Deloitte.

European Commission

Specifications for phase 1 (solution specification and phase 2 set-up) for a visa chatbot

VisaChat: Designing an EU chatbot to improve the efficiency of the visa procedure

HOME/2020/ISFB/FW/VISA/0021

Deliverable 3.01: AI Centre of Excellence definition

Table of Contents

Table of Tables

Table of Figures

1 Introduction

The AI Centre of Excellence (CoE) report is the main output of the third task of the *VisaChat* project. The objective of this project is to develop an EU cross-border chatbot to improve the efficiency of the visa procedure. The scope of the AI CoE goes beyond the development and design of the via chatbot. Since it is expected that more AI initiatives will arise in the area of freedom, security and justice in the near future, there is a need for an overarching organisation to coordinate this exercise. This report outlines how a Centre of Excellence can be leveraged for this purpose.

Since its inception in 2012, the European Union Agency for the Operational Management of Large-Scale IT Systems in the Area of Freedom, Security and Justice (eu-LISA) provides long-term solutions for the operational management of IT systems that are essential in the context of asylum, border management and migration policies of the EU.[1] Therefore, the agency is well placed to support the definition of the AI Centre of Excellence at hand. This report consolidates the input received from eu-LISA and other stakeholders, such as the Member States and DG HOME, during various touchpoints.

1.1 Context

The overall purpose of the VisaChat project is to deliver to Member States a cognitive application that answers questions of short-stay visa applicants in compliance with the Visa Code. The expected benefits of the envisaged visa chatbot are to reduce the number of information requests by phone or emails from applicants handled by consular staff.

This chatbot use case was identified during an AI strategy study conducted in 2020 by Deloitte in collaboration with DG HOME and eu-LISA on *Opportunities and Challenges for the Use of Artificial Intelligence in Border Control, Migration and Security*[2] (further referred to as the AI strategy study). However, the visa issuance for short stays is only one of the nine identified initiatives with opportunities for the use of AI. In total, almost 100 potential use cases were identified. From this longlist of use cases, 35 were shortlisted after a prioritisation exercise considering their value and potential. This entails that the opportunities for AI in this domain are not limited to the VisaChat project.

The study proposes the creation of an AI Centre of Excellence or Technology Hub to '*coordinate and enable the implementation of AI opportunities across the Commission, Member States and other central agencies*'. This report provides the initial assessment of the creation of the AI CoE, including the operational model, scope
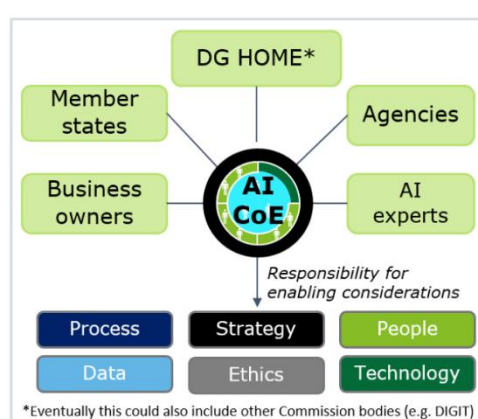

Figure 1 – Schematic representation of the potential AI CoE structure in the previous AI strategy study

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and responsibilities, within the *VisaChat* project. It will also serve as a baseline for the agency taking on the hosting of the CoE. Figure 1 displays a schematic representation of the potential AI CoE structure, taken from the AI strategy study. The CoE is put forward as one of the first steps of the roadmap: '*One of the first actions required is to develop the strategy, operating model and the investment case for the AI CoE.*' As a follow-up to the initial proposal made in the study referred to above, the European Commission (DG HOME) proposed to undertake an initial assessment of the creation of the AI CoE. As such, eu-LISA added the assessment and creation of the AI CoE to its AI roadmap as a planned activity from the last quarter of 2021 onwards.

1.2   Objectives

The intent of the visa chatbot project is to "design an EU cross-border chatbot (solution definition) and to define how it will be delivered (solution delivery definition), supported by a proof of concept and an AI Centre of Excellence blueprint". More specifically these objectives have the following dimensions:

- Define business and functional requirements for the proposed solution, considering the available data sources and most used languages.
- Identify the main use cases and types of interactions with the chatbot.

The objective of the report is to provide the reader with an AI Centre of Excellence (CoE) strategy and purpose, establish the CoE's construct and operating model, and finally define its requirements. To that end, the project team organised three workshops with eu-LISA and the European Commission (DG HOME) to define the AI CoE's strategy and purpose, establish the operating model and define the technology requirements. The aim of the first workshop was to agree on the potential, purpose and need for an AI CoE, align on an initial vision statement and discuss the different stakeholders to be involved within the CoE. The second workshop presented the core and governing services of the CoE as well as a preliminary version of the operating model. The third workshop presented the updated roadmap, the organisational model and the technology requirements for the AI CoE.

The first component to consider for the establishment of a new CoE is a well-defined vision. It is key to understand the purpose and potential benefits of the CoE. This leads to the identification of some key pillars of the CoE foundation. Subsequently, this is expanded into service categories comprising detailed services that the CoE can provide. The service model is then transformed into an operating model, that adds a perspective on how the CoE will operate and support its customers. The report also details how this model can be established, considering a '*dream big, start small*' approach.

This report is structured in five chapters, starting with an introduction to the project and report in Chapter 1. The strategy and purpose definition is discussed in Chapter 2. The following chapter, Chapter 3, describes the services and operating model of the AI CoE, followed by a discussion on the technology and integration requirements in Chapter 4. Finally, Chapter 5 presents the next steps and concludes.

For reference, Table 1 provides an overview of all deliverables in scope of the current project.

Table 1 – Summary of deliverables

ID	Deliverable name
D1.01	Future State requirements report
D2.01	Target Architecture and Design report
D2.02	Proof of Concept report
D3.01	**Artificial Intelligence Centre of Excellence report**
D4.01	Solution Delivery report

2 Strategy and purpose definition

The baseline for any Centre of Excellence is to define its strategy and purpose. Stakeholders must consult together to clearly determine the potential and need for a CoE, prior to drafting the vision statement and detail its benefits. This chapter is divided into seven subchapters, each focussing on a crucial aspect of the CoE's baseline, as presented during the workshops.

2.1 eu-LISA's strategy & AI roadmap

The mission of eu-LISA is to '*support through technology the efforts of the EU and its Member States to keep Europe open and secure*'[3]. To this end, eu-LISA outlined four strategic goals to strive for between 2021 and 2027:

1. Continue to grow as a contributor to and implementing partner for the relevant policies in the EU;
2. Maintain and extend the role of the Agency as an EU ICT Centre of Excellence and service provider;
3. Continue growing as a driver in innovation and digital transformation; and
4. Continue to develop an efficient and agile organisation in compliance with the EU regulatory framework.

In order to achieve this, eu-LISA will focus on both internal and external priorities. Internally, the focus will be on developing solutions to improve the efficiency and security of eu-LISA's internal processes. Externally, they aim to support their stakeholders, such as the Member States authorities. One way this will be done is by establishing centralised solutions, such as the VisaChat project. Additionally, they will support the delivery of decentralised solutions by providing services to their stakeholders.

Over the recent years, AI has gained significant importance as a driving force for transformations across the economy and society, including the public sector, leading to the development of a European approach to AI[4]. This coordinated approach aims to put the EU forward as the leader in technology. With this in mind, eu-LISA has been developing its approach to AI and the specific role the Agency can play in advancing the adoption of AI in the EU.[5]

In terms of AI initiatives, eu-LISA designed its high-level timeline for the implementation of actions through an AI roadmap. This roadmap provides an overview of all existing and future activities of the Agency in the area of AI in the Justice and Home Affairs (JHA) domain, including both planned and potential activities on the near to medium/long-term. This living document outlines 10 initiatives to be completed by the end of Q4 2025. Starting with the creation of the AI CoE and the VisaChat Proof-of-Concept, other initiatives range from implementing AI within ETIAS/CRRS and in the sBMS, to developing internal AI PoCs, and setting up training activities.

2.2 The need for an AI CoE

The current rapid technological developments are enabling a tide of constant innovation. These innovations cover both software developments, due to the appearance of new libraries and frameworks, and hardware enhancements, which allow faster processing and higher computational power. This creates a constant need for updating and learning, so that institutions and companies do not quickly lose their competitive advantage.

These breakthroughs enable AI evolution at a quicker pace than ever before, generating the need for not only large- but also small- and medium-sized organisations to create teams dedicated to AI. These teams could

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[3] eu-LISA Strategy 2021-2027

[4] COM(2018) 237 final. Artificial Intelligence for Europe. Available online: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=51625

[5] For more information, consult the report on the role of AI in the Operational Management of Large-Scale IT Systems, published by eu-LISA: https://www.eulisa.europa.eu/Publications/Reports/AI%20in%20the%20OM%20of%20Large-scale%20IT%20Systems.pdf

leverage AI capabilities to help enhance actual operations and spread this knowledge through the whole organization. To tackle those new challenges, one approach that is being taken by multiple technological and non-technological organisations is to establish an AI Centre of Excellence (CoE).

The main element of the AI CoE is the building of capabilities. In order for the CoE to act as an umbrella organisation, it must have the right internal capabilities and be able to support the Member States. The overarching goal of the CoE will be to increase efficiency through innovation using AI.

In the domain of JHA specifically, Member States and JHA agencies face several challenges due to the complexity and resource-intensive process when developing AI tools. Such developments usually require alignment with existing legal frameworks at both national and EU levels, large-scale data sets for model training, high performance computational infrastructure which are not always available, extensive testing and evaluation to ensure that the system works as expected, and specific skills and capabilities. The setup of an AI CoE would help address the challenges by supporting the EU JHA community in the development of AI tools and capabilities.[6] As the EU agency for the management of IT systems in the JHA domain, eu-LISA can play a pivotal role in this CoE.

Many Member States made progress using AI but it requires significant effort to spread this knowledge. The CoE will be able to lead the collaboration in order to systematically enable the transfer of knowledge among stakeholders. In 2021, eu-LISA therefore established a Working Group on AI to focus on supporting the core activities, developing AI capabilities within the Agency and deploying AI in internal business processes. These quarterly meetings are held including representatives from the Agency, the European Commission, EU Agencies and Member States. eu-LISA is also actively contributing to multiple forums and discussions on the subject.

