



**Electronic Signatures and Infrastructures (ESI);
Testing Conformance and Interoperability of
Registered Electronic Mail Services;
Part 2: Test suites for interoperability testing of
providers using same format and transport protocols**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Electronic Signatures and Infrastructures (ESI).

The present document is part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document defines:

- 1) A test suite for supporting interoperability tests within the field of Registered Electronic Mail (REM hereinafter) as specified in ETSI EN 319 532 parts 1 [3], 2 [4], 3 [5] and 4 [6]. The test suite defines test cases for the following environments:
 - Environments that correspond to the basic model as defined in ETSI EN 319 532-1 [3] where sender and all the entities at receiving side are subscribed to the same REMS. Test cases are defined for REMSs operating Store&Forward and for REMSs operating Store&Notify styles.
 - Environments that correspond to the 4-corner model as defined in ETSI EN 319 532-1 [3] where sender is subscribed to one REMS and the entities at receiving side are subscribed to another one, and no intermediate REMS is required for relaying REM messages between them. Test cases are defined for covering the three possible different combinations of styles, namely Store&Forward to Store&Forward, Store&Forward to Store&Notify, and Store&Notify to Store&Forward.
 - Environments that correspond to the extended model as defined in ETSI EN 319 532-1 [3] where sender is subscribed to one REMS and the entities at receiving side are subscribed to another one, and intermediate REMSs are required for relaying REM messages between them. Test cases are defined for covering two different combinations of styles, namely Store&Forward to Store&Forward to Store&Forward, Store&Forward to Store&Notify to Store&Forward.
- 2) A mechanism for documenting new test cases and expanding the aforementioned test suite.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 319 522-1: "Electronic Signatures and Infrastructures (ESI); Electronic Registered Delivery Services; Part 1: Framework and Architecture".
- [2] ETSI EN 319 522-2: "Electronic Signatures and Infrastructures (ESI); Electronic Registered Delivery Services; Part 2: Semantic contents".
- [3] ETSI EN 319 532-1: "Electronic Signatures and Infrastructures (ESI); Registered Electronic Mail (REM) Services; Part 1: Framework and Architecture".
- [4] ETSI EN 319 532-2: "Electronic Signatures and Infrastructures (ESI); Registered Electronic Mail (REM) Services; Part 2: Semantic Contents".
- [5] ETSI EN 319 532-3: "Electronic Signatures and Infrastructures (ESI); Registered Electronic Mail (REM) Services; Part 3: Formats".
- [6] ETSI EN 319 532-4: "Electronic Signatures and Infrastructures (ESI); Registered Electronic Mail (REM) Services; Part 4: Interoperability profiles".
- [7] IETF RFC 8118: "The application/pdf Media Type".

- [8] IETF RFC 2046: "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types".
- [9] IETF RFC 2183: "Communicating Presentation Information in Internet Messages: The Content-Disposition Header Field".
- [10] IETF RFC 5751: "Secure/Multipurpose Internet Mail Extensions (S/MIME) Version 3.2 Message Specification".
- [11] IETF RFC 5322: "Internet Message Format".
- [12] IETF RFC 2854: "The 'text/html' Media Type".
- [13] IETF RFC 7303: "XML Media Types".
- [14] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TS 119 534-1: "Electronic Signatures and Infrastructures (ESI); Testing Conformance and Interoperability of Registered Electronic Mail Services; Part 1: Testing conformance".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 319 532-1 [3] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACC_REJ_EXP	ACCEptanceREJectionEXPIry
CONS_ACC	CONSignmentACCEptance
CONS_NOT	CONSignmentNOTification
CONS_NOT_FAIL	CONSignmentNOTificationFAILure
CONS_REJ	CONSignmentREJection
CONT_CONS	CONTentCONSignment
CONT_CONS_FAIL	CONTentCONSignmentFAILure
CONT_HAND	CONTentHANDover
CONT_HAND_FAIL	CONTentHANDoverFAILure
ERDS	Electronic Registered Delivery
EV_SET	Evidence SET
IREMS	Intermediate Registered Electronic Mail Service

NOT_F_ACC	NOTificationForACceptance
NOT_F_ACC_FAIL	NOTificationForACceptanceFAILure
REC_F_NERDS	RECeivedFromNonERDS
REL_ACC	RELayACceptance
REL_FAIL	RELayFAILure
REL_REJ	RELayREJection
REL_T_NERDS	RELayToNonERDS
REL_T_NERDS_FAIL	RELayToNonERDSFAILure
REM	Registered Electronic Mail
REMS	Registered Electronic Mail Service
RREMS	Recipient's Registered Electronic Mail Service
SCN_ID	Scenario Identifier
SMIME	Secure/Multipurpose Internet Mail Extensions
SREMS	Sender's Registered Electronic Mail Service
SUB_ACC	SUBmissionACceptance
SUB_REJ	SUBmissionREJection

4 Technical approach

4.1 Components of test cases and their identifiers

As it has been mentioned before the present document defines:

- 1) A test suite for supporting interoperability tests within the field of Registered Electronic Mail (REM hereinafter) as specified in ETSI EN 319 532 parts 1 [3], 2 [4], 3 [5] and 4 [6].
- 2) A mechanism for documenting new test cases and expanding the aforementioned test suite.

