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EUROSYSTEM SINGLE MARKET INFRASTRUCTURE GATEWAY (ESMIG)

TECHNICAL REQUIREMENTS AND COMPLIANCE CHECK

- Attachment 1.1 to the Concession Contract -

TABLE OF CONTENT

1. INTRODUCTION

The Eurosystem operates the financial market infrastructure for the settlement of payments (TARGET2), TARGET Instant Payment Settlement (TIPS) and securities (TARGET2-Securities, or T2S). These platforms form the backbone of the European financial market.

TARGET2 is the real-time gross settlement (RTGS) system. Central banks and commercial banks can submit payment orders in euro to TARGET2, where they are processed and settled in central bank money, i.e. money held in an account with a central bank.

When investors buy and sell securities the security and payment need to change hands – a process called securities settlement. TARGET2-Securities, or T2S, is a safe platform where the exchange can happen simultaneously, i.e. where delivery versus payment is possible.

TIPS is a new market infrastructure service launched in November 2018. It enables payment service providers to offer their customers the possibility to transfer funds in real time and around the clock, every day of the year. This means that thanks to TIPS, individuals and firms are able to transfer money between each other within seconds.

The Eurosystem has launched a project to consolidate TARGET2 and T2S, in terms of both technical and functional aspects. The objective is to meet changing market demands by replacing TARGET2 with a new real-time gross settlement (RTGS) system and optimising liquidity management across all ESMIG. The new consolidated platform will be launched in November 2021.

Another project was launched to implement a common Eurosystem Collateral Management System (ECMS) for managing eligible assets as collateral in credit/liquidity absorbing operations. This single system will replace the current fragmented and decentralised structure composed of 19 local NCBs' collateral management systems. The ECMS will be launched in November 2022.

T2, T2S, TIPS and ECMS are reachable via the Eurosystem Single Market Infrastructure Gateway (ESMIG). The ESMIG is accessed by the Directly Connected Actors (Di.Co.A.) in two modes: "application to application" (A2A) and "user to application" (U2A). The A2A interaction is achieved through two different protocols: Data Exchange Protocol (DEP) and the Message Exchange Processing for TIPS (MEPT).

This document contains the technical requirements that the NSP has to fulfil and the compliance check describing the test cases. Test cases are mapped one to one against the technical requirements.

2. THE COMPLIANCE CHECK WORKFLOW

The criteria for accessing to the compliance check are defined in the following. This section recalls for convenience the two most relevant steps:

- STEP 1 – Project check
- STEP 2 – Running through the test cases

Step 1 is preliminary to the Step 2.

STEP 1 – Project check

In the Technical Solution, the NSP describes the overall architecture by analysing the solution (including technological implementation details from the physical layer to the application layer), the integration among the different components involved in the solution and how the various systems are managed through their respective element managers. The Technical Solution must describe the Connectivity Services and how does the infrastructure looks like. It also must illustrate how all the requirements are matched, i.e. it must correlate the implementation details of the solution to all of the Requirement IDs. The Technical Solution is accepted by the ESMIG OPERATOR only upon successful verification that it meets all the above requirements.

STEP 2 – Running through the test cases

All tests will be conducted on site (i.e. in Banca d'Italia) in cooperation with the NSP. If no Di.Co.A.s are ready in time for the testing phase, they will be emulated by a Di.Co.A. emulator.

Every test case is split into four sections:

1. *Detailed test procedure*: how to perform the test;
2. *Expected result*: what is the outcome of test, i.e. what is the result of the detailed test procedure;
3. *Outcome*: the actual test result; a test can either fail or pass, if it fails then a follow up action is triggered, if it passes then no follow up action is needed and it is possible to proceed straight with the next test;
4. *Formal acceptance*: contains the signatures of the ESMIG Operator testing team staff and the NSP testing team staff performing the test all formally accepting the test result.

Some tests are run in *negative mode*: not only the functionality of the given test condition must be shown, but also additional tests are run to show that in the case that the test condition is not fulfilled, the test result is either a reject or drop.

If a test case identifies a defect and triggers corrective actions, these actions shall be addressed before the end of the user testing phase. Any defect should be remedied or a workaround must have been agreed before the formal acceptance.

Acceptance Test Criteria

Three types of criteria govern the Compliance Check Procedure. The entrance criteria have to be met before the Compliance Check Procedure is started. The acceptance criteria determine the successful completion of the test cases. If the termination criteria are fulfilled, the testing has to be suspended due to major technical issues or immaturity of the solution.

Entrance criteria

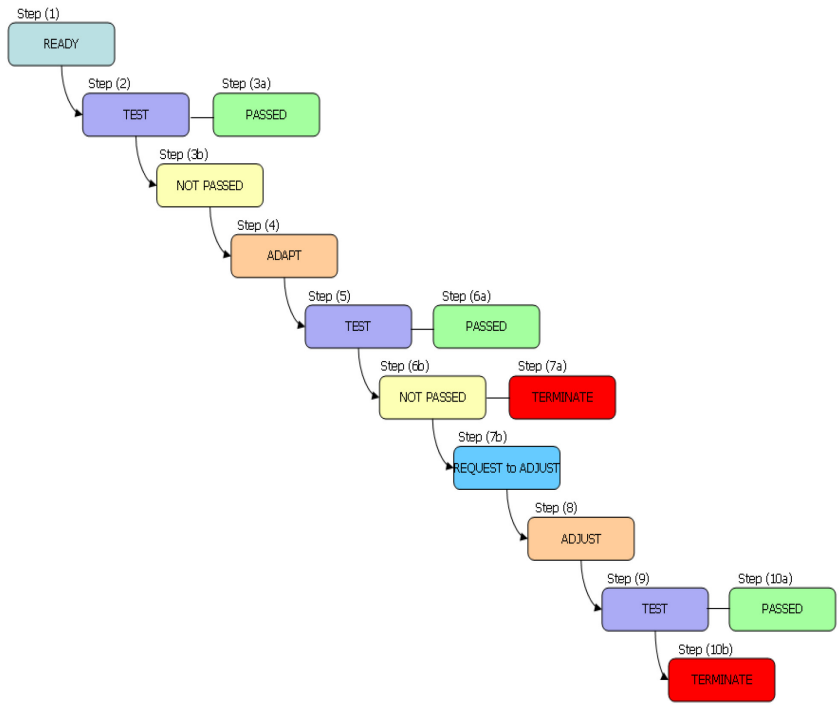
As an entrance criterion, the NSP has passed Step 1 and then communicated to the ESMIG Operator the readiness of its Network for acceptance testing. The NSP has provided to the ESMIG Operator confirmation of the successful completion of the NSP's internal tests. After the ESMIG Operator confirmed the readiness for the Compliance Check Procedure, an acceptance entrance meeting has been held and the ESMIG Operator and the NSP have agreed to start acceptance testing activities.

Acceptance criteria

The acceptance testing phase is completed when all of the following conditions are matched:

- all acceptance test cases have been executed;
- except otherwise agreed with a specific action plan, the NSP has resolved all reported defects;
- all contingency plans and procedures have been successfully tested;
- the NSP's infrastructure has been running without major issues or incidents for at least 7 consecutive calendar days;
- the NSP and the ESMIG Operator have held an acceptance testing exit meeting and agree that the acceptance testing stage has been successfully completed.

The following picture gives a visual representation:



The acceptance flow can be split into 10 different steps: (step 1) ready for acceptance, (step 2) performing the tests, (step 3a) all tests are passed, or (step 3b) some tests are not passed, (step 4) adapt[1], (step 5) tests are repeated, (step 6) some tests are not passed, (step 7a) terminate (i.e. test case is failed), or (step 7b) request to adjust, (step

[1] The "adaptation" starts with listing the deficiency(ies) during the test, then the analysis of the deficiencies by the NSP can lead to a list of remediation to be taken.

8) adjust, (step 9) tests are repeated, (step 10a) all tests are passed, or (step 10b) terminate (i.e. test case is failed).

Termination criteria

If 12 tests have failed, acceptance testing is interrupted for a week. A meeting will be scheduled to check if and what corrective measures can be taken. The staff involved in the acceptance testing shall agree on the measures and a schedule for the next steps.

If the NSP then still fails a repeated set of at least 6 tests, the ESMIG Operator shall be entitled to terminate the Concession Contract.

3. SERVICE LIFECYCLE

3.1 Governance

Project Managers

Requirement ID	ESMIG.30010

The NSP must appoint a Project Manager (PM) who is the responsible central contact person coordinating all required activities and who will communicate with the ESMIG Operator.

The PM has the following duties:

- to maintain the relationship with the ESMIG Operator;
- to coordinate the rollout of the NSP solution;
- to cope with all the issues during the rollout and, when needed, escalate the problem internally within the NSP's organisation;
- to monitor the deadlines of the implementation schedule;
- to prepare a monthly project progress report and to have regular meetings with the ESMIG Operator.

Detailed test procedure:	The NSP' PM is appointed, he/she is the central contact person coordinating all required project activities and central point for coordinating the communication with ESMIG PM. [desk check] Jointly review the relevant documentation provided by the NSP (desk check). List the PM's duties as outlined in the applicable NSP's documentation. Compare the list with the duties outlined above. [desk check]
Expected result:	The NSP has appointed their own PM, the ESMIG Operator is informed about the PMs contact details and the PM is in charge of the duties outlined above.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team _____ date____/____/____

Connectivity service catalogue

Requirement ID	ESMIG.30020

The NSP must develop a catalogue of Connectivity Services as part of the ESMIG overall service catalogue to the ESMIG Operator and the Di.Co.A.s. The content of the Connectivity Services catalogue includes, at least, a description of detailed services and service levels (such as detailing performance, availability and support commitments).

The content of the Connectivity Services catalogue includes the services the NSP offers including:

- Detailed Services,
- Service Levels, performances, availability and support commitments,
- Support for dedicated connectivity solutions,
- Support for backup/Alternative network access solutions,
- Procedures to assure the continuity of service operation.

Detailed test procedure:	Jointly read the Connectivity Service catalogue, verify that it includes a description of detailed services and service levels. The Connectivity Service catalogue contains the topics listed above. [desk check]
Expected result:	The NSP has a Connectivity Service catalogue with all the expected contents.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Operation and Escalation manual

Requirement ID	ESMIG.30030

The NSP must provide the ESMIG Operator with the following documents:

1. **Operations Manual**, which describes the network related components installed in the premises of the ESMIG Operator and contains a complete list of monitored elements and the operational procedures specific to the ESMIG Operator – NSP relation;
2. **Escalation Manual**, which formalises the escalation process in normal and abnormal situations;
3. **User Guides**, which include the detailed technical information needed to install necessary software and hardware infrastructure and make use of the provided services.

It is up to the NSP to consolidate more than a single manual into a single deliverable.

The NSP is the owner of its manuals and is responsible for any updates.

Detailed test procedure:	Jointly read the documentation written by the NSP (the Operations Manual, the Escalation Manual and the User Guides) and check if the contents are as expected. [desk check]
Expected result:	The NSP provides and maintains the Operations Manual, the Escalation Manual and the User Guides. Responsibilities are clearly assigned. To ensure the accuracy of the manuals the ESMIG Operator may submit its observations to NSP and the NSP has to take them on board.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Escalation contacts

Requirement ID	ESMIG.30040

The NSP must maintain the escalation contacts within the Operation Manual.