2.3   Vision and purpose of the AI CoE

There are three different options when setting up a CoE, defined as follows:

1. A centralised command function that selects a single AI platform and steers internal development towards it. This option is suited for building a long-term AI platforms and preventing multiple solutions;
2. A governed use case or light centralised function to support execution of use cases while driving capability evolution. This option enables focus on individual use cases with good business cases while building a capability at the same time; and
3. A decentralised function where the areas of the business identify and resolve issues on their own. This option is best suited for business cases and helpful in creating impact in the short term.

The definition and set-up of the CoE is inherent to the entity implementing the CoE. This implies that the option selected will be tailored to fit the Agency's vision and purpose. In the case of eu-LISA, the AI CoE in its entirety follows a governed use case approach at a centralised level, meaning that the CoE will be set-up from a centralised Agency point-of-view.

By consolidating resources and expertise, the CoE will be able to efficiently expand its internal capabilities in order to support the identified stakeholders within the JHA domain. As such, the creation of the AI CoE is tailored to eu-LISA's vision and mission to support through technology the efforts of the EU and its Member States to keep Europe open and secure.

The focus of the AI CoE includes, among others, testing of AI capabilities, supply data processing and infrastructure services. In summary, the purpose of the AI CoE consists of, but is not limited to, the following:

*   Coordinate the strategy for AI within the JHA domain, to ensure a cohesive plan of implementation across all stakeholders;

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[6] Roadmap for AI initiatives, eu-LISA

- Establishing and promoting standards, best practices and collaboration between different stakeholders. Generating frameworks for future projects to speed up the adoption of AI;
- Leveraging research to support the application of state-of-the-art technologies to use cases in the JHA domain;
- Offering the possibility to stakeholders to contact subject matter experts; and
- Supporting the delivery of prototypes and AI solution, while monitoring and enhancing existing AI systems and ongoing projects.

When the right internal capabilities are built up, the CoE will be able to act as an umbrella organisation to support the Member States with their AI initiatives. It will result in the CoE providing a unique contribution by enabling AI service provision through technology and data.

Approaching the CoE with a "dream big, start small" vision, implies that whilst defining the end state of the CoE is the main goal, starting the implementation of the CoE from a practical project, i.e. the *Visa Chatbot*, is desired. In other words, eu-LISA requested Deloitte to propose steps that could be gradually implemented. This is achieved by scaling the difficulty of the milestones, aligned with the current state of the AI CoE, on each

> **Vision statement**
>
> The AI CoE will enable the successful delivery of AI activities, pilots and solutions by providing technical and data support (IaaS, PaaS, DaaS, SaaS) in the JHA domain.

step and by providing a realistic implementation plan without compromising the end state vision. All the steps should take into consideration the feasibility, available resources, prioritisation, and contribution to the end state. eu-LISA's currently ongoing initiatives focusing on AI, as well as those planned in the near future, will feed into the CoE and help kick-start its operation.

2.4 Examples of AI CoE within Europe

There are many different reasons for setting up a CoE, which are often organisation-specific. It is with this in mind that one must try to understand the various CoEs currently in place throughout Europe. They all have a similar mission, that is, to provide a unique solution to its users.

A first example of a well-established AI CoE within Europe is 'AI4Europe'[7]. The 'European AI on Demand Platform' aims to bring together the AI community whilst promoting European values. The platform acts as a facilitator of knowledge transfer, achieved not only by sharing research and business applications, but also by providing AI training. The AI4EU Platform serves as a catalyst to aid AI-based innovation resulting in new products, services and solutions to benefit European industry, commerce and society. By bringing people together on their platform, they counterbalance the fragmentation of the European AI landscape and facilitate technology transfer from research to business.

By uniting the European AI community, promoting European values and supporting research on human-centred and trustworthy AI, AI4EU aims at creating value, growth and jobs for Europe through their CoE. The platform ultimately acts as a one-stop-shop for anyone looking for AI knowledge, technology, tools, services and experts.

A second example of an existing AI CoE is provided by EFSA. In order to ensure Europe's competitiveness in the world and help shape the digital future of Europe, the European Commission has put forward a European approach to Artificial Intelligence and Robotics. It deals with technological, ethical, legal and socio-economic aspects to boost EU's research and industrial capacity and to put AI at the service of European citizens and economy.

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[7] Home | AI4EU (ai4europe.eu)

In line with this European ambition, EFSA has launched an initiative to join forces with other European Agencies to explore and exploit the benefits of AI. With the aim of leveraging the various benefits (productivity, efficiency, etc.) of Artificial Intelligence, EFSA launched in 2019 the Project P-AMU-23, entitled "Joining Forces at EU level in implementation of AI"[8].

Gathering various EU Agencies during workshops and meetings, allows for the exchange of ideas and (re-)use of AI by those Agencies in future oriented work. Some of the objectives of this initiative are to facilitate meetings and presentations to governance bodies, provide content as inspiration, and handle interactions within the AI community. This is all done to ensure Europe's competitiveness in the world and help shape the digital future of Europe.

Previous examples demonstrate the wide array of options available for organisations to utilise AI and CoEs. Today, eu-LISA has the opportunity to act on its mission by providing Member States and the wider EU JHA community with an umbrella under which capabilities and AI tools will be combined.

2.5   Focus areas of the CoE

In order for the AI CoE to fulfil its purpose, it must focus on providing value in several key areas. These areas all have in common that they are meant to increase efficiency through AI innovation. In line with the Agency's vision of the CoE, the main focus should be on AI applications, enhancement of actual services, performance improvement and understand future AI areas were the demand and impact will be higher.

Additional areas that the CoE will focus on include:

- Providing a testing lab for AI based-solutions;
- Facilitate AI knowledge and best practices sharing between Member States and others;
- Supplying data processing and infrastructure services;
- Supporting the Member States in their initiatives;
- Developing proof-of-concepts, prototypes and actual implementations; and
- Leveraging existing research and risk assessments.

Having the future scope of AI identified, the CoE areas should be focused on tackling those challenges and be prepared to adopt the innovation on current systems. This would be achieved by driving efficiency through innovation with PoCs, prototypes and actual implementations. By enabling AI service provision through technology and data, eu-LISA can offer a unique contribution. The CoE should not rely on doing their own research but instead leverage existing research papers, open source packages, libraries and risk assessments to implement proven solutions (technology intelligence or "*La veille technologique*"). It can thus act as a testing lab of AI capabilities. The exact use cases and services are discussed in section 3.1.

2.6   Stakeholders and interactions of the CoE

Since the AI CoE will be a joint-effort between eu-LISA, the European Commission and the Member States, the implementation should make use of a transversal management approach.

The Member States, together with eu-LISA, are the authorities that would benefit mostly from the CoE. The CoE would be able to assist the Member States in developing independent initiatives from the strategy to roll-out of finished products. Additionally, eu-LISA would also act as an IT service provider to the CoE and other stakeholders by exchanging information and infrastructure. Besides the direct stakeholders, the CoE would also partner up with other Agencies. These collaborations would include the following Agencies, DGs and stakeholders:

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[8] EFSA: Joining Forces at EU Level on the Implementation of AI

- European Commission (DG HOME, DG JUST), Eurojust, Europol and Frontex to investigate what AI capabilities can be used and to recommend products; Eurojust and eu-LISA are jointly exploring the opportunities for application of AI to support cross-border justice cooperation;
- European Innovation Hub on internal security with whom eu-LISA is aiming to foster future collaboration, including on AI-related topics;
- DIGIT to see what they are currently offering and to align with CoE.

The figure below depicts the various stakeholders and interactions in which the CoE will engage. It shows the first step of the to-be state of the AI CoE, including its ecosystem, knowledge exchange, IT provider and stakeholders benefitting from the CoE.
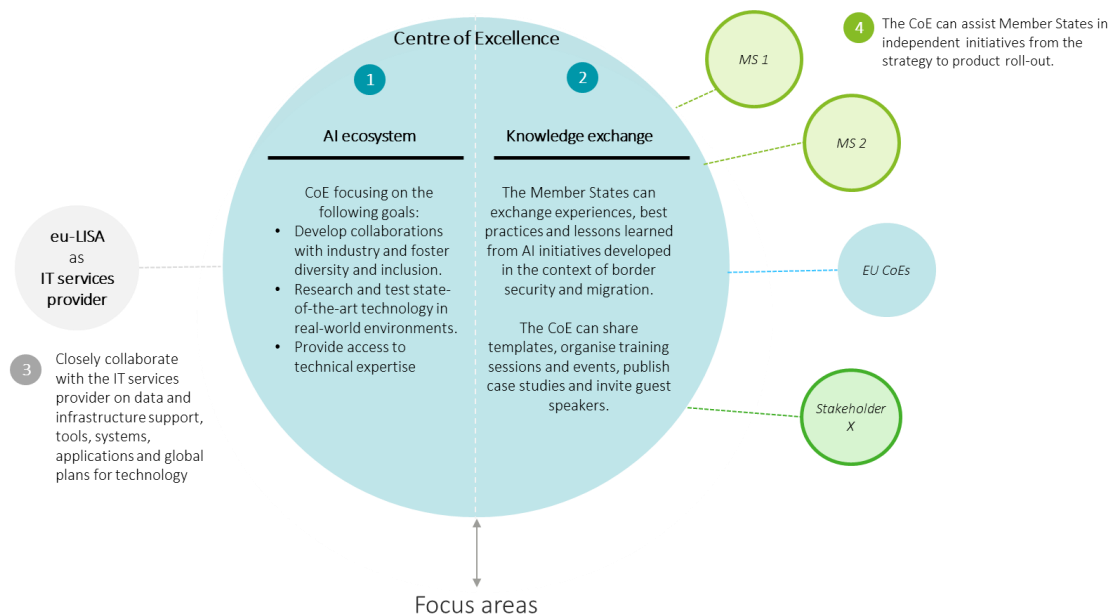

Figure 2 – Stakeholders and interactions of the CoE

Additionally a close link with academics, industries and other DGs and agencies should be kept. Therefore, it is important to know what is happing in the current landscape. Initially, the CoE will be created and driven by a small steering group, whereas the future full-grown CoE will be more formally structured.