The present document follows a layered approach for building the definition of the test cases in the test suite, which can be summarized as follows:

- 1) Clause 5 defines a number of parameterized scenarios. A scenario consists of a number of entities, namely: sender, one or more REMSs, and the entities at receiving side - one or more recipients and/or one or more recipients' delegates -, which exchange different REM messages with time. Each scenario corresponds to one of the three models presented in ETSI EN 319 532-1 [3]. This clause presents a template for defining one scenario, in a way that resembles to some templates used for defining use cases scenarios in software engineering.

This template:

- Includes the enumeration of all the REM messages exchanged by the participating entities. This list of exchanged REM messages is one of the parameters of the scenario.
- Also includes a list of ERDS evidence sets, which, in the scenario, are incorporated in some REM messages.

One scenario may be used for defining several test cases depending on:

- The specific components of each exchanged REM message (suppressing or adding an optional header, or changing the value of a certain header field results in a different REM message and consequently a different test case).
- The entities at receiving part (for instance, changing one recipient by one recipient's delegate, or two recipients and one recipient's delegate results in a different the test case).
- A named set of additional requirements (for instance whether the original message contains or not attachments, is signed, is encrypted, etc.).
- In negative test cases, i.e. test cases where the service failed in consigning or handing over the message to one or more recipients, the reason(s) causing that failure.

This means that one test case corresponds to one scenario where all the exchanged REM messages have been completely defined in terms of their components, all the participating entities have been established, and all the additional requirements have also been defined. Taking the functional notation this can be expressed as follows:

TestCase#i = Scenario_id(<Receiving side identifier>, <REM message identifier 1>, <REM message identifier 2>, ..., <REM message identifier N>, <additional requirements set identifier>, <failure reasons>?)

Where:

- <Receiving side identifier> is the identifier assigned to a certain set of entities at receiving side;
 - <REM message identifier I> is the identifier of a specific instantiation of the aforementioned REM message, namely: REM payload, REM notification, REM Receipt, or REM dispatch, which are defined in clauses 6.3, 6.4, 6.5 and 6.6 respectively.
 - <additional requirements set identifier> is the identifier of a named set of additional requirements. Clause 7.2 defines a number of these named sets.
 - <failure reason(s)>? is the reason(s) that caused that the service failed in consigning or handing over the message to the recipient(s). It shall only appear in negative test cases.
- 2) Clauses 6.3, 6.4, 6.5 and 6.6 define specific instantiations of REM payloads, REM notifications, REM receipts and REM dispatches respectively. Each type of REM message is composed by several MIME sections, with their headers and bodies. One specific instantiation of a certain type of REM message is composed by one specific combination of MIME sections. Each MIME section in turn is formed by one certain combination of headers and has a specific value in its body. The present document defines a number of combinations of MIME sections in clauses 6.2.2, 6.2.3, 6.2.4.3, 6.2.4.4, 6.2.5, 6.2.6, 6.2.7 and 6.2.8, and assigns to each one a unique identifier. This allows to use again the functional notation, and define one instantiation of a certain type of REM message as follows:

REM message instance = Sequence(<outer most MIME header identifier>, <signed data MIME header section identifier>, <multipart/alternative free text MIME section identifier>, <multipart/alternative html MIME section>, <original message MIME section identifier>?, <extension MIME section identifier>*, <ERDS evidence MIME section identifier>*, <signature MIME section identifier>)

Where ? indicates a cardinality 0 or 1 for the affected MIME section, and * indicates a cardinality of 0 or more for the affected MIME sections.

- 3) Clauses 6.2.2, 6.2.3, 6.2.4.3, 6.2.4.4, 6.2.5, 6.2.6, 6.2.7 and 6.2.8 define specific instances for the outermost MIME header, the signed data MIME header, the multipart/alternative free text MIME section, the multipart/alternative html MIME section, original message MIME section, the extension MIME section, the ERDS evidence MIME section, and the signature MIME section respectively. Each clause define different instances of the aforementioned headers and sections and assigns them unique identifiers that are used for defining specific instances of the different REM messages as shown above. Once this level is reached, the specific test case is fully defined as: a scenario where fully defined, REM messages are exchanged between a specific set participating entities, and where a specific set of additional requirements are imposed.

