微型課程「4171」
打造自己的空氣盒子

電資學院 電機系
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圖書館 資訊組
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Date: 2024/05/03

Agenda

1. Logistics/Course Structure
2. Introduction to Design Thinking/the IoT
3. Hardware/Software Fundamentals

#1. Logistics

Logistics

- Time: Friday (10:10 am – 12:00 pm)
- Location: 數位自造工坊
- Course Webpage: NCHU iLearning
- 課程成績評定方式:
  1. 實作成品 (70 %)
     - 空氣盒子實作
     - 雷雕實作
  2. 出缺席 (30%)

Course Structure

- 區分 空氣盒子物聯網系統 及雷雕實作

- 三次上課均為二小時：
  - 第一課 (05/03)：物聯網架構與設計介紹
  - 第二課 (05/10)：空氣盒子實作
  - 第三課 (05/17)：雷雕技術介紹與實作

#2. Introduction to Design Thinking/the Internet of Things

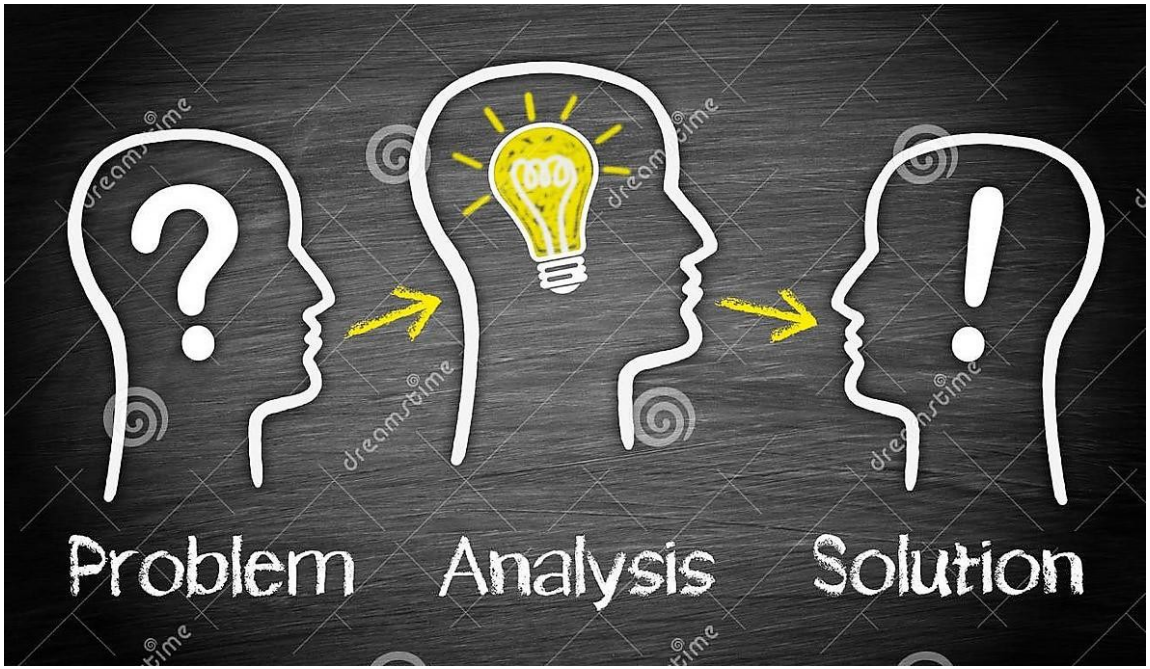
Introduction to Design Thinking

Observation

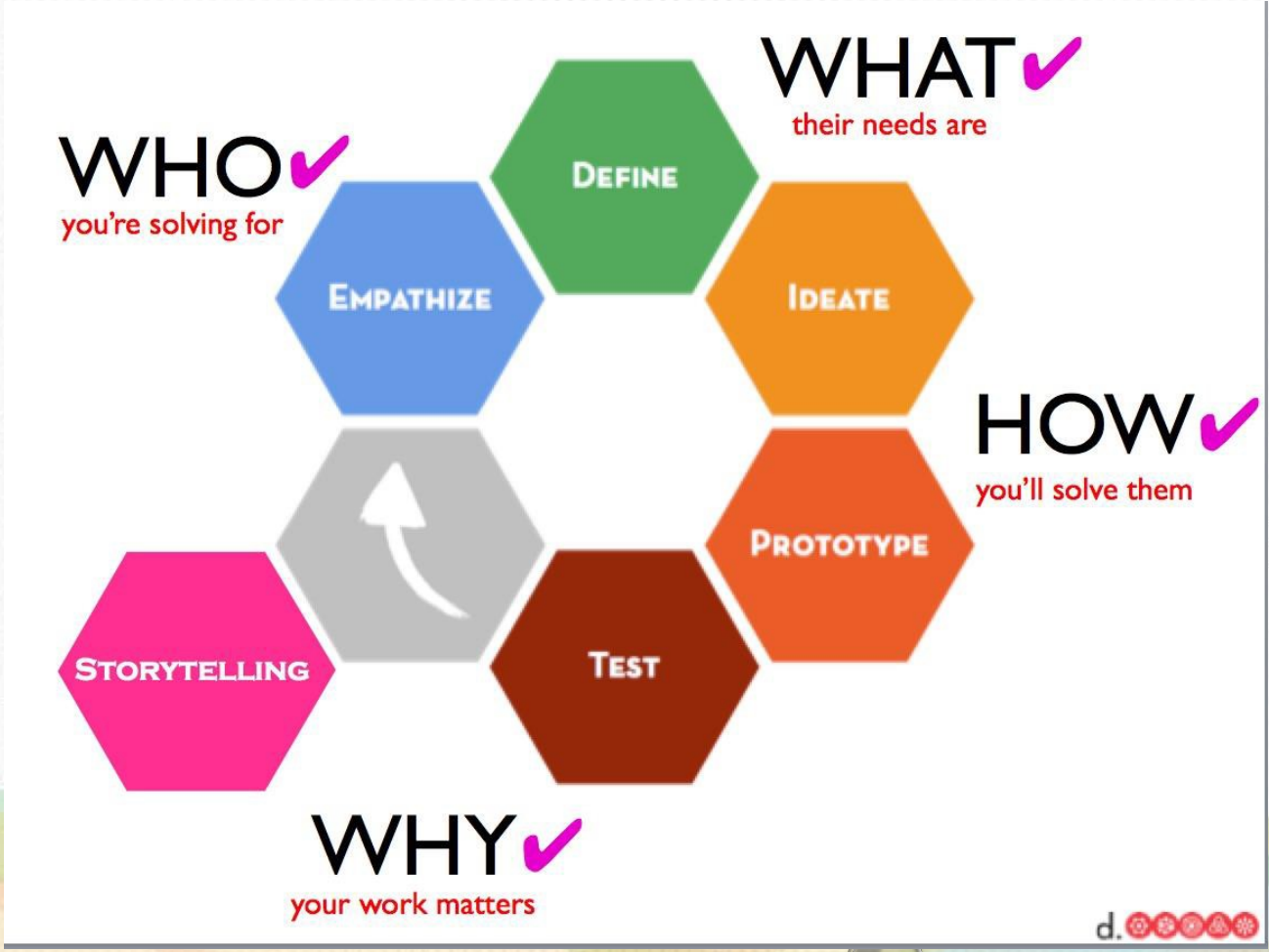
Why & What

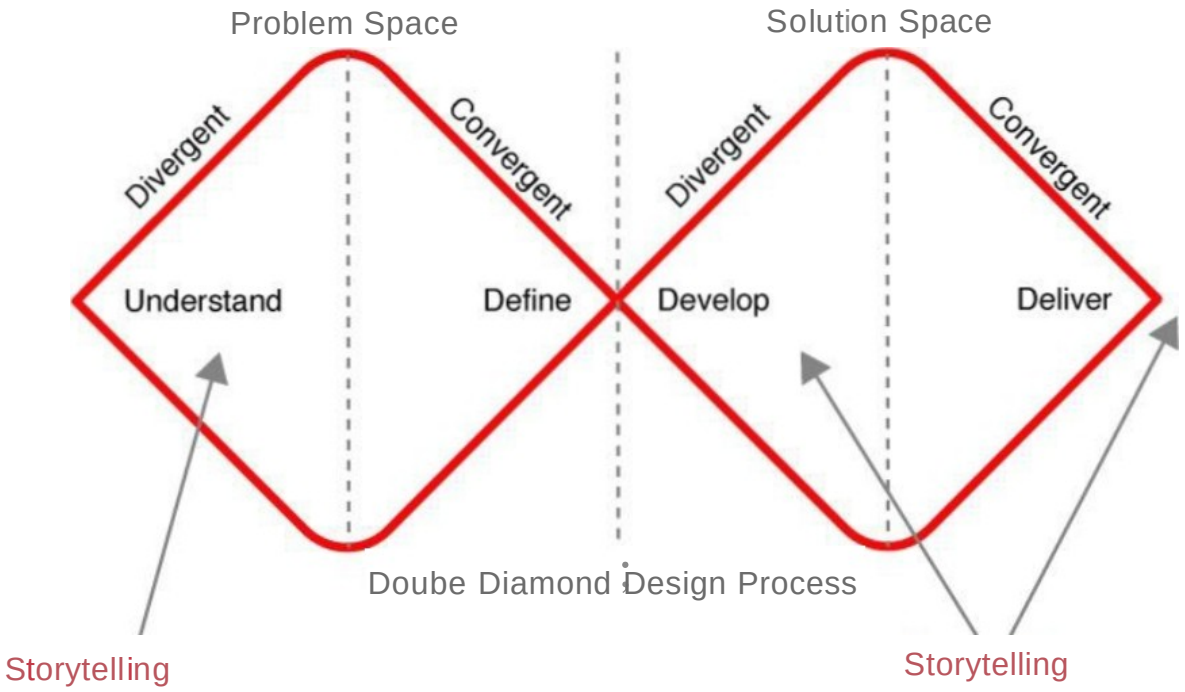
What am I doing?