2.7 Legal mandate for the CoE

The complete scope of CoE as proposed goes beyond eu-LISA's existing mandate. In the first phase, when the CoE is supporting applications that fall under existing legislation (sBMS, ETIAS, VisaChat[9] …), the legal mandate does not have to be changed. In that case AI is only a means to achieve objectives contained in existing legislation. This is also true as long as the CoE is focused on internal use cases for improving the management of the large-scale IT systems. For example, predictive maintenance of the systems has the sole purpose to improve already existing processes, and for this reason, does not require an extended mandate.

Over time, when the CoE will provide for a platform and support to the Member States in their AI initiatives, this lies beyond the current mandate of the agency. Therefore, additional legislation or changes to legal mandate is likely to be required. Given the time required for this, it is important to launch the process once it is clear that the CoE will pursue all services included in this report.

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[9] Note that the VisaChat is not yet covered by existing legislation, but as this is a key requirement for the chatbot development, it is assumed that the legislative aspects will be covered before integration of the VisaChat use case in the CoE. See also D4.01.

3 Service and operating model

A concrete strategy and purpose are necessary blocks to build upon when establishing an AI CoE, but they do not describe what will be in scope and who should be involved. This chapter first elaborates on the different core and governing services in scope of the final stage of the CoE. They come together in the operating model, that will then show through a high-level illustration how the CoE's bodies engage and work together to provide AI services to the stakeholders. In a next step, the services are mapped to the different activities of eu-LISA's AI roadmap through a phased approach. Finally, the organisational model is presented to depict the roles in alignment to the proposed target operating model for the AI CoE.

3.1 Services in scope of the CoE

The focus areas of the CoE must be translated into services the CoE will tangibly provide. The services required can be divided into two groups: core and governing services. The first category of services, the core services, are the services providing business value and are responsible for the actual development or assistance with use cases, discussed from 3.1.1 until 3.1.5. The second category, the governing services, are responsible for the management of the CoE and support the core services in their tasks and are discussed from 3.1.6 until 3.1.8. Finally, all of these are consolidated into a service model that categorises all services a mature CoE would include.

3.1.1 Advisory Services

As stated in the name itself, these services provide advisory services to AI CoE clients with regards to their AI initiatives. These services range from consulting with customers to validate the functional and technical requirements of a use case to providing standalone advisory such as on how to conduct a PoC. It includes having subject matter experts who have specific business/domain knowledge and are able to advise and provide guidance on which data sources exist and how the data can be best utilised to provide insights. This service will be able to act as a conduit between business users and Development Services to help facilitate the process of understanding business requirements; the relevant data available and suitable to support those requirements; the development services required to ultimately deliver the desired business outcomes.

Responsibilities can range from providing guidance on report requirement and design, providing analysis and insights, research, planning and assist with data sourcing/collection (including external data).

Table 2 – Advisory Services

Service name	Description
Strategy & Governance	Strategy accounts for determining the direction taken and fulfilling the following responsibilities: • Use case discovery • Portfolio prioritization • Project onboarding Governance involves overall coordination between the stakeholders and support in the standardisation and harmonisation of solutions.
Learning & Development	This service supports the knowledge sharing between stakeholders. It includes training sessions for the use and capabilities of AI in the context of border, migration and security. This can be done by involving subject matter experts.
Ecosystem Management	The CoE should support the communication to all stakeholders, for example by means of a newsletter. In addition, events can be organised to engage the different stakeholders. A dedicated platform can be built.

Research Monitoring	This service monitors existing research and risk assessments to stay up to date with state-of-the-art innovations. This knowledge can be used to aid during the development of solutions.

3.1.2 Architecture Services

The Architecture service group is responsible for providing architectural guidelines and managing interoperability. Activities within this service can include providing best practice advice, coaching and mentoring to development teams for data architecture and modelling, ETL, BI, analytics, metadata and data quality management. This ensures that the use of software, hardware, patterns, standards, and tools are optimised to improve efficiency and reduce the cost of both project delivery and maintenance. The definition of technology standards for overall enterprise architecture and AI applications can also enable harmonised, interoperable solutions.

Table 3 – Architecture Services

Service name	Description
Architecture Guidelines	Formulation of clear architectural guidelines and principles to which each solution should comply. This includes the selection of common frameworks and technologies, enhancing the harmonisation of the CoE solutions.
Interoperability	Interoperability with other platforms is a key requirement (facilitate data sharing), since the solutions are likely developed in collaboration with many different stakeholders.

3.1.3 Development Services

The Development Services support and develop AI solutions in order to meet stakeholder needs. It consists of resources that are able to develop AI solutions ranging from PoCs and prototypes to mature solutions. This service also covers responsible for the management of data assets and provisioning of sandbox environments. It is not the objective that the CoE is responsible for the full development of new AI solutions, but rather make sure that the stakeholders, service providers and vendors have access to the (well-managed) data sources and a sandbox platform.

Table 4 - Development Services

Service name	Description
Solution Development	The service focusing on the development of: • Proof of Concepts • Prototypes • Mature solutions
Data Management	The service responsible for the management of data. This consists of the supervision of data policies and practices to control, protect and enhance the value of data assets. Among the responsibilities is the cleaning of data such as data anonymization, bias detection, handling missing information, etc.
Sandbox	The service manages the delivery of a sandbox environment to test AI models and evaluate the data sources via a data pool (extract of available data).

3.1.4 Production Services

The Production Services body is responsible for supporting the technology systems and applications which are being used by the end-users. This involves managing the delivered solutions and infrastructure, monitoring incidents and requests from end-users, analysing these and either responding to these or escalating to other services within the AI CoE. This body is also responsible for providing a testing environment and manage releases.

Table 5 – Production Services

Service name	Description
Solution Operation	The service focusing on the operation of • Proof of Concepts • Prototypes • Mature solutions This includes the management of the infrastructure required for these tasks.
Environment Management	The CoE can focus on the management of the production environment. This includes the maintenance and continuous improvement of solutions, release management, monitoring and reporting.
Testing	The Testing service manages the delivery of a sandbox testing environment to test and evaluate implemented solutions.

3.1.5 Platform Services

The Platform Service body is responsible for providing stakeholders access to software, infrastructure and data to aid them in the development of their own solutions. These services will significantly decrease the effort and investment needed by stakeholders in order to pursue initiatives of their own.

Table 6 – Platform Services

Service name	Description
Software	Provision of Software as a Service (SaaS) to stakeholders to use previously developed software.
Infrastructure	Provision of Infrastructure as a Dervice (IaaS) to stakeholders to enable the implementation of independent projects: • Compute services • Data processing platform • Sandbox environment
Data	Provision of Data as a Service (DaaS) manages the collection and provision of data required to successfully train models.

3.1.6 CoE Management

The CoE Management service group is responsible for providing the overall direction of the CoE and determining the breadth and depth of services offered. This includes formulating the long term strategy, develop ethics frameworks and managing the talent.

Table 7 – CoE Management

Service name	Description
CoE Strategy	The CoE Strategy service formulating the vision, approach and roadmap of the CoE.
Ethics	The service safeguarding the ethical use of AI. This is done by aligning on AI ethical priorities and establishing a TAI (Trustworthy AI) framework. This to oversee AI applications to mitigate regulatory and legal risks without stifling innovation.
New Capabilities	The service responsible for managing the enhancement of current capabilities and identifying new capabilities to be adopted.
Talent Management	The service managing the workforce of the CoE to ensure capability is aligned with business needs, addressing talent gaps through the acquisition, development and retention of a skilled workforce.

3.1.7   Stakeholder Engagement

The Stakeholder Engagement service group ensures initiatives are prioritised, improved and aligned. This body involves stakeholder management – e.g. liaising with business users to assist in translating problems, decisions and questions into requests, involving appropriate parties across the department in the relevant discussions. This function also includes ensuring requests are aligned to the business strategy and management of demand – ensuring projects are prioritised accordingly based on business value realisation. As illustrated in Section 3.2, these services typically are the first step in processes of the CoE. Stakeholders can reach out the CoE with a new request, which should be prioritised. Stakeholders can also be engaged during execution of the use case, if this is required.

Table 8 – Stakeholder Engagement

Service name	Description
Stakeholder Management	The stakeholder management service is tasked with managing identification, engagement and relationship management of the stakeholders.
Use Case Prioritisation	The service responsible for the design and management of assessment criteria to facilitate prioritisation of proposed projects.
Use Case Improvement	The service managing the identification of opportunities continuous improvement of existing use cases.
Use Case Alignment	The service aiding stakeholders in translating questions and problems into requests and aligning them with existing strategies.

3.1.8   Program Delivery

The Program Delivery body ensures that AI CoE projects are delivered at a high quality, on time, within budget and capturing the correct scope. It also involves day-to-day PMO and financial control activities – across individual projects but also across a portfolio view of projects. Program Delivery is also responsible for

establishing delivery methodologies (e.g. traditional waterfall, agile), internal KPI management, benefits tracking, as well as vendor management).

Table 9 – Program Delivery

Service name	Description
Project Management	The service focusing on project scheduling, delivery roadmap creation, deadline management and setting team expectations.
Budget Control	The Budget Control service is responsible for tracking the financial aspect to ensure projects are delivered within budget.
Delivery Methodology	The service managing the adoption of Agile delivery methodology and ensuring consistent and repeatable project execution through process, templates and support.
Internal KPI Management	The service responsible for defining and governing the critical success criteria for projects within the AI CoE.

