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Research Innovation Action



Intelligent Portable ContROl SyStem



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D8.5 Periodic Progress Report 2

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1. Progress of Work Plan in the period

The first year (M1-M12) of the project is described in D8.3 Periodic Progress Report (M1-M6) and D8.4 Annual Report (M6-M12). In this deliverable the progress between M13 and M18 of the project will be analysed.

1.1 General progress

iBorderCtrl project continued its progress during the first six months of the second year of the project through seven (7) WPs: WP1: Ethics requirements, WP3: Technological Components and Subsystems Development, WP4: Development of the iBorderCtrl software platform and related interfaces, WP5: Integration and technical testing, WP6: Pilot Deployment and system evaluation, WP7: Dissemination, Exploitation, Communication and WP8: Project Management and Quality Assurance. WP2: Relevant EU Legislation, Requirements Analysis and Reference Architecture was finalized on M8. The main objectives of this period were:

- a) the development of the first version of all technological tools and iBorderCtrl subsystems,
- b) the implementation of the first version of the iBorderCtrl platform, related applications and interfaces
- c) the submission of respective deliverables (D3.2 and D4.1).

In addition, the Data Collection Devices – specifications deliverable (D3.1) and a report by the ethics Advisor of the project (D1.1) were successfully finalized and submitted.

Any issues related to the complexity of the iBorderCtrl system were resolved via frequent meetings between technical partners that included numerous teleconferences, one face-to-face technical meeting and a plenary meeting. Furthermore, the project has continued to work on the dissemination activities, by enhancing the content of its web site and its presence in the social media (LinkedIn, Twitter), by presenting the outcomes so far in publications in scientific journals and by participating to a number of international conferences and relevant dissemination and communication events.

1.2 Progress on all work packages against initial objectives

WP 1: Ethics requirements. The main objective of this work package is to ensure compliance with 'ethics requirements'. During this period (M13-M18) a report by the ethics advisor of the project Mr. [REDACTED] was submitted (D1.1). The aim of this report was to monitor whether the project follows the ethical guidelines which had been developed, as well as to provide an overview of the ongoing developments within the project and the status quo from an ethical point of view.

WP 2: Relevant EU Legislation, Requirements Analysis and Reference Architecture. This work package was successfully finalized at M8.

WP 3: Technological Components and Subsystems Development. An in-depth and comprehensive SWOT analysis of biometric sensors (i.e. fingerprints, face and vein), either commercially available or in research stage, was finalized and submitted in D3.1: Data Collection Devices – specifications, taking into account newest trends and aspects of their overall integration within the iBorderCtrl software/hardware platforms. The analysis also encompassed state-of-the-art document authentication instruments, along with the inclusion of sensors and techniques for hidden humans' detection (taking into account both the relevant tools already used at the Border Control Points as well as the integration and testing of additional ones, as foreseen from the user requirements analysis). In parallel, the technical partners responsible for the selection and use of devices (e.g. cameras, scanners, QR code readers and other) were in continuous discussions in order to identify the optimized solution for each device selection and its integration within the iBorderCtrl solution.

As the work within the framework of D3.1 progressed, the actual design of the main system components was carried out involving both advanced algorithms and hardware / software combined development.

To this context, the main objective of this WP is the development of all subsystems namely: the [redacted] the Biometrics Module incorporating fingerprints and palm vein technologies (BIO), the Face Matching Tool (FMT), the Document Authenticity Analytics Tool (DAAT) and the Hidden Human Detection Tool (HHD). All work carried out took into account the work already done in WP2 in order to comply with the definition of the reference architecture and the user requirements. It should be noted herein, that in order to adequately coordinate the work within the main technical WPs (WP3 and WP4) so that the developments are compliant with each other and the relevant actions to be synchronized, a Technical Meeting was organized. The technical meeting was held in Athens, 2-3 of October 2017 and all aspects concerning the three User Applications and Interfaces – thus all system components within WP3 and WP4 – were discussed and decided. The main result was a mapping of the main interfaces and dataflow among all the various subsystem and the iBorderCtrl database reflecting the interconnections between them throughout all stages (pre-registration, border-crossing and data analytics by the border managers). This mapping acted as the main basis for the development work and for assuring that all system units utilize a common reference for their evolution.

In parallel to the development of the different subsystems, an intensive work has been done in order to design the iBorderCtrl portable unit. This unit consists of all the different sensors / scanners / readers selected based on the work done in deliverables D3.1 and D3.2 while its various iterations and final format will be subject of the WP5 integration framework. The development of all subsystems involved in WP3 intensified towards the end of the 3rd semester in order to deliver the first version of all tools which is documented in D3.2: First version of all technological tools and subsystems (Portable unit, [redacted] DAAT, HHD tool, FMT, Avatar based dialogue). This deliverable describes each of the subsystems in detail providing the relevant interfaces for each system, a detailed functional and technical description, the different structures and objects used and the dataflow description. Moreover, a list of the relevant unit tests for each subsystem that will be used to ensure the readiness of each system for the integration phase, is also included.

