Study on the Feasibility of Improving Information Exchange under the Prüm Decisions

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Cost Benefits Analysis

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Table of Contents

VERSIONING HISTORY

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1. INTRODUCTION

The following document has been drafted in addition to the Advanced Technical Report of the Study on the Feasibility of Improving Information Exchange under the Prüm Decisions.

This document presents a Cost-Benefits Analysis (CBA) for the retained opportunities of the single composite option composed of 15 improvement opportunities, when possible.

Given the nature of the retained improvements opportunities, it has been deemed appropriate to deviate from a standard Cost-Benefit Analysis. Most of the benefits cannot be quantified in a monetary value given the specific nature of security and law enforcement fields. Therefore, all benefits have been qualitatively described in the Advanced Technical report and summarized in this document.

The aim of this CBA is for benefits, expressed in qualitative terms in the advanced technical report, to be assessed against the costs of improvement opportunities. This CBA present therefore relevant information that would help the decision-making process of whether the proposed solutions should be implemented or not.

The cost-benefit model is developed in an additional spreadsheet and provides an estimation of quantified costs.

1.1 Methodology

To collect data on costs for the cost and benefit analysis, the study team used different tools in three distinct phases:

- The first phase was composed by interviews and questionnaires sent to different national experts to identify cost drivers and benefits. Due to the qualitative nature of these benefits and the limited availability of data points, the monetary value of these benefits has not been determined.
- Based on identified cost drivers and benefits, the study team led a workshop to discuss and size the necessary investments to implement each improvement topic through an online voting tool[1]. Preliminary results regarding the investment ranges were collected from Member States.
- Finally, a benchmark analysis and desk research were done in order to size each improvement topic investment, as estimates from Member States could greatly differ.

When it comes to costs, estimations from Member States' representatives, assumptions from the study team and figures of similar projects carried out by Deloitte have been extrapolated to determine the expected costs for each improvement opportunity that should be part of the Next Generation Prüm.

1.2 Limitations

The following improvement opportunities of the single composite option have not been covered in this CBA.

Improvement opportunity	Rationale
Enlarging the material scope of the Prüm framework	This change is mostly a legal change with limited impact on the automated data

[1] Note that the sizing exercise performed during a workshop with Member States only concerns the non-biometric improvements topics.

	exchanges. Moreover this change would impact only a few Member States.
Enforcing a quick answer in the follow-up procedure	The efforts will differ greatly between Member States as they depend mostly on the national law enforcement authority's structure and processes. Therefore, no estimates could be provided for all Member States.
Establishing a single communication channel	All Member States have already access to SIENA, and will therefore not require additional investments.

Most of the benefits are intangible and related to time savings, access to larger set of information and simplification/improvement of police cooperation processes, and further helping law-enforcement officers in their daily operations. Therefore, the quantification of the benefits in monetary terms was not feasible due to the intrinsic nature of the benefits and the lack of available data.

While the CBA continues to be a primary tool for cost estimations, it is important to acknowledge its limitations. The monetary values in the CBA cannot be fully accurate as they largely depend on assumptions, benchmarks and estimations provided by different stakeholders.

The general assumptions are detailed in chapter 2.3 and improvement opportunity-specific ones in chapter 3. These assumptions are subject to change due to various reasons (e.g. functional, political, legal or technological changes). If this cost model is used for budgetary allocation, it is strongly advised to ensure that the assumptions remain valid.

When collecting costs, the following limitations were also identified:

- Dispersed sources of information: Due to the Prüm network's decentralised nature, not all information is in DG HOME's possession. This information had thus to be requested from the Member States and other stakeholders. The limited data collected through the survey and the interviews, and the relatively low level of quality of this data, represented a challenge for the CBA exercise;
- Benchmark unavailability: Prüm has been one of a kind initiative in terms of automated data exchange and law enforcement cooperation. Little data is available as a benchmark for calculating the cost estimations.

