智慧型機器人概論
Introduction to Intelligent Robotics

Week 4
Internet of things

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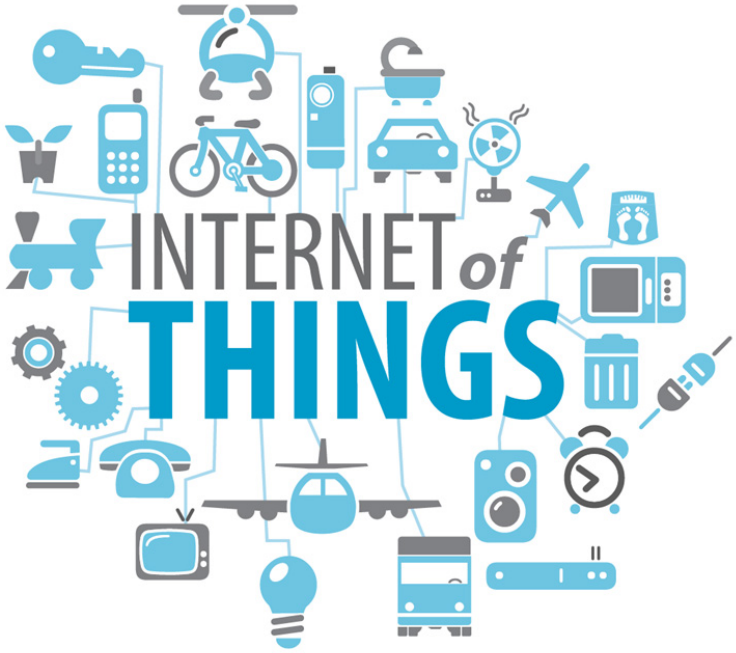
Internet of things

- Internet of things (IOT)
  - network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data.



Internet of things

- Internet of things (IOT)

Intel IoT -- What Does The Internet of Things Mean

Internet of things

- Internet of things (IOT)

物聯網，原來如此

Internet of things

- Internet(網際網路)
- 感測及儲存環境資訊的能力
- 與其他物件互相溝通的能力
- 藉由感知、聯網技術，達到智慧化生活與服務的目的

Status

- 手機快速發展
- 軟硬體整合
- 產業轉型
  - 工業4.0
- 應用環境多元

History

- 1982
  - Coke machine at Carnegie Mellon University becoming the first Internet-connected appliance, able to report its inventory and whether newly loaded drinks were cold.
- 1991
  - Mark Weiser's seminal paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues such as UbiComp and PerCom produced the contemporary vision of IoT.
- 1994
  - Reza Raji described the concept in IEEE Spectrum as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories".

History

- 1995
  - Bill Gates (1995) The Road Ahead, Viking Press
- 1999
  - The concept of the Internet of things became popular
  - Radio-frequency identification (RFID) was seen by Kevin Ashton (one of the founders of the original Auto-ID Center) as a prerequisite for the Internet of things at that point
- 2005
  - **U**nion **I**nternationale des **T**élécommunications (UIT) propose a concept to IOT
- 2009
  - Barack Obama: Smart Planet

Structure


應用層
(Manage)
遠端醫療
智慧交通
智能居家
物流監控
污染監控
智能電網/
智慧電表
網路層
(Connect)
雲端計算平台
行動通訊網路
Internet
資訊中心
網管中心
感知層
(Device)
RFID感測器
感測器閘道
接入閘道
RFID標籤
感測器節點
智慧終端

Applications

- Smart Home
- Manufacturing
- Agriculture
- Energy management
- Environmental monitoring
- Building and home automation
- Metropolitan scale deployments
- Medical and healthcare
- Transportation