3.1.9 Service model

The service model consolidates all the previously mentioned services into one CoE service model. It categorises activities that a typical AI CoE performs into a number of leading practice target-state capabilities that a mature CoE would have, from higher-level strategic capabilities to more technical development and support activities. Service categories 6, 7 and 8 act as support for the remaining categories delivering business value. Furthermore, this model can be used to provide long-term vision of the capabilities.
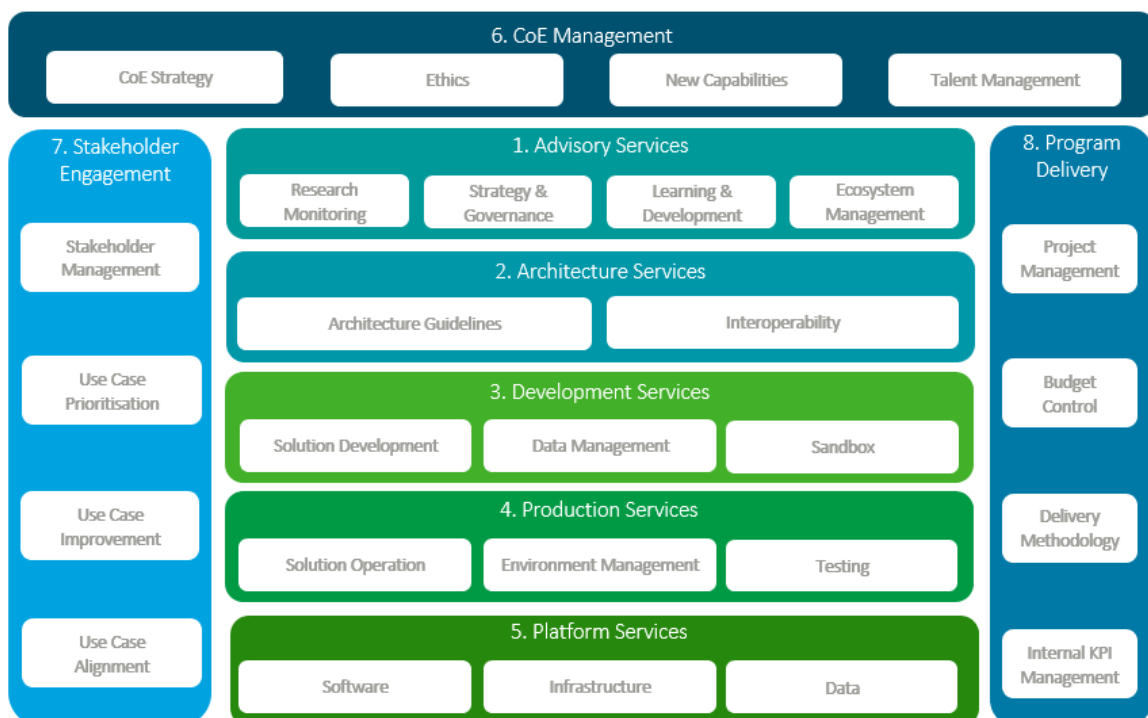
Figure 3 – Service model of the CoE

3.2 Operating model

The following section presents the target operating model for the AI CoE, in alignment with the AI services presented in the previous section. The model provides a visualization of the interaction between the different services that are needed for the CoE to be able to perform its tasks. The purpose of this AI CoE operating model is to illustrate, at a high-level, how internal bodies will engage and work together to provide AI services to the stakeholders.
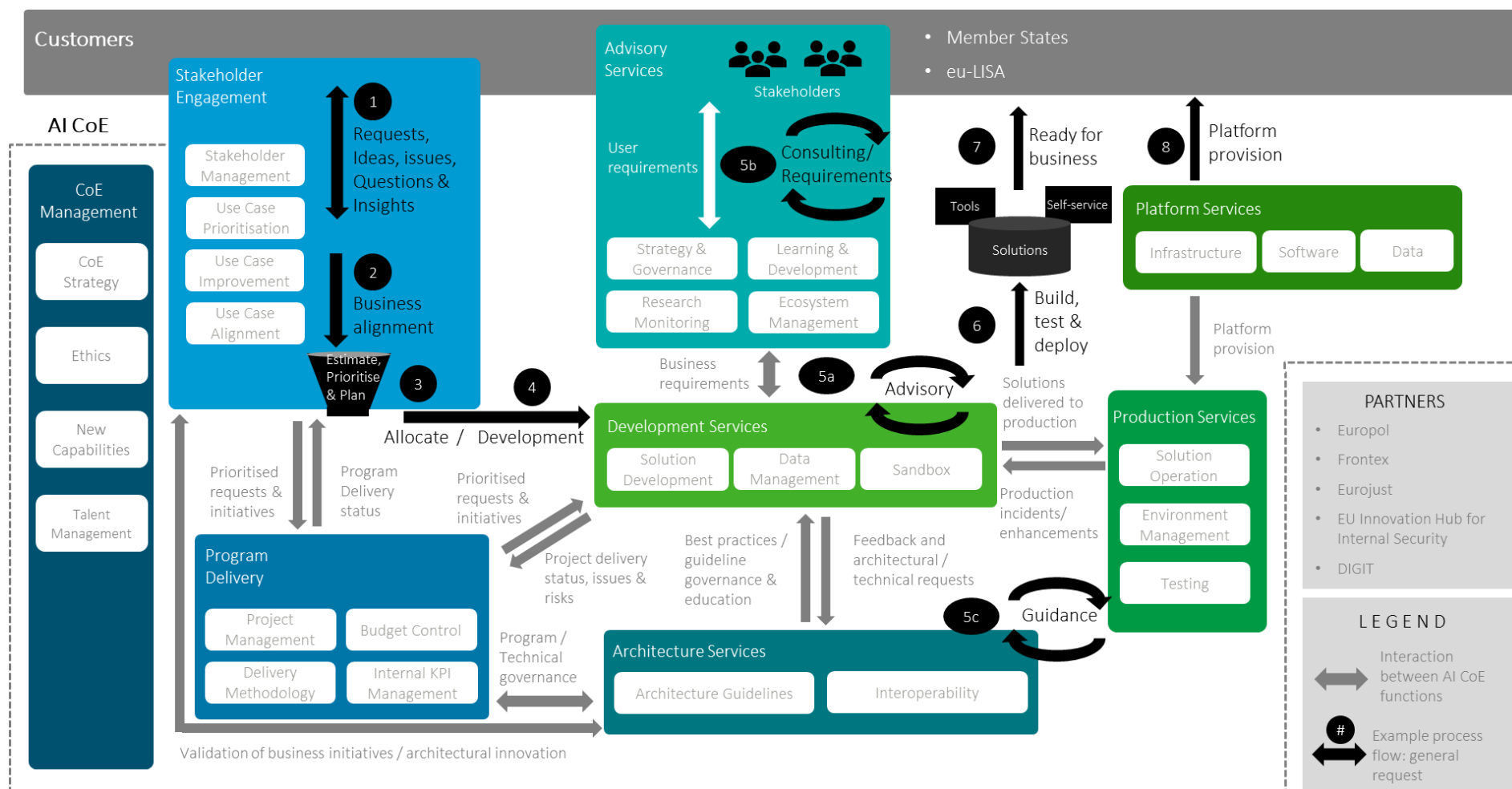
Figure 4 – Operating model of the CoE

Depending on the use case, the necessary services will be called upon to provide the requested service. The tables below outline the steps for these sample process flows in more detail.

Table 10 – Operating model sample flow

Step	Title	Process Description
1	Requests, ideas, issues, questions and insights	Customers liaise with stakeholder engagement body to submit new requests.
2	Business alignment	Use case alignment with different services to estimate effort in order for the request to be prioritised against existing requests
3	Allocation	In case of multiple projects with dependencies, the Program Delivery body is allocated with the new request. When there are no dependencies, a Project Support Office receives the new request and has the role for allocating staff to projects, according to availabilities and skills,. Project management activities are performed (e.g. confirming resource requirements, scheduling the project, mobilising the teams, etc.)
4	Development	Development Services perform the required development work (e.g. data modelling, analytics, and business intelligence development work). Resources are allocated to the project manager for the actual delivery during the project.
5a	Advisory	Development Services liaise with the Advisory body to understand the use case definition. This step is iterative to ensure there is a constant communication loop between the impacted parties.
5b	Consulting / Requirements	Advisory body consults with the customers to validate the functional and technical requirements of the use case.
5c	Guidance	Architecture Services provide architectural guidelines and operability policies to Development Services.
6	Build, test and deploy	Development Services build and deploy the solution into production. Production Services provide operational and testing support.
7	Ready for business	Customer is ready to fully engage with the solution after it is deployed in production.
8	Platform provision	Provision of Platform Services (i.e. access to software, infrastructure and data) for the development of a solution. This step will take place after a request is delivered.

3.2.1   Example: request for PoC

A possible scenario would be a Member State approaching the AI CoE with the request to develop a Proof-of-Concept. In this case, the CoE would handle the project management and development of the PoC according to the requirements from the Member State.
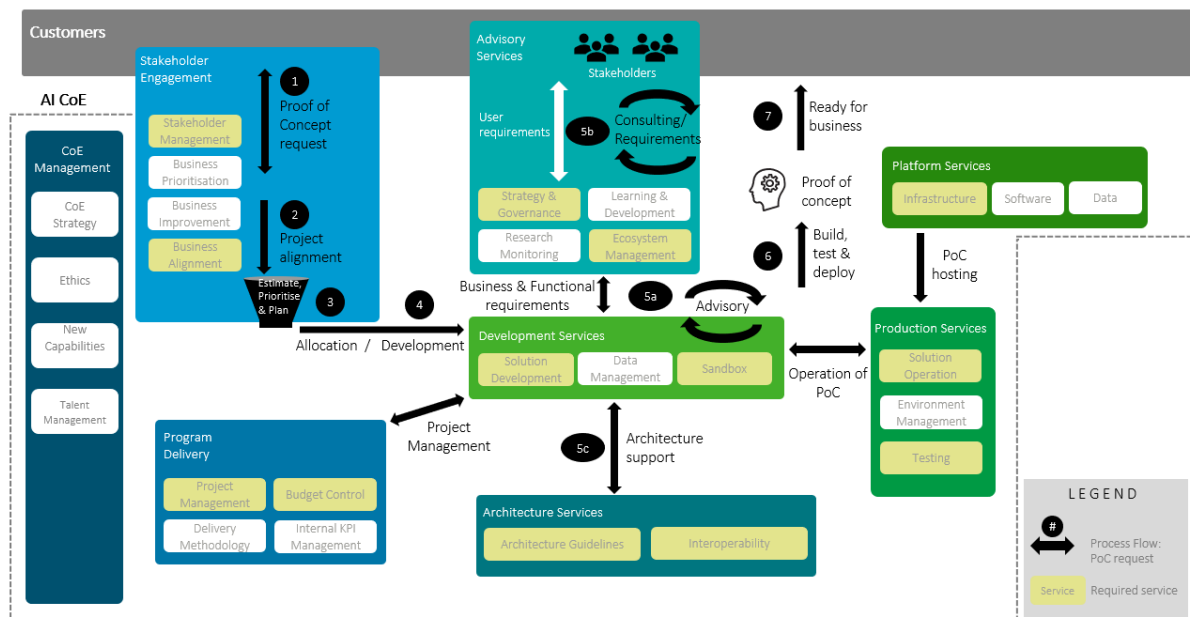
Figure 5 – Operating model during PoC request

The exact steps taken within the process flow are described in in the table below.