2. COST ESTIMATION FRAMEWORK

2.1 Type of costs

To perform the cost analysis, costs were divided between one-off and recurring costs:

- One-off costs are investment costs that will only occur during the implementation stage of the improvement opportunities;
- Recurring costs are costs that will incur after the Next Generation Prüm is implemented. These costs include among others maintenance, operations, and license costs. Yearly recurring costs are estimated to sum up to 20% of the one-off costs.

One-off costs comprise the following cost categories:

- Design costs: Includes costs related to business analysis, technology assessment, architecture design, and specification costs;
- Infrastructure costs: Costs incurred in the selection, acquisition, installation, configuration, and testing of the chosen infrastructure (hardware);
- Off-the-shelf software costs: Costs related to selection, acquisition, installation, configuration, testing of off-the-shelf software;
- System development & integration costs: Costs related to the development and integration of systems. As well as costs related to deployment and operational set-up of systems and respective tests in the initial system set-up;
- Practical adoption costs: Costs incurred for project management, stakeholder management, change management and training of stakeholders in connecting to and using the solution. It also includes costs related to the creation of new processes, adaptation of existing processes, and compliance with administrative processes.

Recurring costs comprise the following cost categories:

- Design costs: Costs related to changes in the business analysis, architecture, specifications, and solution design;
- Infrastructure & off-the-shelf software costs: Recurring costs associated to infrastructure and off-the-shelf software licenses and associated services;
- System maintenance & operation costs: Costs related to corrective, predictive, preventive, and system maintenance. It also includes operation costs, such as daily system management;
- Support costs: Costs related to incident, problem management, and request handling. It also includes stakeholder training costs;
- Practical adoption costs: Stakeholder identification, management costs, and compliance costs.

2.2 Methods of calculation

Cost drivers

The study used an approach based on cost drivers, i.e. cost items that serve as basis for estimating all the other cost items both at EU and Member States' levels.

- Development & integration costs: This is the principal cost driver. The study team estimated the development and integration effort needed in person-days for each improvement opportunity. Efforts are translated into costs using a daily blended rate.
- Design costs: This cost driver is mostly used when efforts are to be undertaken at EU level to further refine some working principles or solution specifications.

Extrapolated costs

The study extrapolated the other cost items based on the cost drivers and ratios.

- Testing costs: Costs covering, amongst others, the technical, the performance, end-to-end and user acceptance testing. The costs estimated for testing are respectively 80% and 120% of development & integration costs for EU (central) and Member States testing. Given the setup of the architecture, Member States are expected to have more testing activities than what is expected to be done at EU level.
- Infrastructure & off-the-shelf software costs: In order to implement the improvement opportunities, the study team expects that there will be a need to upgrade national systems, purchase additional license or setup new integration layers. Based on the nature of the improvement opportunity, an improvement can require low or high-intensive infrastructure costs. In case of low-intensive infrastructure costs, stakeholders are expected to possess most of the infrastructure to implement the improvement opportunity. Low-intensive and high-intensive infrastructure costs are expected to represent respectively 50% and 100% of the development, integration and testing costs.
- Design costs: Costs to design and specify an improvement opportunity as well as adapting current architecture to reflect the changes brought by this improvement opportunity. The ratio is estimated to be 15% of both the development & integration costs and the infrastructure & off-the-shelf software costs. The design costs are equally divided between the analysis & architecture costs and the specification costs.
- Administrative change costs: Costs covering project management as well as other operational costs (e.g. process modification) to support the implementation of an improvement opportunity. The ratio is estimated to be 20% of the design, infrastructure & off-the-shelf software and system & development integration costs.

The study based these extrapolation rules and ratios on cost models from past European Commission studies. Given that there are still technical details that need to be clarified and agreed upon, an error margin of 30% should be considered.

2.3 General assumptions

The study based its assumptions on previous European Commission studies, as well as information collected during interviews, workshops and verified evidence from international and European statistical agencies.

Number of Member States

When computing the costs for all Member States, for each improvement opportunity, the study assumed the total number of Member States to be 27 and additionally the 4 Associated countries with whom the European Union has agreements on their participation in the Prüm Decisions (Liechtenstein, Iceland, Norway and Switzerland), totalling to 31 participating countries.

