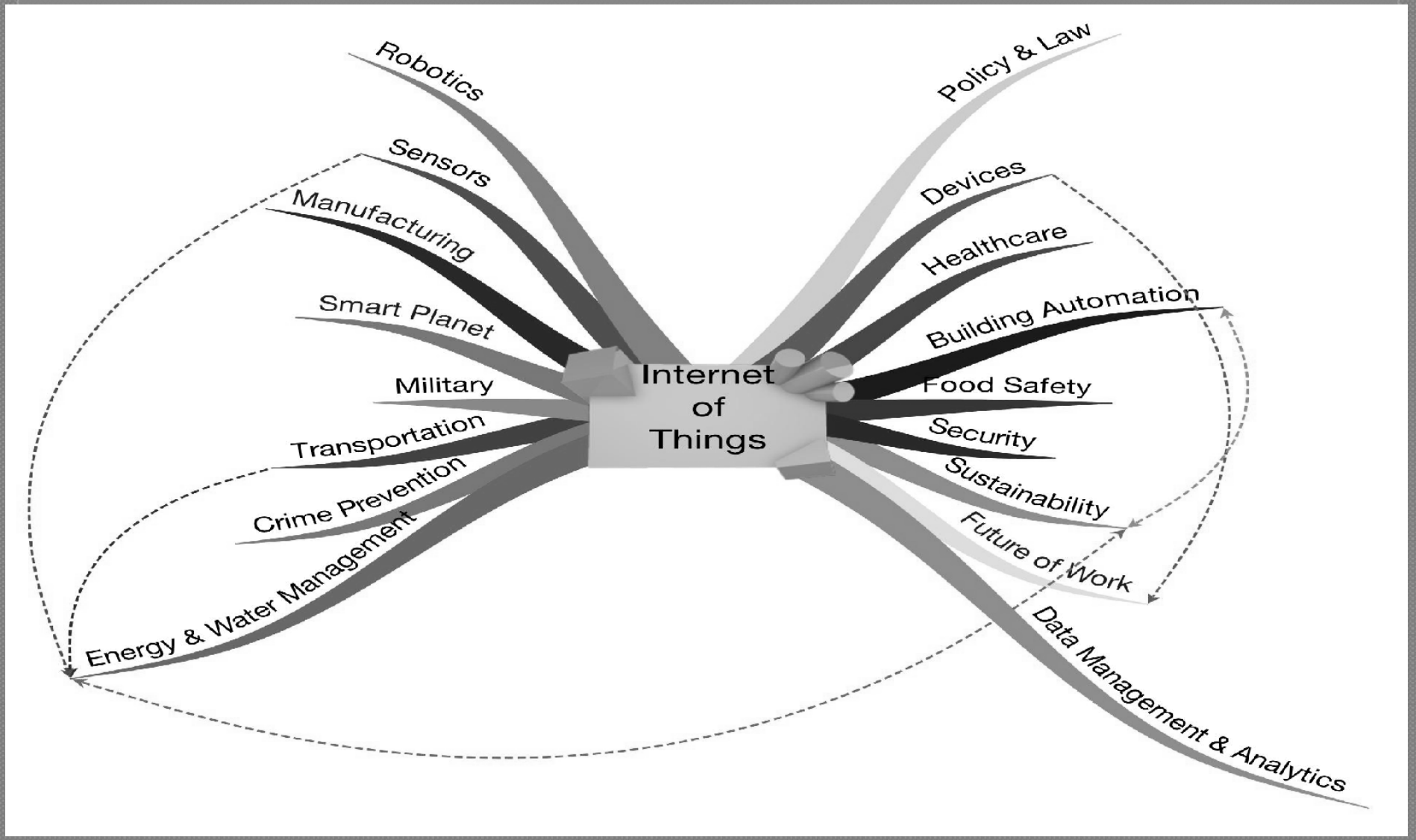
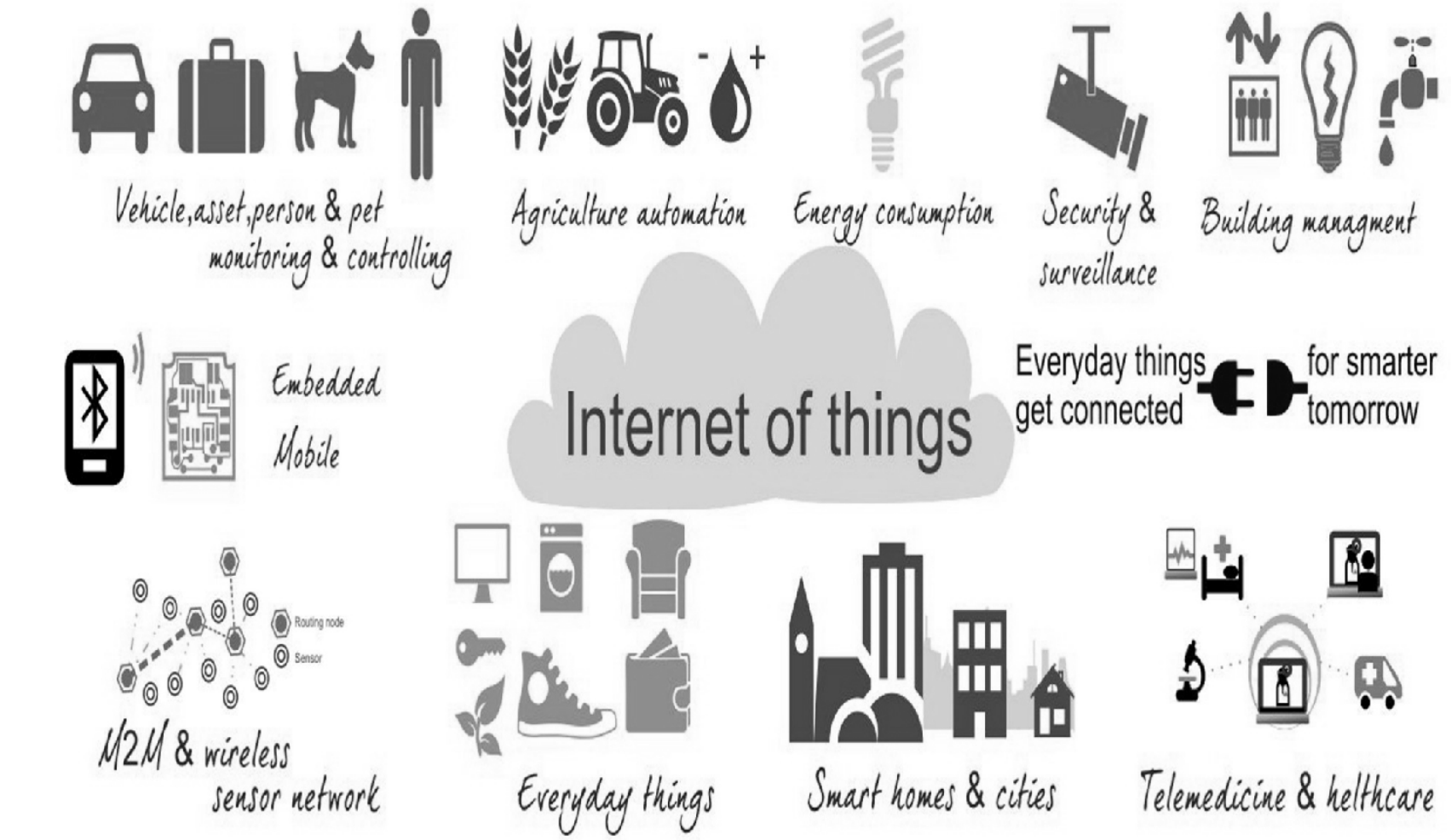
Internet of Things (IoT)

Simple IoT


Robotics
Sensors
Manufacturing
Smart Planet
Military
Transportation
Crime Prevention
Energy & Water Management
Internet of Things
Policy & Law
Devices
Healthcare
Building Automation
Food Safety
Security
Sustainability
Future of Work
Data Management & Analytics

The simliest IoT



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 is IoT?

