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SMart mobILity at the European land borders

SMILE

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Deliverable

D9.4. SMILE Exploitation Plan

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List of definitions & abbreviations

Abbreviation	Definition
ABC	Automated Border Control
BCP	Border Control Point
BWT	Border Wait Time
CAGR	Compound Annual Growth Rate
EES	Entry/Exit System
EU	European Union
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IoT	Internet of Things
IPR	Intellectual Property Rights
ISIS	Islamic State of Iraq and Syria
NFC	Near Field Communication
RFP	Request For Proposal
RTP	Registered Traveller Programme
SoA	State of the Art
UN	United Nations
WP	Work Package

Executive Summary

This document focuses on the development of an appropriate exploitation strategy and plan of the project results. We try to follow the method defined in the original proposal, as it has a major focus on market impact. For instance, we have concentrated our efforts on the analysis of the strength of the market and more importantly on what are the most significant trends in terms of technological acceptance for this market (competitive landscape analysis and monitoring). We have also insisted on the communication and dissemination actions being fully integrated with the compulsory periodic reviews, milestones, deliverables defined in the project.

The core strategy is to use the extensive contact network of each of the consortium members as a starting point to get in touch with new potential users of the project solutions. OT will lead this task with support from all project partners. The partners will also develop their own individual exploitation plans based on their contributions to the project and their business development strategy.

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1 Document Overview

1.1 Purpose

This document is the first report about the exploitation plan related to the outputs of the SMILE project. In accordance with the framework Agreement it reflects on the thoughts and discussion among the consortium about the perspectives and opportunities generated by the outputs of the projects. The methodology has already been described in it, so we will do a simple recall about it. This document mainly focuses on Market analysis and a view of the technological landscape. The document is mainly dedicated to the usage of the project partners to initiate and enhance their activities towards exploitation.

2 Market Perspectives

2.1 Global Border Security Market

"Automated Border Control Market by Solution Type (ABC e-Gate and ABC Kiosk), Component (Hardware, Software, and Services (Installation and Maintenance)), Application (Airport, Land Port, and Seaport), and Geography - Global Forecast to 2023" report by Research and Markets:

The automated border control (ABC) market was valued at USD 456.5 Million in 2016 and is expected to reach USD 1,577.7 Million by 2023, at a CAGR of 17.45% between 2017 and 2023

The major driving forces for the growth of the ABC market are rising security concerns, enhanced traveller convenience in the border crossing process, and increasing need for automation across all port facilities.

The key restraining factors for this market are the lack of standardization and large capital requirement for infrastructure projects. The threat of identity theft acts as a major challenge for the automated border control market.

http://homelandsecurityresearch.com/2016/05/european-smart-borders-immigration-enforcement-border-security-markets-2016-2022/

Smart Borders, Immigration Enforcement & Border Security Markets in Europe – 2017-2022

Border Security Market 2015-2020 CAGR: 15.5%. Granulated by 40 Submarkets

Border Security Markets in Europe - 2016-2022

European Smart Borders, Immigration Enforcement & Border Security Markets

2010, 2015 & 2020

With 1.8 million asylum seekers (UN reports) crossing Western Europe's external borders in 2015, the European border security agencies are facing challenges with a far greater reach than ever before. More than 1000 ISIS-trained jihadists returning to Europe every year, coupled with the surge of migrants to Europe are alarming concerns, as present capabilities of the European border, coast guard, intelligence services and immigration agencies simply cannot meet these challenges.

The EU-Turkey deal (if implemented) might lead to a significant decrease in the flow of refugees (by March-April 2016 the rate of migrants entering Greece declined by 90%). However, the agreement faces formidable practical, political and legal challenges (e.g., each and every one of the 22 EU parliaments has to endorse the treaty).

In the aftermath of the migration crisis and the Paris and Brussels terror attacks, a major overhaul of the Western European border security and immigration infrastructure, strategy, border security technology development and funding is already underway.

Following a 2010 to 2015 annual market growth of 10-13% the 2015- 2020 annual border security market will surge by 104%.

The "European Smart Borders, Immigration Enforcement & Border Security Markets – 2016-2022" report is the most comprehensive review of the border security market available today. It provides a detailed and reasoned roadmap of this growing security market.

The European Smart Borders, Immigration Enforcement & Border Security Market is boosted by the following factors:

The Western European border security, coast guards, immigration agencies and intelligence agencies are ill-equipped to counter the surge of refugees and 21st century jihadists who use sophisticated means to return to the continent.

The Schengen Area is comprised of 26 European countries that have abolished border control at their common borders. Several Schengen Area governments reinstated border checkpoints by 2015.

Europe cannot build a wall to keep out refugees and terrorists or enlist millions of border guards who would need to watch every inch of its over 10,000 km land borders and 80,000 coastlines.

Europol estimates that up to 5,000 European jihadists have already returned to Western Europe after obtaining combat experience on the battlefields of the Middle East.

