



Smart laundry room

Group 5

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Outline

- **Introduction**

- Motivation and application

- **System and structure**

- Software and algorithm
 - Hardware
 - Application Scenario

- **Market analysis**

- **Reference**

- **Task partition**



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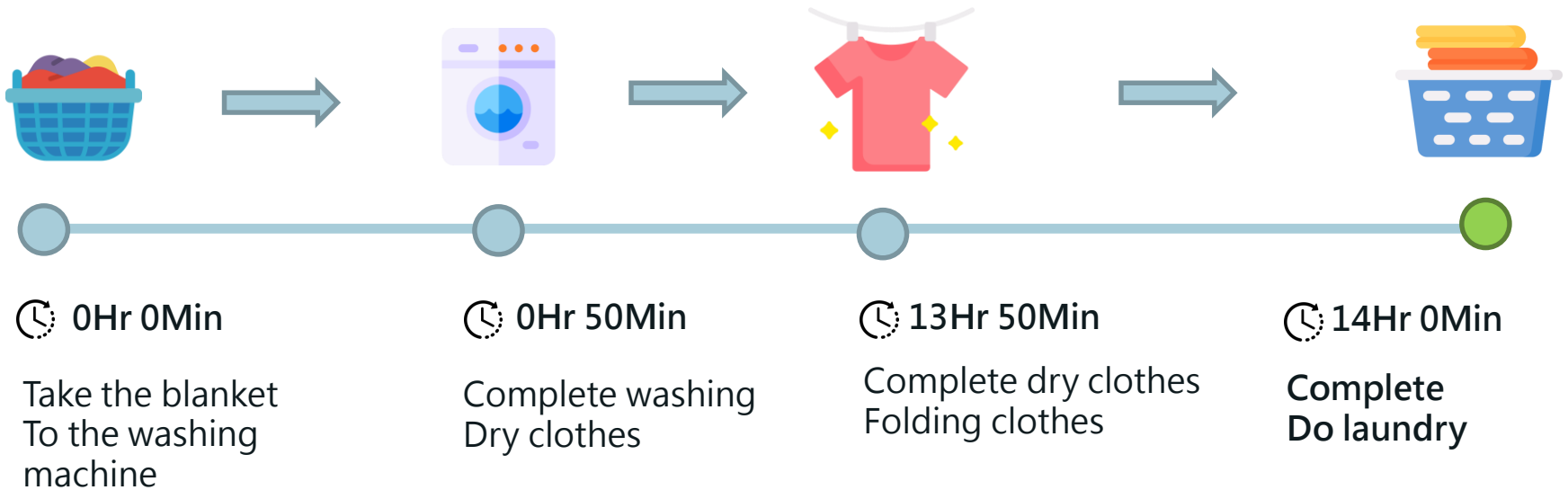
- **Reference**

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Motivation and Application

How much time do you spend on do the Laundry?

Ideal Laundry Time



Motivation and Application

How much time do you spend on do the Laundry?


Actual Laundry Time





Motivation and Application

We Spent too much time to do the laundry

- 
- Wait for available washing machine → 25Min ~ 50Min
 - Bad weather cause the clothes hard to dry, even redo the laundry → 12Hr ~ 24Hr
 - Wait for available clothes dryer → 30Min ~ 2Hr
 - No complete notification, task done but not yet to get your clothes → 1Hr ~ 24Hr

Average waste time: 8 Hr per once (Worst Case)

Do laundry twice per week → **64 Hr/month, 768 Hr/year**



Take the lecture with 3 academic credit in 1 semester
→ **60 Hr, you can take additional 12 lectures** in one year



Take 20 Hr you can learn one skill
→ **You can learn additional 38.4 skills** in one year



Motivation and Application



Wrong Washing & Drying Cause Clothing Damage

- Different clothes material need different washing process
- Different clothes material need different Drying time, temperature

Most People do not know it. **Cause Clothing Damage**

Motivation and Application

送洗衣物3撇步自保 遺失最高求償20倍

洗滌錯誤毀損糾紛多 店家倒閉丟衣又失金

記者 魏舒庭 報導 2013-06-04



▲夏天服飾換季，厚重冬物須清洗收納(圖/卡優新聞網)

有道是「端午過、冬衣藏」，家家戶開始忙著清洗厚重的冬天衣物，讓坊間的洗衣店生意大好，不過也因此產生不少消費糾紛。行政院消費者保護處提醒消費者，送洗衣物前有3招可自保，若發生爭議時，也可向店家要求最高洗衣價的20倍賠償。