- A phenomenon which connects a variety of ***things***
  - Everything that has the ability to communicate

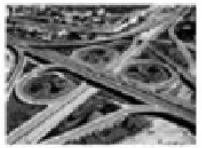
Things Connected: communicated between physical world and information world

Integrated Application


Smart Logistic


Smart Grid


Green Building


Smart Transport


Env. Monitor

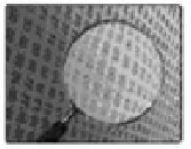
Information Processing


Data Center

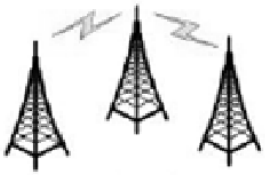

Search Engine

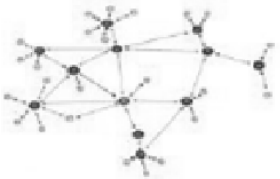

Smart Decision

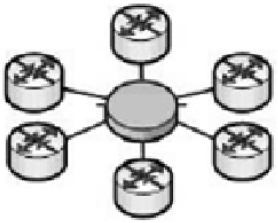

Info. Security

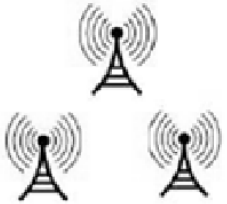

Data Mining

Network Construction


WWAN


WPAN


Internet


WMAN


WLAN

Sensing and Identification


GPS


Smart Device

