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when possible

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No hardware design is requested and customers use their own devices.

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+ Goal 1: customers can queue online without reaching the store online;
+ Goal 2: customers can make a reservation for a store registered in the system;
+ Goal 3: customers can choose their preferred store by the all present;
+ Goal 4: customers must be safe during their visit at a store;
+ Goal 5: customers must be able to buy whatever they need at a store;
+ Goal 6: every customer must be allowed to queue aiming to enter in a store;
+ Goal 7: no crowds have to be present outside the store;
+ Goal 8: customers who queue first are the first to enter the store;
+ Goal 9: precise estimation of the waiting time must be accessible to the queuing customers;
+ Goal 10: customers receive a notification when they need to get out in order to reach the store;
+ Goal 11: customers cannot overload a store's queue;
+ Goal 12: system is configurable for the needs of every store;

Goal 13: customers' access must be supervised.

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Goal 1: user can wait its turn from home until is called;

Goal 2: user can book a visit to the store;

Goal 3: user can optionally insert the approximate duration of the visit;

Goal 4: user can optionally insert items or the items' category they intend to buy;

Goal 5: system provides a precise estimation of waiting time to the user;

Goal 6: system alerts the user about the time they need to reach the store;

Goal 7: system suggests alternative time slots in case the one requested is full;

Goal 8: system can suggest other stores to the user;

Goal 9: system can give periodic notification of available time slots to the user;

Goal 10: system output a QR to the user to identify its digital queue number and it is unique.

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security staff

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checkpoint controllers

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security staff

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says it's his number

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approaches the entrance wanting to be granted to access

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Queue: it is the queue that customers need to be in before entering a store(FIFO)

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+ **Category:** a set of products with similar characteristics;

+ **Checkpoint:** a point at which ticket and temperature checks are performed;

+ **Checkpoint controller:** a worker who performs checkpoint checks;

+ **Customer**: is a person which wants to visit the store in order to buy items;

+ **Item**: a product which is sell in a store;

+ **Queue:** it is the queue that customers need to be in before entering a store (FIFO);

+ **Queue display:** a screen displaying the number of the ticket whose holder is to be admitted into the store;

+ **Sector:** a store's well defined area where products of certain category are stored;

Store manager: is a worker of a specific store at which is granted the access of store's parameters modification service;

+

Queue display: a screen displaying the number of the ticket whose holder is to be admitted into the store

Checkpoint: a point at which ticket and temperature checks are performed

Checkpoint controller: a worker who performs checkpoint checks

Category: a set of products with similar characteristics

Sector: a store's well defined area where products of certain category are stored

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Abbreviations:

OS: stands for operating system

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S2B: system to be;

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Introductory text to the chapter (how it is subdivided and what are we going to say in the chapter)

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The overall description is the part of the RASD document where is explained and specified at a high level what are the requirements and the functions to be realized by the system. This section contains some UML models which explains the machine and world

for the project. The product perspective paragraph explains the scenarios and the behaviour at a high level of the entities involved in the system's scope. The product function contains an explanation of the requirements which must be fulfilled by the system. The user characteristics section details how each user of the system acts.

TIn this section are first presented scenarios to provide examples and more details on the shared phenomena defined in the previous section. Secondly is provided the domain model.provides: scenarios, the class diagram, and statecharts.

T

provides: scenarios, the class diagram, and statecharts.
The following scenarios are all set during a viral outbreak.

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Finally, the father inserts the chosen way to reach the grocery store.

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An elderly man has been shopping using the ticket machine to get his tickets. He realizes that it would be both more convenient and safer for him to use the web app from home. He would avoid unnecessary waiting time in the supermarket. This leads him to buy a new smartphone with a data plan included. He rapidly makes it to the web app by using the phone's default browser. Once there, he is guided to register by a very simple and clear UI. During the registration, he inserts personal information. Finished the registration he starts using the app by booking a visit to his favourite store.