In deliverable D3.2 the relevant hardware components that form the Portable Unit, together with their technical characteristics, the description of how the different components connect within the portable unit and the first approach to the harness design is also described. The iBorderCtrl radio connectivity is also presented in this deliverable, together with a list of technical requirements for the main solution of a private Radio network, both from the user point of view and the equipment minimum requirements, the technical features of the different radio network options along with fail-over solutions and the implementation design with the different performance testing that will be performed (including the metrics that will be used and the testing scenarios).

WP 4: Development of the iBorderCtrl software platform and related interfaces. The work on the initial design of the iBorderCtrl software tools and the relevant interfaces has progressed as planned. A prototype version of the tools and relevant interfaces has been developed and the work is ongoing to complete the final iBorderCtrl software platform and related interfaces (scheduled for delivery on M24). The Deliverable D4.1: First version of the iBorderCtrl software platform was submitted on time and outlines in great detail the work that has been completed. More specifically:

- The data storage and communication infrastructure
- The risk-based assessment tool (RBAT) and the integrated automated border control analytics tool
- The External Legacy and Social Interfaces (ELSI)
- The central data repository to collect the data into a single environment
- The BCAT tool for meta analyses of data to enable a computationally intelligent adaptive border control.
- The user applications and interfaces for the border control agent, the border control manager, and the traveler.

The data storage and communication infrastructure is based on a privacy by design enabled storage and processing implementation. Technical requirements were defined in WP2 of the project. The infrastructure was constructed with appropriate technical specifications, to be capable of supporting the large-scale content storage and processing requirements envisioned by a future Europe wide deployment of iBorderCtrl.

The authoring interface of RBAT and the way that RBAT is integrated with the project through the iBorderCtrl databases is presented through data flows. A Multi Criteria Decision Analysis (MCDA) approach was identified to be the initial point for risk assessment in the Risk Based Assessment Tool (RBAT), which will be further enriched with the progress of BCAT analytics tool to provide in the end the relevant historical data.

ELSI's social component is implemented through the consideration of twitter as the social platform of choice. Twitter's API and user agreements met the requirements of the project. A tool was developed that communicated with twitter's API to recover data from consenting travelers for analyses. The legacy databases were focused on existing systems deployed at the border, such as SIS and VIS, as well as the Entry/Exit System (EES) that, although not widely deployed, is finalized and expected to be adopted in the near future by more countries. To achieve the communication, the Universal Messaging Format (UMF) communication procedures as per the technical papers and descriptions of Europol was taken into account.

BCAT enables the combinatorial analyses of all data collected in iBorderCtrl utilizing statistical, machine learning and data mining approaches to discover new patterns and knowledge that can be used through the RBAT tool to enhance the performance of the system. Furthermore, the tool will be used to evaluate all modules in iBorderCtrl through the analyses of data collected as part of the pilot phase. Finally, BCAT powers the real time generation of widgets that provide key information to border control managers (future risk and traffic prediction) as well as travelers (future waiting time).

The User interfaces for the Border Manager Application, the Border Guard Application through its implementation within the iBorderCtrl portable Unit, as well as the traveler's Application pre-registration phase, are presented with screen shots of the current development versions along with all technical, design and requirement adherence information relevant to the project.

The data protection impact assessment was performed to demonstrate the on-going strict adherence to data protection requirements across the iBorderCtrl system and to this respect a specific matrix for the Data Protection Impact Assessment (DPIA) was developed to assess related issues for all involved system modules. The outcome of all the above, was the timely delivery of the D4.1: First version of the iBorderCtrl software platform. Frequent meetings (mostly through teleconferences or VOIP-based but also in combination with technical in-person meetings) between technical partners ensured the interoperability and accountability between partners fostering the quality of the iBorderCtrl platform.

WP 5: Integration and technical testing. The WP5 started recently at M15, according to the workplan.

The main objective of this work package is the integration of all components and technologies developed in WP3 and WP4 and their merging into functional prototypes. Following the delivery of the first version of all technological (in WP3) and software (in WP4) system components, their integration will be the main aspect to be pursued within the upcoming months.

In parallel to the progress in the development of the three main user Applications and interfaces (traveler's application, border Guard application and border manager application), the integration approach follows a step by step integration of the main system components; currently further tests are made to incorporate the avatar ██████████ backend service to the traveler's user Application while the integration of the rest of the components and the Applications will follow soon after. At the moment, the major focus is being given to the development of the communication protocols and connections between the main iBorderCtrl database and the various system modules along with the integration of the various hardware sensors and scanners to the iBorderCtrl portable unit.

To this respect, the development of a detailed roadmap for a continuous integration of the developed components and platforms is being carried out; describing step by step the integration process and responsibilities of the partners and setting the objectives of each integrated prototype. The whole integration plan will be subject to the first Deliverable of this WP, D5.1 (Integration Plan), foreseen to be delivered in due time according to plan.