Table 11 – Operating model during PoC request

Step	Title	Process Description
1	Proof-of-Concept request	Customers liaise with stakeholder engagement body to submit new requests.
2	Project alignment	Stakeholder Engagement body validates business request and liaises with relevant/impacted stakeholders as required. Request is also assessed to validate use case alignment and use case value realisation (e.g., cost benefit analysis) and to ensure it aligns with the overall AI CoE strategy. Request effort is estimated in order for the request to be prioritised against existing and incoming requests. Program Delivery / Development Services / Architecture Services provide input to facilitate request effort estimation and prioritisation (e.g., can previous outputs be leveraged, how many projects are currently underway, what is the complexity of the required effort)
3	Allocation	Program Delivery body is allocated with the new request. Project management activities are performed (e.g., confirming resource requirements, scheduling the project, mobilising the teams, etc.)
4	Development	Development Services perform the required development work.
5a	Advisory	Development Services liaise with the Advisory body to understand the use case definition. This step is iterative to ensure there is a constant communication loop between the impacted parties.
5b	Consulting / Requirements	Advisory body consults with the customers to validate the functional and technical requirements of the use case. This will be shared back with the Development Services who will perform the required development tasks. This step is iterative to ensure there is a constant communication loop between the impacted parties.

5c	Architecture support	Architecture Services provide architectural guidelines and operability policies to Development Services. This step is iterative to ensure there is a constant communication loop between the impacted parties.
6	Build, test and deploy	Development Services build and deploy the solution into production. Production Services provide operational and testing support. They will be responsible for handling the solution once into production
7	Ready for business	Customer is ready to fully engage with the solution after it is deployed in production.

3.2.2   Example: request for Advisory Services

Not all service groups have to be called upon during a customer request. A customer can for example request for Advisory Services from the AI CoE in order to assist them in increasing their capabilities for independent development. Services performed can range from assisting with strategy and expertise to the training of staff. Although the first three steps of this process flow are identical to the previous example, the difference comes in step 4 with the Advisory Services being the only core service group to be required.
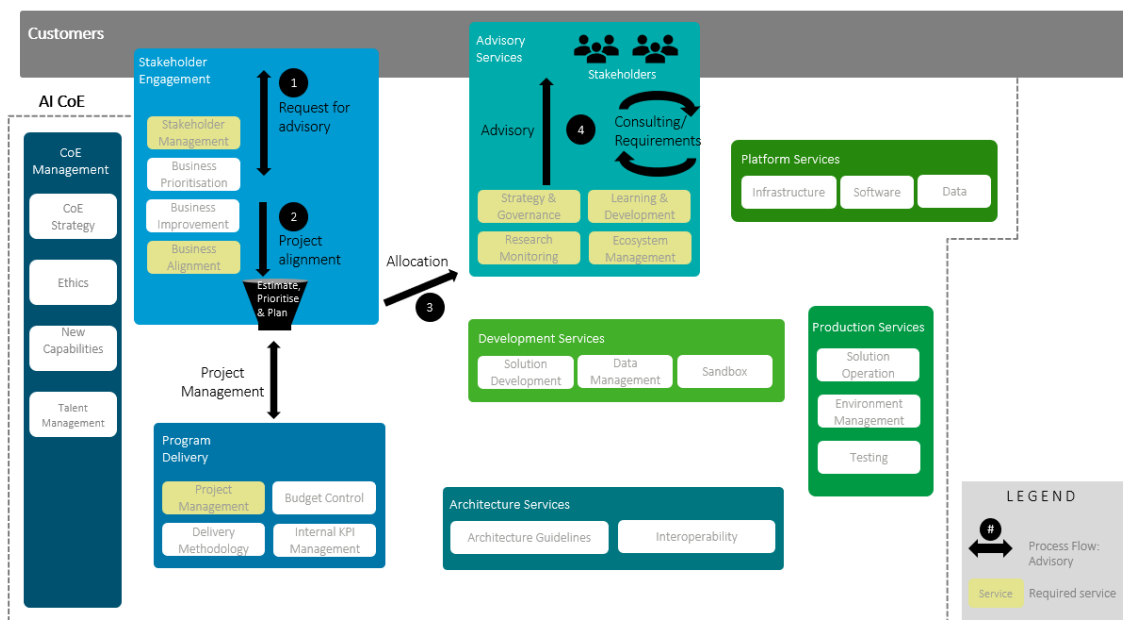

Figure 6 – Operating model when providing Advisory Services

The exact steps taken within the process flow are described in in the table below.

Table 12 – Operating model when providing Advisory Services

Step	Title	Process Description
1	Request for advisory	Customers liaise with stakeholder engagement body to submit new requests.

2	Project alignment	Stakeholder Engagement body validate business request and liaise with relevant/impacted stakeholders as required. Request is also assessed to validate use case alignment and use case value realisation (e.g., cost benefit analysis) and to ensure it aligns with the overall AI CoE strategy. Request effort is estimated in order for the request to be prioritised against existing and incoming requests. Program Delivery and Advisory Services provide input to facilitate request effort estimation and prioritisation (e.g., can previous outputs be leveraged, how many projects are currently underway, what is the complexity of the required effort)
3	Allocation	Program Delivery body is allocated with the new request. Project management activities are performed (e.g., confirming resource requirements, scheduling the project, mobilising the teams, etc.)
4	Advisory	Advisory Services perform the necessary services to fulfill the customer request.

3.3   Phased approach

In order for the AI CoE to grow towards its end state described in the service model, it was recommended to use a phased approach that allows activities to start at the same time. In practical terms, this means starting small and gradually increasing the responsibility of the CoE over time. As shown below, eu-LISA's high-level AI roadmap visually represents the 10 different AI activities the Agency will be focussed on for the next coming years. These activities drive the development of the AI CoE. It should be considered as a living document, that can constantly evolve. At the time of writing, some of the AI initiatives have already started, such as a joint report together with Eurojust and developments in the area of ETIAS and CRRS.

In the end, the CoE should serve as an umbrella for all AI-related activities, also for those launched before the set-up of the CoE. The CoE does not have to be an active driver of those projects but mainly coordinate them, ensure the right expertise and tools are used, and share knowledge afterwards. The CoE can also be leveraged to "promote" initiatives in the broader JHA community.
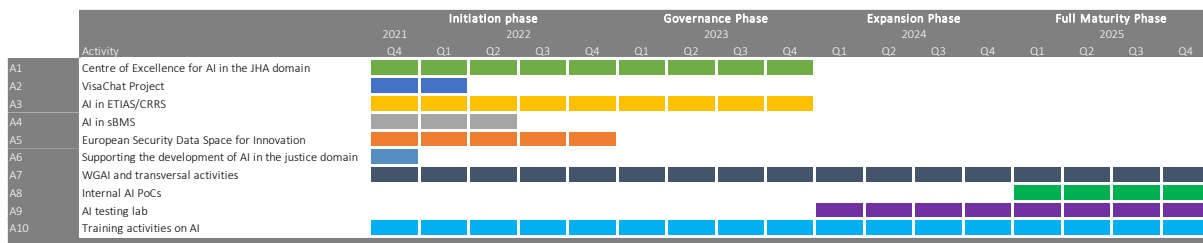

Figure 7 – eu-LISA's high-level AI roadmap

From this roadmap, a timeline for the provided core and governing services is designed. All of the proposed steps take into account the feasibility, prioritisation and contribution to the end state. The phased approach is divided into four phases: Initiation, Governance, Expansion and Full Maturity phase. A visualisation of the timeline is provided in Figure 8. The timeline shows the set-up period of the service. During and after this set-up period, the service is able to provide support during the use cases. Ultimately, each use case will refine and mature the foundational elements over the subsequent period and lift the capability of the CoE.
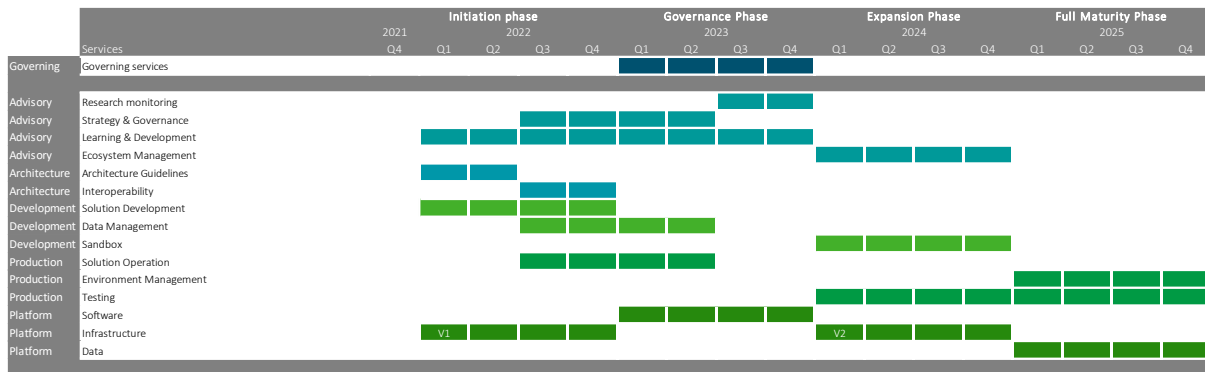
Figure 8 – AI CoE phased approach

3.3.1   Phase 1: Initiation (2021 - 2022)

The Initiation phase focusses on the development of crucial services required for the use cases proposed in eu-LISA's AI roadmap. Implementing the foundational services over the first year will provide a baseline for the AI CoE to kick-start most activities. Worth mentioning is the split of the Infrastructure Service into V1 and V2. The V1 refers to the set-up and management of the infrastructure necessary for internal projects, specifically for the *Visa Chatbot*. The V2 expansion, taking place during the Expansion phase, will allow for infrastructure to be provided as a service to stakeholders.