Applications

- Smart Home

Top 5 Smart Refrigerators 2017

Applications

- Manufacturing

How it Works The Internet of Things and Manufacturing

Applications

- Agriculture

IoT Digital Farming with Krone

Applications

- Energy management

Smart Energy Management Energy Savings with IoT Predictive Analytics

Applications

- Medical and healthcare

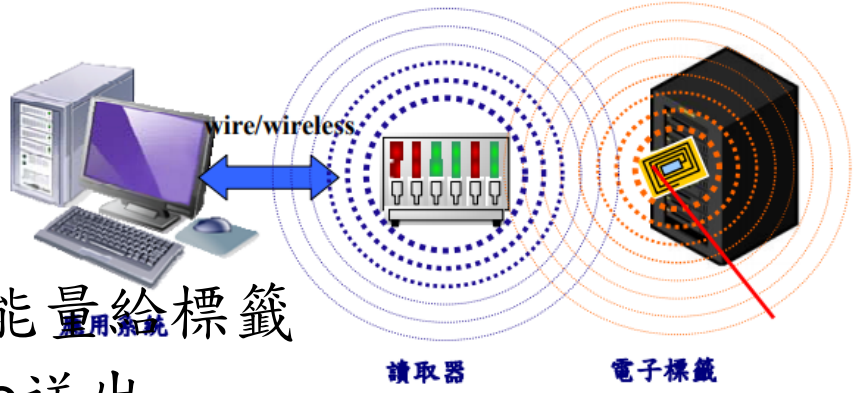
Huawei Healthcare WLAN IoT Solution

Devices

- Things
  - Radio-frequency identification (RFID)
  - Etag
  - PING)))
  - IP cam
  - Infrared (IR)
- Network
  - Bluetooth
  - ZigBee
  - LoRa
  - Wifi
  - 4G

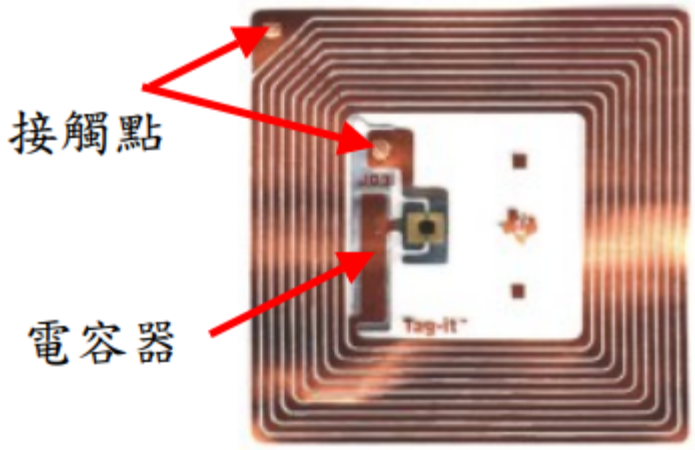
RFID

- 無線通訊技術
- 識別特定目標
- 讀寫相關數據
  - 悠遊卡
- 系統組成
  - 電子標籤(Tag)
  - 儲存ID Code
  - 讀取器(Reader)
  - 發射一特定頻率之無線電波能量給標籤
  - 驅動標籤電路將內部ID Code送出