根據消保處統計，去(101)年各地政府所受理的洗衣申訴案件共有98件，又以衣物送洗毀損占75件，衣物或配件遺失占14件，其他個

案還包括店家倒閉、不當加收附加費用，以及延遲交付等爭議。

**HSBC**
匯豐



匯鑽卡

最高6%現金回饋*

*限指定通路+回饋達檔+帳戶滿額，詳見官網活動說明



謹慎理財
信用至上

在洗衣糾紛中，送洗衣物毀損或損失比例偏高的主因，即是因為消費者在送洗

外宿租屋遇上洗衣機惡霸 引發網友共鳴獻絕招「永除後患」

周刊王CTWANT | 李家穎

2022年10月27日



外宿租屋遇上房客洗好衣服都不收，讓她無法洗衣超困擾。(示意圖/翻攝自pixabay)

[周刊王CTWANT] 外宿租屋經常都是多人共用一台洗衣機，就有一名女網友分享，一位鄰居洗衣習慣讓她覺得超噁心，甚至跟本人與房東反應也都沒有改善，而這樣的習慣也讓不少人直喊有碰過，紛紛表示有共鳴給出意見。

租屋處是共用洗衣機，房客都是女生，但有一位鄰居常常衣服丟進去洗，一放就放好久，在家就算了，有幾次人還出去超過2.3小時才回來，有其他人要洗的時候不能進，也有開重水龍頭過

Motivation and Application





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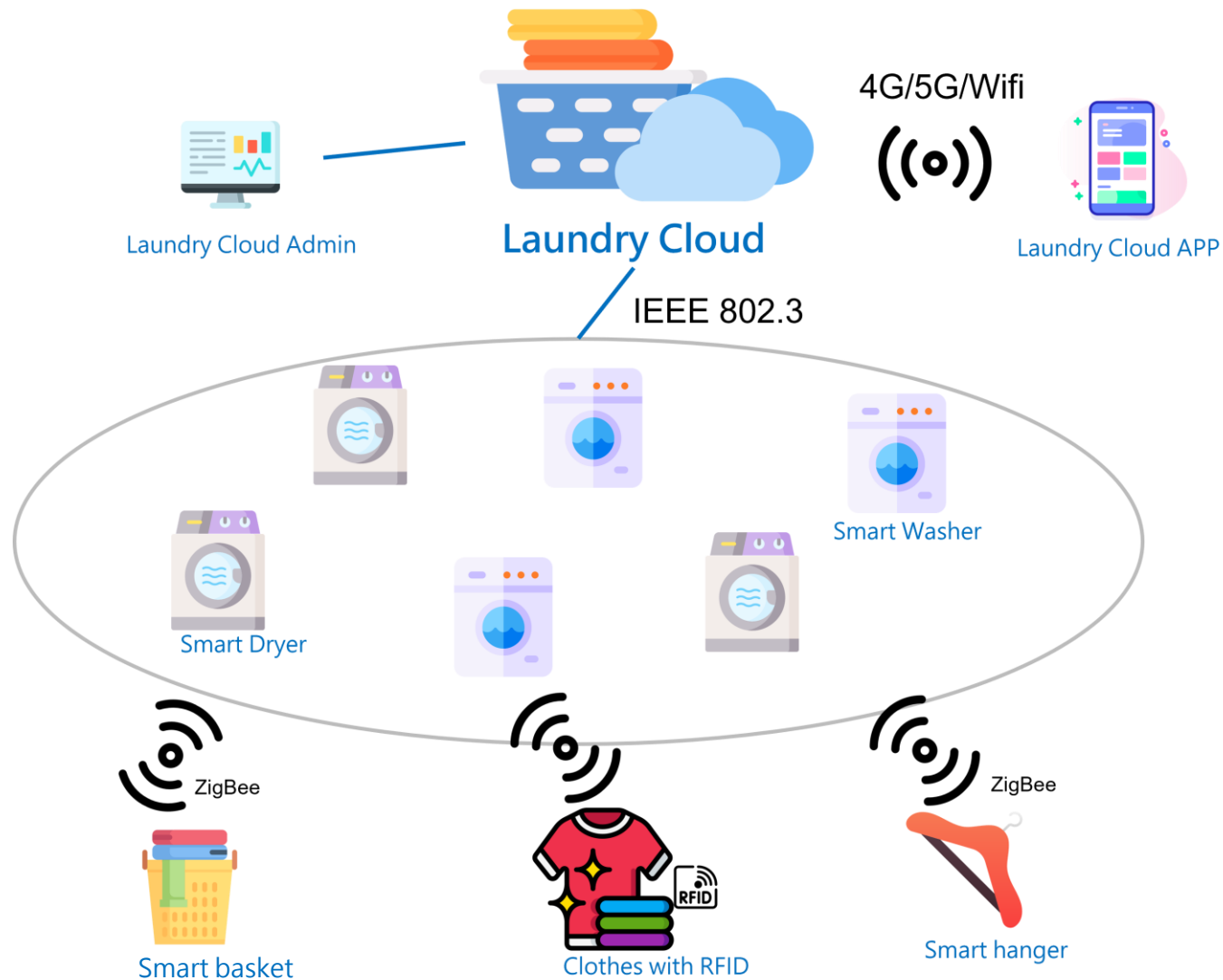
- Software and algorithm
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System and structure



