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Group of Experts on Conceptual and Technical Aspects of Computerization of the TIR Procedure

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eTIR conceptual, functional and technical documentation version 4.3: eTIR technical specifications

General introduction of the eTIR international system and aspects of the interconnection with eTIR stakeholders

Revision

Note by the secretariat

I. Mandate

1. The Inland Transport Committee (ITC), at its eighty-second session (23–28 February 2020) approved (ECE/TRANS/294, para. 84[1]) the establishment of the Group of Experts on Conceptual and Technical Aspects of Computerization of the TIR Procedure (WP.30/GE.1) and endorsed its Terms of Reference (ToR)[2] (ECE/TRANS/WP30/2019/9 and ECE/TRANS/WP.30/2019/9/Corr.1), pending approval by the United Nations Economic Commission for Europe (ECE) Executive Committee (EXCOM). EXCOM during its remote informal meeting (20 May 2020) approved the establishment of WP.30/GE.1 until 2022, based on the ToR included in document ECE/TRANS/WP.30/2019/9 and Corr.1, as contained in document ECE/TRANS/294 (ECE/EX/2020/L.2, para. 5(b)).[3]

2. The ToR of the Group stipulate that the Group should focus its work on preparing a new version of the eTIR specifications, pending the formal establishment of the Technical

[1] Decision of the Inland Transport Committee para. 84 / ECE/TRANS/294 www.unece.org/fileadmin/DAM/trans/doc/2020/itc/ECE-TRANS-294e.pdf

[2] Terms of reference of the newly established Group approved by the Inland Transport Committee and the Executive Committee (EXCOM) of ECE

[3] Decision of EXCOM, ECE/EX/2020/L.2 / para. 5(b) www.unece.org/fileadmin/DAM/commission/EXCOM/Agenda/2020/Remote_informal_mtg_20_05_2020/Item_4_ECE_EX_2020_L.2_ITC_Sub_bodies_E.pdf

Implementation Body (TIB). More specifically, the Group should (a) prepare a new version of the technical specifications of the eTIR procedure, and amendments thereto, ensuring their alignment with the functional specifications of the eTIR procedure; (b) prepare a new version of the functional specifications of the eTIR procedure, and amendments thereto, ensuring their alignment with the conceptual specifications of the eTIR procedure; (c) prepare amendments to the conceptual specifications of the eTIR procedure, upon requests by WP.30.

3. This document presents the general introduction and the guiding principles, as well as the overall and detailed architecture of the eTIR international system. It also described requirements and recommendations applicable to eTIR stakeholders and the declaration mechanisms. All these aspects will be part of the eTIR technical specifications document.

II. General introduction

A. Purpose

4. The purpose of the eTIR technical specifications is to translate the eTIR functional specifications into technical requirements, architectures, guidelines, procedures and detailed descriptions of all messages exchanged between the eTIR international system and the eTIR stakeholders.

5. This document is relevant for all eTIR stakeholders (customs authorities, guarantee chains and holders) which need to interconnect their information systems with the eTIR international system. All aspects of these specifications must be considered as mandatory, unless specified otherwise.

6. The main purpose of this document is twofold: to define the technical aspects of the eTIR international system and to define unambiguously how information is exchanged between the eTIR international system and the eTIR stakeholders.

B. Scope

7. This document is divided in six parts: the present general introduction, the eTIR international system, the security of the eTIR system, the communication between eTIR stakeholders and the eTIR international system, the technical fallback mechanisms and annexes and appendices. This section defines the scope and content of these parts.

1. The eTIR international system

8. The eTIR international system is the cornerstone of the eTIR procedure as it receives and records information exchanged with customs authorities, guarantee chains and, possibly, holders. The eTIR international system is developed, maintained, hosted and administered under the auspices of ECE.[4]

9. This part starts by defining the three principles that were selected to guide the development activities of the eTIR international system, the rationale for the selection and the implications. It then details the overall architecture of the eTIR system[5] and the detailed architecture of the eTIR international system, including its components and interfaces. It also details the technical requirements of the eTIR international system i.e. several aspects that are not directly linked with its functionality but that are at least as important to ensure that the system functions well. The development procedures including various guidelines and the list of environments and related procedures are also described to explain the methods followed by ECE for the development and maintenance of the eTIR international

[4] As per paragraph 1 of Article 11 of Annex 11 of the TIR Convention

[5] See the definition of the «eTIR system» in section I.F

system. Finally, the last section is dedicated to the technical requirements related to information security and details the security model of the eTIR system.

2. Security of the eTIR system

10. This part details all aspects of the eTIR system related to information security starting with the objectives, the principles and the requirements. It then describes the corresponding measures and controls put in place to achieve them in the eTIR international system, and in order to secure the data exchanges between the information systems taking part of the eTIR system.

3. Communication between eTIR stakeholders and the eTIR international system

11. In the eTIR system, information systems of the eTIR stakeholders exchange information with the eTIR international system. This part details the technical requirements of the interfaces between the information systems as well as several aspects that the information systems of the eTIR stakeholders will have to follow. It then describes the web services provided by the eTIR international system and the technical details needed to use them. It elaborates on the architecture and design principles of the implementation of the messages exchanged in the context of the eTIR procedure and provides all technical details. Finally, it explains the interconnection projects that have to be launched by the eTIR stakeholders to connect their information systems with the eTIR international system.

4. Technical fallback mechanisms

12. This part details the technical aspects of the fallback mechanisms that are activated in case of a problem with one or more components of the eTIR international system.

5. Annexes and appendices

13. This final part features the technical glossary and details the notation used for the architecture diagrams. It also presents an analysis to determine the needs in terms of capacity and scalability of the eTIR international system. Finally, it introduces the structure and conventions used for the XSD files and the code lists used in various attributes of the eTIR messages.

C. Target audience

14. This document is prepared for the IT department and IT experts of the eTIR stakeholders that wish to use the eTIR procedure. In particular, this document contains all information needed for the eTIR stakeholders to interconnect their information systems with the eTIR international system.

D. Prerequisites

15. This document should be read after having studied the other documents of the eTIR specifications namely: the introduction, the eTIR concepts and the eTIR functional specifications. In addition, while several key terms and considerations are recalled in this document, a good understanding of the TIR Convention and, in particular, of its Annex 11 is important.

16. It is also assumed that readers have a good understanding of the IT concepts and terminology used in this document, especially related to software engineering. They should also know how web services work and be familiar with SOAP and XML.

E. Applicable documents

17. The following table lists and describes all documents that work in conjunction with the present document to guide the reader on where to find additional information.

Table 1
Applicable documents

Title	*Description*	*Version or date*
The TIR Handbook	This document contains the complete text of the TIR Convention, including its annexes (except Annex 11).	2018
Consolidated eTIR legal framework	Annex I of the report of the seventy-second session of the AC.2 details the adopted changes to the TIR Convention and the text of the new Annex 11 which describes the eTIR procedure.	17 Feb. 2020
Introduction to the eTIR conceptual, functional and technical documentation	This document introduces the conceptual, functional and technical documentation for the eTIR procedure.	4.3a
The eTIR concepts	This document describes the approach and core concepts used to support the business logic, and to implement the eTIR system.	4.3a
The eTIR functional specifications	The purpose of this document is to translate the eTIR concepts into specifications that enable software developers and message designers to further design the eTIR system.	4.3a

F. Definitions

18. The following table provides the definitions of several key terms used in this document.

Table 2
Definition of key terms

Term	*Definition*
Accompanying document	The printed document electronically generated by the customs system, after the acceptance of the declaration, in line with the guidelines contained in the eTIR technical specifications. The accompanying document can be used to record incidents en route and replaces the certified report pursuant to Article 25 of the TIR Convention and for the fallback procedure.
Actor	See “eTIR stakeholder”
Advance amendment data	The data submitted to the competent authorities of the country in which an amendment to the declaration data is requested, in accordance with the eTIR specifications, of the intention of the holder to amend the declaration data.
Advance TIR data	The data submitted to the competent authorities of the country of departure, in accordance with the eTIR specifications, of the intention of the holder to place goods under the eTIR procedure.
Customs office of departure	Any customs office of a contracting party where the TIR transport of a load or part load of goods begins.
Customs office of destination	Any customs office of a contracting party where the TIR transport of a load or part load of goods ends.
Customs office of entry	Any customs office of a contracting party through which a road vehicle, combination of vehicles or container enters this contracting party in the course of a TIR transport.
Customs office of exit	Any customs office of a contracting party through which a road vehicle, combination of vehicles or container leaves this contracting party in the course of a TIR transport.
Customs union	A customs or economic union is composed of two or more member states and form a unique customs territory in the context of the eTIR procedure, provided those member states are contracting party to the TIR Convention and apply Annex 11.
Customs union system	The central information system of the customs union which interconnects