On 15 December 2015, the European Commission presented a proposal for a new agency that would replace and succeed Frontex, having a stronger role and mandate, and forming a "European Border and Coast Guard" along with national authorities for border management.

Of Europe's approximately 50 countries, Russia has by far the longest coastline as well as the longest land border.

Western Europe, the largest economy in the world with a 2015 GDP of approximately $22 trillion (vs. the U.S. $17.5 trillion), can invest "whatever it takes" to protect its citizens from the looming jeopardies of mass migration and terrorism using advanced border security technologies.

The border security and immigration enforcement industry faces a considerable challenge in seeking to provide the necessary solutions to current and future threats. At the same time, this challenge presents multi-billion USD opportunities for the defense, ICT and security industries able to deliver effective functions, integrate systems, and maximize security and productivity per $ invested.

According to European intelligence services, ISIS has approximately 5000 original European blank passports which can be used by jihadists returning to the EU.

The EU and the rest of the European border security and immigration infrastructure enforcement market for products and services are served by local defence and security companies. Even with a preference for locally manufactured products, foreign products can usually strongly compete on the basis of cost-performance. They do not encounter any EU direct trade barriers or quotas. However, the approval process of dual use goods, which include many security market products, might constitute indirect trade barriers.

https://www.mordorintelligence.com/industry-reports/border-security-market

Border Security Market

The market is expected to grow at a CAGR of 7.59% to reach $ 53 billion by the year 2022. A sharp rise in terrorism globally has put the focus back on protection of the national boundaries on the state radars. The issue of border protection was minor especially in the European Continent until a few years ago. The Schengen agreement allowed free movement amongst the members of the European Union, which led to less investment in the border protection measures. Russia controlled the overwhelming majority of the market. But the rise of ISIS and the incessant inflow of refugees have forced the members of the European Union to strengthen their border security apparatus.

2.2   Global Biometrics Market

Global biometrics market stood at $ 12.84 billion in 2016, and is projected to grow at a CAGR of 14.76% to reach $ 29.41 billion by the end of 2022, on the back of rising adoption of biometric tools across banking & finance, consumer electronics, travel, government, defence, healthcare and other sectors. Moreover, growing government initiatives such as e-passports and introduction of other e-government processes, increasing demand for advanced security systems against crimes, frauds, terrorist activities, hackings, etc., are some of the other major factors expected to drive biometrics market on a global level during the next five years. Increasing deployment of biometric technology with growth in the IoT industry is anticipated to positively influence the global biometrics market during the forecast period.

https://www.techsciresearch.com/report/global-biometrics-market/1373.html

Emerging and fast growing mobile market for fingerprint biometric sensors:

Since Apple introduced a fingerprint touch sensor in the iPhone 5S in 2013, the potential of biometric technology for the consumer market became clear. Since then, other Smartphone manufacturers have also integrated fingerprint sensors in their telephones (Samsung, HTC…). More than just unlocking the Smartphone with convenience, other applications are also possible such as authenticating payment in first line.

The fast development of biometric sensors (mainly for fingerprint recognition) for Smatphones and tablets brings new opportunities and solutions for secure e-Services, especially e-Banking, e-Government, e-Health and e-Commerce.

Fingerprint sensors can be found on Smartphones in three different implementations: swipe, touch (the majority) and touchscreen. Swipe technology consists in a narrow sensor on which the finger is swiped. Several images of parts of the finger are captured and the full fingerprint image is then reconstructed. Swipe sensors are quite cheap but have lower usability and tend to disappear and swipe implementation will be more and more dedicated in low-end products. Touch (or touch type) sensor is a sensing area on which the finger is pressed and the fingerprint image is acquired without requiring any additional movement. Touchscreen is a new technology to make very thin and transparent sensors (for example using organic electronics) that could be put over a device's screen (Smartphone or tablet). In this case the entire screen of the device is the actual sensor and can capture fingerprint images from fingers placed anywhere on the screen. Touchscreen is not a completely mature technology, therefore not yet present on the market.

The integration of the fingerprint functionality in smart mobile devices is expected to grow significantly in the coming years. Figure 1 and Figure 2 (source: IHS) show that the growth projection for the implementation of fingerprint sensors is more than 1.4 million units shipped in 2020 and more than 1.5 million US$ in revenues, with the main share for touch sensors.
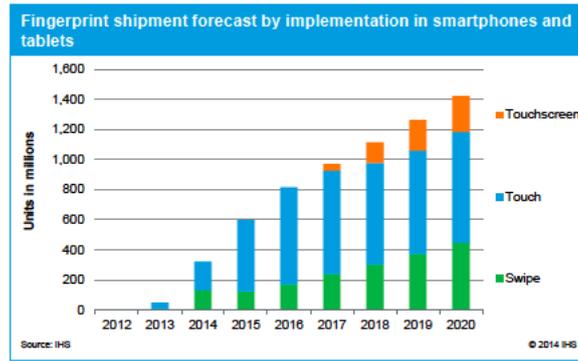
Figure 1: Forecast of sensor type implementation in Smartphones and tablets
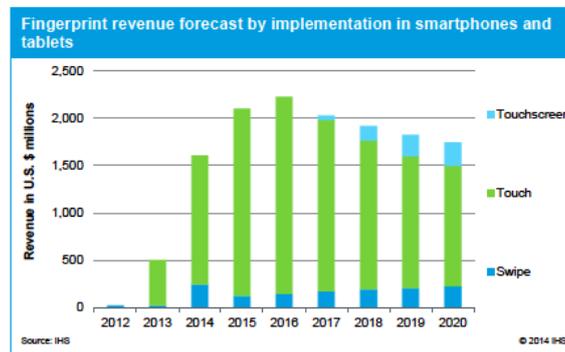
Figure 2: Forecast of revenues by sensor type in Smartphones and tablets