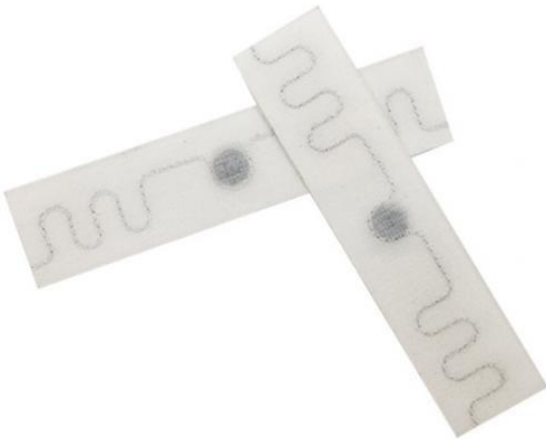
System and structure

Hardware



Clothes with UHF RFID Laundry Tag

- Identify different clothes material
- Recommend washing process
- Recommend washing Drying time, temperature



RW700 RF

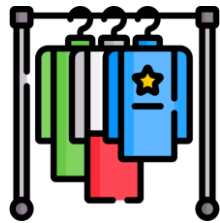
- Frequency: 860~960MHz
- Protocol : EPC Class1 Gen2, ISO18000-6C
- Reading distance : 6m
- Chip :NXP UCODE 9
- Size :90x20mm
- Packing material :
 - Washing: 90°C(194°F), 15 minutes, 200 cycles
 - Pre-drying in Tumbler: 180°C(320°F), 30minutes
 - Ironer: 180°C(356°F), 10 seconds, 200 cycles

System and structure

Hardware



Smart hanger
With humidity sensor
Using Zigbee to transfer humidity data

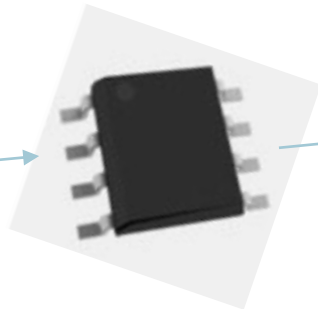


Smart cloth rail
With Sunlight sensor
wireless charging function



**Humidity sensor-
SHTC3-TR-2.5KS**

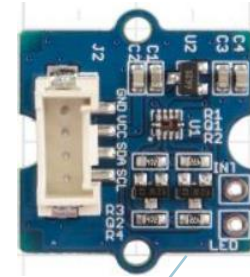
8-bit I2C address



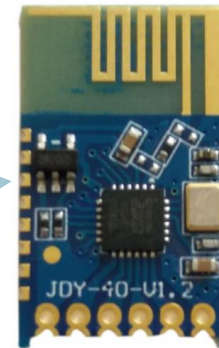
**Microprocessor-
pic12f675**

MCU 8-bit PIC RISC 1.75KB Flash
2.5V/3.3V/5V Automotive
8-Pin SOIC N Tube
RoHS : Compliant

- Programmable configuration
- 3.3/5V Supply
- Detect sunlight directly
- Grove compatible
- I2C Interface



**Grove -
Sunlight
Sensor**



**Zigbee transmitter
JDY-40**

2.4G technology
with a distance of 120 meters

System and structure

Hardware



Smart basket

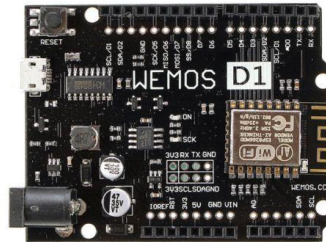
Smart basket:

- Check the amount of clothes
- Remind users to do laundry
- Wireless charging function



Ultrasonic Distance Sensor - HC-SR04

- 5V Supply
- Trigger Pulse Input :10uS TTL pulse
- Echo Pulse Output
- 0V Ground



WEMOS D1 R2 V2.1

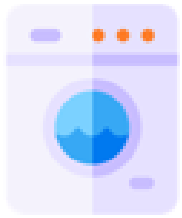
- **Microcontroller:** ESP8266EX
- **Analog Input Pins:** 1
- **Digital I/O Pins:** 11
- **Flash Memory:** 4MB



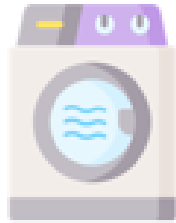
Laundry Cloud

System and structure

Hardware



Smart Washer



Smart Dryer

Smart Washer and Smart Dryer function similarly.

Reserve system (app), if the device is reserved, the washer/Dryer will be locked.

Identify clothing RFID and take suitable washing/drying method.

Being a coordinator between smart hanger/ clothing and laundry cloud.

System and structure

Hardware

■ Smart washer/dryer

RFID Reader- NUCLEO-NFC03A1

RFID Expansion Boards

Core: CR95HF-VMD5T

RFID Reader/Transponder



Laundry
Cloud

IEEE 802.3 ethernet

processor-

Raspberry Pi 3 Model B+

Spec. is in the following slide



Microcontroller- Arduino Uno R3

microcontroller board based
on the **ATmega328P**

6 analog inputs

14 digital input/output pins

USB connection



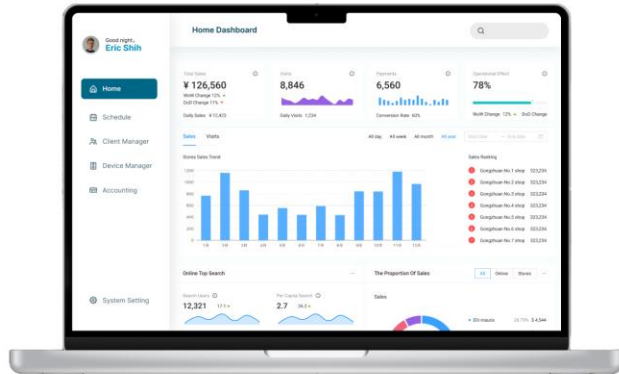
System and structure Hardware

Raspberry Pi 3 Model B+



Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz
1GB LPDDR2 SDRAM
2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
Extended 40-pin GPIO header
Full-size HDMI
4 USB 2.0 ports
CSI camera port for connecting a Raspberry Pi camera
DSI display port for connecting a Raspberry Pi touchscreen display
4-pole stereo output and composite video port
Micro SD port for loading your operating system and storing data
5V/2.5A DC power input
Power-over-Ethernet (PoE) support (requires separate PoE HAT)

System and structure Software



Laundry Cloud

Do laundry on the cloud



Laundry &
Dryer booking



Time Saving



Protect
Clothes



Online
Payment



Instant
notification



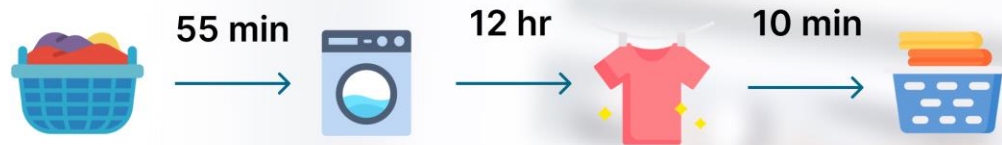
ECO Friendly

System and structure Software



Laundry Time Predictable

Estimated time from laundry to storage in closet



Through AI and big data prediction, Laundry Cloud can let users know how long it will take to do laundry, so that users can freely schedule their laundry time without misjudging or wasting other waiting time. In addition, users can get advice and knowledge about laundry in the app, which not only makes laundry more time-saving, but also ensures that clothes will not be damaged.

System and structure

Software



Reservations & Notifications

Know when to laundry, know when to finish.



Notification

When finish, APP will notify you instantly



Reservations

Book the laundry & drying machine. Easy to schedule.