Detailed test procedure:	The NSP Operational Manual contains the escalation contact and the NSP is committed in updating the contact list. [desk check]
Expected result:	Escalation contacts are up to date.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Service Report and Service Compliance Meeting

Requirement ID	ESMIG.30050

The NSP must report on a monthly basis to the ESMIG Operator the availability of the service connections bandwidth utilization, service incidents, SLAs and open points. The report is discussed and reviewed during a monthly Service Compliance Meeting hosted by the ESMIG Operator.

Detailed test procedure:	Read the monthly report on monitored elements. In case a Service Report is not yet available – because for example the infrastructure has just been setup - then agree on the report mock-up, ie. how the report looks like and what contents are expected to be in the report. [desk check]
Expected result:	The NSP prepares, on a monthly basis, reports on the availability of the monitored communication elements and on the bandwidth utilization of the WAN links.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Service Manager

Requirement ID	ESMIG. 30060

After the go-live, the NSP must appoint a Service Manager (SM) that shall act as unique point of contact for all the Service Compliance related issue.

The SM has the following duties:

- to cope with all the issues during the service lifecycle and, when needed, escalate the problem internally within the NSP's organisation;
- to act as unique point of contact for any request for change submitted by the Eurosystem;
- to verify the status of the Service with periodic meetings and produce the Service Status Report;
- to guarantee the service levels are met.

Detailed test procedure:	Verify on the Operational Manual or any other relevant documentation that the SM duties are clearly described and check whether a SM has been appointed. [desk check]
Expected result:	The NSP has appointed a SM whose roles and responsibilities are clearly identified
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

NSP Technical Solution

Requirement ID	ESMIG.30070

The NSP must provide to ESMIG Operator a comprehensive description of its Technical Solution, encompassing:

- network connectivity (Data centre Connectivity, ESMIG Connectivity, Network Topology, Location of ESMIG Operator data centres, Location of NSP's data centres, Network Access methods, List of Equipment at each ESMIG Operator data centre, Integrity and Confidentiality of Data over the Network, Network Address Translation (NAT), Routing Protocols, Cluster Redundancy Protocol (for example VRRP, FGCP, …), Service Presentation and Demarcation Line, Traffic in the NSP Network for ESMIG, Traffic in the NSP Network for Di.Co.A.);
- secure messaging services covering both A2A (MEPT and DEP) and U2A, NOC, NSP's Network Gateways, GCA, NSP's network Services, A2A Messaging Services, Timestamp service, Scalability and failover in NSP's network, WMQ Connection, Client-server connection, Channel and queue configuration, ESMIG Application Flow, A2A Instant Message, File Store-and-forward, A2A Closed Group of Users Solution, Addressing model, CGU definition, CGU Management, User to Application (U2A), User Authentication, User Authorisation, CGU definition, CGU management, Resiliency, Di.Co.A. Emulator);
- security features (Closed Group of Users (CGU), Key Management, A2A Signature and Non-Repudiation Certificate, U2A authentication, Cryptographic Devices, Processes and Roles);
- operational processes (Customer On boarding, Incident/Problem Management, Change Management, Service Monitoring, Business Continuity Services, Network Connectivity Business Continuity, NSP Business Continuity, Di.Co.A. Business Continuity).

The NSP technical description must include a reference to each requirement defined in this document.

Detailed test procedure:	Analyse the Technical Solution deliverable and make sure all requirements are addressed. [desk check]
Expected result:	The NSP has produced a deliverable describing the Technical Solution, where it is plainly and precisely described how all requirements are going to be met.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Delivery of the NSP Technical Solution

Requirement ID	ESMIG.30080

The NSP must deliver the technical infrastructure and necessary software components as described in the NSP's Technical Solution deliverable. Please notice this applies to ESMIG sites, Di.Co.A. Emulator e NSP data centres.

Detailed test procedure:	Check the part list against the Technical Solution and verify jointly that all HW and SW has been installed and configured. [on field]
Expected result:	Technical infrastructure (HW and SW) components have been delivered by the NSP and are installed in the ESMIG sites, i.e. all equipment and applications have been delivered.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

NSP footprint in the ESMIG Platform

Requirement ID	ESMIG.30090

The NSP must deliver their equipment in the sites of the 4CB, located in two different countries. The 4CB data centres are located in Rome and Frankfurt.

The two sites of a NCB are also named as “region”.

T2 and T2S are deployed in both regions, while TIPS is deployed only in the Italian region.

Detailed test procedure:	The NSP has rolled out the solution in the two data centres in Rome and the other two data centres in Frankfurt. [on field]
Expected result:	The NSP footprint is in line with the Technical Solution.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.2 Change management

Change management

Requirement ID	ESMIG.30100

The NSP must apply a change management process covering all of its components (NSP's Network Gateways and network devices). This process is described in the Operation Manual and it will be compliant with Art. 9 of the Concession Contract.

Detailed test procedure:	NSP has a change management process described in the Operational Manual. [desk check]
Expected result:	The NSP applies a strict change management applicable both to Network Gateways and network devices.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.3 Incident management

Incident Management

Requirement ID	ESMIG.30110

The NSP must have an Incident Management process to detect, notify, escalate and resolve any service related failure.

Detailed test procedure:	Verify the NSP has an operational procedure to handle incidents and failures. Review the section concerning the relevant process handling, and verify the notification and escalation processes. [desk check] Simulate a failure disabling the corresponding Ethernet interface(s) on the demarcation. Verify this event is perceived by the NSP's monitoring, check if it triggers an alarm, see how the alarm is handled, and follow it through the incident management process. [on field]
Expected result:	The NSP has developed an operational procedure to detect, notify, escalate and resolve incidents and failures.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

NSP Support Teams

Requirement ID	ESMIG.30120

The NSP must have Support Teams available 24 hours a day, seven days a week, all year around. The NSP Support Teams operate according to the procedures described in the Operation and Escalation manuals.

Detailed test procedure:	Verify how it is possible to contact the NSP Support Teams. Verify the service level offered by the NSP to ESMIG Operator in the available documentation, , and check the service hours. Verify whether an escalation procedure is contained in the manual. [desk check]
Expected result:	The ESMIG Operator can contact NSP Support Teams 7x24x365. The NSP's Support Teams are aware of the procedure described in the Escalation Manual.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Trouble ticketing management

Requirement ID	ESMIG.30130

The NSP must have a central Trouble Ticketing System (TTS) accessible via Internet.

Detailed test procedure:	An ESMIG Operator logs-in the NSP's TTS via the internet, opens a case for testing purposes, and verifies which input fields are available and the time stamp. [on field]
Expected result:	The NSP's TTS records all actions and time stamps at which a service request/update takes place. TTS is accessible via Internet to both the Di.Co.A.s and the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Incident reports

Requirement ID	ESMIG.30140

The NSP must provide to the ESMIG Operator on a monthly basis a list of all incidents handled during the reporting period. The NSP could produce a report in line with their standard internal procedure.

In case of High Priority Incident, the NSP must produce and deliver an incident report to the ESMIG Operator within 24 hours from the occurrence of the incident.

Detailed test procedure:	Check the format and contents of the NSP's monthly reports. Look for the following information: case creation date/time, case closure date/time, impacted Di.Co.A.s, severity of the incident and incident description and reason for closure. NSP provides further details about parameters and values contained in the report upon request. [desk check]
Expected result:	The NSP provides a monthly report containing all the information described in the technical requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Security Incident Handling

Requirement ID	ESMIG.30150

The NSP must report immediately any security incident to the ESMIG Operator.

Detailed test procedure:	Verify that the NSP has an operational procedure to report any security incident to the ESMIG Operator. Verify whether this procedure regulates how to contact the ESMIG Operator and how to manage the information sharing. [desk check]
Expected result:	The NSP has an operational procedure to report any security incident to the ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.4 Problem management

Problem management

Requirement ID	ESMIG.30160

The NSP must have a Problem Management process to detect and resolve the root cause of incidents.

Major problems must be periodically addressed with the ESMIG Operator during the Service Compliance Meeting.

Detailed test procedure:	Verify that the NSP has a process to detect and resolve the root cause of incidents. Verify whether this process includes exhaustive reporting of Major problem that will be addressed in the Compliance Meeting with the ESMIG Operator. [desk check]
Expected result:	The NSP has a process to detect and resolve the root cause of incidents.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.5 Event Management (Monitoring)

Monitoring of NSP infrastructure

Requirement ID	ESMIG.30170

The NSP must proactively monitor all the components of the deployed infrastructure.

Detailed test procedure:	Part I: The Technical Solution document contains a list of the NSP's components. Jointly assess how the NSP monitors the infrastructure (i.e. provides evidence of the monitoring operational procedures). [desk check] Part II: Simulate a failure and check the relevant events are reported on the NSP's monitoring facility, i.e. all failure events are visible on the monitoring facility and an alarm is triggered. Restore to normal operation and verify that the event is cleared. The test is expected to cover at least the following scenario: 1. Simulate a WAN failure and check the relevant indication on the monitoring facility. Restore to normal operation. 2. Simulate a Network Gateway failure and check the relevant indication on the monitoring facility. Restore to normal operation. 3. Simulate an Ethernet interface failure on the demarcation (§ LAN interface specifications) and check the relevant indication on the monitoring facility. Restore to normal operation. [on field]
Expected result:	The NSP gives evidence that all his components are monitored by the NSP.
Outcome:	Please describe the test result: [] PASSED [] FAILED

	If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Monitoring NSP's Network Gateways and network devices through SNMP v.3

Requirement ID	ESMIG.30180

NSP’s components (Network Gateways and network devices) must send SNMP v.3 traps to the ESMIG network monitoring platform. The list of events is bilaterally agreed.

Detailed test procedure:	Ensure a list of relevant events has been bilaterally agreed. Trigger one of such events (for example multiple failure of login attempts or device failure) and verify a SNMP trap is sent from NSP to the ESMIG Operator. [on field]
Expected result:	The NSP triggers an automated SNMP alert in case of occurrence of a monitored event.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.6 IT Service Continuity Management

Support to ESMIG Business Continuity

Requirement ID	ESMIG.30190

The NSP Technical Solution must support the ESMIG Business Continuity ensuring no impact affects the Di.Co.A. technical configuration: in case of ESMIG site recovery, regional recovery or periodic rotations no change is requested to Di.Co.As..

Detailed test procedure:	Part I: Simulate a Business Continuity scenario, i.e. a site isolation of the active site. Simulate a site A failure (disable the interface(s) on the ESMIG DMZ switch where the NSP demarcation is connected), check if the Di.Co.A. Emulator is able to access the ESMIG seamlessly (without any impact or change to the configuration). Restore to normal operation. Part II: Simulate a Business Continuity scenario, i.e. a regional isolation of the active region. Simulate a site A and B failure (disable the interfaces on the ESMIG DMZ switch where the NSP demarcation is connected), check if the Di.Co.A. Emulator is able to access the ESMIG seamlessly (without any impact or change to the configuration). Restore to normal operation. [on field]
Expected result:	The NSP supports both Business Continuity scenarios (site isolation and regional isolation) without any user intervention or impact on Di.Co.A..
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

T2 Business Continuity time objectives

Requirement ID	ESMIG.30200

The NSP supports the T2 Business Continuity with the following time objectives:

- in case of intra-region recovery, between primary and secondary Site in the same region, upon request of the ESMIG Operator, the NSP switches the traffic between the sites in less than 15 minutes;
- in case of inter-region recovery between two Regions (on request of the ESMIG Operator) and/or on periodic rotation occurrence (almost every six months), the NSP shall switch the traffic between the Regions in less than 30 minutes.

