

Software Engineering

Books or notes are **not** allowed.

Write only on these sheets. **Concise** and **readable** answers please.

Surname, name, matricola _____

Covid green pass

Complete mobility of a person in Italy (moving across regions, entering public events, etc) requires a Covid green pass. A pass is a declaration that certifies that a person

- has performed a Covid swab test with negative results in the previous 72 hours

Or

- has been vaccinated in the previous 9 months (time starting 15 days from performing the first vaccine shot)

Or

- has recovered from Covid illness in the previous 6 months

The green pass is implemented in digital form by the Covid pass system

Swab test. The entity that performs the test enters the required information on a web site (let's call it DGC) maintained by the Ministry of Health. The entity can enter the information only after authentication. Accounts for authentication are released by the Ministry of Health. Swab data entry can be done manually, by an operator. Or (more likely) automatically, connecting the IS of the entity to the DGC. This automatic connection is important since the entity has to enter, in batch, data for a large number of swab tests.

Vaccination. The ASL that performs the vaccination enters the vaccination data on the information system of the ASL. At regular times (ex every night) automatically the information system of the ASL transmits in batch the required information to the DGC, after authentication. ASLs already have accounts, also released by the Ministry of Health.

Covid illness. The hospital or ASL that takes care of the sick person enters the data (when the illness started, when it ended as from negative swab test) on the information system of the hospital or ASL. In a similar way as for vaccinations, the data is sent in batches to DGC.

The **citizen** can access his Covid pass in two ways. Accessing the DGC, using his SPID account (SPID is the digital identity provided by the Italian Government to all citizens who request it). Or using the IO app. IO app is an app (running on Android/ iOS mobile phones) to handle the interaction between citizen and public administration. IO app also requires SPID to authenticate. In both cases the Covid pass can be seen in textual form, or as a QR code. The QR code contains all the information about the pass (citizen data, swab or vaccination information) and a digital signature based on public / private key. The QR code can be stored (digitally or even on paper) by the citizen, and is, in fact, the Covid pass.

The **authority** that needs to control the Covid pass uses the VerificaC19 app on a mobile device. VerificaC19 (also developed by the Ministry of Health) reads the QR code, checks the digital signature, and issues a green / red light in case of valid / invalid pass. VerificaC19 connects with the DGC to collect the public key. A pass is valid if the digital signature is valid, and if the green conditions (vaccination in the previous 9 months, etc) are valid at the date and time of the check.

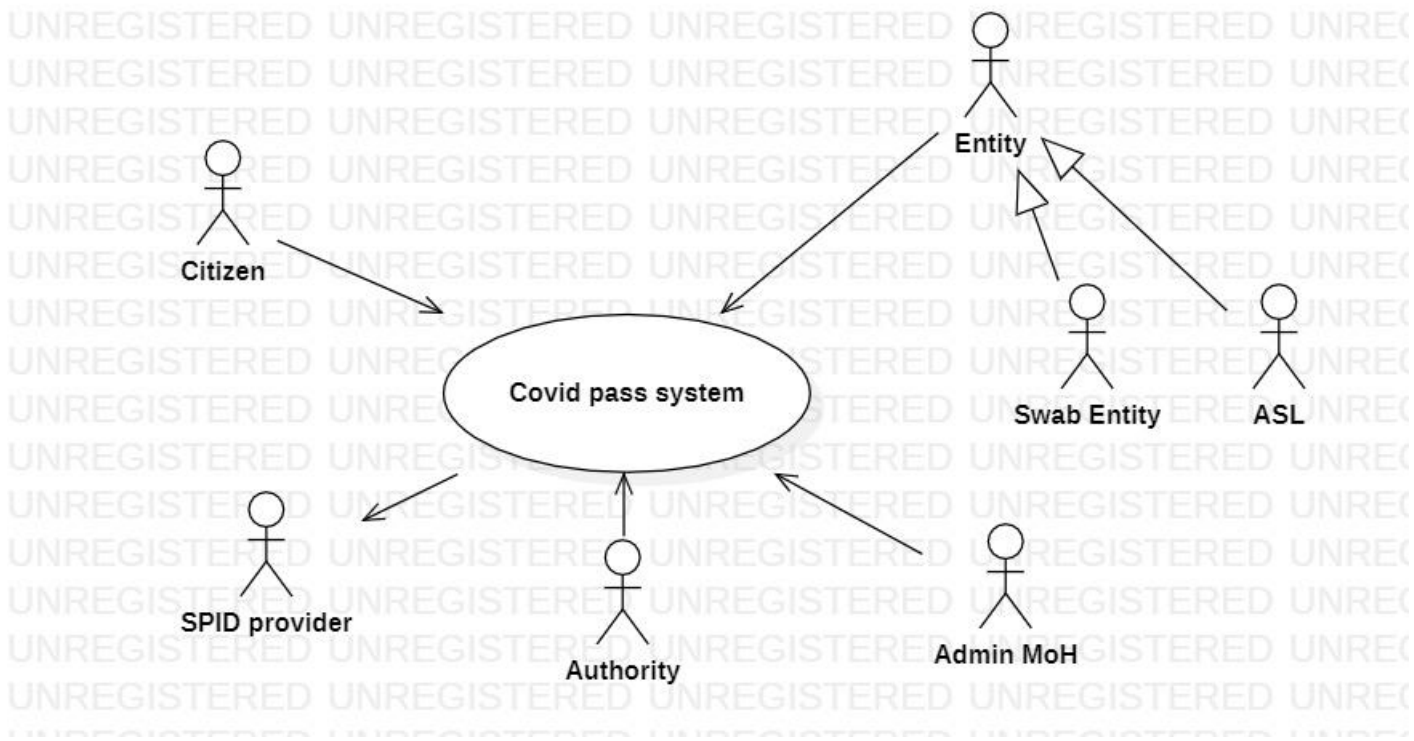
The Covid pass is supposed to be valid all over Europe, however consider only the case in Italy. Consider VerificaC19 as part of the Covid pass system.