Figure 3 and Figure 4 (source: IHS) is another representation of the above showing the expected growth for the implementation of fingerprint recognition functionality in smart mobile device in terms of units shipment and revenues. Dedicated means the integration of swipe or touch sensors. Touchscreen is highlighted separately as it relies on a completely different technology.
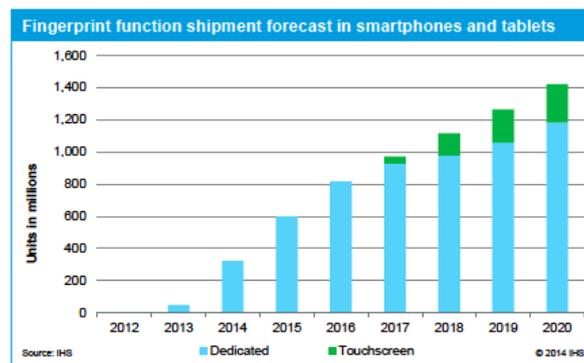
Figure 3: Forecast of fingerprint function shipment in smart mobile devices
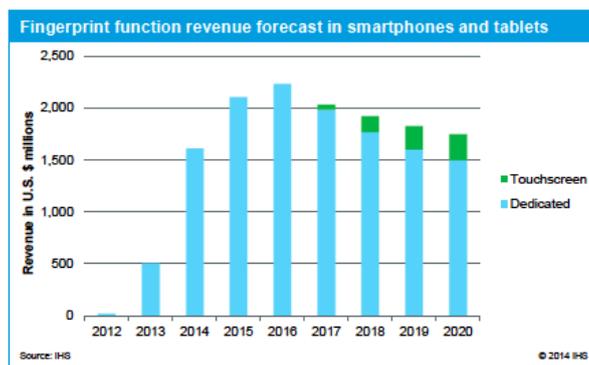
Figure 4: Forecast of fingerprint function revenues in smart mobile devices

2.3   Big Data Market

The term "big data" describes the enormous amount of data that inundate businesses on a constant basis, as well as the industry which has grown around attempts to collect, analyze, and act upon that data. Due to the size and complexity of "big data" sets, traditional data processing applications are seen as inadequate. While the volume of data becomes largely unimportant beyond a certain point, it is what organizations are able to do with the data that matters. According to its proponents, the ability to harness big data effectively allows businesses to make faster, smarter decisions and improve short- and long-term strategic planning.

The statistic shows a revenue forecast for the global big data industry from 2011 to 2026. For 2017, the source projects the global big data market size to grow to just under 34 billion U.S. dollars in revenue.

https://www.statista.com/statistics/254266/global-big-data-market-forecast/

The largest big data segment is currently professional services, which represents around two fifths of the total market and generates around 10 billion U.S. dollars annually. Some analysts suggest this may not last, however, with service revenues giving way to big data software revenues over the coming decade. Across all segments, IBM is the current market leader, with revenues of about 1.5 billion U.S. dollars from big data. Hewlett Packard Enterprise and SAP round out the top three, with big data revenues for each company reaching close to a billion U.S. dollars.

While the industry is growing steadily, client companies continue to have some concerns with the wholesale adoption of big data. Employees and executives working with big data have listed security, cost, and a lack of technical big data expertise as some of their most pressing concerns, and many executives believe that maintaining the quality of collected data remains a significant challenge.

3   Strategy Plan

3.1   Objectives

The SMILE project will focus on the research of several technological solutions that cover any part of a BCP control system and are able to work individually or as a whole. The major scope of the SMILE approach is to provide a palette of cost effective and easy to install or adapt modules, in order to support the increased needs of EU Land Border Infrastructures.

The need for new investments in Land Borders infrastructure has been strongly motivated, among EU member states, by the need to stem the largely uncontrolled flow of migrants across the EU. In South East Europe (SEE) the existence of several non-European Union (EU) member countries and borders procedures makes the regional and international land transport slower and more expensive.

3.2   Challenges

3.2.1   Smart Lanes

Building upon SoA wireless networking technologies and by applying recent advances of the Internet of Things (IoT) paradigm, SMILE proposes the realisation of Smart Lanes as the entrance point to European Land Border infrastructures.

