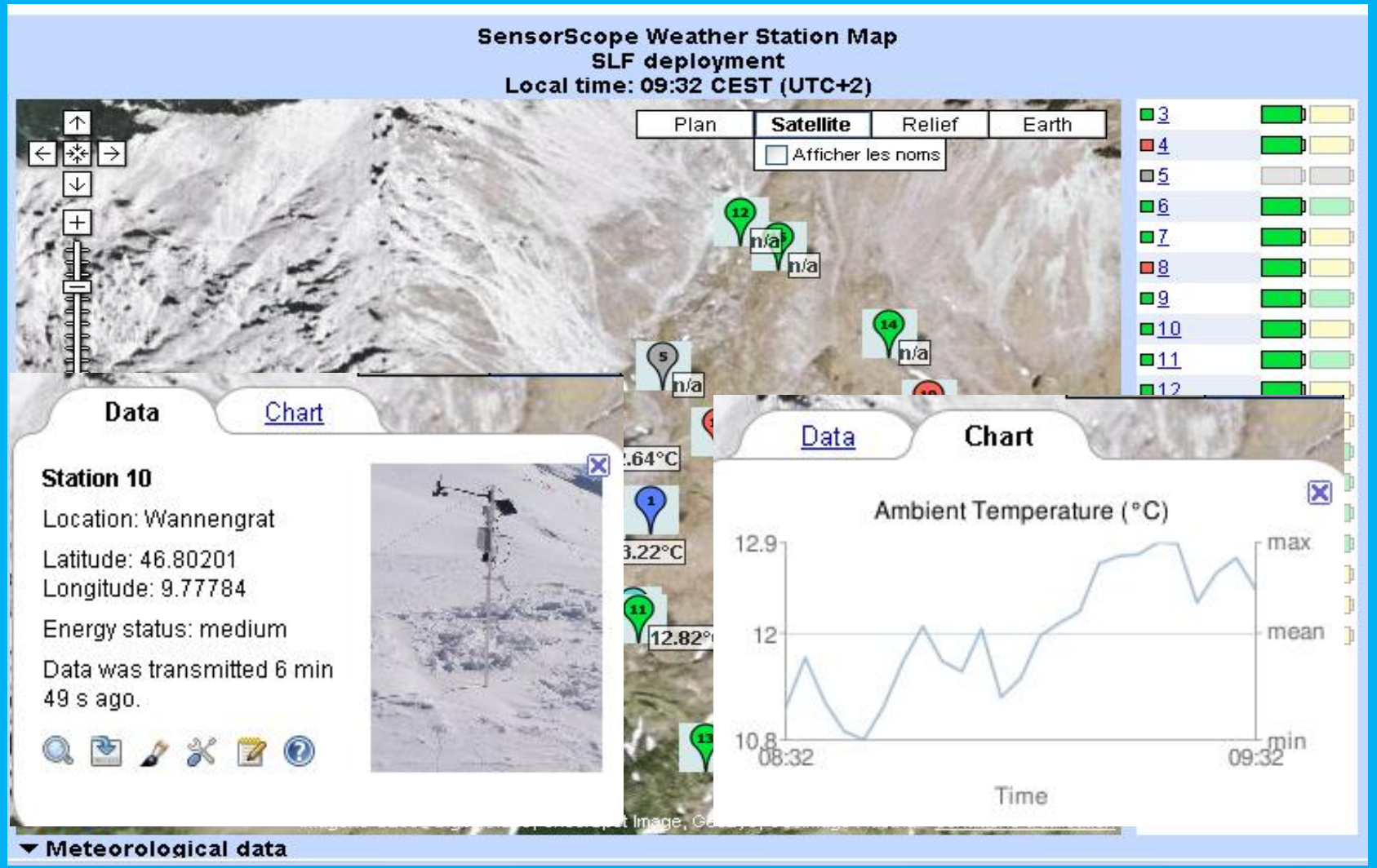
- Future Transportation Systems

  Incorporate both single person and mass transportation vehicles, air and ground transportations.

  Achieve efficiency, safety, stability using real-time control and optimization.

The Application of IoT(6)