Term	*Definition*
	the national customs systems of its member states.
Declaration	The act whereby the holder, or his or her representative, indicates, in accordance with the eTIR specifications, the intent to place goods under the eTIR procedure. From the moment of acceptance of the declaration by the competent authorities, based on the advance TIR data or the advance amendment data, and the transfer of the declaration data to the eTIR international system it shall constitute the legal equivalent of an accepted TIR Carnet.
Declaration data	The advance TIR data and the advance amendment data which have been accepted by the competent authorities.
eGuarantee	In the context of the eTIR procedure, the electronic version of the guarantee described in the TIR Convention and represented by a TIR Carnet in the TIR procedure.
eTIR international system	The Information and Communication Technology (ICT) system devised to enable the exchange of electronic information between the actors involved in the eTIR procedure
eTIR procedure	The TIR procedure, implemented by means of electronic exchange of data, providing the functional equivalent of the TIR Carnet. Whereas the provisions of the TIR Convention apply, the specifics of the eTIR procedure are defined in Annex 11.
eTIR service desk	One of the roles of ECE is to assist the eTIR stakeholders to interconnect their information systems to the eTIR international system.
eTIR specifications	The conceptual, functional and technical specifications of the eTIR procedure adopted and amended in accordance with the provisions of Article 5 of Annex 11.
eTIR stakeholder	An entity being part of the eTIR system and using the eTIR procedure as described in the Annex 11 of the TIR Convention. An eTIR stakeholder uses its information systems to be part of the eTIR system and can be any of the following entities: • ECE, with the eTIR international system; • Guarantee chains, with their information systems; • Customs authorities, with their information systems; • Holders, with their information systems.
eTIR system	The set of all eTIR stakeholders, along with their information systems which apply the eTIR procedure as described in Annex 11 of the TIR Convention.
Holder	TIR Carnet holders no longer hold a TIR Carnet in the context of the eTIR procedure, as the goal is precisely to replace the paper TIR Carnet by an electronic guarantee or eGuarantee. However, the term “holder” is retained in the context of the eTIR procedure and represents the same person as described in Article 1, paragraph (o) of the TIR Convention.
Interconnection project	The project started by an eTIR stakeholder to update and connect its information systems to the eTIR international system so that it can start to use the eTIR procedure.
National customs system	The central information system of the customs authorities of a contracting party to the TIR Convention. In the context of Annex 11, this system should be connected to the eTIR international system.
Pre-declaration	Data sent by the holder to the appropriate customs office, prior to presenting the road vehicle, combination of vehicles or container. This can be the advance TIR data, the advance amendment data or the cancellation of previously sent advance TIR data or advance amendment data.
Query mechanism	Set of messages that can be used by eTIR stakeholders (I5/I6 for customs authorities and E5/E6 for guarantee chains) to retrieve information stored in the eTIR international system, related to an eGuarantee, its holder and TIR operations.

Term	*Definition*
Technical Implementation Body	The Technical Implementation Body shall adopt the technical specifications and monitor the technical and functional aspects of implementing the eTIR procedure, as well as coordinate and foster the exchange of information on matters falling within its competence.

G. Abbreviations

19. The following table describes all abbreviations used in this document. The definition of several of these terms and expressions can be found in the technical glossary, available in the appendices of this document.

Table 3
Abbreviations

Abbreviation	*Description*
AC.2	Administrative Committee for the TIR Convention, 1975
ACE	Arbitrary Code Execution
API	Application Programming Interface
APT	Advanced Persistent Threat
BGP	Border Gateway Protocol
CA	Certification Authority
CAB	Change Advisory Board
CD	Continuous Deployment
CI	Continuous Integration
CL	Code List
CPU	Central Processing Unit
DBMS	Database Management System
DDoS	Distributed Denial Of Service
DMR	Data Maintenance Request
DOD	Definition Of Done
DoS	Denial Of Service
ECE	United Nations Economic Commission for Europe
EDIFACT	Electronic Data Interchange for Administration, Commerce and Transport
GB	Gigabyte
HDD	Hard Disk Drive
HTTP	HyperText Transfer Procotol
HTTPS	HyperText Transfer Protocol Secure
ID	Identifier
IDS	Intrusion Detection System
IDE	Integrated Development Environment
IETF	Internet Engineering Task Force
IPS	Intrusion Prevention System
ISO	International Organization for Standardization
IT	Information Technology
ITDB	International TIR Data Bank

Abbreviation	*Description*
ITIL	Information Technology Infrastructure Library
KB	Kilobyte
KMS	Knowledge Management System
LAN	Local Area Network
MB	Megabyte
MFA	Multi-Factor Authentication
MTO	Maximum Tolerable Outage
MTTR	Mean Time To Recovery
OSS	Open Source Software
OWASP	Open Web Application Security Project
PKI	Public Key Infrastructure
PRD	PRoDuction
PRINCE2	PRojects In Controlled Environments 2
RAID	Redundant Array of Independent Disks
RAM	Random Access Memory
RBAC	Role-Based Access Controls
SAN	Storage Attached Network
SDLC	Sofwtare Development Life Cycle
SSD	Solid-State Drive
SIT	System Integration Testing
SLA	Service Level Agreement
SOAP	Simple Object Access Protocol
SOP	Standard Operating Procedure
SPOC	Single Point Of Contact
SPOF	Single Point Of Failure
TB	Terabyte
TCO	Total Cost of Ownership
TIB	Technical Implementation Body
TIRExB	TIR Executive Committee
TLS	Transport Layer Security
TOGAF	The Open Group Architecture Framework
WSDL	Web Service Description Language
UAT	User Acceptance Testing
UI	User Interface
UN	United Nations
UPS	Uninterruptible Power Supply
UTC	Coordinated Universal Time
UTF	Universal Character Set Transformation Format
VCS	Version Control System
VPN	Virtual Private Network
W3C	World Wide Web Consortium
WCO	World Customs Organization
XML	eXtensible Markup Language
XSD	XML Schema Definition

H. Availability

20. This document is available from the ECE web site and from the web site[6] devoted to eTIR where the reader can always find the latest versions of all documents related to the eTIR system, including all technical guides used in the context of the interconnection projects.

III. The eTIR international system

21. This part describes all the technical aspects of the eTIR international system, and the necessary information is provided to the reader to understand how this system is implemented, managed, hosted and maintained and how it should behave technically.

22. The level of details depends on the aspects being described and not all technical details may be provided for the following two reasons:

- As this document is publicly accessible, certain technical details are voluntarily not mentioned for security reasons. While ECE acknowledges that security through obscurity[7] should not constitute the only security measure in place, it nonetheless does not wish to divulge too much information that could be used against the security of the eTIR system. Contracting parties wishing to learn more about these additional details can contact the TIR Secretary to organize a study visit of the ECE premises;
- Certain aspects related to the software or hardware products, frameworks or libraries used, as well as implementation facets are subject to regular changes as technology quickly evolves. Flexibility should be given to ECE to be able to freely change these aspects, so that it can address evolving technical requirements (e.g. capacity, scalability, performance) without having to provide an updated version of the technical specifications.

23. Given the fact that several technical details are not mentioned in this document, ECE wishes to remain transparent and demonstrate its professionalism to the contracting parties by detailing its ways of working, its guiding principles and development procedures.

A. Guiding principles

1. Introduction

24. The principles described in this section define the underlying general rules and fundamental values that will guide decision-making activities on the technical aspects of the eTIR international system (e.g. development, hosting, management, maintenance, etc.). The approach to define these three principles is based on the method for expressing architecture principles as detailed in the TOGAF Standard.[8]

2. Principle 1: Information security

(a) Statement

25. Information stored in the eTIR international system is considered confidential and shall be accessible at all times by authorized stakeholders only, by means of eTIR messages that shall be authenticated and secured.

[6] See www.etir.org/documentation

[7] See en.wikipedia.org/wiki/Security_through_obscurity

[8] See the TOGAF ® Standard v9.2 : pubs.opengroup.org/architecture/togaf9-doc/arch/chap20.html

(b) Rationale

26. Articles 7 and 8 of Annex 11 of the TIR Convention set up requirements for authentication and integrity of data.

27. Articles 11 and 12 of Annex 11 of the TIR Convention set up requirements regarding the availability and integrity of data.

(c) Implications

28. The confidentiality, integrity, availability and non-repudiation of information exchanged (data in transit) between the eTIR international system and eTIR stakeholders, and recorded on the eTIR international system (data at rest) should be ensured.

29. Information exchanged and recorded in the eTIR international system is classified as confidential information as per the dispositions of the Secretary-General's bulletin titled "Information sensitivity, classification and handling"[9] and the relevant policies and measures apply.

3. Principle 2: High reliability and quality

(a) Statement

30. The eTIR international system shall be developed and maintained following high standards in terms of reliability and quality, and these standards shall be continuously reviewed and improved.

(b) Rationale

31. A high reliability minimizes the costs to develop, operate and maintain the eTIR international system.

32. A high reliability minimizes the resources required by eTIR stakeholders to develop, operate and maintain the interconnection between their information systems and the eTIR international system.

(c) Implications

33. Proven best practices from the information technology industry should be adopted for the development, operation and maintenance of the eTIR international system.

34. Emerging trends from the information technology industry should be regularly assessed to find ways to continuously improve the development, operation and maintenance of the eTIR international system.

4. Principle 3: Ease of connectivity for the eTIR stakeholders

(a) Statement

35. The eTIR international system shall be designed and documented to facilitate the interconnection of eTIR stakeholders, including the upgrade to new versions.

(b) Rationale

36. Ease of connectivity minimizes the resources required by eTIR stakeholders to develop, operate and maintain the interconnection between their information systems and the eTIR international system.

37. Ease of connectivity minimizes the costs on the eTIR service desk to assist contracting parties in interconnecting their national customs systems to the eTIR international system.

[9] See undocs.org/st/sgb/2007/6

(c) Implications

38. The eTIR international system, its interfaces and documentation should use, to the extent possible, worldwide renowned standards.

39. The necessary documentation should be produced, in addition to the eTIR specifications, to guide and accompany the eTIR stakeholders in their interconnection projects.

40. Thanks to the experience acquired and the feedback received while assisting eTIR stakeholders with their interconnection projects, additional enhancements should be included to continuously improve the documentation and assistance provided by the eTIR service desk.