These lanes will enable the Registered Travellers to access the SMILE platform and authenticate themselves (through the SMILE gateway) using multimodal biometrics embedded in their mobile devices (SMILE RTP Client), and exploit smart borders' facilities while approaching Border Control Points (BCP). More specifically, travellers in the Fast Lane will be notified through alerts and/or electronic messages to turn-on their mobile client (which automatically connects to the local Smart Lanes wireless network) and access the SMILE Frontend in order to validate their registration via multimodal biometrics and receive an e- Token. This e-Token will be used repeatedly throughout the travellers' check/authentication processes while crossing borders, and may have a certain lifetime (e.g. 30 minutes) that may vary according to the overall BCPs' traffic, during which travellers may proceed to the BCP for automated controls (i.e. interact with the system under border guard supervision). Otherwise, if the e-Token expires, travellers may have to go through manual controls (controls performed by a border guard who interacts with SMILE and existing BCP infrastructure). At the same time, Smart Lanes will assist border staff/authorities to identify registered travellers and take appropriate actions for facilitating their fast and secure border crossing, by minimizing the intervention during verification and pass control for a pre-registered traveller. In case of travellers passing with a vehicle (e.g. they have registered their car and licence plate) visual/optical sensor devices will also be utilised (mobile camera, legacy systems) for scanning the car's registration number. The challenge, therefore, is to investigate the physical characteristics of these Smart Lanes (e.g. length), the type of IoT modules and their constellation across the envisaged Smart Lanes, the type of network access and corresponding communication protocols, along with the utilisation of any additional modules assisting fast and secure travellers' processing at BCPs.

3.2.2   BWT optimisation

Upon successful retrieval of the e-Token (i.e. while in the Smart Lane), travellers will be guided through e-messages on their mobile client to an RTP clearance point, where they validate their e-Token(s), and get directions to which Fast Lane to proceed. For this reason, the RTP clearance point initially communicates with the RTP data base in order to verify that the specific e-Tokens are valid. Upon successful verification, the clearance point decides to which Fast Lane the traveller should proceed, by calculating (in real time) the Border Wait

Time (BWT) and choosing the least populated Fast Lane, thus contributing towards traffic optimisation among all available Fast Lanes, which in return results to cross-border through-put maximisation. It should be noted that in cases where there are numerous travellers within a vehicle (e.g. car), the clearance point will also be assisted by cameras and other sensory devices in order to identify the number of passengers; an issue that directly affects BWT optimisation, prior to directing the vehicle to the corresponding Fast Lane with the least load.

3.2.3   Fast Lanes

Upon arrival at the BCP, travellers will go through a manual control performed by a border guard who interacts with the systems, or through automated controls by interacting with the system under border guard supervision, whichever is appropriate. Travellers will initially be checked if holding a valid e-Token by connecting their mobile device to an e-Token reader, the communication of which may be based on Near Field Communication technology (NFC). The officer/guard will be notified (by the Land Border Agent – i.e. the local RTP system) if the e-Token is still valid, and will ask the traveller to authenticate him/herself via multimodal biometrics provided via his/her mobile device and any other medium including MRTDs/e-MRTDs. In case there are more travellers in a car, the guard could ask them to authenticate themselves following the same process or some other locally/legally requisite process.

3.2.4   Entry/Exit clearance, monitoring and update

Nowadays, border guards are supposed to check the validity of the traveller's documents, record their EES status, besides being able to monitor any illegal actions (e.g. overstays) and update/renew electronic documents on-site. To automatize this process and make it more efficient, SMILE will elaborate on the design and implementation of the secure IT infrastructure (SMILE gateway, optical PUF, Cloud Backend), software tools (Homomorphic Encryption, Interfaces with BIMS) and applications (Single Search Interface, Multimodal Biometrics) that border staff will utilise for on-line and real time traveller's Entry/Exit clearance and control, alongside the technical requirements and specifications for the underlying networking infrastructure capable of interconnecting with BCPs, not only within the same country (intra-country communication), but also and most importantly between the BCPs located in different states (inter-country communication). Such intra/inter BCP communication will be conducted through a distributed (e.g. instances located in different European states) SMILE Orchestrator entity, and will be carried over Secured Network and Interfaces

3.3   Targeted Market

For the SMILE industrial partners the efforts to conceive and develop a solution are mainly dedicated to governmental markets but as underlined before we can reach a larger Audience:

Government

The major governmental application that has to be to satisfy completely in SMILE is Border Control. The first audience who must be convinced is of course the practitioners involved in each project, hearing their requirements and wishes, the actual questions they have about the interaction between their work and the technology we will deployed. In addition, it should be underlined that this concern is in line with the EU effort regarding the control of immigration, as on the 6th April 2016 the EU commission proposed an Entry-Exit System to speed-up, facilitate and reinforce border check procedures for non-EU nationals travelling to the EU. This system is largely relying on Biometrics technologies and fusion of data is an advantage that has been foreseen.