Detailed test procedure:	Part I (intra-region recovery): Test the business continuity scenario (intra-region recovery) and take note of how long it takes to recover the full service operation: disable the service on the primary site and clock the time elapsed for service recovery. Part II (inter-region recovery): Test the business continuity scenario (inter-region recovery) and take note of how long it takes to recover the full service operation: disable the service on the primary site and clock the time elapsed for service recovery. [on field]
Expected result:	The NSP supports T2 Business Continuity scenarios (site isolation and regional isolation) within the expected time limits.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

T2S Business Continuity time objectives

Requirement ID	ESMIG.30210

The NSP supports the T2S Business Continuity with the following time objectives:

- in case of intra-region recovery, between primary and secondary Site in the same region, upon request of the ESMIG Operator, the NSP switches the traffic between the sites in less than 15 minutes;
- in case of inter-region recovery between two Regions (on request of the ESMIG Operator) and/or on periodic rotation occurrence (almost every six months), the NSP shall switch the traffic between the Regions in less than 30 minutes.

Detailed test procedure:	Part I (intra-region recovery): Test the business continuity scenario (intra-region recovery) and take note of how long it takes to recover the full service operation: disable the service on the primary site and clock the time elapsed for service recovery. Part II (inter-region recovery): Test the business continuity scenario (inter-region recovery) and take note of how long it takes to recover the full service operation: disable the service on the primary site and clock the time elapsed for service recovery. [on field]
Expected result:	The NSP supports T2S Business Continuity scenarios (site isolation and regional isolation) within the expected time limits.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

TIPS Business Continuity time objectives

Requirement ID	ESMIG.30220

The NSP supports the TIPS Business Continuity with the following time objectives:

- in case of intra-region recovery, between primary and secondary Site in the same region, upon request of the ESMIG Operator, the NSP switches the traffic between the sites in less than 15 minutes;
- should the second Region be implemented:
  - in case of inter-region recovery (on request of the ESMIG Operator) and/or on periodic rotation occurrence (almost every six months), the NSP shall switch the traffic between the Regions in less than 30 minutes.

Detailed test procedure:	Part I (intra-region recovery): Test the business continuity scenario (intra-region recovery) and take note of how long it takes to recover the full service operation: disable the service on the primary site and clock the time elapsed for service recovery. Part II (inter-region recovery): The inter-region scenario is currently not envisaged but it was mentioned to assure that NSP will be able to implement it in the future if requested. [on field]
Expected result:	The NSP supports TIPS Business Continuity scenarios (site isolation and, if implemented, regional isolation) within the expected time limits.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

NSP Business Continuity time objectives

Requirement ID	ESMIG. 30230

The NSP shall have in place a solution for the business continuity based on two sites with different risk profiles. A third backup site shall be available to restart from an empty state in the extreme unlikely event of the loss of the primary sites, i.e. cold restart.

The NSP shall manage its disaster recovery solution, which affects the ESMIG connectivity Services, with the following time objectives:

- in case of loss of one of the primary sites the NSP switches the traffic in less than 15 minutes with no data loss;
- in case of loss of both the primary sites the NSP shall activate the backup site in less than 45 minutes in zeroed state. The NSP shall define the procedures with the Direct Connected Actors and the ESMIG Operator to recover the lost traffic.

Detailed test procedure:	Part I (loss of one primary site): Test the business continuity scenario (loss of one primary site) and take note of how long it takes to recover the full service operation: disable the service on one of the primary sites and clock the time elapsed for service recovery. Part II (loss of both primary sites): Test the business continuity scenario (loss of both the primary sites) and take note of how long it takes to recover the operation: disable the service on both the primary sites and clock the time elapsed for service recovery (with empty state). [on field]
Expected result:	The NSP supports Business Continuity scenarios within the expected time limits.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

No single point of failure

Requirement ID	ESMIG.30240

The NSP Technical Solution (and the corresponding roll-out) must avoid any single point of failure (SPOF), i.e. any software or hardware component must be redundant.

Detailed test procedure:	Inspect the Technical Solution and verify whether the technical infrastructure is designed with full redundancy. Prove there is no single point of failure. [desk check] Inspect the implementation rolled-out and check whether it is in line with the technical requirements. Identify deficiencies (if any) and agree on corrective measures to be taken. [on field]
Expected result:	The NSP designs and implements the solution avoiding any single point of failure (SPoF). Additional software and hardware components are redundant.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

DNS functionalities for Business Continuity

Requirement ID	ESMIG.30250

The NSP connects to the ESMIG Domain Name System (DNS) to obtain automatically the current location of the services and URL for A2A and U2A. The ESMIG communicates to the NSP one IP address for each site where a DNS server system - able to provide IP address information to the NSP - will be activated.

It is also possible to agree with the ESMIG alternative non DNS based solutions. In such a case, also a specific detailed test procedure has to be bilaterally agreed.

Detailed test procedure:	Part I – in case there is a DNS Identify the ESMIG DNS servers. ESMIG has communicated to the NSP four IP addresses (one per site) where a DNS server is activated. The NSP uses this information to "route" A2A and U2A to the active ESMIG Site. Check that the DNS disclose to the NSP the IP addresses of the ESMIG Site for the A2A and U2A application services (i.e. both sites in case of active / active). The NSP is able to "route" A2A and U2A requests to the ESMIG. Part II – in case there is no DNS Review the alternative solution as described in the Technical Solution document; examine the alternative solution comparing it to the implementation. Jointly define a testing approach and execute the test [on field]
Expected result:	The NSP interfaces the ESMIG DNS in order to obtain the current location of the services (and URL) for A2A and U2A services.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.7 Release and Deployment Management

NSP Release management process

Requirement ID	ESMIG.30260

The NSP must have a release and deployment management process ensuring no impacts occur on the service, through a rolling approach. Major releases must be announced to the ESMIG Operator at least 6 months before the deployment. Minor releases must be announced to ESMIG Operator at least 4 weeks before the deployment.

Detailed test procedure:	Verify the NSP has a release and deployment management process including the corresponding procedures. The process (and procedures) should provide a rolling approach to release and deployment. Verify whether this process (and procedures) includes the definition of Major and Minor releases and associate the timing mentioned in the requirement. [desk check]
Expected result:	The NSP has a release and deployment management process that is compliant with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Capacity during site/regional failure

Requirement ID	ESMIG.30270

The NSP must ensure that the capacity of all components provided in each ESMIG site are able to handle the whole messaging volumes; i.e. in case of site/regional failure, then the surviving sites must handle the whole traffic without impacting the service level.

Detailed test procedure:	During the whole test (both part I and part II) A2A message traffic is coming simultaneously from the Di.Co.A. Emulator to the ESMIG and from the ESMIG to the Di.Co.A.. Part I: The NSP disables the Ethernet interface(s) at ESMIG site A that are part of the demarcation between the NSP and ESMIG (cfr. ESMIG.30280). The whole traffic is then handled by the remaining link connected to the ESMIG site B. When test outcome is recorded please restore the initial condition. Part II: The NSP disables the Ethernet interface(s) at ESMIG site B that are part of the demarcation line between the NSP and ESMIG (cfr. ESMIG.30280). The whole traffic is handled by the remaining link connected to the ESMIG site A. [on field]
Expected result:	The NSP has to ensure that the link bandwidth to each single ESMIG site (A or B) is able to handle the whole traffic and in case of site failure the link to the remaining ESMIG site is expected to handle the whole traffic.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

3.8 Service Level Management

The boundaries of responsibility (logical demarcation)

Requirement ID	ESMIG.30280

The NSP must define two logical demarcation lines. The demarcation lines define the boundaries of the responsibilities either between the NSP and the ESMIG or between the NSP and the Di.Co.A..

The demarcation line between the NSP's perimetral network device and the ESMIG must be the Ethernet interfaces defined in ESMIG.40040.

The demarcation line between the NSP and the Di.Co.A. is bilaterally agreed by the Parties.

Detailed test procedure:	Verify in the NSP contractual framework template that the boundary of responsibilities between NSP and the Di.Co.A. and between the NSP and the ESMIG are clearly identified. [desk check]
Expected result:	A clear boundary of responsibilities has been defined and agreed. All responsibilities have been clearly identified.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

DEP A2A real-time message delivery time

Requirement ID	ESMIG.30290

The NSP delivers a real-time message from the Sender to the Receiver in less than 2s for the 95% of the messages and 100% in less than 40s. The acknowledgment of the delivery sent back to the sender is not included in the delivery time.

Detailed test procedure:	Send real-time messages from the Di.Co.A. emulator to the Platform at a constant rate – close to the 90% of the overall agreed maximum allowed rate (measured in messages/sec) – for at least 16 hours and record the delivery time for each of the messages. Record the overall number of messages, record the number of messages delivered in less than 2s, record the number of messages which took longer than that to be delivered. Calculate the percentage of the "lazy" ones and make sure they are less than 5%. [on field] Verify that no messages are delivered in more than 40 s.
Expected result:	Sending a message from the Di.Co.A. emulator to the ESMIG takes no longer than 2s and only 5% of the overall number of messages take longer and no messages are delivered after 40s.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

DEP A2A store-and-forward message delivery time

Requirement ID	ESMIG.30300

The NSP delivers a store-and-forward message from the Sender to the Receiver in less than 10s for the 95% of the messages and 100% in less than 60s (and referred to the incoming traffic only, i.e. from the Di.Co.A. to the ESMIG Platform). The acknowledgment of the delivery sent back to the sender is not included in the delivery time.

Detailed test procedure:	Send store–and-forward messages from the Di.Co.A. emulator to the Platform at a constant rate – close to the 90% of the overall maximum allowed rate (measured in messages/sec) – for at least 16 hours and record the delivery time for each of the messages. Record the overall number of messages, record the number of messages delivered in less than 10s, record the number of messages which took longer than that to be delivered. Calculate the percentage of the "lazy" ones and make sure they are less than 5%.. Verify that no messages are delivered in more than 60s. [on field]
Expected result:	Sending a message from the Di.Co.A. emulator to the ESMIG takes no longer than 10s and only 5% of the overall number of messages take longer and no messages are delivered after 60s.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

MEPT A2A instant message delivery time

Requirement ID	ESMIG.30310

The NSP delivers an instant message from the Sender to the Receiver in less than 250ms for the 95% of the messages and 100% in less than 1s. The acknowledgment of the delivery sent back to the sender is not included in the delivery time.

Detailed test procedure:	Send instant messages from the Di.Co.A. emulator to the Platform at a constant rate – close to the 90% of the overall maximum allowed rate (measured in messages/sec) – for at least 16 hours and record the delivery time for each of the messages. Record the overall number of messages, record the number of messages delivered in less than 250ms, record the number of messages which took longer than that to deliver. Calculate the percentage of the "lazy" ones and make sure they are less than 5%. Verify that no messages are delivered in more than 1s. [on field].
Expected result:	Sending a message from the Di.Co.A. emulator to the ESMIG takes no longer than 250 ms and only 5% of the overall number of messages take longer and no messages are delivered after 1s.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____

	NSP testing team_____date____/____/____

Connection availability

Requirement ID	ESMIG.30320

The Connection Availability measures the availability of the connection of the Di.Co.A. to the ESMIG independently of the type of messaging services used.
The Connection Availability is the percentage of time that the connection for the Di.Co.A. is considered to be operational. It is calculated using the following formula.

$$Connection\ availability = 100 - \frac{TotalOutageTime}{TotaleServiceTime} \cdot 100$$

Where:

1. TotalOutageTime is the sum of the product of each OutageTime (in minutes in the reporting period) and the number of affected DiCoAs; if the outage impacts the connection with the ESMIG, all the Di.Co.A. are considered to be affected by the outage;
2. Total Service Time is the product of the total number of the Di.Co.A. and the Service time in minutes in the reporting period as defined above.

