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SMILE

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Deliverable

D2.3. System Requirements and Specifications for smarter and cost-efficient land BCPs including legal/privacy issues to be solved by respective novel technologies

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List of definitions & abbreviations

Abbreviation	Definition
ANPR	Automatic Number Plate Recognition
BCP	Border Crossing Point (any crossing-point authorised by the competent a thorities for the crossing of external borders – including those with mi mal or no infrastructure at all, opened permanently or temporarily)
Border Gate	A permanent BCP with strong infrastructure to facilitate border checks.
Comm	Communication
ECRIS	European Criminal Records Information System
EIS	Europol Information System
eIDAS	electronic IDentification, Authentication and trust Services
ETIAS	European Travel Information and Authorisation System
EURODAC	European Dactyloscopy

HNP	Hungarian National Police (law enforcement agency responsible for borc control in Hungary)
SIS	Schengen Information System
SPP	Serviciului de Protecţie şi Pază (Protection and Guard Service)
SUC	System Use Case
UC	Use Case
UML	Unified Modelling Language
VIS	Visa information System

Executive Summary

This document is about SMILE's system requirements; statements about what the system does (system functional requirements) and how well it does it (system non-functional requirements). Towards deriving them, we used as input the system use cases (we produced them from the use cases and user stories described in D2.2), and the so far documented user requirements (included in D2.2) and policy legal requirements (included in D8.1); so far more than 35 functional and 35 non-functional requirements have been documented. Besides that, this document discusses in brief the system's context diagram, the system's stakeholders, the system's global requirements (aka project constraints), the required system interfaces with the external entities, and finally the external datasets that will be used for testing the functionality of the to be developed biometric analysis modules. It is noted here that the work about system requirements is a continuous one and during the project's course they will be updated towards accommodating new functionalities besides refining old ones. The final outcome of this work will be included in deliverable D2.6 (M28).

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1. Introduction

The DoW describes this deliverable as: "D2.3 - System Requirements and Specifications for smarter and cost-efficient land BCPs including legal/privacy issues to be solved by respective novel technologies."

System requirements is about documenting what the system does and how well it does it. The requirements used to describe the system's functionalities are called (not so surprisingly) functional requirements, whereas the ones used to describe the qualities the system must have are called non-functional or quality requirements. These last ones are used to document a number of quality aspects like security, performance, maintainability, usability, legality, look & feel, and so on (an indicative list is available in the Annex). There are several frameworks and approaches for collecting the requirements, amongst them are the Volere [2] and the IEEE [4] which were used as our map towards documenting the required system's functionalities and qualities.

The rest of the document is structured as follows:

Section 1.1 summarises the SMILE's objectives.

Section 2 presents the system's stakeholders.

Section 3 gives the project's constraints (aka Global requirements).

Section 4 depicts the SMILE's system scope

Section 5 provides definitions for the terminology used in this document

Section 6 documents the system requirements and provides a description of the system interfaces.

Section 7 holds the description of the external datasets that SMILE intents to use towards testing and validating its components and services.

Finally, **section 8** concludes the document.

1.1 SMILE Purpose

SMILE aims to provide a novel solution to the Border Crossing Point (BCP) area by building a novel mobility concept and by utilizing biometrics. In this direction, we will design, implement and evaluate several novel prototype architectures, for the accurate verification, automated control, monitoring and optimization of border traffic (pedestrians and vehicles) at Land Border Infrastructures (BCPs and Border Gates). The project's objectives are summarized in the following table:

Table 1 SMILE's objectives

Code	Description
O1	Provide efficient, hierarchical (weak and strong) and unobtrusive, on the move security control
O2	Introduce the concept of biometrics-based preregistration
O3	Introduce mobile equipment and extension of e-services for BCP checks
O4	Develop a robust context aware biometric authentication framework
O5	Develop a robust multi-factor and multi-modal authentication system for BCP cases, enhanced by soft biometrics
O6	Propose and develop services running on BCPs that will enable their interconnection in a secure, interoperable and efficient manner

O7	Provide legal guidelines that should be adopted and taken into account for further designing and delivering of BCP related technologies
O8	Create a scalable and holistic paradigm for secure inner and cross-border data exchange, storage and overall handling of travellers' data in a legal and ethical way both at national and European levels
O9	Provide a detailed comparative study, about the cost reduction that is achieved by each SMILE technology in relation to the offered improvement in BCPs operation.
O10	Demonstrate, Validate, and Evaluate the SMILE BCP equipment in the context of a real BCP.
O11	Achieve SMILE technologies innovation, exploitation management and cost benefit analysis

2. Stakeholders

The following table provides the main stakeholders for the SMILE project:

Table 2 SMILE's stakeholders

No	Name	Description
1	BCP officers	The officers performing the border checks. Described in D2.2
2	Travellers	The people crossing the borders. Described in D2.2
3	Analysts	They will perform activities related with gathering the requirements from BCPs and converting them into Functional and Non–Functional Specifications.
4	System Architect	This entity will define the physical and logical system architecture
5	Web Designers	They will deliver the layout (design) of the system
6	Front–End Developers	They will be responsible with implementing the layout delivered by web designers
7	Developers	These are the developers that will develop the back-end functionalities of the SMILE platform.
8	System administrator	This entity will perform, during the project, all the maintenance and monitoring related with System and Database Operations.
4	Testers	The testers will verify and validate that SMILE met the user requirements.
5	Installers	This category of stakeholders will deploy SMILE solution in the BCP environments.
6	Regulators	Regulators impose constraints in the way SMILE will design, implement and deploy its solution especially as far as security and privacy aspects are concerned.

3. Constraints

This section presents the project's constraints (aka global requirements).

Table 3 SMILE constraints

Constraints	Description	Rationale	Fit criterion
Solution	The SMILE system shall be conforming to the GDPR.	Conformance to the GDRP is obligatory for all EU from May 2018.	The SMILE system will handle private data according to the GDPR and the respective EU regulations.
	The product shall have interfaces to the SIS (I, II) database	It is the central source of information regarding travellers' data	The interface with the SIS Database shall conform to the respective Interface Specification Standard.
	The product shall have interfaces to the VIS database	It is the central source of information regarding Visa data	The interface with the VIS Database shall conform to the respective Interface Specification Standard.
	The SMILE devices used by the field BCP officers shall be hand-held[1].	The device shall be easy for people to carry and shall operable in low infrastructure environment, like temporary BCPs.	The device shall weigh no more than 600 grams, shall not be larger than an average tablet[2], and there shall be no external power source.
Schedule	The system shall be available by June 30, 2020 at TRL6.	The contract with the project sponsor (EU commission) defines the deadline and TRL level.	The SMILE system and all the accompanying deliverables shall be available by June 30, 2020.

[1] According to recent decisions, border control authorities are moving towards the use of tablets and smartphones with integrated (encased) document, RFID and fingerprint reading capabilities and are deploying them as general control devices (either deployable as workstations in passport control booths as well as mobile passport control devices. Therefore, devices proposed as hardware system components must fulfill these general ergonomic requirements. Availability of "contactless" (wireless) charging is another must have for the devices.

[2] 8.5" inch size is preferred by most of border guards, according to a representative Hungarian survey.

Budget	The SMILE solution will be realised without exceeding the project's budget.	The contract with the project sponsor (EU commission) states the agreed project's budget.	The SMILE system and all the accompanying deliverables shall be produced without exceeding the project's budget.

4. System Scope

The system's scope is depicted in the following diagram showing the interactions with the external systems and actors.