In the following you should analyze and model the Covid pass system.

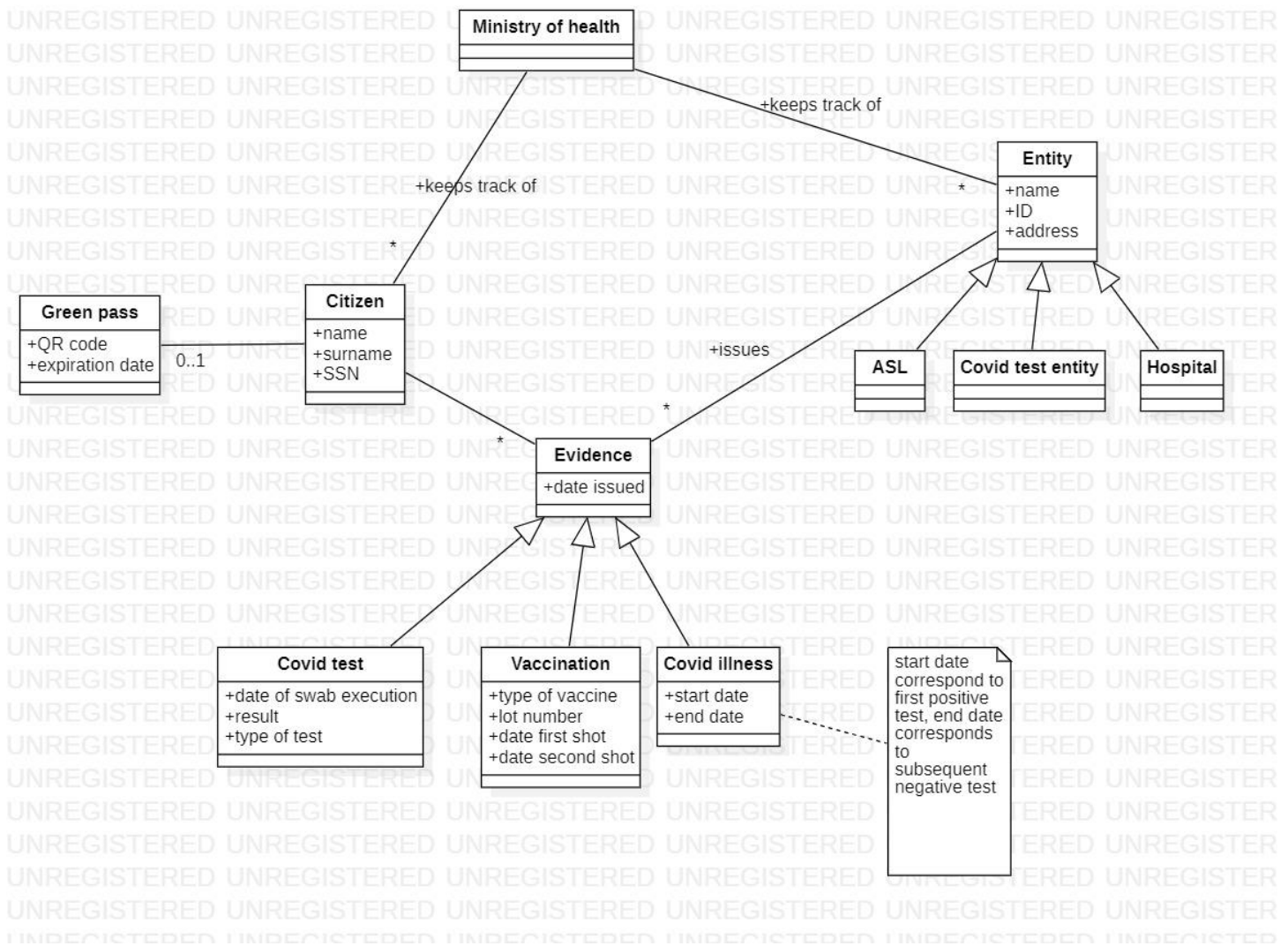
Common mistakes: forgetting SPID as an actor, and Admin
 Also, citizen ISA account. A citizen is not an account, has an account