Working days per month

Given the EU average annual leave (i.e. 25 days[2]), the public holidays (i.e. 10 days) and other causes of absence, the study team estimated the number of working days per month to be 20.

Daily blended rate

[2] See : https://www.europeandataportal.eu/en/highlights/which-country-eu-has-most-annual-holidays

A daily blended rate has been calculated based on the involvement of profiles in the different activities to implement and operate solutions as well as the average rates of these profiles.

Recurring costs

As a rule of thumb, we estimate the annual recurring costs to be 20% of the one-off costs. This means that in 5 years the recurring costs should equal the initial one-off costs.

3. COSTS AND BENEFITS

This chapter presents for each improvement opportunity, the benefits, improvement opportunity-specific assumptions, and cost estimations.

3.1 Revising Prüm Technical Standards

3.1.1 Benefits

Benefit items
The standard used for Prüm will be compatible with other European frameworks and aligned with the Interoperability solutions, fostering the interoperability of the data formats.3

3.1.2 Assumptions

The costs for implementing the standards lie primarily with the Member States. Initial work will be done in conjunction with the EC to define and document the adopted NIST specifications. Once this is done, the remaining costs are incurred by the Member States. No additional hardware should be purchased.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by European Union and Member States:

Type of costs	EU activities	Member State activities
Design costs	Coordinates and oversees the change of the Prüm technical specification document and Interface control document (ICD).	Member States participate to the definition of the Prüm technical specifications and ICD leveraging the NIST standard. Member States will have to adapt the national architecture accordingly.
Infrastructure & off-the-shelf software costs	Not applicable	Member States are not expected to invest heavily in new software or hardware. However, Member States might need to upgrade some of their infrastructure to cope with the exchange of the new Prüm standards.
System development & integration costs	Not applicable	The modification to the exchange standards will be implemented through software development. The development costs will vary between Member

[3] Regulation 2019/817 and 2019/818 on establishing a framework for interoperability between EU information systems in the field of borders and visa and amending Regulations (EC) No 767/2008, (EU) 2016/399, (EU) 2017/2226, (EU) 2018/1240, (EU) 2018/1726 and (EU) 2018/1861 of the European Parliament and of the Council and Council Decisions 2004/512/EC and 2008/633/JHA

		States depending on their system design. Member States will need to do performance, technical, user acceptance and end-to-end testing.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

No data points were collected from the European Commission. It was not possible to for the Member States to evaluate the exact time needed to design, develop and integrate the new data format for the automated data exchange. The produced estimates are extrapolated from similar projects. All biometric data (including facial images) types are included in the estimations.

Two main cost drivers have been identified for the implementation of this improvement opportunity:

- The design of the technical standards at EU level. We estimate that this task will take about six months for 2.5 persons working part time to coordinate the effort between Member States. The costs to host two workshops have been factored in the estimates.
- The development and integration for the Member States is expected to take 1.5 months per data type (DNA, fingerprints and face images) and involving two developers. The development time needed might depend on the complexity of the national systems.

The implementation of this improvement opportunity will most likely have limited impact on the infrastructure of the Member States. Therefore, this improvement opportunity is considered to be a "low-intensity infrastructure improvement opportunity".

3.1.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity at EU level and per Member State:

	Revising Prüm Technical Standards	
	EU	MS
Expected one-off costs (K€)	161	458
Expected yearly recurring costs (K€)	32	92
Total (K€)	193	550
Grand Total (K€)	743	

3.2 Fingerprint efficiency improvements

This improvement opportunity proposes that Member States adopt a standard Prüm quality metric based on NFIQ or NFIQ2.

3.2.1 Benefits

Benefit items
• Quality metric is provided for each returned fingerprint image by using NFIQ (2). The additional information can help the forensic expert in the adjudication process (optional). • A minimum quality for ten-prints can be ensured across Member States by using NFIQ (2) (optional). • Usage statistics can be collected to take data-driven decisions regarding Prüm through usage reporting. • Processing overheads of handling requests can be improved through vendor feature set support (optional).