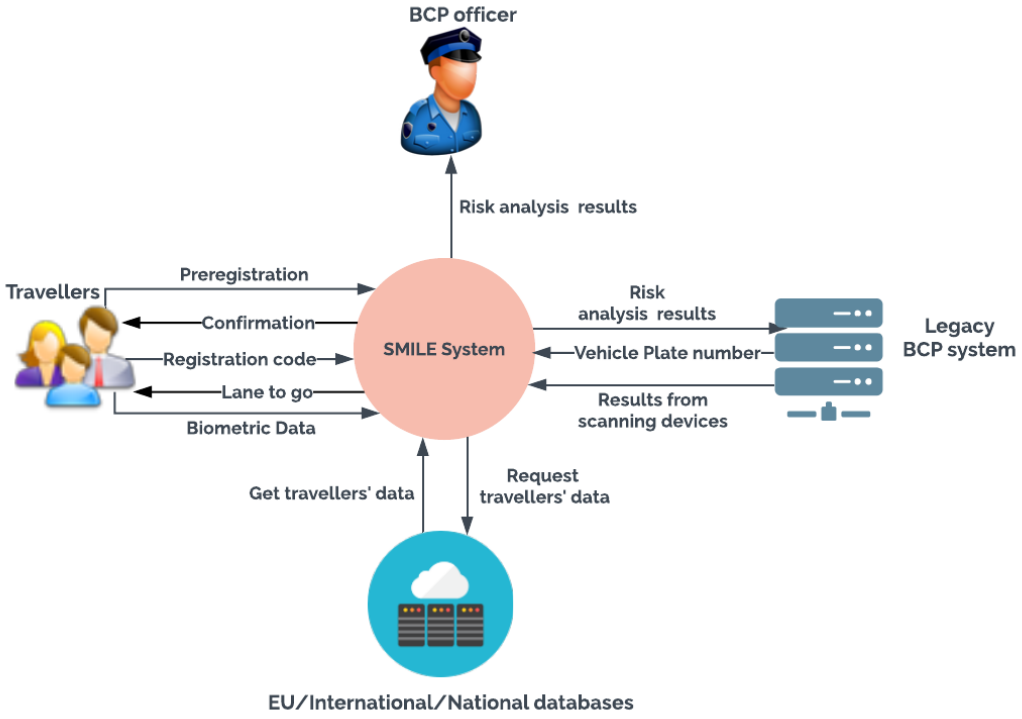

Figure 1 SMILE's system scope diagram

The Travellers can preregister using the SMILE system and receive back a confirmation message (including a preregistration code). Upon arriving in the BCP premises, the preregistration code is entered in the SMILE system and, based on the associated to the code risk analysis results, the travellers are forwarded to the appropriate lane (Fast or Standard). Further to that, SMILE interacts with the external Databases (e.g. VIS, SIS II) for finding out if any alert has been issued for the preregistered travellers and/or their travelling vehicles (if any), or if they have a valid VISA (for TCN cases). The BCP officers can use SMILE towards receiving the risk analysis result for the incoming travellers. Finally, SMILE can interact with the current legacy BCP systems towards retrieving input from scanning devices utilised currently in the legacy BCP systems such as ANPR, devices counting the number of passengers in a vehicle and so on; besides receiving information SMILE could forward to the legacy system, the risk analysis assessment (current or historical) of a preregistered traveller that has been forwarded to the standard lane.

5. Naming conventions and terminology

This section presents the terminology that is specific to the project and its requirements.

Table 4 Terminology specific to requirements documentation

Expression	Meaning
SHALL	This word, or the terms "REQUIRED" or "MUST", mean that the definition is an absolute requirement of the specification.
SHALL NOT	This phrase, or the phrase "MUST NOT", mean that the definition is an absolute prohibition of the specification.
SHOULD	This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
SHOULD NOT	This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood, and the case carefully weighed before implementing any behaviour described with this label.
MAY	This word, or the adjective "OPTIONAL", mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item.

Table 5 Expressions used in this document

Expression	Meaning
Fast lane	The lane where a traveller is forwarded if the SMILE risk analysis result is below the alert threshold.
Functional requirement	A statement describing a specific system functionality.
Green line	The line where a refugee camp visitor is forwarded, if she/he is cleared from the SMILE system.
Non-functional requirement (aka quality requirement)	A statement describing a specific system quality (i.e. how well the system does something).

Preregistration	The process of entering the travellers data (including biometrics) and accompanying vehicle(s) data to the SMILE system. The pre-registration may be performed via a SMILE mobile app, a web browser, or a preregistration kiosk.
Preregistration code	A unique code returned from the preregistration process. This code is used towards routing the associated preregistered traveller(s) to the appropriate lane. The code may be saved in the SMILE's mobile app, and/or received by email.
Red line	The line where a refugee camp visitor is forwarded, if she/he is not cleared from the SMILE system
Second line check	The line where a traveller is forwarded for further checking, if the SMILE system returns an alert, or if there is an alert during the standard lane check.
Stakeholder use case	A use case from the perspective of a stakeholder (e.g. end user). It contains a high-level description of the system's operation.
System context diagram	A diagram visualising a system's scope.
System requirement	A statement describing a specific functionality or quality of a system.
System scope	A description of the interactions of a system (seen as a Blackbox) with its external environment (i.e. users and systems). It defines what the system will do and what not. Very often this is depicted with the use of a system context diagram.
System use case	A use case from the perspective of the system. It is more technical in nature than its Stakeholder counterpart.
Use case	A Use case describes the operational usage of a system. A use case comprises of several scenarios depicting a specific interaction of the system with the external entities (actors).
User need (aka user requirement)	A user statement describing, in a high-level way, its wants and expectations from a system.

6. System Requirements

This section presents the system requirements; in other words what the system does (Functional requirements) and how well it does it (Non-functional requirements). Following Volere [1][2] requirements methodology and the system engineering lifecycle activities, described in [3], we elicited the system requirements using three distinct sources: the system use cases, the user needs and the policy & legal requirements. The system use-cases, depicting SMILE's functionality and behaviour from the system's perspective, were derived from D2.2 use cases (these were based on the stakeholders' perspective). D2.2 was also used for getting the so far documented user needs. As far as it concerns the policy & legal requirements, D8.1 was utilized.

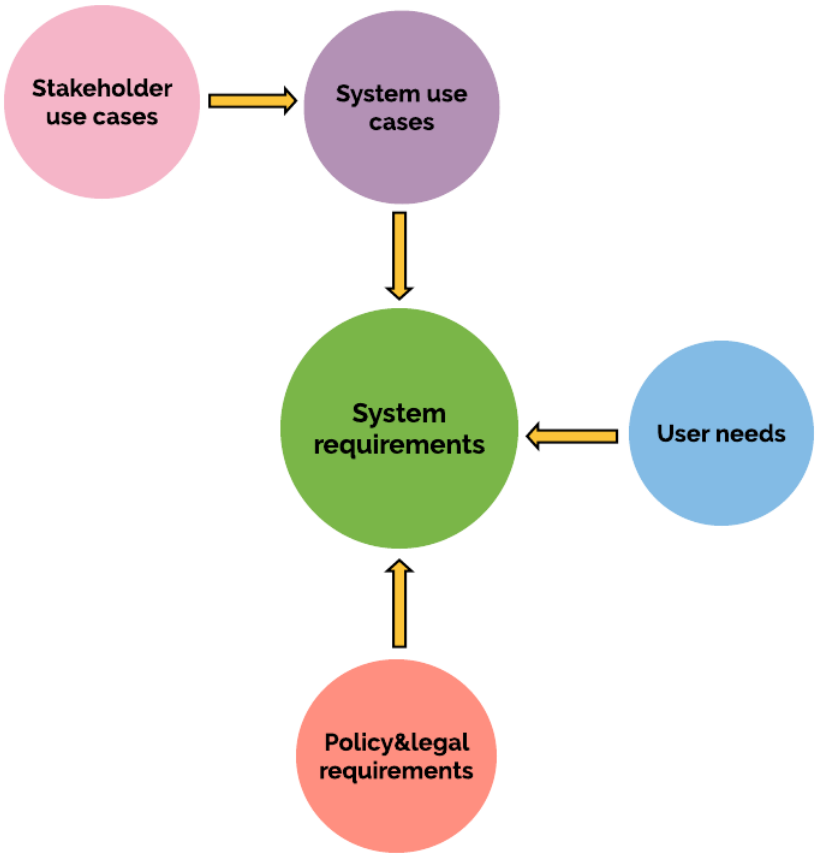

Figure 2 System requirements

6.1 System Use Cases summary

In this section, the summary of the system use cases is given along with the involved actors and the associated user stories/use cases that are described in D2.2.

Table 6 Summary of System use cases

No	System Use Case	Scenarios		Actor(s)	Associated User stories in D2.2
		ID	Title		
1	SMILE Prereg-istration	SUC1.1	Successful prereg-istration	Traveller, External Databases	

		SUC1.2	Failed validation of the preregistration data		Preregistration (*Hungary-Romania border user story*) Pedestrian: User Stories 1, 2 and 3 (*General use cases*)
2	Fast lane check	SUC2.1	Pedestrian traveller: Successful check	Traveller, BCP officer	Pedestrian: User Stories 1, 2 and 3 (*General use cases*)
		SUC2.2	Pedestrian traveller – Risk analysis result above threshold		
		SUC2.3	Pedestrian traveller – Biometrics matching failure		
		SUC2.4	Travellers with a car - Successful check		Car traveller: User Stories 1, 2 and 3 (*Bulgaria-Romania border user story*)
		SUC2.5	Travellers with a car – Risk analysis result above threshold		
		SUC2.6	Biometrics matching failure		
3	Refugee camp access control	SUC3.1	Refugee camp access – Successful control check	Traveller, SPP officer, External Databases	The access in the refugee camp (*Hungary-Romania border user story*)
		SUC3.2	Refugee camp access – Risk analysis result above threshold		
		SUC3.3	Refugee camp access – Biometrics matching failure		

6.2 System Use Cases description

This section provides the system use cases and their associated scenarios using UML sequence diagrams.

6.2.1 System Use Case 1: SMILE Preregistration

In this use case, the interactions of the travellers with the SMILE preregistration system is described in a series of scenarios that include the provision of valid and not valid preregistration data. Below is the system use case diagram that depicts all the scenarios for this use case.