B. Overall architecture of the eTIR system

1. Introduction

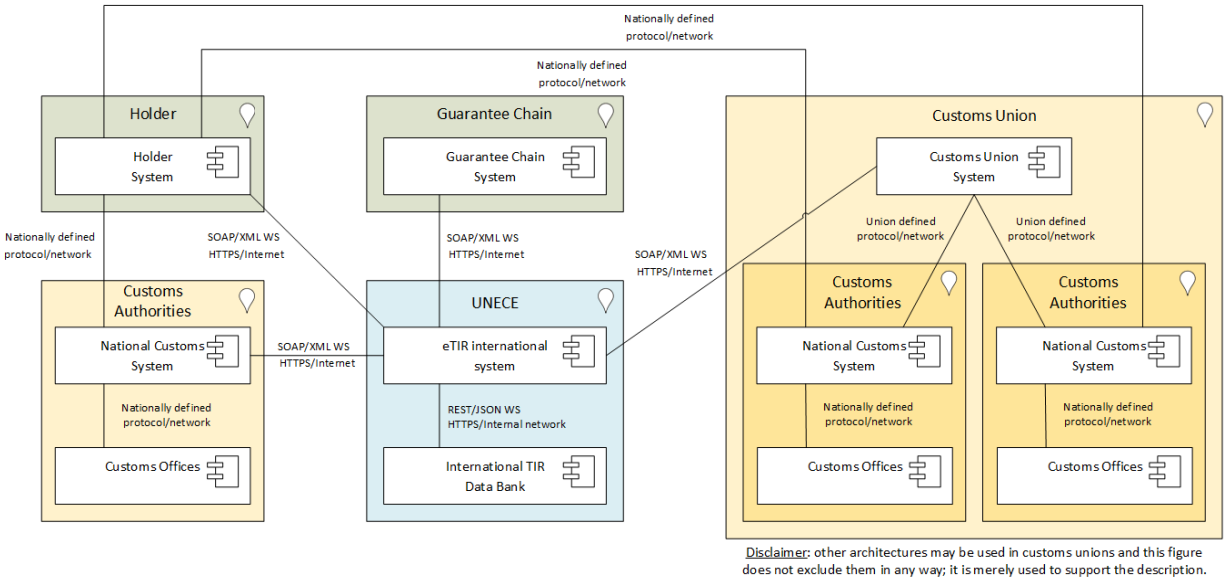
41. This section presents the overall technical architecture of the eTIR system and, in particular, the interactions between the information systems of the different actors of the eTIR procedure. It also provides a more detailed view of each actor's information systems, including the interfaces and the messages exchanged.

42. The diagrams in this section follow the ArchiMate[10] notations that are described in annex IV.A of the present document.

2. Overview

43. The eTIR system is composed of the interconnection of the information systems of the various actors involved in the eTIR procedure: customs authorities, holders, guarantee chains and ECE. The overall technical architecture presented in the figure below shows the interconnection between the information systems of all actors, including the case of customs unions. The latter could take advantage of information systems and interconnections already set up in the framework of the customs union.[11]

Figure I
Overall technical architecture of the eTIR system



44. The following sections provide more details of the information systems of each actor, in particular its interfaces and the messages exchanged. In order to avoid repetitions,

[10] ArchiMate® 3.0.1 Specification. See: pubs.opengroup.org/architecture/archimate3-doc/
[11] As proposed in Explanatory Note to article 3, paragraph 2 of Annex 11 of the TIR Convention

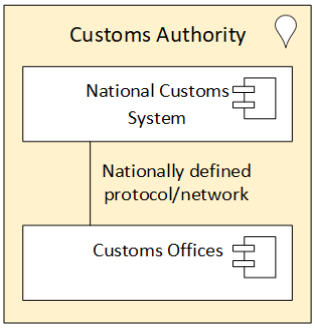
the interfaces between two information systems are only detailed in the section devoted to the actor that initiates most of the transactions.

3. Customs authorities

45. Customs authorities use information systems to manage customs procedures, such as import, export and transit. The design and architecture of these information systems is the sole decision of each and every customs authority and can therefore greatly vary from one contracting party to another. It is assumed that all customs offices are connected with the central information system of the customs authorities, hereafter called: the national customs system.

46. In order to properly implement the provisions of Annex 11 of the TIR Convention and adapt their information systems to the eTIR procedure, customs authorities must connect their national customs system to the eTIR international system. In the context of the eTIR procedure, the main actors on the side of customs authorities are customs officers (located in customs offices) who process TIR transports. While it is necessary that all customs offices approved to carry out TIR transports under the eTIR procedure are connected to the national customs system, the way in which these connections are established is defined by each customs authority. Similarly, the user interfaces used by customs officers to handle the eTIR procedure are designed and implemented by each customs authority.

Figure II
Interactions between the national customs system and the customs offices



47. The customs officers, via their national customs system, exchange information with the eTIR international system using the following messages which allow to:

- accept the guarantee assigned to a TIR transport using the request message “I1 – Accept Guarantee” and its response “I2 – Acceptance Results”;
- verify the authorization of any holder using the request message “I3 – Get Holder Information” and its response “I4 – Holder Information” (this message is optional);
- query all information related to an existing guarantee using the request message “I5 – Query Guarantee” and its response “I6 – Query Results”;
- record the declaration data of a TIR transport using the request message “I7 – Record Declaration Data” and its response “I8 – Record Declaration Data Results”;
- start a TIR operation for the TIR transport using the request message “I9 – Start TIR Operation” and its response “I10 – Start Results”;
- terminate the TIR operation for the TIR transport using the request message “I11 – Terminate TIR Operation” and its response “I12 – Termination Results”;
- discharge the TIR operation for the TIR transport using the request message “I13 – Discharge TIR operation” and its response “I14 – Discharge Results”;
- refuse to start a TIR operation for the TIR transport using the request message “I17 – Refuse to Start TIR Operation” and its response “I18 – Refusal to Start Results”;

- verify the existence of any customs offices using the request message “I19 – Check Customs Offices” and its response “I19 – Customs Offices Validation” (this message is optional).

48. If the customs authorities have a national declaration system available to holders, they may wish also to implement the functionality to send advance TIR data and advance amendment data, using the following optional messages in this direction, to the eTIR international system which will forward them to the customs authorities of the country of departure:

- send the advance TIR data to the customs authorities of the country of departure via the eTIR international system using the request message “E9 – Advance TIR Data” and its response “E10 – Advance TIR Data Results”;
- send the advance amendment data to the customs authorities of the country of departure via the eTIR international system using the request message “E11 – Advance Amendment Data” and its response “E12 – Advance Amendment Data Results”;
- send the cancellation of a previously sent advance TIR data or advance amendment data using the request message “E13 – Cancel Advance Data” and its response “E14 – Cancel Advance Data Results”.

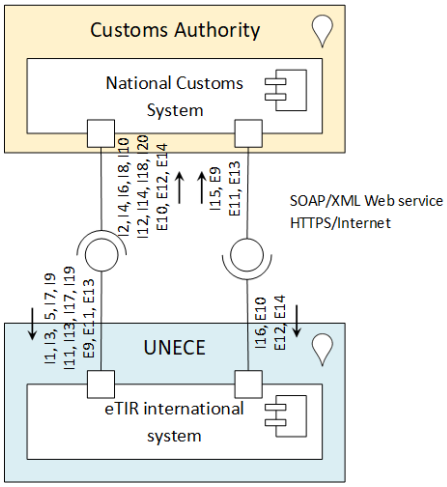
49. In addition, the eTIR international system can notify the national customs system, on specific events related to a TIR transport, using the request message “I15 – Notify Customs” and its response “I16 – Notification Confirmation”.

50. Finally, the eTIR international system can forward information from the holder related to the advance TIR data and the advance amendment data[12] to the relevant customs authorities using the following messages which allow to:

- receive the advance TIR data sent by the holder via the eTIR international system using the request message “E9 – Advance TIR Data” and its response “E10 – Advance TIR Data Results”;
- receive the advance amendment data sent by the holder via the eTIR international system using the request message “E11 – Advance Amendment Data” and its response “E12 – Advance Amendment Data Results”;
- receive the cancellation of a previously sent advance TIR data or advance amendment data using the request message “E13 – Cancel Advance Data” and its response “E14 – Cancel Advance Data Results”.

[12] As per paragraphs 2 and 3 of article 6 of Annex 11 of the TIR Convention

Figure III
Interactions between the national customs system and the eTIR international system



51. All these messages (I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, I15, I16, I17, I18, I19, I20, E9, E10, E11, E12, E13 and E14) are transmitted via HTTPS over the internet using SOAP web services and the data transferred is formatted in XML. Customs authorities should implement all messages, except the following ones that are optional, in these directions:

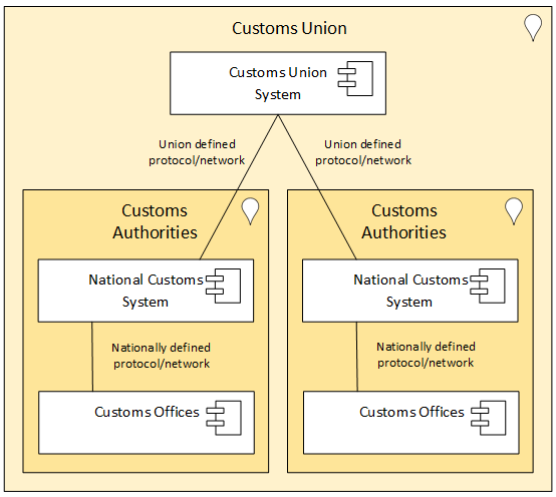
- From the national customs system to the eTIR international system: I3, I19, E9, E11 and E13;
- From the eTIR international system to the national customs system: I4, I20, E10, E12 and E14.