1 – a. Define the **context diagram** (including relevant interfaces)

Actor	Physical interface	Logical interface
Citizen	PC / Smartphone	GUI on PC via DGC web site GUI on smartphone via IO App
ASL	PC	API (for batch secure data transmission) GUI (for manual entry)
Swab test entity	PC	API (for batch secure data transmission) GUI (for manual entry)
Authority	Smartphone	GUI on VerificaC19
MoH Admin	PC	GUI
SPID provider		API

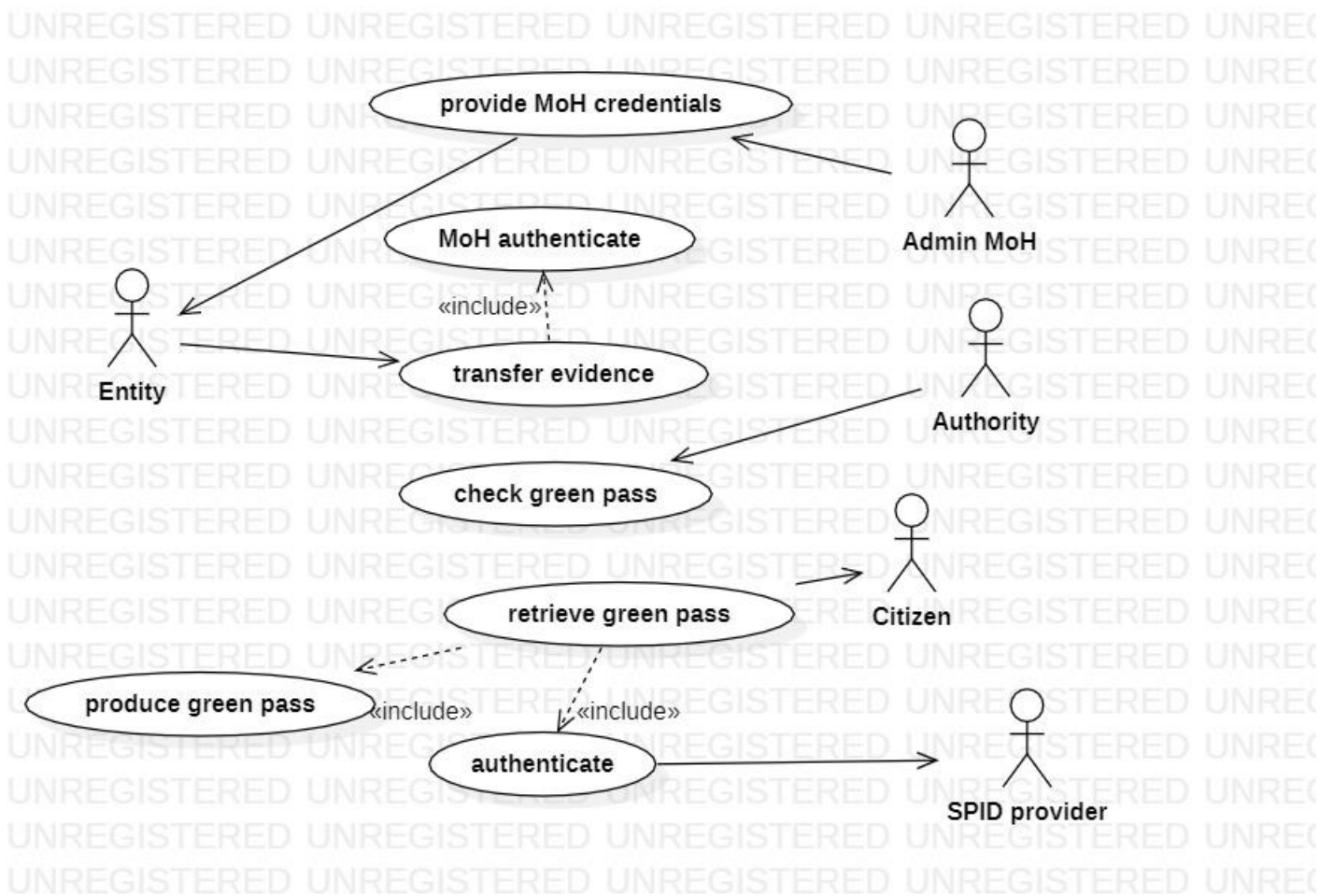


1-b Define the **glossary** (key concepts and their relationships) (UML class diagram) for the Covid pass System



Evidences, or health documents, should be attached to the citizen (not to the green pass, that exists after