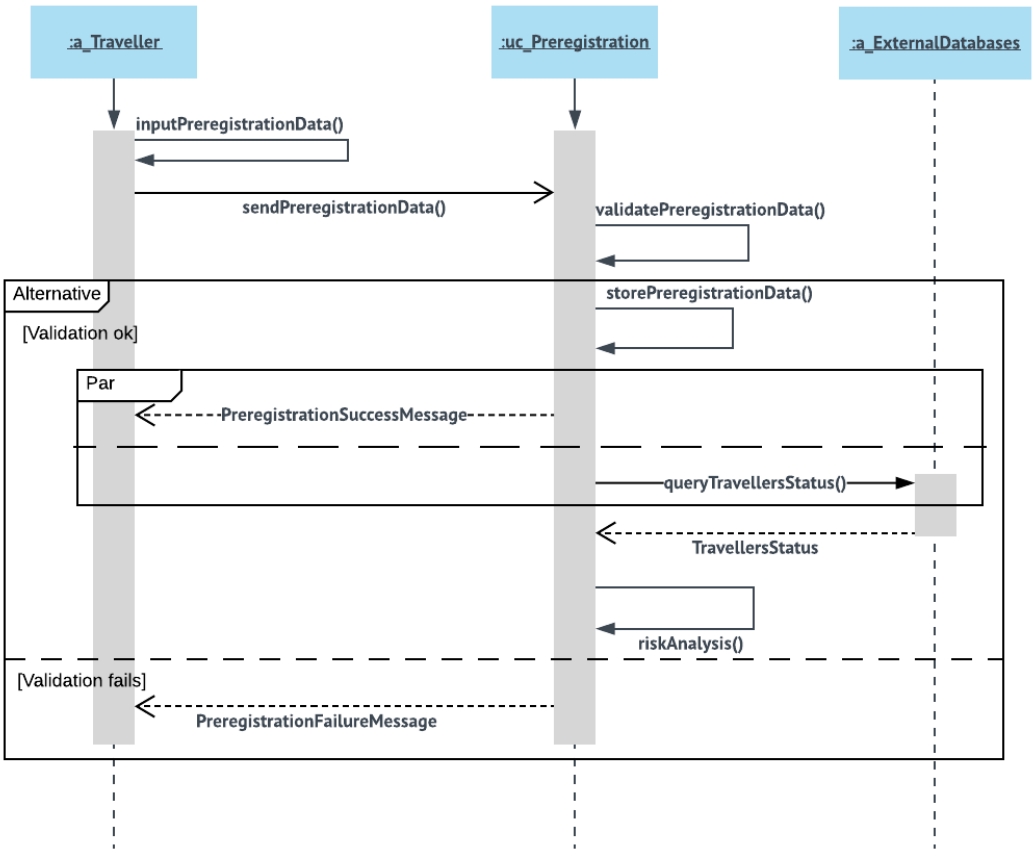

Figure 3 Preregistration – system use case scenarios diagram

6.2.1.1 Scenario SUC1.1: Successful preregistration

Description: The traveller inputs the required preregistration data, via her/his mobile phone SMILE app, to the SMILE preregistration platform where the filed data are validated, stored, and the traveller receives back a success confirmation message with a preregistration code. Based on the filed data and the responses from the external databases, a risk analysis is also carried out; its results will dictate if the associated traveller(s) will be routed to a fast lane or to a standard lane (The result of the analysis is not communicated to the traveller, whereas the routing decision becomes known to the traveller at the BCP premises upon providing the received preregistration code).

Precondition: The traveller is not preregistered with the SMILE system.

Postcondition: The traveller is preregistered with the SMILE system; the risk analysis has been performed and the traveller has received a confirmation message with a preregistration code.

6.2.1.2 Scenario SUC1.2: Failed validation of the preregistration data

Description: The traveller inputs the required preregistration data, via her/his mobile phone SMILE app, to the SMILE preregistration platform, the filed data are not validated, and the

traveller receives back a failure message that includes details about the data that need to be resubmitted.

Precondition: The traveller is not preregistered with the SMILE system.

Postcondition: The traveller is not preregistered with the SMILE system and has received a failure message.

6.2.2 System Use Case 2: Fast lane check

This use case discusses a series of scenarios that include the case of successful and failed fast lane checks by travellers passing the borders on foot (pedestrian) or with a car. Below is the system use case diagram that depicts all the scenarios for this use case.