4. Customs unions

52. Customs unions may have put in place an overarching customs union system to facilitate the exchanges of information between the national customs systems of their member states. The design and architecture of these overarching customs union systems is the sole decision of the customs unions so they can vary from one customs union to another.

53. In order to properly implement the provisions of Annex 11 of the TIR Convention and to adapt their information systems to the eTIR procedure, member states of a customs union may wish to interconnect their national customs systems to the eTIR international system via the customs union system. In such case, the customs union system would then dispatch the messages to the appropriate recipients and, possibly, also act as a converter if the messages exchanged between the customs union system and the national customs system do not follow the eTIR specifications.

Figure IV
Interactions between the customs union system and the national customs systems



Disclaimer: other architectures may be used in customs unions and this figure does not exclude them in any way; it is merely used to support the description.

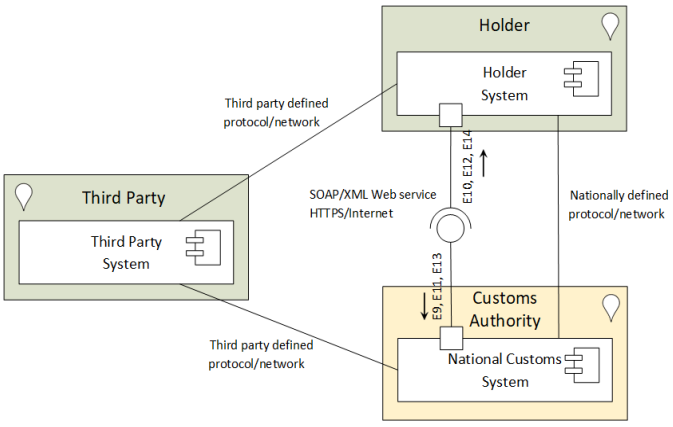
54. For the rest of this document, we will consider that the interface between the eTIR international system and a customs union system is the same as between the eTIR international system and a national customs system, unless otherwise specified.

5. Holders

55. Holders have the responsibility to submit to the customs office of departure the advance TIR data of the TIR transport they wish to initiate. The holder can always cancel previously sent advance TIR data and they can resubmit new advance TIR data. Once the declaration has been accepted by the customs office of departure, the holder can send an "advance amendment data" to the next customs office of entry or departure to request the declaration to be amended. The holder can then cancel a previously sent advance amendment data, as long as it has not yet been accepted by customs.

56. Submitting this information to the customs authorities can be done using several electronic means: from a web portal managed by the customs authorities, from a web portal or using web services directly to the eTIR international system, from a web portal managed by a third party, etc. Each and every customs authority shall publish a complete list of the ways of submitting this information.[13] All these electronic means shall submit the information needed in the respective eTIR messages: E9, E11 and E13.

Figure V
Possible interactions between the holder system and the national customs system



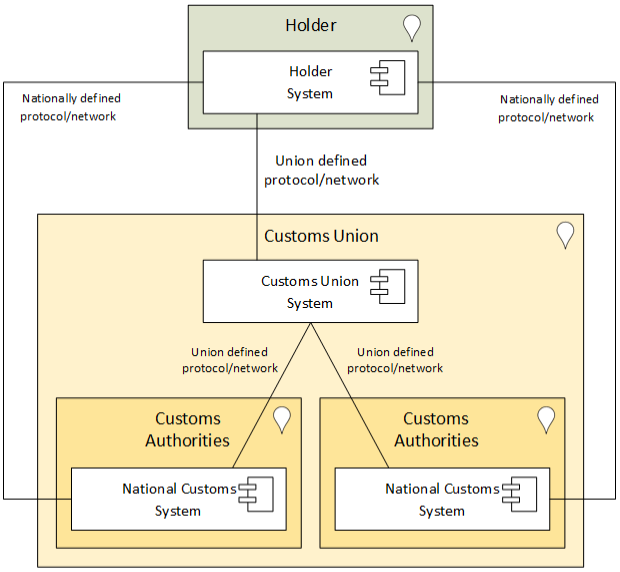
57. In the case of customs unions, the same approaches exist for holders to submit pre-declaration information to the relevant customs authorities of the member states that

[13] As per paragraph 4 of Article 6 of Annex 11 of the TIR Convention

compose this customs union. In addition to the means already detailed in the previous paragraph, an additional portal provided at the customs union level might also be available.

Figure VI

Interactions between the holder system and the systems of a customs union



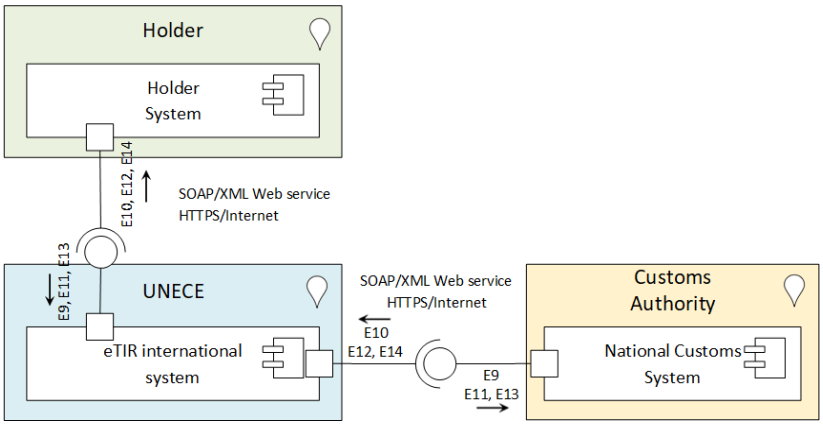
58. Finally, holders always have the possibility to submit pre-declaration information to the appropriate customs offices via the eTIR international system[14] using a web portal or the following messages which allow to:

- send the advance TIR data to the customs office of departure via the eTIR international system using the request message “E9 – Advance TIR Data” and its response “E10 – Advance TIR Data Results”;
- send the advance amendment data to the appropriate customs office via the eTIR international system using the request message “E11 – Advance Amendment Data” and its response “E12 – Advance Amendment Data Results”;
- send the cancellation of a previously sent advance TIR data or advance amendment data to the appropriate customs office via the eTIR international system using the request message “E13 – Cancel Advance Data” and its response “E14 – Cancel Advance Data Results”.

[14] As per paragraphs 2 and 3 of Article 6 of Annex 11 of the TIR Convention

Figure VII

Interactions between the holder system and the national customs system via the eTIR international system



59. These messages (E9, E10, E11, E12, E13 and E14) are transmitted via HTTPS over the internet using SOAP web services and the data transferred is formatted in XML.

6. Guarantee chains

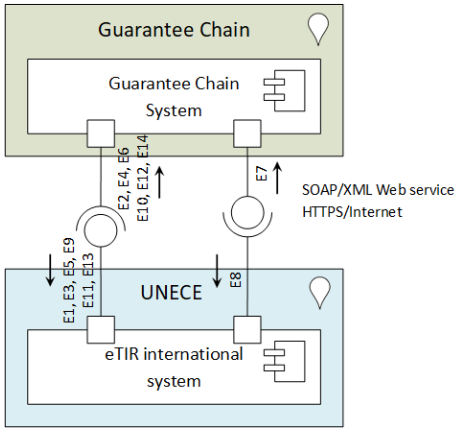
60. Guarantee chains manage the information systems used for the management of electronic guarantees (or eGuarantees) and the exchange of the required data with the eTIR international system using the following messages:

- register a new guarantee using the request message “E1 – Register Guarantee” and its response “E2 – Registration Results”;
- cancel an existing guarantee using the request message “E3 – Cancel Guarantee” and its response “E4 – Cancellation Results”;
- query all information related to an existing guarantee using the request message “E5 – Query Guarantee” and its response “E6 – Query Results”;
- be notified by the eTIR international system on specific events related to an existing guarantee using the request message “E7 – Notify Guarantee Chain” and its response “E8 – Notification Confirmation”.

61. If the guarantee chains have a declaration system available to holders, they may wish also to implement the functionality to send advance TIR data and advance amendment data, using the following optional messages, to the eTIR international system which will forward them to the customs authorities of the country of departure:

- send the advance TIR data to the customs authorities of the country of departure via the eTIR international system using the request message “E9 – Advance TIR Data” and its response “E10 – Advance TIR Data Results”;
- send the advance amendment data to the customs authorities of the country of departure via the eTIR international system using the request message “E11 – Advance Amendment Data” and its response “E12 – Advance Amendment Data Results”;
- send the cancellation of a previously sent advance TIR data or advance amendment data using the request message “E13 – Cancel Advance Data” and its response “E14 – Cancel Advance Data Results”.

Figure VIII
Interactions between the guarantee chain system and the eTIR international system



62. These messages (E1, E2, E3, E4, E5, E6, E7 and E8) are transmitted via HTTPS over the internet using SOAP web services and the data transferred is formatted in XML. Guarantee chains should implement all messages, except the following ones that are optional:

- From the guarantee chain system to the eTIR international system: E9, E11 and E13;
- From the eTIR international system to the guarantee chain system: E10, E12 and E14.

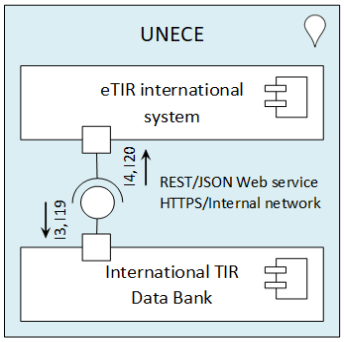
7. United Nations Economic Commission for Europe

63. ECE manages two information systems: the eTIR international system and the International TIR Data Bank (ITDB). The eTIR international system is the cornerstone of the eTIR system and its main role is to receive, validate, record and send data exchanged between the various actors during TIR transports following the eTIR procedure. The ITDB is an information system developed under the purview of TIRExB and its main roles, in the context of the eTIR system, are to manage the list of approved TIR Carnet holders and the list of approved customs offices for accomplishing TIR operations.