System and structure

Software



Mobile Payments & Bonus Points

Do more laundry more cost-effective



Mobile Payment

Pay by Line Pay, Apple Pay, Android Pay, or your credit card secure and instance

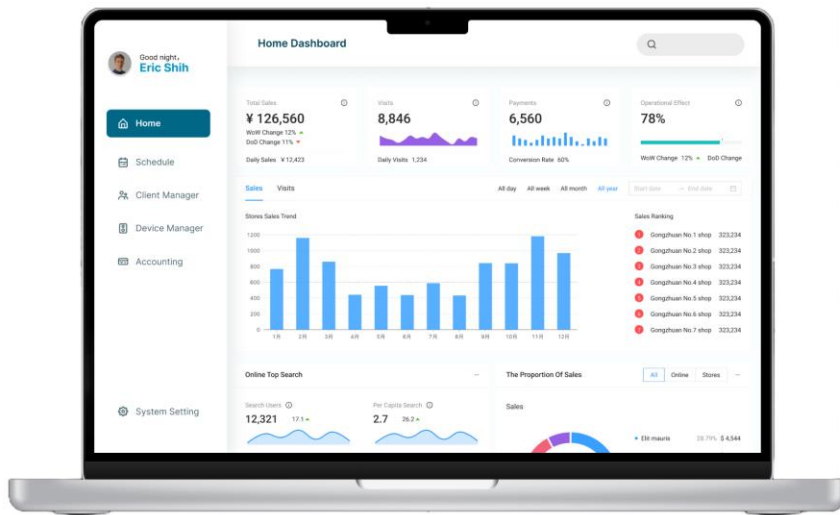


Bonus Points

Every laundry can earn bonus points, it can use for discount on next laundry payment.

System and structure

Laundry Cloud



Laundry Cloud Admin Board

Making it easier for laundry owners to manage



Billing
Management



Customer
Management



Device
Management



System and structure Laundry Cloud

■ Internet Server

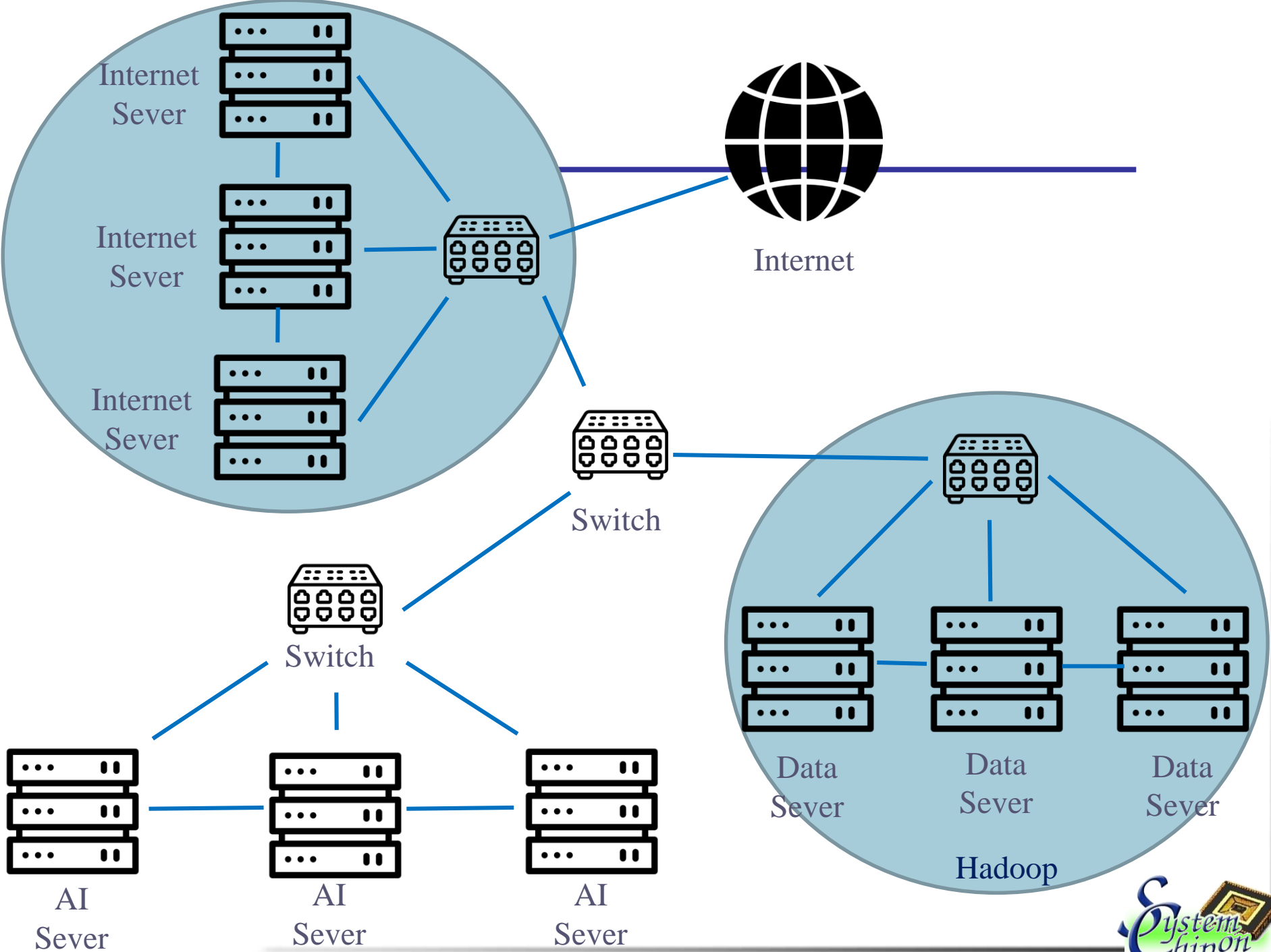
- Transfer the message from washer, dryer and hanger to client
- Electronic Payment
- Support the function of the App