Scenario : Monitoring the Environment

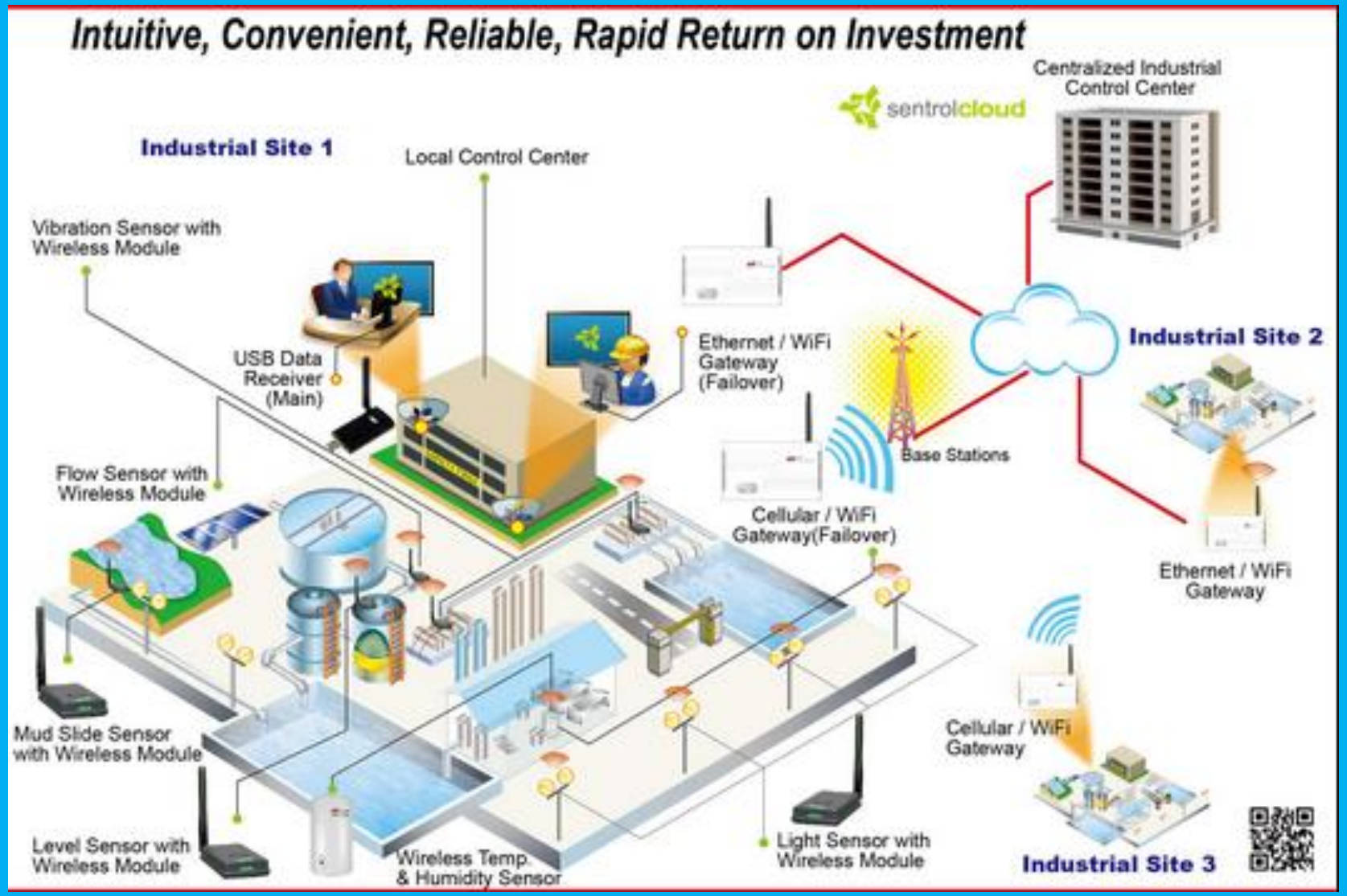


Life in IoT Era

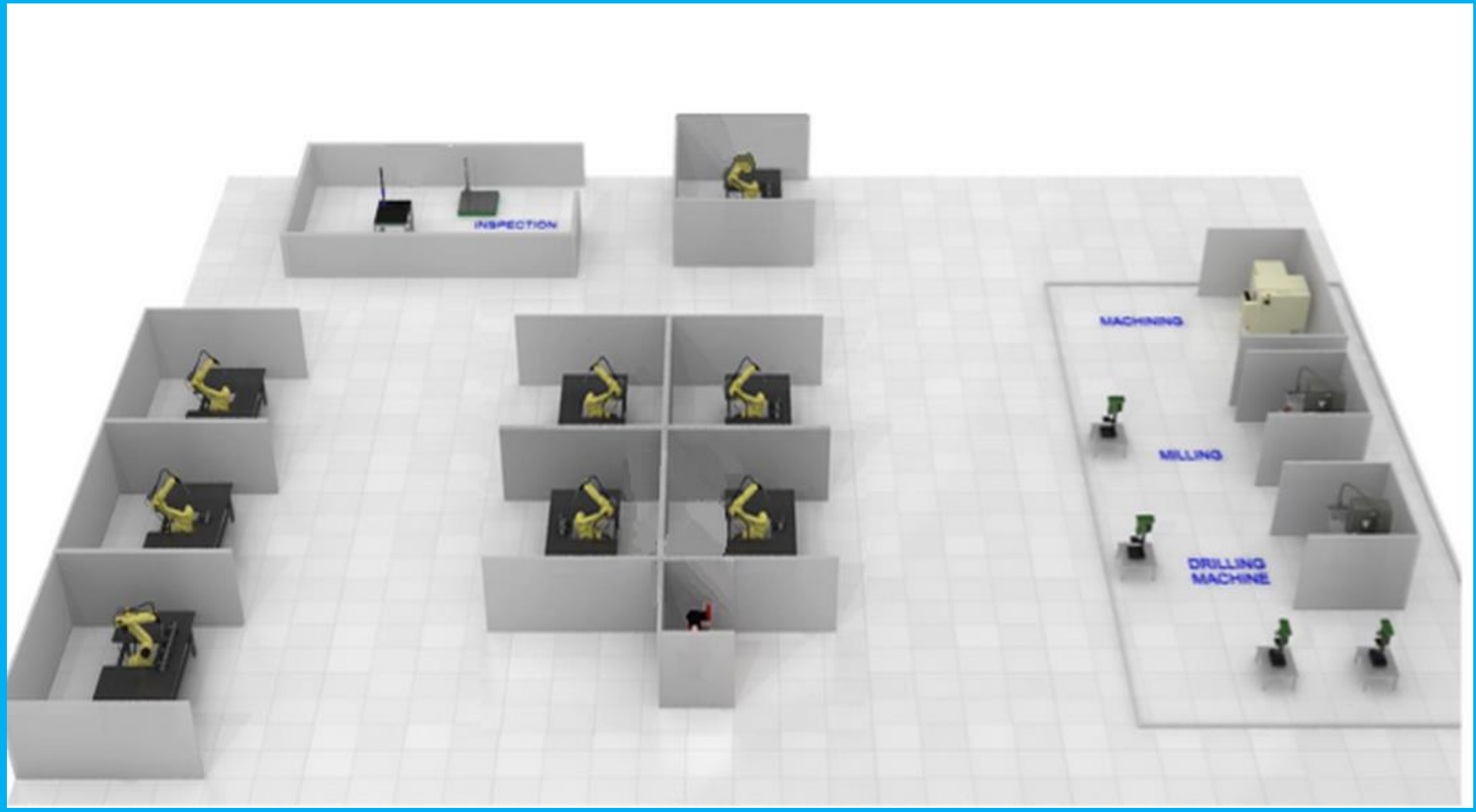
- ITU has described the scene of IoT era as follows
  - The car will generate alarm automatically if the driver has made any mistake during the operation;
  - The bag will send out reminder message if the owner forgot bring something;
  - The cloth will tell the washing-machine about its requirement for the water temperature;