3.4   SMILE exploitation plan and perspectives

GENERIC BUSINESS PLAN	
Products	**Product positioning**
Smart Lanes for Borders Cloud Based Identification Services for Travelers	The concepts designed in SMILE will be the technological grounds of our answers to RFP proposed by governments to ensure the border controls at specific location such airports, harbours or major roads.
Market size and segmentation 1 577 Millions $ 2023	**Go to market** The SMILE solution will be marketed via three main channels: Direct sales: technology providers (FINT) will sell a turnkey end to end solutions to small and medium size customers Channel sales: system integrators (e.g. SIV) will propose a customizable solution (and additional service) to large service providers and corporate customers Governmental sales: industrial partners (e.g. OT) will propose deployment contract of the SMILE solution in large systems to be deployed in Border Control Access context

The spirit of SMILE is to propose a fully integrated solution of intelligent border management systems in land BCPs to help border forces to improve the throughput at BCPs while maintaining a high level of security at the same time. Research results will be exploited for the development and support of new and cost-effective products of course, but in SMILE we will also explore the possibility to exploit and bring to the market the complete solution (infrastructure, technical components, ecosystem, training…). This might be achieved through commercial partnership among SMILE partners. However, it is still too early in the project to define a detailed exploitation plan for the SMILE solution. Better vision is required, based on project's outcomes, to achieve such plans that would be fully developed in deliverable D9.6 describing the final exploitation plan.

3.5   Individual Exploitation Plan

This section gives a first and synthetic overview of possible exploitation of the foreground and project's outcomes by individual partners. These plans show the possible exploitation directions as identified at the beginning of the project. Thorough analysis and full exploitation plan description will be provided at the end of the project in deliverable 9.6, once the final projects results will be known, enabling a better vision of their possible exploitation.

3.5.1   CERTH Individual Exploitation Plan

CERTH as a research institute, has a strong academic background but limited business experience, and thus would be very challenging to employ specialized staff in order to maintain and market a commercialized product on a permanent basis. However, CERTH-ITI has already 6 spin-offs so far, so there is high potential to do the same for at least the CERTH modules out of the SMILE project, or participate as partner in a possible consortium-wide spin-off/start-up.

3.5.2   Fraunhofer individual exploitation plan

Fraunhofer is seeking opportunities for prototyping leading-edge technologies providing value-added in land border security, Internet of Things, and data analytics. These prototypes are turned into pre-product implementations within projects with industrial partners and as the basis for future spin-offs from Fraunhofer. The participation in the SMILE project provides Fraunhofer the unique opportunity to share expertise with the project partners in land border security, and big data. These synergetic opportunities will allow Fraunhofer to shorten the R&D cycle of its products, mainly in the area of security, data harvesting, and data mining. The close collaboration between Fraunhofer and various industrial and public sector partners will ensure that the project receives useful feedback from security companies, and border police, regarding trial results, marketing opportunities, user benefits and wide-scale implementation feasibility.

3.5.3   Technological Educational Institute of Crete Individual Exploitation Plan

As a Higher Educational Institute, TEIC aims at continuously enhancing and keeping the up-to-date level of knowledge offered in its courses. The results obtained via SMILE will be exploited by TEIC for exposing its graduate engineers and researchers in state-of-the-art areas of Security and Border control Technologies, by offering them theoretical knowhow as well as practical and in-hands experimentation tools to be developed within the framework of SMILE. In particular, MSc courses will be enhanced with tutoring on the specific concepts, and extensions on the related aspects will be offered for PhDs. TEIC also puts extreme value in its collaboration via SMILE with other research, civil-sector and industrial partners, since this is the only way to be promptly acquainted with upcoming standards and major imminent technical and scientific breakthroughs.

3.5.4   FINT Individual Exploitation Plan

FINT's core business lines include solutions (SW and HW) for industrial and semi-industrial environments. The company has already developed solutions and products related to Smart Cities (Smart Lighting, Smart Parking, Environmental monitoring, Water Management etc as also Integrated Smart City Management Platform), Smart Roads, Smart Borders, Smart Ports, Smart Agriculture and other more specialized Industrial domains.

The participation of FINT in SMILE is of highly importance for the company because it will take advantage of the project's developments in order to exploit:

- Eventual productization of the technologies developed within the project. Use the platform to offer a key service that can enhance European Smart Border Control connected with already installed platforms in Cities. Specific scope is to interconnect smart borders with smart cities and more authorities under the same framework of exchanging information.
- Offer a border control smart gateway which will act as the point of interconnection of the different technologies that will be applied in SMILE with the legacy systems
- Build proper interfaces for interconnection above smart gateways to IoT infrastructures existing or future ones with the SMILE system. The smart gateway will include various interfaces for connectivity such as 4G, WiMAX, WiFi, Bluetooth, Ethernet, IPv6 (6LowPAN) etc.
- Finally, FINT will set as one of the main exploitation priorities to investigate potential collaboration within the duration of the project in order to create joint venture with some of the project participants in order to minimise the time to market and increase the quality of the end solution.