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Interfaces:

User Interfaces:
Customers web app: offers all the ticket booking and related functionalities
Store managers web app: offers a console where the manager can set store's parameters like opening hours or sections
Checkpoint controllers web app: accesses the user camera and scans the ticket's QR code, showing on screen its validity
Ticket machine UI: very easy and basic UI with a button to print a ticket

Hardware interfaces:
Ticket machine:
Computers:
Mobile devices:
Queue display: it display the queue number in very big font making it easy to read
Software interfaces:
Web app: unique app for all users that offers different UIs and functionalities depending on the logged user type
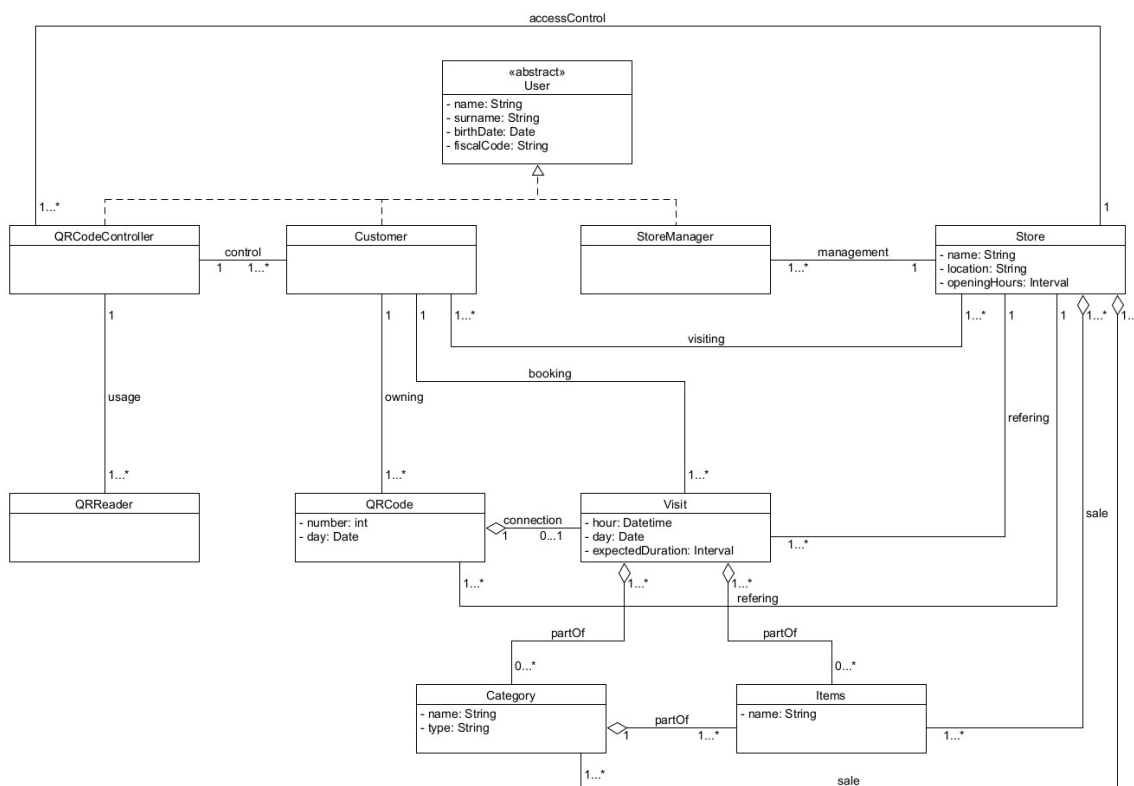**Ticket machine software:**
database

English (United Kingdom)

Figure 2.1

UML Class Diagram

Classes and labels visible in diagram:

- «abstract» User
  - name: String
  - surname: String
  - birthDate: Date
  - fiscalCode: String
- CheckpointController
- Customer
- StoreManager
- Store
  - name: String
  - location: String
  - openingHours: Interval
- TicketMachine
- QRReader
- QRCode
  - number: int
  - day: Date
- VisitReservation
  - hour: Datetime
  - day: Date
  - expectedDuration: Interval
  - groupDimension: int
- Category
  - name: String
  - type: String
- Items
  - name: String