The connection availability shall not be less than 99,999 calculated on a monthly basis.

Detailed test procedure:	Inspect the documentation provided by the NSP [desk check], then collect at least one month of Connection Availability data and calculate the Availability.
Expected result:	The NSP describes how Connection Availability is measured and this availability is in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A Service availability

Requirement ID	ESMIG.30330

The A2A Service Availability is the percentage of the time that the A2A services are available to the Di.Co.A.s to send and receive messages (with no impact on performances). It is calculated with the following formula:

$$ServiceAvalability = \left(\frac{ServiceTime - OutageTime}{ServiceTime} \right) \cdot 100$$

Where:

- Outage time is the sum of the outage time of each NSP connected Di.Co.A. (in minutes) in the reporting period;
- Service Time is the sum of the expected availability time of each NSP connected Di.Co.A. (in minutes) in the reporting period.

The Service Availability is not less than 99,98% calculated on a monthly basis. The NSP describes in detail how the above measurements of the outage times are calculated.

Detailed test procedure:	Inspect the documentation provided by the NSP [desk check], then collect at least one month of A2A Service Availability data and calculate the A2A Service Availability. [desk check]
Expected result:	The NSP describes how Service Availability is measured and this availability is in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

U2A Service availability

Requirement ID	ESMIG.30340

The U2A Service Availability is the percentage of the time that the U2A services are available to the Di.Co.A.s to access the ESMIG Platform web resources. It is calculated with the following formula:

$$ServiceAvalability = \left(\frac{ServiceTime - OutageTime}{ServiceTime} \right) \cdot 100$$

Where:

- Outage time is the sum of the outage time of each NSP connected Di.Co.A. (in minutes) in the reporting period;
- Service Time is the sum of the expected availability time of each NSP connected Di.Co.A. (in minutes) in the reporting period.

The U2A Service Availability must be not less than 99,98%, calculated on a monthly basis. The NSP describes in detail how the above measurements of the outage times are calculated.

Detailed test procedure:	Inspect the documentation provided by the NSP [desk check], then collect at least one month of U2A Service Availability data and calculate the U2A Service Availability. [desk check]
Expected result:	The NSP describes how Service Availability is measured and this availability is in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Fault classification

Requirement ID	ESMIG.30350

The NSP must classify faults at least according to the following classes:

HIGH - Fault causes outage time affecting Service Availability or a system component is unable to perform critical tasks. Examples:

- ESMIG is unable to access the service using anyone of the available accesses
- A single ESMIG site is unable to access the service
- WAN service parameters are strongly degraded.

MEDIUM - Fault results in serious disruptions, limitations or restrictions in the operating infrastructure. Examples:

- ESMIG WAN component is faulty or a link has failed.
- ESMIG access is degraded (intermittent or slow)
- A2A or U2A service parameters are partially degraded.

LOW - Fault results in moderate/limited impact in the operating infrastructure. The ESMIG is able to exchange traffic, problems occur on redundant devices or supporting functions (monitoring access, management interfaces, ticketing system…). Examples:

- Fault has only slight impact on operations
- Request for information submitted by ESMIG Operator.

Detailed test procedure:	The fault classification described in the NSP Operational Manual envisages at least three classes: High, Medium, Low. [desk check]
Expected result:	The description of the fault classes is in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Fault metrics

Requirement ID	ESMIG.30360

The NSP must measure the fault clearance process according to three metrics, as defined as follows:

- Status Notification Interval (SNI): The ESMIG Operator is informed about fault status and the fault clearance progress at recurring intervals;
- Maximum Time To Intervene (MxTTI): maximum time elapsing between the acceptance of a trouble ticket and the start of the fault clearing process;
- Maximum Time To Repair (MxTTR): maximum time between the acceptance of a trouble ticket and the end of the fault clearing process. (MxTTR is temporarily suspended by the following events: 1. ESMIG is not available to support or provision access to the faulty components, or 2. ESMIG refuses to allow contractor personnel to enter the site, or force majeure (a circumstance due to an external, unpredictable event unrelated to computer operations and when that circumstance could not have been either foreseen or prevented with all due reasonable care).

Detailed test procedure:	The fault metrics described in the NSP Operational Manual envisages at least three metrics: SNI, MxTTI, MxTTR. [desk check]
Expected result:	The description of the fault metrics is in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Fault clearance

Requirement ID	ESMIG.30370

The NSP must guarantee a fault clearance of the incidents affecting services provided by the NSP to the ESMIG within the times defined in the following table, depending on the criticality of the identified fault. In order to establish its priority, the criticality of each fault episode may be classified as high, medium or low (or equivalent Priority levels, mapped on the NSP trouble ticketing system).

The definition of the related levels is the following:

	Service level (SL)		
	High	medium	low
MxTTI [hours]	0.5	4	8
MxTTR [hours]	4	8	16
SNI [hours]	1	2	4

Detailed test procedure:	The NSP's Operational Manual reports the agreed service levels for MxTTI, MxTTR and SNI. [desk check]
Expected result:	The NSP contractual framework includes the agreed service levels.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

4. NETWORK

WAN links – connected sites

Requirement ID	ESMIG.40010

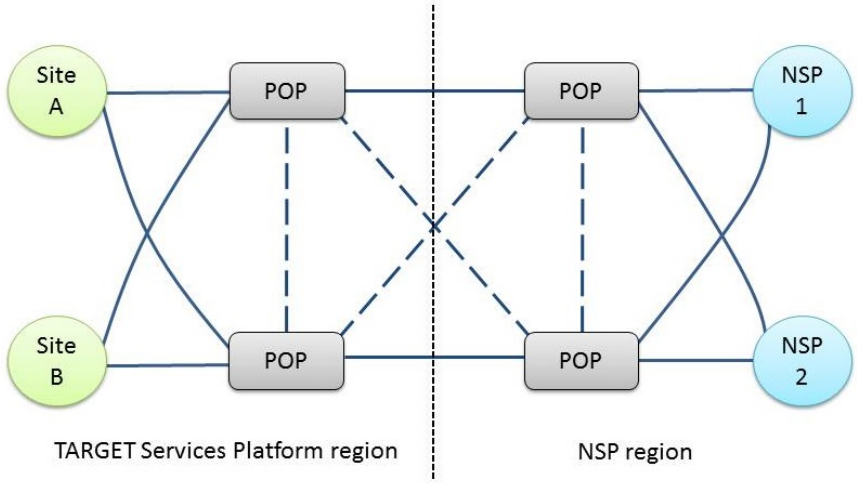
Each ESMIG site must be connected – using WAN links – to at least two NSP sites. [A WAN link is defined as the local loop from ESMIG site to the local metro area PoP + backbone $_{Carrier}$ + metro area from the metro area PoP to the local NSP site].

The NSP can serve the ESMIG sites using one or more carriers.

The NSP can reuse existing WAN links.

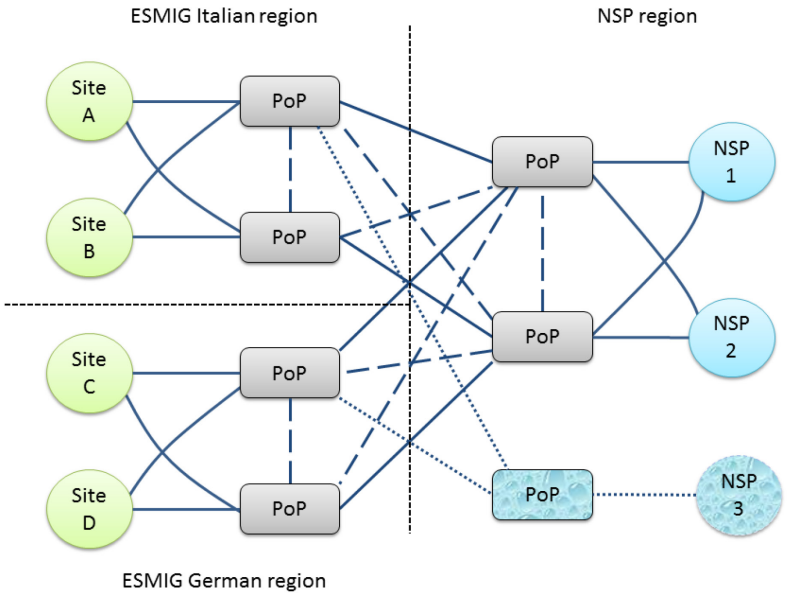
The NSP can be a carrier.

The network topology might for example look like this:



Sites C and D follow the same pattern.

Including the NSP cold site it would then look like the following:


ESMIG Italian region
NSP region
Site A
Site B
Site C
Site D
PoP
PoP
PoP
PoP
PoP
PoP
NSP 1
NSP 2
NSP 3
ESMIG German region

Detailed test procedure:	The NSP details the WAN connectivity: in the ESMIG region (addresses of the metro area PoPs, paths from the ESMIG sites to the local metro area PoPs, ...), in the NSP region (addresses of the metro area PoPs, paths from the NSP Sites to the metro area PoPs, ...) and backbone connectivity from the PoPs in the ESMIG region to the PoPs in NSP region. The NSP describes how the cold site is connected. The NSP describes if the ESMIG sites are served by one or more carriers (information purposes only). The NSP should declare if WAN links reuse any pre-existing infrastructure and if yes which one. [desk check]
Expected result:	Sites are connected using WAN links in line with the requirement description.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WAN links – local loop and metro specifications

Requirement ID	ESMIG.40020

Local loops are the links from each NSP's carrier POPs (Point of Presence) to the ESMIG site. The NSP must have at least two POPs in the metro area (where the ESMIG data centres are located). Each ESMIG sites must have at least two local loops, one connected to the first NSP's POP and another one connected to the second NSP's POP (providing both redundancy and path diversification in the metro area).

Detailed test procedure:	The NSP describes the connectivity from the ESMIG sites to the NSP's PoP in the same metro area and highlights how redundancy and path diversification is achieved in the metro area. The NSP also describes the connectivity from the NSP Sites to his own PoPs in the same metro area and highlights how redundancy and path diversification is achieved in the metro area. [desk check]
Expected result:	Local loop in the metro area are in line with the requirement description.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WAN links – backbone specifications

Requirement ID	ESMIG.40030

The backbone links between the PoPs in the ESMIG data centre metro area and PoPs in the NSP's data centre metro area must provide both redundancy and paths diversification.

Detailed test procedure:	The NSP describes the connectivity through the backbone (i.e. from the PoPs in the ESMIG metro area to the PoPs in the NSP's metro area) and highlights how redundancy and path diversification is achieved in the backbone itself. [desk check]
Expected result:	Backbone is in line with the requirement description.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

LAN interface specifications (physical demarcation)

Requirement ID	ESMIG.40040

The NSP must connect to ESMIG sites either using 1 Gigabit Ethernet ports or 10 Gigabit Ethernet ports. Ethernet local link port interface speed and specifications can be proposed by the NSP, but the ESMIG reserves the right to mandate to the NSP the adoption of a specific LAN interface standard.

The NSP is allowed to connect to the ESMIG using up to two Ethernet interfaces per site per footprint. The NSP is allowed to have a more than a single footprint (i.e. a footprint for T2, another one for T2S and one for TIPS, etc.), each footprint can then have up to two Ethernet interfaces.