4.2 Adding new test cases to the test suite

The strategy followed for building the definitions of the test cases makes it easy to expand the test suite by incorporation of new test cases.

For defining a new test case the following steps are required:

- 1) Identify the **set of receiving entities**. If none of the predefined set of entities at the receiving side is the one required, define a new set as specified in clause 7.3. The sender is always present by default.
- 2) Define the REMSs that will participate in the test case.
- 3) If the set of participating REMSs is not equal to none of the scenarios already identified in the present document, the new scenario will require to be defined in a new template.

- 4) Identify the **sequence of actions** performed by each actor and their order of occurrence and assign a new unique identifier (<SCN_ID >) to the scenario.
- 5) Identify **all the REM messages** generated by the actors as they go through the sequence of actions. For each message:
 - a) Identify its MIME sections.
 - b) For each MIME section identified different than the ERDS MIME sections, check if its header fields combination and the corresponding bodies have already been defined in the present document. If not, add the required combination of header fields and body values to the repertoire of named combinations to the section defining instances of the aforementioned MIME section as in the corresponding clauses (clauses 6.2.2, 6.2.3, 6.2.4.3, 6.2.4.4, 6.2.6 or 6.2.8).
 - c) List all the REM messages exchanged as parameters of the scenario.
 - d) Identify the ERDS evidence format and the set of ERDS evidence for each REM message including them and add the names of the ERDS evidence sets to the Var section of the template.
- 6) Identify and define any other additional requirement for completely define the test case. If the set of requirements is different than all the sets already define, assign a name to it (<ADD_REQ_COMB>) and add it to the repertoire of named sets of additional requirements in Table 23 (clause 7.2).

5 Scenarios

5.1 Introduction

The present clause defines a number of selected scenarios that will be used in clause 8.

Clause 5.3 defines scenarios where sender and recipient(s) are subscribed to the same REMS.

Clause 5.4 defines scenarios where the sender and the recipient(s) are subscribed to different REMSs and there are not intermediate REMSs between them.

Clause 5.5 defines scenarios where sender is subscribed to a REMS and the recipient(s) is(are) not subscribed to the same REMS and there are one or more intermediate REMSs.

Unless anything said against it, all the scenarios assume that there are N entities at the receiving side.

Unless anything said against it, all the ERDS evidences that can contain details of different entities at the receiving side shall incorporate the details of the entire set of N entities at the receiving side.

Table 1 shows the template for defining one scenario.

Table 1: Template for the tabular definition of one scenario

Scenario id: <SCN_ID>			Purpose
Parameter: <REMS_receipt>_with_XML_SUB_REJ <Parameter 1 that helps to fully specify the scenario. Their number depends on the specific scenario>		Var EV_SET#1 = {..., ...} Named sets of ERDS evidence used in the definition of the scenario.	
Parameter: <Parameter 2>		Var EV_SET#2 = {... ..}	
Parameter: <Parameter N>		Var EV_SET#N = {... ..}	
Sequence of actions			
<SEQUENCE OF ACTIONS. THERE IS ONE COLUMN PER PARTICIPATING ACTOR>			
#	Sender	REMS	Receiving side
The sequence is composed of a number of numerated steps, when the actors perform certain actions as shown below. Some frequent actions: send original message, accept submission, reject submission, consign, generate one ERDS evidence, generate one REM message, etc.			
1	Sender sends original message		
2		Rejects submission. Generates XML_SUB_REJ ERDS evidence	
3		Generates <REMS_receipt>_with_XML_SUB_REJ	
4		Sends <REMS_receipt>_with_XML_SUB_REJ	
5	Receives <REMS_receipt>_with_XML_SUB_REJ		

Each scenario is assigned a unique identifier <SCN_ID>. The reasons why the scenario has been defined are shown in column "Purpose".

The definition of each scenario requires that parties exchange a number of REM messages, which appear listed as parameters in the rows immediately below the headers row. Its number depends on the specific scenario.

Below the list of parameters the table shows a sequence of actions performed by different involved entities, which results in that a set of REM messages is generated and exchanged.

The definition of each scenario also can use a number of named ERDS evidence sets, which are listed in cells started with Var. Each ERDS evidence set is given a name EV_SET#<i>, being <i> a non-negative integer number.

The involved entities are sender (or sender's delegate, the scenario definition does not make any distinction between them), one or more REMSs, and the entities at the receiving side (for the same scenario there may be different sets of entities, for instance one recipient, one recipient's delegate, one or more recipients, or one or more recipients and one or more recipients' delegates).

Each step is assigned a positive integer number. The actions performed include: submission of messages, generation of REM messages, generation of ERDS evidence, acceptance of REM messages, rejection of REM messages, consignment of REM messages, retrieval of REM messages by entities at receiving side, failures, etc.

