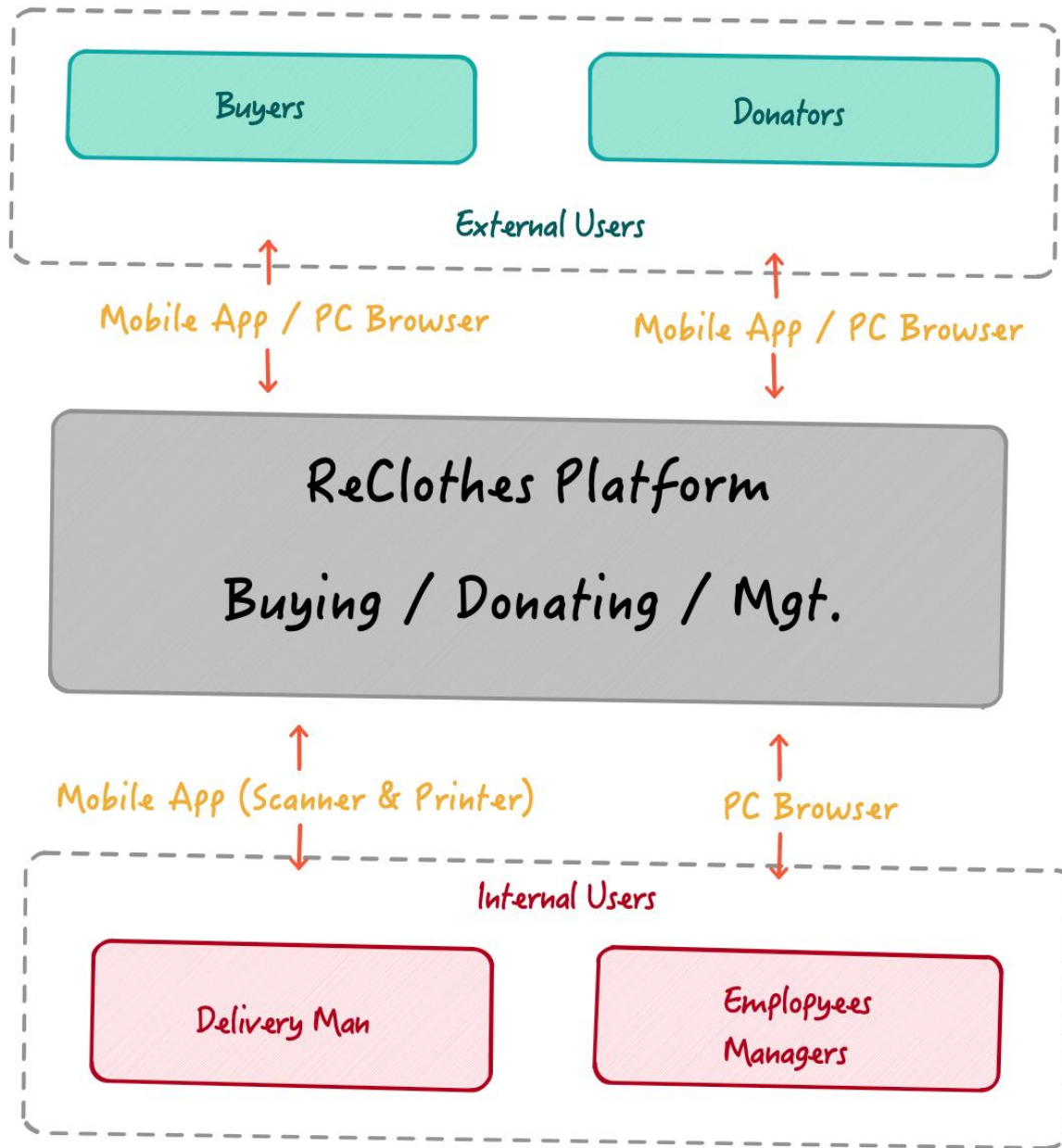ReClothes

Live a More Sustainable Life

Business Process, Quality Attributes, User Experience and User Interface (UX/UI) and Data Architecture

for

ReClothes

Terrier

Table of Contents

1 INTRODUCTION

To solve the pain point about clothes recycling and re-usage, we aim to build an online platform named ReClotheses that connects stakeholders including clothes donors, second-hand clothes consumers, recycled clothes processing plants, and charity organizations, second-hand clothes marketplace and sales distributors. In addition, ReClothes also operates as a second-hand clothes marketplace.

2 DETAILED BUSINESS PROCESSES AND SUB PROCESSES

The graphs shown below are just the overall process for forward and reveres process in donating and buying.
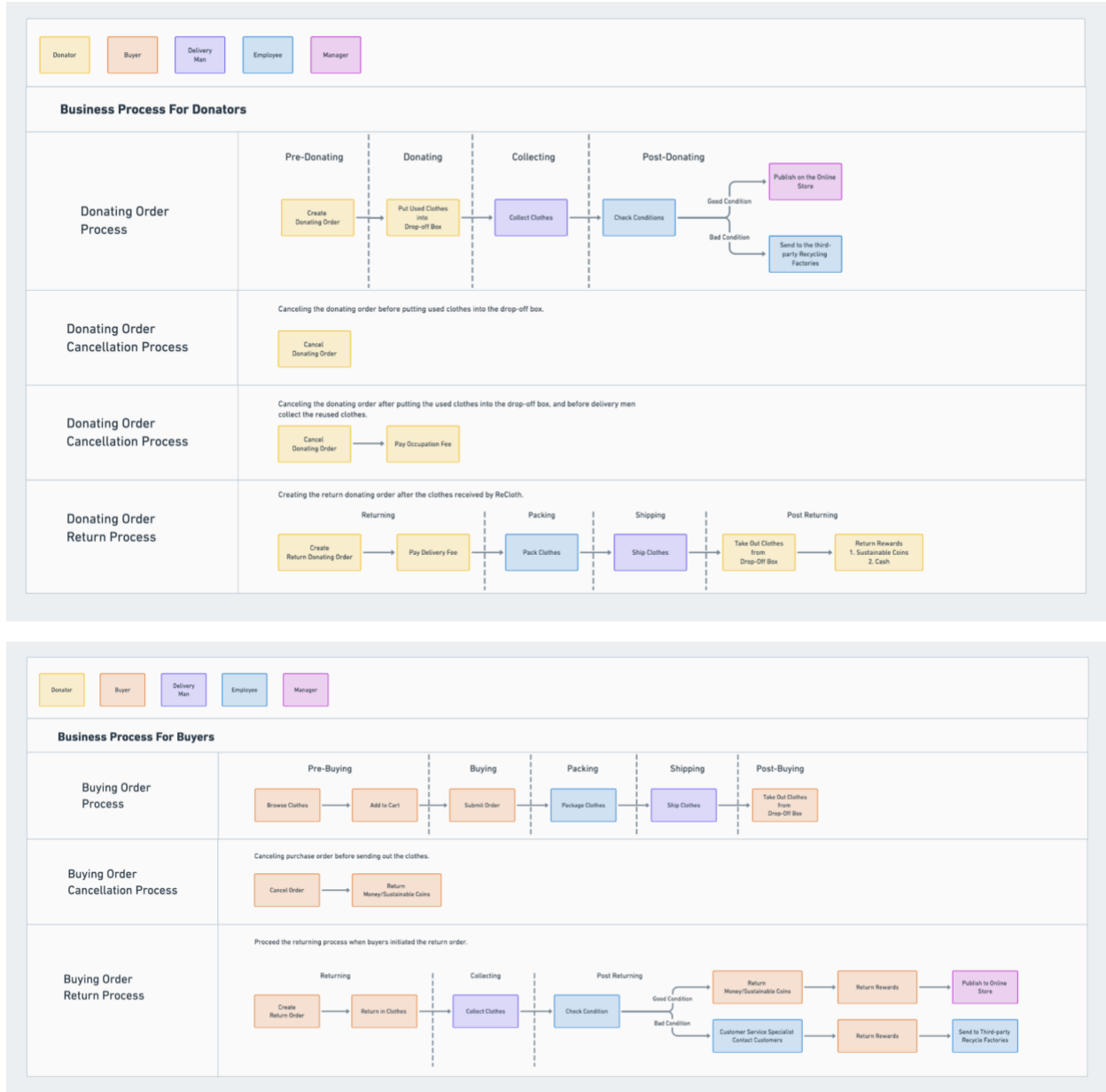
All User Stories among the Six Epics:

Epic 01: Common Functions

- #c-01, As a Donator, I want to register so that I can donate my unwanted clothes to others.

- #c-02, As a Donator, I want to log in so that I can access my account.

- #c-03, As a Donator, I want to log out so that I can make sure my account is secure.

- #c-04, As a Buyer, I want to register so that I can buy some used clothes and it's good for sustainability.

- #c-05, As a Buyer, I want to log in so that I can access my account.

- #c-06, As a Buyer, I want to log out so that I can make sure my account is secure.

- #c-11, As a Delivery Man, I want to log in so that I can access my account.

- #c12, As a Delivery Man, I want to log out so that I can make sure my account is secure.

- #c-07, As an Employee, I want to log in so that I can start my daily work.

- #c-08, As an Employee, I want to log out so that I can make sure my account is secure.

- #c-09, As a Manager, I want to log in so that I can start my daily work.

- #c-10, As a Manager, I want to log out so that I can make sure my account is secure.

Epic 02: Forward Donating Process

Pre Donating

- #d-pr-01, As a Donator, I want to create a donating order so that I can start to donate my used clothes and get some rewards.

- #d-pr-02, As a Donator, I want to add detailed information of my used clothes into the donating order so that buyers can get to know the clothes quickly.

- #d-pr-03, As a Donator, I want to choose a nearby drop-off location so that I can drop by that location conveniently.

- #d-pr-04, As a Donator, I want to submit the donating order so that I can make sure that the donating order is under processing.

Donating

- #d-do-01, As a Donator, I want to scan the QR code on the drop-off box so that the door of the box can open automatically.

- #d-do-02, As a Donator, I want to receive a notification after putting my used clothes into the box so that I can track the progress of the donating order.

- #d-do-03, As a Donator, I want to get some AR animation rewards after putting my used clothes into the box so that I can get the incentive to continue sustainability.

Collecting

- #d-co-01, As a Delivery Man, I want to receive collecting orders so that I can easily track all collecting orders.

- #d-co-02, As a Delivery Man, I want to scan the QR code to open the box so that I can take out used clothes.

- #d-co-03, As a Delivery Man, I want to print a tracking code so that I can stick the tracking code on top of the package for later process.