3.5.5 SIVECO Romania individual exploitation plan

Siveco's is one of SMILE's industrial partners with the integrator solution role in the project.

The exploitation plan of SIVECO is based on the following estimations and assumptions:

1. Payment. License fee for the entire solution providing training and technical assistance during the use of the solution.

2. Commercial release. The commercial version will be launched in 2020 after testing the solution internal in our premises and with the pilots which will be installed on Romanian Border and Bulgarian Border.

3. Costs. The customer will pay for the complete solution and this cost will be based on the estimated number of cores/server that will be used.

4. Incremental and scalable deployment from Bucharest to Romanian Border. We will start the deployment at local level with the intention of consolidating the solution.

3.5.6 NTNU Individual Exploitation Plan

NTNU is an academic institution with strong academic background and tradition. NTNU also has a Technology Transfer Office, which up to date, received 1000 ideas, 395 patent applications, and led to 57 spinoffs and handled 54 license agreements (https://www.ntnutto.no/). NTNU will help through these means contribute to the exploitation of both NTNU modules in the project and the other modules.

3.5.7 OT Exploitation Plan

The following solutions, products and business opportunities are foreseen by OT to valorise the outcome of SMILE

3.5.7.1 ABC Gates

Nowadays, the number of situations with the need of controlling successively the identity of many people is increasing substantially. One of the main issues of this kind of scenario is to be able to automatically and trustfully control the people identity without slowing down the flow. Typically, this situation occurs in airports when passengers disembarking from a plane have to cross border control.

Indeed, the massive increase in the number of travellers going in and out of countries, along with the acute awareness of the risks related to terrorism and illegal immigration, have led governments and airport authorities to encourage changes in their border control procedures, with the help of new technologies: biometric credentials, such as e-passports, e-visas and e-IDs along with the automated e-gates capable of checking them.

E-gates are a suitable solution because this approach is very adapted to the constraints implied by checking verification or identification in a flow of persons without human interaction.
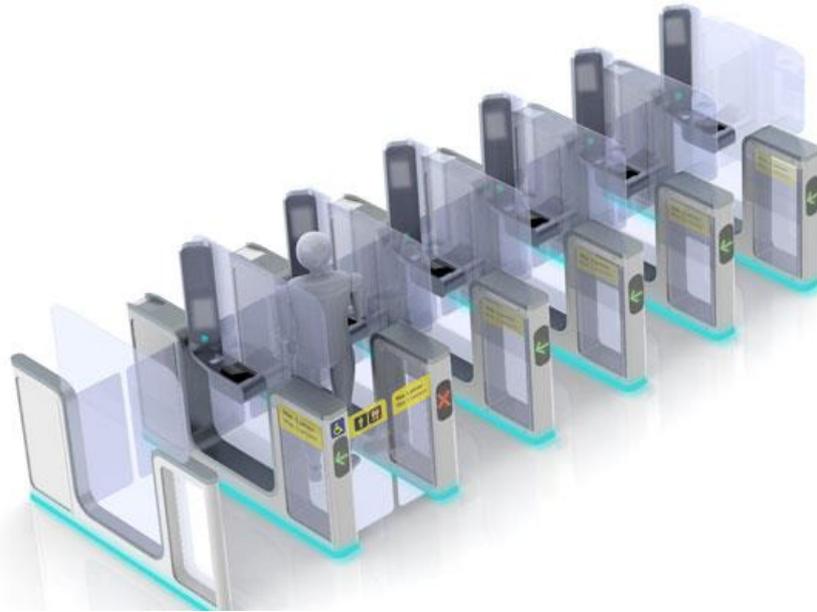
Figure 5: Automatic Border Control gates

Automated Border Control (ABC) gates provide automation of border crossing checks. The level of automation, the biometric modalities used, the travel documents processed, the capacity to automatically send requests to remote data bases, and the performance vary from one system to another.

3.5.7.2   Mobile biometrics

The current growth of consumers' mobile devices has led to the emergence of new business opportunities. In particular, mobile devices such as Smartphones or Tablets exhibit more and more computing capabilities and increasing versatility.

Biometrics are more and more considered as an efficient and reliable solution to perform sensitive operations on a personal mobile device where identity verification is required (banking, health…). Moreover, this kind of devices could be of use for public authorities, if handled properly.

This emerging market would surely benefit from improvements in security brought by the SMILE technologies if they could be reduced in size and cost.

Especially, OT is already selling mobile products suitable for police and border control forces. The MorphoTablet 2 is a tablet featuring fingerprint reader, camera for face capture and ID documents reader enabling identity verification anywhere, anytime. The work done in SMILE will be done taking this product as a basis in order to achieve the next generation, while fulfilling at the same time the projects' requirements.

Figure 6: MorphoTablet 2

Finally, next generation biometrics on a Smartphone or a tablet using the tactile surface as a sensor, known as touchscreen sensor technology, is progressively emerging and might be also suitable for future deployment in the market.

