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REFERENCE IMPLEMENTATION RELEASE 0.5 DESCRIPTION AND SYSTEM TEST SUMMARY

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Author(s) & contributors	
Lead beneficiary: Finnish transport and comm	Finnish Transport and Communication Agency Traficom (FI)
Main Contributor(s):	Lasse Nykänen (Traficom/Vediafi), Coralie Facon (IN Groupe), Teemu Heikura (Traficom/Fintraffic), Christophe Danna (IN Groupe), Mohamed Oulmahdi (IN Groupe)

Contributor(s) (contributing or alphabetical order)	Victor Dolcemascolo (French Ministry of Transport), Enriko Laanemäe (Estonian Ministry of Climate), Heiti Mering (Digilogistika keskus), Benedikt Simon (BALM), Lukas Stepanek (Softcom), Osvaldo Pires Manso (Instituto da Mobilidade e dos Transportes, I.P.) Luca Lucietti (FIT Consulting)
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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations	
Acronym/Abbreviation	Meaning
APP	Authority Access Point
API	Application Programming Interface
ANPR	Automated Number Plate Recognition
CA	Competent Authority
CEF	Connecting Europe Facility
CLI	Command-Line Interface
CMR	Convention des Merchandises par Route (Convention on the Contract for the International Carriage of Goods by Road)
DNS	Domain Name System (including a Resolver)
DTLF	Digital Trade and Transport Forum
eAWB	e-AWB (electronic Air Waybill) is the electronic equivalent of the traditional paper AWB. e-AWB is the contract of carriage between the “Shipper” and the “Carrier”. Shipments can be differentiated by special handling codes (SHC)
eSW	An Electronic Sea Waybill is a transport contract (contract of carriage) - the same as a Bill of Lading. A Sea Waybill, however, is not needed for cargo delivery and is only issued as a cargo receipt.
eBoL	An e-Bill of Lading, or electronic bill of lading, is a digital version of the traditional paper bill of lading, which is a crucial document in international trade and shipping. It serves as a receipt for the goods being shipped and as a title of cargo ownership.
eCMR	Electronic freight documents are used in international road transportation, which paper version is known as CMR. It provides information on the consignor, place of pick-up and consignee, place of delivery, the goods, and all related information about the transport.

eCIM	In rail transportation eCIM means an electronic version of international railroad waybill to document the arrangements made between the carrier and sender. CIM is short for 'Contrat de Transport International ferroviaire des Marchandises'
eSMGS	The carriage of freight between Europe and Asia is governed by two different legal regimes: the CIM Uniform Rules and the SMGS Agreement. The SMGS consignment note, a variant of the railway waybill, is uniquely designed to cater to the requirements of rail freight across multiple geographical regions. It's particularly crucial for freight transport between China, Europe, Mongolia, and Central Asia.
eFTI	Electronic Freight Transportation Information legislation package and freight data exchange network in EU.
eFTI Gate	National or Common eFTI gateway/access point
eFTI platform	Private gateway/access point for Economic operators to connect with eFTI Gate
EU	European Union
GUI	Graphical User Interface
HTTPS	Hyper Text Transport Protocol Secure
ICT	Information and Communication Technology
IMSOC	Integrated Management System for Official Controls
IP	Internet Protocol
JSON	JavaScript Object Notation
KPI	Key Performance Indicator
Mock up	Simplified real example of product/solution, which can be used to demonstrations.
MS	Member State of the EU
PKCS	Public Key Cryptography Standard
PKI	Public Key Infrastructure
PoC	Proof of Concept
RDF	Resource Description Framework
REST	REpresentational State Transfer
UIL	Unique electronic Identification Link

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EXECUTIVE SUMMARY

The eFTI4EU project is a collaboration project between Member States and key stakeholders to build a joint reference implementation model of eFTI authority system, i.e. eFTI Gate, Authority Access Point, Competent Authority (CA) applications and necessary interfaces. This deliverable works as midterm report for work package 2. Aim of the deliverable is to focus and introduce one of the main outcomes of the project: reference implementation release 0.5.

The reference implementation focuses on the authority systems of the eFTI data exchange system. The reference implementation is developed in collaboration with project beneficiaries and it utilizes the work done in other work packages. With this deliverable the project shares first public release of the reference implementation, i.e. release 0.5. The deliverable gives general introduction about the reference implementation, and it includes links and guidance for further technical usage of the reference implementation. In this deliverable the focus is on release 0.5 and later on in the end of 2025 the project will do similar documentation for the release 0.9, which will be the final outcome of the eFTI4EU project.

In addition to the documentation of the reference implementation, the deliverable includes updates of the eFTI4EU project pilot descriptions. The deliverable offers opportunity for project beneficiaries to update their planned pilots and the execution plans of the pilots that were originally reported in the project deliverable 2.1. The deliverable 2.2 covers also first learnings and mid-term results and findings from those pilots, which have been active during the first half of the project, i.e. 2023-H2/2024.

1. INTRODUCTION

The reference implementation is one of the main outcomes of the eFTI4EU project. Aim of the reference implementation is to give technical foundation for all EU Member States, which they can use for their eFTI implementation. The special focus is on authority systems and hence eFTI platform aspects are not included to the reference implementation. The reference implementation will be published for all in two releases: release 0.5 and 0.9, from where release 0.5 is described in this deliverable. The aim of the deliverable is to give common understanding about the reference implementation and to guide to more technical documentation. Hence, the deliverable includes links to the technical documentation and open-source code, from where users can utilize shared results. The deliverable works as mid-term report of the WP2 (National and Corridor Pilots).

This deliverable supplement the work done in the work package 1 (Horizontal Alignment), where eFTI system requirements, use case and architecture work is done. In addition, between the WP1 and WP2 the project team has made a lot of eFTI data set and interfaces related work, which findings and outcomes are absorbed to eFTI requirements, use cases and architecture work (i.e. WP1 related work) and to the reference implementation development. Part of this work is documented in the following deliverables: D1.2, D1.4 and D1.5 (see list below). These deliverables focus mostly on eFTI system in general, while this deliverable 2.2 describes one implementation of eFTI authority solution, i.e. the reference implementation.

- The deliverable 1.2 includes eFTI system overview and interface specification
- The deliverable 1.4 supplements the D1.2 work and also updates the content from those sections where needed, based on latest versions of the EU IA and DAs (N.B. the first IA and the 2 DAs entered into force on 09/01/2025). In addition, D1.4 will include use case descriptions and BPMN (Business Process Modelling Notation) illustration with explanations about the eFTI system.
- The deliverable 1.5 covers description of the reference implementation development plan and descriptions of reference implementation release versions.

In this deliverable, beneficiaries have also had an opportunity to update their pilot descriptions and report first outcomes and findings from the pilots. Most of the beneficiaries have used this opportunity and made some changes to their pilot plans. All beneficiaries are free to highlight those results and findings they see valuable and later on in D2.3 all results will be consolidated and analysed together.

The structure of this deliverable is planned so that:

- Chapter 2 introduces the reference implementation and its purpose. The chapter covers general system description and technical guidance for release 0.5 publication.
- Chapter 3 introduces updated pilot plans and mid-term results of the pilots.
- Chapter 4 summarises the eFTI4EU testplan and first results from the project first testfest.
- Chapter 5 describes the project KPI mid-term status.

- Chapter 6 includes conclusion of the deliverable and recommendations from the project team how to continue piloting, development and testing of eFTI system.

2. REFERENCE IMPLEMENTATION

This chapter outlines the key components of the reference implementation. The first section (2.1) will detail the co-construction approach within the consortium and the objectives of this reference implementation. Section 2.1 gives background information for the reader about the reference implementation.

The second section (2.2) provides an overview of the system implemented in this reference implementation. Finally, the third section discusses the release 0.5, addressing both functional and technical aspects. Section 2.3 includes also links to the technical documentation of release 0.5, from where technical people can find more technical information, guidance and actual code for the reference implementation.

2.1. PURPOSE AND GOAL OF THE REFERENCE IMPLEMENTATION

The reference implementation offers several benefits:

1. **Standardization:** It provides a clear and standardized model for member states to follow, ensuring consistency across implementations.
2. **Guidance:** Acts as a guide for members states and their technical teams, showcasing best practices and design patterns.
3. **Testing and validation:** Serves as a baseline for testing, helping to identify bugs and performance issues.
4. **Interoperability:** Facilitates compatibility between different systems by establishing a common framework.
5. **Documentation:** It includes detailed documentation, which allows member states to understand and implement the eFTI Gate more quickly.
6. **Community work:** Building the reference implementation encourages contributions and feedback from all partners, leading to improvements and refinements to the implementation.
7. **Cost reduction:** by reusing this reference implementation, member states will be able to benefit from this base without carrying out these important and costly developments themselves

Standardization

Standardizing developments is beneficial because it ensures consistency, quality, and interoperability across systems and processes. By adhering to established standards, Member States and the reference implementation users can streamline development efforts, reduce errors, and improve collaboration among teams.

Standardization fosters better communication and understanding, as all stakeholders are aligned on processes and expectations. It also simplifies maintenance and integration, making it easier to update or replace components without disrupting the entire system. Furthermore, standardized practices can enhance compliance with IT benchmarks, ultimately leading to increased efficiency and reduced costs.

Guidance

State-of-the-art IT developments are crucial because they drive innovation, efficiency, and competitive advantage across industries.

By integrating the latest technologies, the developments facilitate better data management and analysis. Furthermore, adopting cutting-edge solutions promotes sustainability and scalability, allowing to adapt to evolving demands and maintain relevance in a rapidly changing digital landscape. Ultimately, embracing state-of-the-art IT fosters a culture of continuous improvement.

Testing and validation

The eFTI4EU project has committed to conducting a comprehensive series of tests and pilot aimed at validating compliance with all specified requirements in the regulation. These efforts will ensure that every aspect of the project meets the necessary standards. By systematically evaluating the reference implementation through these tests, the project aims to provide Member States with clear evidence of its completeness and adherence to regulation. This thorough validation process will not only enhance confidence in the implementation but also facilitate smoother integration and acceptance across Member States participating the project or not.

Interoperability

The eFTI is designed based on a distributed system architecture between each Member State. Hence international interoperability is vital for eFTI. The eFTI reference implementation is developed so that it ensures interoperability and enables interoperability testing for Member States.

Shared and co-developed the reference implementation enhances the interoperability of a distributed ICT system in several keyways:

- **Standardization:** It provides a standardized model or framework that outlines how components should interact, which ensures that different systems can communicate effectively.
- **Consistent Behaviour:** By following a reference implementation, different systems can achieve consistent Behaviour and performance with limitations set by regulation. This predictability reduces compatibility issues that may arise when integrating diverse systems.
- **Encourages Adoption:** When a reference implementation demonstrates successful interoperability, it encourages wider adoption of the defined standards, leading to a more interconnected ecosystem.

Overall, the eFTI reference implementation acts as a blueprint that promotes coherence among various components in the distributed system, facilitating easier communication and collaboration. **However, the reference implementation is not production ready service and each Member**

State needs to adapt it to the national system environment and make necessary integrations to local competent authorities and other local ICT systems.

Documentation

The reference implementation includes a comprehensive suite of documentation that covers various aspects such as testing procedures, installation guidelines, deployment protocols, and detailed specifications. These resources are designed to assist Member States in fully understanding the eFTI's objectives and functionalities. By providing clear and accessible information, the documentation will guide Member States in ensuring compliance with regulation, thereby facilitating smoother implementation processes. This support aims to enhance transparency and promote a consistent approach to adopting the reference implementation.

If Member State considers using the reference implementation as basis of national eFTI implementation it is recommend to study also eFTI4EU workpackage1 deliverables, which are available at project website. In addition, it is recommended to contact eFTI4EU project team to arrange introduction meeting, where the eFTI4EU project team can give technical guidance for further eFTI Gate implementation work.

Community work

By executing the reference implementation, the eFTI4EU consortium will enhance and refine the eFTI Gate, addressing any existing issues and incorporating valuable feedback. This process will involve systematic testing and iteration, ensuring that the eFTI Gate meets the standards of performance and reliability. This mature implementation will not only streamline operations but also facilitate better compliance with regulatory requirements, ultimately supporting smoother information exchange and enhanced collaboration among Member States.

Cost reduction

The provision of this reference implementation enables Member States to significantly lower the costs associated with implementing the eFTI regulation. Cost reduction was one of the main drivers in addition to EU wide interoperability to organise co-development for reference implementation. By leveraging a well-developed and thoroughly tested foundation, they can achieve several cost-saving advantages:

- **Utilization of Existing Developments:** Member States will have access to a substantial base of pre-existing developments that can be adapted to align with local regulations. This is particularly beneficial for customizing control applications to meet specific regional needs, thereby avoiding the expenses associated with developing solutions from scratch.
- **Accelerated Deployment Setup:** With comprehensive associated documentation, Member States can quickly establish an environment to deploy the eFTI Gate. This documentation provides clear guidance on installation, configuration, and operational procedures, which streamlines the setup process and reduces the time and resources required for deployment.

By capitalizing on these advantages, Member States can implement the regulation more efficiently, ensuring compliance while minimizing financial burdens. By using the reference implementation as a

basis, the Member State can achieve testing and piloting capabilities in a few months, which is not possible if the Member State starts from the beginning.