- Life will be changed completely with the technology of IoT

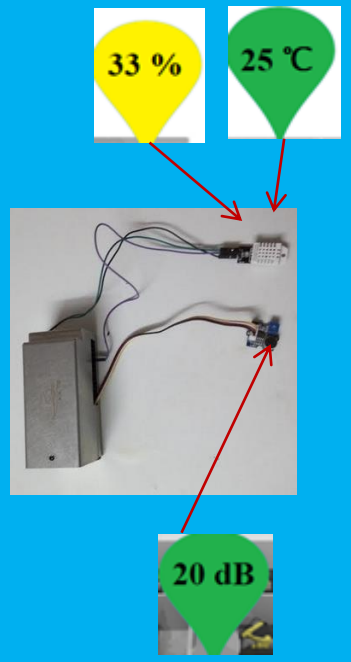
Internet of Things (IoT) for Factory



IoT For Factory Layout



IoT For Factory Layout



alfaDOCK IoT

alfaTKG Co.Ltd. Logout

IoT TOP menu ＞ 第二工場全体

M聴診器

Factory 2 Machine Stethoscope

Current Time : 2016/10/02 08:37:25pm

Last Entry Time : 2016/10/02 08:36:23pm

25 ℃

33 %

20 dB

M聴診器

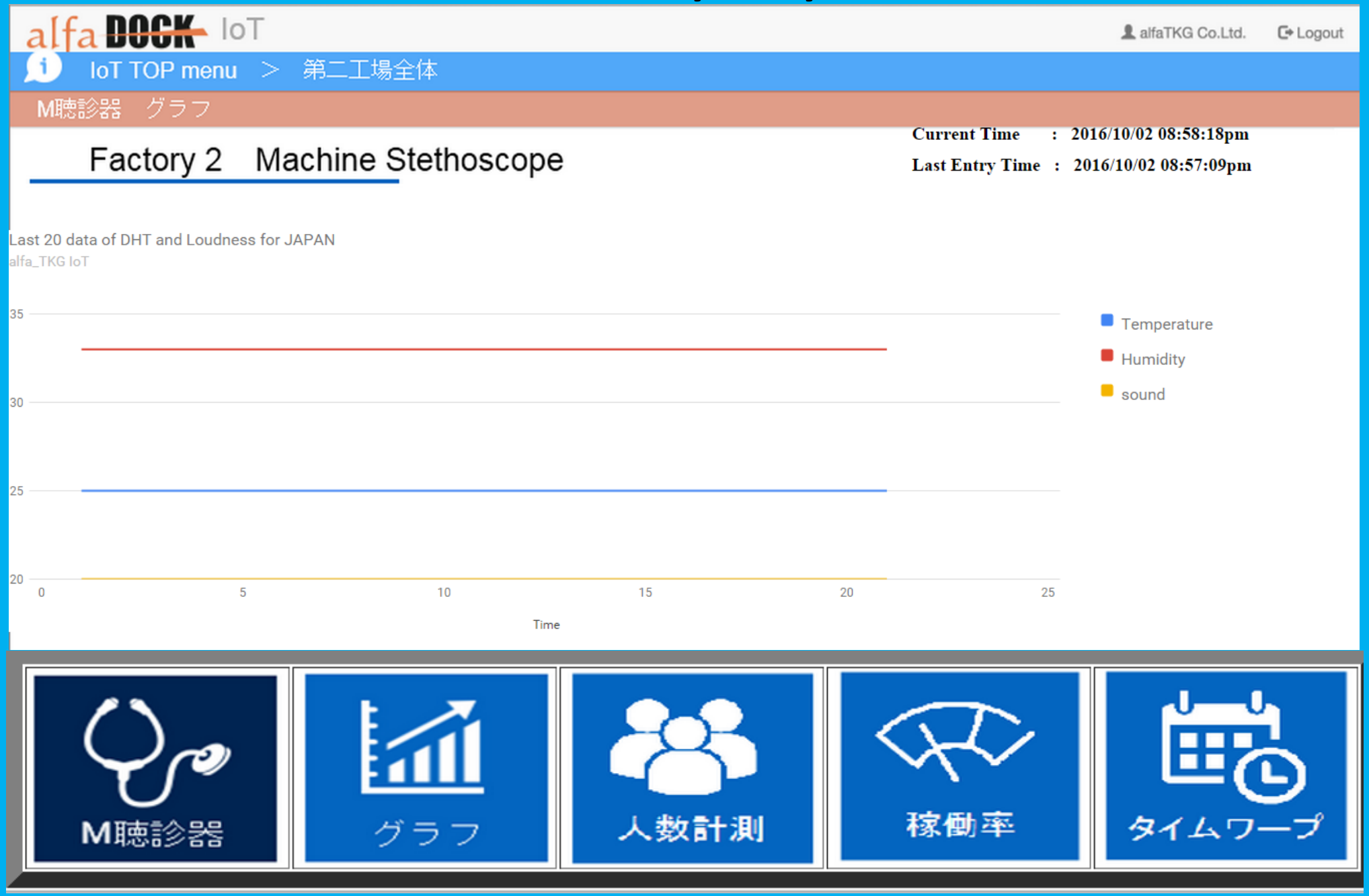
グラフ

人数計測

稼働率

タイムワープ

IoT For Factory Layout



IoT For Factory Layout

alfa DOCK IoT

alfaTKG Co.Ltd. Logout

IoT TOP menu > 第二工場全体

M聴診器 タイムワープ

Factory 2 Machine Stethoscope

Uploading Time Setting

For Temp / Hum Unit : 1 Minutes

For Loudness Unit : 20 Seconds

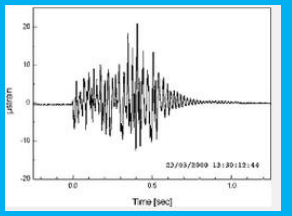
Submit

Threshold Setting

Temperature :		25		30	
Humidity :		10		40	
Sound :		34		45	