Figure 7: Fingerprint sensor on a Smartphone tactile surface - coming soon?

3.5.8   eGov Consulting and Development

eGovCD is a SME focusing on R&D within the field of IT innovations for the public sector, IT consolidation, process management and cloud services. In the SMILE project eGovCD is mainly developing an eID-module, which could be a standalone system or a part of the larger SMILE platform. eGovCD's exploitation plans therefore include the marketing and sales of systems, either standalone or as part of a larger delivery also containing other SMILE elements. This means that eGovCD will exploit the results from the SMILE research project through the reuse of the eID module. In particular, besides the dissemination activities (relevant publications and conferences), eGovCD will use the SMILE project as some kind of test installation and reference for further marketing in areas where a need and a potential for the system arises. In addition to the marketing of the standalone system, eGovCD will coop-

erate with other SMILE partners in cases where the eID module is wanted as a part of a larger delivery.

3.5.9   TECH individual exploitation plan

TECH INSPIRE Exploitation Plan provides an overview of the strategies and actions needed for the adoption and exploitation of the Homomorphic Encryption Solution generated by the SMILE project. It provides the framework for identifying, developing and optimising TECH Security Solution at large for the exploitation of project results during the project and after its completion. The core strategy is based on using the extensive contact network of each consortium members as a starting point to get in touch with new potential users of the project solutions. In addition TECH marketing team has worked closely with UK and European markets to integrate our homomorphic encryption based searchable solutions as part of Cloud offering of major Telco operators. These existing channels will be exploited to seek any potential new business opportunities in the European cyber security market place.

3.5.10 EULAMBIA Individual Exploitation Plan

EULAMBIA is one of SMILE's industrial partners whose one of the roles within the project is to serve the linkage of SMILE technology ideas with industrial needs in the field of secure data storage and encryption. The SMILE technology transfer to EULAMBIA and the future commercial collaboration with SMILE's partners such as FINT, CERTH, OT and the border security end users, will give a substantial advantage to EULAMBIA towards its emergence in the market. The project's outcomes are expected to deliver a great impact on the services and products offered by EULAMBIA targeting on the security of digital data not only in the border security sector but in a much broader perspective. The proposed p-PUF device will offer unprecedented security features in both user authentication/secure communications and encryption of data for cloud-based storage services.

The company's internal planning shift, which is already taking place, concerns the redirection from a service-based to a product-based portfolio and to this end EULAMBIA expects to fully exploit the project's reach and visibility. In addition, the company aims to develop complete integrated photonic-based security solutions that are as close as possible to the user needs and expectations. SMILE will also serve as the vehicle to worldwide recognition of the proposed p-PUF device through proper IPR management as EULAMBIA will immediately seek patent grants from the major IP offices (USPTO and EPO).

Therefore, the company is very interested in the outcomes of the SMILE project as it believes that the information to be derived through the events organized by the project will provide a strong foothold for the company in the related industry and service sectors. In this direction, EULAMBIA intends to play an active role in this process through the conduction of interviews and participation in workshops organized by SMILE. The interviews and the workshops to be organized throughout the project will serve as a communication channel for understanding how these sectors perceive the adoption of photonic-based security solutions and to which extend this adoption can spread.

This will allow the future product releases of the company for the public and border security sector to be closer to the actual users' expectations as it will be able to provide solutions for aspects of the services for which considerations currently exist. Such an effort is expected to make the relevant stakeholders less reluctant towards the adoption of photonic-based solutions for their needs and hence this is expected to raise the market-share for the cloud products released by the company in the public and border control domains and hardware security field in general. Overall, the company believes that the opportunity raised through SMILE project will contribute to a competitive advantage for its future public and border security services among its competitors as cloud solutions will be based on deep understand-

ing of the user needs and considerations. Therefore, a detailed and comprehensive business plan will be developed throughout the duration of SMILE that will take into account the needs and gaps in the respective markets, a thorough cost analysis, a survey acknowledging the public's adoption willingness and the most effective communication channels to be used in order to establish long-term growth and establishment.

3.5.11 Serviciul de Protectie si Paza (SPP) individual exploitation plan

The Protection and Guard Service (SPP) is the state body with functions in the field of national security, specialized in providing protection for the Romanian dignitaries, the foreign dignitaries during their stay in Romania, and their families, within its legal competence. It also provides guard for the headquarters and residences of the above-mentioned dignitaries in accordance with the decisions of the Supreme Council of National Defence.

The research activities in SPP are supported by European Union H2020 program, the Romanian Ministry for Research and Innovation and through memorandums of understanding with main Romanian research centres, universities and private companies. Internally, the research activity is coordinated by Projects Implementation and Coordination Unit which at this moment is under progress to develop internally a pure research and innovation unit.

