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Updates on IoT Centre

2016/1 Technology Development Section Comm Session

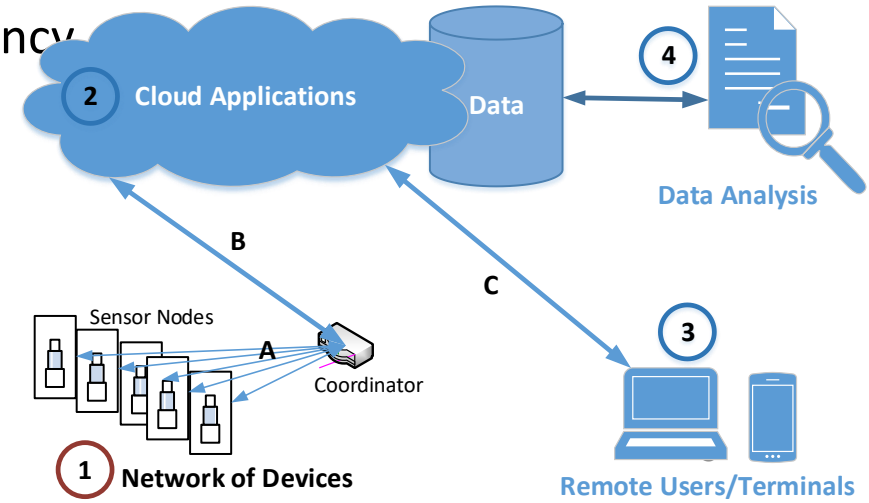
8 Mar 2016

Introduction – Internet of Things

- What is IoT?
  - Physical objects equipped with embedded technologies
  - Communicate, sense and/or interact with external environment
- Connected and “Smart” Things.
  - Readable, recognisable, locatable, addressable, and/or controllable

Introduction – Internet of Things

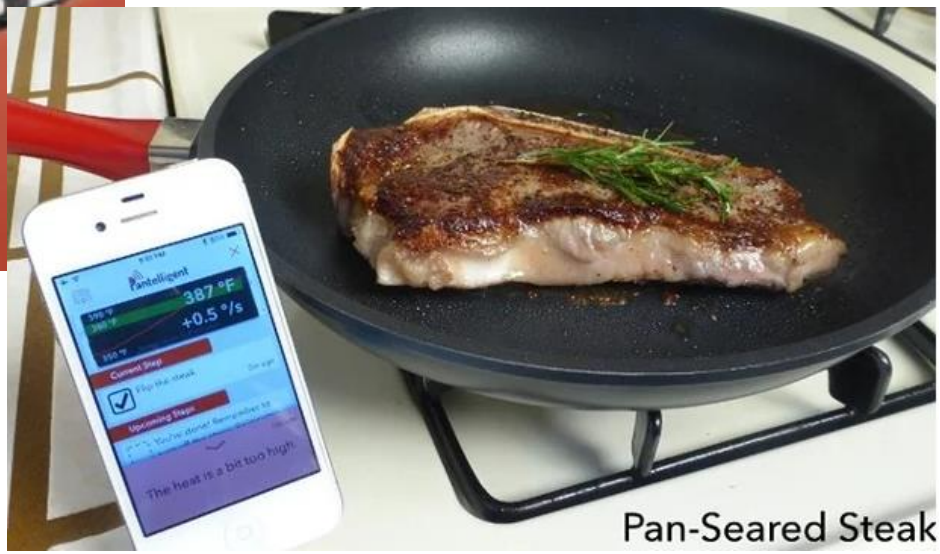
- IoT is about Application!
  - Not standalone technology
  - Not ground breaking innovation
- Why it emerges now?
  - Miniaturization of devices
    - smaller & faster
  - Improved wireless connectivity
    - Coverage, throughput and latency
  - Cloud technologies
  - Data analytics
    - Real-time



Introduction – Internet of Things

- Lots of innovative ideas

Sony Smart Tennis Sensor



Introduction – Internet of Things

- How it Works?