2.2. SYSTEM DESCRIPTION

The reference implementation encompasses the functionalities mandated by the eFTI regulation, serving as a solid foundation for Member States to develop their national eFTI Gate implementations. It is a generic solution that does not include additional functionalities required by only one or two Member States, and it needs to be adapted and modified according to each Member State's regulations. These modifications are often related to non-functional requirements rather than functional ones.

The architecture of the reference implementation is designed to be as versatile as possible, allowing each Member State to choose its platform and environment for running the reference implementation, e.g. will the implementation be adapted to the local or cloud environment. The system's technological choices are standard solutions in software development and utilize open-source libraries.

The reference implementation is open-source software licensed under Apache 2.0, making it easy to use and further develop according to each Member State's needs.

For more detailed documentation on the reference implementation, please visit the eFTI4EU GitHub repository alongside the reference implementation code, available here: <https://github.com/EFTI4EU/reference-implementation/releases>

2.3. RELEASE 0.5

The release 0.5 is the first public version of the reference implementation which can be used as baseline for MS Gate implementation. Version contains:

- eDelivery Gate to Gate (PoC)
- Search + Identifiers interfaces
- Application log (initial)
- Registry of identifiers
- Interface to AAP
- CA application mockup
- Technical documentation
- Open source code

All eFTI4EU beneficiaries can contribute for the reference implementation, but it is mandatory then to follow the latest version of regulation. (N.b. If regulation and technical implementation specification are in conflict, regulation is stronger). However, if errors or bugs are noticed in the reference implementation, those must be reported immediately to eFTI4EU WP2 leads Traficom and IN Groupe.

Quality of the reference implementation depends on testing done by project parties. First level testing is done for the reference implementation, but further testing is planned for 2025. The reference

implementation will not fulfil Member State production quality requirements, because all nations have their own requirements and adaptations. Implementation quality is sufficient for piloting purposes and taken as baseline of national implementation.

Functionalities

The reference implementation will cover main functionalities of eFTI Gate. Most important functionalities in the reference implementation and also in eFTI context are Gate to Gate interface and eDelivery profile, Registry of identifiers and data model. These are in functional level mandatory to be same on each MS and that is why focus has been on those functionalities.

The reference implementation will cover functionalities and use cases:

- Platform upload eFTI data to eFTI Gate
 - o The reference implementation has interfaces for platform side. This is coming after 0.5 version. The reference implementation will also have mockup of platform where to fulfil eFTI data.
- Authority search eFTI data
 - o Authority search by UIL
 - Possible to perform using interface or in later version mock up AAP application
 - o Authority search by Identifier
 - Possible to perform using interface or in later version mock up AAP application
- Authority receives eFTI data from Gate
- Gate search eFTI data from another Gate
- Gate request eFTI data from Platform
- Gate generates logs of requests

Technical documentation

The reference implementation source code is published in eFTI4EU Github space under Apache 2.0 license. Available here: <https://github.com/EFTI4EU/reference-implementation/releases>

Content of the repository

The repository includes mainly the source code of the gate, but not only. We can find different helpful utilities and components:

- Mockups: to run and test the gate, a connection to external systems is required (i.e. platforms and other gates). For the other gates, the reference implementation uses its own gate that deploys in specific way to serve as an external one. For the platform, a dedicated mockup is developed.
- Local development environment: this is the most important utility. It offers a full environment to deploy, test and play with the gate as well as Domibus for eDelivery communication. The format is standard docker-compose files which allow to easily run the gate and Domibus in local development machine. This is the entry point to start working on the gate

- Postman collection: a set of requests examples representing the different use cases of the gate including the three interfaces (gate, platform and authority). The collections include also the required requests for authentication.
- Authority interface swagger: a description of the gate interface for competent authorities. This interface is in RESTful and is described in open api standard.
- Data model schemas: a description of datasets and registry of identifiers in xsd format.

Content of the Gate

The Gate is mainly developed using SpringBoot, a widely used Java framework. It is split into different components which can be deployed either as independent microservices or integrated as libraries. In addition, several other external components are required to run the gate. The following diagram (Figure 1) illustrates the most important ones.

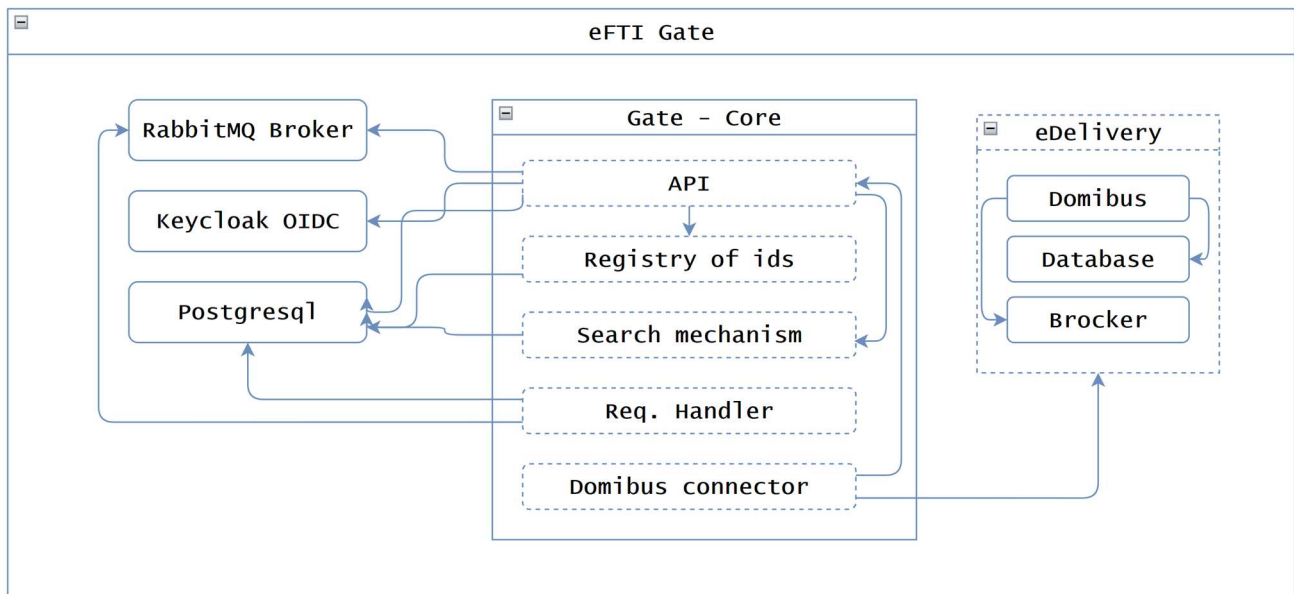


Figure 1. eFTI Gate system diagram

- Gate core: this is the main component including the gate interfaces and workflows logic. It is split into a few sub-components:
 - o API: defines the access points of the gate, including gates, platforms and authority interfaces. This component is the only entry point of the gate.
 - o Registry of identifiers: the identifiers themselves are stored in the database. The registry of identifiers manages access to these identifiers.
 - o Search mechanism: handles both local search in the registry and external search by forwarding the request to the other gates.
 - o Request handler: manage the asynchronous request which are first pushed into the broker queues by the API components.
 - o Domibus connector: manage the communication between the gate and Domibus.

- RabbitMQ broker: offers message queue tools to manage the asynchronous communication between the CA and the gate. Requests from the CA are stored in different queues by the API component, and then pulled by the request handler to process them.
- Keycloak: authentication server used as representation of authorities authentication systems. This component is used in a mockup way and should not be used as it is in production. It is based on OIDC (Open ID Connect) protocol.
- Postgresql: a database system mainly used to store the identifier information coming from platforms. It is also used to manage different request status and establish coordination between gate components in parallel to RabbitMQ.
- eDelivery (AS4): communication protocol between the gates and the platforms. It is provided by three components:
 - o Domibus: implements the logic of eDelivery/AS4 protocol
 - o MariaDB: database system used by Domibus mainly to manage sent and received messages
 - o ActiveMQ: a message broker used by Domibus to coordinate its different instances when it is deployed in a cluster

3. PILOTS

The eFTI4EU pilots' descriptions were first time documented and published in D2.1 and now this deliverable D2.2 offers on opportunity for beneficiaries to update, pivot, delete or add their pilots. Reason for such an iteration work is needed, since beneficiaries and member states are on different degree of readiness and the eFTI regulation has faced some delays. However, since the eFTI4EU project focuses on authority systems which were first described by Commission, the main functionalities and features of eFTI Gates and other authority requirements are well known already (N.B. the first IA and DAs entered into force on 09/01/2025). Additional documentation is expected at the summer 2025.

During the first documentation round of pilot descriptions all together 20 pilots were described. From those 8 pilots were international pilots. During this second pilot description round 17 pilots (N.B Italian pilot includes two separated use cases, but those are counted as a one pilot) were described and 7 are international pilots. Lithuanian pilot was not updated during this reporting period, but updates are expected during the spring 2025. Hence, in total 18 pilots are included in eFTI4EU pilot plans. During the December 2024 12 pilots were active and 2 pilots were fully accomplished. Below in figure 2 general overview of pilot schedule is presented.

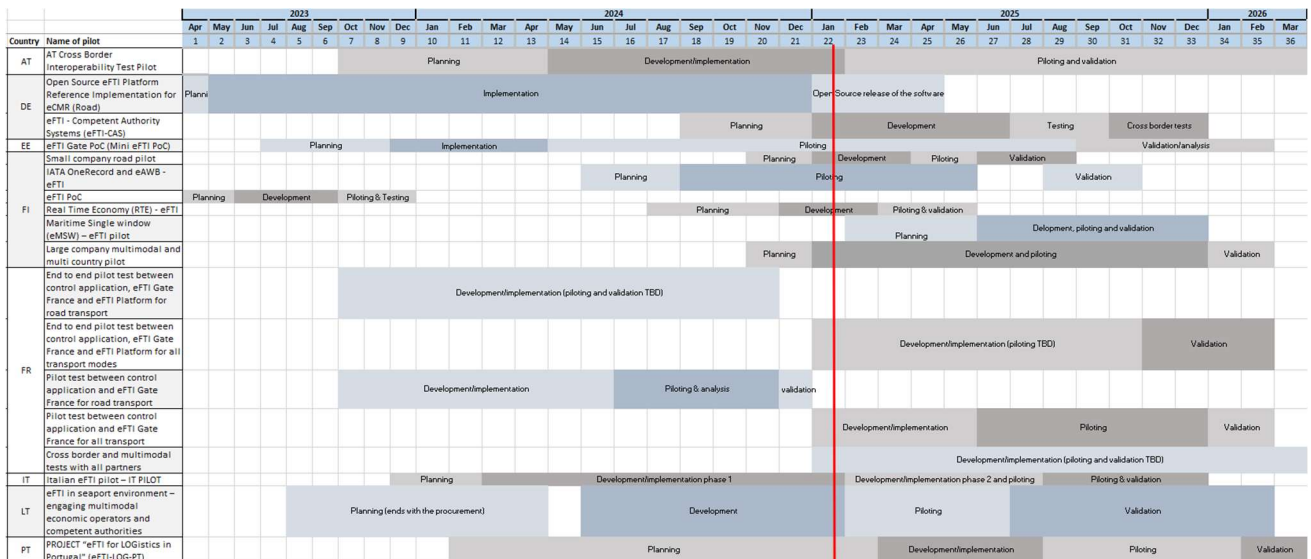


Figure 2. Pilot schedule. (For bigger version see annex 1.)

Below in the chapter 3.1 all pilot descriptions are documented. Annex 2 includes summary table of all pilot components. During the mid-term reporting no new pilots were added, but most of the beneficiaries made updates to their original pilot plans. Only France and Lithuania have not made any changes to their pilot descriptions. Finland was the only beneficiary who deleted one pilot, which was originally planned for dangerous goods, the reason for this decision was that there has been delays in eFTI regulation. In addition, Belgium pilots have not been documented in eFTI4EU documentation anymore, since Belgium withdrawn from the project during the 2024. This change has some impact

also to the project KPIs that were reported in deliverable 2.1. Status update of KPIs is explained in chapter 5.

In the chapter 3.2 all the national pilots are summarised, and the first results are described. The chapter 3.2 also includes recommendations from the national pilots. The chapter 3.3 focuses on cross-border pilots and highlights first results and recommendations of international pilots.

3.1. PILOT DESCRIPTIONS

Austria

Pilot name

AT Cross Border Interoperability Test Pilot (ATCBP)

Description of the pilot

The ATCBP aims at establishing a robust eFTI framework for interoperability in data exchange among the pilot participants, which will be formed out of the eFT4EU MS participants (expected: Italy).