- #d-co-04, As a Donator, I want to receive notification after my used clothes are collected by the delivery man so that I can track the progress of the clothes.

Post Donating

- #d-po-01, As an Employee, I want to receive checking orders so that I can easily track my all checking orders.

- #d-po-02, As an Employee, I want to scan the tracking code on top of the package so that I can choose the result of checking and notify the donators.

- #d-po-03, As a Donator, I want to receive a notification after checking the condition of my used clothes so that I can know the status of my donating order.

- #d-po-04, As a Donator, I want to receive some rewards when my used clothes can only be used in some third-party recycle factories so that I can know the status of my donating order.

- #d-po-05, As an Employee, I want to choose a third-party recycling factory so that I can ship used clothes to a specific factory for recycling.

- #d-po-06, As an Employee, I want to create a new online product after the used clothes are in a good condition so that I can put this product online for selling.

- #d-po-07, As a Manager, I want to edit the price of the created product so that buyers can buy it at an affordable price.

- #d-po-08, As a Manager, I want to publish the created product so that I can choose a suitable period for showing this new product online.

- #d-po-09, As a Donator, I want to receive notification after an employee published my used clothes into an online store so that I can know the status of my donating order.

- #d-po-10, As a Donator, I want to get some rewards after an employee published my used clothes into an online store so that I can get the motivation to donate next time.

Epic 03: Forward Buying Process

Pre Buying

- #b-pr-01, As a Buyer, I want to browse all available used clothes based on my body size so that I can quickly make a smart decision.

- #b-pr-02, As a Buyer, I want to add suitable clothes into the cart so that I can submit this order later.

Buying

- #b-bu-01, As a Buyer, I want to submit the cart so that I can start the process of buying.

- #b-bu-02, As a Buyer, I want to choose the delivery info in reviewing the cart so that I can get my clothes nearby my location.

- #b-bu-03, As a Buyer, I want to submit the order after I confirm the clothes in the cart so that I can complete this order later.

- #b-bu-04, As a Buyer, I want to choose a payment method (third party payment method or sustainability coins) so that I can buy these clothes with my favorite payment method.

- #b-bu-05, As a Buyer, I want to receive a receipt email notification so that I can cancel this order or return this order by this receipt.

Packing

- #b-pa-01, As an Employee, I want to receive packing orders so that I can easily track my all packing orders.

- #b-pa-02, As an Employee, I want to print out the tracking code for the wait-to-send clothes so that I can stick it on the top of the package and track it later.

- #b-pa-03, As a Buyer, I want to receive notification after my package is under packing so that I can know the progress of my order.

Shipping

- #b-sh-01, As a Delivery Man, I want to receive shipping orders so that I can easily track my all shipping orders.

- #b-sh-02, As a Delivery Man, I want to scan the QR code on the drop-off box so that I can open the door of the box and put the package into it.

Post Buying

- #b-po-01, As a Buyer, I want to receive notification after the delivery man puts the package into the box so that I can drive to the location and take it out.

- #b-po-02, As a Buyer, I want to scan the QR code on the drop-off box so that I can open the door of the box and take the clothes out of it.

- #b-po-03, As a Buyer, I want to receive a notification after my package took out from the box so that I can know if my package was taken by me.

- #b-po-04, As a Buyer, I want to receive some rewards after I bought used clothes from ReClothes so that I can have more interest to buy them next time.

Epic 04: Reverse Donating Process

Cancel Donating Order

- #rd-c-01, As a Donator, I want to cancel the donating order so that I can have a chance to change my mind.

- #rd-c-02, As a Donator, I want to pay the occupation fee so that I can have the right to open the door of the drop-off box.

- #rd-c-03, As a Donator, I want to scan the QR code on the drop-off box so that I can open the door of the box and take out the package.

- #rd-c-04, As a Donator, I want to receive a notification after opening the door of the drop-off box.

Returning

- #rd-r-re-01, As a Donator, I want to create a return donating order so that I can track the progress of the returning.

- #rd-r-re-02, As a Donator, I want to pay the delivery fee so that I can continue the return.

Packing

- Reuse user story #b-pa-01

- Reuse user story #b-pa-02

- #rd-r-pa-01, As a Donator, I want to receive a notification after my package is under packing so that I can know the progress of my order.

Shipping

- Reuse user story #b-sh-01

- Reuse user story #b-sh-02

Post Returning

- #rd-r-po-01, As a Donator, I want to receive a notification after the delivery man puts the package into the box so that I can drive to the location and take it out.

- #rd-r-po-02, As a Donator, I want to scan the QR code on the drop-off box so that I can open the door of the box and take the clothes out of it.

- #rd-r-po-03, As a Donator, I want to return all rewards that I acquired from donating process so that I can complete the return donating process.

- #rd-r-po-04, As a Buyer, I want to receive a notification after my package took out from the box so that I can know if my package was taken by me.

Epic 05: Reverse Buying Process

Cancel Buying Order

- #rb-c-01, As a Buyer, I want to cancel the buying order so that I can have a chance to change my mind.

- #rb-c-02, As a Buyer, I want to get my paid money or sustainability coins back so that I can use this for other purposes.

Returning

- #rb-r-re-01, As a Buyer, I want to create a return buying order so that I can track the progress of the returning.

- #rb-r-re-02, As a Buyer, I want to scan the QR code on the drop-off box so that I can open the door of the box and put the clothes into it.

- #rb-r-re-03, As a Buyer, I want to receive a notification after putting my used clothes into the box so that I can track the progress of the return buying order.

Collecting

- Reuse user story #d-co-01

- Reuse user story #d-co-02

- Reuse user story #d-co-03

- #rb-r-co-01, As a Buyer, I want to receive notification after my used clothes are collected by the delivery man so that I can track the progress of the clothes.

Post Returning

- Reuse user story #d-po-01

- Reuse user story #d-po-02

- #rb-r-po-01, As a Buyer, I want to receive a notification after checking the condition of my used clothes so that I can know the status of my donating order.

- #rb-r-po-02, As an Employee, I want to contact the buyer after finding the condition of the clothes is bad so that I can know the reason and make sure how much money or sustainability coins the buyer should return.

- #rb-r-po-03, As a Buyer, I want to return rewards acquired from buying process so that I can complete my return buying order process.

- Reuse user story #d-po-05

- #rb-r-po-04, As an Employee, I want to resume the product that was created before so that I can edit the information and my manager can publish it again.

- Reuse user story #d-po-07

- Reuse user story #d-po-08

Epic 06: Management Functions

External User Mgt.

- #mf-eu-01, As an Employee, I want to forbid a specific buyer or donator after they can't follow the rule of the platform so that I can make sure the interest of other buyers and donators will not be infringed.

- #mf-eu-02, As an Employee, I want to resume a specific buyer or donator after they correct their behaviors so that I can make sure the interest of other buyers and donators will not be infringed.

- #mf-eu-03, As an Employee, I want to reset the password for buyers or donators so that I can help them to access our platform again.

- #mf-eu-04, As a Manager, I want to assign some rewards for a specific buyer or donator so that I can stimulate a buyer or donator to continue sustainability on our platform.

- #mf-eu-05, As an Employee or a Manager, I want to check how many buying orders or donating orders are related to a specific external user so that I can monitor their buying orders or donating orders.

- #mf-eu-06, As a Manager, I want to know the top 10 buyers or donators so that I can assign some rewards to them for their sustainability.

Internal User Mgt.

- #mf-iu-01, As a Manager, I want to CRUD(create, read, update, and delete) internal users so that I can manage all internal users easily.

- #mf-iu-02, As a Manager, I want to reset the password for a specific internal user after they forgot their login password so that I can quickly help them to access the platform again.

Buying Order Mgt.

- #mf-bo-01, As an Employee or a Manager, I want to monitor all buying orders so that I can track the progress of all buying orders.

- #mf-bo-02, As a Manager, I want to check all detail of a specific BO (such as related payment information, packing orders, or shipping order) so that I can do some intervention for it.

- #mf-bo-03, As an Employee, I want to monitor all return buying orders (RBO) that related to buying orders so that I can track the progress of all return buying orders.

Donating Order Mgt.

- #mf-do-01, As an Employee or a Manager, I want to monitor all donating orders so that I can track the progress of all donating orders.

- #mf-do-02, As a Manager, I want to check all detail of a specific DO (such as related to collecting the order or checking the order) so that I can do some intervention for it.

- #mf-do-03, As an Employee, I want to monitor all return donating orders (RDO) that related to donating orders so that I can track the progress of all return donating orders.

Shipping Order Mgt.

- #mf-so-01, As a Delivery Man, I want to receive a notification for assigned shipping order so that it will remind me to monitor this order.

- #mf-so-02, As a Delivery Man, I want to scan the QR code on the screen of the drop-off box so that I can open the door of the drop-off box for putting the package into it.

- #mf-so-03, As a Delivery Man, I want to monitor all assigned shipping orders so that I can track the progress of all shipping orders.

- #mf-so-04, As a Delivery Man, I want to scan the tracking code on top of the package so that I can change the status of the shipping order.

Collecting Order Mgt.

- #mf-co-01, As a Delivery Man, I want to receive a notification for assigned collecting order so that it will remind me to monitor this order.

- #mf-co-02, As a Delivery Man, I want to scan the QR code on the screen of the drop-off box so that I can open the door of the drop-off box for taking the used clothes out of it.

- #mf-co-03, As a Delivery Man, I want to monitor all assigned collecting orders so that I can track the progress of all collecting orders.

- #mf-co-04, As a Delivery Man, I want to print out the tracking code so that I can stick the tracking code on top of the package.

- #mf-co-05, As a Delivery Man, I want to scan the tracking code so that I can change the status of the collecting order.

Packing Order Mgt.

- #mf-po-01, As an Employee, I want to receive a notification for the assigned packing order so that it will remind me to monitor this order.

- #mf-po-02, As an Employee, I want to monitor all assigned packing orders so that I can track the progress of all packing orders.

- #mf-po-03, As an Employee, I want to print out the tracking code so that I can stick this tracking code on top of the package.

- #mf-po-04, As an Employee, I want to scan the tracking code so that I can change the status of the packing order.

Checking Order Mgt.

- #mf-cho-01, As an Employee, I want to receive a notification for assigned checking order so that it will remind me to monitor this order.

- #mf-cho-02, As an Employee, I want to monitor all assigned checking orders so that I can track the progress of all checking orders.

- #mf-cho-03, As an Employee, I want to scan the tracking code so that I can change the status of the checking order.

Online Product Mgt.

- #mf-op-01, As an Employee, I want to create a new online product so that my manager can publish this product for selling.