64. In the context of processing information received in eTIR messages, the eTIR international system queries the ITDB (when applicable) to:

- verify the authorization of the holder using the request message “I3 – Get Holder Information” and its response “I4 – Holder Information”;
- verify the existence of the customs offices using the request message “I19 – Check Customs Offices” and its response “I20 – Customs Offices Validation”.

Figure IX
Interactions between the eTIR international system and the ITDB



65. These messages (I3, I4, I19 and I20) are transmitted via HTTPS over the secured network of the data centre hosting both information systems, using RESTful web services and the data transferred is formatted in JSON.

C. Detailed architecture of the eTIR international system

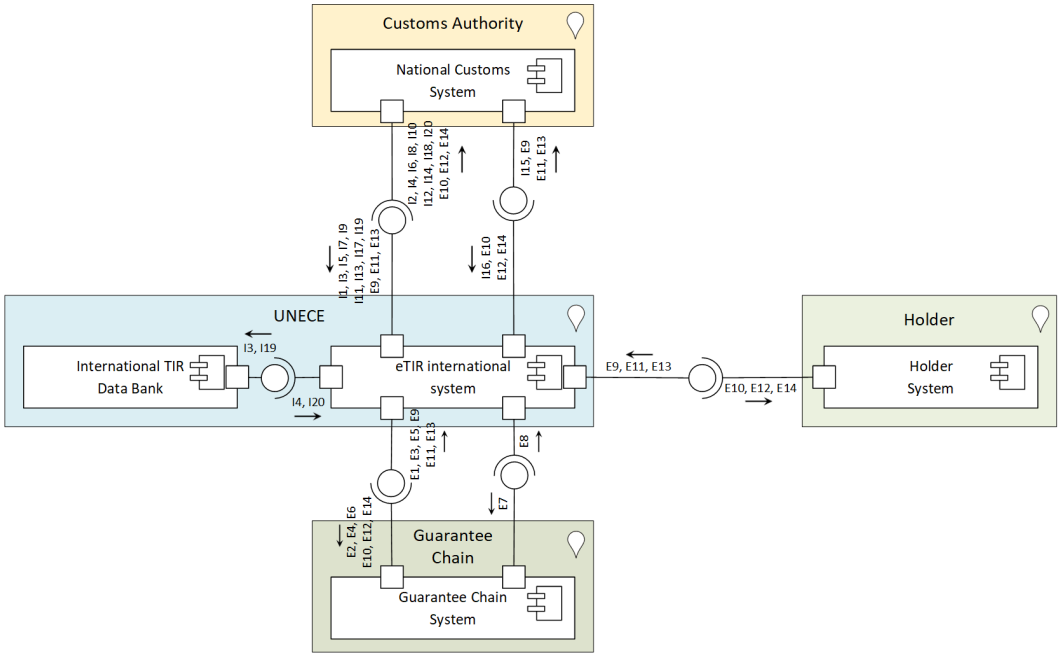
1. Introduction

66. This section describes the software and hardware aspects of the architecture of the eTIR international system. In order to remain technology agnostic, this section does not provide information on products, frameworks or libraries used to implement the functions needed by the components. Indeed, as technology quickly evolves, ECE will continuously monitor the available options and perform changes as it sees fit so that the components of the eTIR international system can continue to perform their functions and properly scale over time to match the capacity and performance requirements (see the next section on technical requirements).

2. Interfaces with eTIR stakeholders

67. The interfaces between the eTIR international system and other eTIR stakeholders are already detailed in the previous section. The following figure summarizes them all, by mentioning the message codes and the flow of information.

Figure X
Interfaces of the eTIR international system



3. Storage locations

68. Messages are processed by the eTIR international system and parts of them are recorded in three different storage locations:

- All incoming and outgoing messages are entirely recorded in the **eTIR logs** to save the data needed to ensure non-repudiation and to provide the information that may be requested by contracting parties;
- Data extracted from the messages is recorded in the **eTIR database** to be used by the query mechanism and for statistical purposes;
- If “attached documents” and “certificates of approval” are embedded into messages (which can be the case in E6, E9, I6, I7 and I15), they are extracted and saved as files in the **eTIR documents**, a separate centralized and secured file system.

4. Software architecture

69. The eTIR international system relies on the following software components:

- The **eTIR web services** are the core of the eTIR international system where messages are received, validated, processed, recorded and sent;
- The **logging service** is used to record all messages sent and received by the eTIR international system, as well as all information logged by its other software components, frameworks and libraries.

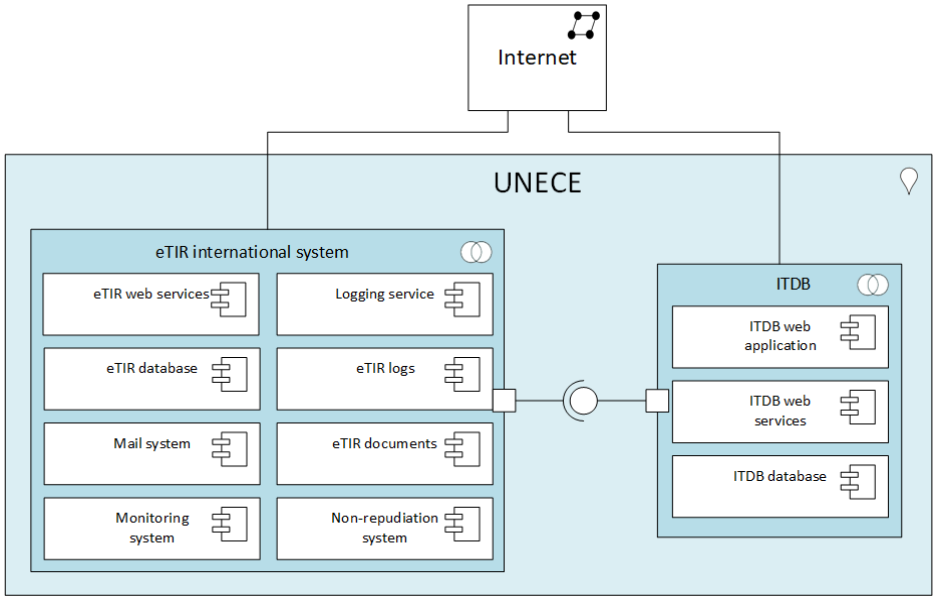
70. The eTIR international system also relies on the following systems:

- The **mail system** is used to send email messages to eTIR stakeholders on specific occasions, principally during fallback procedures;
- The **monitoring system** is used to observe the resources and performance of the virtual servers, as well as the availability and performance of the services of the eTIR international system;
- The **non-repudiation system** will extract data stored in the eTIR logs, index them and feature a user interface only accessible by IT administrators from ECE. This

user interface will allow querying the logs to find a particular message (using the unique "Message Identifier"), a pair of request/response messages, and to provide all information needed by contracting parties for verification purposes.[15]

71. The following diagram presents the software architecture of the eTIR international system. The interfaces exposed and consumed by the eTIR international system are not represented, as they are already listed and described in the sections above.

Figure XI
Software architecture of the eTIR international system



72. The technical requirements of the software components of the eTIR international system are listed in the following section. The software components of the ITDB are listed for informational purposes as they are managed by ECE, under the purview of the TIRExB.

5. Systems architecture

73. The United Nations entity that hosts the eTIR international system (hereafter the hosting entity) has its own private data centre which is located in a United Nations compound and thus benefits from the privileges and immunities enshrined in the United Nations Charter[16] and further detailed in the Convention on the privileges and immunities of the United Nations.[17]

74. The hosting entity uses a virtual server farm to provide virtual servers that form the various systems components of the eTIR international system and at the moment, each node corresponds to a virtual server. In a near future, ECE will consider using containers and container orchestration techniques to further ensure the scalability requirements of the eTIR international system while keeping the hosting costs to an acceptable level.

75. The eTIR international system is designed and implemented in a way that limits single points of failure (SPOF) to meet its availability objectives (as detailed in the next section). This architecture also allows to intervene in systems components without having to stop the eTIR international system. This is particularly important to perform regular maintenance activities like replacing defective hardware parts, updating software components and applying security patches.