Purpose and objectives of the pilot

The purpose of the pilot is to address the challenges associated with implementing the eFTI exchange environment among the pilot participants by implementing a standardized, secure and interoperable IT infrastructure derived from legal frameworks, guidelines and national efforts. This initiative seeks to eliminate barriers to collaboration, streamline cross-border operations and enhance the overall effectiveness of the systems put in place to enable the desired exchange. Particularly, the pilot serves the following purposes and objectives:

- Development, Setup, Configuration and Testing of national eFTI components:
 - Development, Setup and test of eFTI gate functionalities including configuration of necessary connectivity functionalities.
 - Development, Setup and test of eFTI platform including configuration of necessary connectivity functionalities.
 - Setup and test a database serving as registry of identifiers.
 - Setup and test the search mechanism and the corresponding search functionalities.
 - Setup, test and reference implementation of AAP/IAA for CA
 - Development and testing of user app/CA UI including frontend/backend and UIL (URL/UUID) management.
 - Setup and test a logging and error handling system.
- Further Testing and Validation:
 - Test systems interoperability by exchanging data with necessary components and ensuring compatibility of data formats, protocols and versions.
 - Validate implementation guidelines and rules of defined EC documents (e.g. IA, TIS)

- Define desired functional metrics and align with KPIs (see “2.4.1.1. eFTI4EU technical KPIs”)
- Test encryption mechanisms, authentication processes and access controls.
- Data integrity checks to verify that data is accurately transmitted and received without loss or corruption.
- Search for identifiers test
- Secure Data Exchange:
 - Compliance with European and national data protection regulations (GDPR) and standards.
 - Implementation of certificate exchange and validation process.
 - Implementing a PKI for testing purposes (OpenSSL?) (align pilot expectations)
- User Training and Support:
 - Support executing stakeholders with documentation and hands-on UI/UX demonstration.
 - Gather insights and feedback from executing CAO’s and important stakeholders in real-world scenarios (on-site) to evaluate the systems usability and assess user satisfaction.
- Stakeholder-Management and Communication:
 - Define participating stakeholders for the pilot including roles and responsibilities.
 - Who is responsible for project management?
 - Who is responsible for the architecture?
 - Who is responsible for data and platforms?
 - Who is the eFTI gate provider?
 - Additional CAs and agencies?
 - ...
 - Define a contact list with relevant points of contact.
 - Set up mutual communication platform/basis.
 - Set up mutual defect-tracking tool.
 - Define time frame for feedback loops between pilot participants.
- Documentation and Dissemination:
 - Identify, document, validate and manage new functional and non-functional requirements as well as refine existing requirements documentation.
 - Define a form of dissemination of piloting results and key deliverables. (KPIs, Lists, Natural language descriptions, ...)
 - Define who is receiving piloting results and key deliverables (eFTI4EU, CINEA, CAs, ...)
 - Illustration of added values and benefits of the pilot for national and international dissemination
 - Provide eFTI4EU WP3 ready documentation and dissemination.
 - Cross check defined functional and non-functional metrics with test results and align with eFTI4EU defined KPIs.
 - Review system documentation to ensure it accurately reflects the implemented functionalities.

Main focus of the pilot

The main focus of the pilot is to carry out and test the lifecycle of implementing the mandatory components in order to be compliant with the European and national provisions and identify possible point of failures and bottlenecks as well as gaining experience to setup and run an eFTI environment in advance. Furthermore, the interoperability aspect is in focus of the pilot, as it is vital to the overall functionality at the core of eFTI's purpose and gives first results for the internal authority's procedures and recommendations and regulations. The results and insights gained through the pilot are expected to be invaluable in many aspects when it comes to set up and operate an eFTI environment.

Schedule of the pilot

Planning:	Q4 2023 – Q2 2024
Development/implementation:	Q2 2024 – Q1 2026
Piloting:	Q1 2025 – Q2 2026
Validation/analysis:	Q4 2025 – Q2 2026

Technical components of the pilot:

- Databases
- eFTI Gate
 - Gate2Gate communication component
 - Platform2Gate communication component
 - Registry of public key for eFTI Gate(s)
 - eFTI Platform Registry
- Certificate management functionalities
 - Registry of identifiers (service layer)
- Identifiers search component
- Identifiers sync component
 - eFTI data response forwarding (to user application)
- eFTI Platform (Dummy DB)
 - UUID creation, assigning and forwarding component
- Search Mechanism (incl. GUI/CLI)
- Registry of identifiers (Dummy DB)
- AAP
 - Database for user credentials/role concept (Authorisation registry)
 - Interface for connecting to Austrian IAA component.
- CA user app (rudimentary web application)
- Logging solution and error handling

Technologies/Tools used:

- Database: PostgreSQL
- Used data format: XML
- Gate2Gate communication: eFTI4EU reference implementation eDelivery (Domibus)
- Platform2Gate communication: eDelivery/REST API
- Frontend: Javascript/HTML/React
- Backend: Java/Node.js
- Logging: Greylog, Logstash, Winston (tbd)
- Defect-Tracking: JIRA
- Repository: Intern
- Deployment and CI/CD:
 - Azure
 - Docker

Transport modes covered (air, inland waterways/maritime, rail or road)

Road (2 possible corridors identified atm)

Pilot KPIs

Aim is to follow the projects technical KPIs reported in Deliverable 2.1 in the pilot planning. However, additionally extended KPIs are possible and under consideration. For example:

Data Accuracy

KPI: Percentage of accurate data exchanges

Data Exchange (Time)

KPI: Percentage of data exchanges completed within agreed timeframes.

Risk Mitigation

KPI-1: Number of identified and mitigated risks

KPI-2: Number of identified and mitigated issues.

Value of pilot

Overall desired benefits are:

- **Efficient Cross-Border Operations:** Facilitated and accelerated data exchange will lead to more efficient cross-border operations and collaboration.
- **Improved Decision-Making:** Timely and accurate information sharing will empower competent authorities and agencies to make informed decisions.
- **Enhanced Security and Compliance:** Robust security measures will protect sensitive data, ensuring compliance with data protection regulations.

Cost Reduction:

Streamlined processes and reduced redundancies will contribute to cost savings for member states.

Stakeholder specific values:

Value for eFTI4EU project: Contribution to reference architecture and implementation, information on cross border compatibility, general insights of possible point of failures and bottlenecks (risk mitigation), Build up and stabilize the eFTI exchange network.

Value for CAs: Insights of possible point of failures and bottlenecks (risk mitigation), Deriving of needed and important functionalities/features for real world usage, Early training and involving of important CA stakeholders.

Value for EOs: Possible reference architecture for an eFTI platform DB, Reference implementation for eFTI platform to eFTI gate (REST API), Overall insights of the eFTI exchange environment which can be provided to EO's after successful piloting.

Preparations and pre-work

Possible actions needed between pilot participants in advance:

- Align overall pilot expectations between participants (what is being tested and what not)
 - (Define further, e.g. remote checks y/n?; components stress test y/n?; ...) - ongoing
- Define agreed scenarios and use cases (e.g. certificate exchange, PKI, ...) incl. pilot test corridor. - ongoing
- Define common and national functionalities (co-development efforts/national development efforts) – National development efforts mapped out and started – co-development efforts not mapped out to date
- Establishing a timeline with milestones for the pilot initiation and testing phases. - done
- Establish a shared understanding of the validation process and criteria for success.- ongoing
- Agreement on which datasets are being used and tested between participants.- AT Test XML available / proposals shared
- Exchange on how data sets are interpreted in terms of data semantics and structures as well as national implementation/utilization, minimizing ambiguity in interpretation and implementation/utilization.- using eFTI4EU or own adapted XSDs

Status of the pilots

Austrian national roadmap foresees the development and setup of the necessary components and functionalities till 06.01.25 to enable testing of a national use case. In this scenario, eFTI data will be queried by an Austrian Competent Authority Officer (CAO) from our test eFTI platform and forwarded through our eFTI gate reference implementation to the CA User Application Frontend. The desired key components and functionalities for this first national use case are the following:

eFTI Platform

- Receives “raw” eFTI data in XML format, which represents our test data which we want to use across the pilot – shared with you for your review and possible feedback. This data will be stored in the platform’s PostgreSQL database.

Request-Response-Component (RRC)

- This component will serve as the first main building block of the gate. It will receive the mandatory identifiers, according to IA, from the platform and push them to the registry of identifiers (ROI - PostgreSQL DB). Furthermore, the RRC will handle incoming queries for identifiers (identifiers/metadata search), look up the ROI, retrieve the corresponding data from the platform, and send it back to the CA user application.

CA User Application

- A web application for CAO’s to query eFTI data from the platform via the gate. The main functionalities for the first tests are:
 - OAuth 2.0
 - UIL search
 - Identifier search
 - QR code search
 - Detail and result visualization

In addition to the described components, Austrian team is working on implementing the gate reference architecture from eFTI4EU, utilizing the Domibus eDelivery setup to enable gate to gate communication. We will adapt the reference implementation in order to integrate own developments, covering the business logic. We anticipate having the infrastructure ready for gate-to-gate testing **by beginning of Q2 2025** latest.

To summarize, following plan was made:

- Completion of national development efforts to test national use cases by 06.01.2025.
- Setup of the exchange environment for gate-to-gate testing (including identifier search) during this period, with the aim of being able to test by Q2 2025.
- Reach an agreement on a way forward regarding the used data and mutual test cases for piloting with pilot partner.

Belgium

Due the management issues and unclarity in Belgium eFTI implementation, Belgium withdraw from the project during the 2024. Hence Belgium pilot plans does not be updated nor documented anymore under eFTI4EU project.

Estonia

Pilot name

eFTI4EU Gate PoC (Mini eFTI PoC)

Description of the pilot

The Estonian eFTI Gate PoC pilot includes the application of the entire eFTI model to the monitoring activities of the eFTI gate, including the creation of the eFTI Gate, the development of the eFTI Platforms and the eFTI Gate interfaces between potential future eFTI Platforms registered in Estonia, CA user interfaces and other eFTI Gates. As part of the pilot, a functional data network will be created by implementing the required building blocks such as eDelivery Gate to Gate and Gate to Platform for interfacing, as well as REST API interface options. When creating the CA interface, X-Tee services (Estonian national Authority system) are applied, which are mandatory for interfacing with public databases in Estonia.

Purpose and objectives of the pilot

Estonia wants to be a testbed for the whole of Europe, creating a functioning data network between the state and private sector, creating opportunities for sharing freight data between companies and the state. Assumption is that speeding up data exchange will provide a significant economic effect, reduce bureaucracy and help create a fairer and more transparent freight market than before. To prove this, Estonia supports the creation of all components necessary for the operation of a single, open standards-based eFTI network for both domestic and international freight transport.

Through the pilot, plan is to test the possibilities of the eFTI legislation and point out positions that need to be supplemented.

Main focus of the pilot

The main focus of Estonian eFTI Pilot is to create added value for both private companies and public institutions that supervise freight transport or need relevant data (e.g. Statistics Dept.). The Estonian eFTI4EU Pilot is one of the main flagship projects of the Real Time Economy initiative to create an efficient and transparent real-time economic model for goods deliveries and to replace the current report-based statistical model with an event-based one, which significantly reduces the bureaucratic obligations of companies to the state.

Schedule of the pilot

Planning: Planning this has been started already in 2023 and it continues until the end of Pilot.

Development/implementation: Development/Implementation was started in Q1 2024 and continues until the end of Project.

Piloting with CA's, other eFTI Gates and eFTI Platforms was started in Q1 2024 and it continues until the end of Project. New integrations will be made during this period as they will be available.

Validation/analysis

Estonia has already thoroughly analysed the expectations of competent authorities regarding the implementation of eFTI. There are at least 6 potential future eFTI Platforms (6 private companies and

coalitions, which applied eCMR/eFTI development funding) under development in Estonia with the support of the state, and in cooperation with the Digital Logistics Center of Excellence, competent authorities and developers of potential future eFTI Platforms, there has been developed an eFTI architecture model, which will be validated in the framework of the Pilot with the support of real freight transport.

All analysis documents are available: <https://realtimeeconomy-bsr.eu/>

Technical components of the pilot

The technical components that will be created within the Pilot are the following:

- eFTI Gate PoC (including authorization and rights validation modules, encrypted database, log-based reporting module)
- Potential future eFTI Platforms (at least 6)
- Universal API for interfacing potential future eFTI Platforms (including for data exchange between Platforms, as well as for interfacing with ERP and TMS software)
- X-tee services that communicate with competent authorities through X-tee security gates (performs the role of Authority Access Point)
- eDelivery access point and translation module for implementing the XML-AS4 protocol
- eFTI message validator to ensure data quality
- Digital envelopes module to enable the exchange of additional documents and business information between companies for the protection of confidentiality and trade secrets (in addition to the sharing of public information with the competent authorities prescribed by the eFTI regulation).
- Modules for mediation of e-invoices and e-orders based on the PEPPOL standard to support data exchange between companies.

Transport modes covered (air, inland waterways/maritime, rail or road)

Road, rail, maritime (ferry operators), air (eAWB), multimodal & intermodal (International expeditors and carriers), both domestic and international transportation with the priority of road transport.

Pilot KPIs

Number of successful exchange dataset between EO's, potential future eFTI Platforms and CA's. Also, data quality is important (nr of errors per day/month) and ways to avoid mistakes by economic operators or potential future eFTI Platforms (missing data, unclosed waybills, etc).

Value of pilot

Time savings, less bureaucracy, avoid unnecessary activities and documents and to able predictive planning for all supply chain participants by having real time overview of status of transportation of goods.

Preparations and pre-work

Estonia has been planning this Pilot for a long time, analysed the possibilities, readiness and obstacles of digitization of the transport sector. Estonia has carried out a number of analyses of the data, including the alternatives for creating an eFTI gate from the state's point of view, and they have also been presented to the European Commission. In August 2024, the mapping and analysis of the legal framework for implementing the eFTI was completed.