- #mf-op-02, As an Employee, I want to edit the detailed information of the online product so that I can change the description of the product.

- #mf-op-03, As a Manager, I want to edit the price of the online product so that buyers can buy it at an affordable price.

- #mf-op-04, As a Manager, I want to publish online products so that buyers can see this product on our platform.

- #mf-op-05, As an Employee, I want to resume an online product so that buyers can buy this product on our platform again.

Drop-Off Box Mgt.

- #mf-dob-01, As a Manager, I want to monitor the status of all assigned drop-off boxes so that I can do some intervention for them.

- #mf-dob-02, As a Manager, I want to assign a specific drop-off box to a specific delivery man so that the delivery man can receive related shipping orders or collect orders.

- #mf-dob-03, As a Manager, I want to assign a geographical area for a specific drop-off box so that buyers or donators can see that drop-off location.

- #mf-dob-04, As a Manager, I want to set a threshold of the capacity of drop-off so that it will remind the delivery man to collect automatically.

Off-line Coupon Mgt.

- #mf-oc-01, As an Employee, I want to monitor all generated offline coupons so that I can know the status of each one.

- #mf-oc-02, As an Employee, I want to know who received each off-line coupon so that I can do some intervention to it.

- #mf-oc-03, As a Manager, I want to assign a specific offline coupon to a specific external user so that I can stimulate their sustainability.

2.1 DETAIL BUSINESS PROCESSES

For more detailed business logic graphs, you can check the image of "ReClothes - Forward Buying Process.png", "ReClothes - Reverse Buying Process.png", "ReClothes - Forward Donating Process.png", and "ReClothes - Reverse Donating Process.png". Each image will show detailed steps for different roles and also mark the process number and the user story number.

Text with gray background means offline action.

Key Business processes	Module	Sub Processes
Business Process For Donators		
BP-D-1 Donating Order Process	BP-D-1-1 Pre-Donating	BP-D-1-1-1 Create a Donating Order
		BP-D-1-1-2 Fill in Detailed Info of the Donating Items
		BP-D-1-1-3 Choose Drop-off Location
		BP-D-1-1-4 Submit Donating Order
	BP-D-1-2 Donating	BP-D-1-2-1 Head to Drop-off Location
		BP-D-1-2-2 Scan QR Code to Open the Box
		BP-D-1-2-3 Put the Clothes to the Drop-off Box
		BP-D-1-2-4 Receive Notification (Donator)
		BP-D-1-2-5 Receive Rewards 1. AR Animation Reward
	BP-D-1-3 Collecting	BP-D-1-3-1 Receive Collecting Orders
		BP-D-1-3-2 To Drop-off Location
		BP-D-1-3-3 Scan QR Code to Open the Box

		BP-D-1-3-4 Print Tracking Code
		BP-D-1-3-5 Receive Notification (Donator)
		BP-D-1-3-6 Stick Tracking Code
		BP-D-1-3-7 Ship Back
	BP-D-1-4 Post-Donating	BP-D-1-4-1 Receive Checking Orders
		BP-D-1-4-2 Check Condition
		BP-D-1-4-3 Scan Tracking Code (Bad Condition)
		BP-D-1-4-4 Receive Notification (Bad Condition - Donator)
		BP-D-1-4-5 Receive Rewards (Bad Condition) 1. Sustainability Coins 2. Off-Line Store Coupons (After Shipping to Factory)
		BP-D-1-4-6 Choose a Third Party Recycling Factory
		BP-D-1-4-7 Ship to the Factory
		BP-D-1-4-8 Scan Tracking Code (Good Condition)
		BP-D-1-4-9 Receive Notification (Donator - Good Condition)
		BP-D-1-4-10 Wash & Clean
		BP-D-1-4-11 Take Photos of Donated Clothes

		BP-D-1-4-12 Create a New Online Product
		BP-D-1-4-13 Edit Price
		BP-D-1-4-14 Publish
		BP-D-1-4-15 Receive Notification (Donator)

		BP-D-1-4-16
		Receive Rewards
		    1. Sustainability Coins
		    2. Money Reward (Afer Selling Out)

BP-D-2 Donating Order Cancellation Process (don't put into the drop-off box)	BP-D-2-1 Cancel Donating Order	BP-D-2-1-1 Cancel Donating Order
BP-D-3 Donating Order Cancellation Process (already put into the drop-off box)	BP-D-3-1 Cancel Donating Order	BP-D-3-1-1 Cancel Donating Order
	BP-D-3-2 Pay Occupation Fee	BP-D-3-2-1 Pay Occupation Fee
		BP-D-3-2-2 To Drop-off Location
		BP-D-3-2-3 Scan QR Code to Open the Box
		BP-D-3-2-4 Take Out the Package
		BP-D-3-2-5 Receive Notification
BP-D-4 Donating Order Return Process	BP-D-4-1 Returning	BP-D-4-1-1 Create Return Donating Order
		BP-D-4-1-2 Pay Delivery Fee
	BP-D-4-2 Packing	BP-D-4-2-1 Receive Packing Orders

		BP-D-4-2-2 Pack Clothes
		BP-D-4-2-3 Print Tracking Code
		BP-D-4-2-4 Receive Notification (Donator)
		BP-D-4-2-5 Stick Tracking Code
	BP-D-4-3 Shipping	BP-D-4-3-1 Receive Shipping Orders
		BP-D-4-3-2 To Drop-off Location
		BP-D-4-3-3 Scan QR Code to Open the Box
		BP-D-4-3-4 Put in the Package
	BP-D-4-4 Post-Returning	BP-D-4-4-1 Receive Notification (Donator)
		BP-D-4-4-2 To Drop-off Location
		BP-D-4-4-3 Scan QR Code to Open the Box
		BP-D-4-4-4 Take Out the Package

		BP-D-4-4-5
		Return Rewards
		    1. Sustainability Coins
		    2. Money

		BP-D-4-4-6 Receive Notification
Business Process For Buyers		
BP-B-1 Buying Order Process	BP-B-1-1 Pre-Buying	BP-B-1-1-1 Browse Clothes
		BP-B-1-1-2

		Add to the Cart
	BP-B-1-2 Buying	BP-B-1-2-1 Submit the Cart
		BP-B-1-2-2 Choose Delivery Info
		BP-B-1-2-3 Submit Buying Order

		BP-B-1-2-4
		Payment
		    1. Third-Party Payment
		    2. Sustainability Coins

		BP-B-1-2-5 Receive Notification (Receipt Email)
	BP-B-1-3 Packing	BP-B-1-3-1 Receive Packing Orders
		BP-B-1-3-2 Pack Clothes
		BP-B-1-3-3 Print Tracking Code
		BP-B-1-3-4 Receive Notification (Buyer)
		BP-B-1-3-5 Stick Tracking Code
	BP-B-1-4 Shipping	BP-B-1-4-1 Receive Shipping Orders
		BP-B-1-4-2 To Drop-off Location
		BP-B-1-4-3 Scan QR Code to Open the Box
		BP-B-1-4-4 Put in the Package
	BP-B-1-5 Post-Buying	BP-B-1-5-1 Receive Notification
		BP-B-1-5-2

		To Drop-off Location
		BP-B-1-5-3 Scan QR Code to Open the Box
		BP-B-1-5-4 Take Out the Package
		BP-B-1-5-5 Receive Notification

		BP-B-1-5-6
		Receive Rewards
		    1. AR Animation Reward
		    2. Sustainability Coins

BP-B-2 Buying Order Cancellation Process	BP-B–2-1 Cancel Order	BP-B-2–1-1 Cancel Buying Order
	BP-B-2-2 Return Money/Sustainable Coins	BP-B-2-2-1 Return Money/Sustainability Coins
BP-B-3 Buying Order Return Process	BP-B-3-1 Returning	BP-B-3-1-1 Create Return Buying Order
		BP-B-3-1-2 To Drop-off Location
		BP-B-3-1-3 Scan QR Code to Open the Box
		BP-B-3-1-4 Put in the Clothes
		BP-B-3-1-5 Receive Notification
	BP-B-3-2 Collecting	BP-B-3-2-1 Receive Collecting Orders
		BP-B-3-2-2 To Drop-off Location
		BP-B-3-2-3 Scan QR Code to Open the Box
		BP-B-3-2-4 Print Tracking Code

		BP-B-3-2-5 Receive Notification
		BP-B-3-2-6 Stick Tracking Code
		BP-B-3-2-7 Ship Back
	BP-B-3-3 Post-Returning	BP-B-3-3-1 Receive Checking Orders
		BP-B-3-3-2 Check Condition
		BP-B-3-3-3 Scan Tracking Code (Bad Condition)
		BP-B-3-3-4 Receive Notification (Bad Condition - Buyer)
		BP-B-3-3-5 Customer Service Specialist Contact Buyers
		BP-B-3-3-6 Return Rewards (Bad Condition - Buyers)
		BP-B-3-3-7 Choose a Third Party Recycling Factory
		BP-B-3-3-8 Ship to the Factory
		BP-B-3-3-9 Scan Tracking Code (Good Condition)
		BP-B-3-3-10 Receive Notification (Good Condition - Buyers)
		BP-B-3-3-11 Wash & Clean
		BP-B-3-3-12 Resume the Product
		BP-B-3-3-13 Return Rewards (Good Condition - Buyers)

		BP-B-3-3-14 Edit Price
		BP-B-3-3-15 Publish

2.2   MAP THE SUB PROCESSES TO USER STORIES

User Stories	Sub Processes
#d-pr-01 Create a Donating Order	BP-D-1-1-1
#d-pr-02 Fill in Detailed Info of the donating items	BP-D-1-1-2
#d-pr-03 Choose Drop-off Location	BP-D-1-1-3
#d-pr-04 Submit Donating Order	BP-D-1-1-4
#d-do-01 Scan QR Code to Open the Box	BP-D-1-2-1
#d-do-02 Receive Notification	BP-D-1-2-4
#d-do-03 Receive Rewards 1. AR Animation Reward	BP-D-1-2-5
#d-co-01 Receive Collecting Orders	BP-D-1-3-1 BP-B-3-2-1
#d-co-02 Scan QR Code to Open the Box	BP-D-1-3-3 BP-B-3-2-3
#d-co-03 Print Tracking Code	BP-D-1-3-4 BP-B-3-2-4

#d-co-04 Receive Notification	BP-D-1-3-5
#d-po-01 Receive Checking Orders	BP-D-1-4-1 BP-B-3-3-1
#d-po-02 Scan Tracking Code	BP-D-1-4-3 BP-D-1-4-8 BP-B-3-3-3 BP-B-3-3-9
#d-po-03 Receive Notification	BP-D-1-4-4