3.3.2   Phase 2: Governance (as from 2023)

The second phase will continue to increase the responsibilities taken by the CoE. Additionally, the internal structure will be formalised by setting up the governing services. These services will allow the CoE to continue its growth and provide the contact point with stakeholders.

3.3.3   Phase 3: Expansion (as from 2024)

At this stage, the focus is to expand the amount of services provided by the CoE. Indeed, the final Advisory and Development Services will be launched. Additionally, the second wave of Platform Services, through the expansion of Infrastructure Services, will take place and Production Services will advance through the set-up of the testing environment.

3.3.4   Phase 4: Full Maturity (as from 2025)

The aim of the final Maturity phase is to implement the remaining services in order to bring the CoE to full maturity. While existing services can still be improved at this stage and future expansion can be defined, the CoE will be able to provide the necessary services to handle the proposed use cases.

3.4   Organisational model

The model provides a visualization of the interaction between the different roles within the service groups that are needed for the governance of the CoE. The purpose of this AI CoE organisational model is to map the structure of the Agency to the different roles identified within the service categories, in terms of relationships and interactions between roles, to illustrate how internal bodies will engage and work together to provide AI services to the stakeholders.

Every service category is mapped to typical roles. In accordance with the AI roadmap, the roles are also introduced in a phased approach. The prioritisation is shown in Table 13 below. The organisational model is derived from best practices, but tailored to the specific needs of the CoE and the context of eu-LISA.

The diagram below depicts the roles in alignment to the proposed target operating model for the AI CoE.

Figure 9 – Organisational model of the CoE

3.4.1 Roles and responsibilities

The table below outlines the responsibilities and activities expected to be performed by the roles as per the diagram above. A prioritisation per role is given in the 'Phase' column, indicating in which phase it is recommended for the role to start. In a next stage, this diagram should be mapped against eu-LISA's current organigram to determine how the proposed roles could be integrated with the current units in place. Considering the phased approach for the CoE and the limited initial workload, the CoE might kick-off as part of the existing organigramme, to evolve into a new, transversal unit at a later stage.

Table 13 – Roles and responsibilities[10]

Service Group	Description	Role	Phase	Description
CoE Management	Provide overall direction and determine breadth and depth of services offered	AI CoE Lead	I	• Directs the AI CoE organisation • Operates the AI CoE leadership team • Quickly resolve issues and risks escalated from the AI CoE teams • Accountable for performance management of AI CoE • Ensure AI CoE improvement initiatives are prioritized and progressed • Executive stakeholder management, steering and governance

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[10] Please note that the roles do not necessarily correspond to one FTE, as these can be combined.

Stakeholder Engagement (MS, Agencies and DGs)	Ensure initiatives are prioritised and liaise with both stakeholders and AI CoE	Business Lead	I	• Manage the business organisation • Ensure Business Insight Manager representation from all units • Member of the AI CoE leadership team • Review business with AI CoE initiative request / business case development • Manage and co-ordinate all business, communications and training activities for the AI CoE
		Customer Relationship Expert (stakeholders)	II	• First point of contact and subject matter expert • Support end users to maximise self-serve opportunities • Assist business with AI CoE initiative request / business case development • Share knowledge, success stories, challenges between stakeholders
Program Delivery	Oversee the delivery of AI CoE projects	Program Manager	I	• Member of the AI CoE leadership team • Manage the Program Management organisation (in case of dependent projects) • Accountable for the successful delivery of all AI CoE projects and initiatives • Manage program schedules, scope and funding • Resolve PM escalated delivery issues and risks • Summarize, report and present overall program delivery status
		Project Manager	II	• Manage development service project teams to deliver AI CoE projects/initiatives in scope, on time and within budget. • Responsible for project schedule, scope and financials • Provide status reporting for inflight projects • Manage issues and risks for their project, escalating to Program Manager if required • Ensure project complies with AI CoE and PMO guidelines
Advisory Services	Provide advisory services to the AI CoE clients with regards to their AI initiatives (e.g. how to conduct a PoC)	Communication Expert	I	• Helps to convey the messages in an interesting and effective way • Subject Matter Experts who have specific business / domain knowledge • Can advise and provide guidance on what data exists in the department and how the data can be best utilised to provide insights
		Technical Lead	II	• Use of analytics to advice on business operations and strategy • Help to validate functional and technical requirements

Service	Description	Role	Level	Responsibilities
		Research Expert	II	• Monitor existing research and risk assessments to stay up to date with state-of-the-art innovations • Use knowledge to aid during the development of solutions
Architecture Services	Provide architectural guidelines and manage interoperability	Lead Architect	I	• Member of the AI CoE leadership team • Accountable for all AI CoE architectural decisions made • Reviews and signs off on domain architectures and standards • Approves new access to AI CoE environments (including AI workspaces) • Reviews project end to end design artefacts to ensure compliance with overall architecture • Leads relevant AI CoE initiatives / projects for their technical domain
		Data Architect	II	• Define a set of rules, policies, standards and models that govern • Define the type of data collected and how it is used, stored, managed and integrated within an organisation and its database systems
Development Services	Support and develop AI solutions meeting stakeholder needs	Technical Lead	I	• Technical lead resource with expert knowledge • Competent business and domain expertise to assist with managing rest of the team • Able to lead a team of developers and testers to plan, design, build and test AI solutions to meet business needs
		Implementation Expert	I	• Turn strategic objectives into actionable goals • Provide an internal support structure to guide selected programmes and practices through their respective implementation stages
		Quality Assurance	II	• Responsible for ensuring developed solutions meet business / user acceptance criteria • Planning, coordination and management and execution of test activities • Should ideally also have competent business and domain expertise to be able to translate business requirements in order to ensure technical implementation meets the desired business outcomes • Should also have competent business and domain expertise to be able to translate business requirements in order to ensure technical implementation meets the desired business outcomes

Production Services	Deliver and maintain the testing and development platforms and support solution development	**Application Architect**	III	• Link the business mission, strategy, and processes of an organisation to the AI CoE strategy • Document this using multiple architectural models or views
		Testing Expert	III	• Perform checks and testing of processes and solutions deployed to ensure the functionality and requirements are met
		Production Expert	IV	• Plans and organizes production schedule • Oversees the production process and coordinates all production activities and operations as well as determines and validates quality standards
Platform Services	Provide software, infrastructure, and data to stakeholders	**Lead Architect**	I	• Leads the architectural design operations • Maintains an active communication line with stakeholders to capture needs
		Software Architect	II	• Provision of Software as a Service to stakeholders to use previously developed software
		Infrastructure Architect	III	• Provision of infrastructure to stakeholders to enable the implementation of independent projects on compute services, data processing platform and in the sandbox environment

3.4.2 Roles to support the VisaChat project

The VisaChat application will be (one of) the first to be embedded in the CoE. The operating model for the VisaChat application is still under discussion (see also Deliverable D4.01), but will likely involve different stakeholders: DG HOME, Member States and eu-LISA, that would be responsible for the technical development and maintenance of the solution.

The chatbot development will involve a core team, but will also be linked to the AI CoE. The **project manager** of VisaChat will supervise the core team, while also reporting the status and progress to the CoE. The manager can also ensure that the VisaChat project follows the best practices defined by the CoE.

For the development of the chatbot, a consortium of Member States needs to be mobilised. For this, a **communication expert** and **business lead** might be leveraged. These roles can also support in the outreach to potential testers (visa experts within the Schengen area and beyond). During the development, the **lead architect** can advise on the implementation of the chatbot architecture (see also Deliverable D2.01). This is not a full-time role, but is rather activated on an ad-hoc basis. The core team can also consult an **implementation expert** for guidance on the development process, and **technical lead** for advice on the usage of models and logging best practices. Again, these roles provide support on an ad-hoc basis. These roles might also be present already within eu-LISA's current organisation.

The **AI CoE lead** and **program manager** are roles that are less directly involved in the actual implementation of projects, but instead focus on steering and following up on the CoE's evolution. In the initial phase of the CoE, they will be responsible for expansion of the CoE with appropriate use cases. These roles require more continuous work, although a full FTE will not be required in the initial phase of the CoE.

4 Technological and integration requirements

The core services of the CoE (Sections 3.1.2 to 3.1.5), except for the Advisory Services, show that the CoE should offer a platform for AI solution development and maintenance. This chapter specifies the requirements for the CoE platform.

4.1 Platform components

From the CoE service model (Figure 3), a distinction can be made between services that support production AI use cases and the services that support a playground for development and exploratory initiatives by Member States. Next to this, there are transversal services that cover both types of initiatives. The production services should be supported by one or more production environments, while the development services should be covered by a development environment. These environments have a different set of technical components. The division of services according to the environment type is shown in Table 14.

Table 14 – Mapping between services and platform types

Type	Service		Rationale
Development area for stakeholders ↓ Development environment	Platform	Data	Data-as-a-service to enable exploration of the available data in the JHA domain (data space).
	Platform	Software	Software-as-a-service to enable exploration of AI algorithms and programs.
	Platform	Infrastructure	Infrastructure-as-a-service to enable custom explorations by the Member States.
	Development	Sandbox	Sandbox environment as an interface to the platform services above.
	Production	Testing	Testing environment to test and evaluate the models developed in the sandbox.
Production initiatives ↓ Production environment(s)	Development	Solution Development	A platform is required to develop the initiatives in Figure 7 and others.
	Production	Solution Operation	A platform is required to operate the developed initiatives.
	Production	Environment Management	The maintenance of the developed initiatives requires version and environment control.
Transversal services	Architecture	Architecture Guidelines	For both platforms, architectural guidelines need to be established.
	Architecture	Interoperability	For both platforms, interoperability can bring the necessary data.
	Development	Data Management	For both platforms, common data management principles should be in place.

The specifications of both environment types are discussed in the below subsections. They can be physically separated in the future when dealing with sensitive data, but this should be assessed in a later stage.