■ Data Server

- Client Data Storage

■ AI Server

- Use the data in internet server to train model
 - Predict the rush hour of laundry
 - Consumption of electricity, gas and water.
 - Recommendation for the schedule of laundry



System and structure

Laundry Cloud



■ Internet Server

■ Gigabyte R282-NO0 Server

- 2 * Intel Xeon W series, up to 38 core 76 thread per core.
- 24 x 2.5" Gen4 NVMe hot-swappable SSD bays
- Large Data throughput
- Use OCP 3.0 high speed network adapter, such as E810-XXVDA2
- Or PCIE 3.0 high speed network adapter, such as X710-DA4

■ Data Server

■ Gigabyte S452-Z30 Server

- Single AMD EPYC™ 7003 series processor family, 64 core 128 thread per core.
- 36 x 3.5" SATA/SAS hot-swap HDD/ SSD bays

■ Hadoop system

- Large Data storage



System and structure

Laundry Cloud

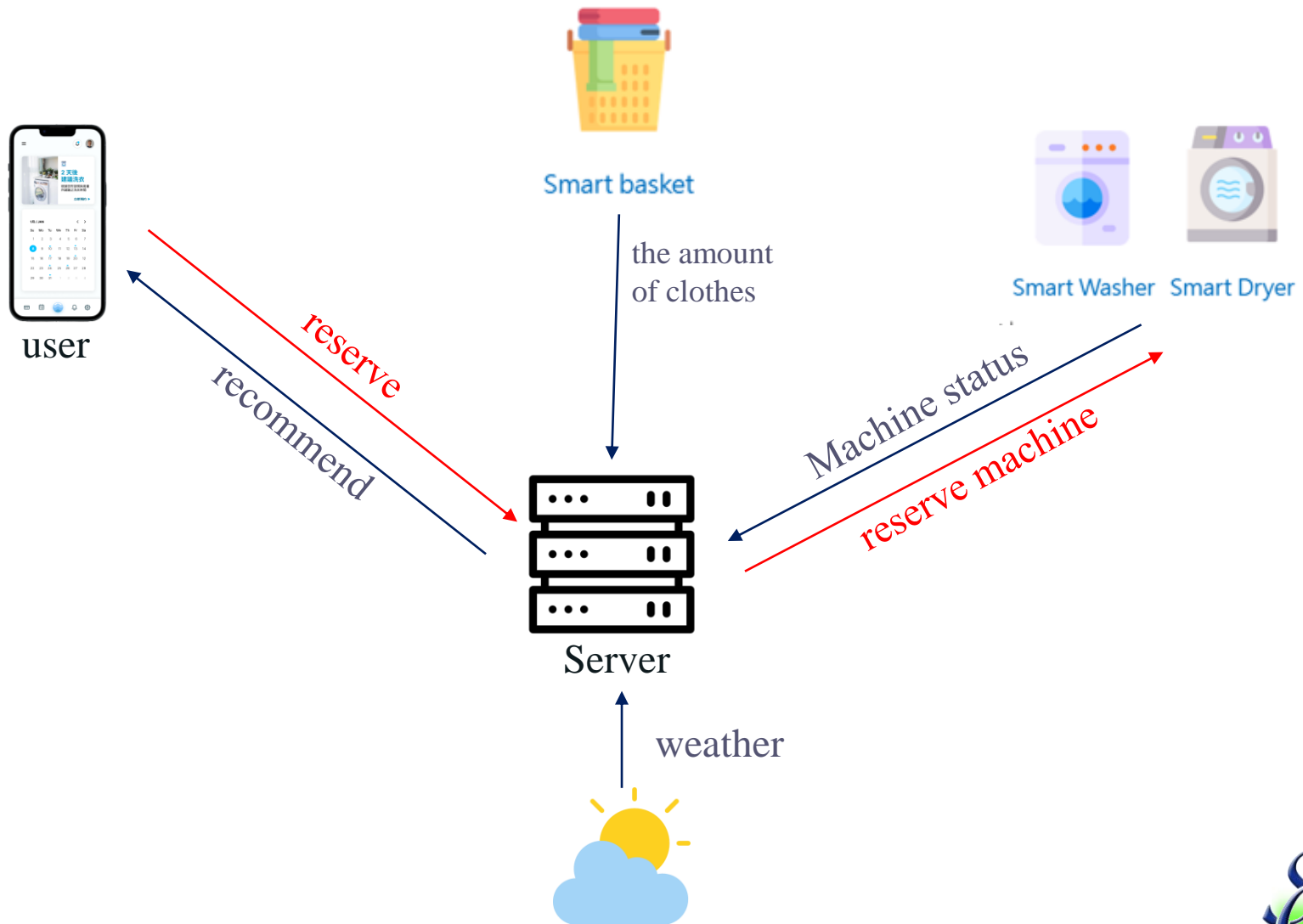
■ AI Server

■ NVIDIA DGX STATION A100

- AMD 7742, 64 cores
- 512 GB Main Memory
- 4 * NVIDIA A100 80GB GPU
- Total 320 GB GPU Memory
- 2.5 peta Flops AI