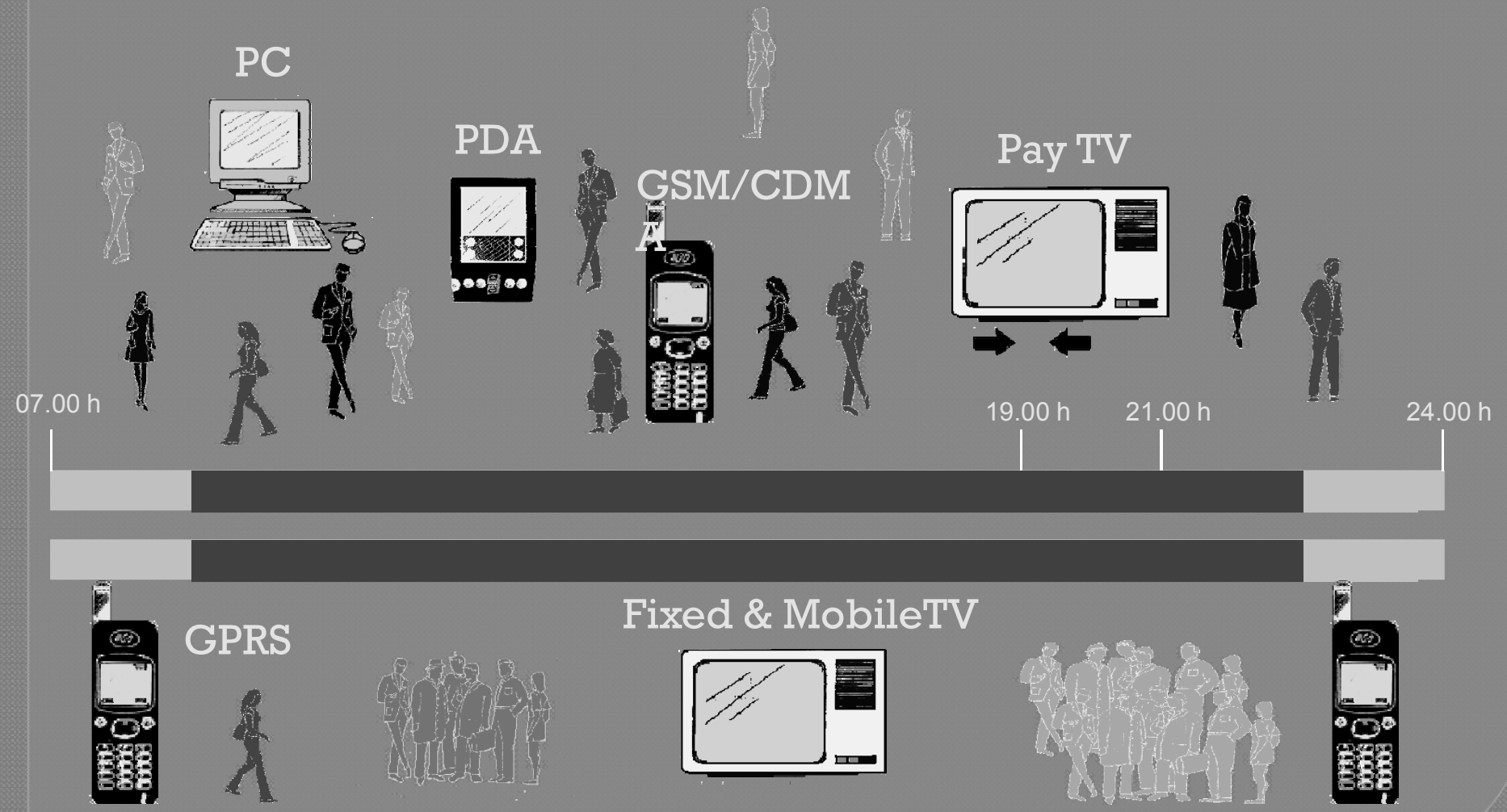

RFID


Sensor


Sensor

Paradigma Cara Akses

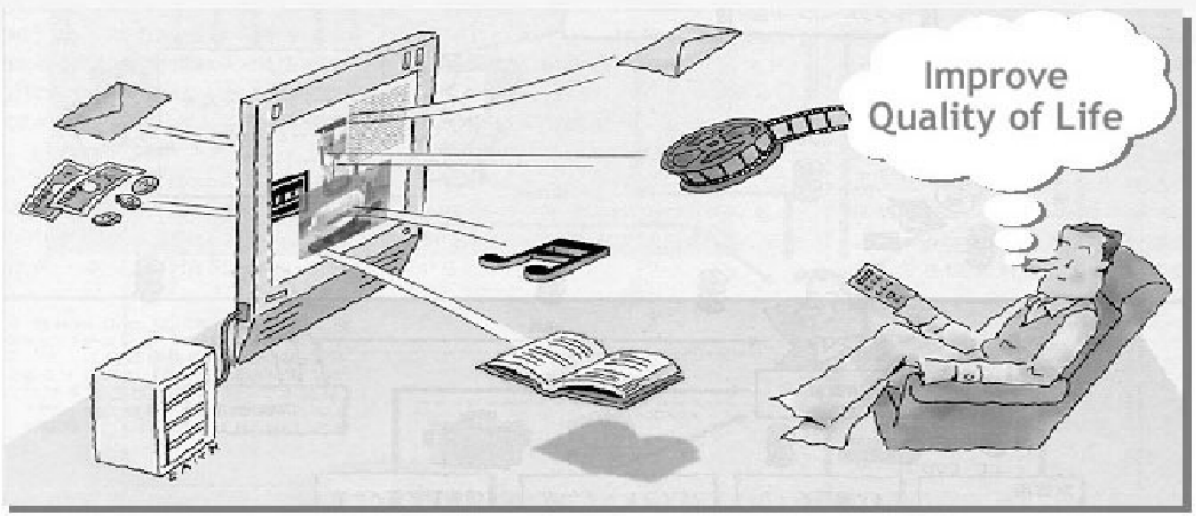
anytime, anywhere, anyhow (3A)

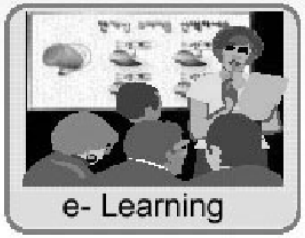


E-Lifestyle


TV Broadcast


Web Surfing



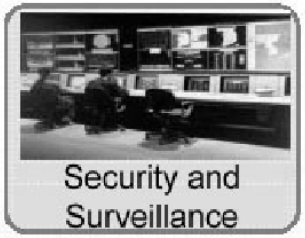

e- Learning


e-Commerce


News


Online Stock Trade


Remote Office


Security and Surveillance


Phone, Videophone and Teleconference


e-Community


Online Game


Movie on Demand


Music Jukebox

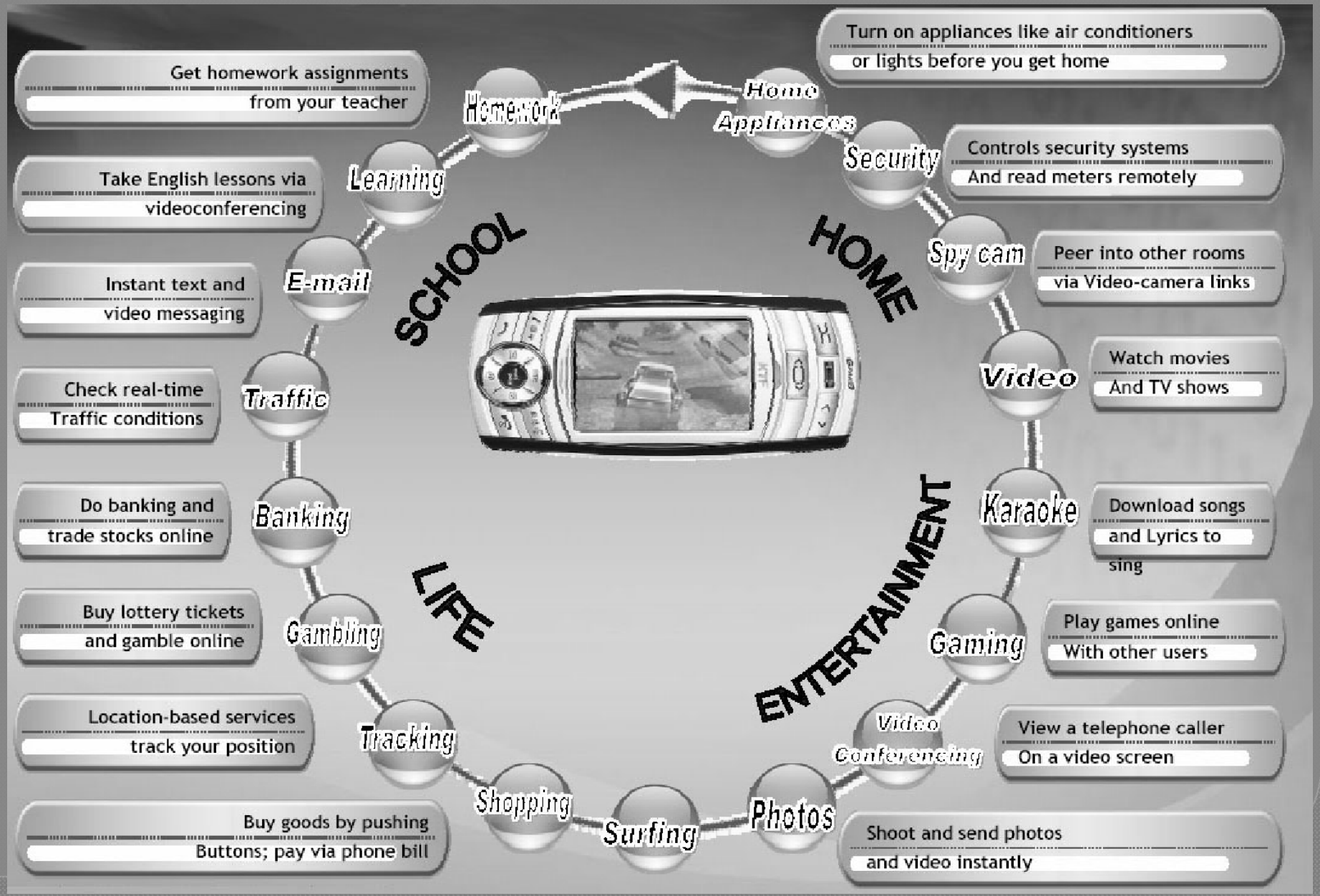

Online Banking and e-Payment


Online Gambling


Online Dating and Adult

e-Lifestyle through personal broadband. Enables home as well as gateway to information, business, commercial, and entertainment in digital era.