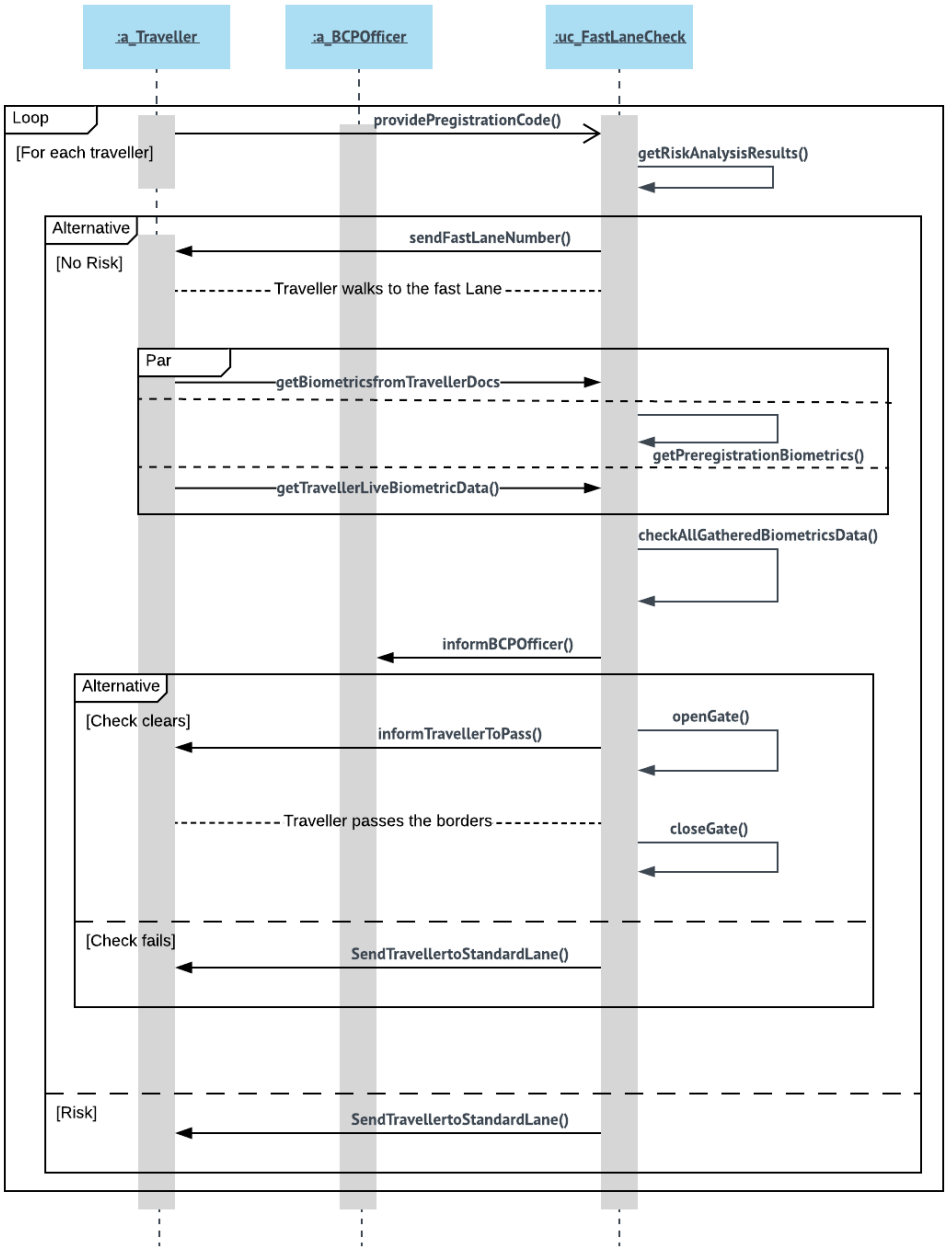

Figure 4 Fast lane check system use case scenarios diagram: Pedestrian Scenarios

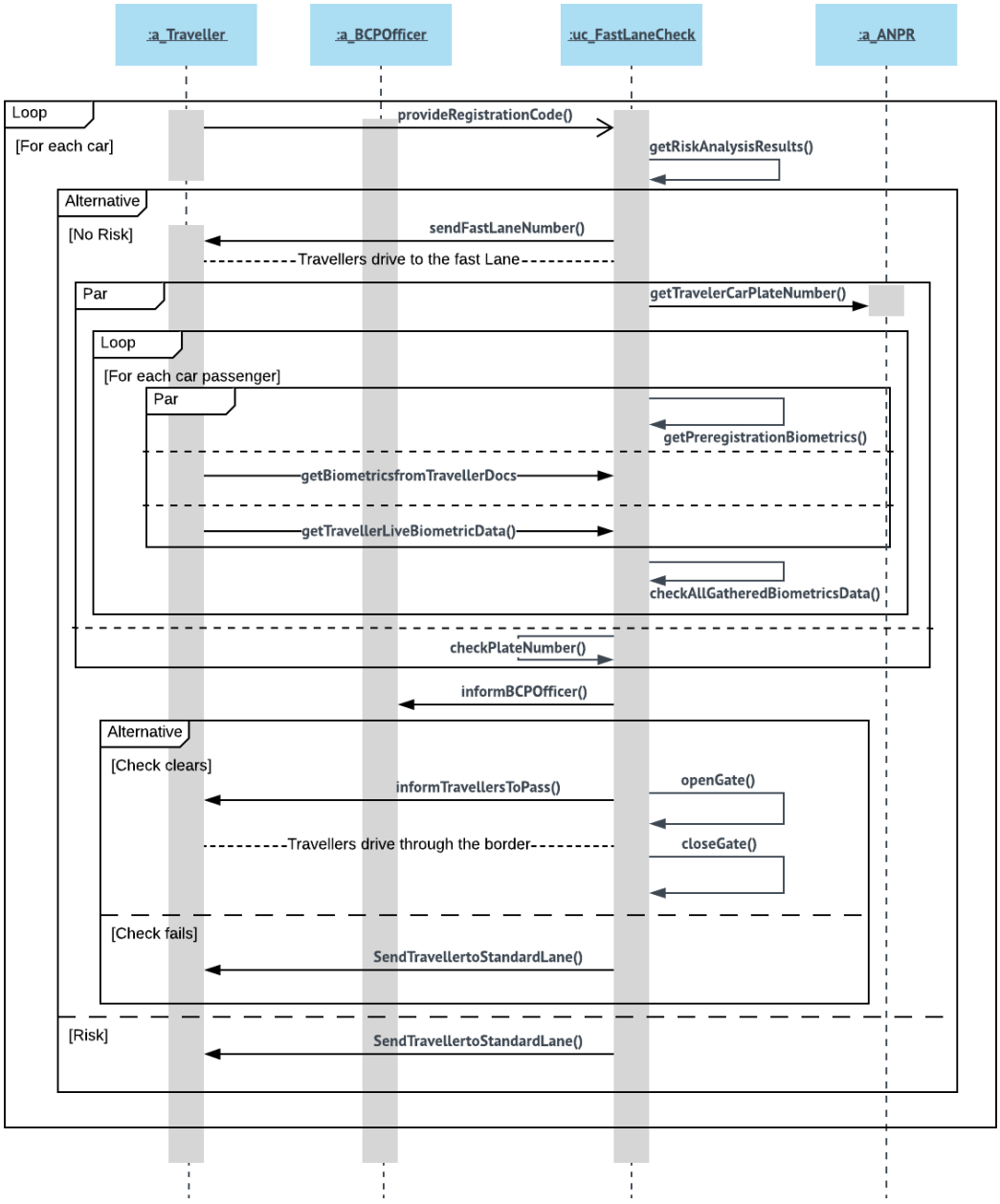

Figure 5 Fast lane check system - use case scenarios diagram: Vehicle Scenarios

6.2.2.1 Scenario SUC2.1: Pedestrian traveller – Successful check

Description: An already preregistered pedestrian traveller uses her/his mobile phone to pass the received preregistration code in the SMILE system. The risk analysis result, associated with the provided preregistration code, is below the alert threshold so the traveller is routed to the appropriate fast lane. At the fast lane, the traveller provides the requested biometrics (e.g. face photo) and the biometrics included in its e-Identity documents (e.g. e-Passport). The collected biometrics, including the ones filed during the preregistration process, are matched to each other successfully. The BCP officer is informed about the check result (in case she/he decides to override the system's decision). Then the traveller is informed to proceed with

passing he borders; at the same time the system may open and close (after the traveller's passing) the gates automatically (if applicable).

Precondition: The traveller is already successfully preregistered via the SMILE preregistration system and has received a preregistration code in its mobile phone.

Postcondition: The traveller has passed the borders (upon authorization) via the SMILE fast lane.

6.2.2.2 Scenario SUC2.2: Pedestrian traveller – Risk analysis result above threshold

Description: An already preregistered pedestrian traveller uses her/his mobile phone to pass the received preregistration code in the SMILE system. The risk analysis result, associated with the provided preregistration code, is above the alert threshold; as such, after informing the BCP officer, the traveller is routed to the appropriate standard lane to be checked following the standard conventional procedures.

Precondition: The traveller is already successfully preregistered via the SMILE preregistration system and has received a preregistration code in her/his mobile phone.

Postcondition: The traveller has been routed to the standard lane.

6.2.2.3 Scenario SUC2.3: Pedestrian traveller – Biometrics matching failure

Description: An already preregistered pedestrian traveller uses her/his mobile phone to pass the received preregistration code in the SMILE system. The risk analysis result, associated with the provided preregistration code, is below the alert threshold so the traveller is routed to the appropriate fast lane. At the fast lane, the traveller provides the requested biometrics (e.g. face photo) and the biometrics included in its e-Identity documents (e.g. e-Passport). The collected biometrics, including the ones filed during the preregistration process, are matched to each other resulting in a mismatch. The BCP officer is informed about the check and the traveller is routed to the appropriate standard lane to be checked following the standard conventional procedures.

Precondition: The traveller is already successfully preregistered via the SMILE preregistration system and has received a preregistration code in her/his mobile phone.

Postcondition: The traveller has been routed to the standard lane.

6.2.2.4 Scenario SUC2.4: Travellers with a car - Successful check

Description: Already preregistered travellers riding one car arrive at the border. The driver uses her/his mobile phone to pass the received preregistration code in the SMILE system. The risk analysis result, associated with the provided preregistration code, is below the alert threshold so the car is routed to the appropriate fast lane. At the fast lane, the driver and all the co-passengers provide the requested biometrics (e.g. face photo) and the biometrics included in their e-Identity documents (e.g. e-Passport). For each car passenger, the collected biometrics, including the ones filed during the preregistration process, are matched to each other successfully. In parallel to this, the car plate number is matched, successfully, with the one provided during preregistration. The BCP officer is informed about the check result (in case she/he decides to override the system's decision). Then the driver is informed to proceed with passing the borders; at the same time the system may open and close (after the car's passing) the gates automatically (if applicable).

Precondition: The travellers and the car are already successfully preregistered via the SMILE preregistration system and the driver has received a preregistration code in its mobile phone.

Postcondition: The travellers have passed (driving) the borders (upon authorization) via the SMILE fast lane.

6.2.2.5 Scenario SUC2.5: Travellers with a car – Risk analysis result above threshold

Description: Already preregistered travellers riding one car arrive at the border. The driver uses her/his mobile phone to pass the received preregistration code into the SMILE system. The risk analysis result, associated with the provided preregistration code, is above the alert threshold; as such, after informing the BCP officer, the car (with all passengers inside) is routed to the appropriate standard lane where the travellers and the car will be checked following the standard conventional procedures.

Precondition: The travellers and the car are already successfully preregistered via the SMILE preregistration system and driver has received a preregistration code in her/his mobile phone.

Postcondition: The car (with all passengers inside) has been routed to the standard lane.

6.2.2.6 Scenario SUC2.6: Travellers with a car – Biometrics matching failure

Description: Already preregistered travellers riding one car arrive at the border. The driver uses her/his mobile phone to pass the received preregistration code in the SMILE system. The risk analysis result, associated with the provided preregistration code, is below the alert threshold so the car is routed to the appropriate fast lane. At the fast lane, the driver and all the co-passengers provide the requested biometrics (e.g. face photo) and the biometrics included in their e-Identity documents (e.g. e-Passport). The car plate number is matched, successfully, with the one provided during preregistration. In parallel to this, and for each car passenger, the collected biometrics, including the ones filed during the preregistration process, are matched to each other, but there is a mismatch with one of the passengers. The BCP officer is informed about the check result, and then the car (with all passengers inside) is routed to the appropriate standard lane where the travellers and the car will be checked following the standard conventional procedures.

Precondition: The travellers and the car are already successfully preregistered via the SMILE preregistration system and the driver has received a preregistration code in her/his mobile phone.

Postcondition: The car and travellers have been routed to the standard lane.

6.2.3 System Use Case 3: Refugee camp access control

This use case discusses a series of scenarios that include the case of successful and failed access of valid preregistered visitors to the refugees' camp premises. Below is the system use case diagram that depicts all the scenarios for this use case.