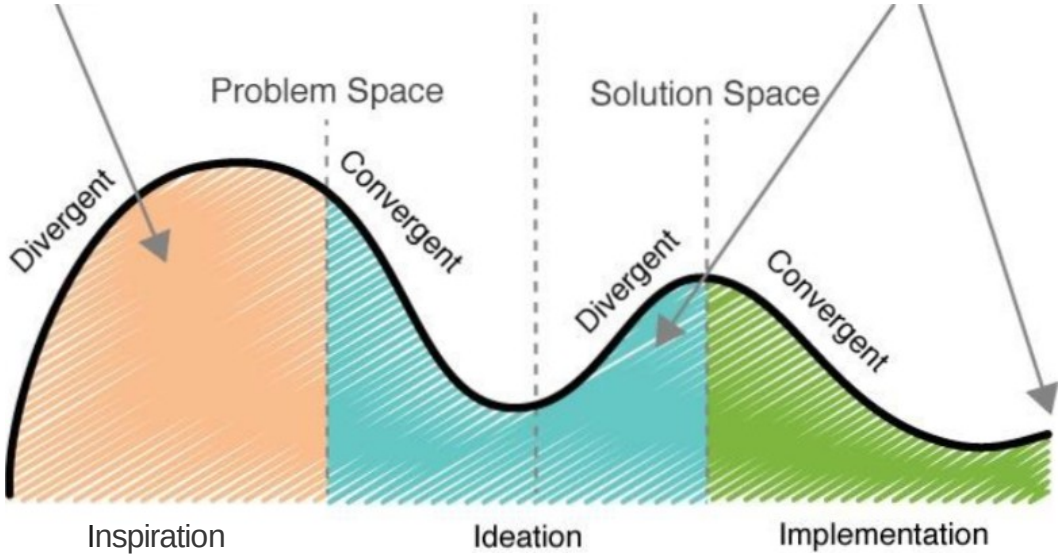
Problem – Analysis – Solution



Design Thinking



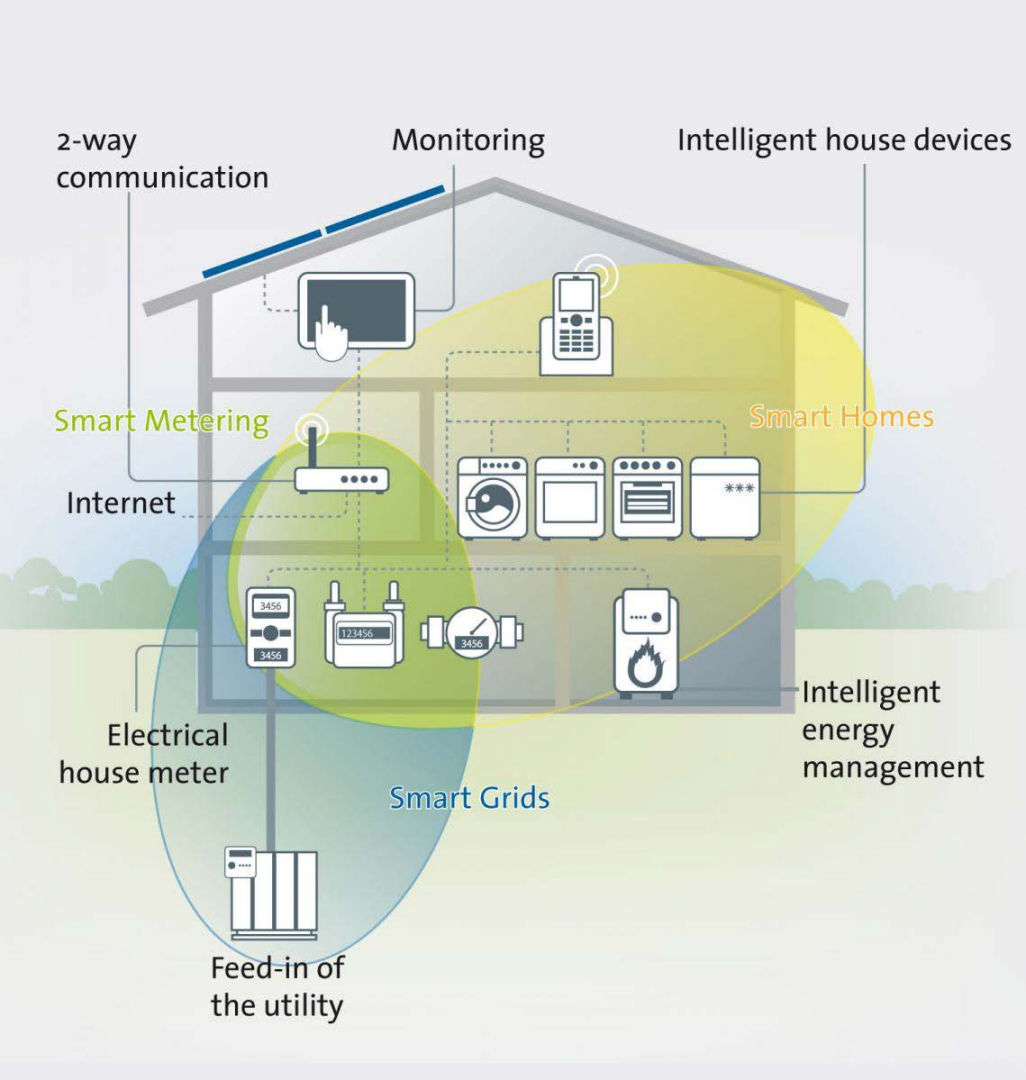




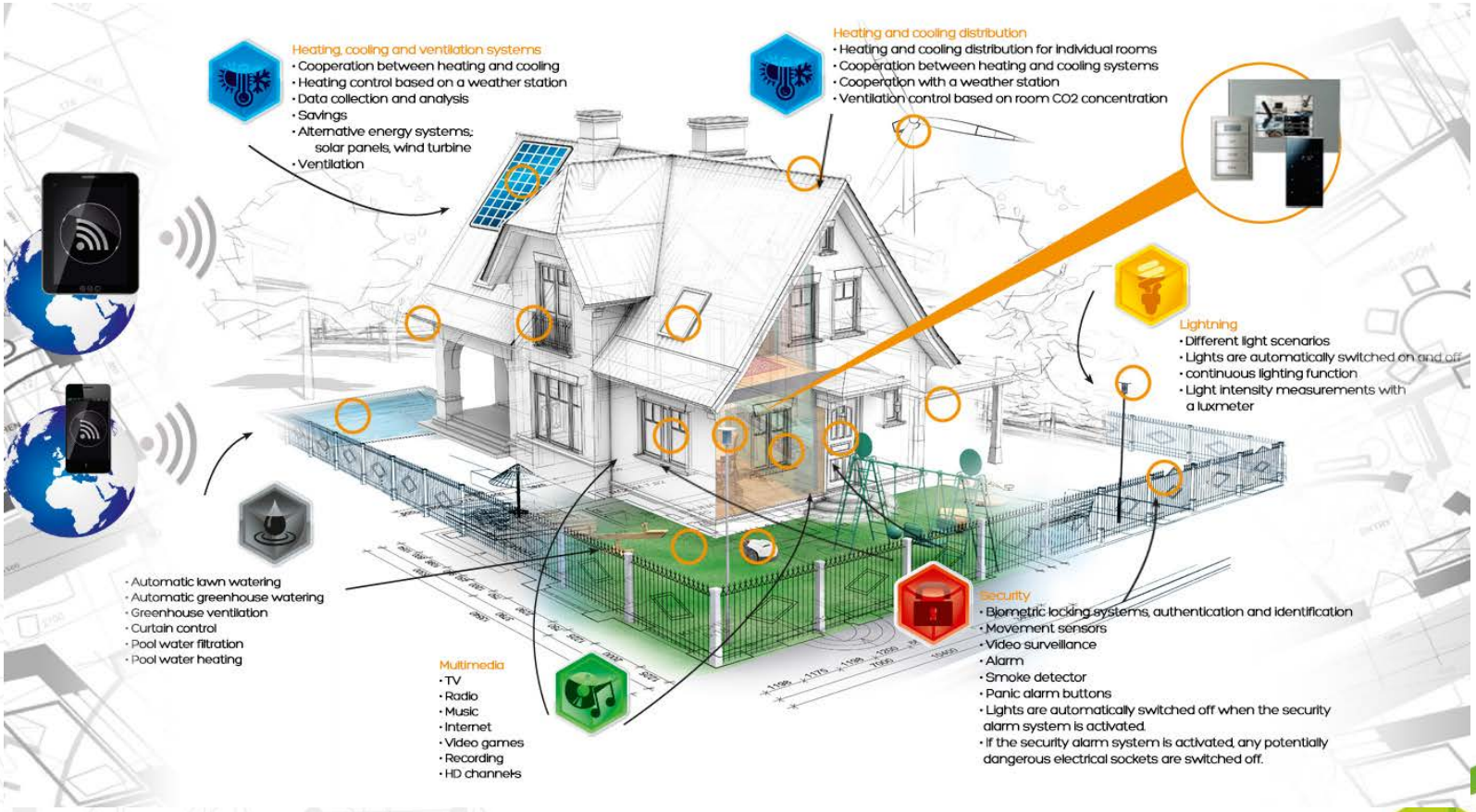
IDEO Design Process

Introduction to the Internet of Things

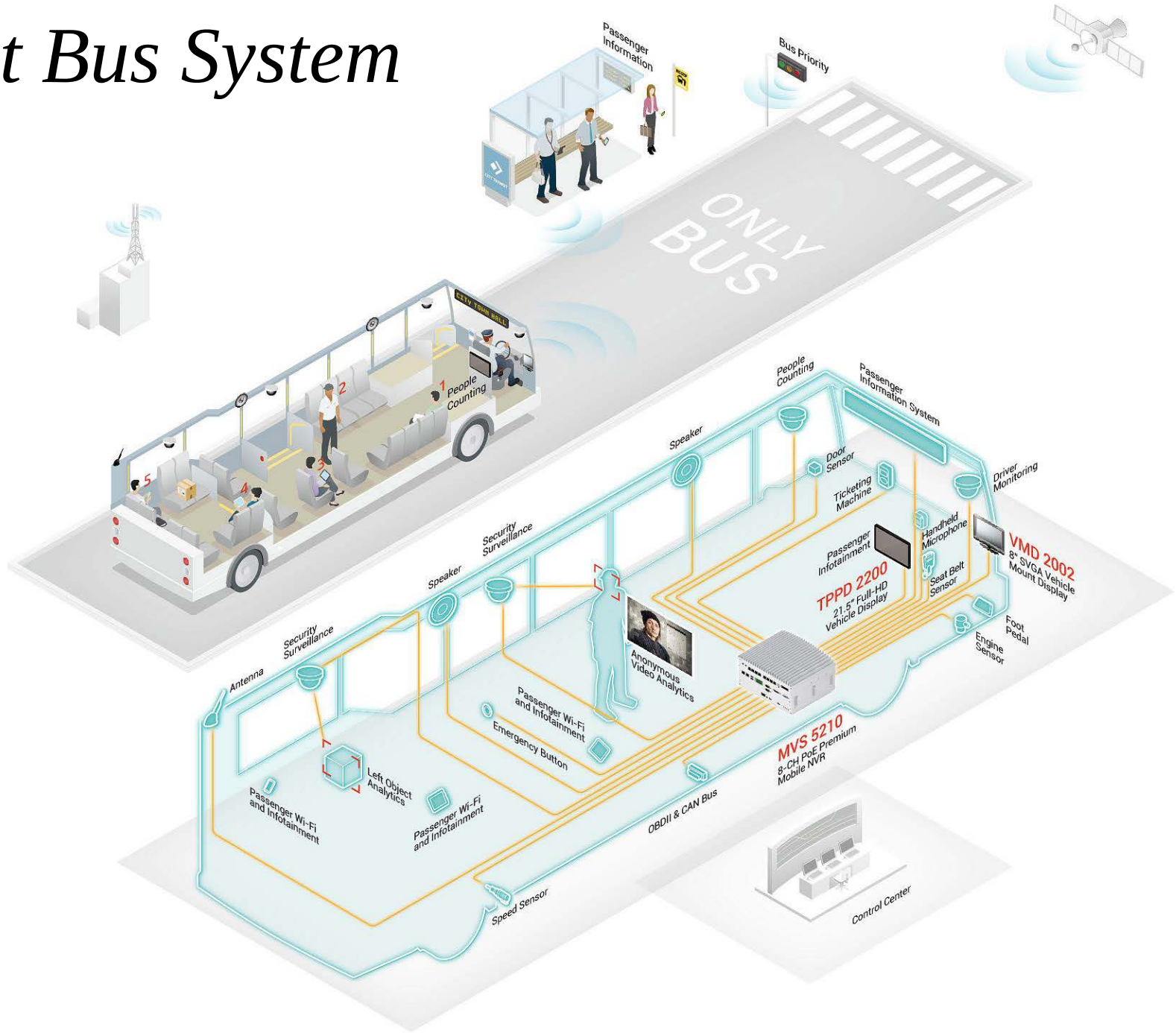
Smart home


2-way
communication
Monitoring
Intelligent house devices
Smart Metering
Smart Homes
Internet
Electrical
house meter
Smart Grids
Intelligent
energy
management
Feed-in of
the utility

Smart home


Heating, cooling and ventilation systems
• Cooperation between heating and cooling
• Heating control based on a weather station
• Data collection and analysis
• Savings
• Alternative energy systems:
solar panels, wind turbine
• Ventilation
Heating and cooling distribution
• Heating and cooling distribution for individual rooms
• Cooperation between heating and cooling systems
• Cooperation with a weather station
• Ventilation control based on room CO2 concentration
Lightning
• Different light scenarios
• Lights are automatically switched on and off
• continuous lighting function
• Light intensity measurements with
a luxmeter
• Automatic lawn watering
• Automatic greenhouse watering
• Greenhouse ventilation
• Curtain control
• Pool water filtration
• Pool water heating
Multimedia
• TV
• Radio
• Music
• Internet
• Video games
• Recording
• HD channels
Security
• Biometric locking systems, authentication and identification
• Movement sensors
• Video surveillance
• Alarm
• Smoke detector
• Panic alarm buttons
• Lights are automatically switched off when the security
alarm system is activated.
• If the security alarm system is activated, any potentially
dangerous electrical sockets are switched off.