Moreover, various initial integration tests between components have already started to be carried out, in order to be able to issue, report and tackle bugs early enough, to identify problems and to address requests with aim to successfully realize the integration process. For this reason, three Github repositories were created to facilitate the integration procedure and communication between all partners' developers' teams:

- iBorderCtrl-integration, which hosts information/documentation and code samples required in order to integrate the different components of the system.
- iBorderCtrl-documentation, which hosts any general documentation concerning the components of the system
- iBorderCtrl-management, which is used for the management needs of the project. Any issues/bugs will be filed there.

WP 6: Pilot Deployment and system evaluation. The WP6 started officially at M15 as well, according to the workplan.

The main aim of this Work Package in the next months is to undergo the verification and validation procedures of the prototypes developed in WP3, WP4 with real end users. A specific methodology for executing the experimental evaluation is currently planned in order to capture the end-user feedback in a unified and consistent manner in the deployment sites. The recruitment methodology for volunteers which are going to participate to the pilots is also being investigated (use of leaflets in 4 languages, billboards signs, posters, social media campaigns etc.). Specific roles are assigned to the volunteers (Border Guards playing the role of "Border Guards", Border Guards playing the role of "travelers", volunteers who register but not travel, volunteers who register and also cross the borders at the BCPs and people responsible for technical issues), participating in a role-play to test the prototype during simulated border crossings and use cases. Furthermore, specific initial tests have already been scheduled for the coming months, in order to assess the current situation at the BCPs from the technical point of view, while the necessary arrangements for certain aspects (i.e. deployment of the radio network and connectivity issues) have already been planned to reassure the appropriate technical background. Furthermore, the use of test sites as a first step of testing, prior the actual piloting at the BCPs, has already been scheduled.

The whole implementation plan will be subject to the first Deliverable of this WP, D6.1 (Experimental Design for Pilot Deployment and Evaluation), foreseen to be delivered in due time according to plan.

WP 7: Dissemination, Exploitation, Communication. In the framework of dissemination activities, three scientific publications should be mentioned; a paper presented at the 2017 CEPOL Research and Science Conference 'Innovations in Law Enforcement' in Budapest, a paper presented in the International Conference on RFID Technology and Applications in Poland and a publication at the UK Artificial Intelligence Committee. Moreover, iBorderCtrl project was presented a) in a special session on the 4th edition of the EAB Research Projects Conference, in Germany, b) in a STEM event of IEEE profiling Women in Engineering at the University of Westminster in the UK, c) in an IEEE workshop on IoT in the UK and d) at the "Borders, Eastern Conference and Border Protection Fair" in Poland.

In parallel, the iBorderCtrl web portal has been extended with additional content to enhance the visibility of the project (a new banner was also added). It should be mentioned that iBorderCtrl consortium organized a special session and submitted 4 papers to the "2018 IEEE World Congress on Computational Intelligence" to be held in Rio de Janeiro, Brazil on the 8-13th of July 2018 and more

specifically to “The Role of Computational Intelligence Technologies in Controlling Borders”.

WP 8: Project Management and Quality assurance. The Project and technical management at this period was very intense to manage effectively the coordination of all the project implementation teams and ensuring the Quality of the submitted deliverables. The maintenance and update of the project collaboration space in Alfresco located at ED premises continued. Two major face-face meetings were organized; one in Athens (technical meeting) and one in Hanover (plenary meeting). The work carried out also included the organization of numerous teleconferences: monthly teleconferences between WP leaders to discuss for various project pending tasks, open actions and the progress of each task and bi-weekly technical meetings to discuss the progress in WP3 and WP4 development.

Project physical meetings during this period			
Place	Dates	Type	Participants
ICCS premises, within the National Technical University of Athens, Athens, Greece	2-3 October 2017	Technical meeting	ED, ICCS, EVR, STR, JAS, BIO, ITTI, MMU
LUH premises "Conti-Campus", Hanover, Germany	24-25 January 2018	Plenary Meeting	ALL

1.3 Identified deviations, problems and corrective actions taken in the period

Nothing to report.

Progress regarding performance indicators

An initial table of Key Performance Indicators has been compiled and included in deliverable D8.1 in M3. The performance assessment based on those KPIs will be conducted in subsequent periods.

WP – Activities	Performance Indicator	Framework for Metrics	Target Values
WP1 – Ethics requirements	1-1 Ensure compliance with the ethics requirements	1-1-1 Advice from an external Ethical Advisor	Target: Positive (on going process) <u>Achieved up to M18:</u> Ethical Advisor submitted his first report on M18.
	1-2 Ensure proper implementation of ethics requirements	1-2-1 Periodic reports in M18 and M36 to be submitted to the European Commission. Related feedback from the pilot implementation.	Target: Positive (on going process) <u>Achieved up to M18:</u> Ethical Advisor submitted his first report on M18.
	1-3 Minimise risks of stigmatization of individuals and groups	1-3-1 Request of full consent from people involved in piloting. Mitigation plan to be included in D2.3, according to international and European legislation	≥ 90% full consents. Zero deviation from the mitigation plan <u>Correction:</u> Consent from 100% of test participants. Zero