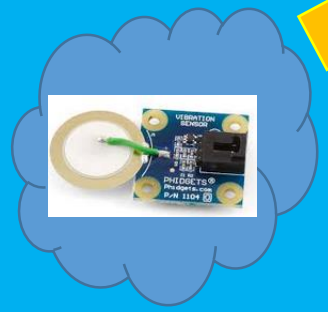
Submit

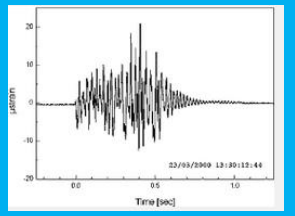
IoT For Micro Machining Factory Layout



Alert

IoT For Sheet Metal Machining Factory Layout



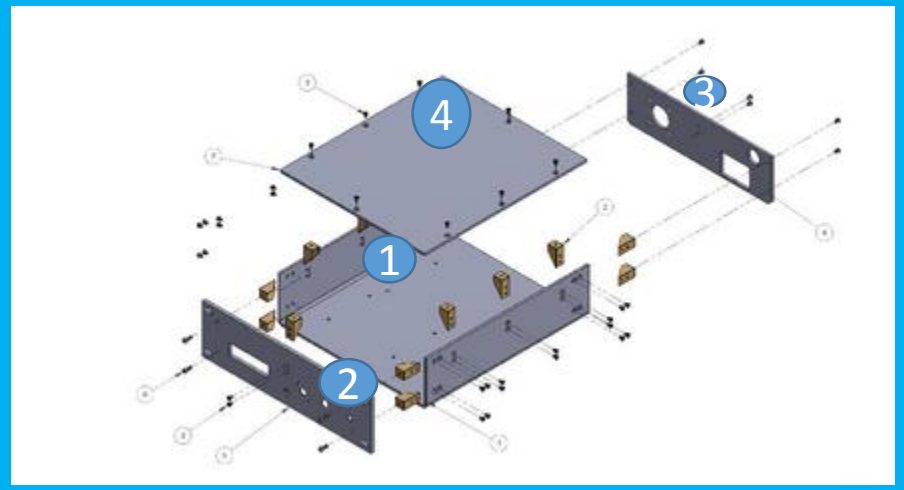


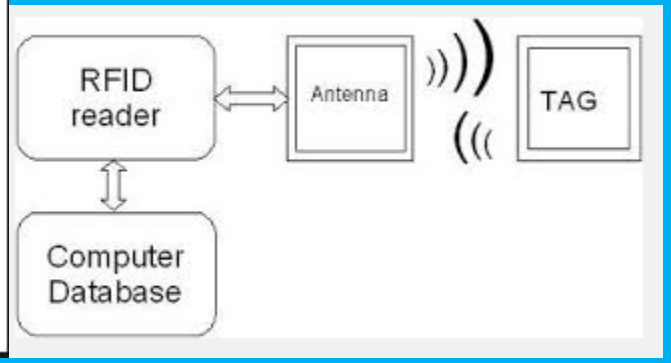
Alert

IoT For alfaTKG

1	2	3	4

PHD





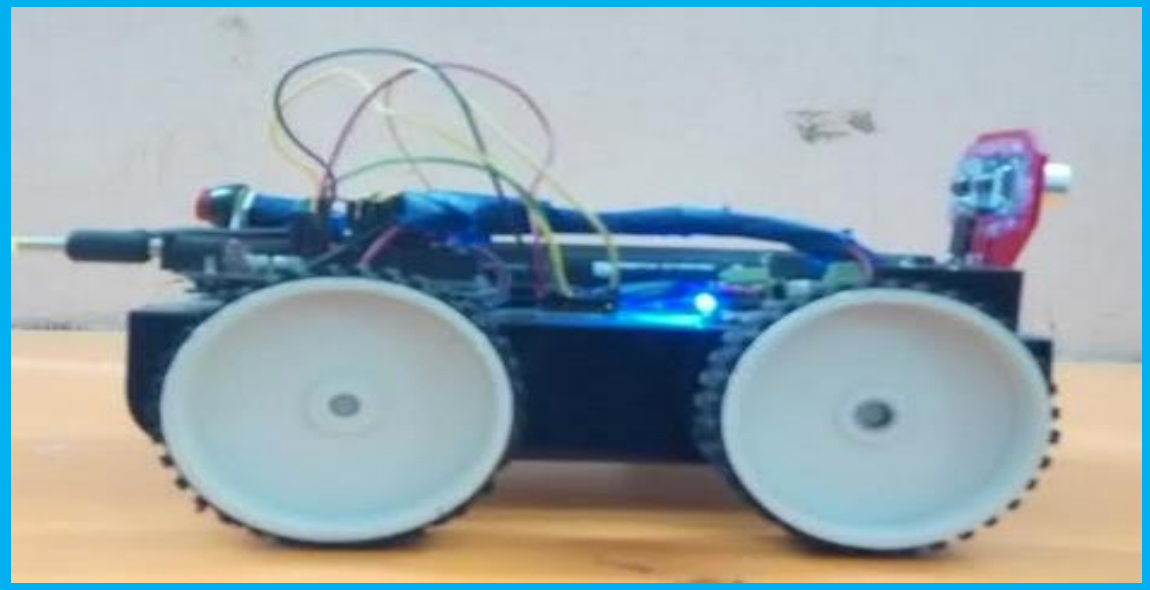
Traditional Automated guided Vehicles – No IoT In Place

Disadvantage:

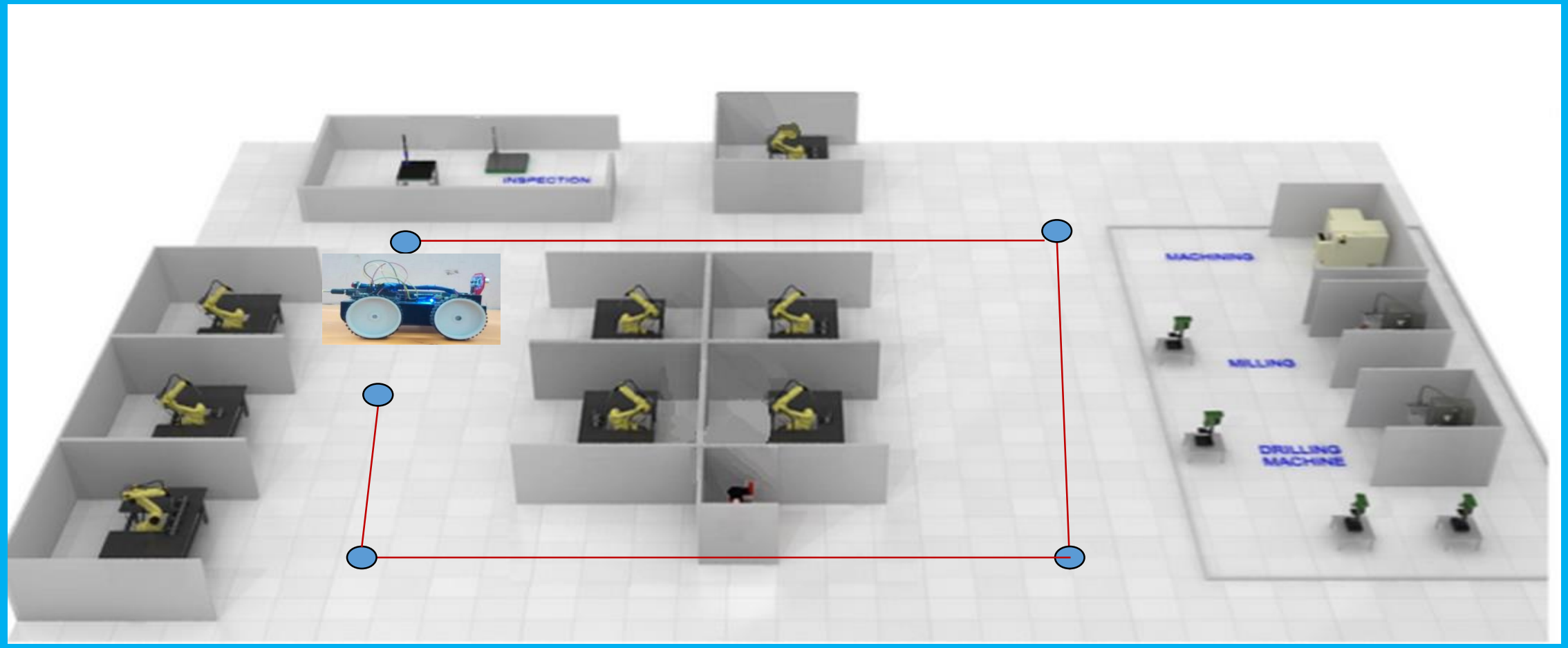
1. Need Programming each time as path changes
2. Needs Shop floor guiding line for movement
3. No information output to the cloud System
4. There is no data analytics of the break down pattern
5. No break down maintenance can be scheduled

The above said disadvantages are non present in IoT Based Robot defined in Next Page

(Pilot AGV) Remote Control, Inspection and Image visualization Robot- Based on IoT