the documents). Further, evidence should be linked to the Entity issuing them. Common mistake was to consider Evidence ISA green pass. A health document is not a pass, it is needed to get a pass.

1-c Draw the Use Case Diagram for the Covid pass system. For each Use Case give self-explainable long names, or a short textual description

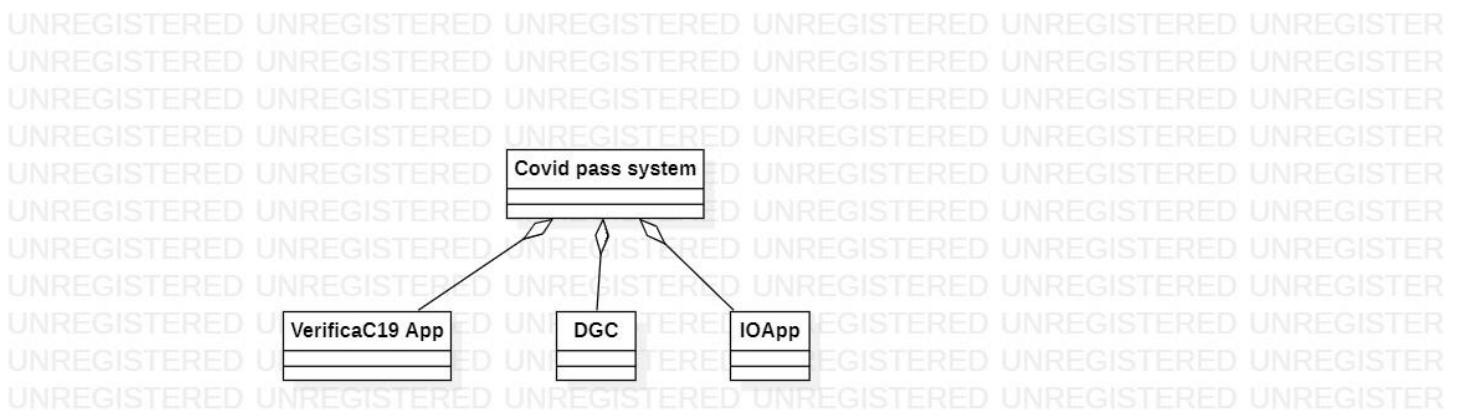


1-d Draw the system design for the Covid pass system

There are no hardware components in the system, so the system design is not doable and not needed. However the Covid pass system is made of several software components: the DGC web site and DGC database, IO app on mobile phones, VerificaC19 on mobile phones.