76. The eTIR international system relies on the following systems components (their technical requirements are listed in the next section):

[15] As per paragraph 3 of article 12 of Annex 11 of the TIR Convention
[16] See www.un.org/en/charter-united-nations/
[17] See treaties.un.org/doc/Treaties/1946/12/19461214%2010-17%20PM/Ch_III_1p.pdf

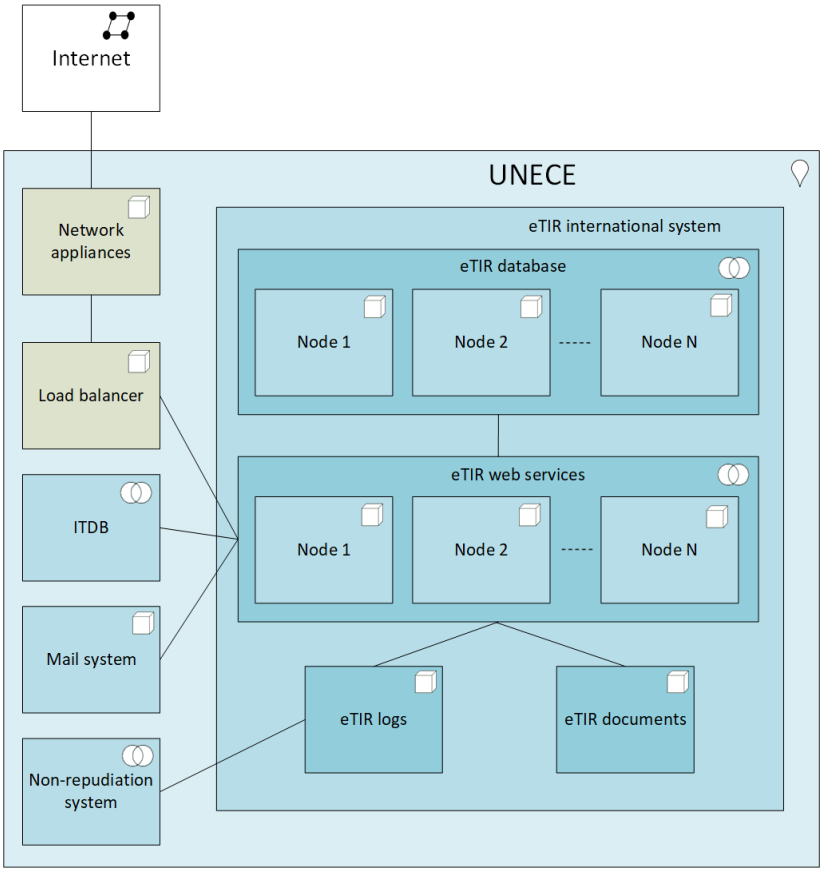
- The **eTIR web services** are the core of the eTIR international system where messages are received, validated, processed, recorded and sent. It consists of several front-end web server nodes to which messages are distributed by the load balancer;
- The **eTIR database** is the core storage location and consists of a clustered database management system (DBMS) using several virtual server nodes and high-performance disk storage;
- The **eTIR logs** is the storage location to which logs are transferred on a daily basis and consists of a virtual server with enough disk space to store all logging information;
- The **eTIR documents** is the storage location to which attached documents are saved and consists of a virtual server with enough disk space to store all documents.

77. The eTIR international system also relies on the following external systems components:

- The **ITDB** which has its own systems architecture to meet its availability objectives. In case of unavailability of the ITDB, the eTIR international system follows a failover procedure which is described later in the document;
- The **mail system** is provided by the hosting entity and consists of a virtual server only used for sending email messages. The eTIR international system principally uses this external system in case of fallback procedures;
- The **non-repudiation system** is an external administration system which is not directly needed for the proper functioning of the eTIR international system and thus consists of a unique virtual server.

78. The following diagram presents the systems architecture of the eTIR international system.

Figure XII
Systems architecture of the eTIR international system



79. With the following sample scenario, we wish to illustrate the usual exchange of information between systems components. An incoming message sent from an eTIR stakeholder over the internet first gets to the network appliances (BGP router and firewall) of the hosting entity. The message is then transferred to the load balancer system which forwards it to the appropriate node of the eTIR web services (front end web server) which validates and processes the message. This web server then stores relevant data in the eTIR database, in the eTIR logs and, if applicable, in the eTIR documents. Finally, the same web server prepares the response message and sends it back to the eTIR stakeholder who initially sent the request message. For the sake of clarity, additional systems related to network routing and security are not shown in this diagram (routers, switches, firewalls, IDS, IPS, etc.).

III. Communication between eTIR stakeholders and the eTIR international system

A. Requirements and recommendations applicable to eTIR stakeholders

80. This section lists the requirements and recommendations that are applicable to all eTIR stakeholders (customs authorities, guarantee chains and holders). They are needed to ensure a proper functioning of the eTIR system and they cover functional and non-functional aspects.

1. Responsibilities

81. eTIR stakeholders are responsible for the correct and timely design, implementation, test, deployment and maintenance of their respective information system involved in the framework of the eTIR system, following the approved version of the eTIR specifications.

This includes implementing or modifying the database, software components and user interfaces needed to accommodate TIR transports following the eTIR procedure.

82. eTIR stakeholders are responsible for applying the functional and technical requirements applicable to them, as defined in the eTIR specifications. In particular, eTIR stakeholders are responsible for ensuring and maintaining the information security requirements of their information system and network.

83. eTIR stakeholders are responsible for timely upgrading their information system to keep pace with the evolution of the eTIR specifications, as decided by the relevant governing bodies.

84. eTIR stakeholders are responsible for putting in place (if not already available) an IT service desk which is the counterpart of the eTIR service desk on the side of the eTIR stakeholder. Staff members of the eTIR service desk should communicate with the staff members of the IT service desk of the eTIR stakeholders to regularly check the proper functioning of the interconnection between their two systems and the operations being carried out. Both parties should also liaise to solve any issues that may occur, and should strive to resolve them as quickly as possible.

2. General requirements and recommendations

85. The following table lists all non-functional requirements, previously defined in this document for the eTIR international system[18], that also apply either as a requirement or as a recommendation for the information system of the eTIR stakeholders that are part of the eTIR system. The denomination of the system is modified in the "description and objective" column, to reflect a generic denomination for the information system of the eTIR stakeholders. Finally, in the case of quantitative requirements, the target values are added to this column. All the requirements and recommendations listed below can be addressed using the mechanisms already described in the previous parts of this document.

Table 4
Requirements and recommendations appliable to eTIR stakeholders' information system

Identifier	*Description and objective*	*Requirement or recommendation*
AE.1	Select a strong authentication mechanism for the information system to prevent unauthorized access.	Recommendation
AE.2	Enable session lock after inactivity to protect the access to the user accounts.	Recommendation
AE.3	Manage passwords securely to prevent unauthorized access.	Recommendation
AE.4	Recommend multi-factor authentication for system access to protect user accounts.	Recommendation
AO.1	Grant the minimum, sufficient access or privileges to prevent unauthorized access.	Recommendation
AO.2	Employ role-based access controls (RBAC) to improve the maintenance of the user accounts.	Recommendation
AO.3	Revoke access upon termination of personnel appointments to prevent unauthorized access.	Recommendation
AO.4	Review user accounts at least annually to prevent privilege creep.	Recommendation
AU.1	All information sent to and received by the information system is linked to a user account and can be audited.	Recommendation
AV.1	Normal maintenance operations for the software and systems components of the information system are performed transparently as the service remains available.	Recommendation
AV.2	General availability of the information system. *Target value*: 24 hours	Requirement

[18] ECE/TRANS/WP.30/GE.1/2021/31 and ECE/TRANS/WP.30/GE.1/2021/34

Identifier	*Description and objective*	*Requirement or recommendation*
	per day, each day of the year.	
AV.3	Percentage of uptime of the information system. *Target value*: Greater than 99%.	Requirement
AV.4	Maximum consecutive information system downtime in case of a major issue. *Target value*: 4 hours during weekdays and 24 hours during weekends, per occurrence.	Requirement
AW.1	Ensure all relevant personnel follow basic training courses on information security to raise their awareness.	Recommendation
AW.2	Maintain records of participation in required training courses on information security.	Recommendation
CM.1	The source code of all modules of the information system should be versioned using a version control system (VCS) to allow for an effective management of this asset.	Recommendation
CM.3	All assets related to the documentation of the information system should be versioned using a VCS to allow for an effective management of this asset.	Recommendation
CO.1	Information transferred between the information systems of the eTIR system remains confidential.	Requirement
CP.1	Maximum number of expected messages to be processed. *Target value*: 120 messages per minute.	Requirement
DR.1	The recovery time objective (RTO)[19] of the information system, after a disaster. *Target value*: 48 hours.	Recommendation
DR.2	The recovery point objective (RPO)[20] of the information system. *Target value*: 4 hours.	Recommendation
FT.1	Gracefully handle the failure of a physical server, which can be due to a piece of equipment (CPU, memory, motherboard, HDD, network card, etc.) to avoid the information system becoming unavailable.	Recommendation
FT.2	Gracefully handle the failure of a piece of equipment used by the storage locations (HDD, SSD) to avoid the information system becoming unavailable.	Recommendation
FT.3	Gracefully handle the loss of internet connectivity to avoid the information system becoming unavailable.	Recommendation
FT.4	Handle gracefully power failures to avoid the information system becoming unavailable.	Recommendation
ID.1	Uniquely identify an individual or an information system with a user account to be able to hold it accountable for its actions.	Recommendation
IN.1	The integrity of the information transferred between the information system and the eTIR international system remains intact.	Requirement
MT.1	Technical debt should not accumulate on the programming languages, frameworks and libraries used to build the information system.	Recommendation
MT.2	Technical debt should not accumulate on the source code of the information system.	Recommendation
MT.3	Knowledge is retained to properly maintain and improve the information system.	Recommendation
NR.1	eTIR stakeholders are accountable for the messages they send to the eTIR international system.	Requirement
NS.1	Securely configure virtual servers, containers or pods to prevent	Recommendation

[19] The RTO is the amount of time in which it should be feasibly to recover the IT service in the event of a disaster.

[20] The RPO is the maximum targeted period in which data (transactions) might be lost from an IT service due in the event of a disruption.