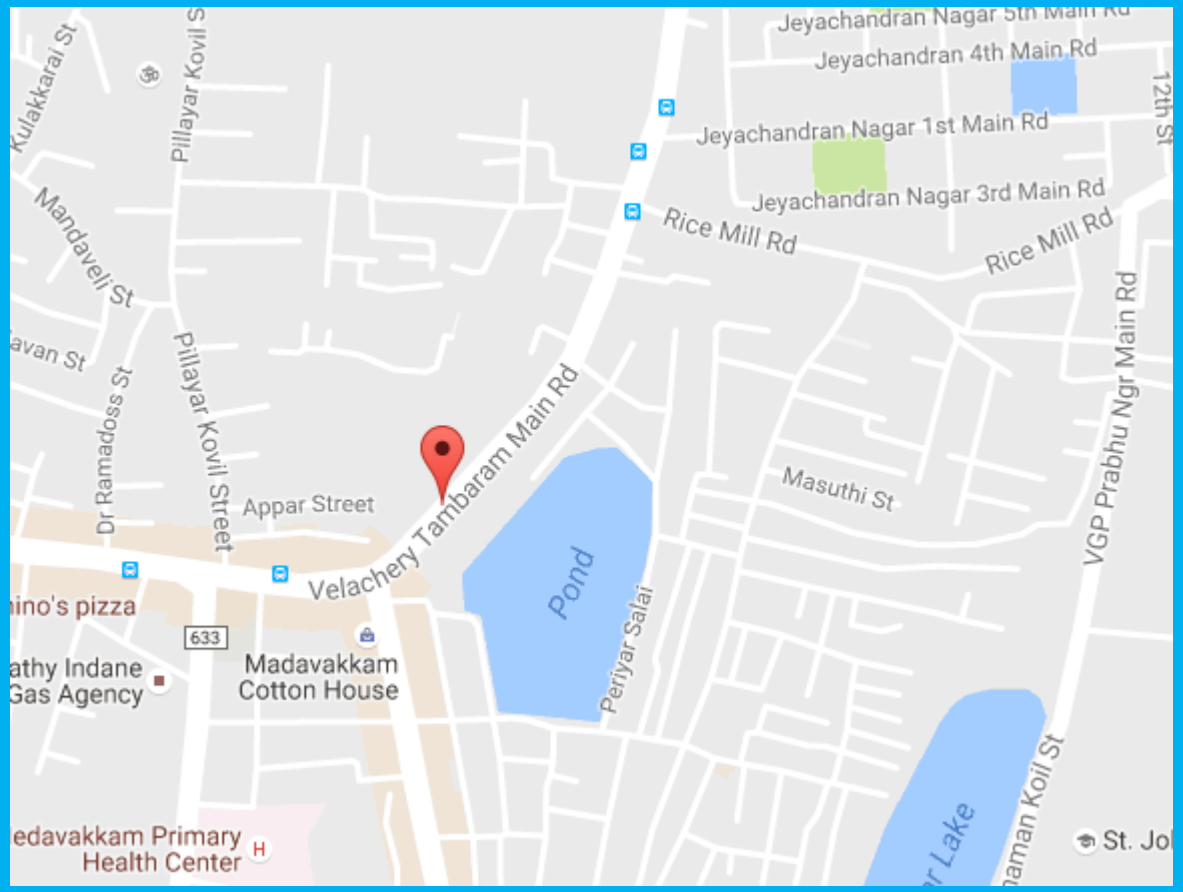


Remote Control, Inspection and Image visualization Robot- Based on IoT



Flexible Route Selection

Remote Control, Inspection and Image visualization Robot- Based on IoT



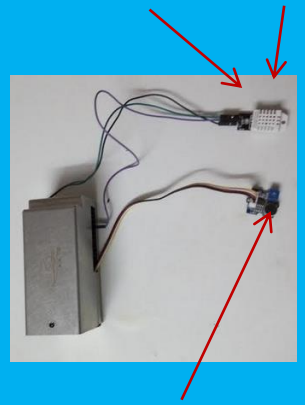
GPS location and Cloud Based Vision Enabled

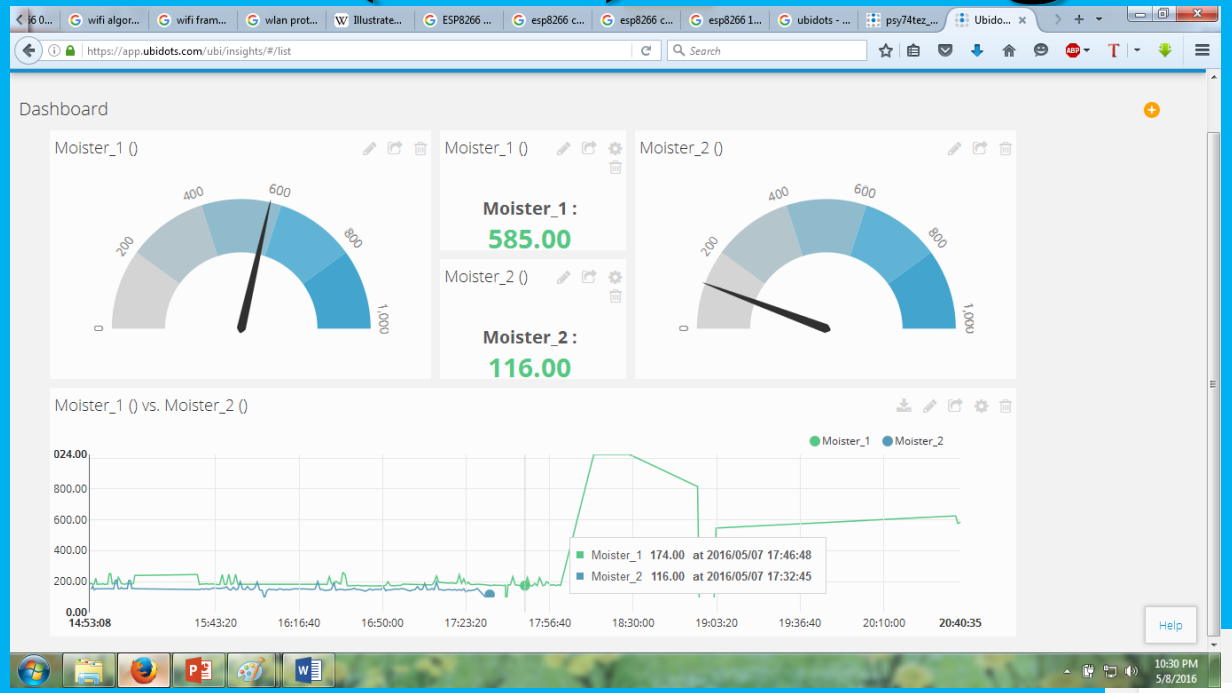
Internet of Things (IoT) for Farm / Agriculture