			<p>deviation from the mitigation plan, no violations of ethical requirements.</p> <p><u>Achieved up to M18 activities (surveys, etc.): 100%</u></p> <p>Mitigation plan was included to D2.3</p>
<p>WP2 –Relevant EU Legislation, Requirement Analyses and Reference Architecture</p>	<p>2-1 Ensure proper understanding of the user needs at border crossing points</p>	<p>2-1-1 Usage of effective means to address the user groups (questionnaires, interviews etc).</p>	<p>Target:≥ 60% total responses in respect to the various users addressed.</p> <p><u>Achieved: 100%</u></p>
	<p>2-2 Ensure extraction of adequate (functional and non-functional) user requirements and formulation of the consequent use case scenarios.</p>	<p>2-2-1 Comprehensive and in depth related qualitative and quantitative analysis according to predefined methodology. Assess consistency of scenarios among the involved border crossing points.</p>	<p>Target: Feasibility and tangibility of user requirements and scenarios mapping. Positive feedback from the end-users.</p> <p><u>Achieved: 100%</u></p>
	<p>2-3 Alignment between user’s requirements and reference architecture</p>	<p>2-3-1 Interpretation of user’s requirements to system requirements, taking into account the SoTA and technology trends. Relationship between end-user system requirements and system architecture technical & functional specifications.</p>	<p>Target: Reasonable consistency. Inevitable deviations should be explainable and fully justifiable in terms of feasibility according to SoTA.</p> <p><u>Achieved: 100%</u></p>
	<p>2-4 Minimizing risks on architecture development to ensure compliance of components and interfaces to system requirements (taking also into account the DoW related roadmap).</p>	<p>2-4-1 Alternative solutions examination, benchmarking with reported similar architectures, mitigation and backup plans in D2.2. Reference architecture to be assessed between M14-M16 following feedback from the first development stages of WP3 and WP4 to identify deviations from initial end-user requirements and system architecture and apply corrections and modifications.</p>	<p>≤ 10% deviations of customised components’ content and of their related interfaces in respect to initial requirements, after identifying deviations and apply corrections.</p> <p><u>Achieved: 100%</u></p>
	<p>2-5 Compliance with EU-wide legislation</p>	<p>2-5-1 D2.3: EU-wide legal and ethical report</p>	<p>Target: Reasonable consistency, inevitable deviations should be explicitly discussed and documented</p> <p><u>Achieved 100%</u></p>
<p>WP3– Technological Components and Subsystems Development</p>	<p>3-1 System components functionality compliance with respect to architecture and system requirements</p>	<p>3-1-1 Reduced deviations of all system components’ functionality and of their related interfaces from initial end-user requirements. Alternative solutions examination, mitigation and backup plans to be employed so that to result in the foreseen results.</p>	<p>≤ 10% deviations at final stage of development</p> <p><u>Achieved up to M18: Compliance more than 95%</u></p>

	3-3 Progress in development of individual sub-systems	3-3-1 Monitoring of time deviations against predefined Gantt charts	Target: ≤ 20% (Cumulative, at any given control time) <u>Achieved up to M18:</u> Successful progress of individual sub-system development
WP4 – Development of the iBorderCtrl software platform and related interfaces	4-1 Software platform architecture acceptance	4-1-1 The percentage of partners that accept the developed system design	≥ 60% at first stage of development 100% at final stage <u>Achieved up to M18:</u> 100%
	4-2 Alignment between requirements and software platform architecture and interfaces.	4-2-1 Relationship between end-user system requirements and software platform architecture and development. Reduced deviations from end-user requirements and system architecture	Reasonable consistency, deviations should be documented, reviewed by the consortium and approved by the coordinator. ≤ 10% deviations at final stage of development. <u>Achieved up to M18:</u> Full coverage of IT and functional requirements (>98%)
	4-3 Provision of adequate platform integration between components, databases and interfaces.	4-3-1 Unique key identifiers per subject must be defined and used consistently to measure adequate linkage across each platform component in order to ensure that integration in WP5 can be achieved.	A table linking unique identifiers between 100% of the components.
WP7– Dissemination, Exploitation, Communication	7-1 Effectiveness and Impact of Dissemination activities	7-1-1 Visibility of the public iBorderCtrl website	Target: Approximately 500 visitors per year <u>Achieved up to M18:</u> 31956 unique visitors
		7-1-2 Number of written and electronic publications (in academic and technical media)	Target (overall): ≥ 5 <u>Achieved up to M18:</u> 8
		7-1-3 Number of written and electronic publications (in industrial, business and public media)	Target: ≥ 3 per year <u>Achieved up to M18:</u> 4
		7-1-4 Number of website / newsletter articles via partner’s channel	Target: ≥ 5 per year <u>Achieved up to M18:</u> 7
		7-1-5 Number of presentations (in symposiums, meetings, congresses)	Target: ≥ 6 <u>Achieved up to M18:</u> 8
		7-1-6 Number of Project workshops	Target: ≥ 1 <u>Achieved up to M18:</u> 2
		7-1-7 Number of followers on Twitter	Target: ≥ 50 per year <u>Achieved up to M18:</u> 38
		7-1-8-Number of followers on LinkedIn	Target: ≥ 50 <u>Achieved up to M18:</u> 29
		7-1-9 Number of publications on LinkedIn	Target: ≥ 5 per year <u>Achieved up to M18:</u> 6

WP8 – Project Management and Quality Assurance	8-1 On time submission of deliverables	8-1-1 In time project progress: Number of deliverables submitted on time	<p>Target: $\geq 80\%$</p> <p><u>Achieved up to M18:</u> 100%</p> <p>Short but justifiable delays occurred in the submission of 2 Deliverables (D3.1 and D7.4). However, the delays were not large enough to jeopardize the achievement of this target.</p>
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2. Deliverables

Grey rows represent the Deliverables that were submitted during M13-18.