4.1.1 Development environment

Adhering to the service model, the development environment should provide data-as-a-service, software-as-a-service, infrastructure-as-a-service, and a sandbox and testing area. To meet this, a layered structure of components needs to be in place. This is visualised in Figure 10 and further described in the below subsections.
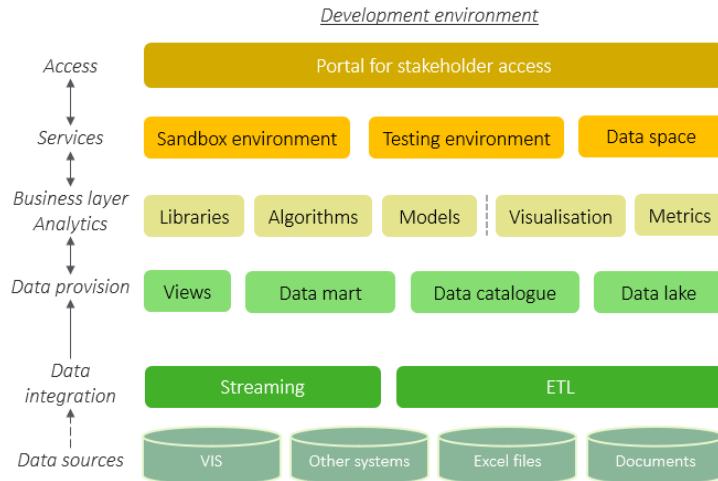
Figure 10 – Component layers of the development environment

4.1.1.1 Access

The development environment should provide access to a wide audience of stakeholders via a **web portal**. The general public should not have access to the environment meaning that **authentication** needs to be put in place. With the onboarding of new stakeholders, a limited number of their employees should be granted access to the environment.

4.1.1.2 Services

Figure 10 shows the typical cloud and platform service offerings – *infrastructure-as-a-service (IaaS), platform-as-service (PaaS), data-as-a-service (DaaS), software-as-a-service (SaaS)* – with the shared responsibilities between the service provider and the client.[11, 12] In this context, the service provider is the CoE and the clients are stakeholders or customers of the CoE.
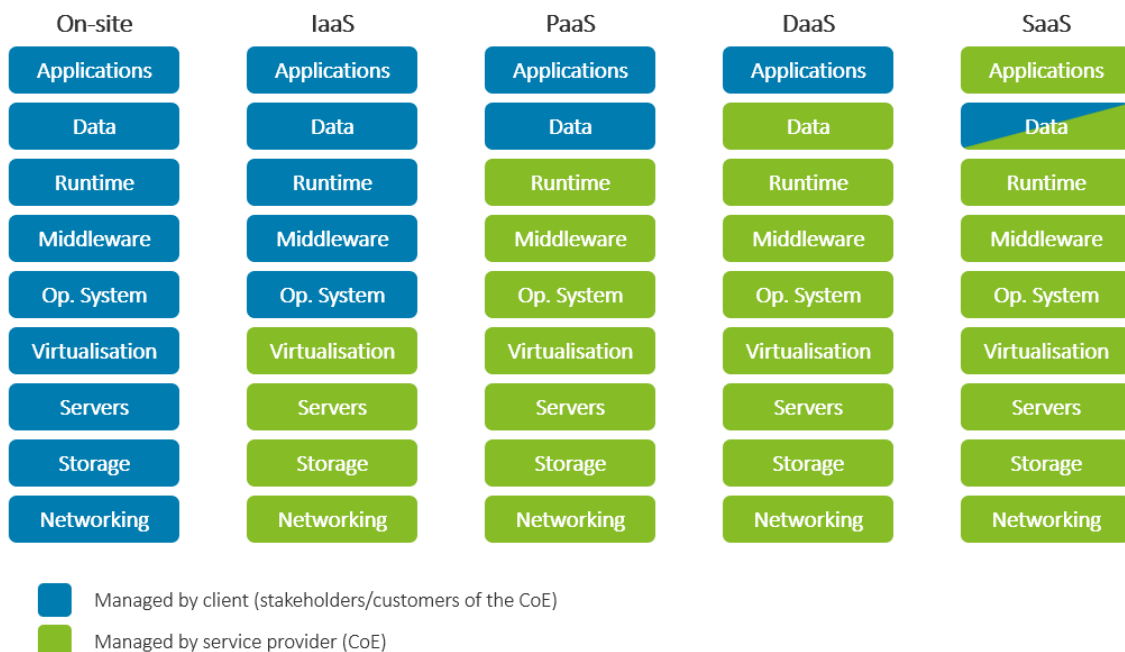
Figure 11 – Standard service offerings

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[11] Figure adapted from: https://www.redhat.com/cms/managed-files/iaas-paas-saas-diagram5.1-1638x1046.png

[12] DaaS refers to data-as-a-service. This acronym is also commonly used for desktop-as-a-service, which is not applicable here.

Without a CoE, all stakeholders interested in AI technology would have to develop an on-site platform (or use other service providers). This means that all capabilities in Figure 10 need to be covered by the stakeholders, which greatly increases the set-up cost of AI initiatives.

As a first step, the CoE should therefore provide **compute resources (infrastructure)**. In the context of this CoE, this can either be a customisable (IaaS) or a managed platform (PaaS). This allows stakeholders to load their custom models and data on the platform and perform the computations.

Next, the platform should offer **data-as-a-service**, implying that stakeholders should have access to common data sets related to the Justice and Home Affairs domain. They can explore which data exists and run their custom models and applications using this data. This is closely related to the creation of a data space, which is explained under Section 4.2.2.2.

Finally, the platform should also offer **software-as-a-service**, implying that stakeholders should be able to re-use models and applications that have been developed by others (vendors or other stakeholders). The stakeholders should either be able to use their own data sources (upload data) or re-use existing data. The data specific to the application (e.g. trained models for chatbots) should be included in the SaaS.

eu-LISA remarked that the platform should be accessible to both technical and business profiles. Therefore, a visual interface should be put in place that allows to build and run models using drag-and-drop technologies instead of by coding only. The platform should encompass a **sandbox environment** and a **testing environment** with a potentially separate link to analyse the **data space**.

4.1.1.3 Algorithms and processes (business layer)

The algorithms and processes form the business layer of new AI initiatives. The CoE should offer this in a '**store**' where users can see **reusable components**. This can be similar to the AI4EU experiments marketplace, where users can publish their models along with a short description. Other users can then access these models and either download them or deploy them on the CoE platform, where they can be adapted to the specific user's needs before running. The code of these models can also be shared, especially if **open-source technology** is used.

Alternatively, the store may also contain **licensed software** sold by specialised vendors. For example, if agreed with the vendor, a chatbot development area could be set-up where users can build their own chatbots to explore this technology. By sharing licenses, the costs for the Member States are greatly reduced. This also offers benefits for the vendors since their technology might be chosen for production implementations.

4.1.1.4 Analytics

Analytics in the context of this CoE serves two purposes: firstly, it allows to analyse the data that is available on the CoE platform, and secondly, it allows to measure the performance of the AI models. The platform should propose standard **performance metrics** and **visualisations**, such as the accuracy, recall, precision, Receiver Operating Characteristic (ROC) curve, etc. This allows non-technical users to assess which model works best.

Particular analytical methods can be applied in the context of **trustworthy AI**. Complex AI models come at the cost of a lack of transparency. To understand the 'decision-making' of the models, additional techniques were developed to **explain the importance of variables** on the output of the model. This can be done for individual predictions, using Local Interpretable Model-agnostic Explanations (LIME), or for the global predictions. The latter can be done through dedicated techniques per model, or in general by the Shapley Additive Explanations (SHAP) method. These methods, combined with the aforementioned visualisations, can also be used to identify bias of the models.

4.1.1.5 Data provision

The aforementioned layers require data, since this is a central aspect of every AI application. Predefined data blocks can be set-up, such as a **data mart** with structured fact and dimension tables, or a **data lake** for

unstructured data. The metadata can be stored in a **data catalogue**. Depending on some applications, the data from different sources can be combined in **views**.

It should also be possible for users to upload their proper data sets, so that these can be processed by the AI models.

4.1.1.6 Data sources and integration

Evidently, the provisioned data should come from data sources. For the purpose of this CoE, the data that is shared from **potentially sensitive data sources** (IT systems managed by eu-LISA, Member State systems and Europol Information System) should be **anonymised**. A limited set of this data can be provisioned to the CoE platform. In addition, custom documents and Excel files can be uploaded. Finally, the data sources should likely also involve referential data, such as information on countries.

The data can be processed from the sources to the data provision layer by means of an Extract Transform Load (**ETL**) or by **streaming** live data.

4.1.2 Production environments

For the production use cases different environments might be required. In contrast to the development environment, the access to the environment should be restricted. The services, business layer, analytics and data provisioning all depend on the use case. For example, for the chatbot, a dedicated report has been written on the target architecture (see D2.01). This should also be done for other initiatives that go into production.

The data source for these environments will largely overlap with the data source layer of the development environment. However, the production applications should have access to the full data set and most likely require the original data (i.e. not anonymised).

4.2 Platform requirements

Since the production applications yield specific requirements (see for example D2.01 for the chatbot technical requirements), this section focuses on the requirements for the development platform only. The AI4EU Experiments Platform is a platform that "facilitates the creation of human-centred AI solutions, building modular structures and using hybrid AI technologies", funded by the H2020 initiative.[13] As the establishment of this platform yields valuable lessons learned for the CoE platform, its technical specifications document[14] is used as an example in the following subsections.

4.2.1 Presentation layer

The main interface should consist of a **web page**, including **authentication** methods. In the context of AI4EU, the web page is developed in Drupal, an open-source web content management system, which proved to be more flexible than existing community platform technologies. The authentication can be provided through an identity server, an open source identity and account management solution.

The interface should also include a **store**. The AI4EU study remarks that the only solution that allows for the orchestration of different AI resources with the possibility to export to on-premises environments is the Acumos Assets Repository & Design Studio. The Acumos project is an entry point for different types of other open-source components. Its Assets Repository manages the assets (in this case the AI models) while its Design

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[13] https://www.ai4europe.eu/

[14] AI4EU Deliverable 2.1: Platform Architecture, Implementation and day-to-day Operations, downloaded from:
https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5d45546a9&appId=PPGMS

Studio is "used to develop visual programming code for AI applications". The store can include both custom models and licensed software or analytics tools.