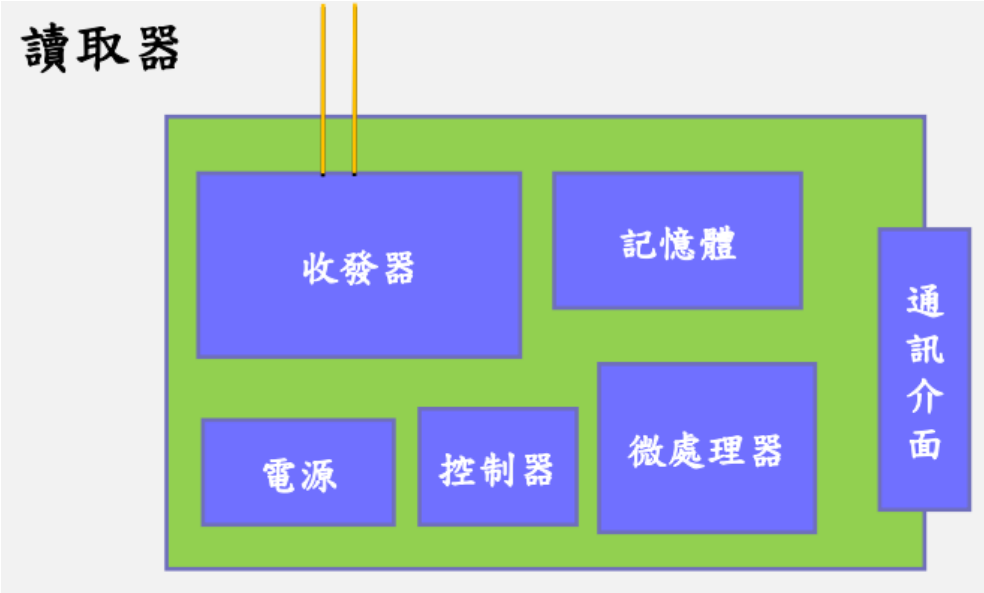
RFID

- 電子標籤 (Tag)
  - 天線
    - 接收由讀取器送過來的信號
    - 把所要求的資料送回給讀卡機
  - 微處理器
    - 解碼讀取器信號
    - 有加密的系統必需做加解密動作



RFID

- Reader
  - 收發器
    - 高頻發射功率以啟動電子標籤
    - 接收來自電子標籤的高頻信號
  - 控制器
    - 允許使用者控制讀取器
  - 通訊介面
    - 提供讀取器與外部互動



RFID

- Reader種類
  - 固定式
    - 通常掛載在不會移動的物品上
    - 物流管理、交通管理
  - 手持型
    - 讀取範圍隨人移動增大
    - 盤點管理、零售管理