Associations: usage, accessControl, management, partOf, visiting, booking, refering, control, owning, usage, connection, sale, partOf, refering, partOf, partOf, sale
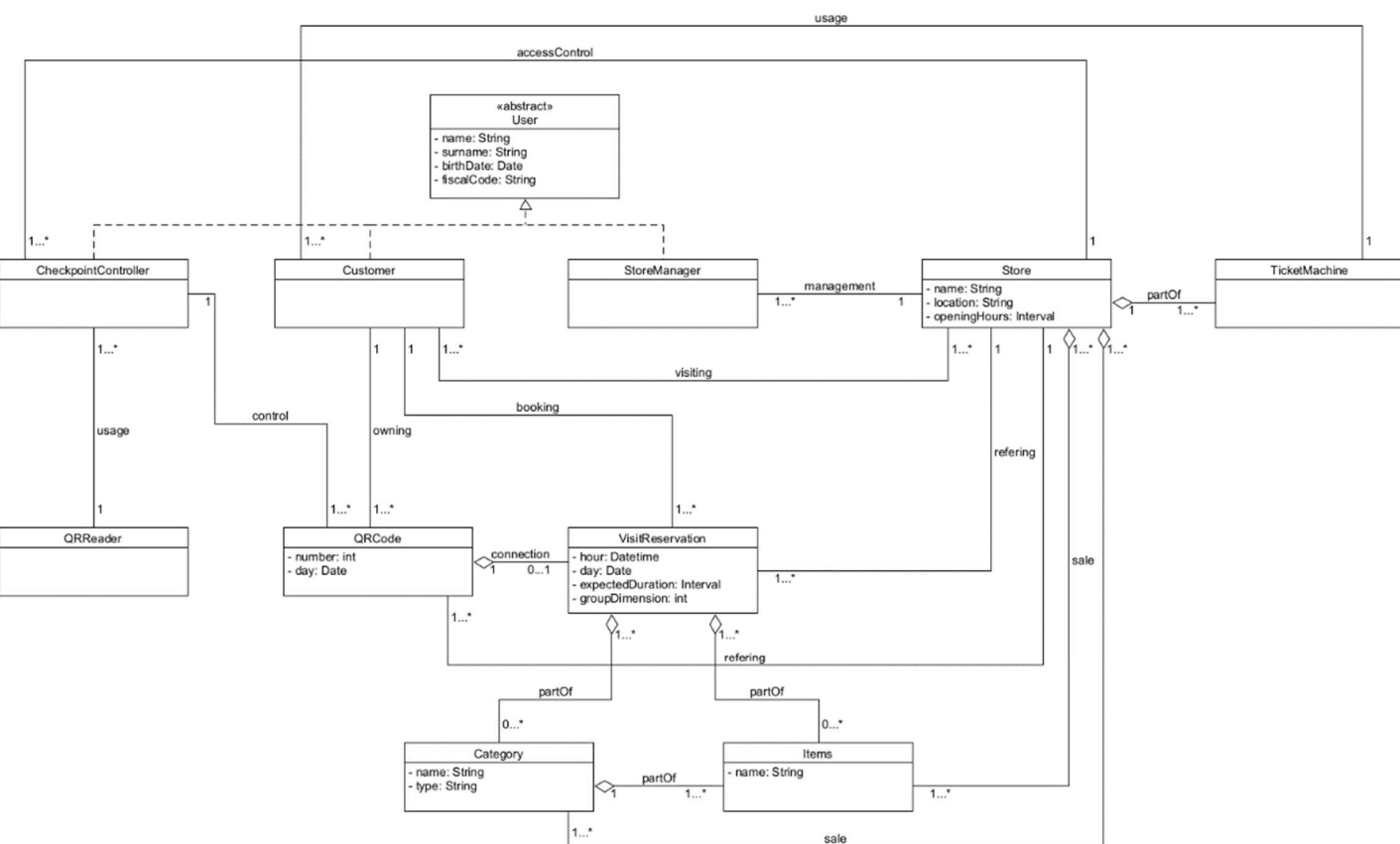
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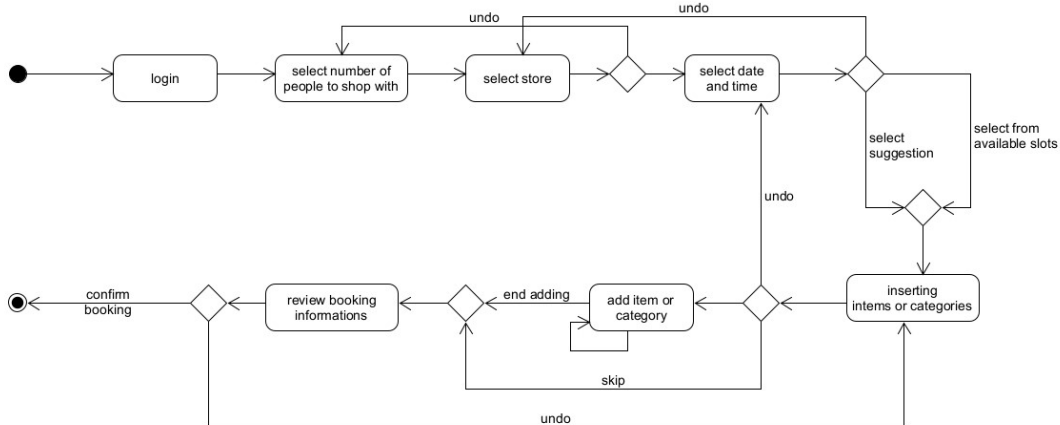| Page 10: Inserted	Marco Petri	05/11/2020 20:48:00
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QR code controller