Mobile E-Lifestyle



Revolusi Jenis Konten

Hiburan

Interaktif Q

Sepak Bola

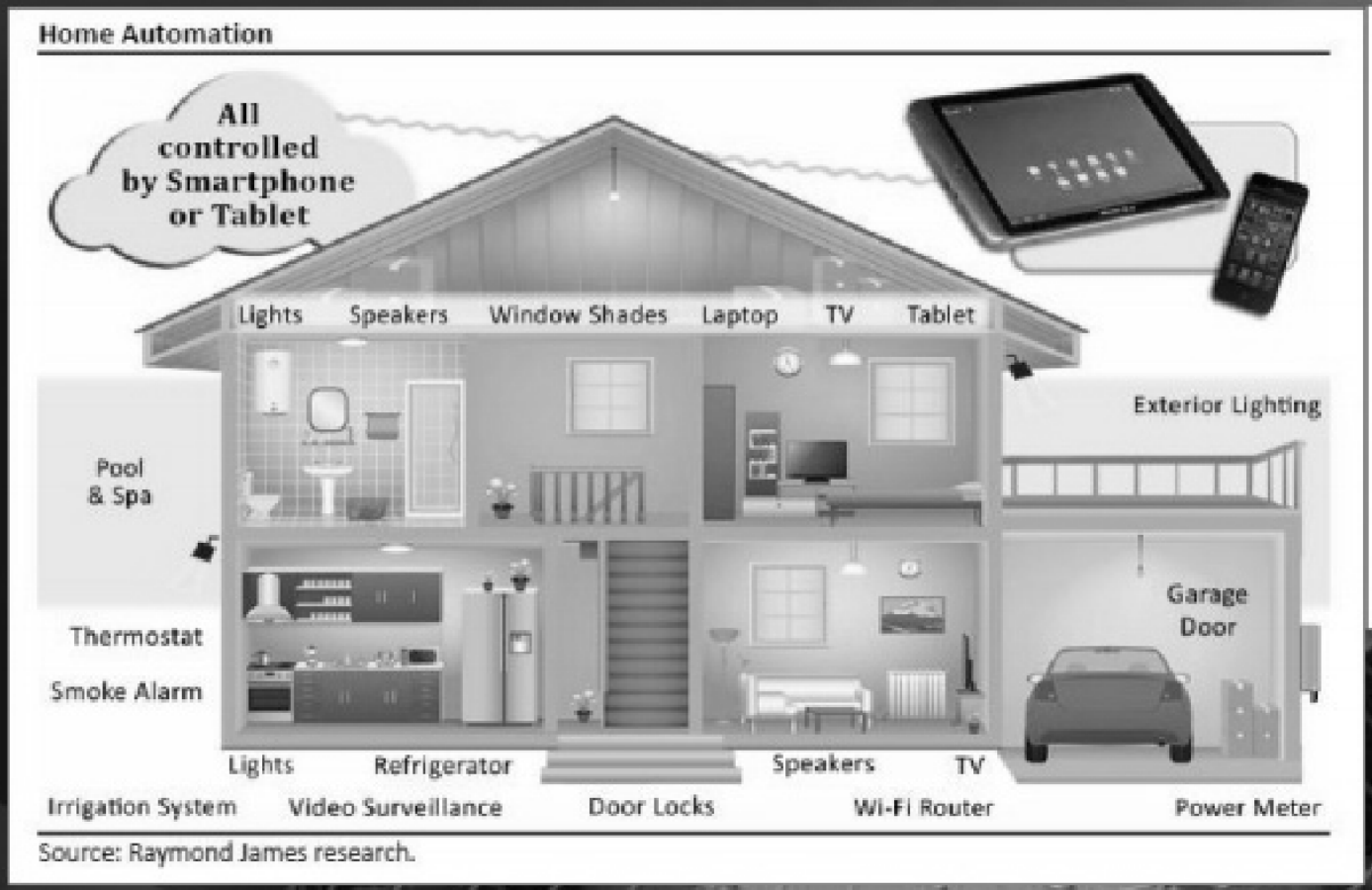
Email

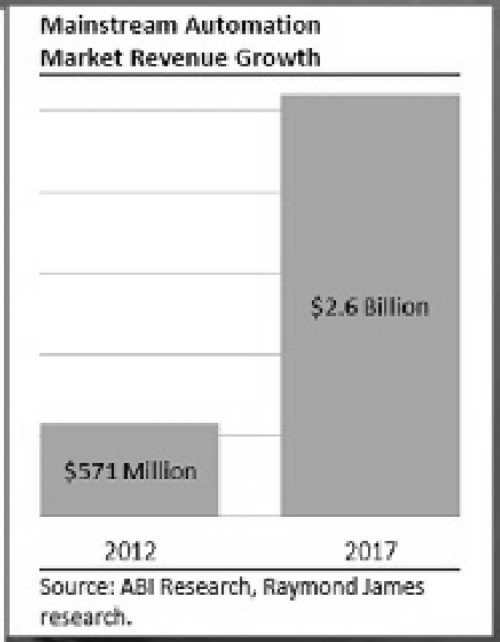
Belanja

Share Info

The application of IoT(5)

Scenario: Intelligent Home



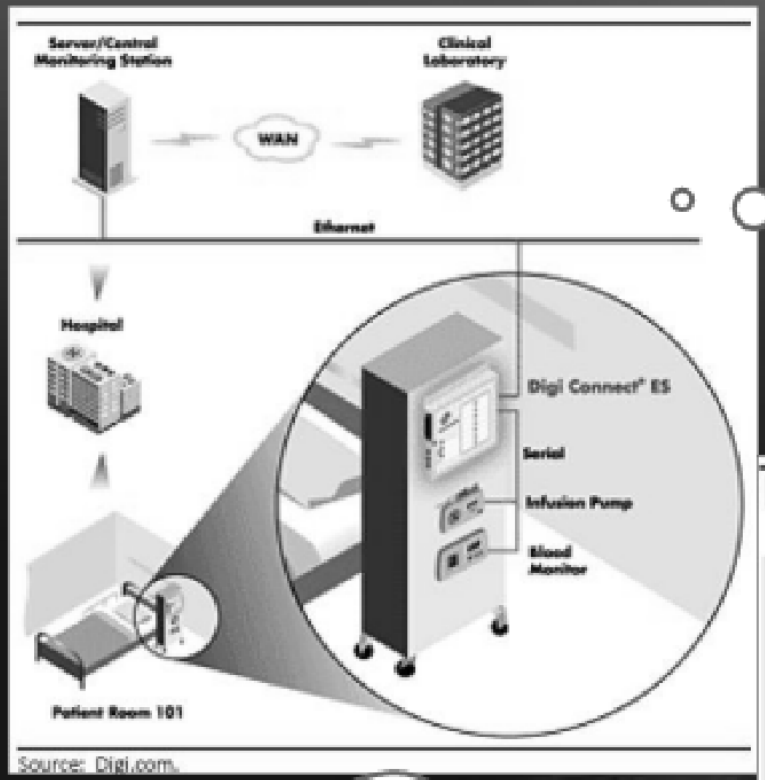



Security
Lights
Security and Alarm
HVAC Control
Light Switch/Dimmer
Thermostat
Energy Management
Internet Gateway
Window Control
Set-Top Box
Home Control Box
Environmental Monitoring
Remote Control
CEV
CUTTING EDGE VISIONARIES

The application of IoT(4)