Identifier	*Description and objective*	*Requirement or recommendation*
	unauthorized access.	
NS.2	Securely configure network infrastructure devices to prevent unauthorized access.	Recommendation
NS.3	Isolate trusted networks containing sensitive data from non-trusted networks to prevent unauthorized access.	Recommendation
NS.4	Monitor events on the nodes to detect potential security issues.	Recommendation
PE.1	Average response time involving short messages (up to 10KB) measured by the sender from sending the request message to receiving the response message. *Target value*: 1 second.	Requirement
PE.2	Maximum response time involving short messages (up to 10KB) measured by the sender from sending the request message to receiving the response message. *Target value*: 10 seconds.	Requirement
PE.3	Maximum response time measured by the sender from sending the request message to receiving the response message. *Target value*: The timeout is set to 60 seconds.	Requirement
PE.4	Performance metrics of the information system should be monitored to identify any potential problem.	Recommendation
PE.5	Performance metrics of the information system remain stable or get better over time.	Recommendation
PS.2	The data centre hosting the information system should be sufficiently protected to prevent intrusions and disasters.	Recommendation
RL.1	Number of remaining issues with the highest severities found by the static analysis tool. *Target value*: 0 (all issues of this kind should be corrected).	Recommendation
RL.2	Number of remaining issues with a normal severity found by the static analysis tool. *Target value*: Less than 150.	Recommendation
RL.3	Percentage of functional source code covered by automated tests (code coverage). *Target value*: More than 60%.	Recommendation
RL.4	Percentage of duplicated source code (code duplication). *Target value*: Less than 3%.	Recommendation
RL.5	All changes to the source code are made in a way that decreases the probability to introduce issues.	Recommendation
RL.6	All changes to the source code are linked to a requirement to ensure proper traceability.	Recommendation
RL.7	Eliminate as many redundant, manual and error-prone tasks from the development procedures.	Recommendation
RU.1	Reuse existing methods, frameworks, software and systems components to save time and achieve higher quality outputs	Recommendation
SC.1	Define security requirements in the early stages of the Software Development Life Cycle (SDLC)[21] to lower the costs and decrease the number of security issues.	Recommendation
SC.2	Separate the stages of the SDLC to prevent mixing different versions by having different environments.	Recommendation
VU.1	Ensure the known vulnerabilities are patched to prevent potential security issues.	Recommendation
VU.2	Conduct vulnerability assessment and testing to prevent potential security issues.	Recommendation
VU.3	Ensure incidents are properly managed to prevent potential security issues.	Recommendation

[21] See en.wikipedia.org/wiki/Systems_development_life_cycle

3. Validation mechanisms

86. eTIR stakeholders should implement mechanisms to validate the following aspects of all incoming messages:

- The structure and format of the fields of the messages. In particular, they should validate the specifications applied to the various data types of the fields, as detailed in the "Implementation and tests of the eTIR messages" section above;
- The rules and conditions applied to specific fields of the messages;
- The code lists applied to specific fields of the messages.

87. It is strongly recommended for all eTIR stakeholders to include the same validation mechanisms implemented in the eTIR international system, as detailed in the "Implementation and tests of the eTIR messages" section above.

4. Error handling mechanisms

88. eTIR stakeholders should put in place the following minimum mechanisms to properly handle errors which can be received in response messages:

- All errors received should be logged by the information system of eTIR stakeholders;
- If the message reporting an error is triggered by the action of an end-user (e.g. a customs officer or a holder), this end-user should be notified of the error and that his or her action could not be processed. He or she should be presented with a clear message on the next steps to follow. Depending on the situation, this message could, for example, request the end-user to correct an issue with the data being submitted or, if the error cannot be resolved, this message could propose to the end-user to initiate the appropriate fallback procedure;
- The IT service desk of eTIR stakeholders should be notified of all errors received and logged in order to investigate on their cause and follow up until they are resolved.

89. Additional information related to error handling is available in the "Implementation and tests of the eTIR messages" section above.

5. Retry mechanism

90. eTIR stakeholders should put in place a mechanism to retry sending a request message to the eTIR international system, if the first attempt to send the message did not go through and was not acknowledged by a response message. In such case, the information system of the eTIR stakeholder may retry sending the request message after the time waiting for the response message has elapsed. The technical aspects of this retry mechanism may be similar to what is implemented in the eTIR international system and described in the part of this document dedicated to the technical fallback procedures.

91. Depending on the event that triggered the communication of the request message, using a retry mechanism might not be appropriate, in particular if the request message was triggered by an end-user who is waiting for an answer from the system. In these cases, it might be more appropriate to inform the user about the issue immediately so he or she can retry the same action again, or decide to initiate the appropriate fallback procedure.

6. Conformance tests

92. The objective of the conformance tests is to ensure that the information system of eTIR stakeholders that interconnects with the eTIR international system, has been developed in line with the requirements set forth in the eTIR specifications. For this reason, passing the conformance tests is a requirement for all eTIR stakeholders before being able to connect their information system to the eTIR international system and participate to the eTIR system in Production.

93. The conformance tests involve a set of activities that have to be performed by each eTIR stakeholder, in collaboration with ECE, to pass several test sets in order to progressively ascertain that the objective stated above is met. As a result, the conformance tests play an important role in the interconnection project as they constitute one of its stages.

94. It is important to note that all tests are performed on the User Acceptance Test (UAT) environments of both systems (the eTIR international system and the information system of the eTIR stakeholder to be tested). For this reason, the UAT environment should be a replica of the Production environment (server infrastructure, operating systems, middleware, software versions, configurations, etc.). Furthermore, the UAT environment shall be hosted in the same premises and with the same network configuration as the Production environment. Finally, selected customs should be trained on the eTIR procedure and have access to the new version of the national customs systems on the UAT environment to perform the tests.

95. The methodology for carrying out conformance tests is described in the following three stages/levels.

(a). Connectivity

96. The project teams (customs authorities and ECE) should check that both systems (the eTIR international system and the new version of the national customs system) hosted on their UAT environments are connected by:

- Verifying that the WSDL[22] files of the exposed webservices are visible on both end;
- Ensuring that signed messages can be sent in both directions.

(b). Messages

(i). Incoming messages (E9, E11, E13, I15)

a. Correct messages

97. The eTIR international system should send messages that do respect the structure and formats, rules and conditions as well as using the codes defined in the eTIR specifications and check that no errors are returned.

b. Incorrect message structure and format

98. The eTIR international system should send messages that do not respect the structure and formats defined in the eTIR specifications and check that the appropriate errors are returned.

c. Breach of rules and conditions

99. The eTIR international system should send messages which break rules or conditions defined in the eTIR specifications and check that the appropriate errors are returned.

d. Incorrect codes

100. The eTIR international system should send messages containing codes that are not part of the code lists defined in the eTIR specifications and check that the appropriate errors are returned.

[22] See en.wikipedia.org/wiki/Web_Services_Description_Language

(ii). Outgoing messages (I1, I3, I5, I7, I9, I11, I13, I17, I19, E9, E11, E13)

b. Message structure and format

101. On the basis of a data set sent to the customs' project team and stored in the national customs system, messages should be generated and sent to the eTIR international system. No structural or formatting errors should be returned.

c. Rules and conditions

102. On the basis of a data set sent to the customs' project team (implying scenarios of increasing complexity) and stored in the national customs system, messages should be generated and sent to the eTIR international system. No errors should be returned regarding the rules and conditions.

d. Validation of codes

103. On the basis of a data set sent to the customs' project team and stored in the national customs system, messages should be generated and sent to the eTIR international system. No errors should be returned regarding validation of codes.

(c). eTIR processes at customs offices

(i). Integration of the eTIR messages in the eTIR processes and customs officers' user interface

104. The eTIR international system should send information to the national customs system using either E9, E11, E13 or I15 messages, and, if required, send a copy of the accompanying document. The eTIR service desk should contact the appropriate customs offices by phone, playing the role of the holder and simulate with customs officers the processing of the information for different scenarios (first departure, first destination, intermediate departure, intermediate destination, entry and exit). Customs officer shall connect to the new version of the national customs systems on the UAT environment for this exercise. The eTIR service desk should ensure that the relevant messages are received by the eTIR international system in due time, contain the relevant information, are formatted correctly and sent in the right sequence.

(ii). Sequence of the TIR transport

105. The eTIR international system should send information to the national customs system using either E9, E11, E13 or I15 messages, and, if required, send a copy of the accompanying document. The eTIR service desk should contact customs offices (but not in the right sequence) by phone and check that the appropriate response is provided. Customs officers should connect to the new version of the national customs systems on the UAT environment for this exercise. The eTIR service desk should ensure that no messages are exchanged in this case, other than a query message (I5/I6).

(iii). Fall back procedures

106. After sending the relevant accompanying document by email, the eTIR service desk should contact by phone customs officers to ensure that the customs officer can process the accompanying document in line with the eTIR specifications. A filled in copy of the accompanying document should be scanned and returned by email to the eTIR service desk.

(d). International testing with neighbouring countries

107. Customs administrations may also wish to participate in international tests with neighbouring countries, the eTIR service desk and the guarantee chain. Such international tests allow verifying the complete sequence of messages, exchanged between all actors, by simulating TIR transports from begin to end.

108. Such international tests remain optional and should be requested by, at least, two (neighbouring) countries which are willing to perform this additional level of testing as part of their conformance tests.

B. Declaration mechanisms

109. Article 6 of Annex 11 of the TIR Convention details how the holder, or his or her representative, should submit advance TIR data and, possibly, advance amendment data, to the relevant competent authorities. Annex 1 of the eTIR concepts describes the procedure for submitting these data. The present section aims at describing the technical aspects of several of the declaration mechanisms of the eTIR system.

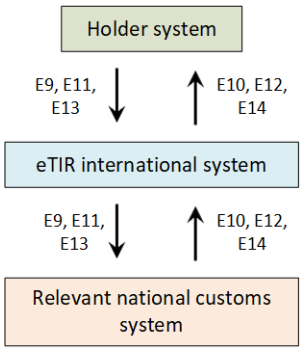
110. Since the competent authorities shall publish the list of all electronic means by which advance TIR data and advance amendment data can be submitted, the objective of this section is not to give a comprehensive list of these electronic means, but rather to provide details on the most common envisioned methods. The following sections use the term “advance data” to mention both advance TIR data and advance amendment data.