5.2 Abbreviations used in tables defining scenarios

The present clause shows some abbreviations (which have already been anticipated in clause 3.3 which have already been anticipated in clause 3.3) used in the tables that define the scenarios.

Table 2 shows the abbreviations used for the different ERDS evidence.

Table 2: ERDS evidence abbreviations

ERDS Evidence name	ERDS Evidence abbreviation
SubmissionAcceptance	SUB_ACC
SubmissionRejection	SUB_REJ
RelayAcceptance	REL_ACC
RelayRejection	REL_REJ
RelayFailure	REL_FAIL
NotificationForAcceptance	NOT_F_ACC
NotificationForAcceptanceFailure	NOT_F_ACC_FAIL
ConsignmentAcceptance	CONS_ACC
ConsignmentRejection	CONS_REJ
AcceptanceRejectionExpiry	ACC_REJ_EXP
ContentConsignment	CONT_CONS
ContentConsignmentFailure	CONT_CONS_FAIL
ConsignmentNotification	CONS_NOT
ConsignmentNotificationFailure	CONS_NOT_FAIL
ContentHandover	CONT_HAND
ContentHandoverFailure	CONT_HAND_FAIL
RelayToNonERDS	REL_T_NERDS
RelayToNonERDSFailure	REL_T_NERDS_FAIL
ReceivedFromNonERDS	REC_F_NERDS

ETSI EN 319 522-1 [1] specify a XML format for ERDS evidence, but also allows that they are PDF documents. The present document differentiates both cases using a prefix for the ERDS evidence abbreviations as follows:

- **XML_** prefix indicates that the identified object is a XML ERDS evidence;
- **PDF_** prefix that the identified object is a PDF ERDS evidence.

EXAMPLE: The abbreviation for the XML SubmissionAcceptance ERDS evidence will be **XML_SUB_ACC**.
The abbreviation for the PDF SubmissionAcceptance ERDS evidence will be **PDF_SUB_ACC**.

The tables defining the Scenarios use the following abbreviations for the different participating REMSs:

- **SREMS** stands for the REMS serving the sender, in the scenarios where it is different from the REMS serving the entities at receiving side.
- **RREMS** stands for the REMS serving the entities at receiving side, in the scenarios where it is different from the REMS serving the sender.
- **IREMS** stands for a REMS that directly serves neither the sender nor the recipient(s)/recipient's delegate, but instead is an intermediate REMS that relays REM messages from SREMS to RREMS and from RREMS to SREMS.

5.3 Black-box model scenarios

5.3.1 Introduction

This clause defines scenarios where the sender and the entities at the receiving side are subscribed to the same REMS and consequently REM messages are not relayed between different REMSs.

Clause 5.3.2 defines scenarios where the REMS operates in Store and Forward style.

Clause 5.3.3 defines scenarios where the REMS operates in Store and Notify style.

5.3.2 Scenarios for Store and Forward style

Table 3 defines a number of scenarios for the case where sender and the entities at receiving side are subscribed to the same REMS operating in Store and Forward style.

Table 3: Scenarios for intra-REMS operating in Store and Forward style (1/13)

Scenario id: REMS_SF#1				Purpose
Parameter: <REMS_receipt>_with_XML_SUB_REJ				The simplest scenario: the REMS rejects the original message submitted by the sender because a unique reason, and sends back a REM receipt with the SubmissionRejection ERDS evidence
Sequence of actions				
#	Sender	REMS	Receiving side	
1	Sender sends original message			
2		Rejects submission. Generates SUB_REJ ERDS evidence with details of the N recipients		
3		Generates <REMS_receipt>_with_XML_SUB_REJ		
4		Sends REMS receipt to the sender		
5	Receives REMS receipt			

NOTE 1: As it has been anticipated, negative scenarios like this one do not mention the reason for failure. This is a separated parameter for the test case definition in clause 8.

Table 3a: Scenarios for intra-REMS operating in Store and Forward style (2/13)

Scenario id: REMS_SF#2				Purpose
Parameter: <REMS_receipt>_with_XML_SUB_REJ		Var EV_SET#1 = {2 XML_SUB_REJ }		As before but now the REMS rejects the original message submitted by the sender because of one reason for M entities at the receiving side and because another reason for the other N-M entities. It generates two SubmissionRejection ERDS evidences it and sends back a REM receipt with these two SubmissionRejection ERDS evidences
Sequence of actions				
#	Sender	REMS	Receiving side	
1	Sender sends original message			
2		Rejects submission. Generates 2 XML_SUB_REJ ERDS evidences. One of them with details of M entities; the other with details of N-M entities		
3		Generates <REMS_receipt>_with the 2_ aforementioned XML_SUB_REJ		
4		Sends REMS receipt to the sender		
5	Receives REMS receipt			