3.2.2 Assumptions

Estimates for this improvement opportunity are based on following assumptions:

- All Member States will need to implement a NFIQ or NFIQ2 based assessment when enrolling fingerprint image data;
- Costs associated to procuring a NFIQ or NFIQ2 quality assessment technical component are low or free, as an open source version has been made available by NIST. A limited number of days for each Member State has been taken into account to implement the quality assessment and provision storage of the metric in databases and messages;
- Member States will need to foresee the capability to exchange the NFIQ score.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Types of costs	EU activities	Member State activities
Design costs	The European Commission will coordinate the implementation of the NFIQ (2) and provide guidance on the implementation of the quality score to the Member States.	Member State will reflect the change in their national architecture and documentation, leveraging the information made available by the European Commission and NIST.
Infrastructure & off-the-shelf software costs	Not applicable	Member States are not expected to invest heavily in new software or hardware. However, Member States might need to upgrade some of their infrastructure to cope with the implementation of the recommendations related to the improvement of fingerprint sharing.
System development & integration costs	Not applicable	Member States are expected to leverage the open source documentation made available by NIST to implement NFIQ. The development costs will vary between Member States depending on their

		system design. Member States will need to do performance, technical, user acceptance and Member State to Member State testing.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

No data could be collected from the Prüm stakeholders to provide accurate figures. The time needed to implement the improvement opportunities is based on similar projects.

The European Commission (or any other mandated organization) is expected to help Member States by providing clear guidance on the use and implementation of NFIQ. Given the presence of existing documentation, it is expected that this activity should not take more than 40 person days. No additional effort is expected from the European Commission on the implementation of this improvement opportunity.

The NFIQ improvement opportunity will have to be integrated in the national systems, the time needed for implementation is expected to take around 40 days, but will depend on the complexity of the national IT systems.

3.2.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Fingerprint efficiency improvements	
	EU	MS
Expected one-off costs (K€)	27	102
Expected yearly recurring costs (K€)	5	20
Total (K€)	32	122
Grand Total (K€)	154	

3.3 Improving DNA matching

This improvement opportunity proposes that Member States define the DNA matching threshold (six loci or more) per Member States and per Type (i.e. Person/Stain), via bilateral agreements.

3.3.1 Benefits

Benefit items
• Member States will be able to adapt the threshold in the future based upon the capabilities of their technology and operational processes; • Usage statistics can be collected to take data-driven decisions regarding Prüm through usage reporting.

3.3.2 Assumptions

The Configurable Minimum Loci Threshold will have to be bilaterally agreed by the Member States. Once agreed, the change will be reflected in the ICD. Given that other changes (e.g. revising Prüm technical standards or IT architecture) are already

foreseen, it is reasonable to assume that improvement opportunities will be implemented altogether.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	The European Commission will provide guidance on the implementation of an adaptive DNA matching threshold to the Member States.	Member State will reflect the change in their national architecture and documentation, leveraging the information made available by the European Commission and the bilateral agreements between the Member States.
Infrastructure & off-the-shelf software costs	Not applicable	Member States are not expected to invest heavily in new software or hardware. However, Member States might need to upgrade some of their infrastructure to cope with the implementation of the recommendations related to the setup of adaptable matching thresholds.
System development & integration costs	Not applicable	The development costs will vary between Member States depending on their system design. Member States will need to do performance, technical, user acceptance and Member State to Member State testing.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item. No costs are foreseen to agree upon the bilateral matching thresholds.

No data could be collected from the Prüm stakeholders to provide accurate figures. The time needed to implement the improvement opportunities is based on professional experience on similar projects.

The costs associated to the provision of extended support for the ESS (as to be defined for the Prüm ICD) will depend on the current status of each Member State. The implementation effort for such solution depends mostly of the national technical landscape. The development time is estimated to take 40 days.

An extra 40 days are foreseen at EU level to arrange the practicalities linked to the setup of the adaptable matching threshold by the Member States.

Usage Reporting
Estimates for usage reporting are included in the central router costs as it is assumed and recommended all statistics would be collected centrally.

Data Exchange Formats
Cost estimates for adopting the new data exchange format have been analysed and are covered in section 3.1.