#d-po-04
Receive Rewards
   1. Sustainability Coins
   2. Off-line Store Coupons
      (After Shipping to Factory)
	BP-D-1-4-5

#d-po-05 Choose a Third Party Recycling Factory	BP-D-1-4-6 BP-B-3-3-7
#d-po-06 Create a New Online Product	BP-D-1-4-12
#d-po-07 Edit Price	BP-D-1-4-13 BP-B-3-3-14
#d-po-08 Publish	BP-D-1-4-14 BP-B-3-3-15
#d-po-09 Receive Notification	BP-D-1-4-15

#d-po-10
Receive Rewards
   1. Sustainability Coins
   2. Money Reward (After
      Selling Out)
	BP-D-1-4-16

#rd-c-01 Cancel Doanting Order	BP-D-2-1-1 BP-D-3-1-1
#rd-c-02	BP-D-3-2-1

Pay Occupation Fee	
#rd-c-03 Scan QR Code to Open the Box	BP-D-3-2-3
#rd-c-04 Receive Notification	BP-D-3-2-5
#rd-r-re-01 Create Return Donating Order	BP-D-4-1-1
#rd-r-re-02 Pay Delivery Fee	BP-D-4-1-2
#rd-r-pa-01 Receive Notification	BP-D-4-2-4
#rd-r-po-01 Receive Notification	BP-D-4-4-1
#rd-r-po-02 Scan QR Code to Open the Box	BP-D-4-4-3

#rd-r-po-03
Return Rewards
   1. Sustainability Coins
   2. Money
	BP-D-4-4-5

#rd-r-po-04 Receive Notification	BP-D-4-4-6
#b-pr-01 Browse Clothes	BP-B-1-1-1
#b-pr-02 Add to the Cart	BP-B-1-1-2
#b-bu-01 Sumit the Cart	BP-B-1-2-1
#b-bu-02 Choose Delivery Info	BP-B-1-2-2
#b-bu-03 Submit Buying Order	BP-B-1-2-3

#b-bu-04
Payment
    1. Third-Party Payment
    2. Sustainability Coins
	BP-B-1-2-4

#b-bu-05 Receive Notification	BP-B-1-2-5
#b-pa-01 Receive Packing Orders	BP-D-4-2-1 BP-B-1-3-1
#b-pa-02 Print Tracking Code	BP-D-4-2-3 BP-B-1-3-3
#b-pa-03 Receive Notification	BP-B-1-3-4
#b-sh-01 Receive Shipping Orders	BP-D-4-3-1 BP-B-1-4-1
#b-sh-02 Scan QR Code to Open the Box	BP-D-4-3-3 BP-B-1-4-3
#b-po-01 Receive Notification	BP-B-1-5-1
#b-po-02 Scan QR Code to Open the Box	BP-B-1-5-3
#b-po-03 Receive Notification	BP-B-1-5-5

#b-po-04
Receive Rewards
    1. AR Animation Reward
    2. Sustainability Coins
	BP-B-1-5-6

#rb-c-01 Cancel Buying Order	BP-B-2-1-1
#rb-c-02 Return Money/Sustainability Coins	BP-B-2-2-1
#rb-c-re-01 Create Return Buying Order	BP-B-3-1-1

#rb-c-re-02 Scan QR Code to Open the Box	BP-B-3-1-3
#rb-c-re-03 Receive Notification	BP-B-3-1-5
#rb-r-co-01 Receive Notification	BP-B-3-2-5
#rb-r-po-01 Receive Notification	BP-B-3-3-4
#rb-r-po-02 Customer Service Specialist Contact Buyers	BP-B-3-3-5
#rb-r-po-03 Return Rewards	BP-B-3-3-6 BP-B-3-3-13
#rb-r-po-04 Resume the Product	BP-B-3-3-12

3 IDENTIFY QUALITY ATTRIBUTES

3.1 MAP USER STORIES TO QUALITY ATTRIBUTES

User Stories	Quality attributes mapping	Justification for the mapping
Epic 01: Common Functions		
#c-01 #c-04 External User Registration	Security	Security - The system must keep all external users' information secure and keep restricted access permission for the different internal user roles. For example, all passwords must be hashed with salt. And sensitive user information can't be accessed by common internal employees.
#c-02	Security	Security - The system can use CAPTCHA to prevent bots from login

#c-05 External User Login		into the system. And the system can provide some OAuth features to let users use third-party accounts to log in.
#c-03 #c-06 External User Logout	Security	Security - Remove the session data related to the user.
#c-07 #c-09 #c-11 Internal User Login	Security	Security - The system must restrict the employees can only log in to the system from their internal network, they can't access the system from the internet.
#c-08 #c-10 #c-12 Internal User Logout	Security	Security - Remove the session data related to the user.
Epic 02: Forward Donating Process		
#d-pr-01 #d-pr-02 #d-pr-03 #d-pr-04 Pre-Donating	Usability	Usability - Easy and simple donating process can give users more satisfaction and let them keep the habit of sustainability.
#d-do-01 #d-do-02 #d-do-03 Donating	Usability Fault Tolerance	Usability - Donators can use their phone to open the drop-off box easily Fault Tolerance - As all drop-off boxes must connect with the internet to operate correctly, these drop-off boxes should still run reliably after a network outage.
#d-co-01 #d-co-02 #d-co-3 #d-co-4 Collecting	Portability	Portability - Deliveryman can use their phone to run our system and also use their phone to connect with their portable printer for printing out tracking code.
#d-po-01 #d-po-02 #d-po-3 #d-po-4 #d-po-5 #d-po-6	Supportability	Supportability - All operations made by employees must be recorded persistently in our system for troubleshooting.

#d-po-7 #d-po-8 #d-po-9 #d-po-10 Post-Donating		
Epic 03: Forward Buying Process		
#b-pr-01 #b-pr-02 Pre-Buying	Availability Performance	Availability - The system should keep available when buyers add clothes into their shopping cart and keep the shopping process smoothly. Performance - The system should respond to buyers as quickly as possible as each delay in the shopping process will lose buyers' patience.
#b-bu-01 #b-bu-02 #b-bu-03 #b-bu-04 #b-bu-05 Buying	Security Fault Tolerance	Security - As this process contains submitting the orders and paying the order, the security among this process becomes more important than before. The system should keep buyers' credit card information securely. Fault Tolerance - The system should connect with some third-party payment tools such as Stripe or Paypal, so the system should keep running correctly after occurring some connection issues with the third-party payment platform.
#b-pa-01 #b-pa-02 #b-pa-03 Packing	Supportability	Supportability - All operations made by employees must be recorded persistently in our system for troubleshooting.
#b-sh-01 #b-sh-02 Shipping	Portability	Portability - Deliveryman can use their phone to run our system and also use their phone to connect with their portable printer for printing out tracking codes.
#b-po-01 #b-po-02 #b-po-03 #b-po-04 Post-Buying	Fault Tolerance	Fault Tolerance - As all drop-off boxes must connect with the internet to operate correctly, these drop-off boxes should still run reliably after a network outage.

Epic 04: Reverse Donating Process

#rd-c-01 #rd-c-02 #rd-c-03 #rd-c-04 Cancel Donating Order	Usability	Usability - The system should give donators a consistent feeling of smoothness not only in the process of donating but also in the process of canceling or returning.
#rd-r–re-01 #rd-r-re-02 Returning	Usability	Usability - The system should give donators a consistent feeling of smoothness not only in the process of donating but also in the process of canceling or returning.
#b-pa-01 #b-pa-02 #rd-r-pa-01 Packing	Supportability	Supportability - All operations made by employees must be recorded persistently in our system for troubleshooting.
#b-sh-01 #b-sh-02 Shipping	Portability	Portability - Deliveryman can use their phone to run our system and also use their phone to connect with their portable printer for printing out tracking codes.
#rd-r-po-01 #rd-r-po-02 #rd-r-po-03 #rd-r-po-04 Post Returning	Fault Tolerance	Fault Tolerance - As all drop-off boxes must connect with the internet to operate correctly, these drop-off boxes should still run reliably after a network outage.

Epic 05: Reverse Buying Process

#rb-c-01 #rb-c-02 Cancel Buying Order	Usability	Usability - The system should give buyers a consistent feeling of smoothness not only in the process of buying but also in the process of canceling or returning.
#rb-r-re-01 #rb-r-re-02 #rb-r-re-03 Returning	Usability	Usability - The system should give buyers a consistent feeling of smoothness not only in the process of buying but also in the process of canceling or returning.
#d-co-01 #d-co-02	Portability	Portability - Deliveryman can use their phone to run our system and also use their phone to connect with their portable

		printer for printing out tracking codes.
#d-co-02 #rb-r-co-01 Collecting		
#d-po-01 #d-po-02 #rb-r-po-01 #rb-r-po-02 #rb-r-po-03 #rb-r-po-04 #d-po-07 #d-po-08 Post Returning	Supportability	Supportability - All operations made by employees must be recorded persistently in our system for troubleshooting.
Epic 06: Management Functions		
#mf-eu-01 #mf-eu-02 #mf-eu-03 #mf-eu-04 #mf-eu-05 #mf-eu-06 External User Mgt.	Security Legality	Security - Not all employees can check the detailed information of buyers or buyers and some sensitive information cannot show to anyone. Legality - The system should follow the legislative constraints of data protection or GDPR.
#mf-iu-01 #mf-iu-02 Internal User Mgt.	Supportability	Supportability - The system should keep logging all operations made by internal users.
#mf-bo-01 #mf-bo-02 #mf-bo-03 Buying Order Mgt. #mf-do-01 #mf-do-02 #mf-do-03 Donating Order Mgt. #mf-so-01 #mf-so-02 #mf-so-03 #mf-so-04 Shipping Order Mgt. #mf-co-01 #mf-co-02	Authorization Supportability	Authorization - The system should keep different roles can only access partial information that needed be processed by this role. And only the super admin or managers can access all information. Supportability - The system should keep logging all operations made by internal users.

#mf-co-03 #mf-co-04 #mf-co-05 Collecting Order Mgt. #mf-po-01 #mf-po-02 #mf-po-03 #mf-po-04 Packing Order Mgt. #mf-cho-01 #mf-cho-02 #mf-cho-03 Checking Order Mgt.		
#mf-op-01 #mf-op-02 #mf-op-03 #mf-op-04 #mf-op-05 Online Product Mgt.	Supportability	Supportability - The system should keep logging all operations made by internal users. And the system should pay more attention to the changes in products' price.
#mf-dob-01 #mf-dob-02 #mf-dob-03 #mf-dob-04 Drop-off Box Mgt.	Supportability	Supportability - The system should keep logging all operations made by internal users.
#mf-oc-01 #mf-oc-02 #mf-oc-03 Off-line Coupon Mgt.	Supportability	Supportability - The system should keep logging all operations made by internal users. And the system should keep recording the usage of each offline coupon.