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checkpoint controller

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 represents the customer

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Booking a visit (andrea, completare)

Customers can also book a visit instead of queueing. They can do it from the web app and diagram (figure 4) describes this process.

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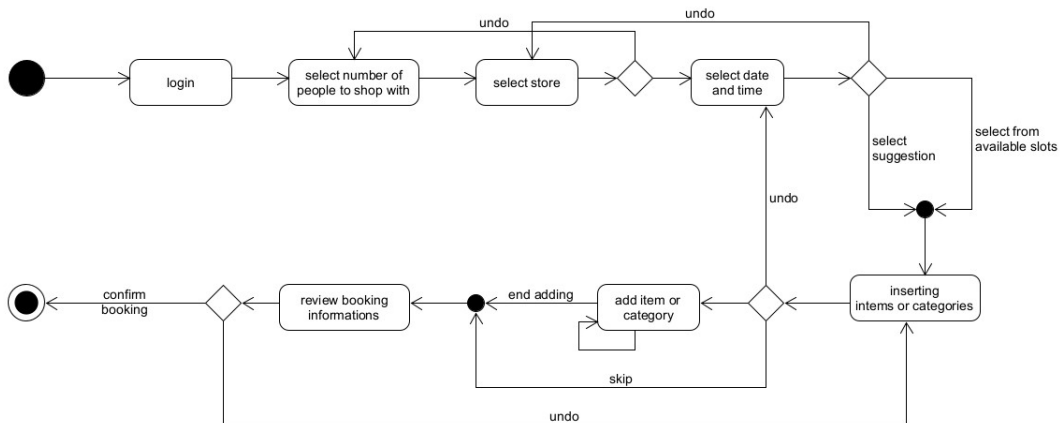
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Ticket machine (andrea, completare)

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When customers are unable use the web app, they can use the ticket machine instead, but for queueing only. The diagram (figure 2.5) describes the process that ticket machine users have to go through to be admitted into the store.