111. Only the normal processes are detailed in the sections below. The exceptional situations (like the impossibility to connect to the national customs system) that would require a fallback mechanism are not mentioned to avoid adding weight to the descriptions.

1. Submitting via the eTIR international system

112. The holder should be able to submit advance data to the relevant competent authorities via the eTIR international system. Several ways to do so can be envisioned (web portal, web services, etc.) and the solution involving web services is shown in the following figure.

Figure XIII
Via the eTIR international system, using web services

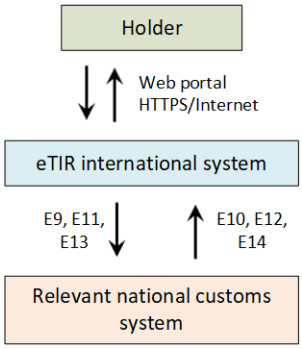


113. To use this approach, the holder must have previously connected its information system to the eTIR international system. Then, in order to submit advance data, the holder sends the relevant message (E9, E11 or E13) through its system to the eTIR international system.

114. The eTIR international system validates the message and immediately returns a response message to the holder if errors are found. If there are no errors, the eTIR international system forwards the message to the national customs system of the relevant customs authorities. The national customs system processes the message and returns a response (E10, E12 or E14) to the eTIR international system which forwards it to the holder system, which, in turn, processes it.

115. Another method using a web portal provided by the eTIR international system can be envisioned, as depicted in the following figure. The holder would connect to and authenticate with this web portal and submit advance data, for example by entering data into online forms, presented on web pages.

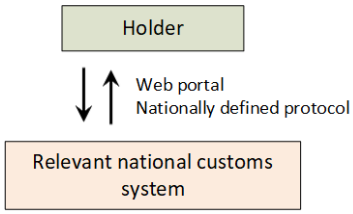
Figure XIV
Via the eTIR international system, using a web portal



2. Directly to the customs authorities

116. In several countries, the holder may be able to submit advance data to the relevant competent authorities directly. Several ways to do so can be envisioned (web portal, web services, etc.) and the solution involving a web portal is shown in the following figure.

Figure XV
Directly to customs, using a web portal



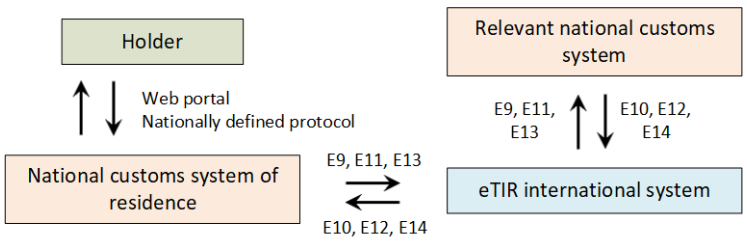
117. In order to submit advance data, the holder connects to and authenticates with the web portal provided by the relevant customs authorities. The holder submits advance data, for example by entering data into online forms, presented on web pages.

118. The data provided should be sufficient for the national customs system to fill in the "I7 – Record declaration data" message. This message should be sent to the eTIR international system later on, when the holder presents himself/herself with the goods and the road vehicle, the combination of vehicles or the container at the relevant customs office.

3. Via the customs authorities of the country residence of the holder

119. In several countries, the holder may be able to submit advance data to his or her customs authorities of residence, so that they can be forwarded to the relevant competent authorities. For example, in case the holder has completed a first TIR transport and has delivered goods from his or her country of residence A to a foreign country B, he or she may wish to initiate a second TIR transport and load goods in country B to deliver them in country A. In this case, if it is difficult for the holder to submit the advance TIR data to the customs authorities of country B (because of a different language, for instance), the holder may wish to submit the advance TIR data to the customs authorities of country B via the web portal of the customs authorities of country A as shown on the following figure.

Figure XVI
Via the web portal of the customs authorities of the country residence



120. In order to submit advance data, the holder connects to and authenticates with the web portal provided by the customs authorities of his or her country of residence. The holder submits advance data, for example by entering data into online forms, presented on web pages. Then, this national customs system forwards the advance data submitted by the holder to the eTIR international system, using web services, in the form of E9, E11 or E13 messages.

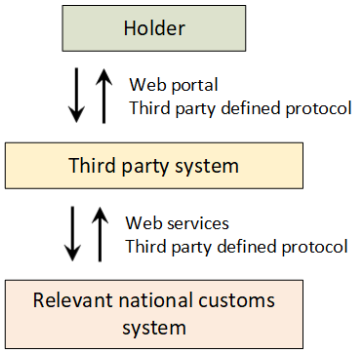
121. The eTIR international system validates the message and immediately returns a response message to the national customs system, if errors are found. If this is the case, the national customs system presents the errors to the holder so he or she can correct them. If there are no errors, the eTIR international system forwards the message to the national customs system of the relevant customs authorities. This system processes the message and returns a response (E10, E12 or E14) to the eTIR international system, which then forwards it to the national customs system of the country of residence of the holder which, in turn, presents the results to the holder.

122. It is to be noted that this method requires, as a prerequisite, that the customs authorities of the country of residence have implemented the E9, E11 and E13 messages to be sent to the eTIR international system (which are considered as optional messages in this direction). This should not be confounded with the same messages (E9, E11 and E13) that all national customs systems should be able to receive and process (see the first method: submitting via the eTIR international system).

4. Via a third party declaration services

123. In several countries, the holder may be able to submit advance data to the relevant competent authorities via the declaration services of a third party. Several ways to do so can be envisioned (web portal, web services, etc.) and the solution involving a web portal for the holder is shown in the following figure.

Figure XVII
Via the web portal of a third party



124. In order to submit advance data, the holder connects to and authenticates with the web portal provided by the third party. The holder submits advance data, for example by entering data into online forms, presented on web pages. These data are then sent to the national customs system of the relevant customs authorities using web services, the specifications of which are specific to the third party.

125. The data provided should be sufficient for the national customs system to fill in the "I7 – Record declaration data" message. This message should be sent to the eTIR international system, later on, when the holder presents himself/herself with the goods and the road vehicle, the combination of vehicles or the container at the relevant customs office.

126. It is to be noted that this method requires, as a prerequisite, a connection between the information systems of the third party and the national customs systems of the relevant customs authorities, using web services.

5. Via a third party and the eTIR international system

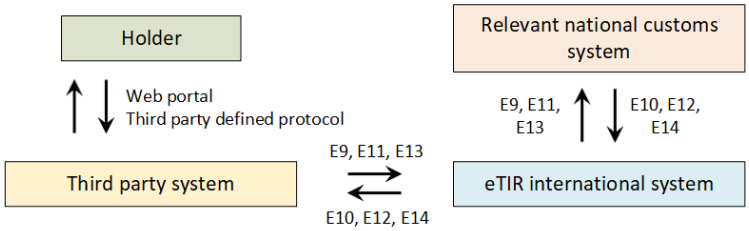
127. As the previous method requires a connection between the third party system and the national customs system of the relevant customs authorities, the third party may wish to

connect its information system directly with the eTIR international system, to benefit from the connection that the latter should establish with the national customs systems of all contracting parties to the TIR Convention bound by Annex 11.

128. In this case, the same scenario for the holder as the one described above applies. The difference happens behind the scene, as the third party forwards the advance data to the eTIR international system which, in turn, forwards the same data to the relevant customs authorities, as shown in the following figure.

Figure XVIII

Via the web portal of a third party and the eTIR international system



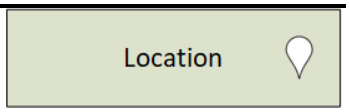
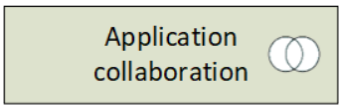
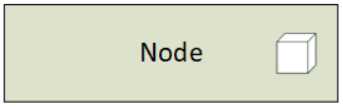
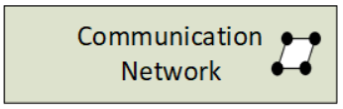
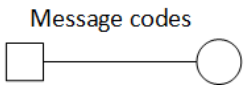
129. As in the first and third method described, the communication between the third party system and the eTIR international system is performed, using web services and the eTIR messages dedicated to advance data (E9/E10, E11/E12 and E13/E14). Similarly, advance data is forwarded to the national customs system of the relevant customs authorities, using the same messages described in the eTIR specifications.

Annex

Diagram notation

The ArchiMate (ArchiMate® 3.0.1 Specification. See: pubs.opengroup.org/architecture/archimate3-doc/) notation is used to represent the various architectural viewpoints in the diagrams of this document. Only the ArchiMate concepts used in the diagrams are described in the table below. Note that the colours used in the background of the shapes represent different actors or systems, not a particular ArchiMate concept.

Table 1
ArchiMate diagram notation

Concept	*Description*	*Symbol*
Location	A location is used to model the places where other concepts are located.	
Application Component	A modular, deployable, and replaceable part of a software system that encapsulates its behaviour and data and exposes these through a set of interfaces.	
Application collaboration	An application collaboration represents an aggregate of two or more application components that work together to perform collective application behaviour.	
Node	A node represents a computational or physical resource that hosts, manipulates, or interacts with other computational or physical resources.	
Communication Network	A communication network represents a set of structures that connects computer systems or other electronic devices for transmission, routing, and reception of data.	
Interface provided	Represents a point of access where application services are made available to another application component. The codes of the messages provided by this interface can be listed on top of the symbol.	
Interface required	Represents a need to connect to application services that are made available by another application component. The codes of the messages sent back through this interface can be listed on top of the symbol.