3.2   GROUP USER STORIES BASED ON QUALITY ATTRIBUTES

Quality attribute	User stories	Explanation of the attributes
Availability	#b-pr-01 #b-pr-02 Pre-Buying	All these user stories belong to the process in the shopping cart, and the shopping cart will be frequently used by the buyers. So, availability

		becomes the top priority. Without availability in the shopping cart, buyers will quickly lose patience for the further process.
Security	#c-01 #c-04 External User Registration #c-02 #c-05 External User Login #c-03 #c-06 External User Logout #c-07 #c-09 #c-11 Internal User Login #c-08 #c-10 #c-12 Internal User Logout #b-bu-01 #b-bu-02 #b-bu-03 #b-bu-04 #b-bu-05 Buying #mf-eu-01 #mf-eu-02 #mf-eu-03 #mf-eu-04 #mf-eu-05 #mf-eu-06 External User Mgt.	For all functions related to login and registration, security is the most important thing. Without security in these processes, attackers can easily acquire buyers' or donators' sensitive information or payment information, it's very dangerous. Besides this, the system also needs to store the user information carefully, such as complying with the rule of GDPR or some other legal rules.
Portability	#d-co-01 #d-co-02 #d-co-3 #d-co-4 Collecting #b-sh-01 #b-sh-02	As deliverymen need to use their mobile app to connect with an external printer for printing out tracking codes. It's more important for developers to write efficient and fault-tolerant codes to connect with third-party

	Shipping #b-sh-01 #b-sh-02 Shipping #d-co-01 #d-co-02 #d-co-02 #rb-r-co-01 Collecting	hardware.
Performance	#b-pr-01 #b-pr-02 Pre-Buying	For the process of buying, any degree of latency will influence the experience of buyers, and it finally will reduce the percentage of the user retention.
Usability	#d-pr-01 #d-pr-02 #d-pr-03 #d-pr-04 Pre-Donating #d-do-01 #d-do-02 #d-do-03 Donating #rd-c-01 #rd-c-02 #rd-c-03 #rd-c-04 Cancel Donating Order #rd-r–re-01 #rd-r-re-02 Returning #rb-c-01 #rb-c-02 Cancel Buying Order #rb-r-re-01 #rb-r-re-02 #rb-r-re-03 Returning	All functions that are exposed to external users need to keep simple and easy to understand. Buyers and donators will lose patience quickly for some complex front-end logic. Keeping front-end pages simple and easy will attract them to stay on this platform for hours. And finally, they can get some sustainable habits.
Testability	All user stories	As this system contains two sub-systems, it's more important to write unit tests

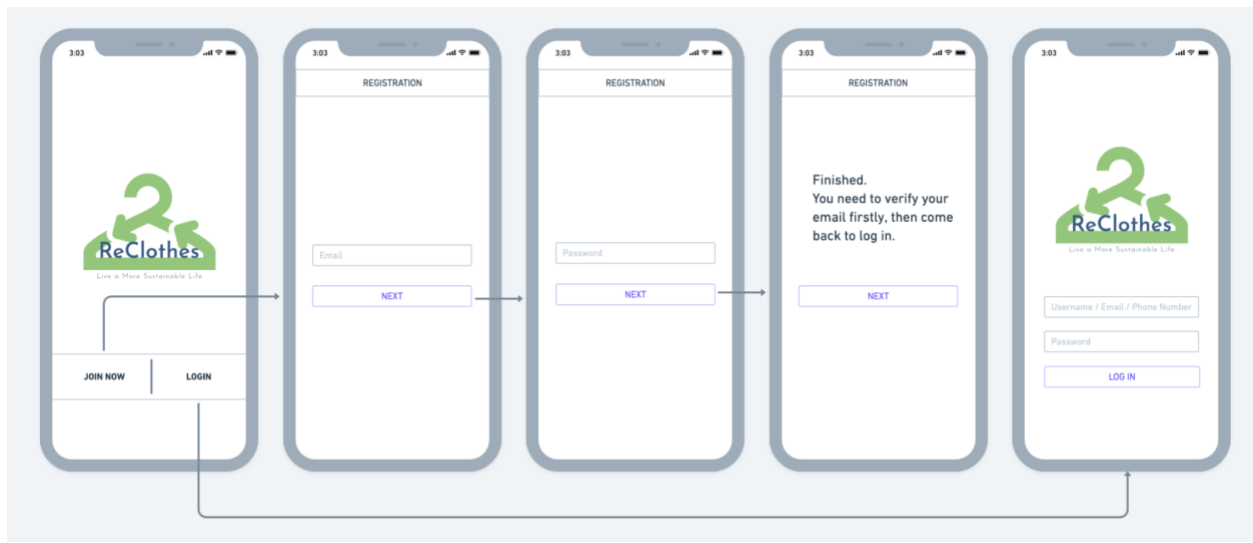|		for making sure all codes comply with the requirements correctly. In addition, the system might reach 70% test coverage for core functions.
Scalability	All user stories	Different modules will have different degrees of traffics. For example, almost all processes need to use the order module, so we need to put more servers in this module in case of any kind of traffic surge.
Agility	All user stories	We consider using agile methodology to develop this platform, so the whole system will separate into several different domains for each agile team to develop. And companying with CI/CD will improve the efficiency of development and deployment.
Supportability	#d-po-01 #d-po-02 #d-po-3 #d-po-4 #d-po-5 #d-po-6 #d-po-7 #d-po-8 #d-po-9 #d-po-10 Post-Donating #b-pa-01 #b-pa-02 #b-pa-03 Packing #b-pa-01 #b-pa-02 #rd-r-pa-01 Packing #d-po-01	All functions related to the order module need a persistent log and some kind of alerting for notifying employees to process manually.

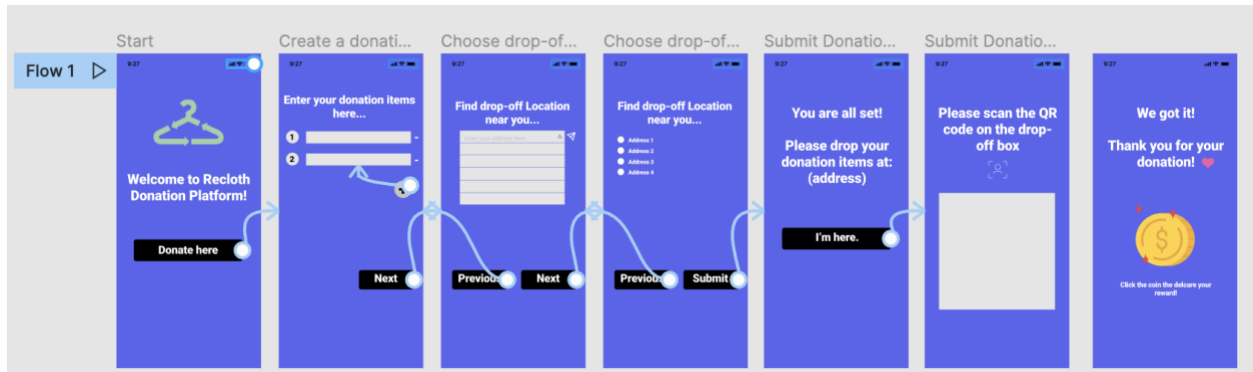|		
	#d-po-02 #rb-r-po-01 #rb-r-po-02 #rb-r-po-03 #rb-r-po-04 #d-po-07 #d-po-08 Post Returning #mf-iu-01 #mf-iu-02 Internal User Mgt. #mf-bo-01 #mf-bo-02 #mf-bo-03 Buying Order Mgt. #mf-do-01 #mf-do-02 #mf-do-03 Donating Order Mgt. #mf-so-01 #mf-so-02 #mf-so-03 #mf-so-04 Shipping Order Mgt. #mf-co-01 #mf-co-02 #mf-co-03 #mf-co-04 #mf-co-05 Collecting Order Mgt. #mf-po-01 #mf-po-02 #mf-po-03 #mf-po-04 Packing Order Mgt. #mf-cho-01 #mf-cho-02 #mf-cho-03 Checking Order Mgt. #mf-op-01 #mf-op-02 #mf-op-03 #mf-op-04	

	#mf-op-05 Online Product Mgt. #mf-dob-01 #mf-dob-02 #mf-dob-03 #mf-dob-04 Drop-off Box Mgt. #mf-oc-01 #mf-oc-02 #mf-oc-03 Off-line Coupon Mgt.	
Fault Tolerance	#d-do-01 #d-do-02 #d-do-03 Donating #b-bu-01 #b-bu-02 #b-bu-03 #b-bu-04 #b-bu-05 Buying #b-po-01 #b-po-02 #b-po-03 #b-po-04 Post-Buying #rd-r-po-01 #rd-r-po-02 #rd-r-po-03 #rd-r-po-04 Post Returning	All functions related to the drop-off box need to improve the fault-tolerance as these boxes might lose internet connection for some reason. So, it's more important to provide some alert or manual process after an internet outage in the drop-off box.
Legality	#mf-eu-01 #mf-eu-02 #mf-eu-03 #mf-eu-04 #mf-eu-05 #mf-eu-06 External User Mgt.	For storing external users' information, our system needs to comply with some data protection rules such as GDPR.
Authorization	#mf-bo-01 #mf-bo-02 #mf-bo-03	All internal users must assign a role for different management permissions.

	Buying Order Mgt. #mf-do-01 #mf-do-02 #mf-do-03 Donating Order Mgt. #mf-so-01 #mf-so-02 #mf-so-03 #mf-so-04 Shipping Order Mgt. #mf-co-01 #mf-co-02 #mf-co-03 #mf-co-04 #mf-co-05 Collecting Order Mgt. #mf-po-01 #mf-po-02 #mf-po-03 #mf-po-04 Packing Order Mgt. #mf-cho-01 #mf-cho-02 #mf-cho-03 Checking Order Mgt.	