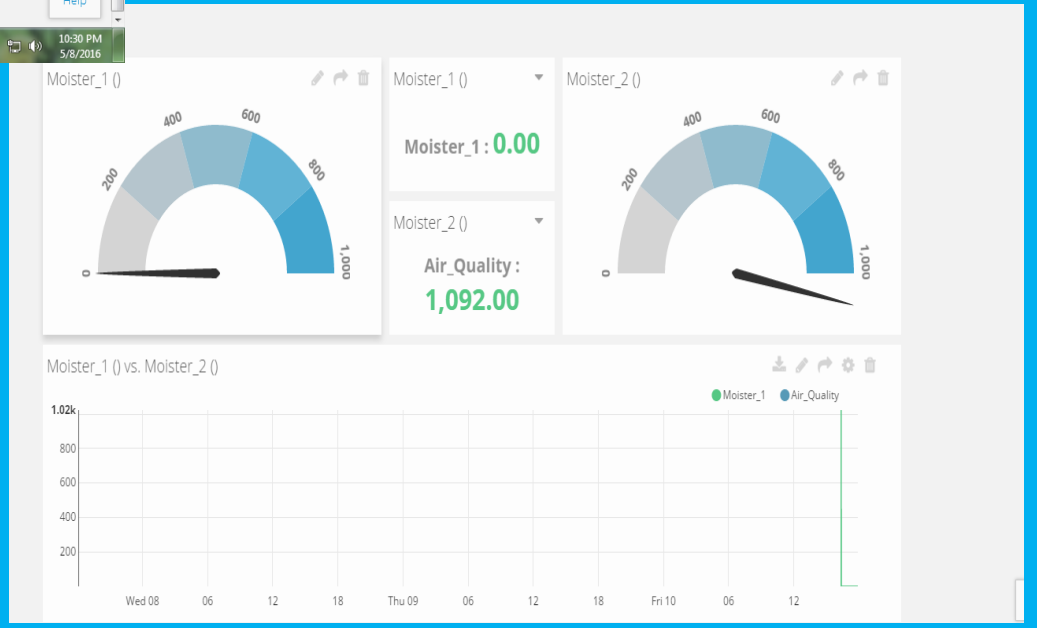
(IoT) for Agriculture

(IoT) for Agriculture

(IoT) for Agriculture







(IoT) for Agriculture

(IoT) for Agriculture

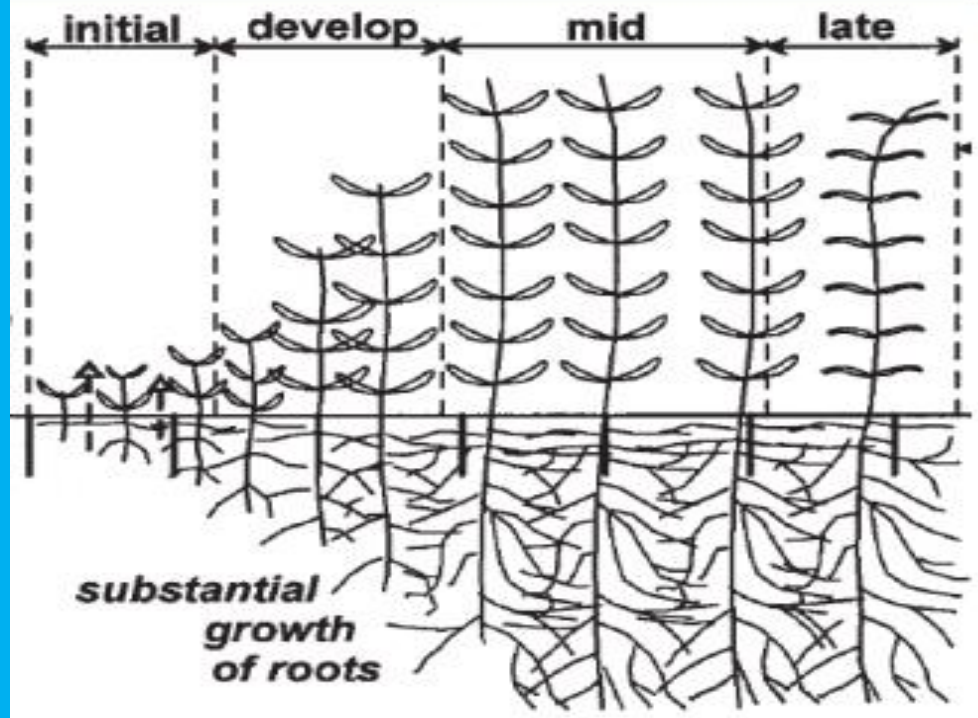
On Going Collaborative Project with GRT Institute of Engineering & Technology

1. Quad Copter / Drone for Oil Field Inspection, Scanning, Surveillance, Agriculture Pesticide Spraying, Organ Transplantation etc.

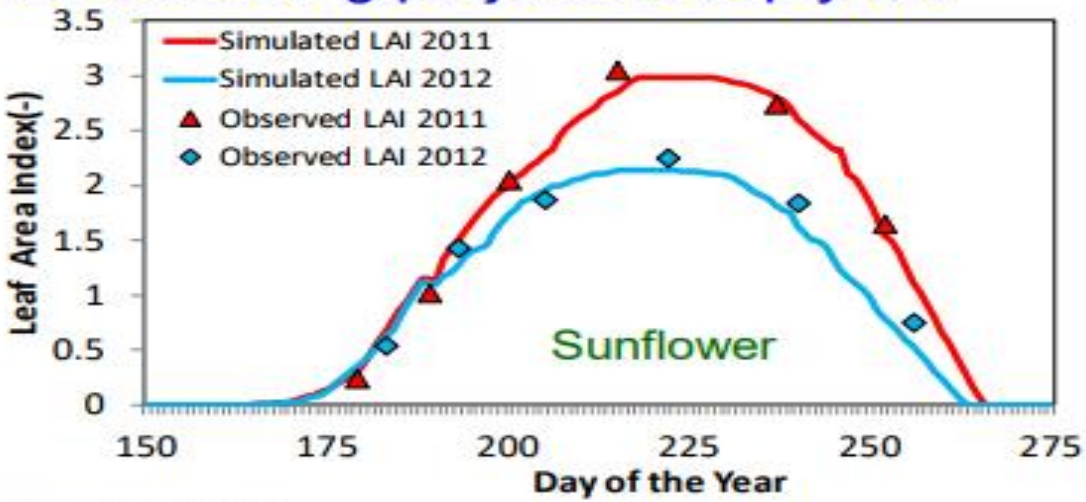
2. Robots for Remote Surveillance and Visualization & IoT Concepts

Developed this in Collaboration with GRT Engineering College-R & D Cell

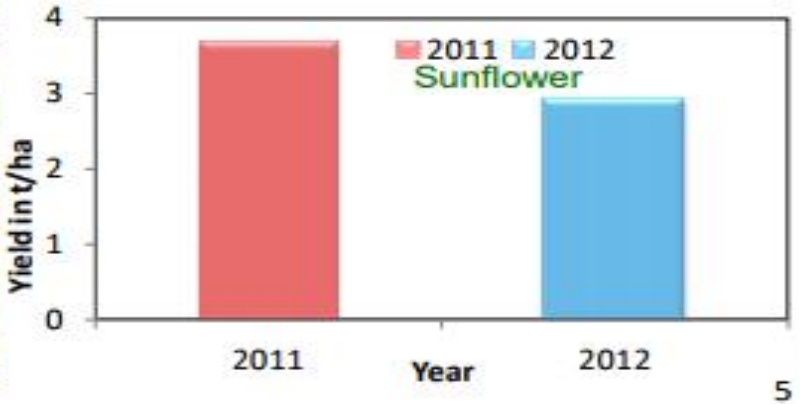
Soil moisture & linkage to Crop Growth



- Moisture stress leads to poor growth of the crop & lower crop yields.
- Sensing the LAI & its forecast helps in water & nutrient inputs during the season plus for estimating projected crop yield.