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Manager (andrea, completare)

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Store managers can modify parameters regarding their store from the web app. The diagram (figure 2.7) shows how they can do it.

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If the customer is not able to provide a list of items if can optionally *provide a list of categories of items they intend to buy*.

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In any case, the system will not accept a QR code that has already been used for a valid entrance: once the customer has entered he or she will need a new ticket or booking in order to re-enter.

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among the store employees

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Assumption?

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checkpoint controller

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the logistics regarding the customers

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They may have internet at home as well as they may not.

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They have a mobile devices used to scan QR codes;

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o
o They may grant access to customers as well as they may disallow customers to enter the grocery store.

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1.1

The following statements are assumed to be true:

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they have
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 (this could be achieved by granting special discounts to those that do respect their declarations or by enforcing sanctions if a customer buys a product from another section) *to move somewhere else
1.

Customers who do not explicitly declare their intension might instead visit any store sector
1.

the
1.

Every access point to the store or exit is monitored by one or more checkpoint controller who is in charge of preventing irregularities. In particular such employee will not permit multiple groups to enter at a time and will make sure that customers who exit do not get in contact with queuing/entering customers within the area of the store.
1.

Customers who leave the store make their ticket or booking no longer usable, regardless of what they purchased, i.e. they need a new ticket or the booking of a new visit to enter again. *requirement maybe
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Maybe a requirement?

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Customers who get a ticket through their app must show their QR code in order to prove the validity of the ticket, either on their phone or on paper.

1.

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A checkpoint controller will scan the QR codes of every customer in order to prove the validity of their ticket/booking. Customers holding an invalid ticket will be prevented from entering the store.

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1.

A customer can reach the store by foot, car or public transport. No other ways of getting to the store are considered.

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1.1.1

- **Customers web app:** offers the queueing, booking, and related functionalities.

-

- **Store managers web app:** offers a console where the manager can set store's parameters like opening hours or sections
- **Checkpoint controllers web app:** accesses the user camera and scans the ticket's QR code, showing on screen its validity
- **Ticket machine app:** very easy and basic UI with a button to print a ticket
- **Queue display web app:** shows the queue state of a store

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1.1.1

The application does not have any hardware interface. This is because all the hardware services used like the GPS or the camera are accessed indirectly through the web browser, that then interacts with the operating system.

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1.1.1

- **Web browser:** it is necessary to run the web app (descrivere)
- **Map service:** it is needed to estimate how much time the user will need to reach the store
- **DBMS:** it is used by the application to store and retrieve data to perform its main activities
- **Windows OS:** it is necessary to run the ticket machine app. It is chosen over the other OS because it is the most popular among ticket machines

1.1.1

- **HTTPS:** the application will use this protocol to safely communicate over the internet