Scenario - reservation



Scenario - washing processing



user



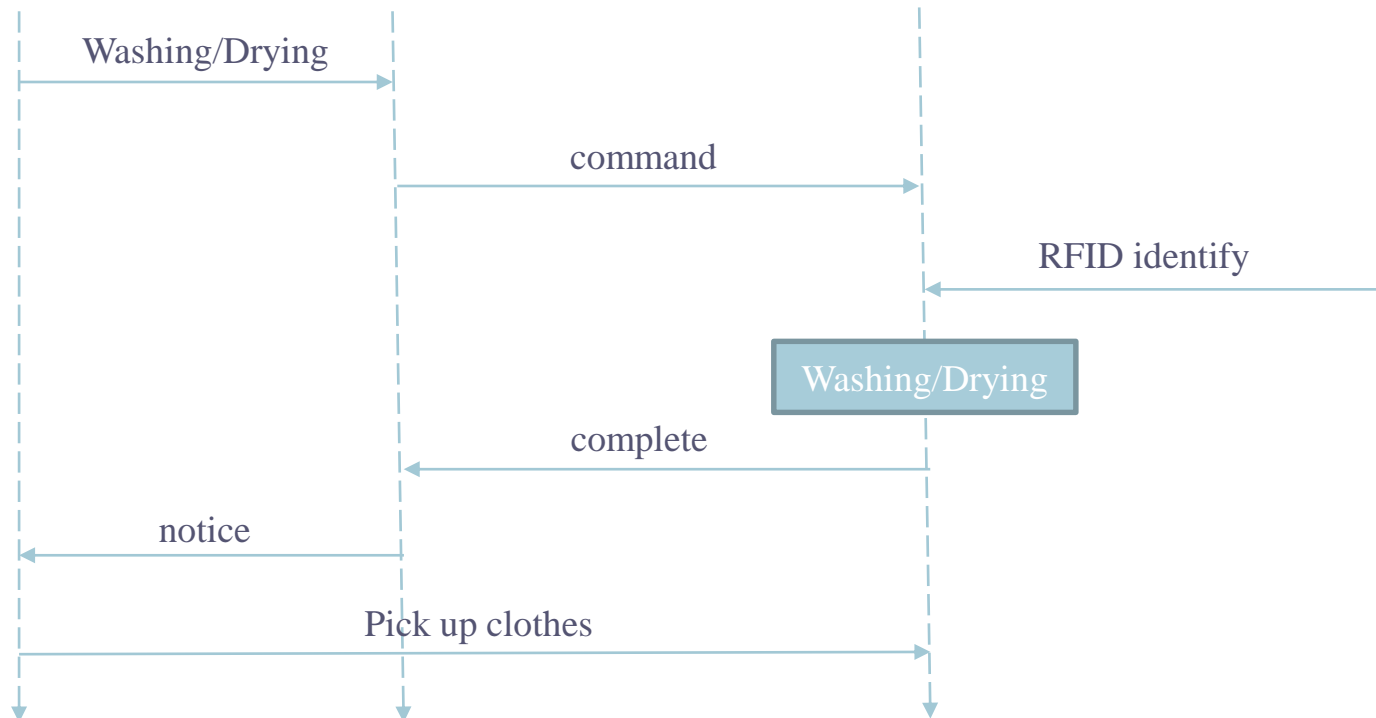
Server



Smart Washer



Smart Dryer





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Market analysis

- according to statistics from 財政部不動產資訊平台
- Since March 2018, there were 1243 laundromats in Taiwan, and by March 2022, there were 2289 laundromats, **an increase of 80% over four years.**
- In 2020, in Taiwan, the value of **laundry industry** is about **TWD 20 billion**
 - Including washing machines, commercial washing machines, self-service laundromats, and traditional laundries
 - Among these, the total value of self-service laundromats is about TWD 10 billion

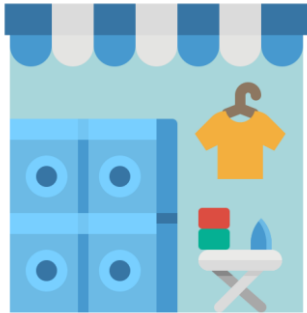
自助洗衣店店數統計

| 時間 | 新北市 | 臺北市 | 桃園市 | 臺中市 | 臺南市 | 高雄市 | 全國家數總計 |
|---------|-----|-----|-----|-----|-----|-----|--------|
| 107年 3月 | 149 | 177 | 217 | 186 | 65 | 128 | 1,243 |
| 108年 3月 | 179 | 194 | 232 | 230 | 73 | 153 | 1,422 |
| 109年 3月 | 208 | 211 | 243 | 266 | 96 | 179 | 1,644 |
| 110年 3月 | 236 | 233 | 268 | 295 | 191 | 225 | 1,977 |
| 111年 3月 | 271 | 248 | 298 | 335 | 229 | 280 | 2,289 |

資料來源：財政部統計資料庫



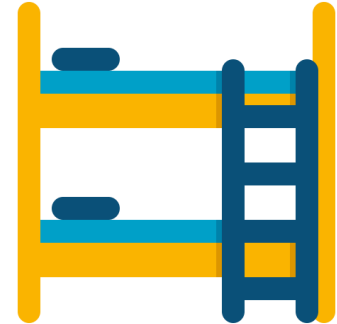
Market analysis: TA



Laundry Shop



Home User



School Dormitory

Market analysis: Competitor



Fami 自助洗衣 (Family mart)



Self-service laundry



IoT home washing machine (panasonic)



Market analysis