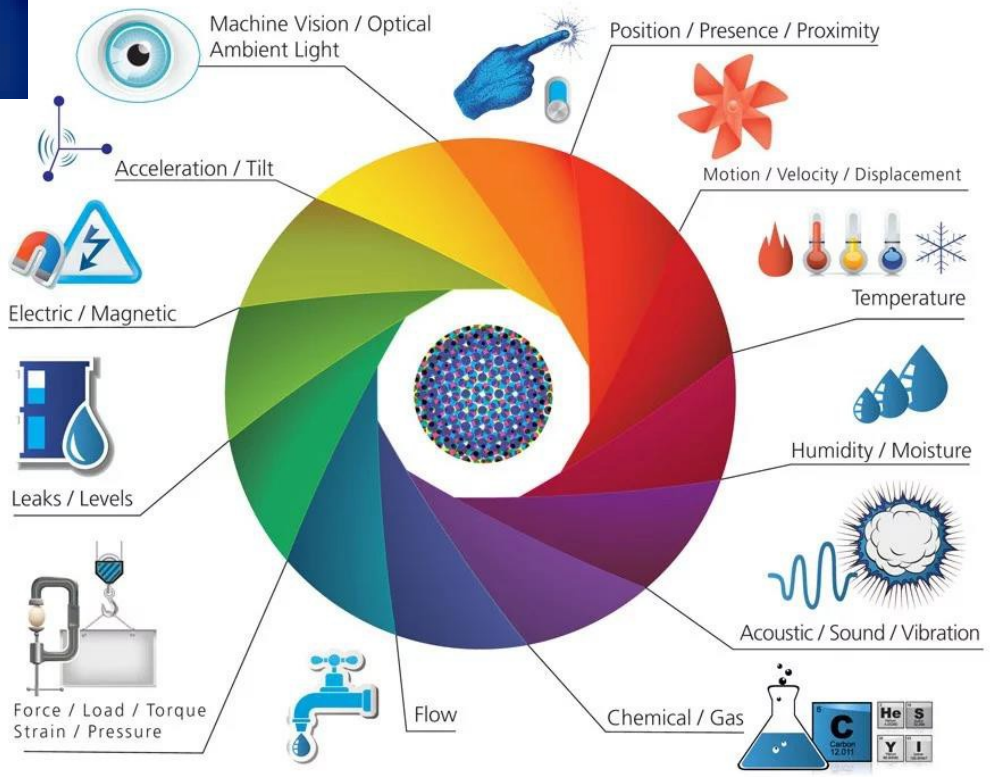
Smart Bus System



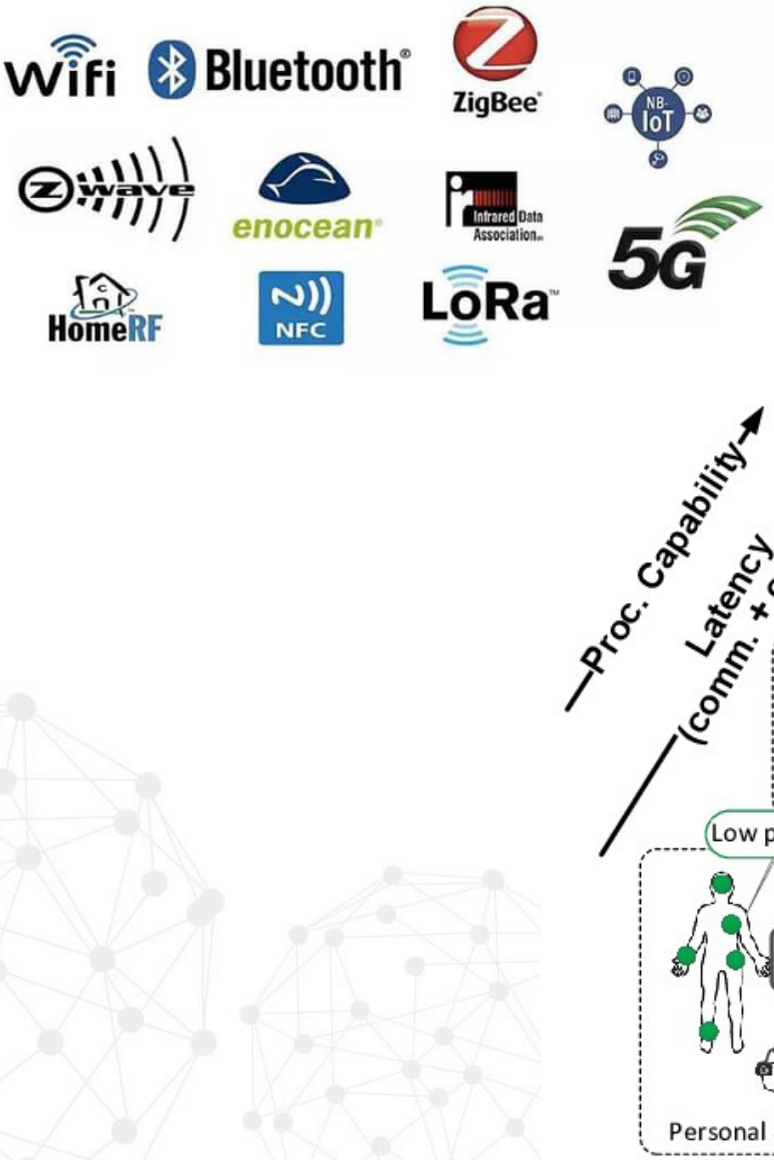
IoT Elements

Gain a better insight into the real meaning and functionality of the IoT.