1.1.1 Use cases

1.1.1.1 Registration

Registration involves a customer which is not already registered to the service. It must use the generic web application accessible to everyone and start registration filling the form.
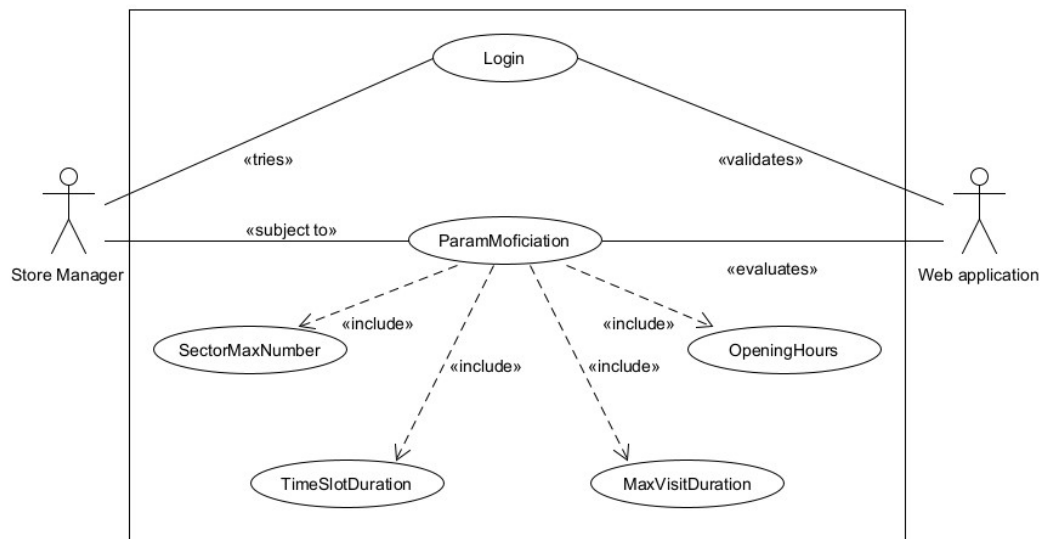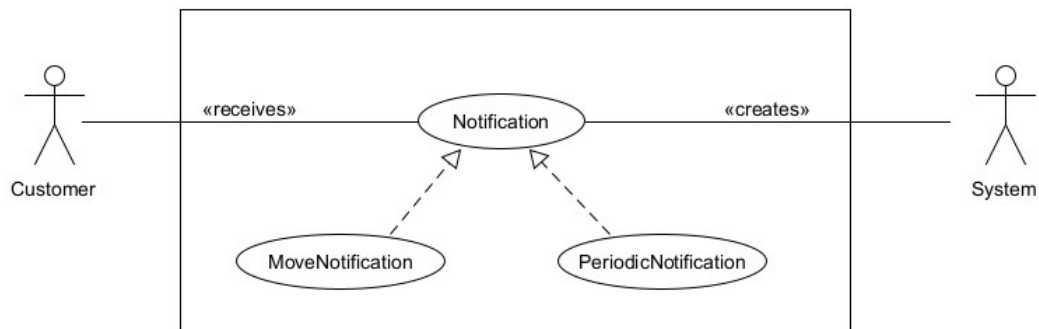
1.1.1.2 Store manager sets parameters

The modification of parameters done by the store manager passes through its web application, which is an important actor in this use case.

1.1.1.3 Notifications

Notification is the process of the system intended to notify the user about a free slot or about the necessity of getting out to reach the grocery store in time.

1.1.1.4 Taking a ticket
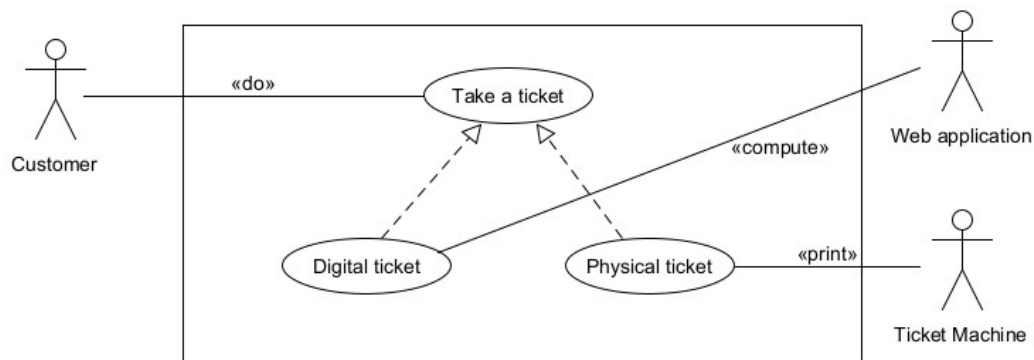
Taking a ticket is an activity involving three different actors of the S2B.

1.1.1.5 QR Code validation

Taking a ticket is an activity involving only the customer and the checkpoint controller.