Del. N°	Deliverable name	Lead Beneficiary	Type/ dissemination level	WP N°	Delivery date from Annex I	Delivered (yes/no) and status (draft/final)	Forecasted delivery date	Comments on progress
D1.1	Report by the ethics advisor	ED	CO	1	28 Feb 2018	Yes, final		
D1.2	Ethics of profiling and the risk of stigmatization	ED	CO	1	31 May 2017	Yes, final		
D1.3	Ethics Advisor	ED	CO	1	30 November 2016	YES, final		
D2.1	Requirement Analysis Report	MMU	CO	2	30 December 2016	YES, final		
D2.2	Reference Architecture and components specifications	ICCS	CO	2	28 April 2017	YES, final		
D2.3	EU wide legal and ethical review report	LUH	CO	2	28 April 2017	YES, final		
D3.1	Data Collection Devices - specifications	ITTI	PU	3	30 Nov 2017	YES, final		
D3.2	First version of all technological tools and subsystems ble unit, DAAT, portable radar,	EVR	PU	3	28 Feb 2018	YES, final		

	FMT, Avatar based dialogue)							
D4.1	First version of the iBorderCtrl software platform	STR	PU	4	28 Feb 2018	YES, final		
D7.1	Project Web Portal	ED	CO	7	30 November 2016	YES, final		
D7.2	Project flyer	ED	CO	7	28 February 2017	YES, final		
D7.3	Dissemination and communication plan	ITTI	CO	7	31 August 2017	YES, final		
D7.4	Early Business Plan	ED	CO	7	31 August 2017	YES, final		
D8.1	Quality Management Plan	ED	CO	8	30 November 2016	YES, final		
D8.3	Periodic Progress Report	ED	CO	8	28 February 2017	YES, final		
D8.4	Annual Report	ED	CO	8	31 Aug 2017	YES, final		

3. Milestones

Milestone N°	Milestone Title	Related WP N°	Lead Beneficiary	Delivery date from Annex I	Achieved (yes/no)	Forecasted achievement date (if not achieved)	Comments on progress
MS1	Reference Architecture and components specifications	2	ICCS	(M8) 28 April 2017	Yes		
MS2	First version of all tools	3,4	EVR	(M18) 28 Feb 2018	Yes		

4. Critical Implementation Risks and Mitigation actions

4.1 Foreseen Risks (risks already identified prior the initiation of the project, see Annex 1)

Risk N°	Description of Risk	Related WP N°	Proposed risk-mitigation measures
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R1		3	
R3	Difficulty in collecting and analysing end-users requirements	2	The detailed methodology developed during Task 2.1 thoroughly described how to collect and analyse the relevant data. Partner's expertise was a major factor to overcome this risk. Therefore, no major issue occurred.
R4	Requirements of the pilot users are not aligned	2	The border control officers have addressed similar problems. No significant issues occurred.
R5		3	
R9	Integration is too complex and time consuming	5	The integration plan is developed in parallel to the system design. The aim is to understand the potential complexity and risks as early as possible to develop the integration plan accordingly. In addition, Github repositories have been created to facilitate the integration procedure. This will allow to have daily software builds with automatic test cases in order to identify bugs and issues as early as possible.

4.2 Unforeseen Risks

Grey rows represent the new ones during M13-18.

Risk N°	Description of Risk	Related WP N°	Proposed risk-mitigation measures
UR1	Not enough answers to the online questionnaire in the set time frame	2	More survey leaflets were printed and distributed at the borders. A short extension in the time frame was given to gather more answers.
UR2	Due to the system's complexity, a small delay to the architecture design may be observed.	2	All partners were cooperating and communicating with frequent teleconferences in order to avoid any possible delay regarding the submission of the D2.2. An architecture physical workshop with involved partners has been scheduled in M7, to assure the progress of the design of the reference architecture and the editing of the respective deliverable. Despite that the amendment of the Regulation (EU) 2016/399 by Regulation (EU) 2017/458 took place on 7 th of April (towards the finalization of D2.2) the project managed to quickly uptake the needed changes presenting only a short delay in delivering it.