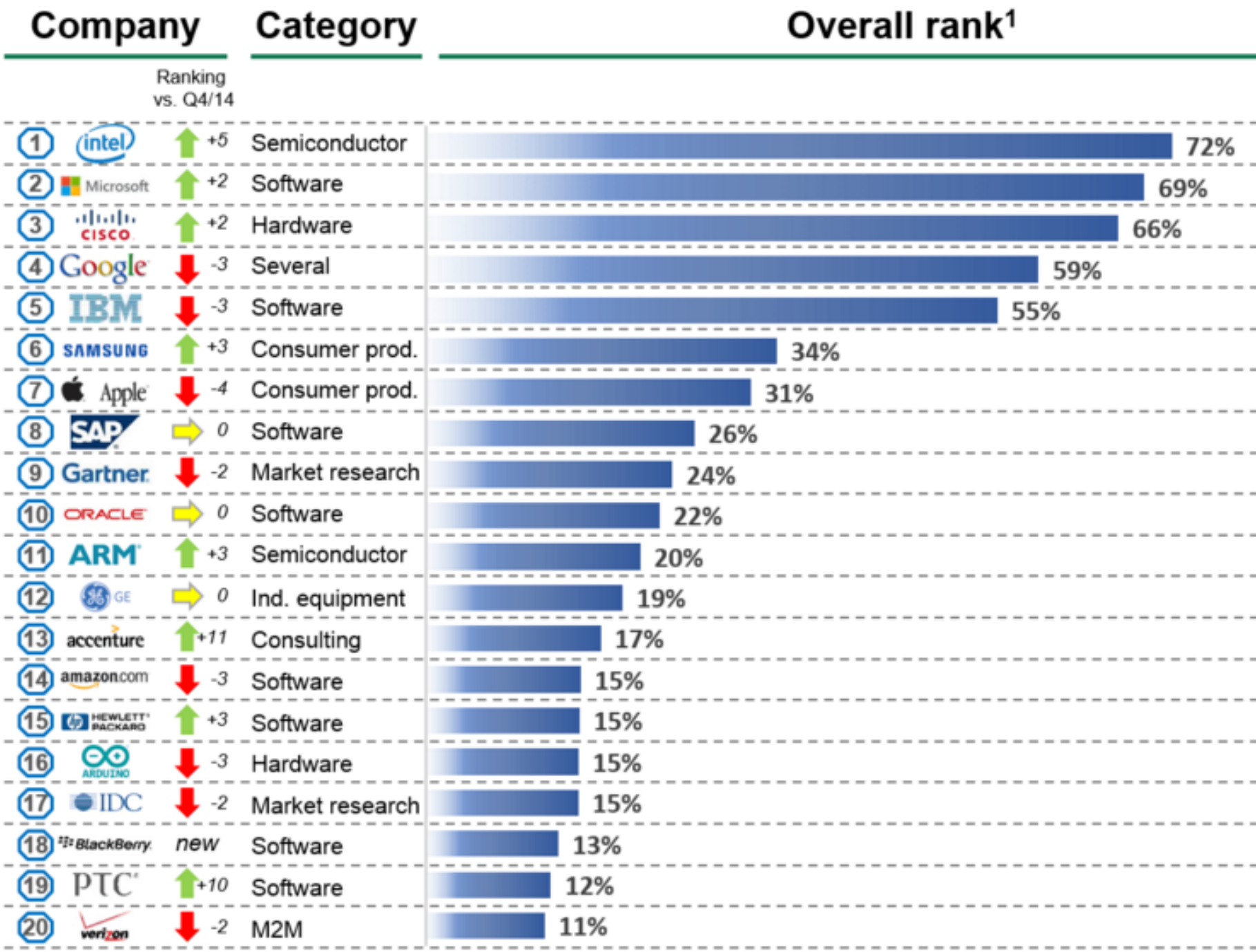
https://youtu.be/QSIPNhOiMoE

Introduction – Capability of IoT Systems

4 Levels of Capabilities

- Monitoring
  - Product condition, ext environment (alert & notification)
- Control
  - Product functions, personalized user experience
- Optimization
  - Algorithms to optimize product operation/performance
  - Predictive diagnostics, service & repair
- Autonomy
  - Products function with complete autonomy
  - No need to control individual thing

https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition


Company
Category
Overall rank[1]
Ranking vs. Q4/14
1 intel +5 Semiconductor 72%
2 Microsoft +2 Software 69%
3 CISCO +2 Hardware 66%
4 Google -3 Several 59%
5 IBM -3 Software 55%
6 SAMSUNG +3 Consumer prod. 34%
7 Apple -4 Consumer prod. 31%
8 SAP 0 Software 26%
9 Gartner -2 Market research 24%
10 ORACLE 0 Software 22%
11 ARM +3 Semiconductor 20%
12 GE 0 Ind. equipment 19%
13 accenture +11 Consulting 17%
14 amazon.com -3 Software 15%
15 HEWLETT PACKARD +3 Software 15%
16 ARDUINO -3 Hardware 15%
17 IDC -2 Market research 15%
18 BlackBerry new Software 13%
19 PTC +10 Software 12%
20 verizon -2 M2M 11%

Introduction – Smart Nation

- Singapore announced plan to become Smart Nation in late 2014
  - Support better living, support stronger communities, create more opportunities
  - IoT is one of the key enablers

Our vision is for Singapore to be a Smart Nation – where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all."

Prime Minister Lee Hsien Loong

Introduction – Smart Campus

- Higher priority on ageing, mobility and data sharing
  - Smart Healthcare
  - Smart Mobility

Singapore launches Smart Nation fellows programme

Looking to attract engineers to work on cutting-edge public sector projects.