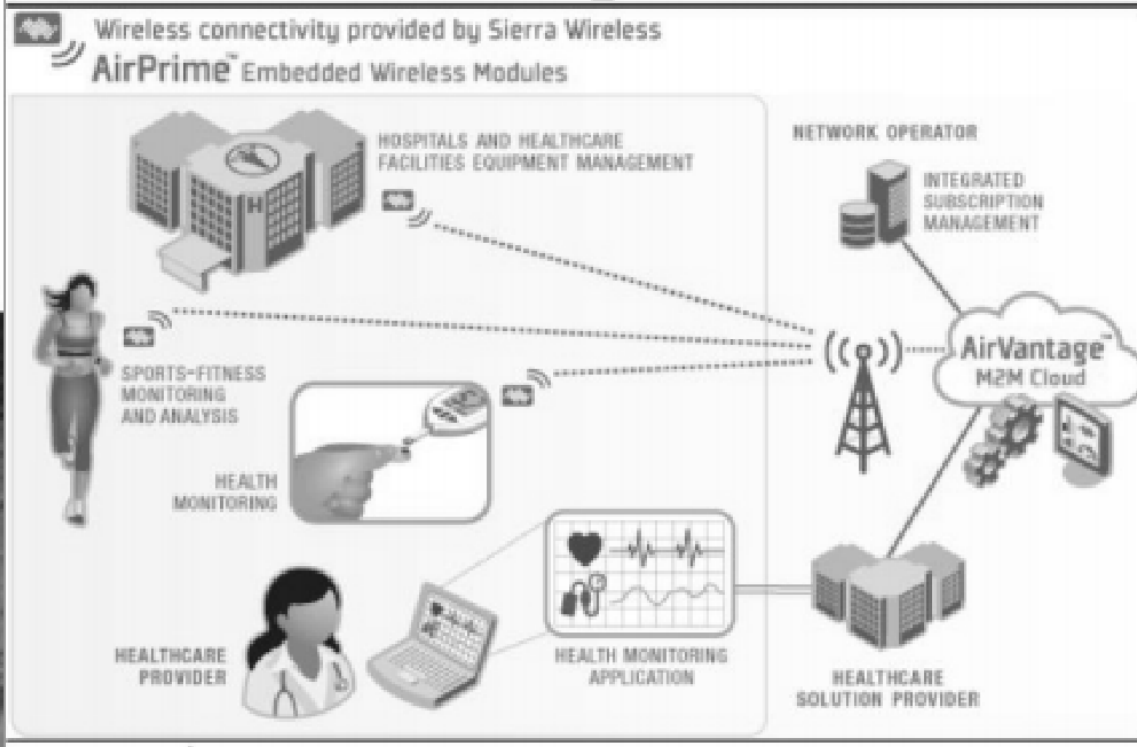
Scenario: Health Care

illustration below from Sierra Wireless describes how a health care provider could theoretically use real time data collected from hospitals, wearable devices, home health monitoring devices, and elsewhere to provide better service



Source: Digi.com

illustration of a solution allowing for remote monitoring of bedside diagnostics, which is just one application for the Internet of Things within the health care environment



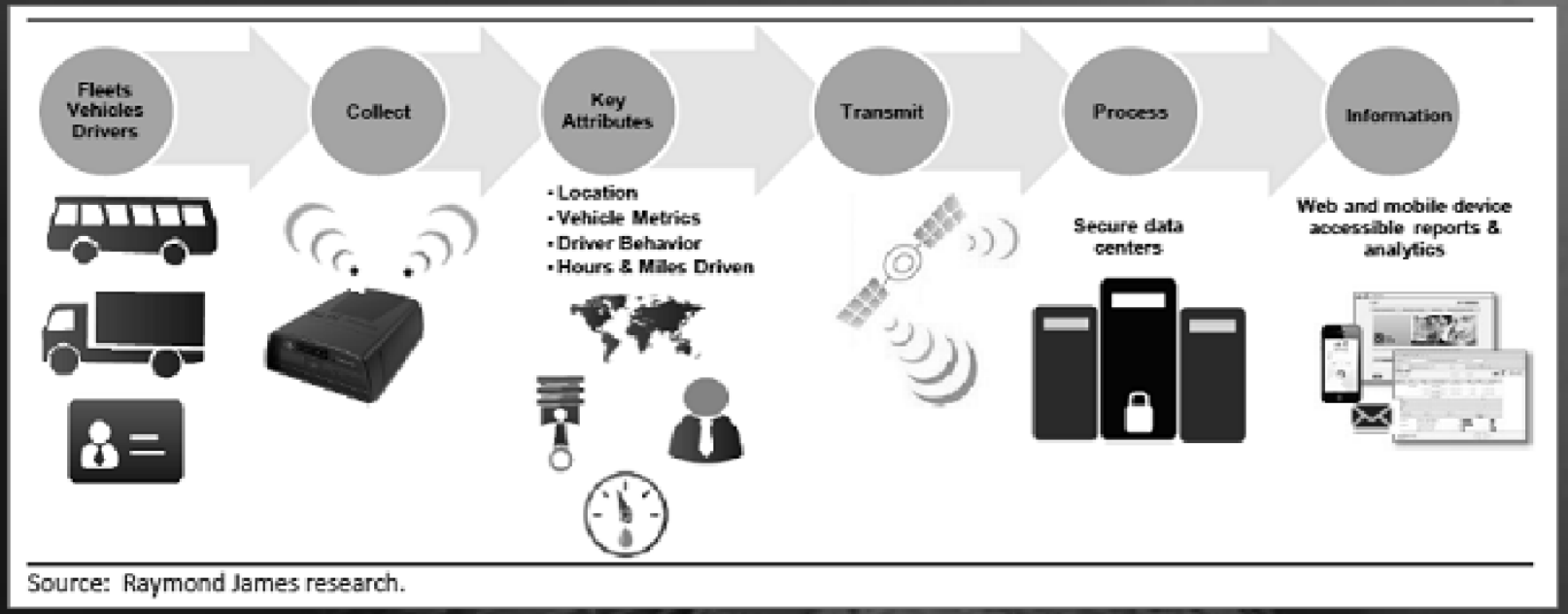
The Application of IoT(4)

Scenario: Intelligent Home

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

The application of IoT(6)