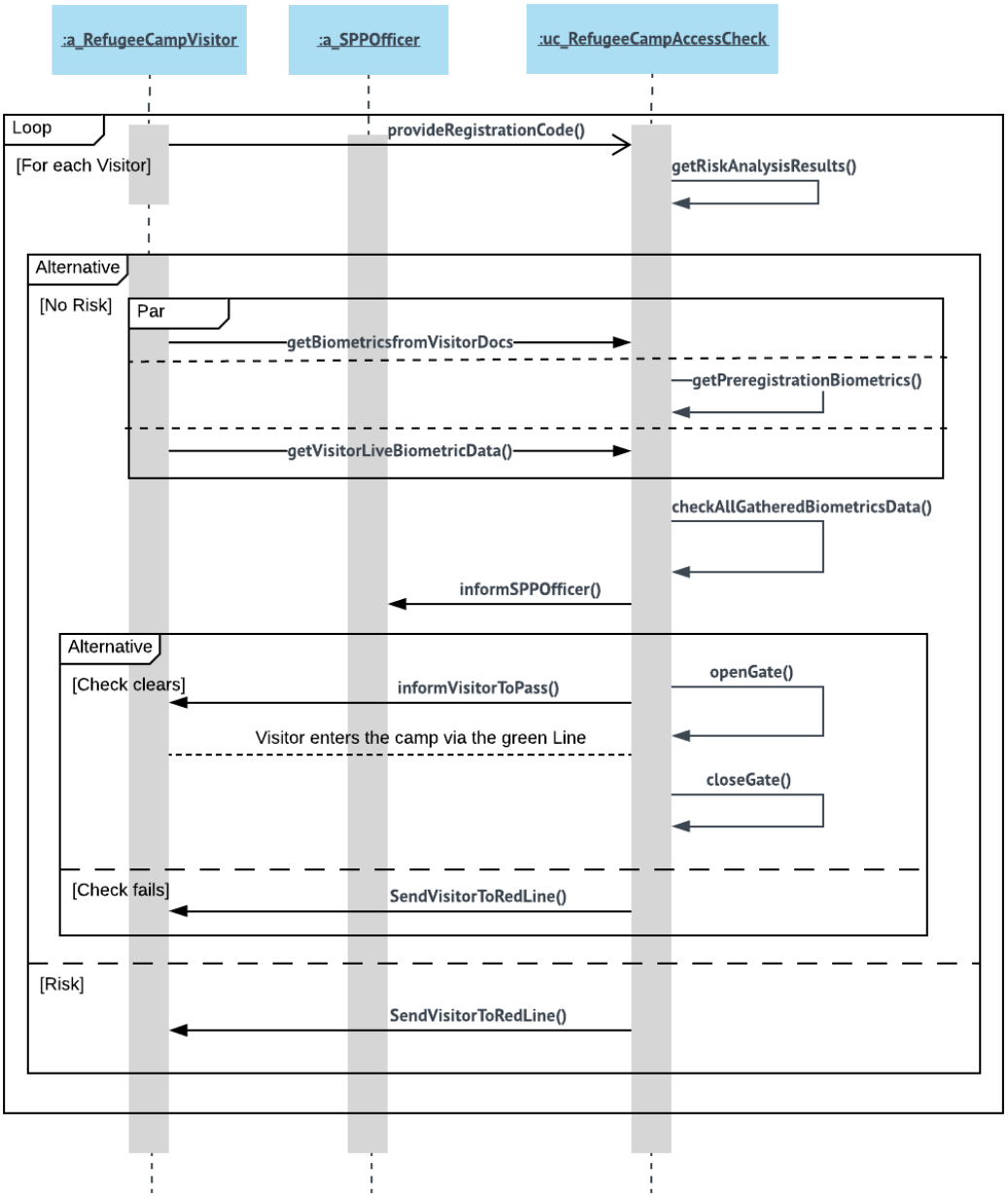

Figure 6 Refugees' camp access - system use case scenarios diagram

6.2.3.1 Scenario SUC3.1: Refugee camp access – Successful control check

Description: An already preregistered refugee camp visitor uses her/his mobile phone to pass the received preregistration code at the check point. The risk analysis result, associated with the provided preregistration code, is below the alert threshold, so the visitor continues by providing the requested biometrics (e.g. face photo) and the biometrics included in its e-Identity documents (e.g. e-Passport). The collected biometrics, including the ones filed during the preregistration process, are matched to each other successfully. The SPP officer is informed about the check result (in case she/he decides to override the system's decision). Then the visitor is informed to proceed in the camp via the green line; at the same time the system may open and close (after the visitor's passing) the gates automatically (if applicable).

Precondition: The visitor is already successfully registered via the SMILE preregistration system and has received a preregistration code in its mobile phone.

Postcondition: The visitor has entered the refugee camp (upon authorization) via the green line.

6.2.3.2 Scenario SUC3.2: Refugee camp access – Risk analysis result above threshold

Description: An already preregistered refugee camp visitor uses her/his mobile phone to pass the received preregistration code at the check point. The risk analysis result, associated with the provided preregistration code, is above the alert threshold; as such, after informing the SPP officer, the visitor is routed to the red line to be checked following the standard conventional procedures.

Precondition: The visitor is already successfully registered via the SMILE preregistration system and has received a preregistration code in its mobile phone.

Postcondition: The visitor has been forwarded to the red line.

6.2.3.3 Scenario SUC3.3: Refugee camp access – Biometrics matching failure

Description: An already preregistered refugee camp visitor uses her/his mobile phone to pass the received preregistration code at the check point. The risk analysis result, associated with the provided preregistration code, is below the alert threshold, so the visitor continues by providing the requested biometrics (e.g. face photo) and the biometrics included in its e-Identity documents (e.g. e-Passport). The collected biometrics, including the ones filed during the preregistration process, are matched to each other leading to a mismatch. The SPP officer is informed about the check, and then the visitor is routed to the red line to be checked following the standard conventional procedures.

Precondition: The visitor is already successfully registered via the SMILE preregistration system and has received a preregistration code in its mobile phone.

Postcondition: The visitor has been forwarded to the red line.

6.3 System interfaces

In this section, the interfaces of the SMILE system with the main external entities, namely the SMILE end-users and the external databases are briefly discussed.

6.3.1 SMILE end users

SMILE end users are the BCP officers and the travellers. For the former the main interaction with the SMILE system will be via the verification tablet (towards performing the check operations) whereas for the latter via their PC, laptop, mobile device or an enrolment kiosk (towards performing the preregistration process).

6.3.1.1 Preregistration system

The preregistration system will have two user interfaces for normal users and BCP officers. The interface for normal users is a responsive web application (webapp), which allows the user to conduct preregistration and retrieve their preregistration records by using laptops or mobile devices. The interface for BCP officers allows them to check data compliance between

user-input data and the eIDAS returned records. As far as it concerns the communication interface, a HTTPS RESTful interface that allows the travellers to securely submit their preregistration data will be utilized.

6.3.1.1.1. Preregistration data

SMILE intents to follow ETIAS (European Travel Information and Authorisation System) proposal [5], Article 15, for defining the traveller's data that will be collected during the preregistration phase. Acknowledging that ETIAS is for TCNs (Third Country Nationals) a subset of these data will be utilised for the travellers that have the right to move freely under Union law (e.g. EU citizens).

Table 7 ETIAS application data

SN	Data	
(a)	surname (family name), first name(s) (given name(s)), surname at birth; date of birth, place of birth, country of birth, sex, current nationality, first name(s) of the parents of the applicant	
(b)	other names (alias(es), artistic name(s), usual name(s))	
(c)	other nationalities (if any)	
(d)	type, number and country of issuance of the travel document	
(e)	the date of expiry of the validity of the travel document	
(f)	the applicant's home address or, if not available, his or her city and country of residence	
(g)	e-mail address, phone number	
(h)	education (level and field)	
(i)	current occupation	
(j)	Member State of first intended entry	
(k)	for minors, surname and first name(s) of the applicant's parental authority or legal guardian	
(l)	where he or she claims the status of family member referred to in Article 2(1)(c):	their status of family member
		the surname, first name(s), date of birth, place of birth, country of birth, current nationality, home address, e-mail address and phone number of the family member with whom the applicant has family ties
		their family ties with that family member in accordance with Article 2(2) of Directive 2004/38/EC
(m)	in the case of applications filled in by a person other than the applicant, the surname, first name(s), name of firm, organization if applicable, e-mail address, mailing address, phone number; relationship to the applicant and an electronically signed representative declaration.	

In addition to this, and only for TCNs that are required to have a Schengen VISA, the Visa sticker number should be entered. As far as it concerns biometrics, SMILE will enable the traveller to scan the face, the fingerprints and the iris of the traveller. Furthermore, in case a vehicle will be used for passing the borders, the license plate number along with the country that the car is registered, and the number of passengers must be entered. Finally, SMILE will scan and extract information from e-passports (following ICAO 9393-1 [6] guidelines) and visa stickers.

6.3.1.2 Verification Tablet

The verification tablet will perform identity verification of the travellers when required. The tablet will provide a graphical interface, accessible via its touch screen supporting a set of functionalities for capturing biometric from travellers and for reading identity documents. As far as it concerns the hardware interfaces the tablet will embed the following sensors:

- Optical fingerprint sensor for fingerprints capture and recognition
- IR camera for iris capture
- Camera for face capture and ID document reading (MRZ)
- Swipe reader for MRZ reading
- NFC for ID document chip reading

6.3.1.3 Soft face biometrics module

An API will be developed in order to extract soft biometric features from the travellers (The type of biometrics to capture will be described in D3.1). The feature extraction process will be initiated from a handheld device (preregistration App, border officers' tablets), and will be performed either locally on the device or remotely through secure cloud services, with the extracted biometric features being saved on the SMILE's cloud databases.

6.3.1.4 Biometric module

An API will be developed for the biometrics module. The SMILE verification Tablet will have the capability of capturing three biometric modalities, namely fingerprint, face and iris. The processing of those biometric data could be done either in the device itself or in the SMILE private cloud. Therefore, an interface will be developed to exchange data (processing results, templates or biometric data themselves) between the hardware device and the cloud service.

6.3.2 External databases

Towards being compliant with the EU regulations regarding border checks, SMILE has to connect with the external databases VIS and SIS (II). The former is used to exchange visa data to all Schengen states whereas the latter for finding out if any alert has been issued for a person or object. In addition to these, other databases such as the EURODAC (EU fingerprints database), ECRIS (European database of criminal records) and EIS (Europol's central information system) may be used during the border checks. Besides the EU databases, each participating BCP utilises several national databases (e.g. National VIS, National SIS systems, other proprietary databases) that SMILE system may use towards validating travellers' data and performing its risk analysis. All the prementioned databases are described in SMILE's deliverable D4.1.

For each of the used databases, SMILE has to implement the associated API endpoints towards being able to access the stored information. Because of the sensitive nature of the stored

information, during the testing and pilot phases, no connection with these DBs will take place; instead replicants (in structure) of these databases hosting emulated data will be utilised.