3.3.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Improving DNA matching	
	EU	MS
Expected one-off costs (K€)	27	102
Expected yearly recurring costs (K€)	5	20
Total (K€)	32	122
Grand Total (K€)	154	

3.4 Vehicle Registration Data changes

The changes of EUCARIS, used by Member States to exchange vehicle registration (VRD) data, are divided in 5 sub-improvement opportunities:

- VRD Changes Solution 1: Make the country field optional when performing a vehicle search;
- VRD Changes Solution 2: Implement a search log for all international searches;
- VRD Changes Solution 3: Search all vehicles registered under a single person or entity;
- VRD Changes Solution 4: Include vehicle colour and mileage as new items in the EUCARIS data set;
- Driving licences: Include driving licences in EUCARIS Prüm application as a new data category.

3.4.1 Benefits

Benefit items
• The search of vehicle for which the country could not be identified will be facilitated; • Law enforcement officers will receive additional information on previously searched vehicles; • The search of all vehicles belonging to a single person or entity will be facilitated; • Additional data sets will be shared, increasing the likelihood for identification of the vehicle; • The access of driving license data from other Member States will help law enforcement officers in corroborating or nullifying the trustworthiness of the documentation.

3.4.2 Assumptions

This improvement opportunity assumes that the changes of EUCARIS will be able to reuse existing search tools/software. The analysis does not foresee the costs that could incur by Member States that need to collect additional data.

This study considers that the same assumptions can be made for the five sub-improvement opportunities.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EUCARIS and Member States:

Type of costs	EUCARIS activities	Member State activities
Design costs	All generic development specifications and architectural modifications will have to be taken into account by EUCARIS.	Member State will reflect the change in their national architecture and documentation, leveraging the information made available by EUCARIS.
Infrastructure & off-the-shelf software costs	EUCARIS will most likely need to upgrade the infrastructure to deal with the new requests and the provision of new data sets to Law Enforcement Authorities.	Member States are not expected to invest heavily in new software or hardware. However, Member States might need to upgrade some of their infrastructure to cope with the exchange of new data sets.
System development & integration costs	EUCARIS will need to adapt the current Prüm application to reflect the changes that are preconized in the study.	The development costs will vary between Member States depending on their system design. Member States will need to do performance, technical, user acceptance and Member State to Member State testing. No extra costs are foreseen for Member States that possess customized EUCARIS application.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

The cost drivers for both EUCARIS and the Member States are the development and integration costs. The assumptions on the costs have been discussed with EUCARIS' officials and the complexity has been benchmarked with the other improvement opportunities of this study. Most of the changes will have to be performed centrally by EUCARIS and Member States will have to configure their systems to integrate the changes.

As mentioned the adaptation of Member States' customized systems are not included in the costs, and the possible costs to collect additional data could not be accurately estimated.

The study corrected the values estimated for the proportion of Member States that will actually require to adapt their national applications, with EUCARIS Operations estimating 70% of Member States with customized applications.

3.4.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Vehicle Registration Data changes	
	EU	MS
Expected one-off costs (K€)	458	484
Expected yearly recurring costs (K€)	92	97
Total (K€)	550	580
Grand Total (K€)	1130	

3.5 Implement UMF

This improvement opportunity proposes the implementation and use of UMF, a standardised data exchange format, for the follow-up procedure.

3.5.1 Benefits

Benefit items
Data quality and collection through exchange is allegedly supposed to be higher, as a common understanding (e.g. definition of serious crime) will be shared across Member States and the collection and filling of the UMF will be partly automated.

3.5.2 Assumptions

The cost estimation only considers the necessary development & integration efforts related to the implementation of the UMF.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	All generic development specifications and architectural modifications will have to be made available by a European Body or Commission. The definition of the UMF3+ is expected to already have taken place.	Member State will reflect the change in their national architecture and documentation, leveraging the information made available at European level and based on the national technical landscape.
Infrastructure & off-the-shelf software costs	Not applicable	Member States are not expected to invest heavily in new software or hardware. However, Member States might need to upgrade some of their infrastructure to cope with

		the use of UMF for the sharing of information after a hit has been confirmed.
System development & integration costs	Not applicable	there is a need to adapt national systems to use UMF for the exchange of follow-up information has to be taken into account. The study team provides an order of magnitude of the needed effort.
Practical adoption costs	Not applicable	Generic costs linked to project management are attributed to this cost item.