4   UI / UX

4.1   LOGIN & REGISTRATION

4.2 Forward Donating Process

https://www.figma.com/file/sgg74LxagXlWP4WoCmu7xX/Forward-Donating-Process?node-id=0%3A1

Donator's user interface:

Delivery man's user interface:
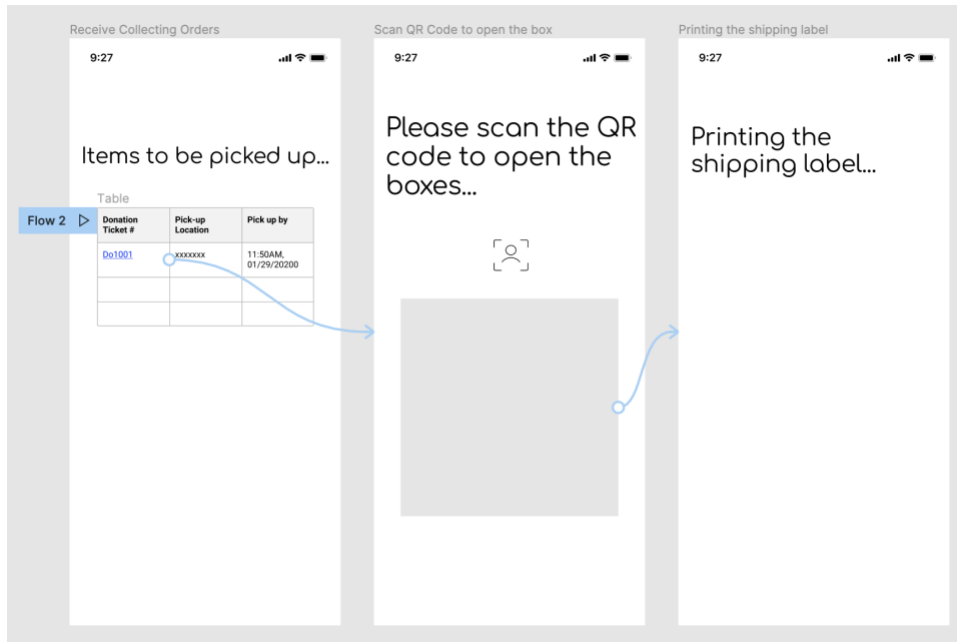
Recloth Employee's User Interface:

Condition

Checking Order:

Table

Good Condition	Bad Condition	Item #	Item Name
0/1	0/1	xxxx	Pink Jacket

Good Condition   **Bad Condition**

Items in Good Condition

Items in Good Condition

Items in Good Condition

	Item #	Item Name	Price	Picture
⊘				
⊘				
⊘				
⊘				
⊘				
⊘				
⊘				

Publish

STUDENT IT ARCHITECTURE COMPETITION

Items in Good Condition
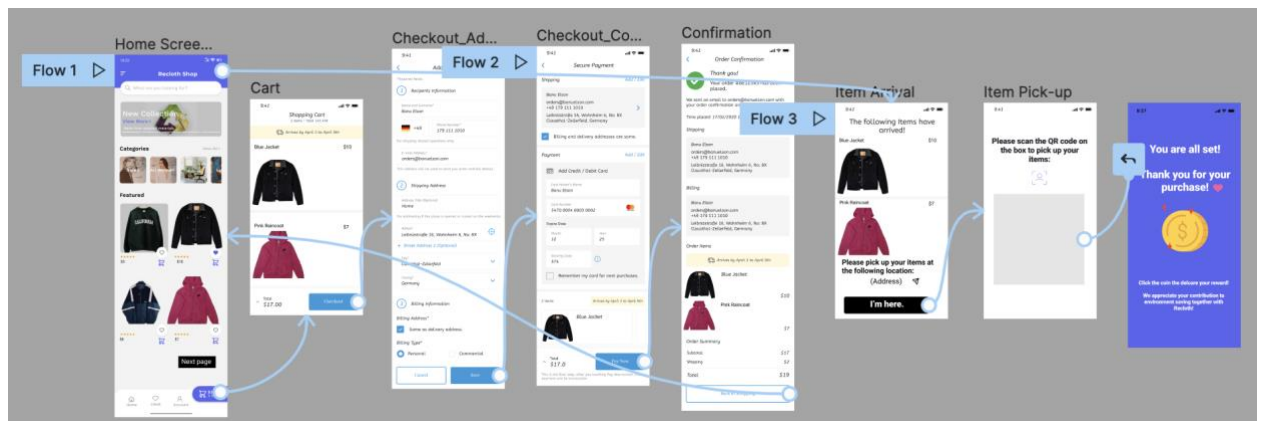
Items in Bad Condition

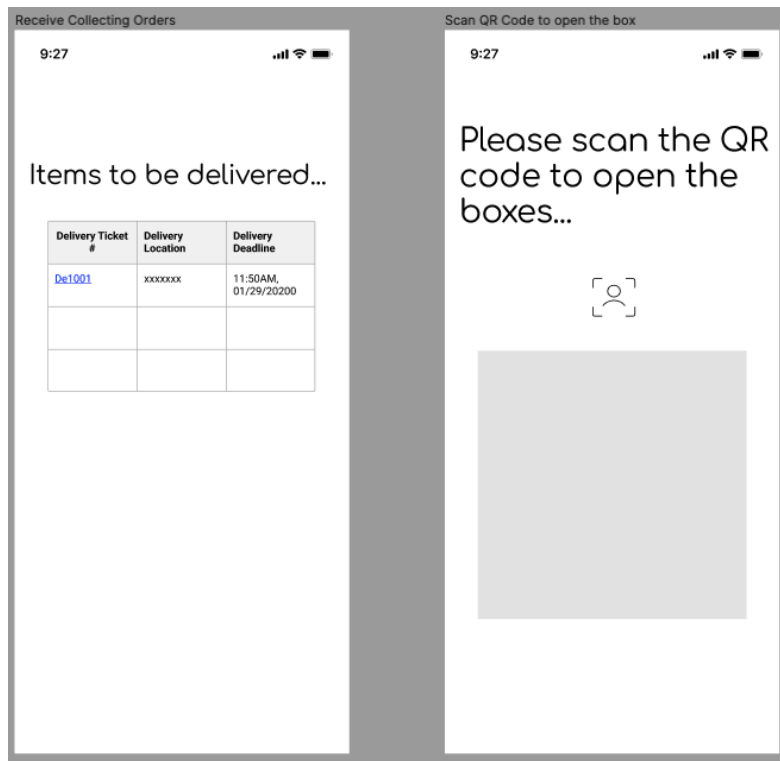| Item #	Item Name	Price	Factory

4.3   FOWARD BUYING PROCESS

https://www.figma.com/file/w1PdjW8hx4ThMVRmImbvjG/Forward-Buying-Process?node-id=0%3A1

Buyer's user interface:

Delivery man's user interface:

5 DATA ARCHITECTURE

5.1 IDENTIFY DATA ENTITIES FOR EACH USER STORY

User Stories	Entities	Description
Epic 01: Common Functions	User Customer	User entity and customer entity are used for registration, login, and logout functions.
Epic 02: Forward Donating Process **Pre-Donating**	Order(Donating Order) Order Item	Donators should create a donating order and related order items to record the information of used clothes.
Epic 02: Forward Donating Process **Donating**	Drop-off Location Drop-off Box	Donators should use the app to scan the QR code on each drop-off box to open the door of the drop-off box for putting their used clothes. Each donating order

|		will belong to one specific drop-off box.
Epic 02: Forward Donating Process **Collecting**	Order(Collecting Order) Order Item Drop-off Location Drop-of Box Notification	After receiving the collecting order, the app will show a related drop-off box to the deliveryman, then the deliveryman driver to the location and scan the QR code to open the door of the drop-off box. After collecting by the deliveryman, the notification will be sent to the customer.
Epic 02: Forward Donating Process **Post Donating**	Order(Checking Order) Order Item Notification Product Coupon Sustainability Coin Coin Record	After receiving the checking order, the employee can start to check the condition of the used clothes. No matter these used clothes are sent to the third-party factories or saved for online selling, the donator will receive notification from the system. After determining to send to the factories, the donator will receive some off-line coupons for rewarding. If the used clothes were determined to sell online, the donator will receive some sustainability coins for rewarding. For the used clothes that are determined for selling, employees and managers will create an online product for that and set a reasonable price.
Epic 03: Forward Buying Process **Pre-Buying**	Product Cart Cart Item	Customers can browse all products and related detailed information. After clicking the "add to cart" button, the product will add to the cart for later ordering.
Epic 03: Forward Buying Process **Buying**	Order(Buying Order) Order Item Payment	After submitting the shopping cart, the system will create a buying order for all purchased products. In addition, the payment record will be

		created after successful payment.
Epic 03: Forward Buying Process **Packing**	Order(Packing Order) Order Item Notification	The employees will pack used clothes after they receive a packing order. At the same time, the notification will also send to the buyer.
Epic 03: Forward Buying Process **Shipping**	Order(Shipping Order) Order Item Drop-off Location Drop-of Box Notification	As soon as the deliverymen get the shipping order, they will take the package and drive to a specific drop-off location, then put the package into a specific drop-off box.
Epic 03: Forward Buying Process **Post Buying**	Drop-off Location Drop-of Box Coupon Sustainability Coin Coin Record	The buyer can take out the clothes by scanning the QR code on the drop-off box. After that, they can receive some rewards such as offline coupons or sustainability coins.
Epic 04: Reverse Donating Process **Cancel Donating Order**	Order(Canceling Donating Order) Order Item Payment Drop-off Location Drop-off Box	After creating the canceling donating order, the customer needs to pay some occupation fee for the period of occupation of the drop-off.
Epic 04: Reverse Donating Process **Returning**	Order(Returning Donating Order) Order Item Payment	If the used clothes had already been sent to the company, the customer needs to create a returning donating order for the further process. After that, the customer also needs to pay the delivery fee.

Epic 04: Reverse Donating Process **Packing**	Order(Packing Order) Order Item Notification	Same in the process of packing of Epic 03(Forward Buying Process)
Epic 04: Reverse Donating Process **Shipping**	Order(Shipping Order) Order Item Drop-off Location Drop-of Box Notification	Same in the process of shipping of Epic 03(Forward Buying Process)
Epic 04: Reverse Donating Process **Post Returning**	Drop-off Location Drop-of Box Coupon Sustainability Coin Coin Record	After taking out the used clothes from the drop-off box, the rewards that the donator previously received need to return for completing the returning process.
Epic 05: Reverse Buying Process **Cancel Buying Order**	Order(Canceling Buying Order) Order Item Payment	If the buyer didn't pay anything before starting the canceling process, the buyer can directly cancel this buying. And the system will create a canceling buying order for recording this event. If the used clothes didn't send to the drop-off box but the customer already paid for the used clothes, the system will create a canceling buying order and the system will return the money or the sustainability coins to the buyer.
Epic 05: Reverse Buying Process **Returning**	Order(Returning Buying Order) Order Item Drop-off Location Drop-of Box	After taking out the used clothes from the drop-off box, the buyer can still return these clothes for any reason. At this time, the system will create a returning buying order for the buyer. After that, the buyer can put the clothes into the drop-off for further process.