Detailed test procedure:	Visually inspect the NSP's physical demarcation in the ESMIG sites and verify if it has either a 1 GbE or 10 GbE. The interface media type has been bilaterally agreed between the ESMIG and the NSP. [on field]
Expected result:	LAN interface specifications are in line with the requirement description.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Internet Protocol (IP) type (IPv4 and IPv6) and IP addressing schema

Requirement ID	ESMIG.40050

The NSP must deliver the connectivity to the ESMIG sites either using Internet Protocol (IP) version 4 (IPv4) or Version 6 (IPv6); no other layer three protocols are allowed between the ESMIG and the Di.Co.A..

The NSP must use an IP addressing schema agreed with the ESMIG; this IP addressing schema can either be a private address allocation in terms of RFC1918 or a public IP address range registered by the NSP.

Once the boundary subnets – between the NSP and the ESMIG – have been agreed, the NSP agrees with the ESMIG on how to split the IP addresses within the subnet and how to map them to the specific services.

Detailed test procedure:	Jointly inspect the documentation describing the Network, including network diagrams and verify either IPv4 addresses or IPv6 addresses are transported on the service boundaries. [desk check]
Expected result:	IPv4 and IPv6 are the two only allowed protocols on the boundary between the NSP and the ESMIG Platform. The IP addressing schema are in line with the requirement description.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Static Routing

Requirement ID	ESMIG.40060

The NSP must use only static routes in the boundary between the NSP itself and the ESMIG; ie. no dynamic routing protocols are allowed.

Detailed test procedure:	Check network equipment configuration and verify there is no dynamic routing protocol between the NSP and the ESMIG. [on field]
Expected result:	Only static routing has been implemented between the NSP itself and the ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5. SECURITY

5.1 Information security policies

ISO 27001:2013 certification

Requirement ID	ESMIG.50010

The NSP must have an ISO 27001:2013 (Information technology — Security techniques — Code of practice for information security controls) certification.

Detailed test procedure:	Verify the NSP's conformity to the ISO27001:2013 standard. [deck check]
Expected result:	NSP is compliant with the ISO27001:2013 standard and is able to formally demonstrate this compliancy.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

PCSG - Requirements and Controls

Requirement ID	ESMIG.50020

The NSP must have in place a guidance document - aimed to the Di.Co.A.s - describing its security services regarding connectivity Participants Connectivity Security Guidance (PCSG), where the "Participants" are the Di.Co.A.s. The PCSG shall define requirements and controls towards the NSP's Di.Co.A.s that ideally aim to cover the following areas:

- Protection and segregation of the Di.Co.A's infrastructure used to connect to the NSP, (hereafter the "NSP connected local infrastructure") from the enterprise IT environment.
- Network security of the traffic flow to and within the NSP connected local infrastructure.
- Security testing of the NSP connected local infrastructure testing also access from the enterprise network.
- Vulnerability and Patch Management of the NSP connected local infrastructure.
- Physical Security of the NSP connected local infrastructure.
- HR screening such as background and credit checks as well as other industry standard anti-fraud measures for users of the NSP connected local infrastructure.
- Plans, procedures and responsibilities for Incident Response with demonstrated readiness.
- Information sharing for security incidents and near misses with industry members and ecosystem participants.
- Credential security of the NSP connected local infrastructure taking into account multifactor authentication where needed and protection of privileged identities as well as proper user management, account and password practices.
- System and applications security including adoption of antimalware and endpoint security, hardening of systems and applications, control of software and use of software integrity mechanisms.
- Detection of security incidents and fraudulent transactions from the NSP connected local infrastructure (system, application, middleware, other).
- Security training and awareness for all users with access to the NSP connected local infrastructure.
- Perform risk assessments for the NSP connected local infrastructure taking into account any relevant 3rd parties.

Detailed test procedure:	The NSP has a PCSG aimed to the Di.Co.A.s that covers all the areas described in the requirement. [deck check]
Expected result:	NSP has provided a PCSG and is able to formally demonstrate this to the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

PCSG - NSP's management commitment to guide and evolve the PCSG

Requirement ID	ESMIG.50030

The Board of the NSP must strongly commit to keep the Di.Co.A.s' connectivity security guidance (PCSG) fit-for-purpose in order to assist its Di.Co.A.s to secure the IT environment through which it connects to the NSP infrastructure and network.

The NSP must commit to ensure that the PCSG evolves with the threat landscape and shall - at least annually - review the PCSG and assess whether further requirements and controls shall be included in the PCSG to help ensuring the security of its network infrastructure, the infrastructure of its Di.Co.A.s as well as the infrastructure of the entire ecosystem.

The Eurosystem may in the future require an alignment of PCSGs if significant divergences are identified.

Detailed test procedure:	It is possible to prove the NSP's board commitment to the implementation and annual review of the PCSG. [deck check]
Expected result:	NSP's Board is committed to guide the evolution of the PCSG and is able to formally demonstrate this to the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

PCSG - compliance checking process and self-attestation

Requirement ID	ESMIG.50040

The NSP must have a process in place which requires its Di.Co.A.s to regularly self-certify or attest, at least annually, that they are in line with the PCSG. The Di.Co.A.s shall be required to present action plans to ensure, within 12 months after self-certification or attestation that it complies with those elements of the guidance against which it has reported as being not compliant.

The NSP should ideally have measures in place, possibly within the contractual relation with its Di.Co.A.s, to ensure that Di.Co.A.s comply with the PCSG such as for example:

- The transfer of liability for potential security breaches that may be attributed to the non-compliance to one or several controls in the PCSG;
- The possibility to disconnect a Di.Co.A.s from the network in case of systematic non-compliance with the PCSG.

The NSP shall also commit to provide aggregated results of the compliance checks to the ESMIG service providing central banks which may share these results with the community of central banks participating in the ESMIG.

Detailed test procedure:	It is possible to prove the compliance checking process and annual self-attestation. [deck check]
Expected result:	NSP's has a compliance checking process including a yearly self-attestation exercise and is able to formally demonstrate this to the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.2 Organization of information security

Security Cooperation

Requirement ID	ESMIG.50050

The NSP must cooperate with the ESMIG Operator Computer Emergency Response Team (CERT) in order to share Cyber Threat Intelligence (CTI) and IOC (Indicator of Compromise) and security relevant information (alerts, bulletins,…).

Detailed test procedure:	Verify that the NSP CERT and ESMIG Operator CERT have identified their respective contact points, are willing to cooperate and communication channels have been agreed. [desk check]
Expected result:	Cooperation between NSP CERT and ESMIG Operator CERT has been established.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.3 Access control

Logically segregated groups of users and Closed Group of Users (CGU)

Requirement ID	ESMIG.50060

The NSP must allow creation, management and removal of logically segregated groups of Di.Co.A.s through Closed Group of Users (CGU). The NSP must have different CGUs for the production environment and for the test environments, for each ESMIG application.

The subscription to a group of users, and any subsequent modification to such subscription, must be arranged through an electronic workflow on the Internet. All the electronic forms must be authorised by the relevant National Central Bank and/or CSD. The activation date for the subscriptions must be set at latest within two weeks following the form's approval by the ESMIG Operator; the new subscription must be scheduled and activated ensuring the availability of the service (e.g. adopting the "rolling update" approach). Upon request from the ESMIG Operator, the NSP must withdraw from the CGU a Di.Co.A. within one hour.

Detailed test procedure:	Subscribe some Di.Co.A.s (using the Di.Co.A. emulator) to a test CGU already created by the NSP. Check any new Di.Co.A. is able to operate. Request to remove a Di.Co.A. assigned to the CGU. Check the removed Di.Co.A. is not able to operate anymore. While performing these actions verify the Internet electronic workflow for Di.Co.A. creation/deletion. [on field]
Expected result:	The NSP allows the creation and removal of logically segregated groups of users, manages all the user groups, and is able to segregate production environment from each test environment. The NSP shall demonstrate that the process to remove a user within an hour has been documented. User and group creation are in line with the process described in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

ESMIG's access control

Requirement ID	ESMIG.50070

The NSP must ensure that only authenticated parties are able to access the ESMIG.

Detailed test procedure:	Verify that the A2A and U2A traffic between the NSP and the ESMIG is allowed only to authenticated parties. [on field]
Expected result:	Only authenticated parties are able to access the ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Unique identification of users (A2A and U2A)

Requirement ID	ESMIG.50080

The NSP must identify the Di.Co.A. and the ESMIG in a unique way (every time a new session is being set up). The NSP must guarantee the identification of A2A users and U2A users via digital certificates.

Detailed test procedure:	Verify that the NSP uniquely identifies Di.Co.A. (use the Di.Co.A. emulator) via digital certificates, then verify that the NSP uniquely identifies ESMIG via digital certificates. [on field]
Expected result:	NSP uniquely identifies both the Di.Co.A. and the ESMIG using digital certificates.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Authentication in A2A

Requirement ID	ESMIG.50090

The NSP must authenticate the Di.Co.A. and the ESMIG (every time they open a new session). The NSP must base this authentication mechanism on the availability of digital keys stored in a Hardware Security Module (HSM) accessible by the NSP's Network Gateways.

Detailed test procedure:	The possibility to open a new session on the NSP's Network Gateway mandates the presence of a valid digital certificate. Part I: A new session is opened from a Di.Co.A. (using the Di.Co.A. emulator) with no certificate or invalid certificate (i.e. suspended certificate or expired certificate), then verify the NSP's Network Gateway rejects the session. Part II: A new session is opened from a Di.Co.A. (using the Di.Co.A. emulator) with a valid certificate, then verify the NSP's Network Gateway accepts the session. [on field]
Expected result:	Every time a new session is opened the NSP authorizes both the Di.Co.A. and the ESMIG (through the A2A NSP's Network Gateway) using digital keys stored in a HSM. NSP successfully completes the message partners authentication, digital certificates are checked, same keys are used for authentication and digital signatures.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Authentication in U2A mode – Smartcard/USB token

Requirement ID	ESMIG.50100

The NSP must provide either Smart Cards or USB tokens for storing all digital keys used for U2A. These devices must be compliant with FIPS 140-2 Level 3 or Common Criteria EAL4+.

Smart Card readers or USB tokens must comply at least with the following specifications:

- USB interface with A-type connector;
- power supply through the same USB interface;
- ISO 7816 Class A, B and C (5V, 3V and 1,8V) smart card support;
- short circuit protection;
- compatible with ISO 7816-1,2,3,4 specifications. T=0 and T=1 protocols;
- PC/SC for Microsoft driver;
- Microsoft Windows Hardware Quality Labs (WHQL) compliance;
- Operating Systems: Windows, Linux and Mac OS X.

Detailed test procedure:	The specifications of the smart card readers are verified and checked. Check if smart card/USB token are compliant either with FIPS 140 - L3 or Common Criteria EAL4+ and complies with the specifications described above. [desk check]
Expected result:	The smart card /USB token provided by the NSP comply with FIPS 140 - L3 or Common Criteria EAL4+.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Authentication in U2A mode – Remote HSM

Requirement ID	ESMIG.50110

The NSP must provide an authentication mechanism based on remote HSM for storing all digital keys used for U2A. These devices must be compliant with FIPS 140-2 Level 3. The Di.Co.A. can either use the "Authentication in U2A mode – Smartcard/USB token" (ESMIG.50100) or this "Authentication in U2A mode – Remote HSM" (ESMIG.50110). This authentication is two factor based (because of the user's knowledge of the PIN). The NSP must check validity of the digital certificate

Detailed test procedure:	The NSP demonstrate that the remote HSM solution is FIPS 140-2 L3 compliant. [desk check] The NSP has generated the client certificates for the Di.Co.A.s. Access to the ESMIG in U2A mode using the remote HSM as a part of 2FA mechanism. [on field]
Expected result:	The NSP's remote HSM solution is FIPS 140-2 L3 compliant. The authentication to the ESMIG is successful using the remote HSM.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.4 Cryptography

Public Key Infrastructure and Certificate Extensions

Requirement ID	ESMIG.50120

The NSP must deliver a Public Key be Infrastructure ("PKI") that shall comply with X.509 version 3 standard for the digital certificates. The NSP's PKI must produce certificates for both A2A and U2A.