Given the difficulty to anticipate the effort that will be needed, the study team has provided an order of magnitude of the effort that is expected to be required in order to use UMF for the exchange of follow-up information.

The study team foresees for the development and integration (driver cost) a total of two developers working full time during three months per Member State. Additional time and one workshop have been foreseen to align the Member States in the use of UMF in the context of Prüm.

3.5.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Implement UMF	
	EU	MS
Expected one-off costs (K€)	70	305
Expected yearly recurring costs (K€)	14	61
Total (K€)	84	367
Grand Total (K€)	451	

3.6 Including facial images within Prüm

This improvement opportunity proposes that Prüm supports automated exchanges of facial images between Member States to facilitate the identification of potential suspects.

3.6.1 Benefits

Benefit items
Member States will be able to query other Member States facial images' databases to step up the cross-border cooperation in combating terrorism and cross-border crime.

3.6.2 Assumptions

Cost estimation have been based on the following assumptions:

- Member States do not currently have a facial recognition (FR) platform that can be used for Prüm requests. Therefore they will need to purchase one.
- The main cost driver is related to implementation and facial recognition license costs. 1.5 million € is foreseen for each Member State to implement a facial recognition system.

120 person-days are foresee for the implementation of an integration layer and the setup of the connection with the central router.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	No costs are to be foreseen as the exchange standards costs for facial images are foreseen in section 3.1 revising Prüm technical standards.	Member States will need to organize a tender to purchase the facial recognition system, and update the national architecture based on the system that will be selected and implemented.
Infrastructure & off-the-shelf software costs	Not applicable	Member States are expected to purchase a facial recognition system and install it, but they should already possess a database of facial images. Therefore, limited resource should be allocated to a database.
System development & integration costs	Not applicable	Member States will have to setup the integration layer needed to exchange automatically data with the other Member States.
Practical adoption costs	Not applicable	Generic costs linked to project management are attributed to this cost item.

3.6.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Including facial images within Prüm	
	EU	MS
Expected one-off costs (K€)	0	2 274
Expected yearly recurring costs (K€)	0	455

Total (K€)	0	2728
Grand Total (K€)	2728	

3.7 Including the exchange of biographic data in Prüm

This improvement opportunity proposes the implementation of a search mechanism leveraging EPRIS-ADEP technology to facilitate the exchanges of biographic information (police records) between Member States.

3.7.1 Benefits

Benefit items
The process of being notified of the presence of information in another Member States' databases will be partially automated, allowing for better targeted requests and ultimately limiting the overheads for requesting information.

3.7.2 Assumptions

The cost estimation is based on the implementation of the ADEP-EPRIS solution, and not the handling of requests, as the number of searches and the time needed to handle the request cannot yet be accurately estimated.

Costs regarding the setup of the index cannot precisely be estimated as many aspects are still to be decided. Many other parameters still need to be taken into account to have a view on all the costs related to the full implementation of the exchange of police records.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	Decisions need to be taken at European level to: Design the details of the technical architecture. Define clear processes Harmonize with other initiatives	Member States will need to provide consequent effort to design a new national architecture, and the specifications to ensure the access of national data through the developed solution.
Infrastructure & off-the-shelf software costs	Depending on the chosen architecture costs will vary. However, the study team still expects costs related to the backbone infrastructure (i.e. EON), and the possible need for integration layer(s) at European level.	Member States are expected to either set up a new index or render an already existing index available. Regardless of the option, costs will have to be borne by the Member States. The costs will differ depending on the chosen option.
System development & integration costs	The EPRIS-ADEP solution still requires further development as mentioned by the stakeholders of the pilot project.	Member States will re-use the centrally developed solution and need to integrate it to the national

		systems, which will require development efforts.
Practical adoption costs	Not applicable	Generic costs linked to project management are attributed to this cost item.