UR3	Selection of the second language for the avatar still pending. This could impact in the avatar development.	3	A study of the most used languages in the different pilot sites has been done. During the plenary meeting that took place at the end of July 2017, it was decided that the two European male and female border guard avatars will be implemented in three languages: English, Russian, Hungarian based on the statistics of the nationality of people crossing the iBorderCtrl pilot sites.
UR4	Need of native speakers in the selected languages of the avatar in order to produce the recordings for the avatar	3	The iBorderCtrl Consortium already has native speakers of the most common languages among all project partners. In case it's not possible to find a native speaker in a specific language the possibility of subcontracting the recording of the questions will be assessed if required.
UR5		3	
UR6	Not enough followers on twitter and LinkedIn members due to the project name change and replacement of all previous accounts.	7	Dissemination via social media will be continued and will be intensified, especially due to the upcoming project pilots. Short updates will be reported on social media. The pilots are also likely to draw more attention from the public. This will be reflected in increased number of Twitter followers and LinkedIn members.

5. Work plan for the next period

5.1 Planned activities in the next period

WP 1: The ethics Advisor will continuously monitor the project's activities. All partners (end-users, tech partners) will be in close collaboration and communicate with LUH, in order to get a common understanding on the different needs and on technical implementations.

WP 3: All partners will continue their work with the development of each respective module. The second version of all technological tools and subsystems (Portable unit, Biometrics (BIO), Document Authenticity Analytics Tool (DAAT), Face Matching Tool (FMT), Hidden Human Detection in vehicles (HHD), Radio Network Design and Development) is expected by the end of M24 (submission of D3.3) according to the workplan. During this process, any unforeseen issues will be detected as early as possible. Several teleconferences will take place to ensure that the different interfaces between the subsystems are aligned to minimise the risk of potential integration issues. In parallel to the development of the different subsystems, the design of the portable unit will also progress while its various iterations and final format will be subject

of the WP5 integration. The development works within the WP3 are still ongoing and evolving according to plan, in order, following the feedback gathered during the first steps of the integration and implementation, to result in the final version of all subsystems, ready for the actual piloting.

WP 4: The development of the iBorderCtrl software tools and relevant applications/interfaces will continue [Secure Storage/Processing and Data Protection, Risk Based Assessment Tool (RBAT), External, Legacy and Social Interfaces capabilities (ELSI), Mobile application (Traveler User Application), Integrated Border Control Analytics Tool (BCAT), Border Manager User Application, Border Guard User Application] towards the second version to be presented in D4.2 (expected by the end of M24) according to the workplan. Based on the mapping of the main interfaces, interconnections and dataflow among all the various subsystem and the iBorderCtrl database the three main user Applications and interfaces (traveller's application for the pre-registration, border Guard application for the border-crossing and border manager application with data analytics) have evolved; with the traveller's application and interface to be almost ready while further tests are made to incorporate the avatar ██████████ backend service. Based on all the above, the development works within the WP4 are still ongoing and evolving according to plan, in order, following the feedback gathered during the first steps of the integration and implementation, to result in the final version of the software platform, ready for the actual piloting.

WP 5: The development of the iBorderCtrl Integration plan will be finalized during M20 and presented in D5.1, to act as the specification of the whole integration process, ensuring that there will be no conflicting requirements of the individual components, defining the integration cycles and the tasks of each step. The aim is to integrate each one of the developed components and platforms, by thoroughly describing the integration process, the responsibilities of the partners and setting the objectives of each integrated prototype through the created Github repositories. Furthermore, the infrastructure needed for the successful realization of the integration process will be deployed (i.e. Rest APIs). Early versions of the integrated prototype (with limited functionality) and of the portable unit are expected by the end of M24. The WP5 is currently at its early stages, however, following the Delivery of D3.2 and D4.1, it is foreseen to occupy most of the partners' activities in the following months in parallel to the early stages of the WP6 implementation.

WP 6: The methodology for executing the experimental evaluation will be finalized and presented in D6.1: Experimental Design for Pilot Deployment and Evaluation. The actual end users of the pilots will be selected and trained in the use of the system as well as in test methodology solution. The deployment will take place in an iterative approach, where already integrated and technically tested system components will be deployed in steps. The collection and analysis of the evaluation of the early version components (D3.2, D4.1) will take place in order to collect the feedback on the deployed prototypes in all pilots and documented in D6.2: Feedback of components evaluations with end users. In the same way as with WP5, WP6 is currently at its early stages, however, it is foreseen to occupy most of the partners' activities in the following months in parallel to the early stages of the WP5 integration.

WP 7: The partners will engage further with the identified related stakeholders to establish the most likely exploitable outcome and will translate this objective into a well-detailed route to market and exploitation plan (D7.5). Efforts will also be made to start getting traction on social media with targeted campaigns to various target groups, and to achieve widespread dissemination via media and advanced academic publications. The second project flyer (D7.7) will be prepared (M20) and the yearly communication report (D7.6) and the dissemination and communication plan for the second year of the project (D7.8) will be submitted by the end of M24. All partners and especially the universities, continuously investigate future events (conferences, paper publications) where the iBorderCtrl project and corresponding research and activities could be presented.

WP 8: The coordinator and corresponding partners will continue to effectively monitor the project in administrative, technical and financial terms, to ensure its strategic and everyday management, and to guarantee the adherence of the work to the overall project plans, available resources and timing.