Identification & Sensing

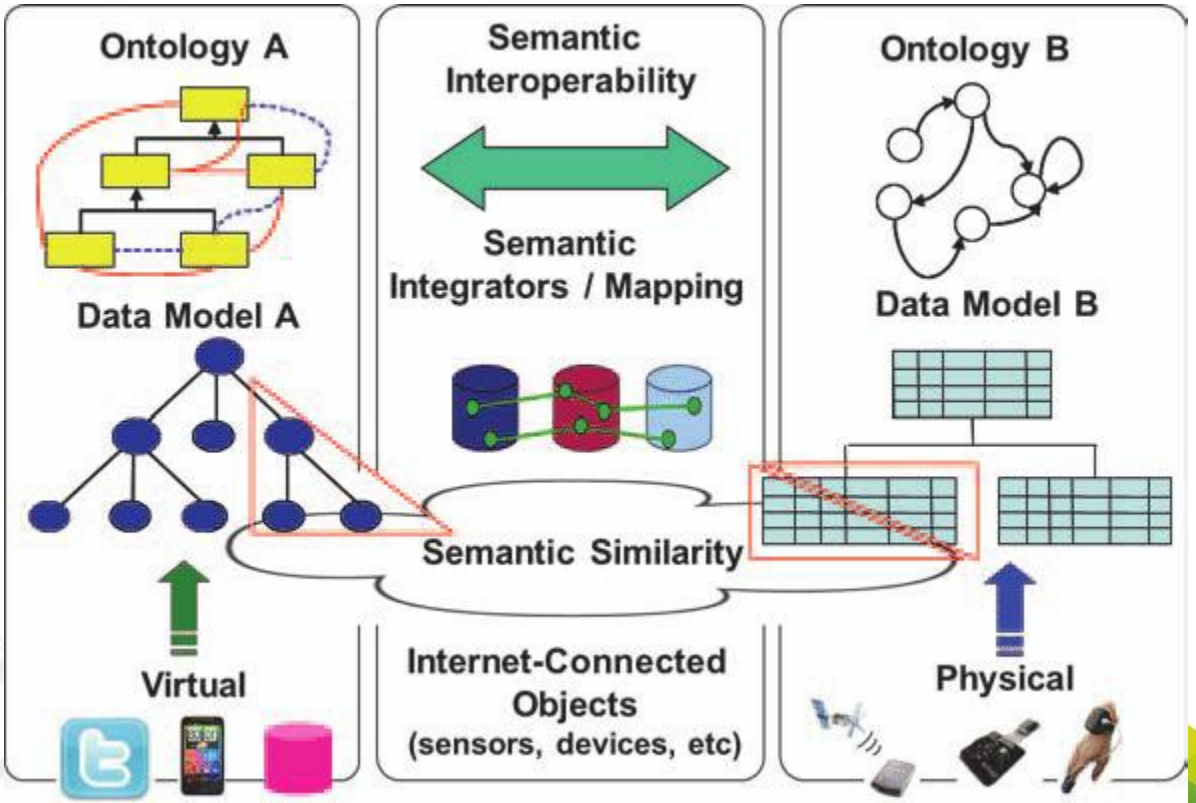


Communication & Computation

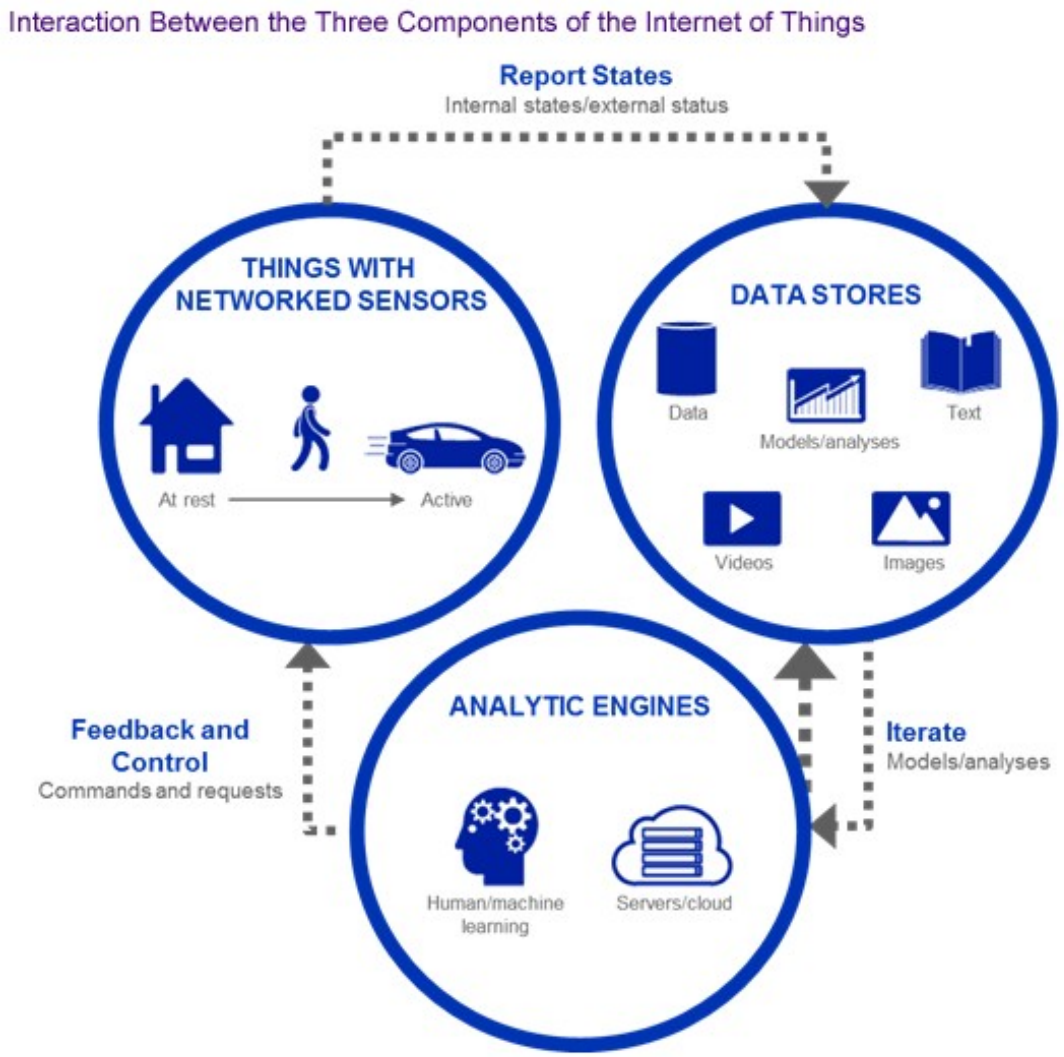


Services & Semantics

Provide a common description of sensor data



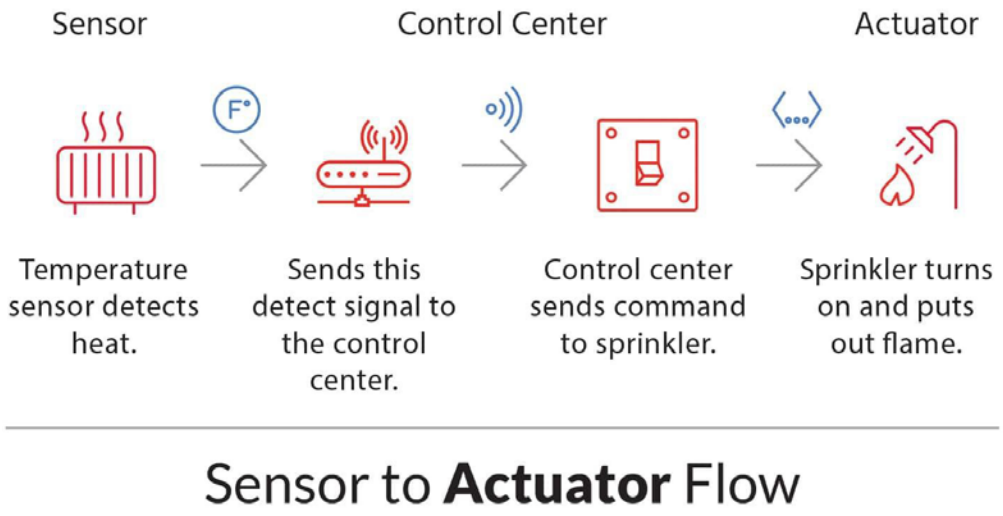
How IoT works?



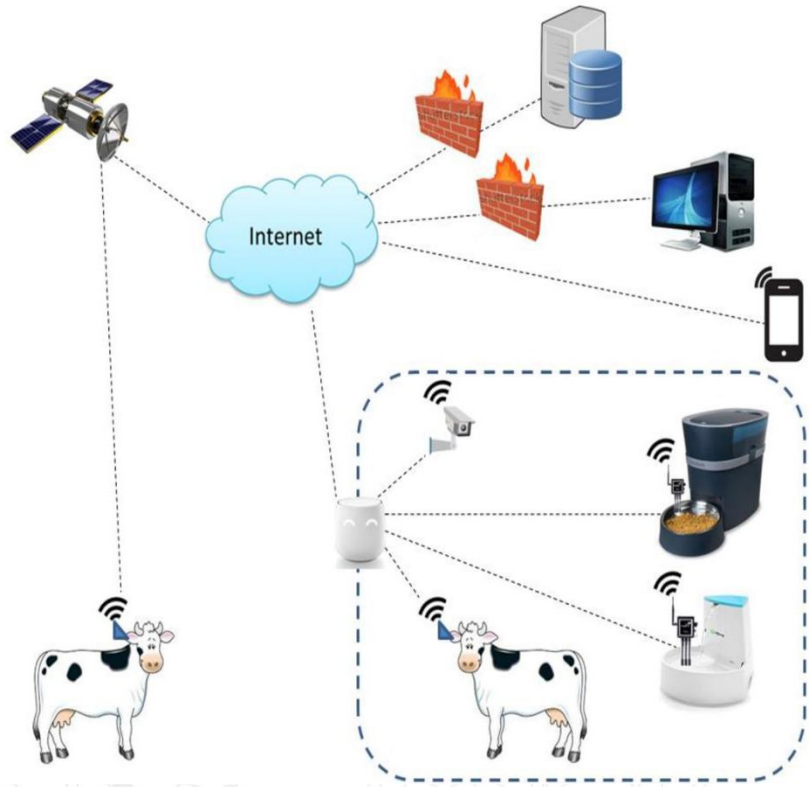
https://data-flair.training/blogs/how-iot-works/