All analysis documents are available: <https://realtimeeconomy-bsr.eu/>

As part of the eFTI4EU project, Digital Logistics Center of Excellence in cooperation with Estonia started the development of the eFTI Gate, and the state has supported the creation of future eFTI Platforms since the spring of 2021, conducting public tenders to find interested companies. Today, at least 6 companies have reached the end of their developments and are waiting for the technical requirements approved by the European Commission to complete the development work.

Status of Pilots

To date, Estonia have also conducted several workshops with competent authorities, presented the architecture and functionality of the eFTI gate, and set up the security servers necessary for X-tee interfacing. Thus, they have reached the end of preliminary work and analyses in order to start the pilot use of eFTI Gate PoC in cooperation with eFTI Platforms, competent authorities and economic operators.

Schedule of the pilot

Planning:	Autumn 2023 – Winter 2024
Development/implementation:	Winter 2024 - Spring 2024
Piloting:	Spring 2024 – Autumn 2025
Validation/analysis:	Autumn 2025 – Winter 2026

Finland

Pilot name

eFTI PoC

Description of the pilot

An eFTI PoC (Proof of Concept) was the first Finnish eFTI pilot. This PoC was built to demonstrate eFTI data exchange between economic operator (EO), eFTI Gate and the competent authority (CA). This PoC was planned together with Finnish authorities and it covered demonstration of key eFTI modules: eFTI Platform, eFTI Gate and CA user interface. The PoC did not engage real logistics operators and it was not integrated into CA systems, but CAs participated in defining the requirements and scoping of the PoC.

Purpose and objectives of the pilot

Main target of the PoC was to support Finnish national eFTI implementation and to provide demonstration about eFTI data exchange. PoC was also used to make analysis about strengths and weaknesses of eFTI system from IT security point of view. In addition to technical PoC, the pilot included several stakeholder interviews and knowledge sharing, which were used to gather more information for the future eFTI implementation.

Main focus of the pilot

To demonstrate eFTI data exchange environment and to provide visual example, which can be used in communication with eFTI stakeholders. Hence, it can be stated that the PoC also worked as a support action for starting national eFTI implementation in Finland.

Schedule of the pilot

Planning: planning started already before eFTI4EU project in early spring 2023.

Development/implementation: Development started in June 2023 with the technical specifications and actual PoC development was started in September 2023.

Piloting: After the project steering group validation, the piloting of PoC was started in October 2023.

Validation/analysis: During the piloting, the project group made continuous testing and validation and in December the pilot results were submitted for the project steering group.

Technical components of the pilot

PoC included three servers: 1) transport data/eCMR, which demonstrated EO services 2) eFTI platform, which worked as data gateway between EO and CA 3) eFTI Gate/APP, which included CA user interface from where CA was able to make search for the system.

For servers one and three there was a GUI developed.

Transport modes covered (air, inland waterways/maritime, rail or road)

PoC utilized road transportation data, but no real transport service providers were included.

Pilot KPIs

- Data exchange between eFTI technical components
- Number of interviews (authority interviews and private sector)
- System alerts and risks

Value of pilot

On a national level, the eFTI PoC pilot provided first level communication with eFTI stakeholders and functional eFTI demonstration. As an outcome the pilot pointed out few issues, which national

authorities need to tackle later on. One significant non-technical issue was that for the EOs terms waybill and consignment note mean various issues.

Pilot name

Real Time Economy (RTE) - eFTI

Description of the pilot

RTE and eFTI together can provide more benefits and create a bigger value chain for users. RTE focus is on procurement and invoicing processes, which are core functions of each business process. When the object of procurement is physical goods, the waybill is an essential part of the process from procurement to invoicing.

In Finland there will be integration interface for companies. In this pilot, objective is to show the benefits of digital process, not only transportation but whole supply chain process.

Benefits to be gained:

- Avoid value chain fragmentation
- Improve companies' digital capabilities
- Moving towards fully digital information handling improves profitability which is also eFTI main idea

Schedule of the pilot

Planning:	Autumn 2024
Development/implementation:	Autumn 2024 – Spring 2025
Piloting:	Spring 2025
Validation/analysis:	Spring 2025

Technical components of the pilot

RTE environment (Digital and population data services agency) – eFTI platform (TBD) – eFTI Gate (Fintraffic) – AAP PoC (Fintraffic)

Transport modes covered (air, inland waterways/maritime, rail or road)

Focus in on system to system integration, but aim is to utilize mostly road transportation as reference.

Pilot KPIs

Technical concept testing. If this is technically possible, then test in real use case like cases.

- Data exchange between eFTI technical components
- Number of interviews (authority interviews and private sector)

Value of pilot

Creating wider value chains and finding interconnection between business processes and eFTI.

Pilot name

IATA OneRecord and eAWB - eFTI

Description of the pilot

In Europe a lot of air cargo is handled with trucks after those have arrived from outside Europe. These cases work to transfer information from one standard to another. In this pilot aim is to check how similar eFTI and air cargo standards are and how to convert information from one to another so that it will smooth the data processing in this area.

Purpose and objectives of the pilot

To show how eFTI will support and work in air cargo process from economy operator point of view and also from authority point of view.

Main focus of the pilot

How data is created and updated in this process and converted from IATA One Record to eFTI.

Schedule of the pilot

Planning:	summer 2024
Piloting:	autumn 2024 – spring 2025
Validation/analysis:	autumn 2025

Technical components of the pilot

Data converter from IATA One Record / eAWB to eFTI datamodel

Transport modes covered (air, inland waterways/maritime, rail or road)

Air and road.

Pilot KPIs

Data mapping and process mapping.

Value of pilot

Increase understanding of air cargo process and eFTI relations and pinpoint possible challenges in data and process. Validation of air cargo eFTI interoperability.

Pilot name

Maritime Single window (eMSW) – eFTI pilot

Description of the pilot

eMSW and eFTI are quite similar considering their basic nature. Also, on both regulations, the data sets contain some of similar data. Indeed, based on initial research there are more than 100 similar data fields. In this pilot, the aim is to find processes that can be integrated from eMSW and eFTI, resulting in a smooth data exchange, and as such benefits to both process parties.

Purpose and objectives of the pilot

Test and validate compatibility, similarities and synergy with eMSW and eFTI.

Main focus of the pilot

Seek benefit of eMSW and eFTI sharing data and study what it means to authorities.

Schedule of the pilot

Planning:	spring 2025
Development/implementation:	2025
Piloting:	2025
Validation/analysis:	2025

Technical components of the pilot

eFTI platform (TBD) - eFTI Gate (Fintraffic) – eMSW (Fintraffic)

Transport modes covered (air, inland waterways/maritime, rail or road)

Maritime

Pilot KPIs

How many data elements can be utilized from both data sets (i.e. from eMSW and eFTI). Data is flowing between platforms.

Value of pilot

Most of the value goes to role of forwarder. Better understanding about eMSW and eFTI synergies.

Pilot name

Large company multimodal and multi country pilot

Description of the pilot

Piloting eFTI in a real case pilot with a large production company. Initial idea is to test this with steel or forest industry, which represent significant export sectors in Finland.

Purpose and objectives of the pilot

See how eFTI will work on large company supply chain process and find the value for large company. Test case will be multimodal and multi Member State.

Main focus of the pilot

International eFTI data exchange and gate to gate communication. International interoperability.

Schedule of the pilot

Planning:	end of year 2024
Development/implementation:	2025
Piloting:	2025
Validation/analysis:	2026

Technical components of the pilot

eFTI platform separately or integrated with existing ERP system

eFTI gate (Fintraffic) and communication between gates

Competent Authority

Transport modes covered (air, inland waterways/maritime, rail or road)

Road and sea

Pilot KPIs

Not defined

Value of pilot

- **Value for eFTI4EU project:** International eFTI Gate to eFTI Gate interoperability testing
- **Value for CAs:** International interoperability and network
- **Value for EOs:** International interoperability and network

Pilot name

Small company road pilot

Description of the pilot

Aim is to pilot end to end eFTI data exchange in collaboration with SME road carrier, eCMR service provider, eFTI platform service provider, national eFTI Gate and Competent authority. Special focus is given on SME road carrier systems how they can provide data from their operative systems and how eFTI platform to eFTI Gate interface will work with certain identification and certification processes. Purpose of the pilot is not to test most challenging use cases and several consignment combinations. The aim is to focus on common data set, and it can be shared between EO and CA by utilising eFTI data exchange system.

Purpose and objectives of the pilot

Test end to end eFTI data exchange system and basic features of eFTI Gate. In addition, the aim is do data mapping with small company and to test how SME road carrier can produce eFTI data. Subobjective is also to analyse how eFTI can provide a real value for companies and especially for SME companies.

Main focus of the pilot

End to end eFTI data exchange with SME road carrier.

Schedule of the pilot

Planning:	11/2024
Development/implementation:	01/2025
Piloting:	04/2025
Validation/analysis:	06/2025

Technical components of the pilot

SME road carrier - Flowertrucks, eCMR platform – iToDEV, eFTI platform - Vediafi, eFTI gate – Fintraffic national eFTI Gate, AAP PoC – Finnish Customs

Transport modes covered (air, inland waterways/maritime, rail or road)

Road

Pilot KPIs

eFTI common data set data fields

Number of pilot shipments

Challenges found

Real life value found

Value of pilot

Proof that end to end eFTI data exchange can be used in simple cases and learnings from SME companies main challenges and benefits regarding eFTI implementation. Aim is also to utilise the pilot in future tests and Gate to Gate testing.

Preparations and pre-work

Finland started pilot planning at the same time, when the eFTI4EU project application was drafted. Finland, represented by Traficom in this project, is committed to do piloting for different transport modes, but the scope of the pilots can vary. Traficom wanted also to highlight those transport modes and use cases, which are most vital for the Finnish economy and its transportation systems and hence focus in on road and maritime. One strategical decision was also not to emphasize road transportation, but to cover it via multimodal use cases and pilots and therefore also utilise collaboration between beneficiaries especially for road transportation. However, Finland wants to do piloting with both small and large companies in order to gather information from different user groups and hence SME road carried pilot was also included to Finnish piloting plans.

During the preparations, the project team of Finland communicated with Finnish competent authorities and listed potential pilot candidates. Since then, competent authorities have been engaged to all pilot discussions and national eFTI development. This work was also supported via the national eFTI authority collaboration group.

During the planning phase, Traficom also shared pilot coordination work for Fintraffic, which is in charge of national eFTI Gate development and operations. However, eFTI PoC was launched already in 2023 in collaboration with Finnish National Supply Emergency Centre in order to get better understanding about eFTI implementation and stakeholder expectations. eFTI PoC was also used to get feedback and ideas for other pilots and use cases.

Status of the pilots

Finland has a clear plan for pilots and those are aligned with other transport and supply chain developments. Some delays have been faced due to the delays in eFTI regulation, but the Finnish team is confident that piloting can be done in project time lines. During the year 2023, the first national pilot eFTI PoC was executed, and second pilots were launched during the Q3 2024 (Real Time Economy (RTE) – eFTI and IATA OneRecord and eAWB - eFTI). At the end of November, a small company road pilot was also launched. Last two pilots will be launched during the spring 2025. However, Traficom and other Finnish eFTI team is also open for new initiatives if something urgent is recognised.

France

France has maintained the same pilot objectives outlined in Deliverable D2.1, which are as follows:

- CA and the French eFTI Gate – Road transport
- CA, French eFTI Gate, and eFTI PLATform – Road transport
- CA and the French eFTI Gate – All transport modes
- CA, French eFTI Gate, and eFTI PLATform – All transport modes
- Cross-border tests with the consortium

In 2024, IN Groupe developed a comprehensive eFTI Gate for road transport controls. Throughout the development process, IN Groupe employed automatic testing procedures to ensure the quality and functionality of the code.

These developments by IN Groupe contributed to the creation of the reference implementation 0.5.

Meanwhile, the DGITM (French Ministry) developed a control application (CA) in 2024.

A pilot test was scheduled between CA and the eFTI Gate France in the third trimester of 2024. These tests were successfully conducted in August and September 2024.

Looking ahead to 2025, IN Groupe plans to finalize the eFTI Gate, incorporating all the updated data model published in July 2024, with support for all modes of transport.

In 2024, IN Groupe met several economic operators to plan the end-to-end pilots (CA <> eFTI Gate <> eFI Platform). These operators awaited the final version of the data model, published in July 2024, before initiating their development work. Consequently, the end-to-end pilots are now scheduled for 2025.

All pilot tests conducted in France are designed to ensure that the French eFTI Gate fully meets the regulatory requirements. These tests also aim to verify that the developments align with the expectations of both the control authorities and economic operators, ensuring the system's effectiveness in real-world operations. Additionally, the pilot phase will provide valuable insights into potential improvements and ensure the eFTI Gate's capacity to support seamless compliance and data exchange within the regulatory.

As mentioned above, the DGITM has produced a first version of the control application. This first version is limited to reconstituting the consignment note in order to present it to the inspectors during an inspection operation. The request to access the data via the control application is made either via the number plate or using UIL (i.e. a QR code).

We have used UNECE's MMT (Multi Modal Transport Reference Data Model). It should be noted that the development of the control application has been halted at this stage, pending the release of the final eFTI data model by the European Commission.