固定式讀取器

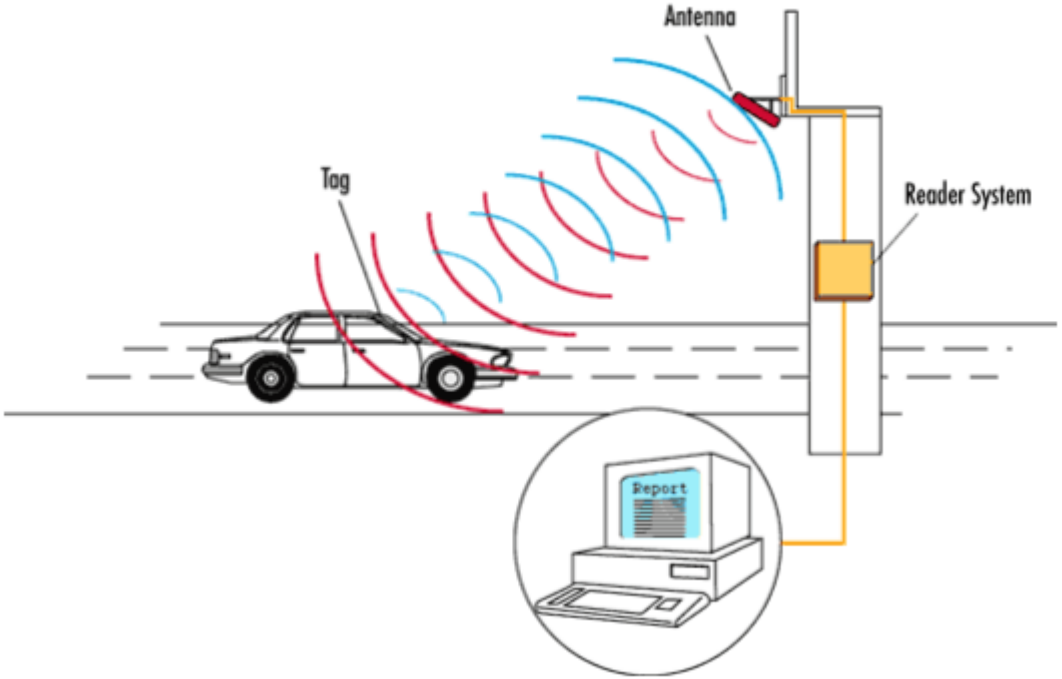
手持式讀取器

RFID

- 無人新商機
  - 淘咖啡
    - 人臉識別
    - RFID商品扣款
  - 繽果盒子
    - RFID商品扣款

E-tag

- 背景
  - 高速公路電子收費系統(ETC)
    - 車輛的偵測系統
    - 前端車上標籤（Etag）
    - 帳務資訊系統

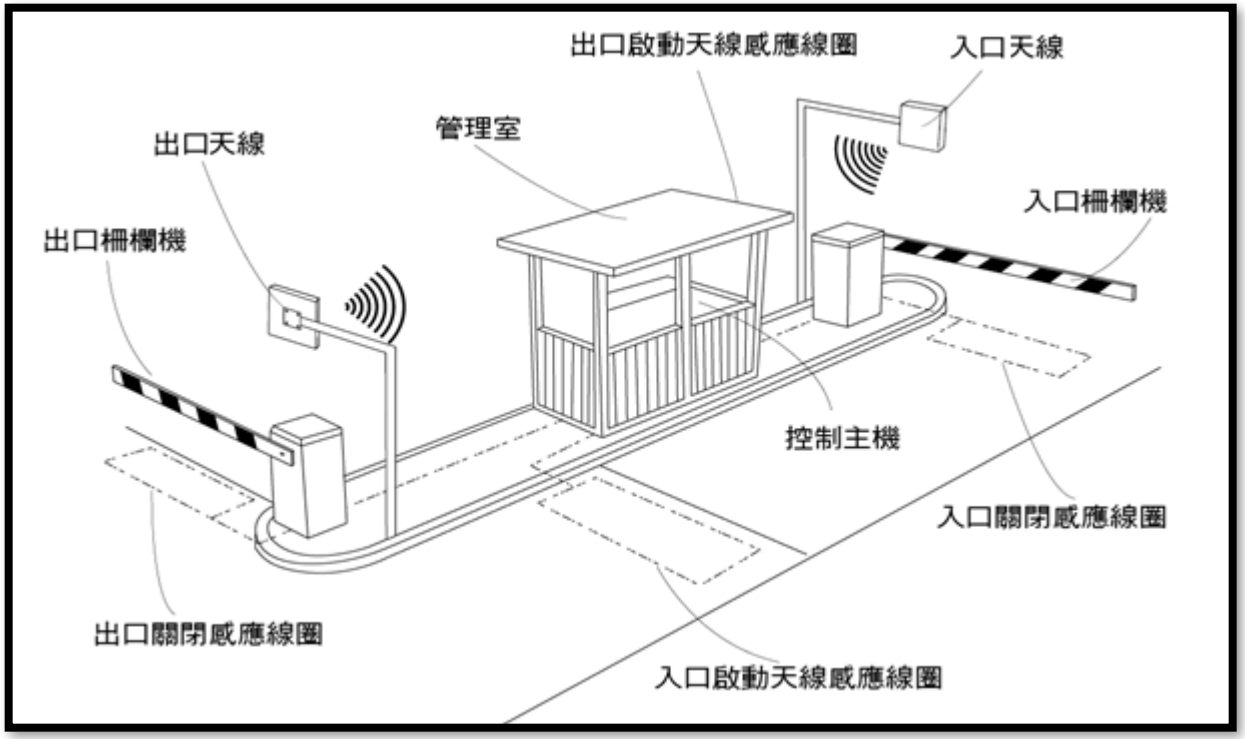


Etag

- 標籤
  - 被動RFID標籤貼紙
    - 前擋玻璃、車頭燈型
    - 不須安裝電池
  - 頻率
    - 922.75MHz與924.25MHz
  - 遠通ETC功率為2W