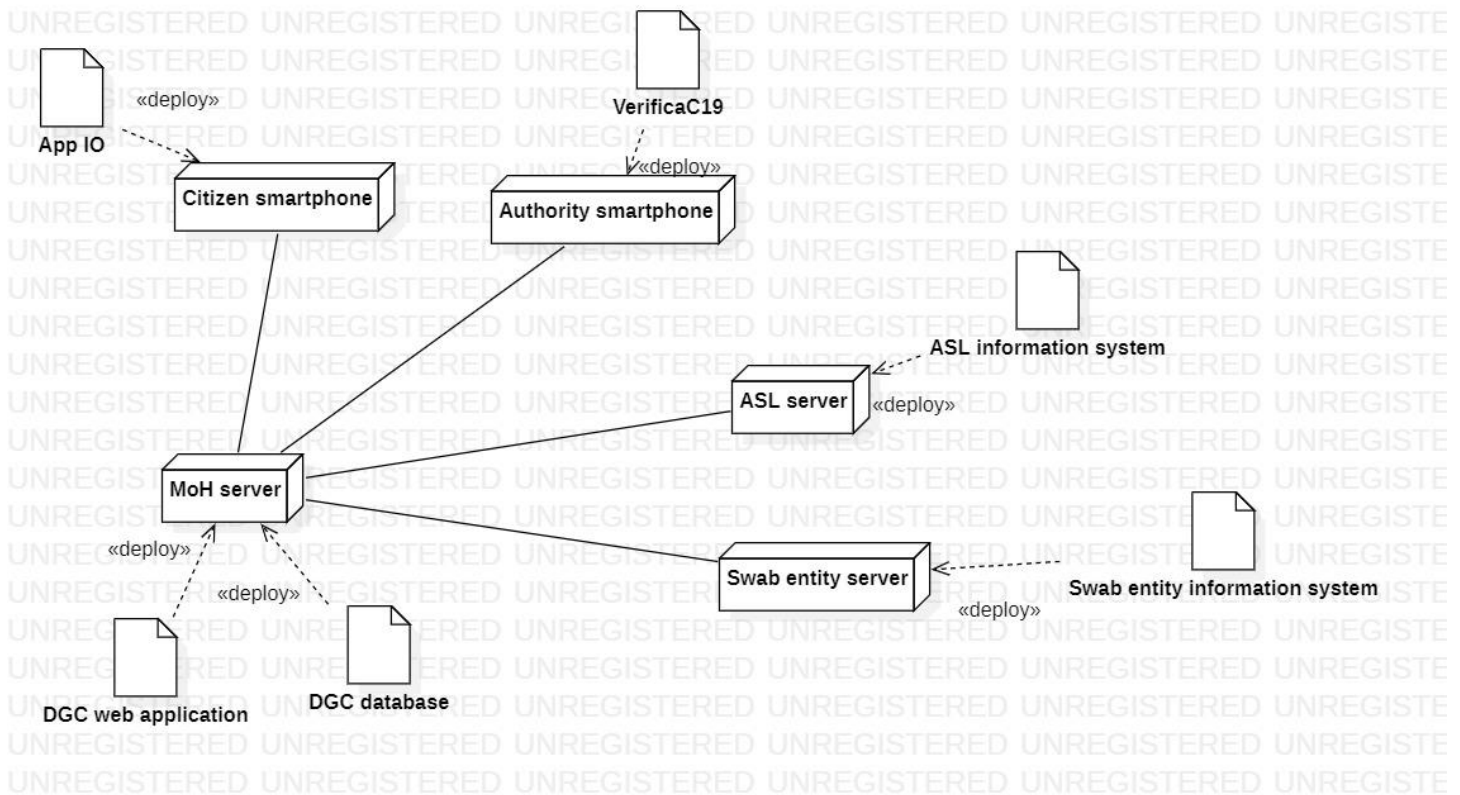
(IO app was available before the Covid pass system, so it is not, strictly speaking, part of it. However, it had to be extended with functionality to handle the covid pass.)

These components are visible as artifacts in the deployment diagram. They can also be shown as system design (considering software components instead of hardware components)



The SPID authentication system is external.

1-e Draw the deployment diagram



1-e Non Functional requirement for the Covid pass system

Privacy – data about citizen should be never disclosed to other citizens

Efficiency – all functions should complete in < 0.5 sec

Usability – citizens should be able to use all functions (for citizens) with no training

2 Describe the ‘repository’ architectural pattern

See slides

3 Describe the ‘adapter’ design pattern

See slides

4 Mention a few risks that can be encountered in a software project

See slides – the question was explicitly about Boehms list of most common risks in *software engineering*

5 The estimated effort for a new development project is 48 person months. Discuss what could be the estimated calendar duration of the project

The rough formula is $\text{effort} / \text{\#persons working full time}$

If one person works full time on the project, 48 calendar months

If two people work full time, 24 calendar months

And so on. However, there is a limit to the max number of people that can work effectively in parallel, and therefore a limit to the min calendar duration. This limit can be computed by defining the Gantt chart for the project.