Visit booking

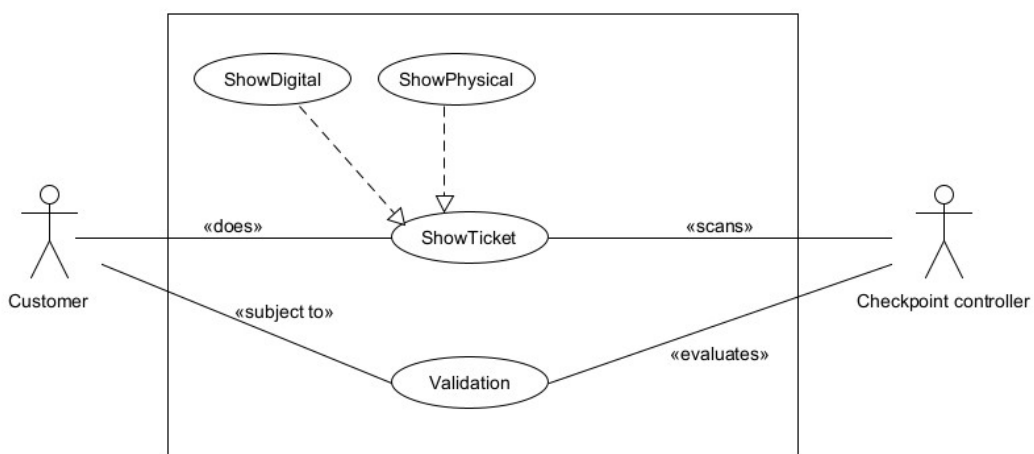| Page 20: Formatted	Marco Petri	10/11/2020 16:07:00

Heading 3

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1.1.1.1

Registration

Connection
Fill fields
Validation

Store manager sets parameters

Store managed logs in his system interface
Store manager may set:
Maximum number of customers for each sector of the store
Sets the duration of time slots
Sets the maximum duration for a visit
Sets the opening hours

User receives the notification of free slots

System sends a notification to the user periodically of a free slot

Take a ticket via internet

Select store
Ask ticket
Show waiting time

Notification to arrive

Send notification to arrive to the shop

Take a ticket personally

Go to the machine
Take the ticket

QR code validation

  User get closer to QR controller
  Show code
  Use case: QR code controls validity

QR code controls validity

  QR code controller scan QR with its machine
  QR code controller verifies the validity

Book a visit

  User chooses the preferred store
  Use case: Selection of the time slot
  Use case: Selection of duration for a visit
  Use case: Selection of items for a visit

Selection of the time slot

  User chooses the visit day
        If that day is full, other stores are suggested
  User receives a list of available time slots
  User receives a list of suggested time slots
  User selects a time slot or ask for a suggestion

Selection of duration for a visit

  If the user is a long term user may specify duration, instead it must

Selection of items for a visit

  User can select exact items if present, if not it selects the category

Requirements and comments

Intelligent granularity: no category of things with milk, pasta category ok

requirement: chosen time slots must be consecutive

requirement: suggested time slots are distant from each other of K minutes

1. A user who wants to use the system online as a customer must register for free. Further uses require customers to login with valid credentials. Registration requires submitting a user name, a password, name, surname and birth date. However only the username and password couple is required in order to log in.
2. Store managers and checkpoint controllers need to log in as well, but their accounts are created by a sys-admin. Thus they do not need to register as store managers or controllers. (mapping)
3. After logging in, a user can only access the functionalities that are specific of their role.
4. The system will display a digital map with all the available stores in their area. Customers can select a store where they intend to make a purchase, among the displayed ones.
5. If a store was previously selected, customers can join a digital FIFO queue. After joining a queue, the system will send the user a digital ticket. A user can have at most one valid ticket for a given store at any time, i.e. it is not allowed to get another ticket for a store S while being in the digital queue for S. (mapping)
6. A digital ticket consists of a number representing the position in the queue and a QR code. For any two customers waiting in the same queue, their waiting numbers are not equal.
7. If a customer A is in a digital queue, the system will display an estimated waiting time t. Such time is such that the difference between t and the real time T should not exceed 5 minutes. (pensiamoci in seguito, formalizzare meglio)
8. When the estimated time calculated at point 7 is less or equal than the estimated travel time for a customer A, they will receive a notification telling them to reach the store.
9. If a customer wishes so, they can retrieve a paper printed ticket at the store. Such ticket is identical to a digital ticket for what concerns its validity constraints.
10. The system will "call" waiting numbers by displaying them on a monitor at the entrance of the store.