SPP main objective for exploitation is the integration of the solution in operational activities, in order to protect sensitive areas and events. As a Law Enforcement Agency, commercial exploitation is not an objective for SPP, because also of the national legislation, but through creation of service level agreements (SLA) with stakeholders (universities, research and business partners) in order to commercialize the developments done within SMILE, could support SPP's research unit in the future activities. The potential incomes from commercial exploitation will support research activities in SPP, based on IPR on work done, from the starting point till the testing and validation phase.

SPP will use its experience from SMILE to support future co-operation with industries, universities and other LEAs interested in using the technology developed. Last but not least, SPP will also exploit the results from the project in its operational activities and other research and innovation projects. SPP is an active member of ENPPF (European Network for the Protection of Public Figures) and APPS (Association of Personal Protection Services), which are composed by protection services spread all over world, SPP's direct involvement in the project and the operational feedback, represents a guarantee that the SMILE solution responds to real operational needs. In this way, SPP is fully dedicated to serve EU society and increase the competitiveness of EU and national industries.

The research group from SPP is also keen to advance SPP's reputation by publishing some of their research work.

3.5.12 RBP Individual Exploitation Plan

The Romanian Border Police is one of SMILE's end-user partners and is the only specialized state institution with responsibility for the surveillance and control of the state border crossing. By participating in this project, RBP is interested in new trends in innovation / research in the field of automatic border crossing, having the opportunity to test in the real world the new solutions developed in the project to increase passenger traffic by the BCP and to reduce waiting times. Also, by testing this new solution, we could assess the benefits of its use in order to modernize the border control system and improve security at the EU's external borders.

3.5.13 HNP Individual Exploitation Plan

HNP is an end-user organization, responsible for border checks at national level. Therefore, it plans to use the results as whole or just certain parts to enhance its own national integrat-

ed Entry-Exit, SIS II, VIS, Interpol FIND and national entry clearance checking and query system (HERR). Depending on decision of the Hungarian Parliament, such procedures may be exempt from public procurement in Hungary; in such case consortium members owning relevant results will be directly involved. Such development and integration projects are subjects to internal regulations of HNP (High Commissioner's Command No. 34/2017) and will be led by the designated unit of HNP. As contributor to all the border check procedures related to technologies newly developed by the SMILE consortium, especially by providing actual end-user needs and testing, HNP considers itself and all other end-users the co-owner of all results (devices, technologies, solutions) arising from the SMILE project. It plans to support partners to bring the system to the market and generate income from royalties, for example by serving as operator of a reference system.

Summary:

As end-user organization, HNP plans to use the results for its own national border management system, by implementing parts of or the whole SMILE concept. On the other hand, it will serve as reference for further market exploitation, in turn for royalty.

3.5.14 CDBP Individual Exploitation Plan

The Bulgarian Border Police is also a SMILE's end-user partner like HNP, RBP and SPP. Chief Directorate Border Police is a national specialized structure within MoI with protective, preventive and investigative functions. Its main purpose is to perform border control and protection of the state borders of Bulgaria.

By participating in this project, CDBP will have the opportunity to be part and test the new level technologies as well as to be aware of the new innovative trends in the field of automatic border controls and new generation mobile devices for biometric checks. This will lead to reducing the time waiting at the BCPs but following the rules for control and security at the EU's external borders.

In particular, besides the information on EU funding under the grant agreement, CDBP will ensure exploitation of the SMILE project results using them in further research activities and by marketing the process.

3.6 IPR management

In case of exploitation, either from individual partners of for the whole SMILE solution, Intellectual Property Management has to be handle was care and appropriately and is an important part of the project. The IPR strategy and the exploitation management will be handled in the Consortium Agreement, as well as in the WP1 Task 1.3.

More precisely, the Consortium Agreement defines the rules to apply for the management of IPR, especially regarding patents, exploitation of common foreground generated by the project. Additionally, Task1.3 of SMILE deals with knowledge management and the potential revision of the Consortium Agreement especially regarding: Ownership of the knowledge, Protection of knowledge, Publication of results, Use and dissemination of knowledge arising from the project, access rights, incompatible or restrictive commitments, use of marks, etc. Deliverable D1.5 IPR Management Plan & Report will describe in full details the IPR strategy defined for the project by common agreement among partners.

Conclusion

The SMILE project plan aims to promote the value of SMILE standards, scheme, and technological platform to targeted lighthouse deployment of smart lanes at real Border Control Points. The validation of the experiments is crucial for the exploitation of the results regarding performance, accuracy but more important the feed of end-users and services integrator. By showing the integration of SMILE system to the existing infrastructure the return of experience will directly prepare partners for commercial operations.

The commercial launch of SMILE follows a approach on many levels. This approach's first objective is to tune SMILE information intended for European and World-Wide dissemination. The second objective is to accelerate the adoption of novel and disruptive approach for the management of Identity at the Border including a view of the complete travel for the benefit of a better control and the facilitation for citizens. The third objective, targeted by OT and the industrial partners, is to transform the Use Case deployments into a commercial exploitation.

They will be in a position to address the global market for automated border control that is already burgeoning although facing a lack of relevant open standards and commercial products.