Etag

- 自動化管理
- 安全且穩定
- 停車場、社區、學校、政府機關皆可使用



Etag實際狀況

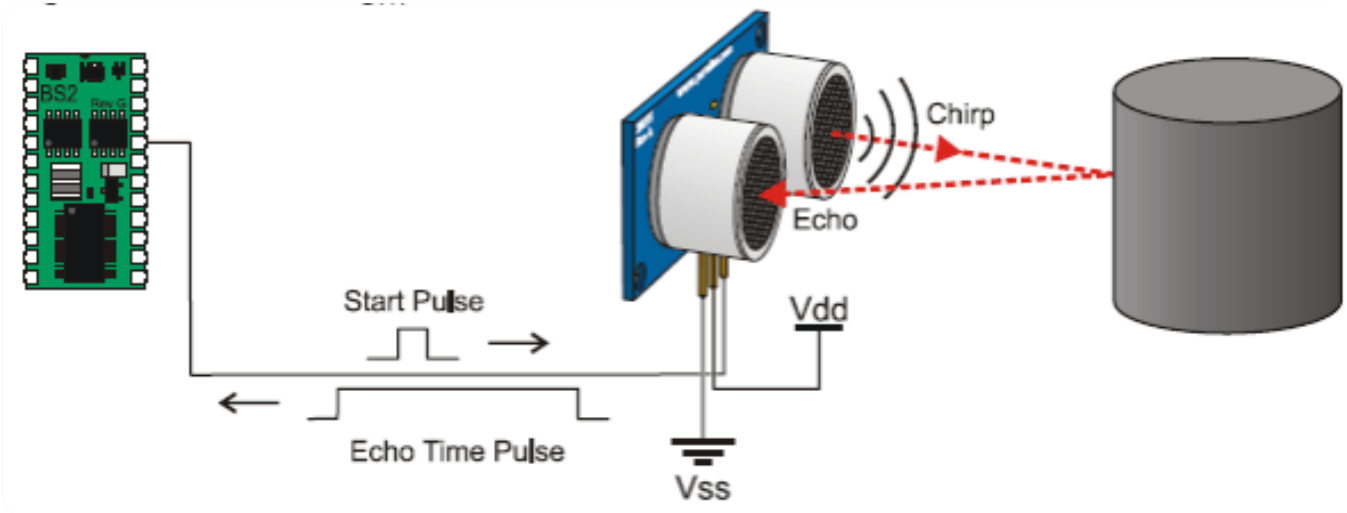
- 中央法規限制，僅用於過路費扣款
  - 用於停車管理只能提供月票服務
- 遠通電收獨佔事業
  - e-parking綁定聯名卡信用卡付費
  - 政府(1/3)遠通電收(2/3)
- 接收器機台限制
  - NCC審核機台功率

Ping)))超音波感測器

- 原理
  - 利用超音波喇叭傳送一個短波

    ↓

    用超音波麥克風 測量回音回來的時間

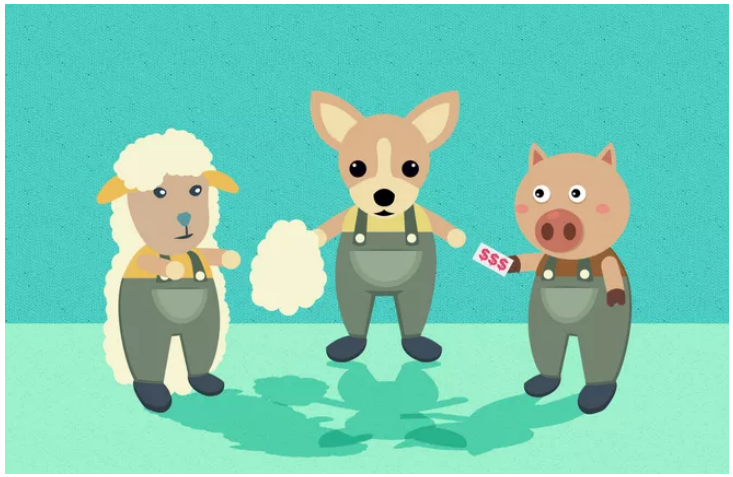


Market value

- The figure of online capable devices increased 31% from 2016 to 8.4 billion in 2017.
- Experts estimate that the IoT will consist of about 30 billion objects by 2020.
- It is also estimated that the global market value of IoT will reach $7.1 trillion by 2020.

物聯網商業模式

- 物聯網怎麼賺錢?
- 產品即「服務」
  - 數據分析、軟體升級、直接提供人力、售後服務盈利
  - Apple watch
- 資料販售與交換
  - 羊毛出在狗身上，豬來買單
    - 豬＝電力公司
      - ✓ 吸收了設備費用
      - ✓ 但是獲得了使用者數據。
    - 羊＝用戶
      - ✓ 免費得到智慧溫控裝置
    - 狗＝Nest
      - ✓ 免費做為號召，賣出無數台智慧溫控



Home work

1. Please list 5 applications to IOT's approach.
2. Please list 5 devices that apply in IOT.