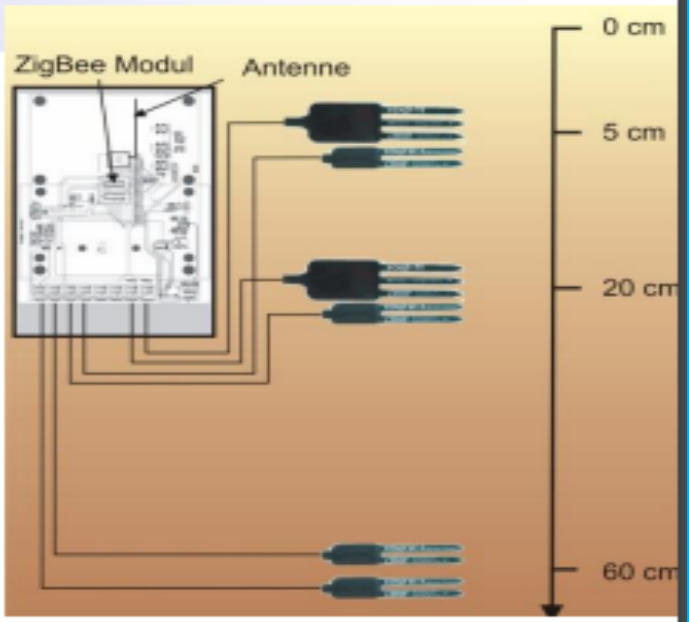
Field Plot Expts - AMBHAS

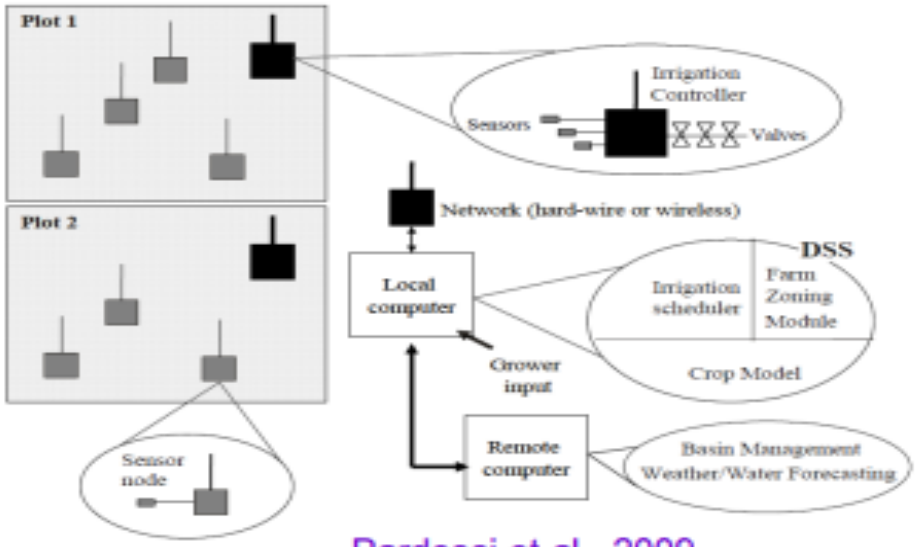


IoT Lab @ IISc - Framework

- Tools & products for Bigdata & IoT to support improvements in agricultural water resources management.

  - Soil moisture can be retrieved through cost effective sensors. Calibration of such ground 'capacitance' based sensors under all farm conditions.
  - Further, sensors of water flow and energy characteristics from bore well will be used for preparing a decision tool of irrigation scheduling.
  - Upscaling of this approach though smart sensors is a way to take the idea from 'bench to field'.

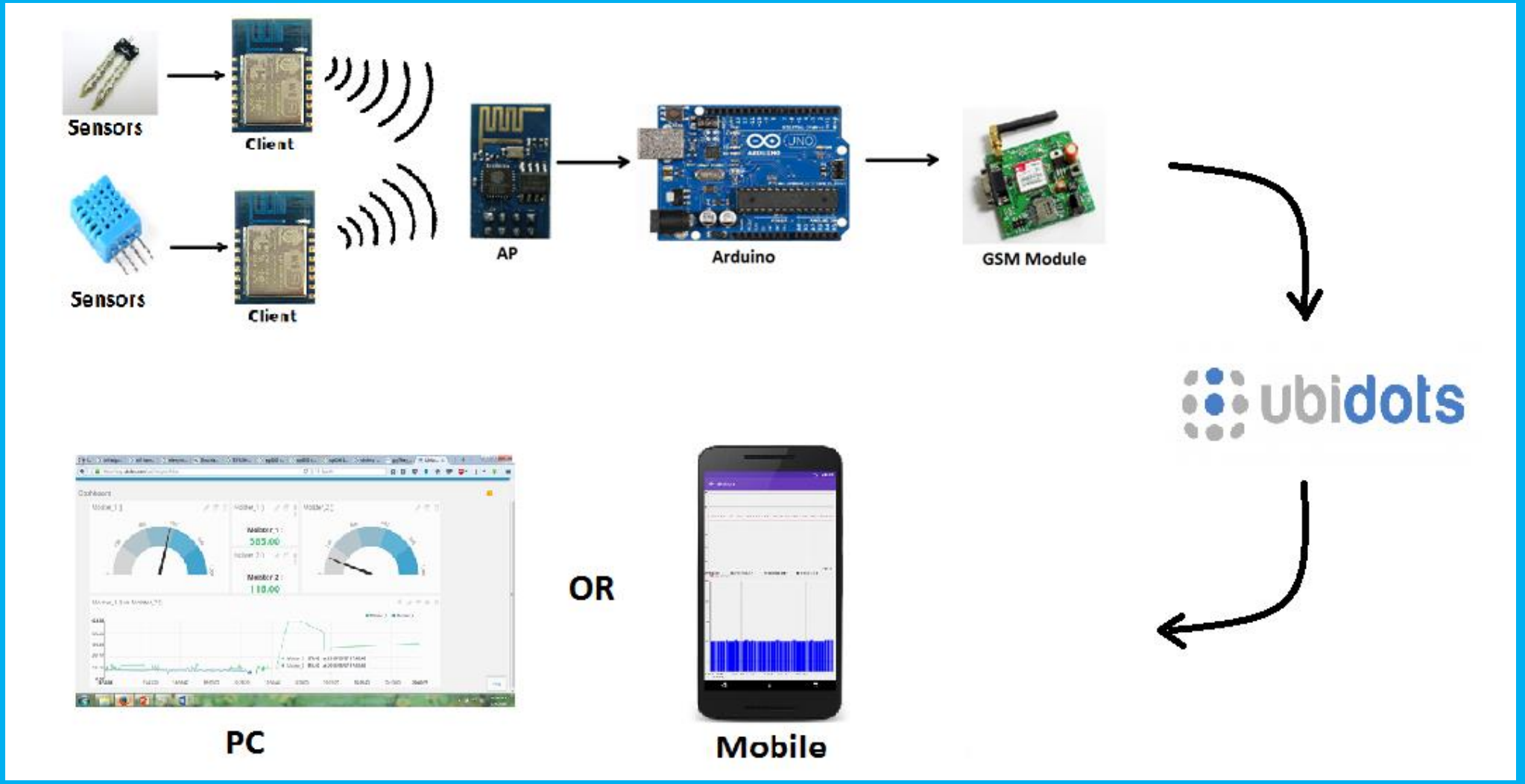




Pardossi et al., 2009

Automatic Drip Irrigation System Based on IoT

Overall data flow diagram



UBI DOTS

AWS
(Amazon Web Server)