| | laundry reminder | Automatically washing (based on each cloth RFID) | Laundry warning | notification (the clothes are sun-dried) | recommend laundry schedule (based on wether) | recommend laundry schedule (based on traffic) | Reserve system |
|---|------------------|---|-----------------|---|---|--|----------------|
| Self-service laundry | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| IoT home washing machine (panasonic) | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ |
| fami自助洗衣 | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ |
| Smart Laundry (our) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |



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Reference

- <https://hadoop.apache.org>
- <https://www.gigabyte.com/tw/Enterprise/Rack-Server/R282-NO0-rev-100>
- <https://www.gigabyte.com/tw/Enterprise/Storage-Server/S452-Z30-rev-A00>
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- <https://www.taiwaniot.com.tw/product/grove-sunlight-sensor-%E9%99%BD%E5%85%89%E6%84%9F%E6%>
- <https://www.digikey.tw/en/products/detail/sensirion-ag/SHTC3-TR-2-5KS/8628148B8%AC%E5%99%A8/>
- <https://www.st.com/en/ecosystems/x-nucleo-nfc03a1.html>
- <https://docs.arduino.cc/hardware/uno-rev3>
- <https://www.raspberrypi.com/products/raspberry-pi-3-model-b-plus/>



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Task Partition

■ Introduction

- Motivation and application: 施冠彰

■ System and structure

- Software: 施冠彰
- Server: 張又仁
- Hardware: 黃廉傑、許詠晴
- Application Scenario: all

■ Market analysis: all

■ Organize report: all

■ Presentation: all