The time needed to further refine the EPRIS-ADEP technology and working principle cannot yet be estimated accurately with the figures that were provided to the study team. However, based on the tasks that are still pending the team provided estimates to have an order of magnitude of the costs that will incur.

The study team has foreseen that the cost driver, development and integration, would require six developers working for five months to develop the solution at European level, amounting to a total of 600 person-days. Member States would need to foresee 180 person-days to develop and integrate the solution.

3.7.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	EPRIS-ADEP	
	EU	MS
Expected one-off costs	1.666	1.527
Expected yearly recurring costs	333	305
Total (K€)	2000	1833
Grand Total (K€)	3832	

3.8 Implementing a central router architecture

This improvement opportunity proposes the implementation of a hub-and-spoke architecture by introducing a central router. This router would allow Member States to connect to and to route messages to the respective matching engines of every Member State through one connection.

3.8.1 Benefits

Benefit items
• The introduction of the new IT architecture would reduce the number of connections to establish and to maintain, making the network more scalable. • Usage data of the Prüm network can be collected at central level. • A better suited technology, web-service, will be used for the exchange of XML files.

3.8.2 Assumptions

The cost estimation for the central router includes both the setup of the router, the setup of middleware handling web services requests, including the integration layer, and the establishment of new connections from Member States to the router. In order to ensure the need for high availability and reliability, redundancy is required to make the system robust. This cost has been included in the estimations.

The total cost that should be borne is ought to be distributed as follows:

- Set up of the central router and help Member States in the connection of their national systems by the European agency.
- Set up of the web services middleware and connecting the national systems to the central router by the Member States.

A single router (and its redundant/back-up router) will be setup. This router will handle the communication of all biometric data exchanges (using the same Web service and NIST standard). The router should be able to handle every request and send the request to the appropriate national system(s).

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	The technical specifications and architecture of the central router will have to be further refined to select the best manner to integrate all Member States, how to ensure robustness, security and how reporting on the automated data exchange should be done.	Member States will need to upgrade their infrastructure to support the exchange of web services and set up the connection with the central router, implying efforts to analyse and define the new architectural landscape.
Infrastructure & off-the-shelf software costs	The selected agency is expected to re-use wherever possible already existing IT infrastructure to support the implementation of the central router. However, additional infrastructure related costs are foreseen to complete the already present infrastructure.	Member States will need to upgrade their infrastructure to support the exchange of web services and set up the connection with the central router.
System development & integration costs	Depending on the business functionalities that are ultimately selected, additional costs regarding the system development and integration are to be added. The study team foresees that the central router will provide an integration layer and basic reporting capabilities.	Member States will need to configure a web service exchange system and the setup of the connection with the central router.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

The driving cost for the Member States to implement a connection to the central router is the development and integration costs. The study team foresees that 2 developers will have to work for 2 months for the three biometric data type, resulting in a total of 240 person-days.

A cost of 700 K€ has been estimated to design the architecture and the specifications of the central router. Furthermore, the study foresees that 6 developers working for 6 months would be necessary to develop and integrate the central router, resulting in a total of 720 person-days.

3.8.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Implementing a central router architecture	
	EU	MS
Expected one-off costs (K€)	2.144	611
Expected yearly recurring costs (K€)	429	122
Total (K€)	2573	733
Grand Total (K€)	3306	

3.9 Integrating the Prüm network with the interoperability solutions

This improvement opportunity proposes the creation of an interface between the central router and the European Search Portal (ESP) to streamline law enforcement queries for the purpose of establishing the identity of an unknown person. .

3.9.1 Benefits

Benefit items
With major European information systems made interoperable, it can be expected that information exchanges in the EU will become smoother, given that the ESP will technically be able to retrieve information from all EU information systems. Interoperability between information systems will allow the systems to complement each other, help facilitate the correct identification of persons and contribute to fighting identity fraud.

3.9.2 Assumptions

The connection between the central router and the ESP should be configured by eu-LISA which will host the interoperability solutions and most likely the Prüm central router.