6.4 System use case 1: preregistration

6.4.1 Functional requirements

Table 8 Functional requirements system use case 1

Code	Description	Rationale	Fit Criterion	Input	Output
SUC1-F-001	The system **shall** prompt the end user for inserting their preregistration data.	The system needs the traveller's data for providing the preregistration functionality	The system provides a way (e.g. a form) for the traveller to fill in the required data	Alphanumeric and biometric data	Message indicating submission status
SUC1-F-002	The system **shall** prompt the end user for inserting their vehicle plate number.	The system needs the traveller's vehicle plate number to provide the preregistration functionality	Check if plate number is valid	Vehicle registration number	Message indicating submission status, SMILE registration code on success
SUC1-F-003	The system **shall** prompt the end user for the number of travellers.	The system needs the number of travellers and their data to provide the preregistration functionality	Check against definitions of number of travellers and each traveller's data	Number of travellers, passport information of all travellers	Message indicating submission status, SMILE preregistration code on success
SUC1-F-004	The system **shall** prompt the travellers to provide their consent prior to data submission.	The system has to be compliant with the Regulation (EU) 2016/679(GDPR) of the European Parliament and of the Council	The UI provides a method to the travellers to give (or not) their consent	Confirmation YES/NO	Message about the processing of personal data an
SUC1-F-005	The system **shall** save the preregistration data of the user.	The system needs the traveller's data to be saved for being use during the border checking process.	The preregistration data are saved in the associated DB.	Submitted preregistration data	Confirmation of saving the data.
SUC1-F-006	The system **shall** support the input	The system needs the traveller's biometric	Validate format of submitted biometric data	Travellers' Biometric data	Message indicating submission status

	of travellers' biometric data	data for providing the preregistration functionality			
SUC1-F-007	The system **shall** validate the submitted preregistration data.	The system needs to know if the provided data are valid or not before storing them	Validate format of submitted preregistration data	Alphanumeric and biometric data	Message indicating submission status
SUC1-F-008	The system **shall** notify the traveller with the status of their data submission	The traveller has to know if its data were submitted correctly	System returns a notification message	Preregistration data	Message about the submission status
SUC1-F-009	In case of a successful preregistration, the system **shall** include in the notification message a unique preregistration code	The system can use this code to retrieve fast the associated to the traveller preregistration data	The traveller receives a preregistration code	Preregistration data	Preregistration code
SUC1-F-0010	In case of an unsuccessful preregistration, caused from erroneous input (e.g. misspelling, wrong image format), the system **should** include in the notification message a description of the errors and how to fix them	The traveller may this information for correcting its input before trying to resubmit its preregistration data.	The traveller receives a notification message indicating the erroneous input	Preregistration data	Notification message
SUC1-F-011	The system **shall** allow the end-user to print SMILE preregistration code after successful preregistration.	The system shall allow the user to use non-electronic means.	The generated printed code shall be able to be scanned and used from the SMILE system	SMILE preregistration code	Printed code
SUC1-F-012	The system **shall** do a risk analysis using the submitted preregistration data and the verification results	The system needs to know if the travellers are legit for using the fast lane.	The system will have a risk analysis result for the submitted preregistration data.	Preregistration data, verification results from the external databases	Risk analysis result

	from the external databases (VIS, SIS II, etc)				
SUC1-F-013	The system **shall** connect to the external EU (e.g. VIS, SIS II, etc) and National databases (if applicable) towards verifying the submitted traveller's data.	The system needs verify that there is no alert issued for the specific person or object (e.g. vehicle)	The system needs the results from the external databases towards performing a complete risk analysis	Travellers id documents	Verification results

6.4.2 Non-functional requirements

Table 9 Non-Functional requirements system use case 1

Code	Type	Description	Rationale	Fit Criterion
SUC1-NF-001	Performance	The system **should** provide a responsive pre-registration interface.	A responsive interface improves user-friendliness	The system should give a response to the registering user in less than 5 seconds
SUC1-NF-002	Usability	The system **should** provide hints to the user during the pre-registration process.	These hints help the user to fill in information	For every select data input a hint would be displayed (automatically or manually triggered) to the user
SUC1-NF-003	Usability	The system **should** support accessibility features	Accessibility features will enable people with disabilities to use the system	The system exploits the use of assistive technologies, provides alternate text for each image, and offers transcript services for each audio message.
SUC1-NF-004	Security	The system **shall** restrict and check the data input.	The system must be able to prohibit/detect invalid input	The system should report to the submitting user any invalid input

SUC1-NF-005	Scalability	The system **should** handle the increase in load regarding the travellers' entry and exit.	This helps in handling large amount of data with ease.	The platform should be equipped with big data processing systems as well as No-SQL databases.
SUC1-NF-006	Availability	The system **should** make the data available to each and every authorized external entity during the period of operation.	This is necessary for the smooth interaction with the external entities that use our system.	This can be achieved through the Fault tolerant distributed systems.
SUC1-NF-007	Security	The system **shall** provide secure communication with any external entity	As the data is sensitive, it will provide security.	This can be handled through client authentication.
SUC1-NF-008	Security	The system **shall** store travellers' Data in an encrypted format.	As the data is sensitive, it will provide security.	Database defaults on operating by using a data encryption scheme.
SUC1-NF-009	Privacy	The system **should** be anonymized for the visualization and reporting purpose	Traveller's data are subject to privacy regulations	Visualised and reported statistical data should not lead to travellers' identities.
SUC1-NF-010	Usability	The system **shall** provide e-access to the preregistration functionality without requiring the physical presence of a traveller to any authority premises.	The travellers have to be able to preregister from wherever they want as long as they have network access to the preregistration system.	A traveller can pre-register via a web browser or via a mobile app.
SUC1-NF-011	Privacy	The system **shall** process the collected biometric data in accordance with the data protection Directive	The system must comply with EU regulations	The processing of data does not violate the rules described in the respective regulations

		95/46/EC and GDPR		
SUC1-NF-012	Security	The system **shall** prohibit any unauthorized access to the stored preregistration data.	The system must comply with EU regulations regarding data confidentiality	Any unauthorized attempt to access the stored data should be logged and an alert should be issued to the system's administrators
SUC1-NF-013	Operability	The system **shall** have an efficient data backup system.	The system must be able to cope with system errors.	In case of a system error the data needed to resume operation are retrieved from the backup system
SUC1-NF-014	Operability	The system **shall** support group preregistration	The system must be able to support the preregistration of groups of travellers instead of just single ones	In case of a group, there should be the option in the pre-registration application to add passengers travelling together

6.5 System use case 2: Fast lane check

6.5.1 Functional requirements

Table 10 Functional requirements system use case 2

Code	Description	Rationale	Fit Criterion	Input	Output
SUC2-F-001	The system **shall** read the travellers' preregistration code (automatically or manually)	The system needs to associate the incoming travellers with their preregistration data	The system acquires the provided preregistration code	preregistration code	Read operation status
SUC2-F-002	The system **shall** verify the pro-	The system needs to verify if the provided	The system reads and validates	preregistration code	Validation result

	vided travellers' pre-registration code	code is a valid SMILE preregistration code	each provided code		
SUC2-F-003	The system **shall** use the verified preregistration code to retrieve the risk analysis result	The system needs the risk analysis for assessing if the traveller is eligible to use the fast lanes and for informing the BCP officer, handling the incoming travellers, for the risk analysis result	The system retrieves the analysis result associated with the provided preregistration code	preregistration code	Risk analysis result
SUC2-F-004	The system **shall** use the preregistration data to request information from the External databases (e.g. SIS II, VIS)	The system needs to provide these data to the BCP officer handling the incoming travellers	The system retrieves the analysis result associated with the provided preregistration code	Query arguments supported from each DB (e.g. Traveller document id)	DB query results
SUC2-F-005	The system **shall** inform the travellers about the lane number they have to go	The system needs to route the incoming travellers to the selected lane	The system informs the incoming travellers at what lane to go	Preregistration code	Lane number
SUC2-F-006	The system **shall** be able to scan the travellers Identity documents	The system needs to compare the pre – preregis-	The system has successfully acquired all	Identity document(s)	Scanning operation result

		tration information and the Identity document information	the required information from the provided travellers documents		
SUC2-F-007	The system **shall** be able to get the required biometric data (e.g. face photo) from the traveller.	The system needs to compare the preregistration biometric data with the ones acquired in real time from the incoming travellers	The system has successfully acquired all the required information from the provided travellers documents	Biometric data	Biometric acquirement operation result
SUC2-F-008	The system **shall** validate the scanned travellers' Identity documents	The system needs to validate the provided Identity documents	The provided scanned traveller documents are successfully validated from the system.	Scanned Identity document(s)	Document check result
SUC2-F-009	The system **shall** check the biometrics acquired live from the system with the ones provided in the preregistration phase.	The system needs to compare preregistration submitted biometrics with the ones captured in the BCP premises	The system acquires and checks the biometrics acquired from the different sources	Preregistration biometrics, BCP captured biometrics.	Matching result
SUC2-F-010	The system **shall** check the biometrics acquired live	The system needs to compare the travel-	The system acquires and checks	Identity document biometrics, BCP captured biometrics.	Matching result

	from the system with the ones provided in the travellers' id documents (e.g. e-Passport).	lers' biometrics from their documents' RFID chip with the ones captured in the BCP premises	the biometrics acquired from the different sources		
SUC2-F-011	The system **shall** inform the BCP officer about the check results	The BCP officer needs to know if the travellers are clear to pass	The BCP officer receives a message indicating the checking results	Identity document biometrics, Pre-registration biometrics, External databases data, BCP captured biometrics.	Check result
SUC2-F-012	The system **shall** inform the traveller where to go (pass, or second line check)	The Traveller needs to know where to go after checking procedure is finished	The Traveller receives a message indicating where to go	Identity document biometrics, Pre-registration biometrics, External databases data, BCP captured biometrics.	Routing information
SUC2-F-013	The system **should** open the gate barrier (if existing), in the case the travellers are clear to go	The Travellers needs to exit the lane if they are clear to go	The gate barrier is lifted up.	Command to open the gate	Command result
SUC2-F-014	The system **should** close the gate barrier (if existing), in the case the travellers have exited the lane.	The gate needs to be closed for the new checking procedure to start.	The gate barrier closed.	Command to close the gate	Command result