The aim of these tests was to:

1. Check that the connection between the control application and the French eFTI Gate is satisfactory.
2. Verify that the regulatory information pushed to the Gate (via the POSTMAN software, which simulates an eFTI platform) is found identically on the control application.

The DGITM (French Ministry) tested the association between eFTI Gate and control application according to the following 2 schemes:

- a. 6 scenarios prepared by Cerema (French public institution - center for studies and expertise on risks, the environment, mobility and adjustment):
 - Scenario 1: Declaration of one consignment is made on a single eFTI platform connected to the national eFTI Gate
 - Scenario 2: Follow-up communication message sent by the Competent Authority (Not tested yet, because follow-up communications are not available)
 - Scenario 3: Declarations of two consignments are made on a single eFTI platform connected to the national eFTI Gate (Transport Unit ID request)
 - Scenario 4: Declarations of two consignments are made on a single eFTI platform connected to the national eFTI Gate (UIL request)
 - Scenario 5: Declarations of several consignments are made on a single eFTI platform connected to the national eFTI Gate
 - Scenario 6: Declarations of several consignments are made on several eFTI platforms connected to the national eFTI Gate
- b. Real consignment notes:

For these pilot tests, a control expert provided real consignment notes representative of the transport situations most often encountered during roadside checks. This enabled us to model 5 consignment notes. A draft about these pilot tests is available.

All the above tests performed by DGITM were satisfactory.

Germany

Pilot name:

Open Source eFTI platform reference implementation for eCMR - Road

Description of the pilot

The German pilot is developing an Open Source eFTI Platform Reference Implementation for eCMR (Road). This will provide an interface to import data from eCMR Services to the eFTI Platform. Economic Operators will be able to register their eFTI Platform at their national eFTI Gate and provide eFTI Common Datasets to Competent Authorities. Additionally, the Pilot provides a basic implementation of an eFTI Gate to register an eFTI Platform and furthermore test the request functionality for Competent Authorities. The Reference Implementation of the eFTI Platform, as well as the eFTI Common Dataset Implementation will be released Open Source under the Open Logistics License (<https://openlogisticsfoundation.org/>).

Purpose and objectives of the pilot

Main target of the Pilot is the Reference Implementation of an eFTI Platform, focusing on mapping company data (e.g., (e)CMR data) to eFTI Data Sets (interface company IT <-> eFTI Platform). This eFTI Platform as well as the eFTI Common Dataset will be released Open Source. Furthermore, the Pilot will include a basic implementation of eFTI Gate to test eFTI Common Dataset request functionality from eFTI Platform.

Main focus of the pilot

The simple and transparent connection of Economic Operators and their IT systems (if relevant for eFTI) to the eFTI ecosystem via an Open Source Reference Implementation of an eFTI Platform. The Open Source Implementation will also include the eFTI Dataset Data Model. In addition, the demonstration of the eFTI processes from the perspective of Economic Operators and eFTI Gates.

Schedule of the pilot

Planning: Planning started late 2022/early 2023.

Development/implementation: Implementation started in May 2023. The Implementation phase is planned to end in December 2024. This will be accompanied by the Open Source release of the software.

Technical components of the pilot

- eCMR Service: Interface to import eCMR data to eFTI Common dataset model.
- eFTI Platform: Reference Implementation to demonstrate usability by economic operators
- eFTI Gate: Basic implementation to test eFTI Common Dataset request functionality
- eFTI Common Dataset: Open Source implementation

Transport modes covered (air, inland waterways/maritime, rail or road)

The pilot contains road transport, using eCMR and eCMR Service (<https://openlogisticsfoundation.org/foundation-projects/working-group-electronic-transport->

[documents/](https://git.openlogisticsfoundation.org/wg-electronictransportdocuments/ecmr), eCMR developments can be found here (as Open Source):
<https://git.openlogisticsfoundation.org/wg-electronictransportdocuments/ecmr>)

Pilot KPIs

- eFTI Common Datasets created from eCMR
- Requested data from eFTI Platform using the eFTI Gate

Value of pilot

- **Value for eFTI4EU project:** Link to transport operators and their eCMR developments
- **Value for CAs:** Provision/connection of eCMR data in eFTI dataset format.
- **Value for EOs:** Open Source eFTI Platform Reference Implementation for eCMR companies how an eFTI connection is structured and which steps, interfaces and data models need to be implemented.

Pilot name:

eFTI - Competent Authority Systems (eFTI-CAS)

Description of the pilot

During this German pilot of the authority's side, Germany will develop and test the connection and communication from an eFTI-user application to the eFTI gate and vice versa. The users will be able to request eFTI data using a visible identifier (such as a number plate) of a truck via their user application (designed as a web application in the pilot) connected to a dedicated AAP of the eFTI gate. The gate will perform the search and interacts with other gates and send back all relevant eFTI data sets to the users, who can show them on their user application as well as they can export the eFTI data into a file or to a secondary software. The pilot shows how eFTI-data can be accessed by the control officers and how eFTI data is displayed. Furthermore, it shows which search options can be used.

Purpose and objectives of the pilot

The pilot is about learning and knowledge sharing about how-to integrate the eFTI data exchange environment into a web based user application of a competent authority. Therefore, the objectives of this pilot are the following:

- AAP to Gate communication
- connection of the user application to the eFTI exchange environment
- data presentation for control personnel

- data transfer to control case file

Main focus of the pilot

Germany focuses on the connection of the CA traffic control environment to the eFTI - exchange environment. The pilot will provide the following functionalities: Identifier search, eFTI-data-request, data export to control case file, audit track and monitoring.

Schedule of the pilot

- Planning: done
- Development: Jan-Jun 2025
- Testing: July 2025
- cross border tests: October 2025

Technical components of the pilot

- dedicated CA-AAP to the gate
- authorisation and authentication of CA users
- CA-internal data exchange environment
- handling of eFTI-Data
- software user interface
- interface to the data storage file system
- eFTI gate search mechanism (using, not developing)

Transport modes covered (air, inland waterways/maritime, rail or road)

- Road (rates & conditions, cabotage, combined transport, DG)

Pilot KPIs

Functional KPI:

- Number of eFTI roadside control use cases covered
- Functional and agreed eFTI reference architecture model
- Stable error handling

Technical KPI:

- Response Time
- Availability
- Defect correction
- Documentation
- Compatibility
- Respect of the process

Value of pilot

- **Value for eFTI4EU project:** sharing experiences and results on development and testing of the authority connection to eFTI-Exchange-Environment via AAP
- **Value for CAs:** sharing experiences and results on development and testing of the conditions to be created for the acceptance obligation and picking up eFTI-Data via eFTI-identifiers.
- **Value for EOs:** ensuring the creation of the preconditions for acceptance obligation of the CAs .

Preparations and pre-work

Open Source eFTI platform reference implementation for eCMR – Road pilot

n/a

eFTI - Competent Authority Systems (eFTI-CAS)

BALM will develop and test a dedicated AAP. Therefore, the technical concept for the AAP pilot was finalized in November 2024. The requirements were previously derived based on the current project status. Based on this, the core functionalities of the pilot, which consists of the AAP and web-based user application components, were defined. The reference implementation will be used to illustrate the functionality of the eFTI-gate. Core functionalities will be the identifier search and the data request. Development of the AAP will start in January 2025 once the design phase has been completed.

Status of the pilots

Open Source eFTI platform reference implementation for eCMR – Road pilot

Implementation phase of eFTI Gate and eFTI Platform is active. Open Source release of eFTI Common Dataset is planned for Q2/2024.

eFTI - Competent Authority Systems (eFTI-CAS)

Software development of the AAP-pilot will start in January 2025. Following development, testing activities are planned from the end of June 2025.

BALM will carry out various types of tests during its pilot:

- Acceptance tests: It is checked whether the technical requirements are met and the usability of the overall system reaches the agreed level.
- Performance tests: It is checked whether the implemented system can withstand defined loads and how the response behaviour develops with the degree of load.

For test purposes the components AAP, CA user application, the gate reference implementation and the platform simulator are installed. These installations will be tested and, if possible, connected to the gates in other countries, thus forming the basis for the cross-border tests.

Italy

Pilot name

Italian eFTI pilot – IT PILOT

Cross-border Road Transport eFTI pilot

Multimodal Transport eFTI pilot

Description of the pilot

The pilot is to be divided into two use cases aiming to implement eFTI's functions and potentialities.

Use case 1: Cross-border Road Transport eFTI pilot

The first use case is primarily aimed at testing the validity of using eFTI instruments as tools to improve the quality and efficiency of road freight transport checks throughout Europe, when it comes to the continental transport of goods between EU countries via trucks. The use case will also be used to assess the use of e-CMR on par with eFTI for the digitalization of documents aimed at the B2B segment. The economic operators (EOs) involved will be truck operators, and consignors/shippers. The flow of goods should ideally be monitored from departure from Italy to the goods' consignee in another EU country and vice versa. It represents the cross-border pilot between Italy and Austria.

Use case 2: Multimodal Transport eFTI pilot

The second use case is focused on multimodal transport and aims at utilizing eFTI tools and technologies to monitor and simplify the logistic process in Italy, for both the import and export of goods in a multimodal freight transport chain, from the port to the goods' consignee via road and rail transport. It aims at simplifying checks by Competent Authorities (CA) involved via the use of the eFTI

architecture as the central component of the Italian National Logistic Platform. The pilot aims at covering different logistic segments and establishing a strong interoperability between the different IT systems used by CAs. Moreover, it seeks to include also the so-called Documento di Trasporto (DDT), the Italian standard transport document, as part of those information that should transit through the eFTI gate.

Purpose and objectives of the pilot

1. Develop and implement a first kernel of national eFTI infrastructure, and validate it in an operating environment (through selected use cases)
2. Digitalize and simplify the logistic supply chain in Italy using eFTI infrastructure as a core National Logistics Platform (PLN) component
3. Assess general suitability of eFTI for the international transportation of goods among EU countries through a dedicated cross-border pilot (between Italy and Austria)

Main focus of the pilot

Within the Italian Recovery and Resilience Plan, the “Digitalization of the Supply Chain” represents a key objective for increasing national logistics competitiveness through the implementation (among other measures) of the National Digital Logistic Platform (PLN), which is meant as an interoperable digital ecosystem for facilitating the cooperation between governmental and non-governmental entities. The main focus of the pilot is on the native integration of a first kernel of the eFTI infrastructure with the PLN, which will be validated in an operating environment through two use cases covering the cross-border road freight transport and the inland stretch of a multimodal chain at a port hub level.

Schedule of the pilot

Planning: start date 12/2023 - end date 02/2024

Development/implementation:

- o First phase: start date 03/2024 - end date 01/2025
- o Second phase: start date 01/2025 – end date 07/2025

Piloting: start date 02/2025 - end date 12/2025

Validation/analysis: start date 04/2025 - end date 12/2025

Technical components of the pilot:

Main components:

- eFTI infrastructure (eFTI Gate, AAP, eFTI Platform)
- interoperability with PLN (National Logistic Platform)

Other components

- interoperability with Customs System (AIDA)
- PCSs, port community systems in use by the various System Port Authorities (2 identified)

- e-CMR platform (Accudire)

Each component must be designed and built in such a way as to be able to evolve autonomously compared to the others. The ecosystem to be implemented needs being compliant with the criteria set for the establishing of an eFTI Gate and the AAP. The implementation of the features necessary to comply with the requirements can be progressive, giving priority to the features necessary for the completion of the two pilots and considering interoperability with the other components of the PLN.

For the purposes of implementing the use cases and verifying its functionality, the system will be able to implement components whose functions will subsequently be carried out by external systems, such as the tools by which the CAs are equipped to carry out checks.

The main external systems with which the system will interact can be categorized as follows:

- other eFTI Gates (in the Cross-border Road Transport eFTI pilot with Austria)
- information systems of the CAs for controls via a "Unique Access Point"
- eFTI Platform
- other PLN component systems (via eFTI Gate Extender)
- Public Authority and CAs systems (via AAP)
- systems of infrastructure managers and logistics hubs (infrastructure managers) – (via eFTI Gate Extender)

Each category provides for the definition of specific communication and authentication methods. For example, communication with other eFTI Gates will have to take place using eDelivery while the exchange of information with other components of the PLN can take place through API Rest. The architecture involves the creation of various specialized, self-consistent and integrated components.

The system exposes APIs via an API gateway enabling asynchronous communication of events and data. The services that make up the system can communicate with each other via Rest API (synchronous communications) or via the bus (asynchronous communications). Each service can have a database for data persistence whose access is precluded to other services.

There are shared utility services, such as log collection or system status monitoring.

Below is the indicative logical diagram with the system components.