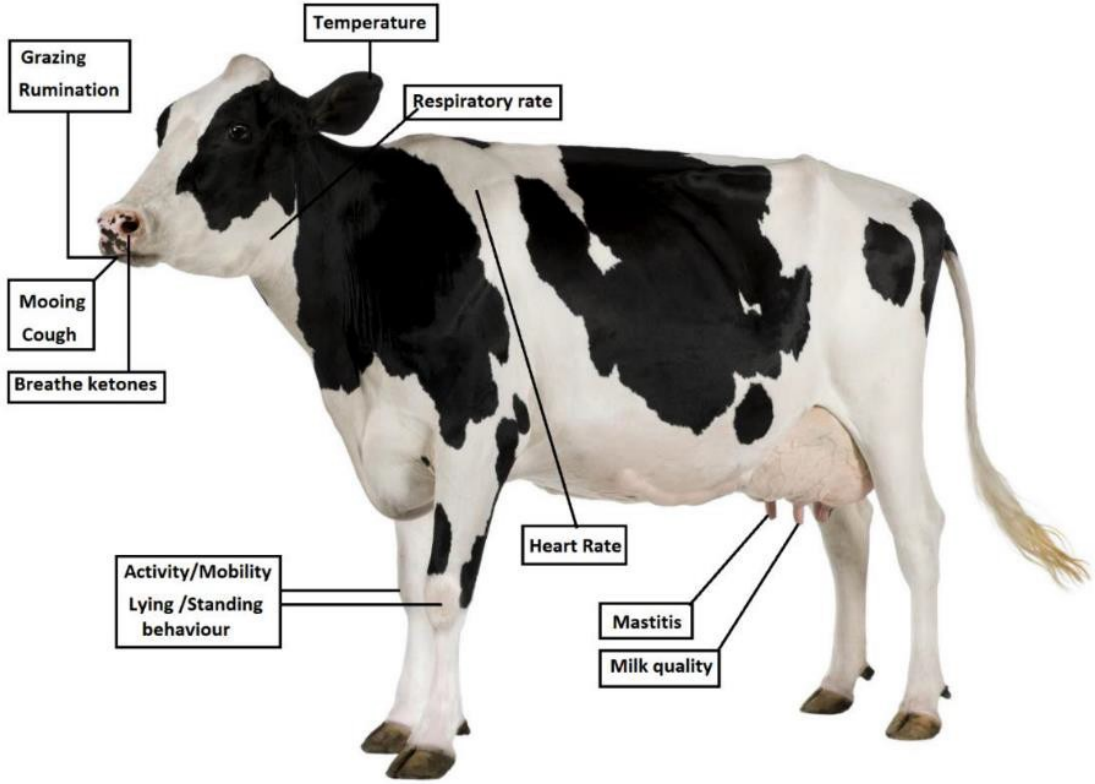
IoT System Design

- What is the necessary deployment infrastructure?
  - The sensing and actuating infrastructure?
  - Data input/output?
  - Main functionality and associated services?



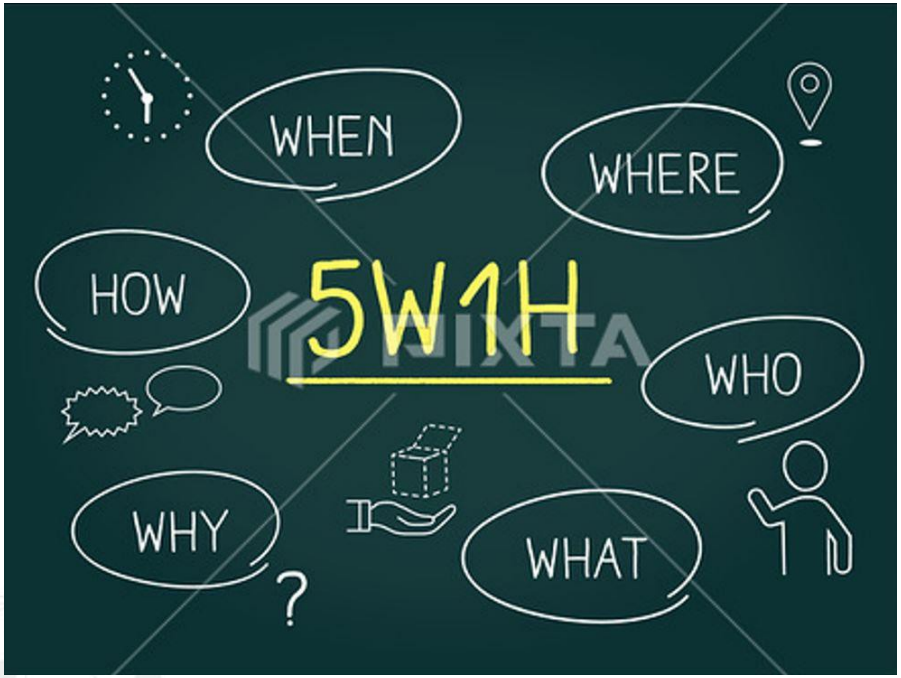
Smart Care Tele-Monitoring System





Appling Design Thinking to Internet of Things

專題研究 – 5W1H



- 問題探索（Research/Discover）
  - 背景知識
    - Domain needs
    - Knowledge
- 定義問題（Insights/Define）
  - 問題與需求分析
    - Requirements
- 腦力激盪（Ideation/Develop）
- 解決方案（Prototypes/Deliver）

以空污監控為例的創意發想

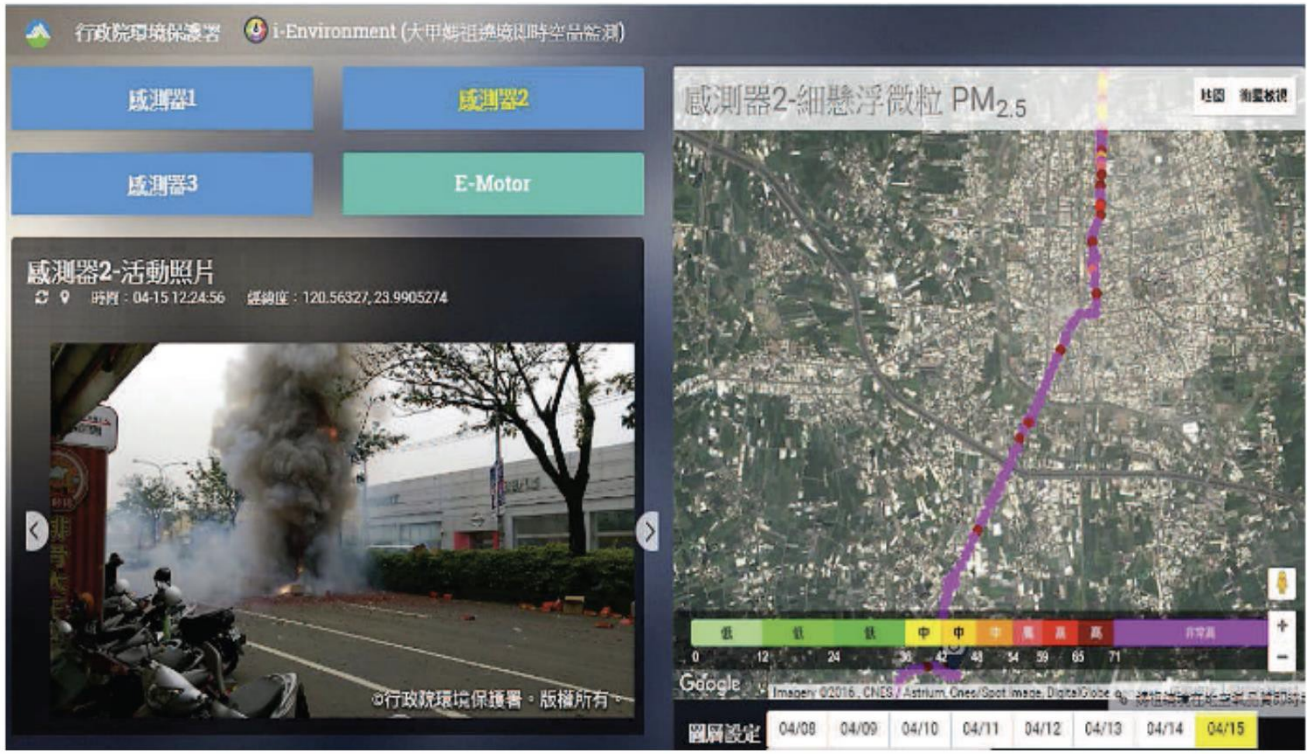


Fig. 1. The monitoring system may be applied to indicate the "sources" or areas in the city where the temperature is above the normal and the air quality is inappropriate. Observe that the purple line represents poor air quality due to an extremely high PM2.S air quality index (AQI). Collapse