Scenario: Transportation



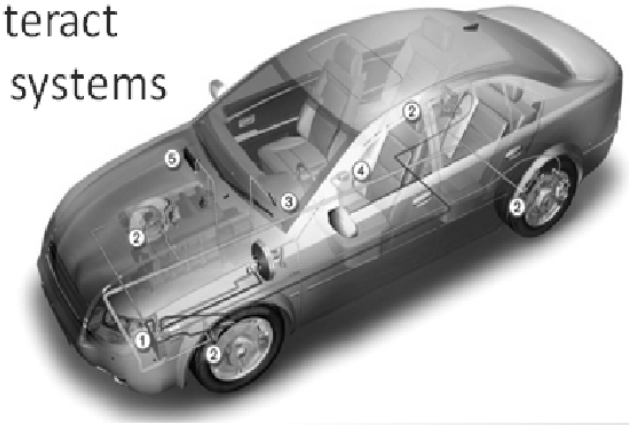
+200 variables on each truck

5% market penetration

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

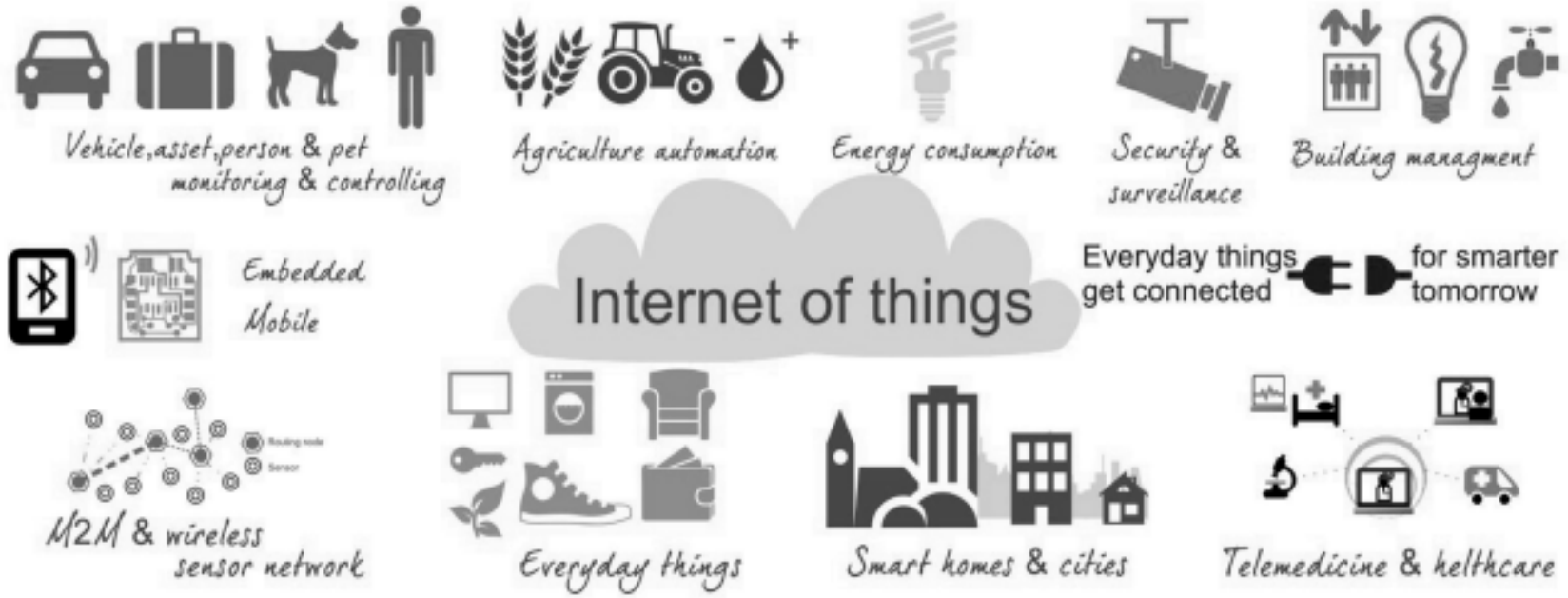
  Autonomous navigation

- 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.

Applications



- Several different domains
  - Transportation and logistics
  - Healthcare
  - Smart environment (home, office, etc.)
  - Personal and social domain

Healthcare Applications

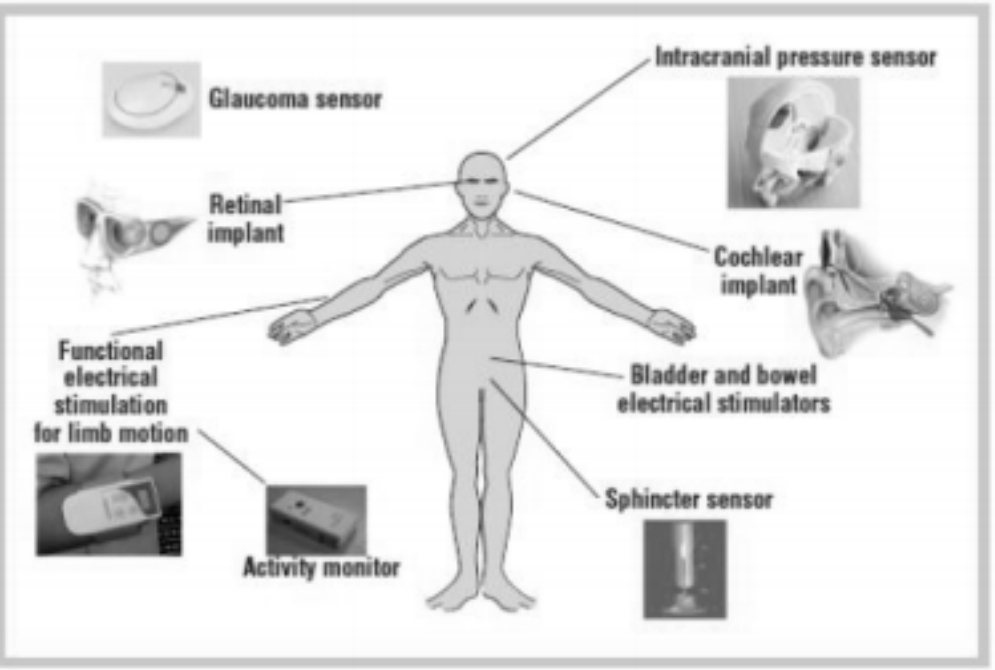


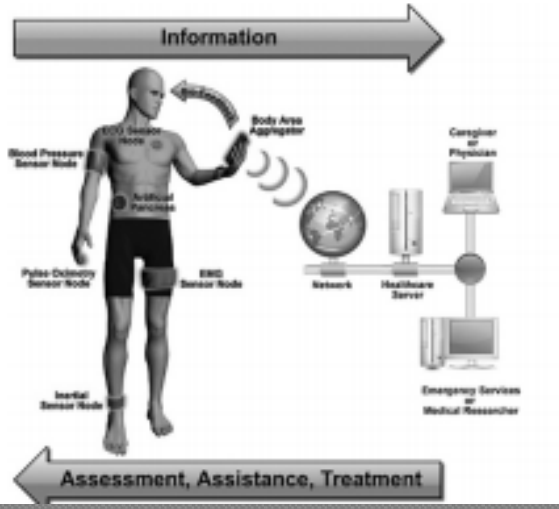
Figure 6. Fully implantable wireless sensor for the intracranial pressure monitoring system.