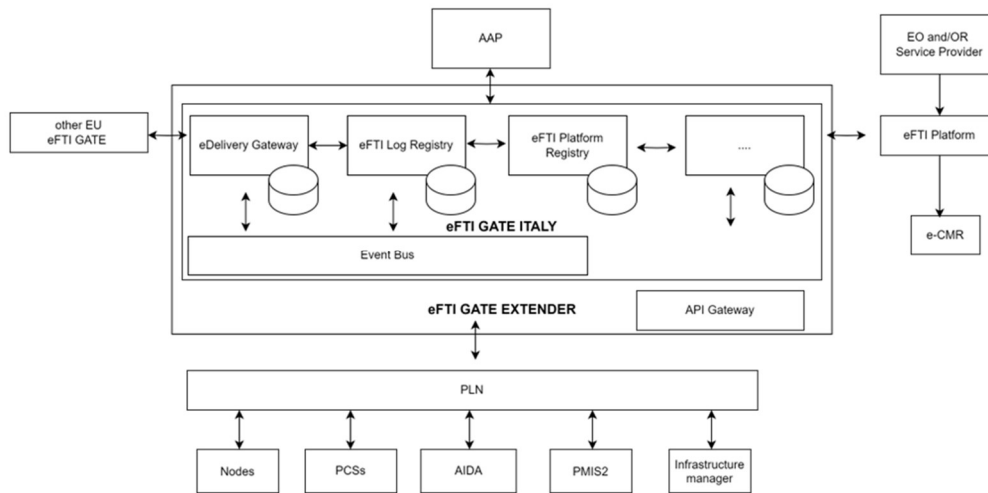


Figure 1. Italian logical diagram

The services that will make up the expanded ecosystem are:

- eFTI platform registry and public key manager (eFTI Gate component)
- eFTI access and operations log registry (eFTI Gate component)
- eFTI metadata registry and search mechanism (eFTI Gate component)
- eFTI Gates connector
- eFTI Platforms connector
- Authority authentication and authorization mechanism (eFTI AAP component)
- User authentication and authorization mechanism (UAP mockup for pilots)
- e-CMR data registry
- e-CMR connector
- PCS Connector (GOV.Way)
- ADM connector
- CGCP connector (GOV.Way)

To be compliant with the e-CMR protocol and the eIDAS regulation, the e-CMR component of the pilot will make use of the Advanced electronic signature and of blockchain technology.

Transport modes covered (air, inland waterways/maritime, rail or road)

- Cross-border use case: road
- Multimodal use case: maritime, rail, road, multimodal

The multimodal pilot is specifically designed to target different freight transport modes for both goods import and export from the port to goods' consignee via road, rail and multimodal transport.

Pilot KPIs

KPIs which will be used to assess and monitor the pilots will be those indicated in Deliverable 2.1.

Value of pilot

Value for eFTI4EU project

The Italian pilot will implement a first kernel of the national eFTI infrastructure; such kernel will be fully operational and integrated with the overall National Logistics Platform (PLN), thus being available for the realization of cross-border pilots (especially through the use case 1, “Cross-border Road Transport including e-CMR”).

Value for CAs

CAs will be able to validate on the field the overall functionality of the new integrated data exchange environment, facilitating the activities requested for doing checks, controls and sharing information, also including those not strictly in the scope of eFTI (e.g. customs, phytosanitary, health, administrative etc.). CAs will also have the possibility to assess margins for improvements and work on their synergies through the cooperation among different authorities in charge of respective checks.

Value for Eos

EOs will be able to use a digitalized system for exchanging their data, which will help them by speeding up bureaucratic processes and tasks and with their archival work. In particular, the pilot's stakeholders will be able to use an integrated system covering both B2B and B2A domains, obtaining significant advantages over the whole logistic process (e.g. integration of eFTI and e-CMR data sets).

Preparations and pre-work

In the planning phase, activities to develop the two use cases which are being carried include:

- Overall design of the pilot and of two use cases (multimodal and cross-border use case):
 - Definition of relevant data sets, data flows, use case scenarios, etc.
- Defining and allocating subcontractors to partake in the Italian component of eFTI4EU.
- Stakeholder engagement and involvement:
 - This is being done either via direct liaison with relevant Competent Authorities, or via events such as the one on the 6th of December 2023 and the second on the 28th of November 2024 where eFTI4EU was presented to several economic operators' representatives which may be potentially interested to join the planned pilot activities
 - Necessary for the onboarding of the stakeholders, including both CAs and EOs.
- Scouting and definition of an eFTI4EU participant country for the cross-border use case.

Status of the pilots

The pilot is currently nearing the end of its implementation phase, with the technical components almost finished and the specifications being laid. Subsequently, the specifications, particularly those related to the interoperability with the eFTI platform, and the cross-border part of the pilot will be shared with the EOs involved in the pilot. Stakeholder engagement process is ongoing. It started with the collection of information on potential stakeholders and Letter of Support (LoS) for presenting pilot

and for formal engagement stakeholders including Carriers, Freight Forwarders and Technical Operators. The IT Pilot will be used as the starting point for the implementation of the overall eFTI ecosystem in Italy which will be the centerpiece of the future National Logistics Platform. It is important to underline that the testing and piloting activities within eFTI4EU project are a part of a much broader ongoing logistics chain digitalization process in Italy, as in-depth described in the 2nd Level eFTI Roadmap.

Lithuania

In Lithuania there are no significant updates for pilot since D2.1, where the pilot plan was documented. New updates are expected during the spring 2025. However, Lithuania was the first country, which made procurement for national eFTI Gate. However, there has been some delays in EU regulation, which have also impacted to the Lithuanian national eFTI Gate implementation and the project has not proceed as planned. Lack of the eFTI Gate has reflected to Lithuanian pilot, but aim is still to execute the pilot.

Portugal

Pilot name

PROJECT “eFTI for LOGistics in Portugal” (eFTI-LOG-PT)

Description of the pilot

The “eFTI for LOGistics in Portugal” pilot aims at evaluating the practical obstacles on the implementation and interoperability of the eFTI components developed by Portugal between different transport modes and other cross-border solutions.

Purpose and objectives of the pilot

- Test the interoperability of systems/technologies in the real world between:
 - Different modes (ports, road and rail)
 - Competent Authorities (IMT) and enforcement bodies (GNR, PSP)
 - Member States (possibly with France)
- Strengthen a joint eFTI implementation (between Business and Governance) through:
 - Defining and simulating stakeholders roles and responsibilities
 - Integrating eFTI components with legacy systems
 - Onboarding other stakeholders as observers in the pilot and consider their feedback
 - Promoting the development of eFTI platforms by interested stakeholders
 - Identifying added values
- Check for potential improvements or problems before full-scale implementation:
 - Connectivity Testing
 - Performance Testing
 - Compatibility Testing
 - Compliance Testing
 - Usability Testing

- Define desired functional metrics and align with KPI's
- Secure Data Exchange
 - Guarantee compliance with data protection regulations (European – GDPR – and national) and standards
 - Test certification procedures with the national management centre for governmental networks (CEGER/ECCE)
- User Training and Support
 - Support executing stakeholders with documentation and hands-on user interface / user experience
 - Gather insights and feedback from users

Main focus of the pilot

Building from the Logistics Single Window (JUL) platform, as well as other eFTI platforms (to be promoted), the main focus of the pilot is to build an eFTI Gate able to exchange data according to the eFTI Regulation and according to the Delegated and Implementing Acts. The pilot will focus on a specific connection, involving at least two modes of transport, between a port and a foreign destination (possibly France), i.e. passing through at least one international border, and test two use cases (Sines and Leixões) of the eFTI Platform(s) and the eFTI Gate.

Schedule of the pilot

Planning:	Q1 2024 – Q1 2025
Development/implementation:	Q1 2025 – Q3 2025
Piloting:	Q3 2025 – Q1 2026
Validation/analysis:	Q1 2026 – Q2 2026

Technical components of the pilot:

- eFTI Gate
 - Gate2Gate communication component
 - Platform2Gate communication component
 - App2Gate communication component
- Database(s)
 - Registry of public key for eFTI Gate(s)
 - Registry of certified eFTI Platform
 - Certificate management functionalities
 - Registry of certified apps
- eFTI Platform(s) (possibly a subset of JUL DB data)
- App AAP
 - Credentials/user profile (Authorisation registry)
 - Search Mechanism

- Logging solution and error handling

Technologies/Tools used:

Work in progress. A technological prototype will be created to provide an environment for initial tests.

Transport modes covered (air, inland waterways/maritime, rail or road)

- Maritime (Port of Sines; Port of Leixões *tbc*)
- Road (Patinter; other EO *tbd*)
- Rail (Medway *tbc*)

Use Case 1 – Port of Sines ► Patinter ► Medway ► Destination MS

Use Case 2 – Port of Leixões ► EO *tbd* ► Destination MS

Pilot KPIs

- Connectivity KPI's
 - Gate2Gate - % of data exchanged
 - Gate2Platform - % of data exchanged
 - Gate2App - % of data exchanged
- Performance KPI's
 - Gate2Gate – Response time (sec.)
 - Gate2Platform – Response time (sec.)
 - Gate2App – Response time (sec.)
- Compatibility KPI's
 - Data validation - % of accurate data exchanged
 - Compliance KPI's
 - Data validation - % of eFTI compliant data
- Usability KPI's
 - Survey data users

Value of pilot

The main value of the pilot is to serve as **Proof of Concept** for the eFTI system and gather operational data for the development of eFTI components.

Overall desired benefits are the following:

- **Testing eFTI environment with real logistics processes:** Using stakeholders systems and real documentation.
- **Efficient Cross-Border Operations:** Facilitated and accelerated data exchange will lead to more efficient cross-border operations and collaboration.

- **Raising awareness for improved decision-making:** Raising Stakeholders awareness for the benefits of timely and accurate information sharing, demonstrating that eFTI will empower competent authorities and agencies to make informed decisions.
- **Enhancing Security and eFTI Compliance:** Robust security measures will protect sensitive data, ensuring compliance with data protection regulations.
- Demonstrating that eFTI can **streamline processes reducing paperwork and administrative burden.**
- **Interconnecting the eFTI system with other institutional IT systems:** Tax and Customs Authority; PSP - Public Security Police; GNR - National Republican Guard; National Civil Aviation Authority, among others.
- Demonstrating that digital documents can be **accessed remotely and easily shared** between the relevant parties, improving communication and collaboration in the supply chain.

Preparations and prework

Apart from the dissemination activities in which Portugal has been engaged since the end of 2023, which have indirectly contributed to the planning phase of the pilot, the following activities have been carried out or have been planned:

- Technical visit and onboard meeting with the Port of Sines authority – FEB 2024
- Onboard meeting with GNR (national police force) – APR 2024
- Onboard meeting with Patinter (road carrier company) – JUN 2024
- Onboard meeting with PSP (national police force for urban areas) – SEP 2024
- Onboard (?) meeting with Medway (freight railway undertaking) – DEC 2024
- Onboard (?) meeting with Luís Simões (road carrier company) – DEC 2024
- Meetings with consultants to support technical work. These meetings involve the IT team – NOV 2024
- Preparation of public tender specifications for the development of national eFTI components – NOV 2024/JAN 2025
- Launch of public tender for the development of national eFTI components – JAN/FEB 2025

Status of the pilots

Portugal is currently working on two parallel stages:

1. **Pilot Plan Development:** Together with Portuguese IT team, team has identified the stakeholders who will participate in the pilot plan and determined the circuit responsible for its execution. Based on these decisions, team has designed the pilot plan, as the following scheme shows:

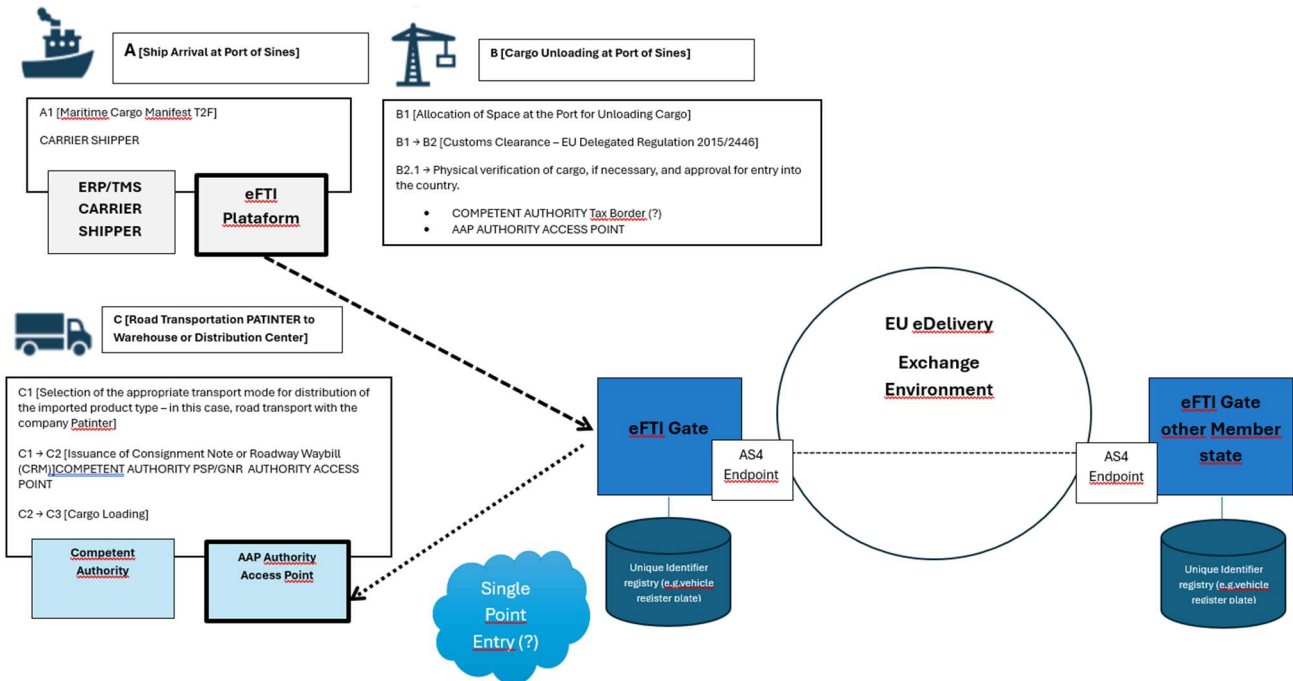


Figure 3. Portugal pilot plan.