SUC2-F-015	The system **should** be able to scan the travellers vehicle documents	The system has to compare the preregistration information and the vehicle document information	The system has successfully acquired all the required information from the provided vehicle documents	Vehicle document(s)	Scanning operation result
SUC2-F-016	The system **should** be able to validate the scanned travellers vehicle documents	It is needed to verify that the vehicle documents are not fake.	The system has successfully validated the provided vehicle documents	Scanned vehicle document(s)	Validation result
SUC2-F-017	The system **shall** check the vehicle's licence plate number against the one inserted during the preregistration phase.	The system needs to compare the digitised license plate number, with the licence plate number inserted by the traveller during the preregistration form	The digitised plate number is matched against the one stored in the preregistration database.	Camera extracted plate number, Preregistration inserted plate number	Check result
SUC2-F-018	The system **shall** check the captured licence plate number against the Vehicle related external databases	The system needs to Check the license plate number against the external databases to find out if the car is	The digitised plate number is queried in the external databases.	Camera extracted plate numbers	Check result

		stolen or associated with any crime.			
SUC2-F-019	The system **shall** allow a limited number of unsuccessful login attempts	The system needs to be protected against brute force attacks.	After the threshold of the unsuccessful login attempts is reached the login functionality is locked	Number of unsuccessful attempts	Locked login functionality (if number of unsuccessful logins > threshold)

6.5.2 Non-functional requirements

Table 11 Non-Functional requirements for system use case 2

Code	Type	Description	Rationale	Fit Criterion
SUC2-NF-001	Security	The system **shall** use encrypted communication channels.	The exchange of data has to be secured.	Communication channels will utilise be encrypted using proven encryption frameworks and mechanisms
SUC2-NF-002	Security	The system **shall** be able of generating large number of unique authentication keys	The system must be capable of generating enough unique authentication keys in order to serve all possible users/smart devices per BCP	The system must be capable of generating at least 100 unique authentication keys
SUC2-NF-003	Usability	The system **shall** offer an easy way acquiring the preregistration code from the traveller	The traveller must have a user-friendly way to input its preregistration code to the system	The traveller will input the code with none or no more than a few interactions with the system
SUC2-NF-004	Performance	The system **shall** offer a time effective way for acquiring the	The system must acquire the preregistration code with adding	The preregistration code will be retrieved in less than 20 seconds

		preregistration code from the traveller	none or very small delay in the overall Border Waiting Time.	(if it requires the travellers involvement) or with no (observable) delay, if it is retrieved fully automatically.
SUC2-NF-005	Usability	The system **shall** clearly indicate to the traveller the lane number she/he has to go.	The traveller must understand in a clear and easy way in what lane she/he has to go.	The traveller needs no more than a few seconds for realising where to go.
SUC2-NF-006	Usability	The system **shall** provide an easy way to retrieve the information from the provided traveller documents	The system has to retrieve with as little as possible interactions with the BCP officer or traveller the data contained in the travellers' documents.	The system acquires the data in less than 5 steps.
SUC2-NF-007	Performance	The system **shall** provide a time effective way to retrieve the information from the provided traveller documents	The system has to retrieve fast and accurately the data contained in the travellers' documents.	The system acquires the data in a matter of seconds.
SUC2-NF-008	Performance	The system **shall** provide a time effective way to retrieve the vehicle plate number	The system has to retrieve fast and accurately the plate number of the approaching vehicle.	The system acquires the vehicle plate number in a matter of seconds.
SUC2-NF-009	Performance	The system **shall** provide clear instructions to the incoming travellers on the way to provide their biometric data (e.g. look straight in the camera, etc.)	The system has to retrieve the biometric data with as less as possible interactions with the incoming travellers.	The traveller understands the biometric gathering process in a matter of seconds.

SUC2-NF-010	Performance	The system **shall** provide a time effective way to retrieve the incoming travellers biometric data (e.g. face photo, fingerprints, etc)	The system has to retrieve fast and accurately the biometric data of the incoming travellers.	The system acquires the biometric data in a matter of seconds.
SUC2-NF-011	Usability	The system **shall** provide the check results to the BCP officer in a clear way.	The system has to provide the overall and specific check results to the BCP officer in clear and comprehensive way.	The BCP officer understands the results in a matter of seconds.
SUC2-NF-012	Usability	The system **shall** provide a unified interface to the BCP officer towards performing the border control activities.	The system has to enable the BCP officer to perform its duties without the need to use different frontends for each activity.	The system provides a single unified interface to the BCP officer for performing the border control activities.
SUC2-NF-013	Usability	The system **shall** clearly indicate to the traveller where to go after the check finishes	The traveller must understand in a clear and easy way if she/he can pass the borders or proceed for a second line check.	The traveller needs no more than a few seconds for realising where to go.
SUC2-NF-014	Security	The system **shall** be able to handle basic spoofing attacks on the collected biometrics	The system must be secured against any attack that compromise its operations.	The system uses counter spoofing techniques and detects the attacks launched during the testing phase.
SUC2-NF-015	Operation	The system **shall** be capable of collecting biometrics at various weather conditions such as rainy day or sunny day	The system must be operational in various weather conditions.	The system is tested in various weather conditions (real or simulated)

SUC2-NF-016	Security	The system **should** contain hardware able to collect more sophisticated biometrics (e.g. iris)	The system should exploit the use of more advanced biometrics towards enhancing further the security level	The system has integrated the appropriate hardware modules and is able to acquire the more sophisticated biometrics
SUC2-NF-017	Operation	The system **should** be capable of collecting biometrics at various weather conditions such as rainy day or sunny day	The system must be operational in various weather conditions.	The system is tested in various weather conditions (real or simulated)
SUC2-NF-018	Interoperability	The system **shall** implement the official API for each external database (e.g. VIS, SIS II, etc) it needs to connect to.	The system must be interoperable with the interacting external systems	The system can query the external databases and get back the verification results
SUC2-NF-019	Security	The system **shall** allow access only to authorised users (persons and systems)	The system must be protected against unauthorised use.	The system grants access only to the successfully authorised entities
SUC2-NF-020	Reliability	The system **shall** be able to deal with power failures	The system has to continue operation in case of a power failure	The system utilises a UPS or power backup system.
SUC2-NF-021	Reliability	The system **shall** be able to come back after a power failure	The system must resume normal operation after a power failure	The system retrieves data from the backup system and resumes operation after powered again.

6.6 SMILE use case 3: The access in the refugee camp

Most of the requirements specified for system use case 2 (section 6.5) apply also here. Therefore, and order to avoid redundancy, the below tables contain only the requirements specific to system use case 3.

6.6.1 Functional requirements

Table 12 Functional requirements for system use case 3

Code	Description	Rationale	Fit Criterion	Input	Output
SUC3.1-F-001	The system **shall** scan the image of the traveller's face image from the provided identity document	The system needs the image to perform face recognition	The system is able to scan the provided identity document	Information from scanner	Scanning operation result
SUC3.1-F-002	If the face recognition result is not accurate, the system **shall** prompt the visitor to go to the red line	Possible attempt to enter the camp using falsified or stolen documents.	The system redirects all visitors with a non-accurate face recognition result to the red line	Image from the face recognition camera	The person is redirected to the red line
SUC3.1-F-003	If the scanned photo does not exist in the database, the system **shall** prompt the visitor to go to the red line	The lack of pre-registration data prohibits the use of the fast line.	The system redirects all visitors with no or incomplete pre-registration data to the red line	Information from scanner	Redirect to the red line
SUC3.1-F-004	The system **shall** check the information of the traveller from the red line	The system needs to do a risk analysis and checks in external databases	The system scans the provide traveller documents, perform a risk analysis and informs the officer in charge with the result.	Traveller identity document	Permit or deny access in the refugee camp
SUC3.1-F-005	In case the check results are clear, the system **shall** prompt the visitor to enter the refugee camp	If all checks are clear the visitor can enter the camp	Every cleared check outputs an entry allowance message	Traveller identity document	Message that the visitor can enter in the camp
SUC3.1-F-006	The system **shall** track the number of	The module needs to visualize and generate	Visualisation and reporting of the analysed	Tracked down num-	Reports, Visualization dashboards.

	travellers entering and exiting the camp	report according to the statistics	data via the SMILE UI.	ber of travellers enter and exit	
SUC3.1-F-007	The system **shall** verify the persons' ID also during exiting the camp	The system must verify the identity of people going inside and outside the camp	All persons exiting the camp are checked from the system	Biometrics and ID document	Confirmation of ID

6.6.2 Non-functional requirements

Table 13 Non-Functional requirements for system use case 3

Code	Type	Description	Rationale	Fit Criterion
SUC3.1-NF-001	Availability	The system **should** be operable 99.9% of the time	The system should provide its service	99,9% availability
SUC3.1-NF-002	Fault tolerance	The system **should** continue operating properly in the event of the failure (or one or more faults within) some of it modules.	The system has to be fault tolerant	The system will integrate fault tolerance mechanisms, which will be tested during the validation phase.
SUC3.1-NF-003	Robustness	The system **should** cope with errors during execution and cope with erroneous input	The system should no pause its operation because of receiving or processing erroneous input.	The system will check and validate any received input prior to processing it

6.7 Requirements summary

So far there is a relevant equilibrium in the number of the collected functional and non-functional requirements. This reflects our deliberate effort to make sure that both the functional and quality properties of the system will be equally documented during this task.