5.2 Planned meetings, activities related to market uptake and dissemination activities

Frequent meetings and teleconferences are planned at various levels to ensure that the progress is well monitored.

iBorderCtrl consortium members actively seek relevant opportunities to present and promote the project objectives and results. **It should be mentioned that the highlight of the iBorderCtrl dissemination activities is the organization by the project of a special session entitled “The Role of Computational Intelligence Technologies in Controlling Borders” in the “2018 IEEE World Congress on Computational Intelligence (WCCI)” to be held in Rio de Janeiro, Brazil on the 8-13th of July 2018.** WCCI is probably the major and most important Conference in Computational Intelligence worldwide; actually, it comprises of three Conferences organized in parallel with a very wide target group in terms of number of attendees. The specific special session was organized by the project during the 3rd semester and specifically by [REDACTED] (MMU), [REDACTED] (ICCS) and [REDACTED] (ED). The iBorderCtrl consortium submitted 4 papers to the “2018 IEEE World Congress on Computational Intelligence WCCI” to be held in Rio de Janeiro, Brazil on the 8-13th of July 2018 and more specifically to the “The Role of Computational Intelligence Technologies in Controlling Borders” special session, while publication acceptance results are expected soon (around middle of March 2018). The aims of this Special Session are:

- to provide a forum for new computational intelligence methodologies / techniques and systems which contribute towards improving border crossing efficiency and security within border control solutions;
- to provide the opportunity to present recent advances towards holistic systems that combine computational intelligence within an expanded multi-disciplinary context;
- to highlight and assess novel insights and intelligence that can effectively contribute in identifying threats, vulnerabilities and risks in border control improving decision making and efficiency;
- to investigate the social and ethical implications of using computational intelligence technology on the ‘passenger’ themselves.

The following papers have been submitted to the special session by the iBorderCtrl consortium and are under review.

1. George Boultaidakis, Anna Malamou, Rodoula Makri, Athanasios Panagopoulos, Panos Karaivazoglou, Apostolos Papafragkakis, Athos Antoniadis, Philippos Kindynis, Keeley Crockett, Jim O’Shea, Laura Rodriguez Carlos Roca, Piotr Bilski, Bartosz Kosciug, Peter Gyorgydeak, Lukasz Szklarski, Piotr Gmitrowicz, Mateusz Oles, Jonathan Stoklas, Zoltan Szekely, Raimonds Kublickis, Alexandros Dalkalitsis, Manolis Kermitis, “*An Intelligent Portable Border Control System: Overall System Design with Computational Intelligence Technologies for Border Control Procedures Enhancement*”, submitted to the “2018 IEEE World Congress on Computational Intelligence, Special session: The Role of Computational Intelligence Technologies in Controlling Borders”, Rio de Janeiro, Brazil, 8-13.07.2018.
2. Prof. Dr. Tina Krügel, LL.M., RA Benjamin Schütze, LL.M. (Wellington), Dipl.-Jur. Jonathan Stoklas, “*Legal, ethical and social impact on the use of computational intelligence-based systems*”, submitted to the “2018 IEEE World Congress on Computational Intelligence, Special session: The Role of Computational Intelligence Technologies in Controlling Borders”, Rio de Janeiro, Brazil, 8-13.07.2018.
3. L. Rodriguez, I. Hupont, C. Fernandez, “*Facial recognition application for border control*”, submitted to the “2018 IEEE World Congress on Computational Intelligence, Special session: The Role of Computational Intelligence Technologies in Controlling Borders”, Rio de Janeiro, Brazil, 8-13.07.2018.

4. James O'Shea, Keeley Crockett, Wasiq Khan, Philippos Kindynis, Athos Antoniadis, "Intelligent Deception Detection through Machine Based Interviewing", submitted to the "2018 IEEE World Congress on Computational Intelligence, Special session: The Role of Computational Intelligence Technologies in Controlling Borders", Rio de Janeiro, Brazil, 8-13.07.2018.

6. Dissemination and exploitation of results

6.1 Scientific Publications

Grey rows represent the new ones, held during M13-18.