Epic 05: Reverse Buying Process **Collecting**	Order(Collecting Order) Order Item Drop-off Location Drop-of Box Notification	Same in the process of collecting of Epic 02(Forward Donating Process)
Epic 05: Reverse Buying Process **Post Returning**	Order(Checking Order) Order Item Notification Product Coupon Sustainability Coin Coin Record	Just like the process of post-donating of Epic 02(Forward Donating Process), the employee will check the condition of the used clothes again for the further process. If everything is OK, the buyer will receive the money or the sustainability coins back. If something wrong in the process, the customer specialist will contact the buyer for the further process.
Epic 06: Management Functions **External User Mgt.**	Customer Coupon Sustainability Coin Coin Record	In this management module, the internal employees can manage all buyers and donators and manage their offline or sustainability coins.
Epic 06: Management Functions **Internal User Mgt.**	User Role Log	Only higher-level internal admins can manage this module, they can create a new internal user or assign different roles to this user. In addition, they can also check out all logs related to a specific internal user for auditing.
Epic 06: Management Functions **Buying Order Mgt.** **Donating Order Mgt.** **Shipping Order Mgt.**	Order Order Item	Different internal users with different roles can only see orders that belong to them. They can also see the status of each order. After they complete their tasks, they can click the complete button and move this order to the next stage.

Collecting Order Mgt. **Packing Order Mgt.** **Checking Order Mgt.**		
Epic 06: Management Functions **Online Product Mgt.**	Product	In this module, after washing and cleaning the used clothes and taking photos of them, employees can create a new online product in this module. In the meantime, the manager can edit the price of this product for publishing this product.
Epic 06: Management Functions **Drop-Off Box Mgt.**	Drop-off Location Drop-off Box	Employees can use this module to manage all drop-off boxes that spread over each corner of the city. They can monitor the health of each drop-off box, and check the status of the door of the drop-off box.
Epic 06: Management Functions **Off-line Coupon Mgt.**	Coupon	Employees with sufficient permissions can manage this module to set a rule that can assign coupons automatically after buyers purchase the used clothes or donators donate the used clothes. They can also assign offline coupons manually.

5.2 BUILD DATA ARCHITECTURE
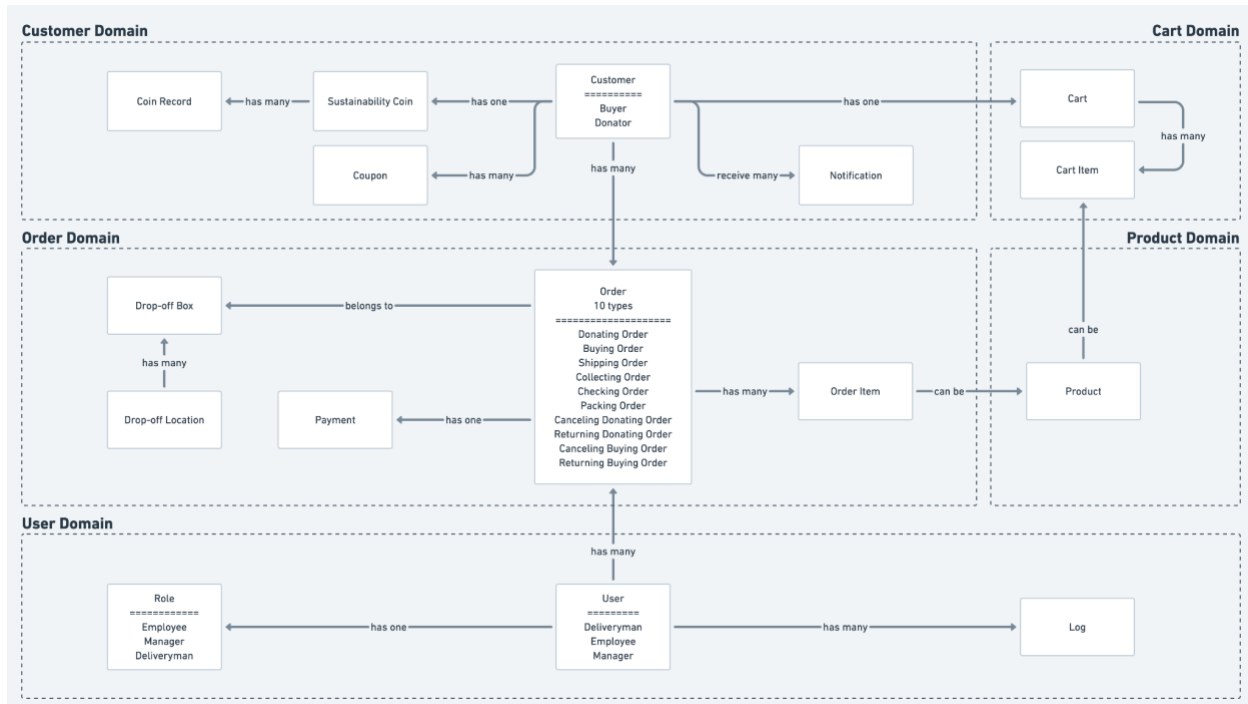
For the data architecture above, we separate this whole platform into five different domains, and each domain only has one dependency on the other domains. Because we consider using the microservices architecture, each domain above will represent a single service in the microservices. And for different degrees of pressure, each domain will have different auto-scaling policy to scale out or scale in to match the traffic.

1. **Customer Domain**

   All entities that have strong dependencies with buyers or donators will count into this domain. Gathering related entities into one domain can also reduce the probability of distributed consistency.

2. **User Domain**

   Only user entity, role entity, and log entity count into this domain.

3. **Order Domain**

   This is our key domain in our platform. For this domain, we can add extra servers for any spike of traffics.

4. **Cart Domain**

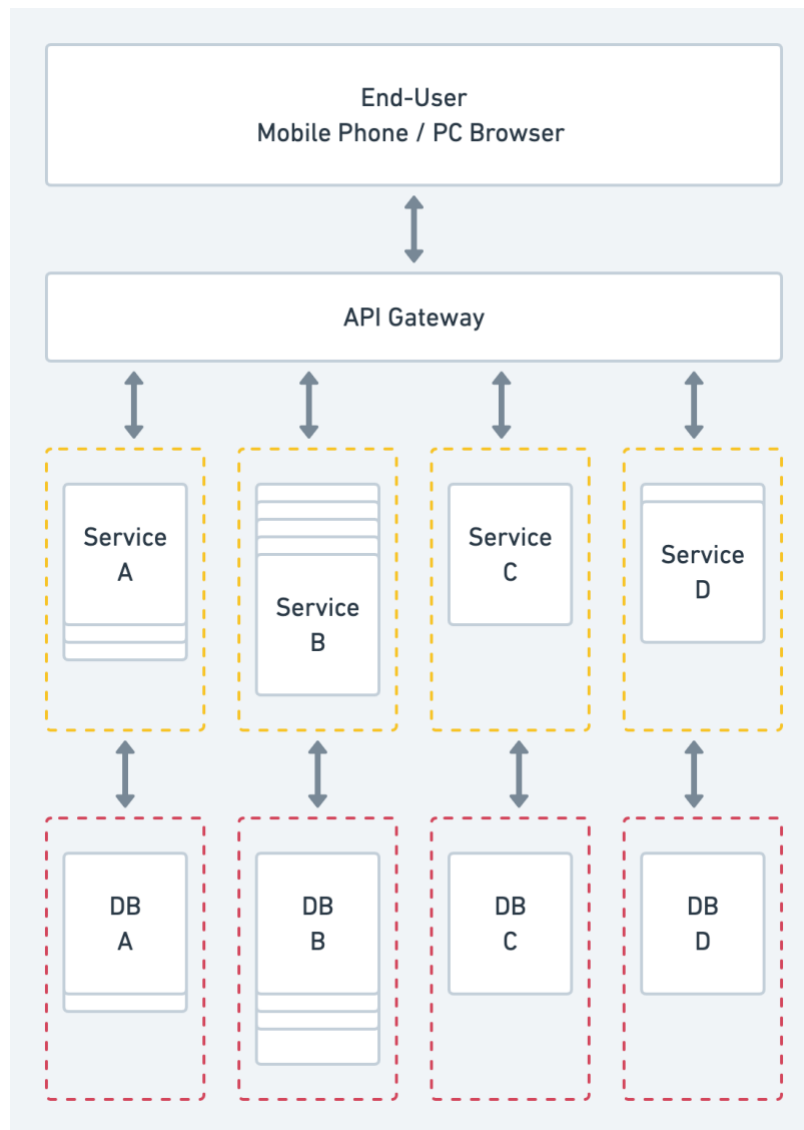   High availability is the top priority in this domain.

5. **Product Domain**

This domain should have the quick searching capability and can support frequently changing information of products.

6 SYSTEM LEVEL ARCHITECTURAL CHOICES

6.1 ARCHITECTURE STYLE

Choosing Microservices Architecture.

The Features of Microservices Architecture:

1. Decoupling

Each service among microservices can be decoupled with each other and transfer messages through message queues.

2. CI/CD

   Microservices can easily deploy with CI/CD tools such as Jenkins, after submitting the codes into a remote code repository, Jenkins can do some unit tests and integrate tests, then update the image of the Docker. And Kubernetes can create a new pod with an updated Docker image. This whole process will improve the efficiency of the development and coding delivery.

3. Agility

   Microservices greatly match the methodology of Agility. Each service in microservices can use the Agile approach can the number of the team can be fixed into 5 - 8 people. It's easy and more efficient than the waterfall methodology.

4. Scalability

   Using microservices can easily scale in or scale out the number of servers to match the changes of the traffic.

Some Drawbacks:

1. More complex than monolithic

   It's true that it's more complex than before, but microservices are truly suitable for higher accessing pressure and multi-domain systems. Because the whole platform needs to support the future a massive number of visiting and million concurrent users, this architecture can automatically scale out to resolve the visiting pressures easily. In addition, each domain of our platform can act as a service, and it's decoupled between services. So, it's good to set different numbers of servers for different services. For example, the function of shopping cart is our core function, we need to set more servers to address frequently adding or removing products.

2. More expensive than before

   Since the microservices can easily tune the number of servers, the system can automatically set fewer servers when the traffic is lower. So, setting the auto-scaling policy is the most important thing. We can set some metrics to monitor the average transactions per second (TPS), after this metric is higher than a fixed value, we can launch a new instance to resolve the pressure.