Assuming that at most N people are allowed to be in the store at the same time, and M people are currently in the store, the system will call N-M numbers sequentially. I

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1. N-M > 1, then the calls will have a temporal distance of two minutes in order to avoid the formation of crowds while entering the store. (aggiungere che la coda è solo per client singoli)
12. A non-scanned ticket is valid for store S if and only if it was issued for S and its number has not been called by S yet or if the call happened no longer than 2 minutes before. In any other case, the ticket is marked as invalid, and the next waiting number will be called.
13. A customer may also ignore the digital queue and book a visit for a store instead.

If the functionality specified at point 13 was selected, the system will display a time

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1. table on the customer's device, plus a set of pre-calculated suggested visits. Each day is divided in time slots of equal length. The customer may either select a finite number of contiguous and free time slots for their visit, or one of the suggested visits.

15. Suggested time slots always have a total duration between 15 and 20 minutes.

16. In case the customer chooses to specify their own time interval, the total time they specify must not exceed a time limit established by the store manager. Furthermore, customers can only choose time slots that start and end after the opening time and before the closing time of the selected store.

17. While booking the user may input a list of items and categories of items that they intend to buy. Their app will show a list of categories and items that they can choose.

18. Finally, in order to validate the booking of a visit, the user must submit how they intend to reach the store, choosing from a fixed list of options. After doing that the system will send the user a QR code that certifies their booking.

19. The system will send a notification to the user who has successfully booked a visit T minutes before their due visit time. T is the expected travel time, and is set to the average travel time for the type of option that the user has selected as specified in the previous point.

20. A non-scanned QR code for a visit is valid for store S if and only if it was issued for S and either the selected time of arrival has not arrived yet or no more than 5 minutes have passed since the selected time of arrival.

21. Checkpoint controllers can scan a customer's QR code upon letting them into the store. The system will check the validity of the code, and will display an error message if the token has lost its validity. After being scanned and approved, the token is marked as invalid, and thus cannot be reused for entrance.

22. A store manager who has previously logged in may set parameters for their store only. Such parameters are: the maximum number of people allowed in a store sector at the same time, the length of each time slot, the maximum permitted duration of a visit, opening and closing time of the store.

If a customer has used their app for longer than one month, the system will send them a notification once every two days. Such notification contains a list of 3 stores that are within their area and that have free time slots. The stores whose data is sent are always the 3 stores for which the sum of free time intervals at the time of sending is maximum.

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1.1.2 Requirements to goal mapping

Requirements must be mapped in the goals of the application. Goals must be granted given the domain assumptions and the requirements. Here there is a list of the mappings between the requirements and the

goals of the application. We adopt the convention to identify the requirements with the format RN where N is the requirement number and GN is the goal number N:

R1	G1, G2, G3, G4	The listed goals can be reached only if the user is registered, if not they cannot be reached
R2	G11	
R3	G1, G2, G3, G4	
R4	G1, G2	If a customer wants to book a visit or to queue to a store to enter, he needs the presence of an object making him able to select the store
R5	---	
R6	G10	
R7	G5	
R8	G5, G6	
R9	G13	
R10	G12, G14	
R11	G12, G13, G14	
R12	G2	
R13	G2, G3	
R14	G3	
R15	G2, G3	
R16	G4	
R17	G2	
R18	G6	
R19	G12, G13, G14	
R20	G13	
R21	G11	
R22	G8, G9	

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Software system attributes

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Software system attributes

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Header and footer text box changes
Footnote changes
Endnote changes