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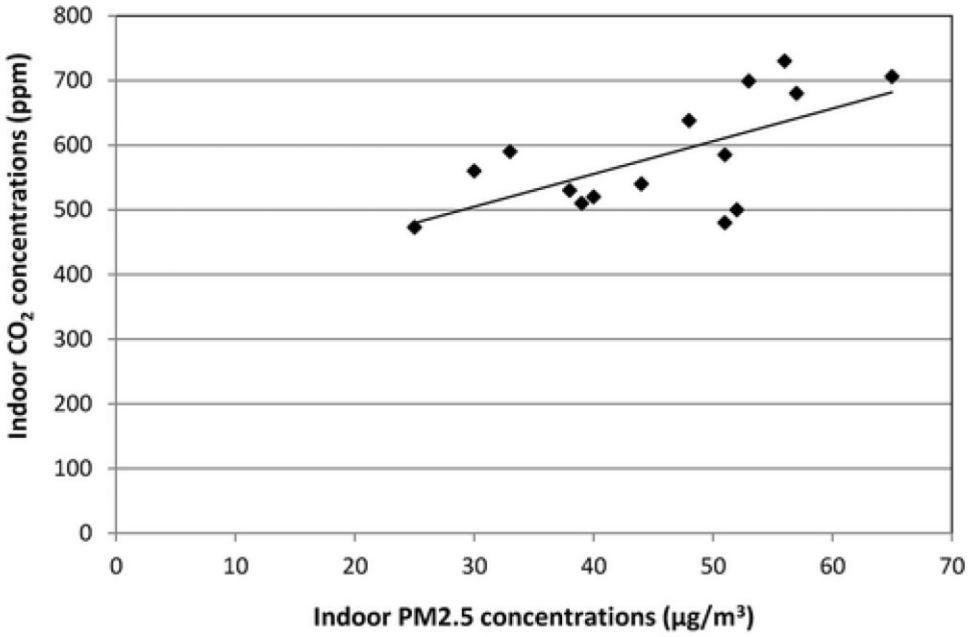
Distributed bus information management for mobile weather monitoring

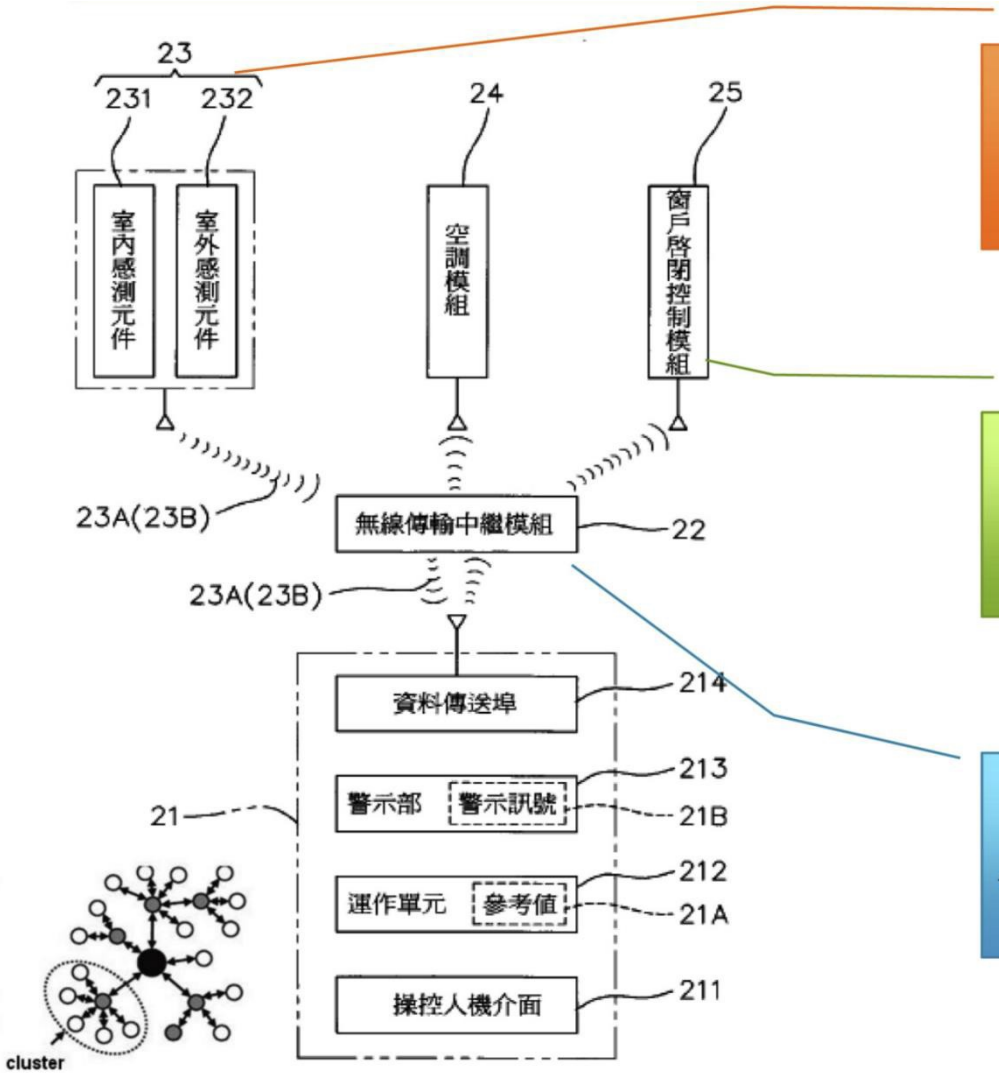
Ying-Chih Chen, Ping-Yen Chen, Chih-Yu Wen

以空污監控為例的創意發想

	種類	主要來源	影響
空氣汙染物	PM2.5、PM10、CO、臭氧、硫氮氧化物	人為: 1.燃燒化石燃料 2.工業化畜牧	1.對人體直接傷害 2.不會吸收太陽輻射熱能
碳排放(溫室氣體)	水蒸氣、CO2、CH4、氟氯碳化物	自然: 1.沙塵暴 2.火山活動	1.無色、無味、無臭 2.對人體無直接傷害 3.易吸收太陽輻射熱能造成全球暖化