By Medha Basu

7 MAR 2016

INNOVATION

http://www.channelnewsasia.com/news/business/ageing-mobility-and-data/1795682.html
http://www.channelnewsasia.com/news/singapore/singapore-opens-doors-to/2579186.html

Introduction – Smart Campus

- Ngee Ann aims to be a Smart Campus
  - Great Place to Learn for Students
  - Great Place to Work for Staffs
- Focus Areas
  - Smart Classroom
  - Smart Facility
  - Smart Building

IoT Centre - Objectives

- To provide a platform for staff, students and industry partners to work on IoT projects
- To support the development of Smart Campus and Community related projects
- To provide a platform for cross-disciplinary collaborations
- To support SkillsFuture initiatives

IoT Centre – Seeking Industry Partners

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IoT Centre – Collaborators

- Nextan Pte Ltd
  - Collaborator for Smart Campus Solutions
  - Experience in project implementation at nursing homes
- Vanguard Healthcare
  - Managing multiple nursing homes
  - Interested for pilot run once project is ready

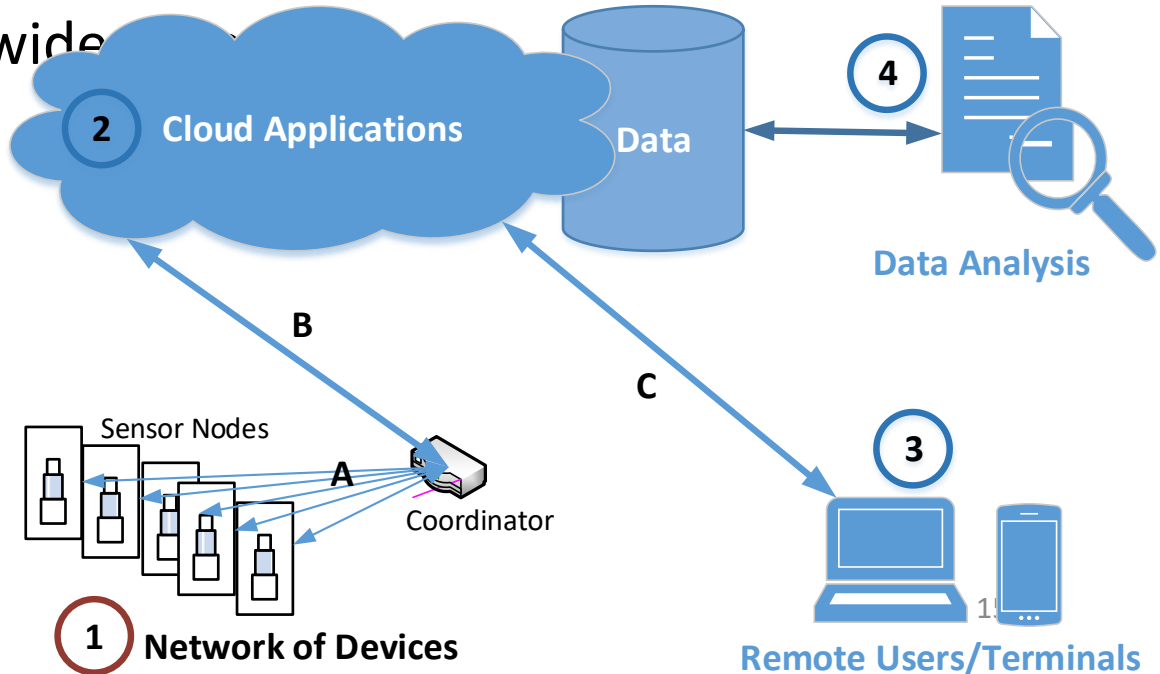
IoT Centre - Collaborators

- Pending MOU
  - 5 May (Thur) AM

- Avnet Technology Solutions
  - One of the largest global distributor of electronic parts and embedded subsystems, which includes parts from Xilinx and TI.
- Rohde & Schwarz Asia Pte Ltd
  - Manufacturer of test and measurement (T&M) equipment for radio communications.

IoT Centre – Capability Building

- IoT covers lots of area. What will be our core competencies?
- Some Considerations
  - Proven technology
  - Common for IoT Solutions
  - Market trend for wide