A2A certificates used for digital signature must have the Non-Repudiation bit set in the "Key usage" extension.

U2A certificates used for digital signature and authentication must have the Non-Repudiation and the "DigitalSignature" bit set in the "Key usage" extension. Two separate certificates for digital signature and authentication can be used, in this case only the certificate not used for NRO must have the "DigitalSignature" flag set.

Detailed test procedure:	Check that the NSP has in place a Certification Authority. Check certificates signed by the NSP's Public Key Infrastructure (PKI) are compliant to version X.509 ver.3. Examine certificates to check which extensions NSP uses. Verify NSP all requested extensions are actually used. [on field]
Expected result:	NSP's PKI Infrastructure provides a Certification Authority. Certificate extensions in use are documented.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Decentralised management of users

Requirement ID	ESMIG.50130

The NSP must allow local security administrators of its Di.Co.A. and the ESMIG to manage the end users' identity and credentials required to access the ESMIG (such as end user provisioning, service provisioning).

Detailed test procedure:	The local security administrator creates a new user and assigns credentials, ESMIG' security administrator approves access privilege granting access to the ESMIG. [on field]
Expected result:	Local security administrators manage users' identity and credentials required to access ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Cypher suite and usage of up-to-date algorithms (hashing and encryption)

Requirement ID	ESMIG.50140

The NSP must use only strong and not deprecated encryption algorithms and digest (hash) algorithms:

- AES-256 is the minimum required algorithm for encryption (with a minimum length of 256 bit for symmetric encryption keys and 2048 bit for asymmetric encryption keys).
- SHA-256 is the minimum required algorithm for digest computation.

The usage of alternative algorithms can be bilaterally agreed between the NSP and the Platform.

Detailed test procedure:	List which algorithms are used and where. [desk check]
Expected result:	The NSP uses only strong and not deprecated algorithms.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Administration of cryptographic keys

Requirement ID	ESMIG.50150

The NSP must ensure the following administration functions for symmetric and asymmetric (private only) cryptographic keys.

- *Generation*: The NSP must ensure secure generation of keys.
- *Distribution*: The NSP must ensure secure (i.e. encrypted) electronic distribution of the keys.
- *Renewal*: The NSP must ensure the renewal of the keys and must ensure that keys renewal does not interfere with its own services.
- *Storage*: The NSP must ensure that keys are stored securely (e.g. on the HSM).
- *Revocation*: The NSP must ensure immediate revocation of the key/certificate when compromised.

Detailed test procedure:	Verify together with the NSP the procedure used to generate, distribute, renew, store and revoke symmetric/asymmetric cryptographic keys. [desk check] Generate and distribute the symmetric crypto keys, then repeat the test for the asymmetric crypto keys. Renew the symmetric crypto keys, then repeat the test for the asymmetric crypto keys. Store the symmetric crypto keys, then repeat the test for the asymmetric crypto keys. Revoke the asymmetric crypto keys, then try to use it and verify it fails. [on field]
Expected result:	The NSP ensures the foreseen administration functions (generation, distribution, renewal, storage and revocation of the keys).
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

NSP's Network Gateways Certificate independence

Requirement ID	ESMIG.50160

The certificates issued by the PKI must be used without any constraint to the physical location of the NSP's Network Gateways active site. The certificates used by the Di.Co.A. must be valid on all ESMIG sites, i.e. during a ESMIG site recovery (or in case of loss of a ESMIG site) the sessions from the Di.Co.A. to the Platform remain valid on the surviving site. Vice versa the certificates used by the ESMIG must be valid on all Di.Co.A. sites, i.e. during a Di.Co.A. site recovery (or in case of loss of a Di.Co.A. site) the sessions from the ESMIG to the Di.Co.A. remain valid on the surviving site.

Detailed test procedure:	Use Di.Co.A. emulator for this test. Part I: Isolate site B (disabling the Ethernet interfaces on the 4CBNet switch), have the Di.Co.A. to send successfully messages to the Network Gateways in site A. Restore site B and isolate site A, have the Di.Co.A. to send successfully messages to the Network Gateways in site B. No changes of certificate on the Di.Co.A. are expected. Part II: Isolate Di.Co.A. site 2 (disabling the Ethernet interfaces on the 4CBNet switch), have the ESMIG to send successfully messages to the Network Gateways in site 1. Restore site 2 and isolate site 1, have the ESMIG to send successfully messages to the Network Gateways in site 2. No changes of certificate on the ESMIG are expected. [on field]
Expected result:	Independently of where the ESMIG is running (either site A or site B), the Di.Co.A. can successfully connect to the ESMIG; i.e. all certificates are signed by the same CA.

Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Certificate Revocation List (CRL)

Requirement ID	ESMIG.50170

The NSP must provide to the ESMIG Operator the CRL in the HTTP or LDAP or OCSP formats. The ESMIG will select with the NSP the most appropriate protocol for the intended scope.

Detailed test procedure:	Query the NSP's CRL using at least one of the supported protocols (HTTP, LDAP, OCSP). [on field]
Expected result:	It is possible to read the CRL using at least one of the following protocols: HTTP, LDAP and OCSP.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Certification Authority, Certificate Policy (CP) and Certificate Practices Statement (CPS)

Requirement ID	ESMIG.50180

The NSP must deliver Certification Authority (CA) functions to the Di.Co.A. and to the ESMIG. The functions provided by the CA must support the generation, management, storage, deployment, revocation and signature of public key certificates. The NSP's CA functions are described in the Certificate Policy (CP) and operated in accordance with the Certificate Practices Statement (CPS). The contents of the CP and CPS are described in RFC 3647 "Internet X.509 Public Key Infrastructure, Policy and Certification Practices Framework". The NSP must deliver to the ESMIG Operator both deliverables (CP and CPS).

Detailed test procedure:	1. A Di.Co.A. generates a certificate using the NSP's CA. The Di.Co.A. is able to manage the certificate life cycle (store, deploy and eventually revoke certificates). ESMIG Operator performs the same tests. In case no Di.Co.A. is available during the testing phase, then please run the test only with the ESMIG Operator and using the Di.Co.A. emulator. [on field] 2. Compare the life cycle with CP and CPS. [desk check] 3. Jointly analyse the NSP's CP and CPS, in the analysis give a focus on NSP responsibilities and certificates usage, enrolment, issuance, revocation, and liability, then make sure all NSP's CA functions are covered within operational procedures. [desk check] 4. List the CA functions the NSP performs. Jointly inspect the CPS. Make sure all listed functions are covered within operational procedures. [desk check]
Expected result:	The NSP delivers Certification Authority (CA) functions to Di.Co.A. and the ESMIG, i.e. generation, management, storage, deployment, and revocation of public key

	certificates. The NSP delivers the CP and CPS to ESMIG. The CA functions are compliant with the CP and operate in accordance with the CPS. The NSP provides CA functions to ESMIG Operator and Di.Co.A., and ensures the above mentioned functions within the CP and CPS context.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

MEPT Hardware Security Modules

Requirement ID	ESMIG.50190

The NSP must provide tamper-proof HSM for storing all digital keys used for A2A. The HSM(s) must be compliant at minimum with FIPS 140-2 Level 3 or Common Criteria EAL 4+. The NSP's Network Gateway must be equipped with tamper-proof HSM(s).

Detailed test procedure:	1. Check if the HSM(s) are installed in the ESMIG sites; [on field] 2. Check if the HSM(s) are FIPS 140-2 L3 compliant or Common Criteria EAL 4+; [desk check] 3. Check if all A2A keys used (both on the ESMIG and the Di.Co.A.) are stored in the HSM(s); the HSM contains a key pair for every certificate, during the test list the available certificates. [on field]
Expected result:	The NSP have installed FIPS 140-2 Level 3 or Common Criteria EAL 4+ compliant HSM in the ESMIG sites. HSM(s) contain(s) the digital keys used for A2A.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

MEPT Responsibilities for management of cryptographic keys

Requirement ID	ESMIG.50200

The management of cryptographic keys (assigned to ESMIG) must remain under the sole responsibility of the ESMIG Operator, which must be the only Institution having key management duties to its key storage devices delivered by the NSP.

Detailed test procedure:	Verify that the ESMIG Operator is able to manage crypto keys in the HSM; then verify whether the NSP is able to logically access the HSM (for example in order to perform a SW upgrade of the device), but is not authorized to manage the key material in the HSM itself. Logical access is permitted to the NSP only for administrative and operational purposes. [on field]
Expected result:	The management of cryptographic keys is under the sole responsibility of the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.5 Operations security

Protection from malware

Requirement ID	ESMIG.50210

The NSP must implement detection, prevention and recovery controls to protect against malware. Anti-malware software must be deployed on NSP's Network Gateways and be updated daily. Anti-malware scans are conducted on the NSP's Network Gateways Operating System and on the files transmitted through the infrastructure.

Detailed test procedure:	List the anti-malware software installed on the NSP Network Gateway. Verify the software is updated daily. Check anti-malware scans are conducted on the Operating System and on the transmitted files. Identify what actions are triggered when a malware is detected.
Expected result:	Anti-malware software is in place accordingly to the requirement. The NSP detects malware and promptly alerts the ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

ESMIG Operator

Event logging

Requirement ID	ESMIG.50220

The NSP must enable logging functionality on all its components (both NSP's Network Gateway and network devices). Event logs record user activities (i.e. audit logs), exceptions, faults and information security events. Event logs should include the fields listed in ISO/IEC 27002:2013 § 12.4.1.

Detailed test procedure:	Part I Check that all network devices are logging all events described in the ISO control. Part II Identify which logging servers are configured and verify they are actually receiving the expected logs. [on field]
Expected result:	All provided NSP's components have a logging functionality enabled in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Protection of log information (anti-tampering)

Requirement ID	ESMIG.50230

The NSP must ensure and control the integrity of all ESMIG related logs. All logs produced by the NSP devices must be maintained on a Security Information and Event Management (SIEM). The SIEM must have anti-tampering measures (ISO/IEC 27002:2013 § 12.4.2 “Protection of log information”), i.e. it must ensure that logs cannot be manipulated. Logs are transmitted from the device to the SIEM using an encrypted channel.

Detailed test procedure:	List all NSP devices, list all audit logs produced, prove the compliancy with the ISO 27002:2013 control 12.4.2 “Protection of log information” and give evidence of the anti-tampering measures in place. Verify integrity can be ensured for all audit logs. [on field]
Expected result:	The NSP ensures and controls the integrity of NSP related equipment audit logs; audit logs integrity is ensured and the NSP is able to determine when integrity is compromised.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Control of operational software and software integrity

Requirement ID	ESMIG.50240

The NSP must ensure the integrity of software installed both on NSP's Network Gateway and network devices. Software integrity checks provide a detective control against unexpected modification to operational software. Software integrity checks on NSP Network Gateway are conducted upon start-up and additionally at least once per day; while network devices only on start-up. Integrity check of downloaded software is conducted via verification of the checksum at the time of its deployment. Software integrity should cover middleware (e.g. MQ) configuration files. The NSP must automatically detect every modification to its own software and immediately alert the ESMIG Operator.