Microservices Domains:

For the purpose of decoupling, we consider setting each service for each domain in our system.

Domains:

- Order Domain
- External Users Domain
- Internal User Domain
- Shopping Cart Domain
- Product Domain

6.2   AR TECH

For letting people live a sustainable life, we consider providing some AR animations to attract people to continue to donate their used clothes or buy some used clothes.

In the mobile app, the different platforms have different implementation tools to help developers to implement an AR animation for developers. For example, in IOS, we can use ARKit to show the animation on the Apple mobile devices. And in Android, we can use ARCore to show the same animation on any Android phone.

6.3   CLOUD PROVIDER

Choosing AWS Cloud Provider.

Reasons for AWS:

1. No Upfront Cost

   Deploying our platform in a cloud provider is more beneficial than in our own data center since there's no mass of upfront cost that we need to pay. We only pay for what we used.

1. Reduce Time

   Without building our own infrastructure, we can reduce a lot of time to provide our service in the market.

2. Leading Position

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services

Source: Gartner (July 2021)

Through the report of Gartner, AWS is still the leading cloud provider among other cloud providers. This means that AWS can provide a more reliable service and the best user experience than others.

3. Better Secure

    AWS utilizes an end-to-end approach to secure and harden the infrastructure, including physical, operational, and software measures.

4. Easy For Migration

    We can deploy our system through the service of EKS, it's easy to migrate to other cloud providers in the future as almost all cloud providers support the Kubernetes. So, without abundant changes of configuration, we can successfully and easily migrate the whole platform from one to another.

6.4 SECURITY

6.4.1 Role-based Permission

Our platform consists of two subsystems, one for external users (buyers and donators) to let them live a sustainable life. Another system is built for all kinds of orders management and external users and internal users management. For buyers and donators, there is no feature of membership levels, each buyer or donator has the same levels to use all provided features. But for the internal system, we assign different employees for different tasks for higher working efficiency. Such as our deliverymen have the responsibility to collect user donated clothes to our company or ship donated clothes to drop-off boxes for buyers. So, after the deliveryman logs in to our internal system, he/she can only see his/her shipping orders or collecting orders, he/she can't have the opportunity to see other kinds of orders.

For most information systems, role-based permission management is really popular and pervasive. We can use the role and related access rules to give a specific user a fixed role, which will give that user a fixed access scope. When you want to change the access permissions of a bunch of users, you can just edit the access permissions of the role related to those users without editing each user's permissions one by one. Role-based permissions are really intuitive and just like real enterprise human resources management. A new coming employee will assign a position and that position will give this new employee some permissions to access internal resources and some responsibilities to fulfill.

For implementing this in our internal system, we need two management modules, one for user management, another for role management. In the user management module, the administrator can assign each user a specific role that will give this user different access permissions. In the role management module, the administrator can assign different roles with different access permissions, such as full permission or reader permission.

In our codes, we can use some interceptor to intercept every API request, and the interceptor can acquire the current user's role, then check which kind of permissions this role owns in this API scope. If this current user doesn't have any permission to call this API, the interceptor will respond with a permission issue to the user. In contrast, if this user owns correct permissions, the interceptor will transfer this request to a specific controller to process this request.

6.4.2 HTTPS

Hypertext Transfer Protocol Secure(HTTPS) is an extension of the Hypertext Transfer Protocol(HTTP). It is used for secure communication over a computer network and is widely used on the Internet. So for more secure access in two sub-systems, we determine to use this protocol for all requests and not provide HTTP access entirely.
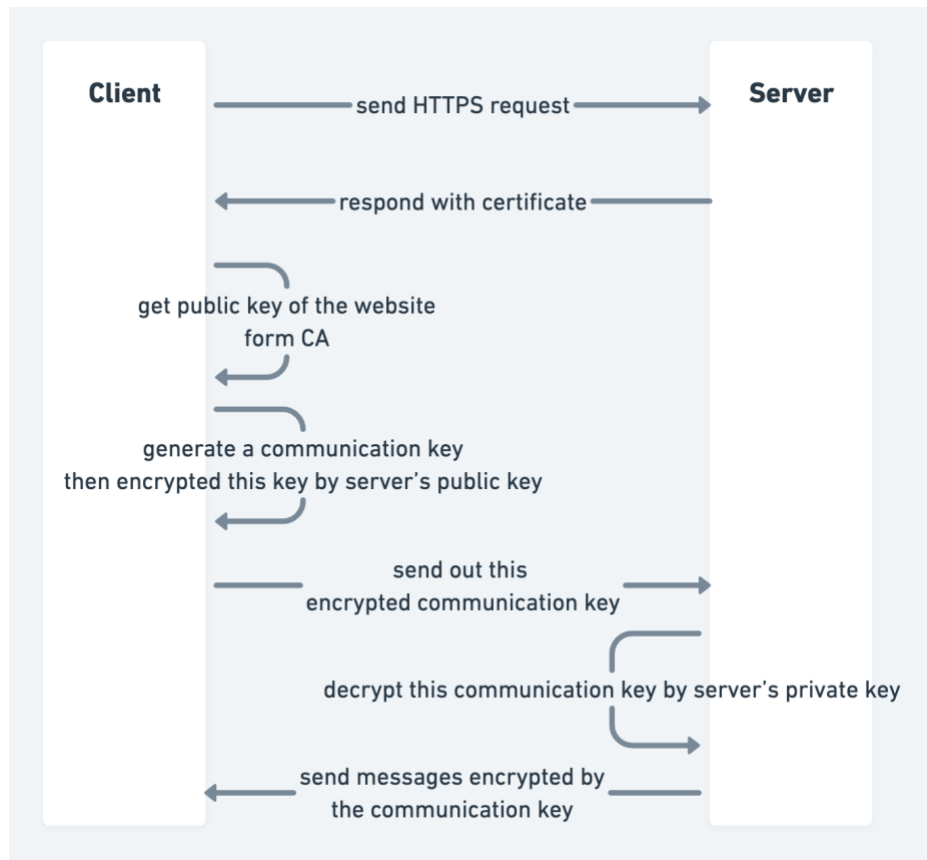
The encryption of actual message data exchanged by the end-user and our website will be done by using symmetric encryption as it's safe enough and efficient. So for encrypting all messages, the end-user and our website need a communication key to encrypt messages. For that purpose and also prevent the man-in-the-middle attack, the end-user needs to get our website's public key from an authorized and trusted organization, the certificate authority (CA). After getting this public key, the end-user's browser can generate this communication key for later message transfer, then use this public key to encrypt this communication key with an asymmetric encryption algorithm such as RSA. After our website gets this encrypted communication key, we can use our private key to decrypt this communication key. For now, the two sides all have a communication key to encrypt subsequent messages. Finally using HTTPS protocol can easily prevent the common "man-in-the-middle" attack.

```
server {
    listen              443 ssl;
    server_name         www.example.com;
    ssl_certificate     www.example.com.crt;        ——→ certificate file
    ssl_certificate_key www.example.com.key;         ——→ pricate key file
    ssl_protocols       TLSv1 TLSv1.1 TLSv1.2;
    ssl_ciphers         HIGH:!aNULL:!MD5;
    ...
}
```

For implementing this strategy, we need to purchase an SSL certificate from a certificate authority (CA) firstly, then copy the certificate file the private key file into the directory of our website, and do some configuration in our web server such as Nginx to implement HTTPS.

6.4.3   Restricted Access for Internal Management Sub-system

For our internal sub-system, we need to pay more attention to security as any kind of end-users' sensitive information leak will destroy the trust of the end-users and also result in some degree of financial loss. Not the same with the external system that provides features for buyers and donators, the internal management system only provides management features for our internal limited employees. We have three kinds of internal users, the deliverymen, the common employees, and the managers. The common employees and the managers usually use this internal system in our company environment by our internal network that can connect to the internet. But the deliverymen have a different situation, they usually use their mobile phones to connect to our internal system and they connect to the internet by the cellular network, not our internal network.

For common employees and managers, we can restrict to access our internal system only from a fixed IP range that belongs to our internal network IP range. So, common employees and managers can only access this internal network only when they use our internal network to access it.

But for deliverymen, we need some other solution to restrict their access. We can use a VPN tool to let their mobile phone connect to our internal network, then their mobile phone will transfer each request to our internal network, and get responses through the internal network. In the perspective of the internal system side, it just looks like the deliverymen access the internal management system from our internal network. And more importantly, this VPN needs to log in with an account and password. Finally, the deliverymen who installed a valid VPN tool and owned a valid account and password can access this internal system through the internal network.

7   APPLICABLE STANDARDS

7.1   GDPR

The General Data Protection Regulation (GDPR) was enacted by the European Union to deepen and harmonize personal data protection regulations. It is a comprehensive and clear set of guidelines that acknowledges that different "flavors" of personal data require different levels of protection. Sensitive data, such as health, biometrics, genetic, or criminal history are subject to the highest levels of protection. The quantity of data also counts, with companies that regularly collect and process large volumes of personal data having to register with government-appointed Data Protection Authorities.

GDPR applies to all companies, no matter where they are based, who collect and process personal data on EU residents. Non-EU companies have to appoint a GDPR representative and will be liable for all fines and sanctions.

Six principles of the GDPR:

1. Lawfulness, fairness and transparency : you must process personal data lawfully, fairly and in a transparent manner in relation to the data subject.
2. Purpose limitation : you must only collect personal data for a specific, explicit and legitimate purpose. You must clearly state what this purpose is, and only collect data for as long as necessary to complete that purpose.
3. Data minimization : you must ensure that personal data you process is adequate, relevant and limited to what is necessary in relation to your processing purpose.
4. Accuracy : you must take every reasonable step to update or remove data that is inaccurate or incomplete. Individuals have the right to request that you erase or rectify erroneous data that relates to them, and you must do so within a month.
5. Storage limitation : you must delete personal data when you no longer need it. The timescales in most cases aren't set. They will depend on your business' circumstances and the reasons why you collect this data.
6. Integrity and confidentiality : you must keep personal data safe and protected against unauthorized or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organizational measures.

For complying with GDPR, we consider the strategy below:

1. We are committed to protect customer personal information and guarantees that such information is only used for the purposes agreed to by customers. Our privacy policy is completely transparent to the public. At the same time, we take various technical measures to ensure that customer personal information is well protected.
2. We need to state the purpose and the objective of data in the privacy policy page.
3. Erecting a complete and specific data collection plan.
4. providing user profile page which give user rights to edit or remove personal data.
5. providing an account deletion function, which achieves systematic account deletion.
6. encrypting and/or pseudonymizing personal data wherever possible.

5. REFERENCES:

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