At this stage, it is also important to note that the team is working on the preparation of a document laying down the baseline for a public tender for the implementation of the Portuguese eFTI infrastructure. This tender will focus on the development of the national components of the eFTI system, which will subsequently undergo testing during the pilot phase scheduled for the second half of 2025.

The proposal for the Public Tender Structure is based on 8 Work Packages as follows (subject to change):

WP1 – Project Management

An internal team will be established for the management and oversight of the project, including at least one technical representative from the contractor. This representative will play a crucial role in direct coordination between the contracting authority and stakeholders, both nationally and internationally.

The internal team will oversee all project phases, ensure deadlines are met, manage resources, and maintain communication with involved entities, ensuring alignment across the various work packages (WPs).

WP2 – Development of the National GATE

Identify the hosting location for the GATE, assessing the need for a higher-capacity server.

Define the specifications of the National GATE in compliance with published delegated acts.

Ensure the interconnectivity of the GATE with other Member States.

WP3 – Development of the Access Authority Point (AAP)

Design and develop the Access Authority Point (AAP) system to manage access to the eFTI information by enforcement authorities.

Conduct an analysis to determine whether a separate AAP is needed for each law enforcement authority involved or if access permissions can be adjusted to accommodate multiple authorities using a unified system.

Perform a national analysis to evaluate the feasibility of establishing a single national authority for managing AAP access, ensuring compliance with regulatory and operational requirements.

WP4 – Development of an Application

Develop an application that interfaces with the GATE, enabling the retrieval of information reported by companies via certified eFTI software platforms.

WP5 – Technical Specifications for Reporting

Define the formats and methods companies must use to report information from eFTI-compliant software to the National GATE (e.g., XML format).

WP6 – Support for the Pilot Project

Ensure the implementation, correction, and adaptation of any errors identified during the testing phase.

WP7 – Cybersecurity

Implement measures to guarantee the security and integrity of data transmitted and stored within the system.

WP8 – Training and Knowledge Transfer

Provide training and ensure knowledge transfer to the IMT, safeguarding intellectual property and operational know-how.

3.2. NATIONAL PILOTS

During the first 21 project months all project Member States have been able to launch their pilots. However, the readiness level of pilots varies, since most of the pilots are on planning phase, while some pilots have been finalised already. National pilots cover all transport modes, but road transportation is dominant. The second most common transport mode of the pilots is vessel

transportation (maritime/inland waterways). For air and rail there are less pilots, but more than one pilot covers also those. Six (plus Lithuanian pilot) pilots are considered as multimodal pilots and France and Lithuania have reported piloting of dangerous goods use case.

In general, most of the pilots have delayed a bit due the fact that eFTI regulation has also delayed. Especially the lack of eFTI platform specifications is causing some delays for end to end testing and beneficiaries are needed to develop PoCs and mock-ups for eFTI platforms. However, pilots have shown eFTI capabilities and challenges, which need to be solved before actual eFTI implementation. Pilots have been used to engage end-users, i.e. competent authorities (CA), and economic operators to the eFTI development. Engagement of these stakeholder groups has provided vital information and knowledge about everyday requirements and user usability. The final results and findings from the pilots will be published in D2.3, that is scheduled for December 2025.

During the national pilots, beneficiaries have been able to test different basic features of eFTI Gates. Estonian pilots included several eFTI platform candidates, which were connected to national eFTI Gate proof of concept, from where national police was able to check data. In Germany pilot also focused on open source eFTI platform, which later on can be connected to eFTI Gate. In France the focus has been on eFTI Gate to CA communication and during the pilot CA data query and Gate response has been tested. Austria is preparing for end to end cross-border testing and piloting is planned to start early 2025. In Finland the pilot focus has been on data interoperability, where eFTI interoperability with EMSW and IATA One Record data sets have been studied. At the end of 2024 road transport pilot was launched, where the aim is to integrate economic operator systems to Finnish eFTI Gate and to pilot end to end eFTI data exchange. In Italy and Portugal eFTI is planned to be integrated to national logistics digitalization platforms, but work is still mostly on planning mode and actual piloting is expected in 2025. Lithuania was the first country, which made procurement for eFTI Gate development, however development has been paused and Lithuanian pilot is suffering the lack of national eFTI Gate.

3.3. CROSS-BORDER PILOTS

From documented pilots 7 pilots have been reported to have cross border aspects. These pilots are reported by Austria, Germany, Estonia, Finland, France, Italy and Portugal. Hence, from the beneficiaries only Lithuania is not considering cross border pilots in eFTI4EU project. The reason for this is that in Lithuania the national eFTI Gate project was launched as a separate project and in eFTI4EU Lithuanian focus is on competent authority and authority access point.

Since most of the eFTI4EU beneficiaries are aiming for cross border pilots, it promises solid support for EU eFTI implementation. By using the joint developed data schemas, interfaces and requirements beneficiaries can enable interoperability between national Gates, which is one of the main targets of the eFTI4EU project.

Timewise the cross border pilots must happen during the year 2025, since during the 2024 only technical interoperability was achieved between Finnish, France and reference implementation Gates. However, such a technical interoperability gives a good foundation for future cross border

pilots and according to the original plan cross border pilots are planned to happen during the 2025. Inside the project team more functional testing is planned to happen in upcoming testfests. The next testfest is planned for March 2025, where testing should happen in open network and available eFTI platforms might be engaged.

4. EFTI4EU TESTPLAN

4.1. MASTER TEST PLAN - SUMMARY

Introduction

Testing will be executed mainly as part of the pilots however a common approach should be followed. There is a huge effort gain for both the participants and reporting parties if the approach is similar or identical for all participants. This is also an invitation for participants to share effort in the test process. The key delivery defining the overall approach is the master test plan (MTP), which is published for the project internal usage. It contains the governance aspects of the test process and not the technical details on how tests will be executed.

The level test Plans (LTP)

The level test plans are intermediate levels between the master test plan and the test descriptions. A test plan will focus on a specific test path and a target. It will include a set of requirements to be tested (its scope).

The LTP will be designed from lower level to higher test levels.

1. Integration by pairs of components.
2. System testing, end-to-end testing.
3. Technical Use Case Testing (~Transport UC / Data Subsets).
4. User Acceptance Testing (Use Case scenarios).
5. Pilots testing (~Business Acceptance Testing).

Technical Testing (non-functional requirement testing) should be as soon as possible, once stable versions with all features are ready.

Testing process

For each test plan, the process to identify defects is:

1. Test preparation: This includes setting up the test workgroup, having resources and tools available, creating testware and planning the test activities.
2. Test execution: This includes preparing the test data, performing a test readiness review (entry criteria check), and executing the tests. Test plan testing ends when exit criteria are met.
3. Test reporting: This includes creating test logs and reports and entering issues in the issue register.
4. Follow up of test issues: Re-test after the test issue has been closed and update the issue register. This may also include updates of the test logs and test reports.

Test Management System

The test management tool is a software application designed to help teams to manage their software testing processes effectively. It provides a centralized location for storing and managing test cases,

test scenarios, requirements, and defects. The selected tool for the project is Xray which is an Add-on for Jira. Below the test process is described (see figure 3).

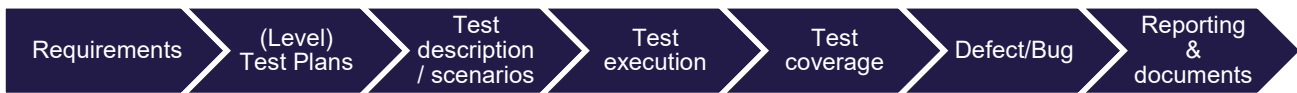


Figure 4. Test process.

Requirement and test coverage

A requirement is something expected from the eFTI system or its subsystems and features. Each requirement is written as a Jira issue/ticket. Jira eases the writing process with dashboard, workflow, versioning and customized fields and template.

Test coverage of requirements can then be monitored to ensure software quality and to measure the percentage of test cases covering the entire system.

Test Plan

Test plan is used to define the scope of test cases for a given test campaign/execution. A foreseen list of test plans is included in the master test plan: Each test plan is defined in a Jira ticket and includes content such as features and requirements to be tested, test methods, test responsibilities (organizations), environment used and pass/fail criteria i.e. entry and exit criteria.

Test cases/descriptions

A test case is a Jira ticket linked to requirements to provide coverage. It is a sequence of steps coupled with conditions or variables, test inputs, test data and an expected result. Workflow and Dashboard ease the writing process. Since the project may end with hundreds of tests, they are organized efficiently in order to find relevant tests quickly:

- With test sets are used to create groups of test cases with a logical order.
- And with test repository that provides a tree-like organization (folders and sub-folders).

Test execution

One defined and planned, test cases must be executed and monitored to ensure that each test is running as expected:

- Test parameterization allows the same test to be executed multiple times with different parameters. These values are like input values that change with each iteration of the test case.
- A testing board aggregates all executions for those tests displaying the latest result for each test case. The board allows to track testing progress and identify issues quickly, making collaboration within members states easy and effectively.

Bug tracking system and reporting

The execution ends with generating the test results and report any errors found to the development teams. When a bug is created, the bug is linked to the test execution within which it has been met. Therefore, requirement and test plans to which it refers are known. The writer of the bug is also identified and can be contacted if further explanations are needed.

Final reporting is made with a document generator that allows to customize an eFTI4EU template and generate fully detailed documents that will archive (MS word document) test plan, tests descriptions, requirements, execution and defects.

4.2. TESTFEST

Introduction

From November 12 to 14, 2024, this three-day event gathered technical experts, pilot leaders, and co-development teams to explore the first implementations of eFTI Gates. The foundation of any network is getting the requested data from one server to another. Therefore, the objective in the first test fest was to test communication between eFTI Gates (see figure 4).

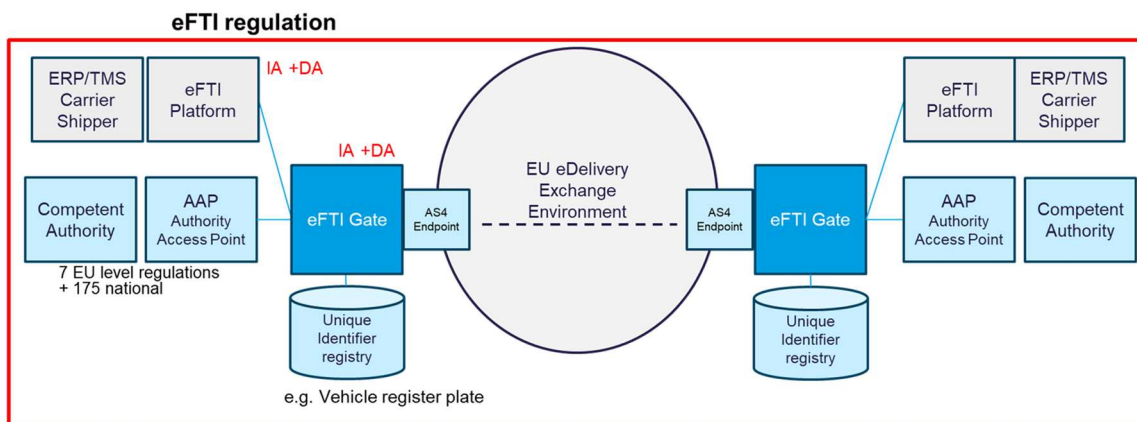


Figure 5. eFTI system.

Environment

A local closed network was built to be able to ignore security issues. In this closed network several computers act as eFTI Gates running national implementations of eFTI Gates. Gates communicate with each other via the eDelivery network that was set up. Gate-to-Gate connections tested are:

- Finnish Gate to French Gate.
- French Gate to Finnish Gate.
- Finnish Gate to reference implementation Gate.
- French Gate to reference implementation Gate.
- Reference implementation Gate to Finnish Gate.
- Reference implementation Gate to French Gate.

Any data that was passed around was simulated using simulators for the platforms and competent authority application.

Test Scope

The Testfest objective was to test integration of UIL and Identifiers requests/responses between gates, i.e. the following messages:

- uilQuery
- uilResponse
- identifierQuery
- identifierResponse

These messages were tested for Happy path, timeout and some error handling cases.

Test Cases Execution

For each test case several iterations are tested. For example, testing eDelivery connectivity from the Finish Gate to the French Gate makes one test iteration.

31 Tests Iterations have been executed for 7 Test Cases. Some of the supposed/specified errors cases could not be tested (4 Test Cases), as this is not possible yet to make them occur (see table 1).

Table 1. Testfest test cases.