Detailed test procedure:	List the software installed on the NSP Network Gateway and network devices. Verify how the operational software is protected to detect unexpected modification. Identify what actions are triggered when a validation fails. [on field]
Expected result:	Control of software integrity is in place accordingly to the requirement. The NSP detects validation failures and promptly alerts the ESMIG Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Time synchronisation

Requirement ID	ESMIG.50250

The NSP must synchronise the date and time of all its Network Gateway and Network devices either with the same date and time source adopted by the ESMIG or by using a Stratum 2 (or 3) time source, approved by the ESMIG Operator. The Network Time Protocol (NTP) synchronisation interval is at least every one minute. In terms of time zone and time format, the official time of the ESMIG is the ECB time (i.e. the local time at the seat of the ECB); the NSP must provide time information using Coordinated Universal Time (UTC) format.

Detailed test procedure:	Considering the reference terminology described in Request for Comments 5905 "Network Time Protocol Version 4: Protocol and Algorithms Specification" verify that all the NSP devices adopt a NTP synchronized with a single time source. Check the compliance of the time source with the ones approved by the ESMIG Operator. Check the synchronisation interval, the time format and the Stratum level. [on field]
Expected result:	NSP's devices date and time are NTP synchronised with a time source in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Technical vulnerability management of NSP's Network Gateway and network devices

Requirement ID	ESMIG.50260

The NSP must have a process of Vulnerability Patch Management (VPM) where responsibilities are clearly defined; this process must include monitoring, prioritization, remediation and reporting. The NSP must ensure quick updates of all its NSP's Network Gateway and network devices; security patches must be installed according to the following table:

CVSS Score	**Vulnerability Rating**	**Rollout schedule**	
		Target	**Maximum**
0 – 2	Negligible	With the next release of the service / component.	Within 1 year
2.1 – 4.5	Low		
4.6 – 7.0	Medium		
7.1 – 10	High	48 hours (for configuration related vulnerabilities)	Within 1 month.
		2 weeks (after release of the patch)	Within 3 months (after release of the patch)

Table 1: CVSS scoring and prioritization scheme

Detailed test procedure:	Part I Verify the NSP has a VPM procedure taking into account the Vulnerability Rating. [desk check] Part II List the versions of all SW installed on the NSP's Network Gateway and network devices, verify the CVSS Scoring associated to the vulnerabilities present in the installed SW (if any), focus on scoring higher or equal than 7.1, and demonstrate the Rollout schedule has been respected. [on field]
Expected result:	The VPM is in line with the requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.6 Communications security

A2A Segregation of data

Requirement ID	ESMIG.50270

The NSP must ensure each Di.Co.A. is able to access only its own data (incoming and outgoing A2A traffic).

Detailed test procedure:	1. a Di.Co.A. (use the Di.Co.A. emulator) can access in A2A his own relevant data; 2. a Di.Co.A. (use the Di.Co.A. emulator) cannot access in A2A data relevant to other Di.Co.A.s; [on field]
Expected result:	The NSP ensures Di.Co.A. can access only their own A2A incoming and outgoing traffic.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

U2A Segregation of data

Requirement ID	ESMIG.50280

The NSP must ensure that each Di.Co.A. must be able to access only its own data (incoming and outgoing U2A traffic).

Detailed test procedure:	1. a Di.Co.A. can access in U2A his own relevant data; 2. a Di.Co.A. cannot access in U2A data relevant to other Di.Co.A.s. [on field]
Expected result:	The NSP ensures Di.Co.A. can access only their own U2A incoming and outgoing traffic.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A Integrity of traffic

Requirement ID	ESMIG.50290

The NSP must ensure the integrity of all A2A traffic exchanged between its Di.Co.A. and the ESMIG. Integrity of A2A traffic is ensured using a Local Authentication (LAU) mechanism. The NSP must perform an integrity check of each message forwarded through its network, i.e. an hash must be calculated and verified at both the sending and receiving side.

Detailed test procedure:	Verify that the NSP performs an integrity check on each message entering/leaving its network; an hash must be calculated at both the sending and receiving side. [desk check]
Expected result:	The NSP ensures the integrity of all traffic from the Di.Co.A. to the ESMIG and back.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Segregation of traffic

Requirement ID	ESMIG.50300

The NSP must ensure segregation of data traffic between different CGU. Di.Co.A.s belonging to different CGUs cannot exchange data with each other. Di.Co.A.s belonging to test CGU shall not be able to send or receive messages from the production environment and vice versa.

Detailed test procedure:	Send a message to a user belonging to a different CGU. Repeat test for a file. Both attempts are expected to fail. Using a test user account, send messages to the production environment. Repeat test for a file. Both attempts are expected to fail. Using a production user account, send messages to the test environment. Repeat test for a file. Both attempts are expected to fail. [on field]
Expected result:	The NSP ensures segregation of data traffic between different groups of users and segregation of environments (production vs. test) within the same user.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Confidentiality and integrity of data in transit across the public soil

Requirement ID	ESMIG.50310

The NSP must take appropriate measures to protect all data in transit between ESMIG sites and the NSP's sites and between the NSP sites and the Di.Co.A.'s sites. An example of an "appropriate measure" is an IPSec VPN tunnel. All traffic must be encrypted and authenticated.

Detailed test procedure:	Part I: Verify that all data leaving the NSP to the ESMIG, and vice versa, is cryptographically protected (encrypted and authenticated). Part II: Verify that all data leaving the Di.Co.A. (using the Di.Co.A. emulator) to the NSP, and vice versa, is cryptographically protected (encrypted and authenticated). [on field]
Expected result:	All traffic – between the ESMIG and the NSP and between the NSP and the Di.Co.A. – is encrypted and authenticated, confidentiality and integrity of data in transit across the public soil is ensured.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

MEPT Non Repudiation in A2A

Requirement ID	ESMIG.50320

The NSP must manage the non-repudiation of emission on A2A messages. The NSP's Network Gateways of the sender must sign - on behalf of the Di.Co.A. - using the appropriate private key stored in the HSM. The signature must include the (digest of) message payload provided by the sending application. The signature data shall be delivered to the receiver together with the A2A message. The NSP's Network Gateways of the receiver must check the validity of the certificate and verify the signature (using the public key certificate of the sender).

Detailed test procedure:	Send a message from a Di.Co.A. (using the Di.Co.A. emulator) and check that the business payload is signed by the Network Gateway on the sender. The signature includes the (digest of) message payload and is delivered to the receiver together with the "instant" message. Verify that the Network Gateway of the receiver: 1. checks the validity of the signing certificate (for example include its ID in the CRL and verify that the Gateways rejects the message) 2. verifies the signature. [on field]
Expected result:	The non-repudiation mechanism is in place (signing is in line with the requirement described above).
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Non Repudiation support in A2A

Requirement ID	ESMIG.50330

The NSP must provide a non-repudiation support service to verify the signature of a message (this service could be requested by the Di.Co.A. in case of dispute or claim). In order to perform the signature validation, the Di.Co.A. should provide the signature and all signature-related information (including the A2A message to be validated) to the NSP. The NSP must be able to retrieve the certificate and the certificate status at the time of the signature. The verification report should containing at least the following information: User DN, User Status, the certificate information (certificate Serial Number, Issue Date, Expiry Date) and a verification summary.

The non-repudiation service must be available up to three months after the traffic exchange took place. The NSPs could choose their favourite modality to deliver this service (email, electronic workflow, ...).

Detailed test procedure:	A non-repudiation support service is made available by the NSP. Select an A2A message at least one week old. The message and all the associated necessary information is given to the NSP, who then verifies the validity of the signature and reports back the outcome of the verification. [on field]
Expected result:	The NSP performs the signature verification of the message and produces a report with an outcome of the validity assessment.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Digital Signature management

Requirement ID	ESMIG.50340

The NSP must ensure the sender of a message uses the certificate provided by the NSP to digitally sign the message. The receiver of the message must be able to check the validity of the signature by using the associated certificate (public key) of the sender.

Detailed test procedure:	Part I: The sender (ESMIG) digitally signs a message; the receiver (Di.Co.A. emulator) of the message is able to check the validity of the signature through the NSP. Part II: The sender (Di.Co.A. emulator) digitally signs a message; the receiver (ESMIG) of the message is able to check the validity of the signature through the NSP. [on field]
Expected result:	The digital signature is created with the certificate provided to the sender by the NSP and the receiver of the message is able to check the validity of this signature.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

5.7 Supplier relationship

Information security in supplier relationships

Requirement ID	ESMIG.50350

The NSP must propagate the relevant information security requirements also to his own suppliers; the subset of "relevant requirements" is contained in this Technical Requirement document, chapter 5, proposed by the NSP and validated by the ESMIG Operator. All relevant information security requirements must be established and agreed with each supplier that may access, process, store, communicate, or provide IT infrastructure components to the NSP.

Detailed test procedure:	List the requirements contained in the Technical Requirement document (chapter 5), the NSP proposes the subset of information security requirements applicable to his own suppliers, the list is validated by the ESMIG Operator (which is empowered on what stays in the list and what not). The NSP demonstrate if and how these requirements are propagated to his own suppliers. [desk check]
Expected result:	Relevant information security requirements are propagated from the NSP to his own suppliers.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Supplier service delivery management

Requirement ID	ESMIG.50360

The NSP must regularly monitor and review supplier service delivery. Changes to the provision of services by suppliers, procedures and controls, must be managed in line with the previous requirement about “Information security in supplier relationships”.

Detailed test procedure:	The NSP demonstrates if and how is regularly monitoring and reviewing the supplier service delivery. [desk check]
Expected result:	Information security in supplier relationships is managed in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

6. MESSAGING SERVICES

The "application to application" (A2A) and "user to application" (U2A) modes

Requirement ID	ESMIG.60010

The NSP must offer the A2A and the U2A modes to the ESMIG and to the Di.Co.A..

Detailed test procedure:	Inspect the NSP Technical Solution describing the A2A mode, then go through the NSP Technical Solution describing the U2A mode. [desk check]
Expected result:	The NSP offers both A2A and U2A services to ESMIG and to its Di.Co.A..
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

6.1 A2A Common requirements

A2A multi-protocol support

Requirement ID	ESMIG.60020

The NSP must offer to the Di.Co.A. connectivity services using A2A DEP and MEPT protocols to exchange messages and files with all Market Infrastructure Service and Application via the ESMIG.

The NSP must support the message/file exchange based on the following addressing elements:

- Sender Address, to identify the sending network entity, according to the network addressing scheme (e.g. X500, URI);
- Receiver Address, to identify the receiving network entity, according to the network addressing scheme (e.g. X500, URI);
- Combination of Service and Environment names, to identify the business environment and the closed group of users (e.g. ESMIG Test #1, ESMIG Test #2, ESMIG Prod)
- Type of Message Flow, to identify different message typologies (e.g. Message2)

Detailed test procedure:	Send a DEP message/file from a Di.Co.A. (using the Di.Co.A. emulator). Collect the message at the receiving interface at the ESMIG and inspect the message itself. The four following addressing elements should be present: Sender Address, Receiver Address, Service and Environment names and Type of Message Flow. Repeat the test with a MEPT message[on field]
Expected result:	NSP routes the messages based on the four addressing elements mentioned above.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A NSP routing independency

Requirement ID	ESMIG.60030

The NSP must provide a location independent routing. The ESMIG is unaware of the physical location of the Di.Co.A. and viceversa. If the Di.Co.A. configuration changes, for example due to disaster recovery procedures, no changes are required to the ESMIG .