以空污監控為例的創意發想

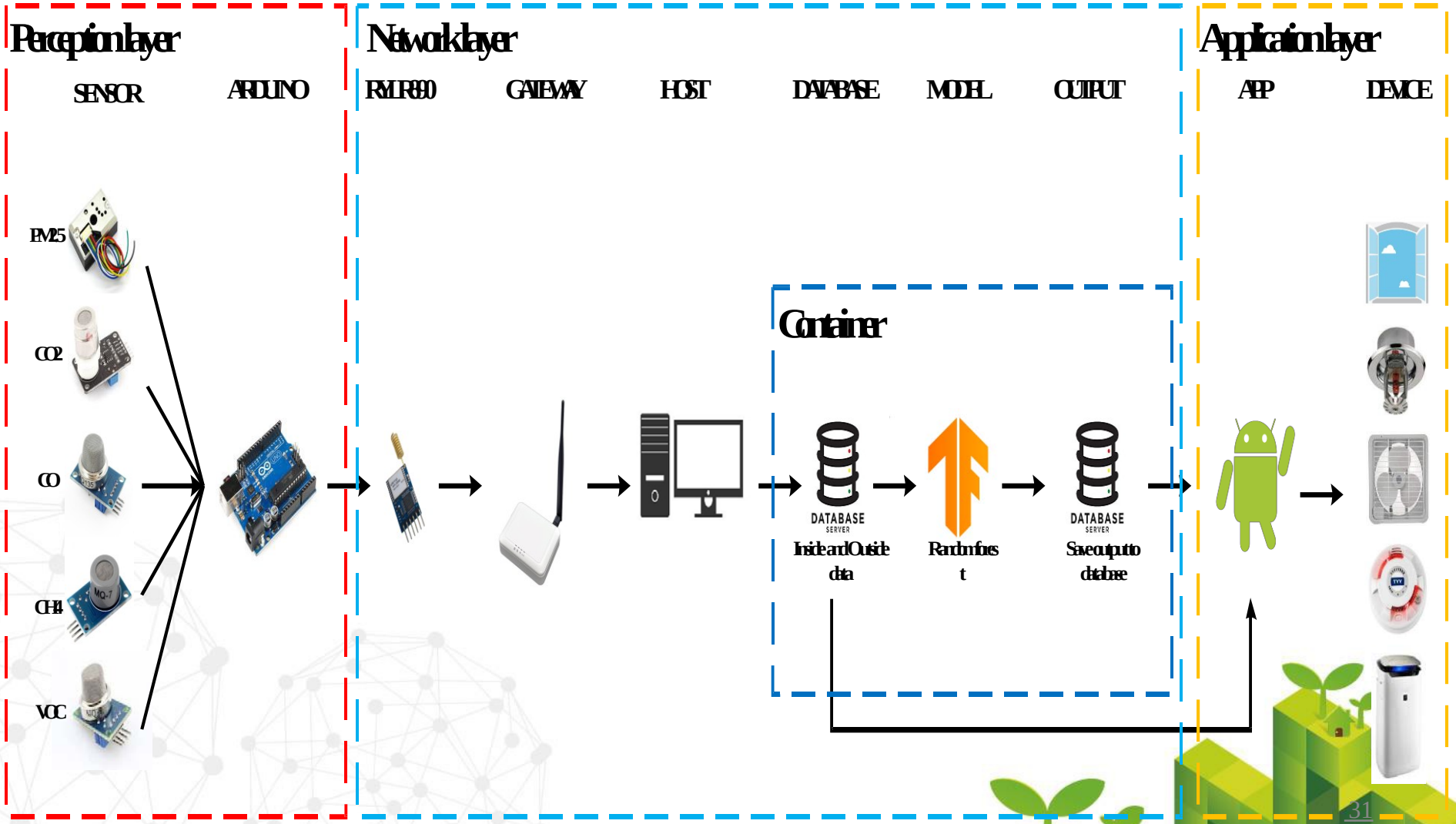


判斷汙染源來自屋內或室外
定時自動校正與喚醒

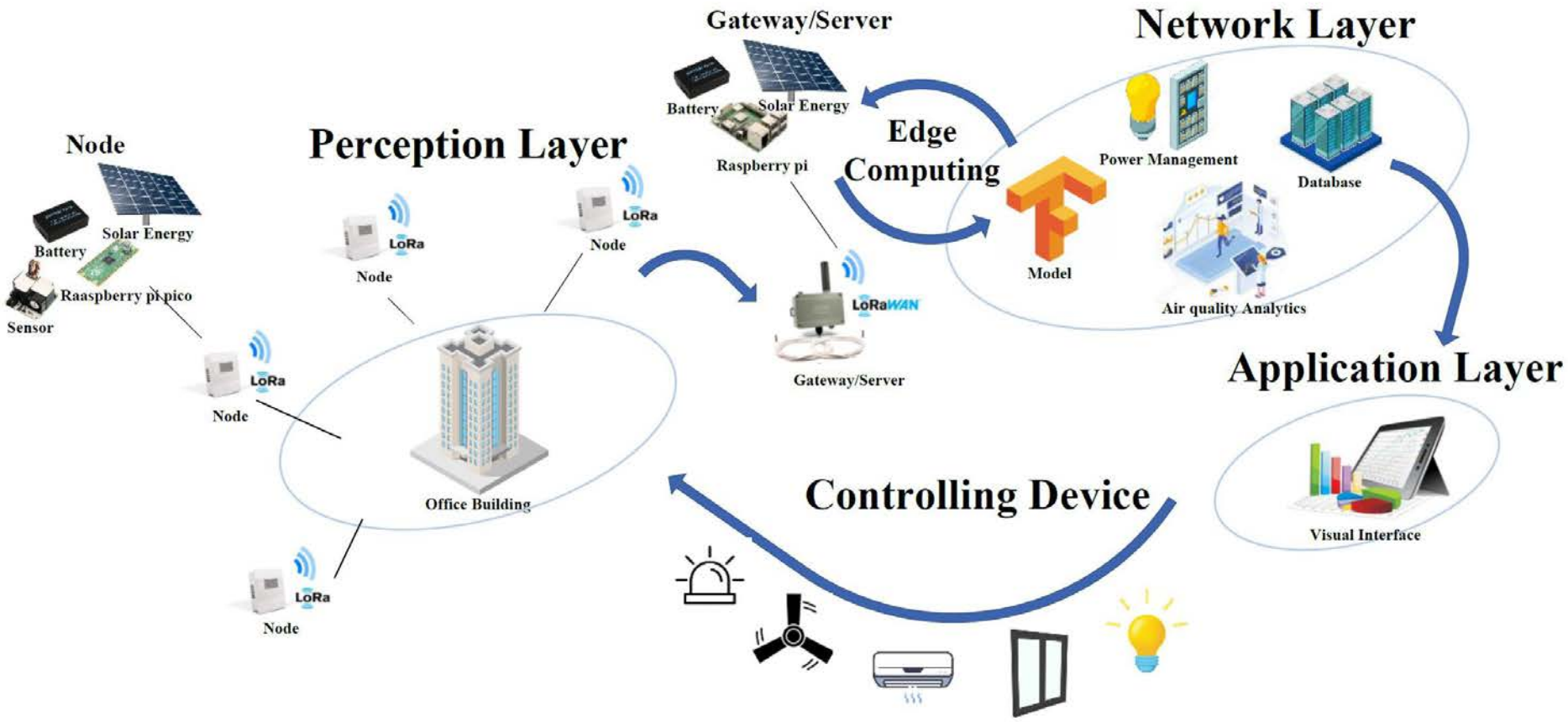
採取調控對策
警報、關窗、空調(濾淨機)

適用任何空間
智慧型物聯網系統(無線感測網路)

以空污監控為例的創意發想

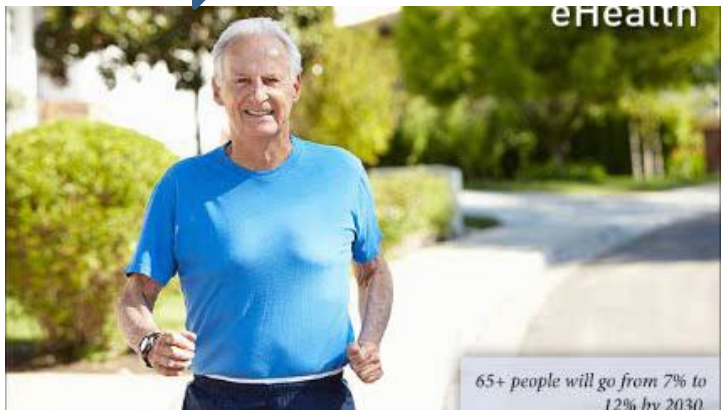


以空污監控為例的創意發想



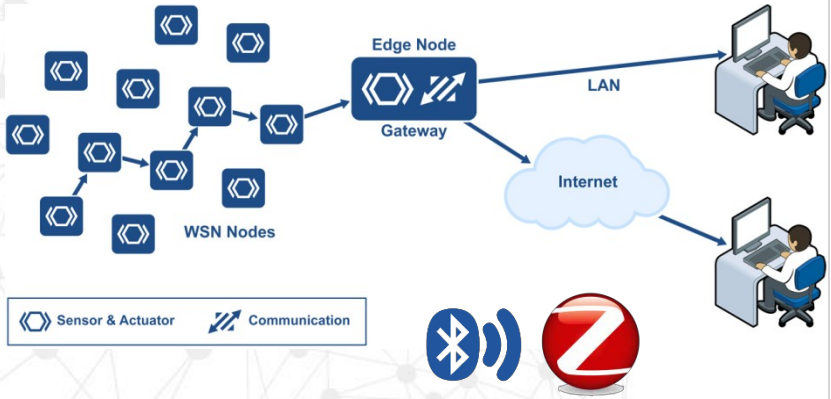
ABCD's of IoT

Applications



Big Data Analytics

Connectivity and Communication



Devices – that are smart!

Photos – Libelium, Google Image Search

#3. Hardware/Software Fundamentals