Freeboard / Pub Nub

IOT Work: IISc Bangalore

90% Work Completed

WI-FI
RX&TX

WIFI TX

WIFI TX

WIFI TX

WIFI TX

COLOUR SENSOR

HUMIDITY

TEMPERETURE

MOISTURE

e.g. Solar powered wireless irrigation

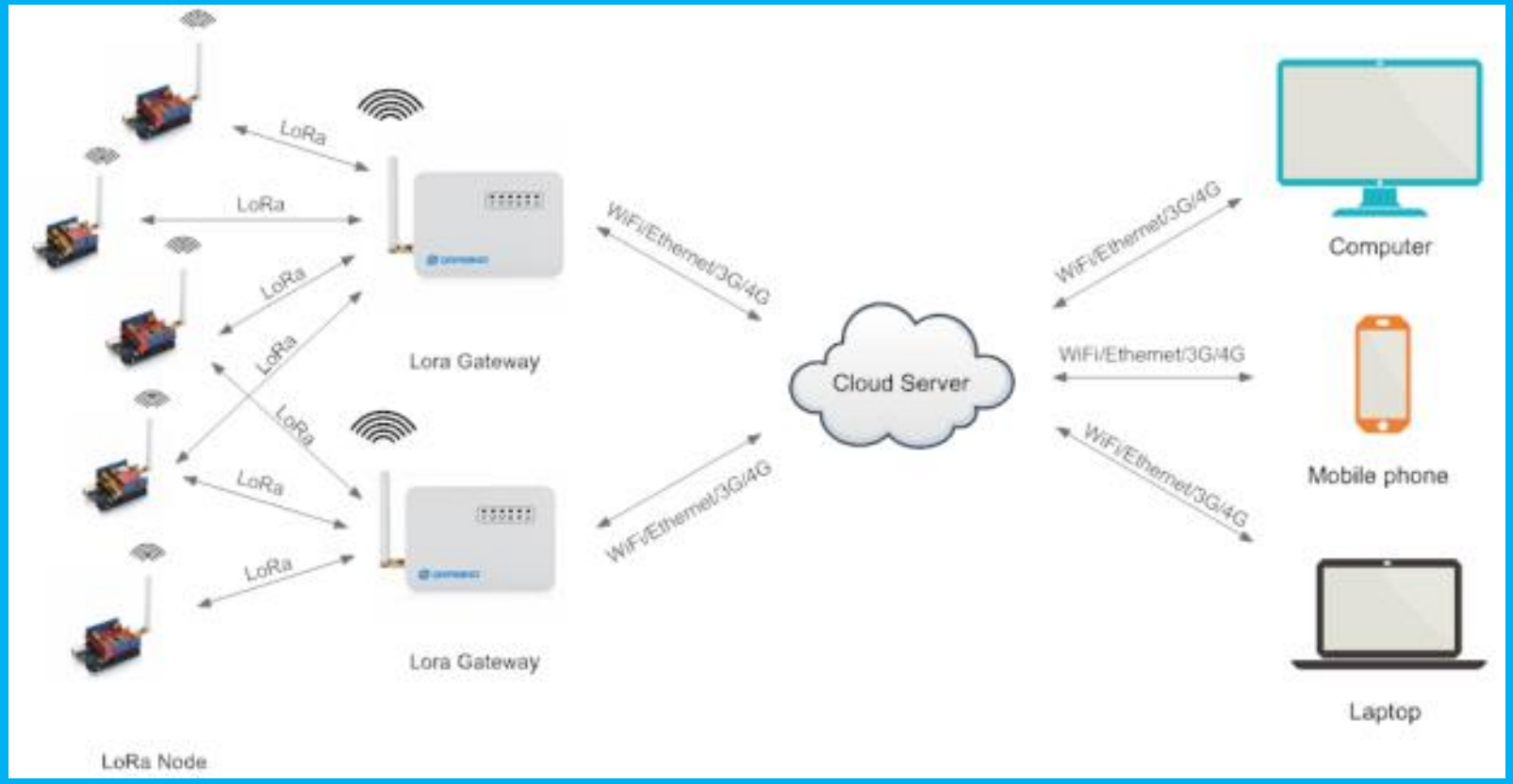
LoRa Module

LoRa is a wireless technology developed to create the low-power, wide-area networks (LPWANs) required for machine-to-machine (M2M) and Internet of Things (IoT) applications.

- **Very compelling mix of long range, low power consumption and secure data transmission.**

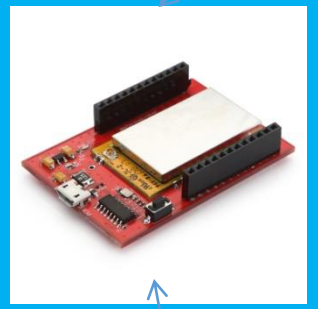
- **A network based on LoRa wireless technology can provide coverage that is greater in range compared to that of existing cellular networks.**

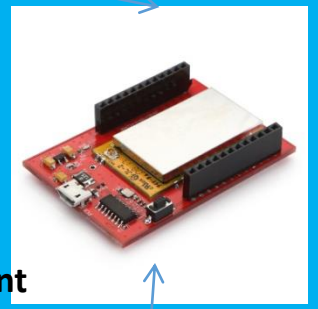
- **Many mobile network operators have chosen to complement their existing cellular/wireless networks with a LPWAN based on LoRa technology because it is easy to plug into their existing infrastructure and also allows them to offer their customers a solution to serve more IoT battery-operated applications.**


LoRa
LoRa
LoRa
LoRa
LoRa
LoRa
LoRa
Lora Gateway
Lora Gateway
LoRa Node
WiFi/Ethernet/3G/4G
WiFi/Ethernet/3G/4G
Cloud Server
WiFi/Ethernet/3G/4G
WiFi/Ethernet/3G/4G
WiFi/Ethernet/3G/4G
Computer
Mobile phone
Laptop

MQTT

Gateway





LoRa Client Module

PC

Sensor

Sensor

Client List

IITM Research Park-alfaTKG

IISc Bangalore-IoT Lab

alfaTKG-IoT Lab-Presentation in Germany

www.okabeiot.com

Thank You

For More Information:

Visit: www.ajlontech.com

Mob: 9962673502

Partner to : AlfaTKG Japan, IISc Bangalore, IITM