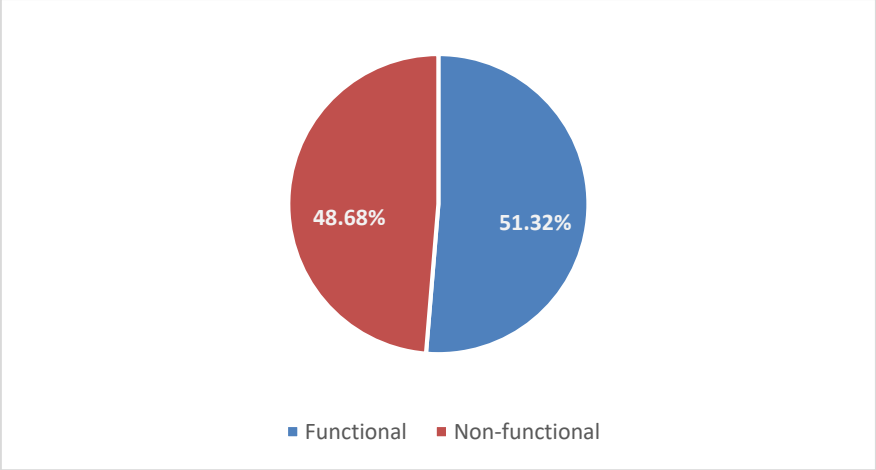

Figure 7 Functional versus Non-functional requirements

As far as it concerns the types of the non-functional requirements it is evident that so far there is a tendency to focus on the security, usability and performance aspects of the system; It is expected that during the coming period, based also in the input received from the development and testing activities, to enhance further the other types (or even introduce new ones).

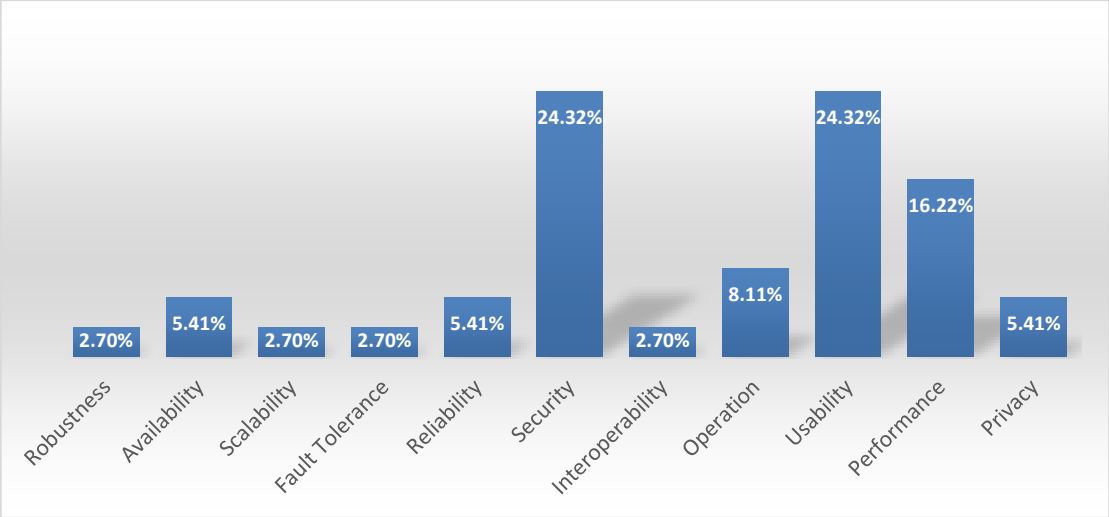

Figure 8 Type of collected non-functional requirements

7. External datasets

The below section summarises the external datasets that will be used for validating and testing the biometrics' extraction and analysis modules of SMILE. A more thorough analysis about these datasets is currently running in the context of T4.2 and will be included in D4.2.

7.1 Public face datasets for soft face biometric features extraction and person matching

In order to develop the soft face biometric feature extraction module, and to evaluate its detection accuracy and robustness in various settings, as well as its person matching and identification potential, the following publicly available face datasets will be utilized:

- **LFW Soft Biometrics Database:** The dataset is based on the "Labelled Faces in the Wild (LFW)" human face dataset, which has been designed as an aid in studying the problem of unconstrained face recognition. The dataset contains 13233 target face images from 5749

different individuals. For each image the ground truth[3] for a series of soft and hard biometric facial attributes are provided, namely: gender, age, ethnicity, eyewear, skull form, facial hair, forehead position, eyes position, mouth position and face pose. The dataset is available online at: http://atvs.ii.uam.es/atvs/LFW_SoftBiometrics.html

- **NIST Special Database 32 - Multiple Encounter Dataset (MEDS):** The dataset is provided to assist the FBI and partner organizations to refine tools, techniques, and procedures for face recognition. It includes 1309 headshots from 518 different subjects. For each image the following ground truth annotations are provided: 68 facial landmarks, face pose age, gender, race, weight, height. The dataset is available online at: https://www.nist.gov/itl/iad/image-group/special-database-32-multiple-encounter-dataset-meds
- **OUI-Adience Face Image:** The dataset attempts to capture all the variations in appearance, noise, pose, lighting and more, that can be expected of images taken without careful preparation or posing. It includes 25580 face images from 2284 different subjects. For each image the following ground truth annotations are provided: 68 facial landmarks, age and gender. The dataset is available online at: https://www.openu.ac.il/home/hassner/Adience/data.html

8. Conclusions

In the lifecycle of system engineering, the system requirements are a key element for the implementation of a product that does not only do what its users need but it also does it well. In this direction and following the Volere and IEEE-29148 requirements' frameworks, we produced system use cases using as a basis the users' use cases and stories that were included in D2.2. These (system) use cases were used to describe the interactions of the SMILE platform with the external entities regarding the travellers' preregistration process, the project's envisioned fast lane border checking and the access to a refugee camp (part of one of SMILE's pilot scenarios). Based on the derived interaction diagrams, and on the so far documented user needs and policy/legal constraints, we derived more than 70 functional and quality (non-functional) system requirements that will be used by the development team (along with the architectural descriptions) as the main input towards realising SMILE solution. In front of us awaits a new cycle of discovering any missed requirements, of refining existing ones, and of feeding them again back to the development team, helping them as such to build a system that satisfies the users' needs.

References

[1] Suzanne Robertson and James Robertson. 2012. Mastering the Requirements Process: Getting Requirements Right (3rd ed.). Addison-Wesley Professional.

[2] Volere Requirements Resources, Online: http://www.volere.co.uk/, Last accessed: 12/06/2018

[3] Bruce Powel Douglass. 2015. Agile Systems Engineering. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

[4] ISO/IEC/IEEE International Standard - Systems and software engineering -- Life cycle processes --Requirements engineering," in ISO/IEC/IEEE 29148:2011(E), vol., no., pp.1-94, Dec. 1 2011

[5] COM (2016) 731: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a European Travel Information and Authorisation System (ETIAS)

[3] The term "ground truth" refers to the accuracy of the training set's classification for supervised learning techniques.

and amending Regulations (EU) No 515/2014, (EU) 2016/399, (EU) 2016/794 and (EU) 2016/1624

[6] ISO/IEC 7501-1:2008 (ICAO 9393-1) Identification cards -- Machine readable travel documents -- Part 1: Machine readable passport

Annex I: Indicative list of non-functional requirements

Table 14 Indicative list of Non-functional requirements

SN	Non-functional Requirement
1	Accessibility
2	Adaptability
3	Auditability
4	Availability
5	Backup
6	Capacity
7	Compatibility
8	Certification
9	Compliance
10	Configuration management
11	Cost
12	Data integrity
13	Data retention
14	Dependency
15	Deployment
16	Development
17	Disaster recovery
18	Documentation
19	Durability
20	Efficiency
21	Environmental protection
22	Escrow
23	Exploitability
24	Extensibility
25	Failure management
26	Fault tolerance
27	Legal and licensing
28	Interoperability
29	Maintainability
30	Management
31	Modifiability
32	Network topology
33	Open source
34	Operability
35	Performance
36	Privacy
37	Portability
38	Quality
39	Readability
40	Reliability
41	Reporting

42	Resilience
43	Resource constraints
44	Response time
45	Reusability
46	Robustness
47	Safety
48	Scalability
49	Security
50	Stability
51	Supportability
52	Testability
53	Throughput
54	Transparency
55	Usability
56	Integrability