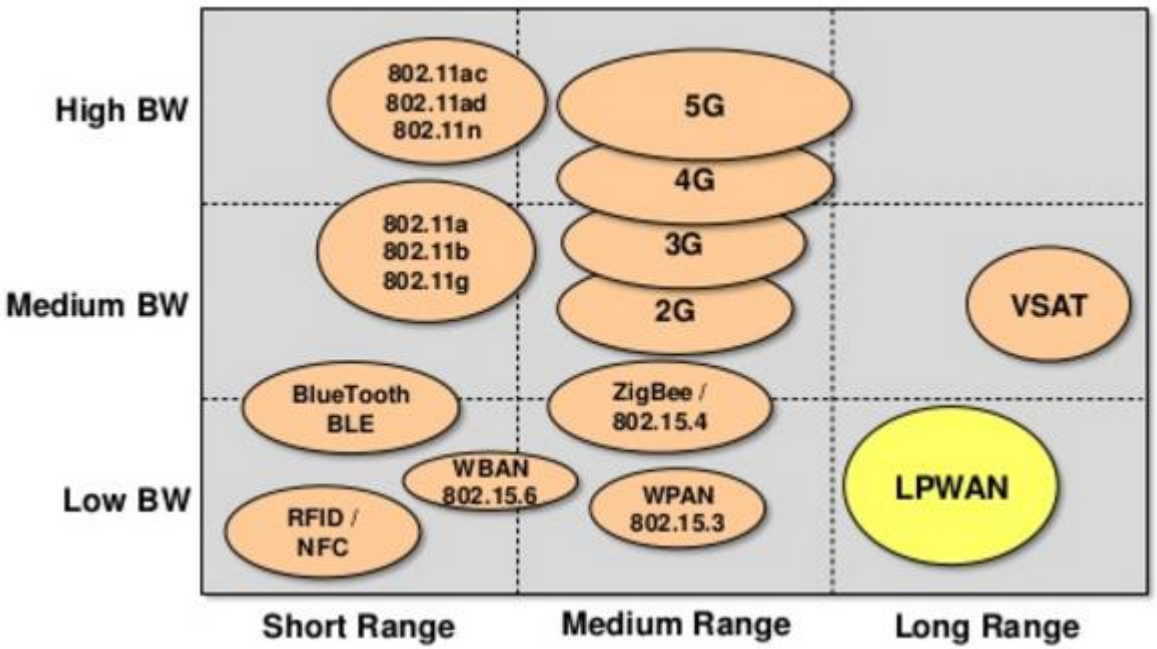
Capability Building – Bluetooth LE

- Bluetooth Low Energy (BLE) vs. Bluetooth Classic
  - Designed for reduced power consumption
  - Used in iBeacon (Apple) and EddyStone (Google)
- Bluetooth 4.0 / Bluetooth Smart
  - Device capable of dual-mode Bluetooth operations
  - Widely available on smart phones, tablets and laptops

http://www.link-labs.com/bluetooth-vs-bluetooth-low-energy/

Capability Building – LoRa Wan

- Wireless technology mainly targeted for M2M and IoT networks.
- Long-range, Low bandwidth and low power consumption.
- LoRa Alliance
  - > 140 Members



Capability Building – Others

- Image/Video Analysis
- Mobile App
- Web Services

Project – Crowd Monitoring

- To develop and implement a system to monitor the crowdedness of campus canteens.
- Features
  - User can use Raspberry Pi or any low-cost embedded system to implement a camera module.
  - User can easily configure camera modules to communicate with server
  - Images are stored and analysed in server to provide estimation of the crowd.
  - Android app is available for user to monitor their camera modules

Team:

- Li Yan
- Soon Hock Wei
- Tey Ching Sze Billy
- Ngu Leh Ee
- Zhang Qinjie

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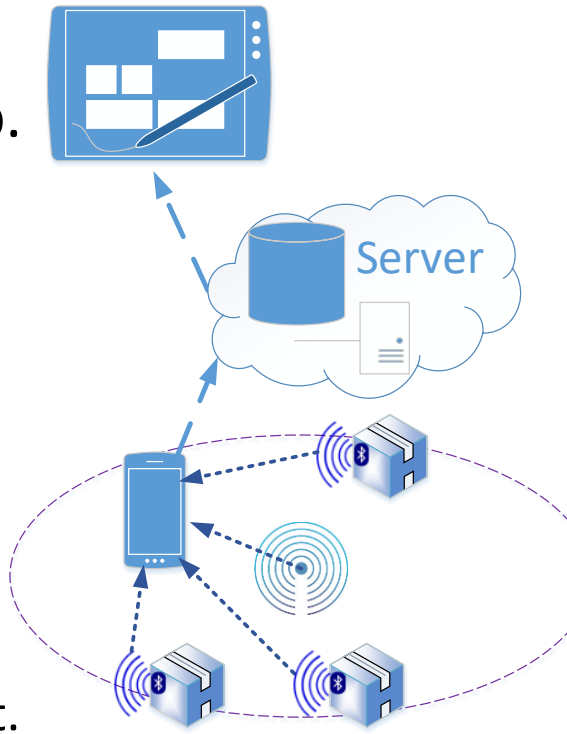
http://eceiot.np.edu.sg/publiccamera/web/

Project – Asset Tracking with Beacon

- To develops a asset tracking system using Bluetooth LE beacons and mobile phone app.
- Features
  - Use beacons to identify location and equipment
  - Use mobile app to crowdsource location data of equipment
  - Location data of equipment are updated in cloud and readily available
- Benefits
  - No manual recording of movement of equipment.
  - Location of equipment is always up to date.
  - Movement history of the equipment is available for analysis purpose



Team:

- Hong Lei
- Soon Hock Wei
- Zhang Qinjie

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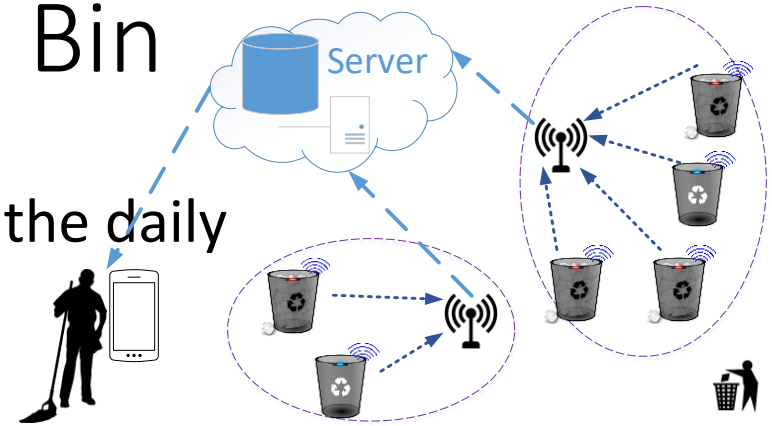
http://eceiot.np.edu.sg/assettracking/web/

Project – Smart Recycle Bin



- To develop a system which monitors the daily level of recycle bins in campus
- Features
  - Embedded system which monitor recycle bin levels and communicate using LoRa.
  - Server which stores data on cloud for further analysis;
  - An mobile app which send push notification to alert cleaners when a recycle bin reach a level.
- Benefits
  - Improve productivity of the cleaners
  - Optimal locations for recycle bins by data analysis

Team:

- Yung Weng Ho
- Choo Ching Hwa (TDO)
- Foo Duon Foung (TDO)
- Cui-Li Yan (TDO)
- Zhang Qinjie

Project – Park Lot Counter

- To develop a low-cost system to estimate empty parking lots for various parking zone in campus.
- Features
  - Monitor entries/exits of cars at each entrance/exit of a car park zone to estimate number of empty lots.
  - Display parking lots status around campus on LED board at car park zone entrance.
- Benefits
  - Help drivers to find a parking lot in shorting time

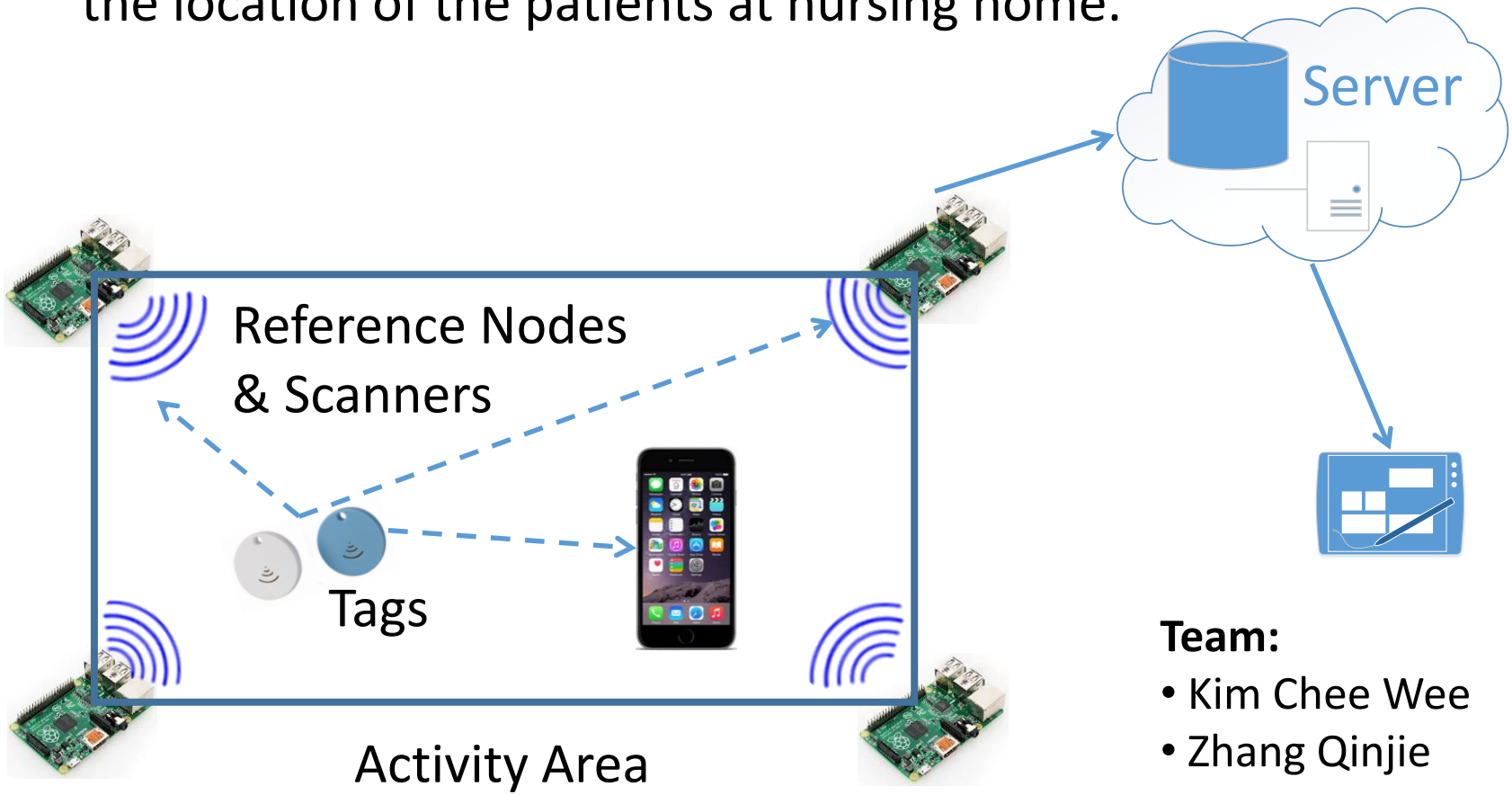
Team:

- Hong Lei
- Yip Choon Keat (TDO
- Phuan Dickson (TDO)
- Leow Kwee Lye (TDO
- Zhang Qinjie

http://eceiot.np.edu.sg/parking-lots/api/web/index.php/v1/car-park

Project - Patient Tracking System

- To develop a tagging system which can track the location of the patients at nursing home.



Team:

- Kim Chee Wee
- Zhang Qinjie

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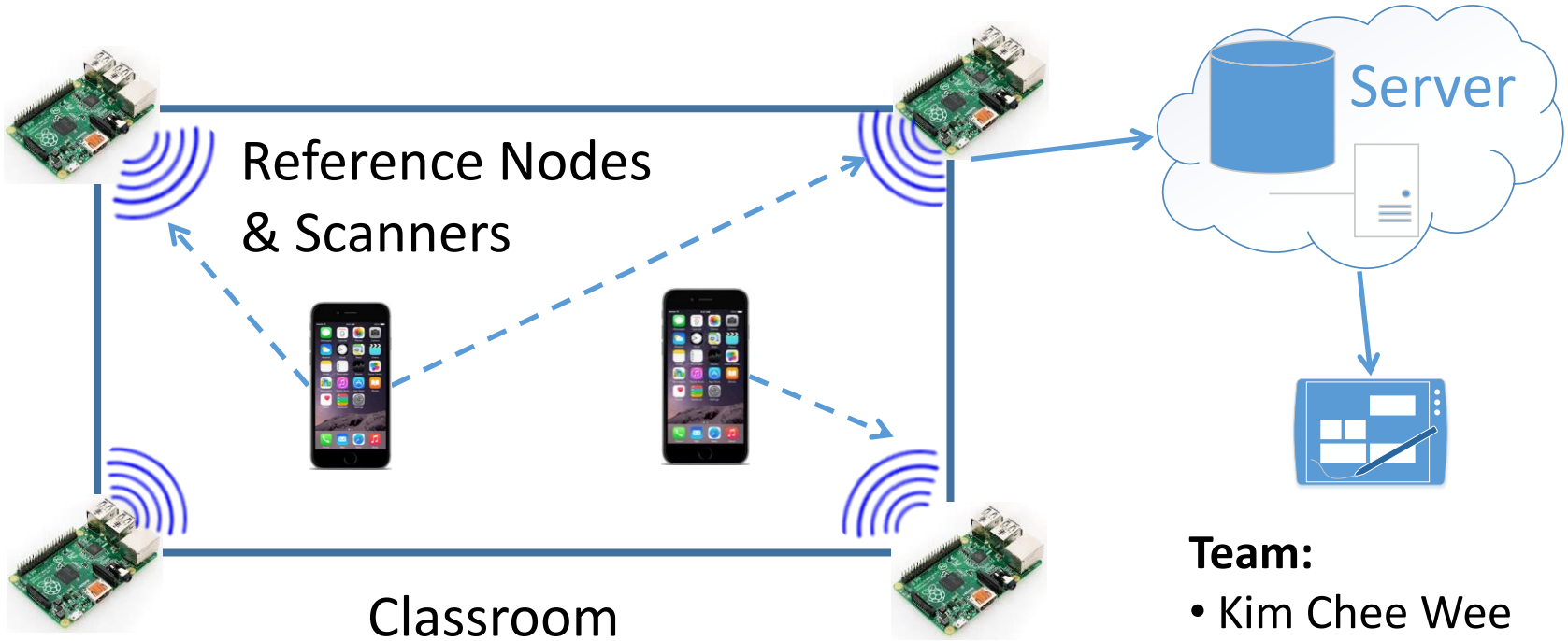
Project – Attendance Taking System