- 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

Source: Qian Zhang. Lecture notes. 2013

Healthcare Applications

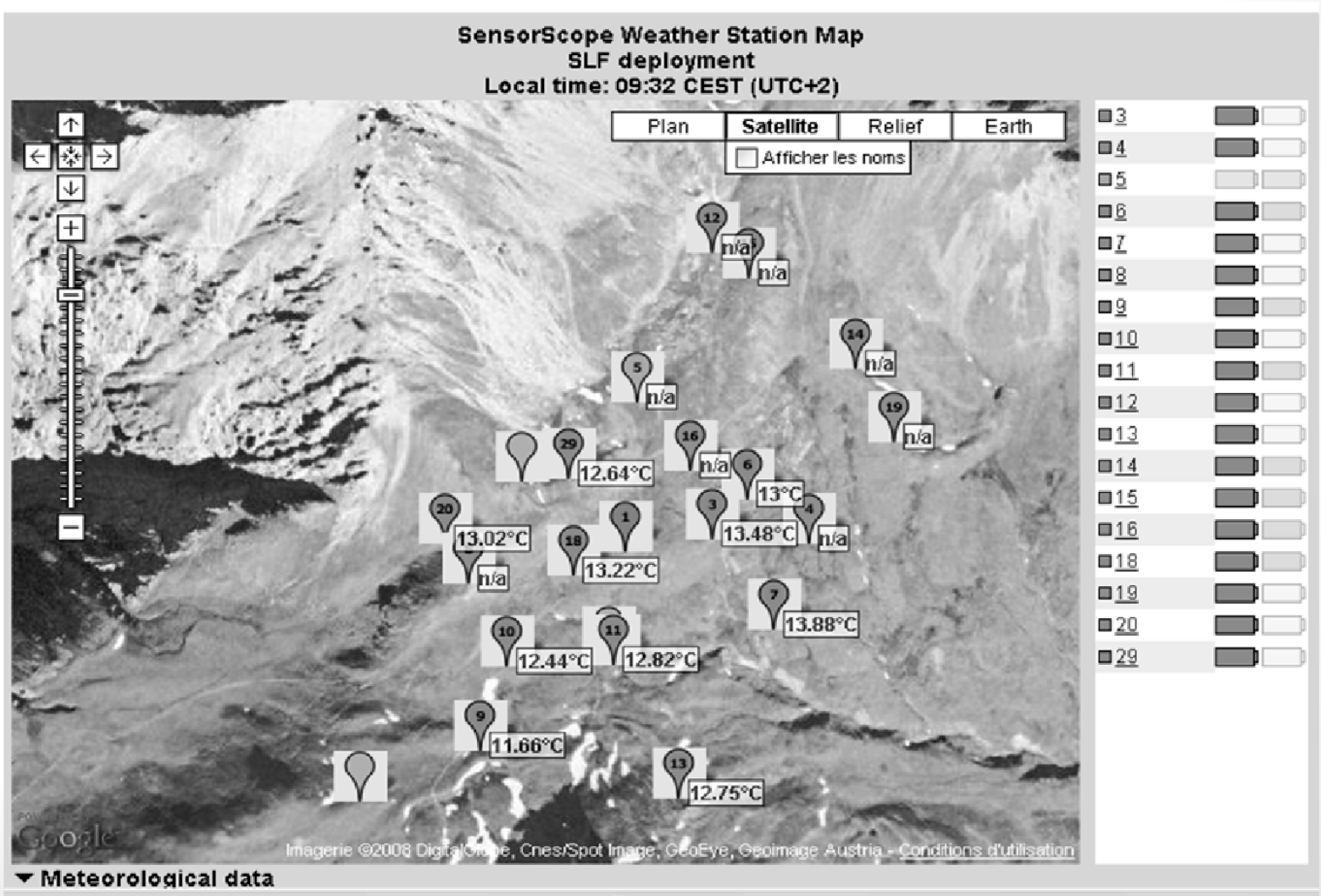
- Other applications:
  - National Health Information Network
  - Electronic Patient Record
  - Home monitoring and control
    - Pulse oximeters, blood glucose monitors, infusion pumps, accelerometers
  - Bioinformatics
    - Gene/protein expression
    - Systems biology
    - Disease dynamics



Source: Qian Zhang. Lecture notes. 2013

The Application of IoT(6)

Scenario : Monitoring the Environment



Environmental Application: CitiSense

- Air quality monitoring project in UCSD CSE

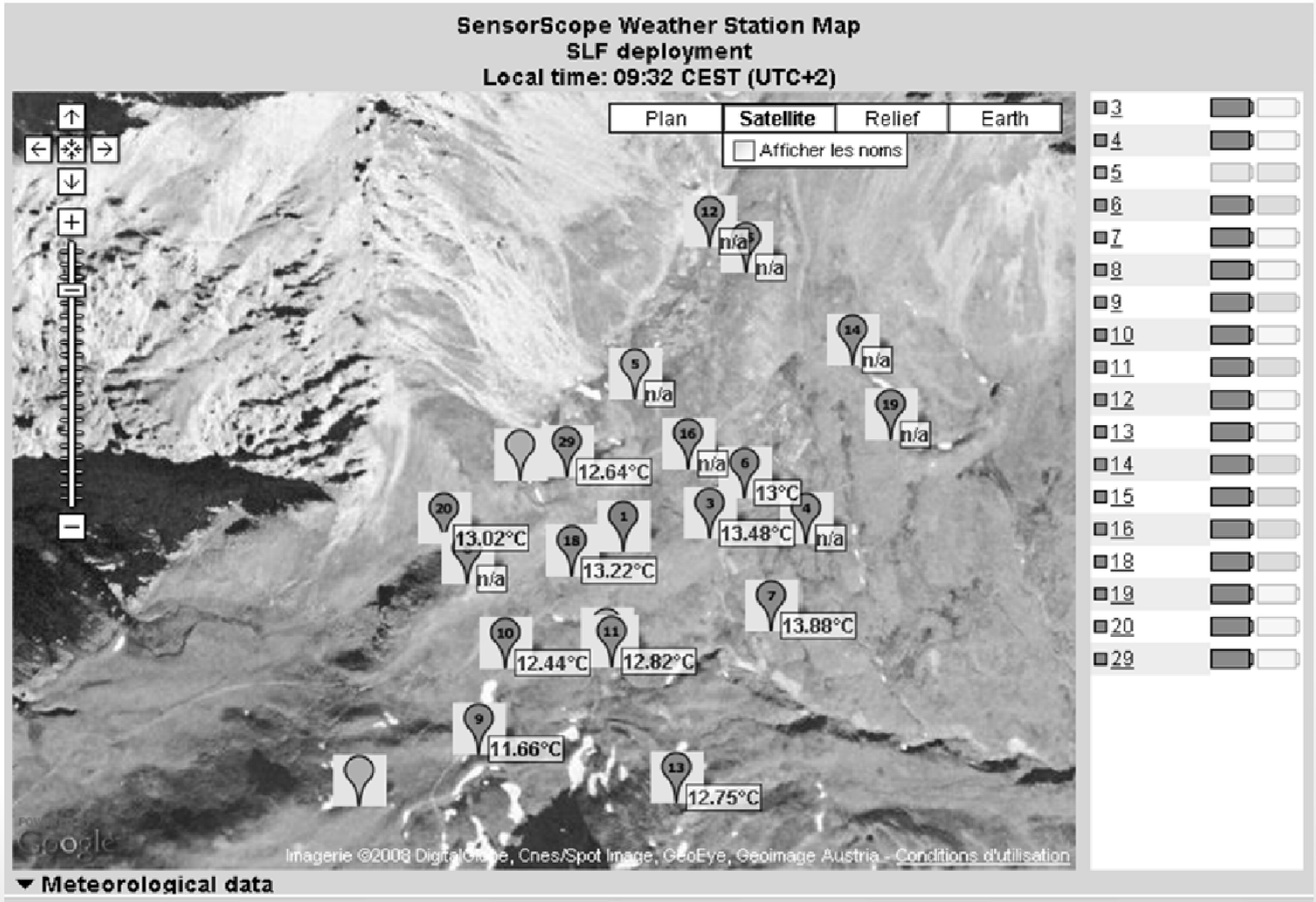
- Environmental application

- Electrochemical **sensors**, **microcontroller** for data collection and transmission to an **Android** app