List of Test Cases	Test Status [#Iterations]
eDelivery Connectivity/Ping Between Gates	PASSED [6]
Request For Remote UIL, Happy Path	PASSED [6]
Request For Remote Identifiers, Happy Path, Multi-Gate	PASSED [3]
Request For Remote Identifiers, Happy Path, Peer to Peer	PASSED [6]
Request For Remote Identifiers, Happy Path, Multi-Criteria Search	PASSED [3]
Request For Remote UIL, response with timeout status [504]	PASSED [3]
Request For Remote UIL, response with an error [404] Not Found	PASSED [4]
Request For Remote UIL, response with an error [503] Service Unavailable	TO DO [3]
Request For Remote UIL, response with an error [502] Bad Gateway	TO DO [3]
Request For Remote UIL, response with an error [400] Bad Request	TO DO [3]
Request For Remote Identifiers, Errors Cases	TO DO [6]

100% of executed tests have passed. Only minors side bugs have been found.

Results

The Test management system was fully set up and used for that first Testfest. It allowed participants to record, to organize, to manage and to share: Test Plan, Test Cases, Test Execution, Test Defects, Reporting (day-to-day status and final full report).

The testfest has validated communication between Gates. This first successful Gate-to-Gate communication lays a solid groundwork for the advancement of eFTI implementation and system testing, which can now be established efficiently using the eFTI reference implementation.

5. PROJECT KPIS STATUS

eFTI4EU project KPIS were documented in D2.1. Below in table 2 mid-term status is presented. Figures in table 2 are still open to interpretation, since most of the pilots are still active and the readiness level varies between the pilots. For this mid-term status report WP2 coordination team has selected those actions, which has been documented and presented for the consortium.

KPI 1 covers pilots, which has been done between Gate and competent authority (CA) systems. For example, in summer 2024 Estonian eFTI Gate PoC was tested together with Estonian national police and 6 eFTI platform candidates, which were part of Estonian national eCMR/eFTI development project. These 6 platform pilots are also counted for KPI 4. In addition to Estonian pilot, KPI 1 covers France CA piloting.

For KPI 2 tested interoperability tests between Finnish, France and the project reference implementation model eFTI Gates have been counted.

For KPI 3 there are few actions ongoing, e.g. in Finland data mapping between eFTI and EMSW is tested, but those have not been finalised yet and thus status is zero.

Table 2. eFTI4EU project KPI status

eFTI4EU functional KPIS			Status 12/2024	Clarification
Number	Name	Target value		
1	Number of eFTI Gate to competent authority pilots	5	2	These are test connections between the national eFTI Gate and individual competent authorities (like customs, transport authorities, police). This KPI shows how many different gate to authority integrations have been tested for data exchange.
2	Number of eFTI Gate to eFTI Gate connections	20	3	Represents connections tested between different countries' or reference eFTI Gates. Demonstrates cross-border interoperability testing scope. Critical for ensuring seamless international data exchange, using different eDelivery access points.

3	Number of eFTI Gate to linked authority system pilots	5	0	Number of national applications (existing government IT systems) integrated with the MS eFTI Gate. Example: Customs, MSW, Rescue services
4	Number eFTI Gate to eFTI platform pilots	5	6	Indicates how many connections have been tested between national eFTI Gates and private sector eFTI platforms.
5	Number of national pilots	5	4	Counts the total number of pilot projects completed within individual countries to test domestic implementation.
6	Number of international/cross border tests	20	0	Represents the total number of tests conducted involving data exchange between two or more countries, i.e. gate to gate data exchange.
7	Number of eFTI data subsets covered	5	1	Shows how many eFTI subsets that relate to different EU regulations within the scope of the 2020/1056 eFTI regulation (rates and conditions, cabotage, combined transport, dangerous goods, waste, air-cargo security declaration) have been successfully tested in the system.
8	Number of pilots modes covered (road/inland waterways/air/rail/multimodal) in total	6	1	Indicates the number of different transport modes (road/rail/air/water) that have been included in pilot testing (each pilot must include more than 1 mode or multi-leg transportation process).
9	User feedback private and public organizations	Pass & presentable	tbd	Measures the overall satisfaction and acceptance level from both government and business users.

10	Functional and agreed eFTI reference architecture model	Pass	tbd	Confirms that the technical design meets all requirements and has been accepted by stakeholders.
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For KPI 5 only those pilots have been calculated, which have been finalised or pilot mid-term results cover actual testing. These four pilots are: France x 2, Estonian pilot and Finnish eFTI PoC.

KPI 6 is reported as a zero, since the testfest covered only technical interoperability testing and actual end to end testing in cross border conditions was not tested. Although, three eFTI Gates were able to share data during the testfest.

Only rates and conditions data set are reported for KPI 7, although several other data sets have also been analysed. However, pilots have focused mainly on simple road transport use cases. Thus, also KPI 8 status is also only 1 (reflecting to road).

For KPIs 9 and 10 a proper analysis will be done only for D2.3, when documenting final results of the pilots.

6. CONCLUSION AND RECOMMENDATIONS

During 2024 eFTI reference implementation has proceeded as planned and on schedule. The reference implementation release 0.5 was originally scheduled for December 2024 and this goal is now achieved via this deliverable, code and its technical documentation in Github. During the second half of 2024 external interest towards reference implementation has increased and several external Member States have indicated that they are interested in using the reference implementation as foundation for their national eFTI Gate development. The reference implementation does not cover all eFTI authority functionalities nor requirements yet, but it includes already several key aspects of eFTI Gate. Hence, it is recommended that Member States utilizes the reference implementation, when launching national eFTI implementation actions.

The eFTI4EU team will continue the reference implementation development and especially testing of the reference implementation is something that is planned to happen during the 2025. Testing will happen in pilots, but also technical testing is done while doing co-development. Target is that in December 2025 the reference implementation release 0.9 will be published.

Most of the beneficiaries have been able to launch their pilot activities and few pilots have been finalised. During the first testfest in November 2024 co-development teams managed to integrate three eFTI Gates (FI, FR and reference implementation), which enables future cross border testing. Cross border testing will be main target of WP2 during the year 2025.

6.1. RECOMMENDATIONS

This deliverable 2.2 works as a mid-term report of eFTI4EU WP2. These findings and outcomes can be used by several stakeholders. However, three main target groups are project partners, EU Commission (DG MOVE) and external Member States. For project partners this deliverable works as technical guidance for reference implementation. In addition, beneficiaries can benchmark pilot activities inside the project and hence find synergies and potential collaboration for cross border pilots.

For EU Commission the deliverable provides profound status update of Member State eFTI implementation and piloting. In addition, it is recommended that Commission will study the reference implementation release 0.5 and analyse, if that can be further used also by the Commission in testing or technical guidance for example. The reference implementation development has also practically pointed out the need for technical harmonisation, interoperability testing, international collaboration, governance and maintenance of the system. These topics are relatively complex, and they have internal connections. Hence, it is recommended to focus on these issues and continue active communication with the CEF eFTI projects.

For observers and other external Member States it is recommend to study and analyse the reference implementation and all supportive documentation, e.g. WP1 deliverables. Although, the reference implementation code and documentation is openly available after the publication of this deliverable it is recommended to contact eFTI4EU co-development team via WP2 coordinators (Finnish Transport

and Communication Agency Traficom or IN Groupe) and to ask introduction of reference implementation.

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ANNEXES

Annex 1. Pilot schedule

Annex 2. Pilot components

ANNEX 1. PILOT SCHEDULE

		2023									2024									2025									2026												
Country	Name of pilot	Apr 1	May 2	Jun 3	Jul 4	Aug 5	Sep 6	Oct 7	Nov 8	Dec 9	Jan 10	Feb 11	Mar 12	Apr 13	May 14	Jun 15	Jul 16	Aug 17	Sep 18	Oct 19	Nov 20	Dec 21	Jan 22	Feb 23	Mar 24	Apr 25	May 26	Jun 27	Jul 28	Aug 29	Sep 30	Oct 31	Nov 32	Dec 33	Jan 34	Feb 35	Mar 36				
AT	AT Cross Border Interoperability Test Pilot							Planning			Development/implementation									Piloting and validation																					
DE	Open Source eFTI Platform Reference Implementation for eCMR (Road)	Planni	Implementation																				Oper	Source release of the software																	
	eFTI - Competent Authority Systems (eFTI-CAS)																			Planning			Development						Testing			Cross border tests									
EE	eFTI Gate PoC (Mini eFTI PoC)				Planning			Implementation															Piloting			Development						Piloting			Validation			Validation/analysis			
FI	Small company road pilot																							Development			Piloting			Validation			Validation								
	IATA OneRecord and eAWB - eFTI																									Planning			Development/implementation						Piloting			Validation			
	eFTI PoC	Planning	Development			Piloting & Testing																																			
	Real Time Economy (RTE) - eFTI																																								
FR	Maritime Single window (eMSW) - eFTI pilot																								Planning			Development, piloting and validation													
	Large company multimodal and multi country pilot																																								
	End to end pilot test between control application, eFTI Gate France and eFTI Platform for road transport										Development/implementation (piloting and validation TBD)																														
	End to end pilot test between control application, eFTI Gate France and eFTI Platform for all transport modes																									Development/implementation (piloting TBD)						Validation									
FR	Pilot test between control application and eFTI Gate France for road transport									Development/implementation						Piloting & analysis			validation																						
	Pilot test between control application and eFTI Gate France for all transport																								Development/implementation			Piloting			Validation										
IT	Cross border and multimodal tests with all partners																							Development/implementation (piloting and validation TBD)																	
	Italian eFTI pilot - IT PILOT										Planning			Development/implementation phase 1									Development/implementation phase 2 and piloting						Piloting & validation												
LT	eFTI in seaport environment - engaging multimodal economic operators and competent authorities						Planning (ends with the procurement)						Development						Piloting			Validation																			
PT	PROJECT "eFTI for LOGistics in Portugal" (eFTI-LOG-PT)																		Planning			Development/implementation						Piloting			Validation										

ANNEX 2. PILOT COMPONENTS

Country	Name of pilot	eFTI architecture/components				Stakeholders			Transport modes					Use case			
		eFTI Gate	eFTI Platform	AAP	CA solutions	CA	EO	Air	Maritime/inland waterways	Rail	Road	Dangerous goods	Multimodal	Gate to Gate	Gate to CA	Gate to platform	Gate to other system
AT	AT Cross Border Interoperability Test Pilot (ATCBP)	X	X	X	X	X				X				X	X	X	
DE	Open Source eFTI platform reference implementation for eCMR - Road	POC	X				X			X						X	
	eFTI - Competent Authority Systems (eFTI-CAS)	POC		X	X	X				X				X	X		
EE	eFTI Gate PoC (Mini eFTI PoC)	POC	X	X		X	X	X		X	X	X	X	X	X	X	
	Small company road pilot	X	X	X	X	X	X				X				X	X	
FI	IATA OneRecord and eAWB - eFTI							X									
	eFTI PoC	POC	POC		POC						POC				POC	POC	
	Real Time Economy (RTE) - eFTI	X	X	X							X						X
	Maritime Single window (eMSW) – eFTI pilot	X	X							X						X	X
	Large company multimodal and multi country pilot	X	X	X	X	X	X			X	X		X	X	X	X	
FR	End to end pilot test between control application, eFTI Gate France and eFTI Platform for road transport	X	X	X	X	X	X				X				X	X	
	End to end pilot test between control application, eFTI Gate France and eFTI Platform for all transport modes	X	X	X	X	X	X		X	X	X		X		X	X	
	Pilot test between control application and eFTI Gate France for road transport	X		X	X	X				X					X		
	Pilot test between control application and eFTI Gate France for all transport	X		X	X	X			X	X					X		
	Cross border and multimodal tests with all partners	X	X	X	X	X	X	X		X	X		X	X	X	X	X
IT	Italian eFTI pilot – IT PILOT	X	X	X	X	X	X		X	X	X		X	X	X	X	X
LT	eFTI in seaport environment – engaging multimodal economic operators and competent authorities	X	X	X	X	X	X		X	X	X		X		X	X	X
PT	PROJECT "eFTI for LOGistics in Portugal" (eFTI-LOG-PT)	X	X	X		X	X		X	X	X		X	X	X	X	X

Country	Name of pilot	Use case			
		Gate to Gate	Gate to CA	Gate to platform	Gate to other system
AT	AT Cross Border Interoperability Test Pilot (ATCBP)	X	X	X	
DE	Open Source eFTI platform reference implementation for eCMR - Road			X	
	eFTI - Competent Authority Systems (eFTI-CAS)	X	X		
EE	eFTI Gate PoC (Mini eFTI PoC)	X	X	X	
	Small company road pilot		X	X	
FI	IATA OneRecord and eAWB - eFTI				
	eFTI PoC		POC	POC	
	Real Time Economy (RTE) - eFTI			X	
	Maritime Single window (eMSW) – eFTI pilot			X	X
	Large company multimodal and multi country pilot	X	X	X	
FR	End to end pilot test between control application, eFTI Gate France and eFTI Platform for road transport		X	X	
	End to end pilot test between control application, eFTI Gate France and eFTI Platform for all transport modes		X	X	
	Pilot test between control application and eFTI Gate France for road transport		X		
	Pilot test between control application and eFTI Gate France for all transport		X		
	Cross border and multimodal tests with all partners	X	X	X	
IT	Italian eFTI pilot – IT PILOT	X	X	X	X
LT	eFTI in seaport environment – engaging multimodal economic operators and competent authorities		X	X	X
PT	PROJECT "eFTI for LOGistics in Portugal" (eFTI-LOG-PT)	X	X	X	X