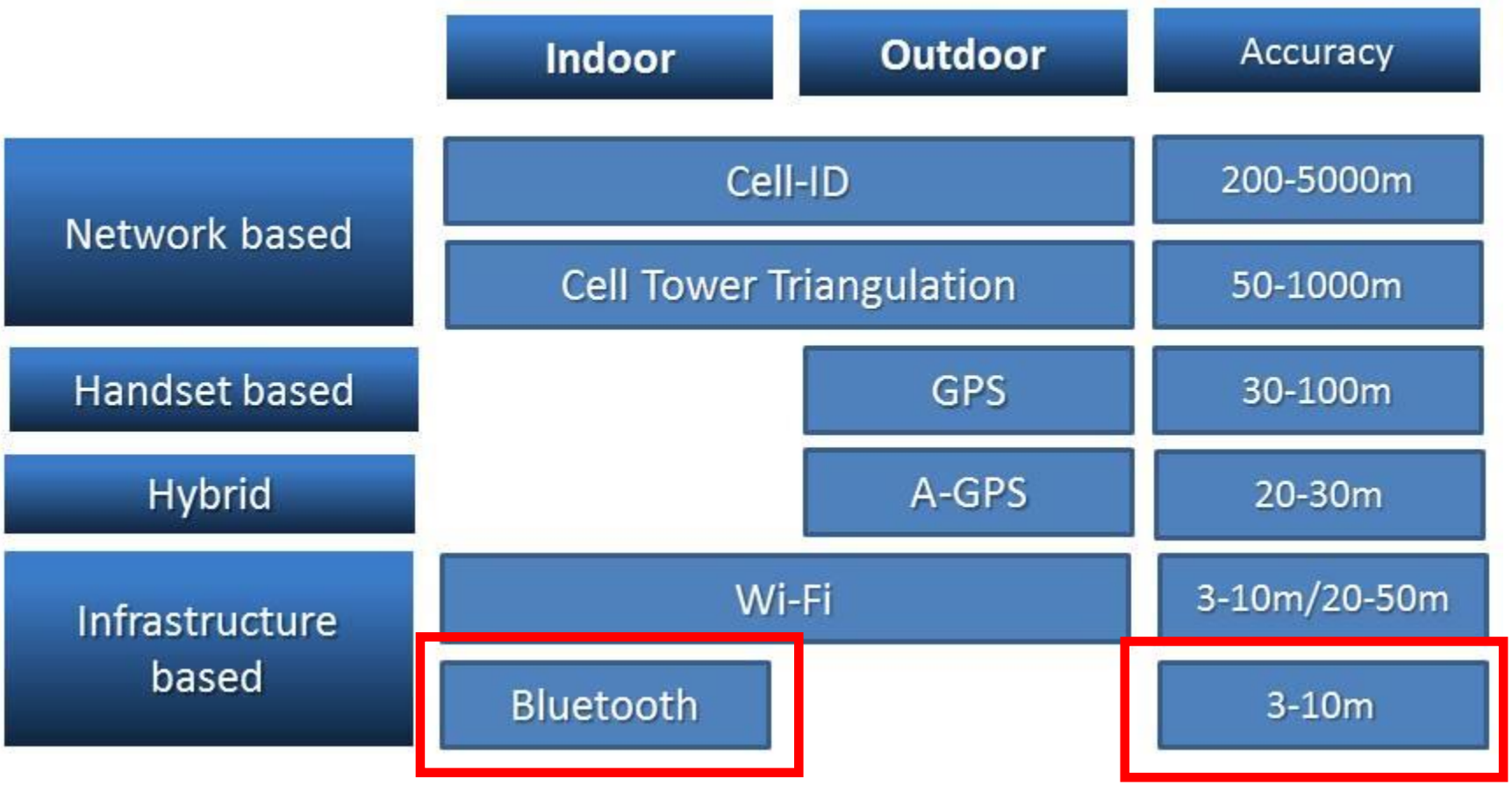
- To develop a mobile app for students which will take attendance automatically upon entering classroom.



Team:

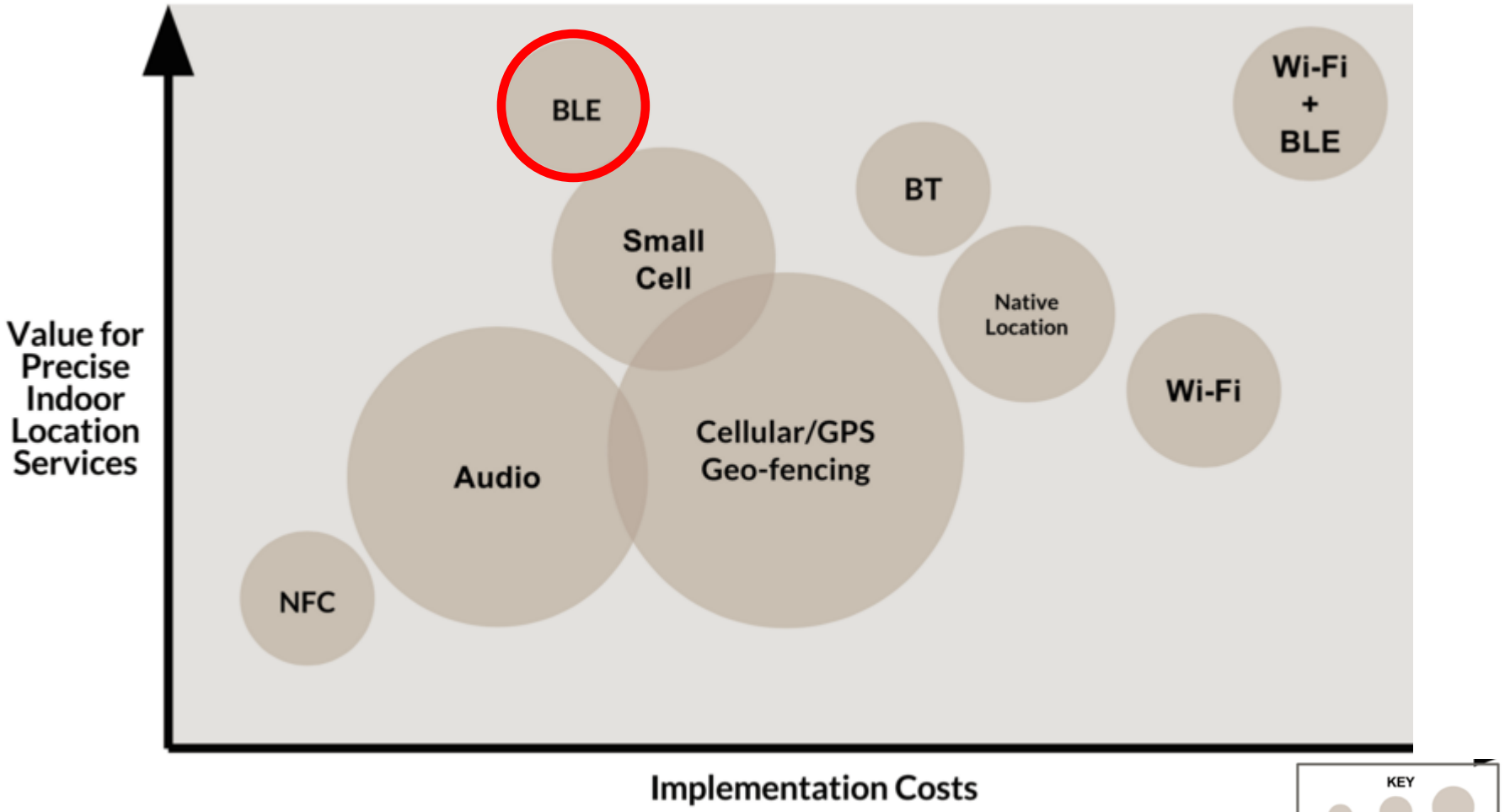
- Kim Chee Wee
- Zhang Qinjie

Projects – Indoor Positioning using BLE



http://geoawesomeness.com/knowledge-base/location-based-services/location-based-services-technologies/

Projects – Indoor Positioning using BLE



http://mw2015.museumsandtheweb.com/paper/location-location-location-the-proliferation-of-indoor-positioning-and-what-it-means-and-doesnt-mean-for-museums/

Project – Smart Door Lock

- Develop a system where user can identify visitor through mobile app, and able to unlock the door remotely.
- Features
  - Door Lock unit takes photo of visitors upon pressing of button bell.
  - Photo are sent to server and users will be notified through mobile app
  - User can view the photos and choose to unlock door through mobile app.

Team:

- Tey Ching Sze
- Cheng Kong Chit
- Wong Song Sing
- Zhang Qinjie

Project – Smart Digital Signage

- To develop a low-cost and easy-to-manage digital signage system
- Features
  - Raspberry-Pi as client instead of PC to display content on monitor.
  - Each client unit are connected to internet and download contents from server.
  - User can manage the multimedia content on server and controlling playlist for each client through web browser.
- Possible Application
  - TV Monitor at Lift Lobby
  - Venue timetable outside classroom

Team:

- Cheng Kong Chit
- Zhang Qinjie

Other Projects - Capability Building

- Home Automation System
  - Ferdinan Widjaja, Tey Ching Sze
- Zynq 360 View platform
  - Li Yan, Lu Tan
- Intelligent Applications with Gesture Control
  - Ngu Leh Ee

Specialist Diploma in IoT

Certificate	Module	Module Leader
PDC in IoT Devices	Fundamental Embedded Systems	Seng Puay Hong
	Mobile Application Programming	Zhang Qinjie
PDC in IoT Solutions	Embedded System Interfacing and Networking	Soon Hock Wei
	Cloud Services for IoT Solution	Zhang Qinjie

- Industrial Collaborator - MediaTek

Q&A

Thank You!