Member States will still need to ensure that the connection, through the central router, with the ESP is appropriately configured.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	The technical specifications and architecture of the interface will have to be defined at EU level.	Member States will need to update their architecture to reflect the integration of the interoperability solutions through the central router.
Infrastructure & off-the-shelf software costs	The selected agency is expected to re-use wherever possible already existing IT infrastructure	Little additional infrastructure costs are expected at Member States' side.

	to support the setup of the interface between the central router and the ESP.	
System development & integration costs	Most of the effort will have to be provided to develop and integrate the interface between the systems.	Member States will need to adapt their national systems to ensure the possibility to reach the ESP through the central router. Most of the effort will be made at European level.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

Only a search function can be provided for the two common data types (fingerprints and facial images) stored in both systems (i.e. interoperability solutions and Prüm).

The study team foresees two developers working for two months for the two data types resulting in 160 person-days as driving costs at European level.

Every Member State should have two developers working for a month for every data type to ensure the connection with the ESP.

3.9.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Integrating the Prüm network with the interoperability solutions	
	EU	MS
Expected one-off costs (K€)	333	204
Expected yearly recurring costs (K€)	67	41
Total (K€)	400	244
Grand Total (K€)	644	

3.10 Integrating Europol in the Prüm landscape

This improvement opportunity foresees the inclusion of Europol as a new stakeholder, making some of its databases accessible to Member States via the Prüm network.

3.10.1Benefits

Benefit items
Biometric data from 3rd countries held by Europol would become accessible in an automated manner to Member States.

3.10.2Assumptions

The inclusion of Europol as a new stakeholder will require the setup of the agency's connection to the Prüm network and the automated data exchange capabilities. These costs will be borne at European level.

Cost estimation for this opportunity are based on the following assumptions regarding activities to be performed by EC and Member States:

Type of costs	EU activities	Member State activities
Design costs	The technical specifications and architecture of the automated data exchange system by Europol.	Member States will need to update their architecture to reflect the integration of Europol in the Prüm landscape.
Infrastructure & off-the-shelf software costs	Europol will need to setup a search interface, a communication server, a server for messaging (web service based solution), and an integration middleware.	Little additional infrastructure costs are expected at Member States' side.
System development & integration costs	Europol will have to develop the search interface and integrate the ABIS they currently possess to the middleware.	As soon as Europol has set up its connection to the central router, Member States will need to configure and test the new connection.
Practical adoption costs	Generic costs linked to project management are attributed to this cost item.	Generic costs linked to project management are attributed to this cost item.

The development and integration is the cost driver for both Europol and Member States. Europol estimate that the effort required to setup the connections to three experts working during three months plus an additional five days per Member State for the effective deployment of the connection. This leads to a total of 335 person-days for Europol. Given the need for new hardware, the study estimates the infrastructure costs to be high-intensive (i.e. 100% of system development & integration one-off costs).

The study team foresees that two developers will have to work for a month per data type to be able to automatically exchange biometric data with Europol, resulting in 120 person-days.

3.10.3 Cost estimation

The table below presents the cost estimation for this improvement opportunity:

	Integrating Europol in the Prüm landscape	
	EU	MS
Expected one-off costs (K€)	930	305
Expected yearly recurring costs (K€)	186	61
Total (K€)	1116	367
Grand Total (K€)	1483	

3.11 Cost estimation for the single composite option

The table below presents the cost estimation of the single composite option for the European Commission:

	Minimum total costs (M€)	Expected total costs (M€)	Maximum total costs (M€)
Total one-off costs EU	4,1	5,8	7,6
Total operating costs for 5 years EU	8,1	11,6	15,1
Total	12,2	17,4	22,7

The table below presents the cost estimation of the single composite option for one Member State:

	Minimum total costs (M€)	Expected total costs (M€)	Maximum total costs (M€)
Total one-off cost per MS	4,5	6,4	8,3
Total operating costs for 5 years per MS	8,9	12,7	16,6
Total	13,4	19,1	24,9

The minimum and maximum have been calculated based on the expected total costs and considering a 30% error margin.

	Minimum total costs (M€)	Expected total costs (M€)	Maximum total costs (M€)
Total one-off costs	142,3	203,4	264,4
Total operating costs for 5 years EU	174,1	248,7	323,3
Total	316,4	452,0	587,6

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