- **Actuation**: air quality is immediately reported, as well as retransmitted to a backend for larger-scale analysis

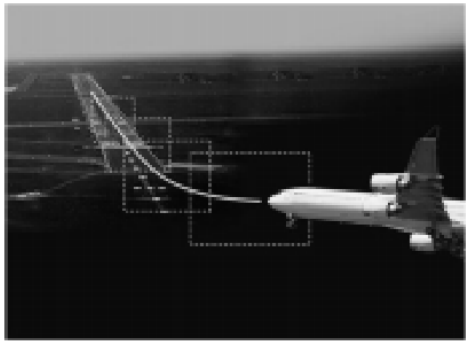
The Application of IoT(6)

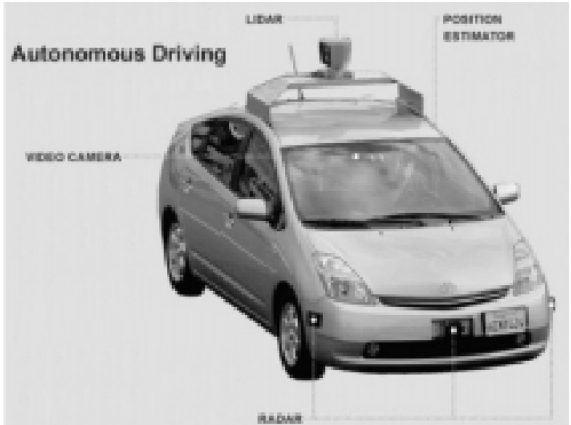
Scenario : Monitoring the Environment



Transportation Applications

- **Vehicle control:** Airplanes, automobiles, autonomous vehicles
  - All kinds of sensors to provide accurate, redundant view of the world
  - Several processors in cars (Engine control, break system, airbag deployment system, windshield wiper, door locks, entertainment system, etc.)
  - Actuation is maintaining control of the vehicle
  - Very tight timing constraints and requirements enforced by the platforms





Example Transportation Scenarios

1. A network of sensors in a vehicle can interact with its surroundings to provide information
   - Local roads, weather and traffic conditions to the car driver
   - Adaptive drive systems to respond accordingly
2. 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
3. Sensors for fatigue and mood monitoring based on driving conditions, driver behavior and facial indicators
   - Ensuring safe driving by activating warning systems or directly controlling the vehicle

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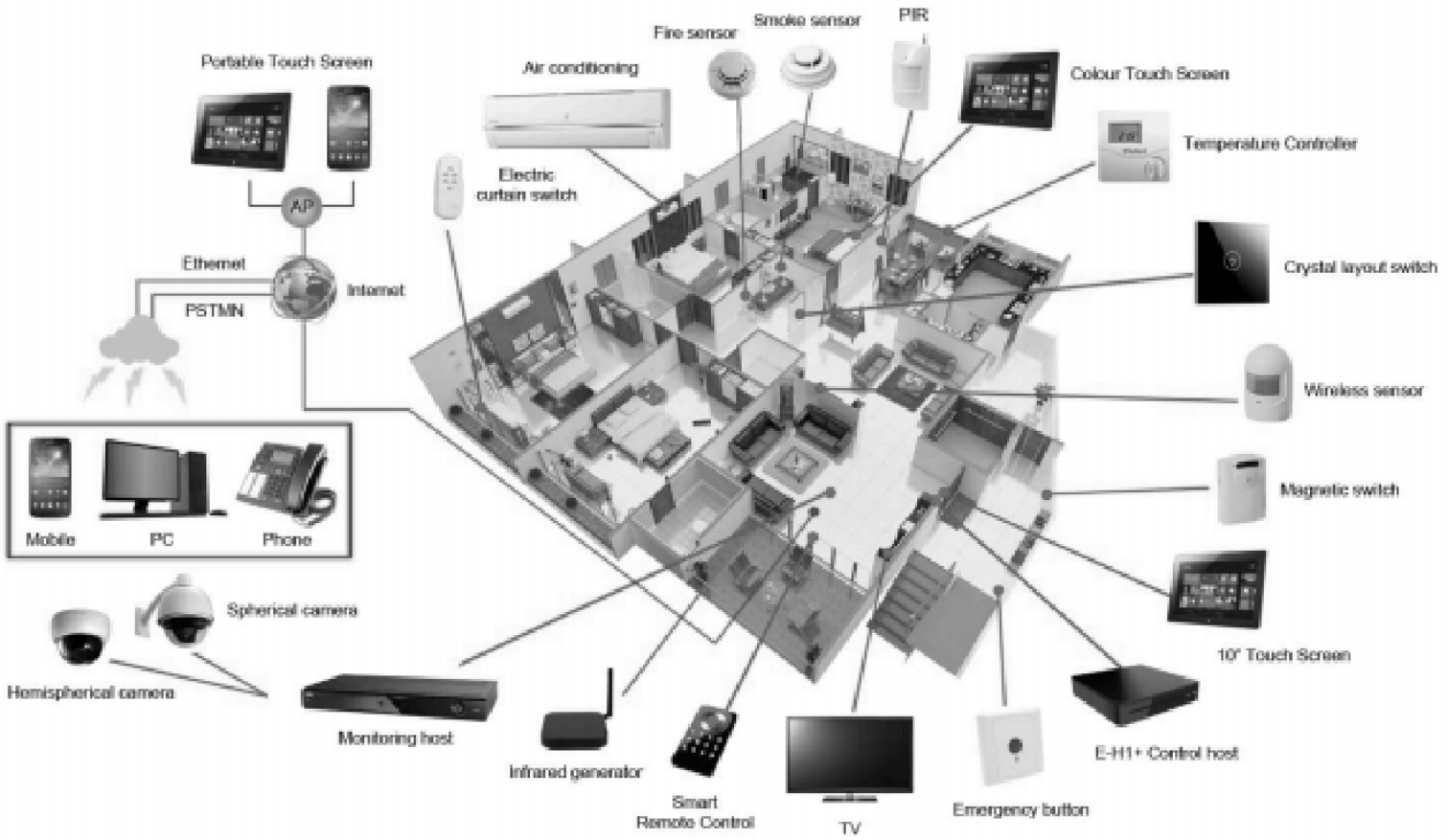
Smart Home Applications



- Smart meters, heating/cooling, motion/temperature/ lighting sensors, smart appliances, security, etc.

An exciting future!