4.2.2 Orchestration and infrastructure layer

To allow users to run experiments, the interface should be connected to **computing resources** with high availability, scalability, monitoring, etc. This can be ensured by orchestrating with a typical Docker and Kubernetes set-up. The underlying infrastructure layer covers the CPUs, GPUs RAM, storage and networks.

In the context of AI4EU, TeraLab is leveraged for the provisioning of virtual compute environments and workspaces in a highly customisable way (type of virtual machines, operating system, firewall rules etc.) TeraLab is an initiative of the Institute Mines-Télécom (IMT), a French public academic institution.

4.2.3 Data layer

The data related to the CoE platform can be divided into data that is **required for the functioning of the platform** on the one hand and the availability of **data-as-a-service** on the other hand. For the first, the AI4EU project foresees 500 GB in total for the document repositories, model repositories and software images (Docker). The second category is not applicable to the AI4EU project. The data-as-a-service required capacity depends on which data will be available and how large the samples will be. As a key requirement, it should be able to increase the capacity when needed.

4.2.4 Transversal requirements

The transversal requirements include security, architecture guidelines, data management principles and interoperability. The **security** and **architecture guidelines** can follow the principles already put forward by eu-LISA. These principles mainly come into play when initiatives are pursued for production. As explained in Sections 4.1 and 4.2, the access should be managed (i.e. restricted) for both environments. This can be achieved through **Identity and Access Management** (IAM).

The **data governance and management** should be applied to the data source and integration layer and will consequently be common for the development environment and production environments. Finally, the **interoperability** should also be guaranteed in these layers. The interoperability for the development environment will be limited to sourcing of data coming from other IT systems. For the production applications, a bi-directional interaction might be required between the application and other data sources. This should be determined after a cost-benefit and feasibility study.

There are additional requirements, not yet discussed in the service model, that are by default included when managing data platforms. The platform should be **monitored and audited**, to ensure that the platform is aligned with the data governance and business goals. This also includes follow-up of the resource consumption and costs associated to the platform (e.g. for software licenses).

Finally, there should be a support channel for the platform. Through a **service management** tool (e.g. Jira Service Desk, ServiceNow), users should be able to report bugs or receive support.

4.3 Implementation of the platform

The previous section explains the requirements and components of the platform(s). This section focuses on the implementation of the platform(s).

4.3.1 Cloud vs. on-premise

The major cloud vendors (Amazon, Microsoft, Google, IBM, SAP …) typically offer many of the components described above. To maintain data ownership, ensure the data resides in the EU and support the European ecosystem, some actions can be taken that deviate from the fully public cloud approach.

- Design of a **hybrid cloud solution**: the aforementioned vendors allow for the establishment of a hybrid solution, which combines on-premises data centres with public cloud technology.
- Design of a **(virtual) private cloud solution**: the full platform can also be hosted privately, but with incorporation of cloud services and capabilities. For example, Azure Stack offers a portfolio of these services for private hosting.
- Opt for **SAP** as a vendor: German and hence EU-based SAP also offer a cloud platform (SCP). Discussions with SAP should be held to determine whether their solution meets the requirements.

In the cloud context, it is important to mention that **DG DIGIT** has recently developed an EC corporate Data Platform (ECDP), offering a stack of big data and analytics tools to the DGs and EC Agencies. It includes three components: a *Data Science Lab* (DSL) as an experimental environment for data scientists, *Self-Service Analytics* (SSA) for both technical and non-technical users to perform analytics and finally a *Data-as-a-Service* (DaaS) to support the access to data. The ECDP is supported by AWS and (more recently) Azure technology.

On the other hand, a fully on-premise with open-source technology can also be designed. This is shown in the **AI4EU** case study. The technologies that can be leveraged are referenced in the previous section. This approach will typically require more development efforts, but ensures full ownership over the developed solution.

4.3.2 Approach

eu-LISA indicated that the development of the platform should follow a phased approach. At first, the requirements for the chatbot and other initiatives that are already under development will be collected. This is combined with the requirements for the development environment, explained in this document.

The requirements likely yield both commonalities and differences. The objective is to design a common architecture in a second step that can meet the various sets of requirements. Later on, when new initiatives are explored, they should fit within the existing architecture as much as possible. This is visualised in Figure 12.
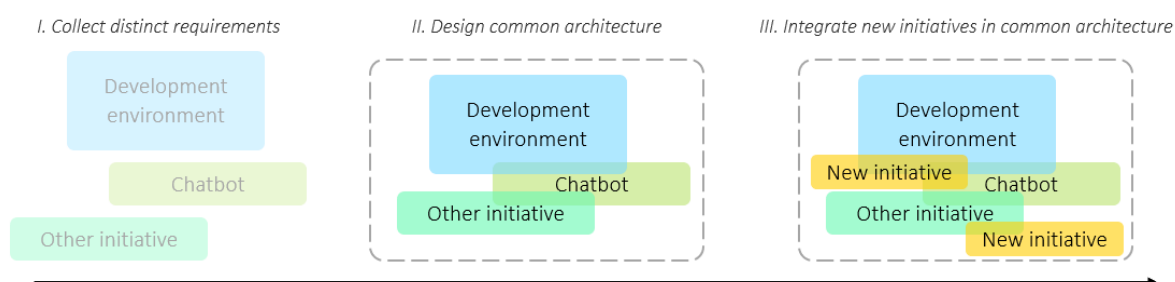

Figure 12 – Phased approach for development of platform

4.3.3 Other initiatives

Two other initiatives should be mentioned in the context of the CoE AI platform: the creation of a sandbox by eu-LISA for the exploration of new technologies, and the ambition to create an EU data space for the Justice and Home Affairs domain.

4.3.3.1 eu-LISA sandbox beyond AI

AI technologies are typically characterised by large volumes of data, considerable computing power and rapidly evolving state-of-the-art techniques. If a sandbox environment can be designed for AI technologies, it should

also be possible to explore non-AI technologies using the same platform. This can accommodate eu-LISA's ambition for other future innovations.

4.3.3.2   EU data space for the Justice and Home Affairs domain

The European Strategy for Data[15], published in 2020, envisages the creation of European Data Spaces, bound to different domains such as health, agriculture, mobility, etc. The objective is to enable the flow of data between public administrations, companies and individual users, adhering to the EU rules and values. This CoE platform can serve as an accelerator or enabler for such a space, given its data-as-a-service capability.

In its roadmap, eu-LISA has put forward this data space, with the objective to "serve the interests of all stakeholders in charge of public or internal security in Europe, including the national law enforcement authorities and authorities in charge of border security as well as the relevant European JHA Agencies, such as Europol, Frontex, and eu-LISA. It aims to lay the economic, organisational and technical foundations of a federated data infrastructure for innovation in the area of security, as a hybrid model including a reference architecture, data quality standards, data governance, data protection safeguards and privacy, with interoperable datasets." These objectives are very much aligned with the CoE.

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[15] https://ec.europa.eu/info/sites/default/files/communication-european-strategy-data-19feb2020_en.pdf

5 Conclusion and next steps

The expected raise in AI initiatives in the area of freedom, security and justice in the near future is underlying the need for an overarching organisation to coordinate this exercise. An AI strategy study conducted in 2020[16] proposed a way forward through the creation of an AI Centre of Excellence (CoE). As a result, this report provides an initial assessment on the creation of the AI CoE, including the operating model, scope and responsibilities, within the VisaChat project that will also serve as a baseline for the agency taking on the hosting of the CoE.

The implementation of the AI CoE should make use of a transversal management approach. It should be a joint effort between eu-LISA, the European Commission and the Member States, but also including other Agencies, DGs and additional relevant stakeholders. This transversal management approach fits into the eu-LISA's request to match the CoE's organisational model to its existing structure.

The various focus areas of the CoE have been be translated into the AI services that the CoE will tangibly provide. These are consolidated into a service model that categorises all services a mature CoE would include. Then, the target operating model of the AI CoE is defined. This model depicts the different possible interactions between the different services that are needed for the CoE to be able to perform its tasks. In parallel, all service categories are mapped to typical roles.

Growing the AI CoE towards its end-stage should be done through a phased approach, allowing for more granularity and overlap between the ten activities identified in the AI roadmap. In practical terms, this means starting small and gradually increasing the responsibility of the CoE over time. In the end, the CoE should serve as an umbrella for all AI-related activities, also for those launched before the set-up of the CoE. The aim of the CoE is not necessarily to be an active driver of those projects but mainly coordinate them, ensure the right expertise and tools, and share knowledge afterwards.

The CoE's core services show that the CoE should offer a platform for AI solution development and maintenance. A set of requirements need to be taken into consideration for the creation of the CoE platform. Production applications yield specific requirements, as described more in-depth for the chatbot context deliverable (D2.01). eu-LISA indicated that the development of the platform should follow a phased approach. At first, the requirements for the chatbot and other initiatives that are already under development will be collected. This is combined with the requirements for the development environment, explained in this document. The platform can then grow over time, in line with the CoE services in general.

In a next step, eu-LISA should start an internal exercise on the development of the AI CoE as well as involve the relevant identified external stakeholders. As the service model is being implemented, the external stakeholders can be informed of this to demonstrate the value of the CoE. The objective should be to have the main stakeholders on board during Phase 1 and 2 of the phased approach. A decision on the technical platform should also be made in the initial phases, although its roll-out is only foreseen for Phase 3.

Deliverable D4.01 discusses the operating model of the visa chatbot. There will be a shared responsibility model, with technical ownership by eu-LISA and a mixed business ownership by DG HOME and/or the Member States. The details are yet to be refined, but there will be close linkages between this exercise and the CoE presented in this document. Indeed, the chatbot will be one of the first use cases that is brought under the umbrella of the CoE.

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[16] European Commission, Directorate-General for Migration and Home Affairs, Opportunities and challenges for the use of artificial intelligence in border control, migration and security . Volume 1, Main report, Publications Office, 2020, https://data.europa.eu/doi/10.2837/923610