Type of scientific publication (journal/conference proceedings/workshops/book/monograph/thesis/dissertation/ etc.	Authors, Title, Publisher, Place of publication, Volume/Number of issue, date, Relevant pages, ISSN or eSSN.
(Online)-Journal	J. Stoklas, "Europäischer Grenzschutz 2.0 - Ein Überblick über datenschutzrechtliche Herausforderungen", ZD-Aktuell, Beck, Munich, Heft 21, 16.12.2016, (2016, 05418), 2192-5593.
Scientific Conference	C. I. Kourogorgas, A. D. Panagopoulos, R. Makri, "A Copulas-Based Time Series Synthesizer for Mobile Satellite Communications Operating Above 10 GHz", 11 th European Conference on Antennas and Propagation 2017 (EUCAP Conference), Paris, France, 19-24 March 2017. https://doi.org/10.23919/EuCAP.2017.7928349
Scientific Conference	Sz. Zoltán, "The Intelligent Border Control System and the future of Integrated Security Management in Public-Private Cooperation", Tourism and Security, in Nagykanizsa, Hungary, 2016.
Journal	K. Crockett, J. O'Shea, Sz. Zoltán, Ł. Szklarski, A. Malamou, G. Boultradakis, "Do Europe's borders need multi-faced biometric protection?", Biometrics Technology Today journal, Elsevier, Volume 2017, Issue 7, July-August 2017, Pages 5-8.
(Online)-Journal	J. Stoklas, "Sicherheit im Schengen-Raum: Eine unendliche Datensammelei?", ZD-Aktuell, Beck, Munich, Heft 12, 28.06.2017 (2017, 05684), 2192-5593.
Scientific Conference	Sz. Zoltán, "BorderCtrl and BBA242: Examples for research and innovation in border security at European and national level", 2017 CEPOL Research and Science Conference 'Innovations in Law Enforcement', Budapest, 28-30.11.2017.
Scientific Conference	P. Bilski, J. Modelski, B. Kosciug, J. Olejnic, I. Badaczewska, A. Malamou, R. Makri, "Application of the RFID technology in the European Union border control system", International Conference on RFID Technology and Applications, Warsaw, Poland, September 20-22, 2017.
Evidence for Government Policy Formation	O'Shea, J. "Dr James O'Shea - written evidence" (to the UK House of Lords Artificial Intelligence Select committee), AIC0226, published 26 October 2017, http://www.parliament.uk/business/committees/committees-a-z/lords-select/ai-committee/publications/

6.2 Progress regarding market uptake and exploitation

The Consortium Partners have already included on their websites and dissemination channels their expansion of services based on the outcomes of the related research work project, to enhance both the dissemination of the project as well as to cultivate potential collaboration beyond the consortium partners on future projects that will build on top of the technologies developed in iBorderCtrl. In addition, iBorderCtrl already implements many of the features planned to be included in the Entry/ Exit (EES) and the European Travel Information and Authorisation (ETIAS) Systems both proposed by the European Commission to enhance the border control check procedures. Moreover, iBorderCtrl solution paves the way towards the interoperability of EU systems for security, border and migration management as envisaged by the EC. These are considered as major assets towards the implementation of a concrete exploitation plan.

6.3 Dissemination and Communication activities

Grey rows represent the new ones, held during M13-18.

Type of communication and dissemination activities	Number of activities
On 14th December 2016, an iBorderCtrl end-user workshop on new intelligent portable control systems for land border checks was held with the participation of the Hungarian project team and external experts from law enforcement, private security sector, research and academia.	1
<p>iBorderCtrl Dissemination as part of STEM Outreach Activities</p> <p>1) 5th December 2016, iBorderCtrl presentation of the aims and core of objectives of the projects to a wide and varied audience at the event Fun Tech Jobs - A series of short talks on Engineering and Computer Science, designed to Inspire, Educate and Engage! The overview of the traveller's pre-registration system was well received and was followed by a discussion of the ethical and social use of artificial intelligence to detect deception. The event was sponsored by the School of Computing, Mathematics & Digital Technology at Manchester Metropolitan University, IEEE Women in Engineering United Kingdom and Ireland, and IEEE Women in Computational Intelligence.</p> <p>2) 15th December 2016, short talk on Artificial Intelligence, Artificial Neural Networks and the iBorderCtrl application to pupils aged 11 - 14 at Levensulme Girls High School in Manchester (United Kingdom). The pupils asked many questions about how the iBorderCtrl Pre-Travellers system would work, especially for Schengen and Non-Schengen countries. The majority had experienced European travel and they felt that anything to speed things up at borders would be very good.</p>	2
Featured Article about iBorderCtrl: "Avatar interviews and portable scanners to speed up border crossings" in the EU Research & Innovation Magazine (8 th of February 2017). https://horizon-magazine.eu/article/avatar-interviews-and-portable-scanners-speed-border-crossings_en.html	1
Presentation of iBorderCtrl at the FRONTEX Workshop on EU funded border security research projects, 8th June 2017. The presentation was made by the Coordinator.	1
<p>██████████ (MMU) gave a key note talk ██████████</p> <p>██████████</p> <p>██████████</p> <p style="text-align: right;">Details:</p>	1



The iBorderCtrl project was presented in detail in a Special Session dedicated on the iBorderCtrl at the "4th edition of the EAB Research Projects Conference", 18-19 September 2017, Fraunhofer IGD, Darmstadt, Germany in the framework of EAB (European Association on Biometrics) activities. The presentation was made by the Coordinator and the Technical Manager.	1
iBorderCtrl Dissemination as part of STEM Outreach Activities: IEEE Day for United Kingdom and Ireland Talks, Profiling Women in Engineering, STEM event, 7 th October 2017 at the University of Westminister, Crockett (MMU) presented iBorderCtrl on Panel session AI and Ethics.	1
_____ (MMU) gave invited talk on Women in Engineering and showcased iBorderCtrl project at the IEEE Workshop on IoT, Liverpool, 17th October 2017	1
Presentation of iBorderCtrl at the "Borders, Eastern Conference and Border Protection Fair" 25-26 October 2017, Lublin, Poland.	1