Detailed test procedure:	Part I: Assuming the Di.Co.A. has at least two sites, send a message to the ESMIG from a test Di.Co.A. (using the Di.Co.A. emulator to simulate “site 1”). Then, recover the Di.Co.A. on another site (using the Di.Co.A. emulator to simulate “site 2”) and send another message. Check that both messages are received by the ESMIG while no configuration change has been performed. Part II: Send a message to the Di.Co.A. (using the Di.Co.A.emulator) from the ESMIG (site A). Then, recover the ESMIG on another site (site B) and send another message. Check that both messages are received by the Di.Co.A. (using the Di.Co.A. emulator) while no configuration change has been performed. [on field]
Expected result:	The ESMIG is unaware of the physical location of the Di.Co.A..
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A NSP flooding control

Requirement ID	ESMIG.60040

The NSP must implement an anti-flooding (throttling) mechanism to ensure that no single Di.Co.A. can affect the availability of the solution at ESMIG side.

Detailed test procedure:	Send from a Di.Co.A. (using the Di.Co.A. emulator) a set of messages with a rate higher than the threshold set by the NSP. The NSP should drop the messages above the predefined threshold rate. For example, before starting the test set a very low threshold (ie. 5 msg/sec), then try to send messages at a higher rate; the messages above threshold should be dropped. [on field]
Expected result:	The NSP has a throttling mechanism in place.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A message size management

Requirement ID	ESMIG.60050

The NSP rejects as soon as possible any message that is not in the allowed size range indicated for the specific protocol (DEP or MEPT). The NSP rejects the operation by sending back to the originator a negative acknowledgement message with the explanation of the error (e.g. "Message size out of allowed range.").

Detailed test procedure:	Generate from a Di.Co.A. (using the Di.Co.A. emulator) an oversized message and verify that the NSP rejects it and sends back to the Di.Co.A. Di.Co.A. a negative acknowledgement message. The ESMIG does not receive the initial oversized message. [on field]
Expected result:	The NSP rejects any message that is not in the allowed size range. The originator receives a negative acknowledgement message. The NSP rejects the oversized message as close as possible to the source.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A user authentication

Requirement ID	ESMIG.60060

The NSP must provide to the Di.Co.A. the required certificates to access the A2A messaging services. The private keys of the PKI certificates must be secured by means of FIPS 140-2 Level 3 HSM – compliant equipment.

Detailed test procedure:	The NSP delivered the certificates to the Di.Co.A.. Verify certificates' private keys are secured by means of FIPS 140-2 Level 3 HSM, and the protocols, including key length, are in line with the most up-to-date security recommendation (e.g. NIST 800-57). [on field]
Expected result:	The devices and the certificates provided by the NSP to the Di.Co.A. are in line with the requirement.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A closed group of user authorization

Requirement ID	ESMIG.60070

The NSP checks the authorization of the Di.Co.A. to access the ESMIG based on enforced rules at NSP level, supporting segregation of traffic flows between participants.

Detailed test procedure:	Part I: Send a message to the ESMIG from an authorized Di.Co.A. (using the Di.Co.A. emulator), then send another message from another Di.Co.A. (using the Di.Co.A. emulator) not present in the CGU. First one should pass, while the second one should fail. Part II: Add the second Di.Co.A. to the CGU and send messages from the ESMIG to both the Di.Co.A.. Check that each message is delivered only to the intended addressee. [on field]
Expected result:	The NSP checks that the Di.Co.A. belongs to the Closed Group of Users and guarantees the traffic segregation among different users.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ product version

Requirement ID	ESMIG.60080

The NSP must connect to the ESMIG sites using the IBM Message Queuing ("WMQ") transport protocol. The NSP uses a WMQ product version compliant with the WMQ version adopted by ESMIG.

Detailed test procedure:	Check the WMQ product version on all NSP's Network Gateways. Check the WMQ version on all ESMIG systems, ensure a bilateral compatibility. [on field]
Expected result:	The NSP adopts an WMQ product version compliant with the WMQ version adopted by the ESMIG. WMQ versions are either the same or compliant between each other.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ channels

Requirement ID	ESMIG.60090

The NSP must support the use of multiple channels to connect to the ESMIG WMQ infrastructure.

The NSP and the ESMIG shall jointly agree the channels set up for different flows.

Detailed test procedure:	Count the number of WMQ channels available for messages and for files store-and-forward. Verify NSP is able to manage all available WMQ channels simultaneously. [desk check + on field]
Expected result:	Each kind of flow – both messages and files store-and-forward - has at least one WMQ channel. The number of channels is bilaterally agreed.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ channels TLS connection

Requirement ID	ESMIG.60100

WMQ channel connections must be secured by using the TLS protocol and digital certificates exchanged between the ESMIG and the NSP. Digital certificates for the WMQ channels TLS connection are provided by the ESMIG Services Operator to the NSP.

Detailed test procedure:	Check that WMQ channels are secured with TLS certificates. Make sure that the TLS certificates are signed by a ESMIG Operator's compliant CA. [desk check + on field]
Expected result:	WMQ channels are secured with TLS certificates provided by the ESMIG Services Operator.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ channels type

Requirement ID	ESMIG.60110

The NSP must connect to the ESMIG WMQ infrastructure using client-server mode (channels SVRCONN located at the ESMIG sites). The name of the channels follows the ESMIG naming convention.

Detailed test procedure:	Check if the NSP connects to ESMIG WMQ in client-server mode (channels SVRCONN located at the ESMIG sites). The name of the channels should follow the ESMIG naming convention. [desk check + on field]
Expected result:	The NSP connects to ESMIG WMQ infrastructure using client-server mode and the channels name is compliant with the agreed naming convention.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ message queues

Requirement ID	ESMIG.60120

The NSP must manage a set of queues for each specific flow in the transport protocol. The name of queues shall follow the ESMIG naming convention. The NSP and the ESMIG shall jointly agree the WMQ configuration details.

Detailed test procedure:	Verify the WMQ message queues managed by the NSP are in line with ESMIG naming convention and the NSP is able to get and put messages on all the defined queues. [on field]
Expected result:	On each defined WMQ message queue NSP is able to manage the messages (reading from outgoing queues and writing to incoming queues) .
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ messages management - load balancing

Requirement ID	ESMIG.60130

The NSP must manage the load balancing across WMQ traffic queues (also belonging to different WMQ instances) for incoming messages/files (sent by Di.Co.A.) with a load balancing mechanism based on a random choice (e.g. round robin mechanism) across the queues dedicated to each kind of flow.

For outgoing messages the NSP must manage all WMQ traffic queues (also belonging to different WMQ instances) foreseen for this kind of flow.

Detailed test procedure:	The NSP gateway performs load balancing on traffic queues for incoming messages (sent by the Di.Co.A. using the Di.Co.A. emulator). Simulate incoming message traffic while monitoring the queues to verify the load balancing mechanisms. Simulate outgoing message traffic while monitoring the queues to verify that all messages are processed by the NSP. [desk check + on field]
Expected result:	There is a messages load balancing mechanism across WMQ queues for incoming messages. All outgoing messages are processed.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ message description section – CCSID

Requirement ID	ESMIG.60140

The NSP handles the WMQ message description section field CCSID based on the one used by ESMIG (character set name: UTF-8, CCSID: 1208).

Detailed test procedure:	Inspect the message description section field CCSID 1208. Take note of field value. [on field]
Expected result:	WMQ message description section field CCSID 1208 is populated with a significant and meaningful value.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WMQ additional headers

Requirement ID	ESMIG.60150

The NSP must support additional WMQ standard header RFH2 and JMS.

Detailed test procedure:	Check the additional header structure RFH2 and JMS in the WMQ messages. [on field]
Expected result:	NSP supports the additional header structure RFH2 and JMS in WMQ.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Di.Co.A. Emulator Access Point

Requirement ID	ESMIG.60160

The NSP must provide to the ESMIG a “Di.Co.A. Emulator access point” to perform testing/monitoring (continuous and/or specific after any change implementation).

The Di.Co.A. Emulator access point includes:

- a connectivity infrastructure at one of the ESMIG sites. The connectivity infrastructure is of the same type as the one provided to the Di.Co.A.;
- a minimal set of software components to manage simple message exchange, i.e. to trigger message sending and to support message receiving, emulating the basic configuration of a Di.Co.A..

The ESMIG Operator is able to use the Di.Co.A. Emulator software without the need of any prior notice to the NSP. It must be possible to have more than a single Emulator, to support the various Business Services and Application (e.g. T2, T2S, TIPS, ECMS) message exchange.

Detailed test procedure:	Verify that through the Di.Co.A. Emulator access point it is possible to manage simple message exchanges between the ESMIG and the emulated Di.Co.A.
Expected result:	The ESMIG Operator is able to use the Di.Co.A. Emulator access point without the need of any prior notice to the NSP.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

6.2 A2A DEP

Application to Application (A2A) mode

Requirement ID	ESMIG.60170

The NSP must support exchange of messages in A2A mode via "store-and-forward" and “real time” . The NSP must support exchange of files in A2A mode via "store-and-forward" and “real time”. For the real-time mode, although incoming/outgoing messages and files exchange are part of the DEP protocol, for the time being usage of real-time mode is limited to incoming messages only.

Detailed test procedure:	Part I: Send messages (A2A mode) via the “real time” transfer mode. Part II: Send messages (A2A mode) via the “store-and-forward” transfer mode. Part III: Send files (A2A mode) via the “store-and-forward” transfer mode. Part IV: Send files (A2A mode) via the “real time” transfer mode. Verify that all messages and files has been received.
Expected result:	The NSP exchange A2A messages via the "real time" transfer and "store-and-forward" mode; the NSP exchange A2A files in the "real time" transfer and "store-and-forward" mode.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Backup of messages and files

Requirement ID	ESMIG.60180

The NSP must create back-up copies of store-and-forward information exchanged (both messages and files) and must store them for a period of six months. A restore action using one back-up copy provided by the NSP will be tested by the ESMIG at least once a year.

Detailed test procedure:	Verify how the NSP intends to back up messages and files and how to retrieve them. [desk check] Select a message one week older and perform the restore procedure. Repeat the test for a file. [on field] [Please notice it is not practical to test six months retention period.]
Expected result:	The NSP is able to back up and restore messages and files.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Real-time timeout management

Requirement ID	ESMIG.60190

The NSP must manage the timeout for real-time message exchange. This timeout has a value of 60 seconds. The timeout will occur if the exchange of the message will not be completed in the timeout timeframe duration.

Detailed test procedure:	Position the receiver as not being able to receive messages. Send messages to the receiver. Verify a time out after 60 seconds.
Expected result:	The timeout occurs if the receiver is not available to receive the message in the timeout timeframe duration.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Usage for messages and files

Requirement ID	ESMIG.60200

The NSP must manage message/files exchanged with the ESMIG in the following format:

- The Exchange Header section contains all "service information" needed for the transport layer, exchanged between the NSP and the ESMIG to manage messages and files flows;
- The Exchange Payload for business layer (BusinessEnvelope + document or document set) section. This section contains "business information". It shall reach the receiver in an unchanged form, consequently the NSP shall not modify this section. The NSP shall not execute any checks on that content unless explicitly requested by a bilateral agreement between the NSP and the Di.Co.A.. The business layer does not fall into the scope of this document.

Detailed test procedure:	Jointly analyse the contents of the EH and EP and verify they are in line with the Technical Requirements. Identify defects, each defects shall be recorded in an action plan.
Expected result:	The NSP manages messages/files exchanges accordingly to the requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A message size limitations

Requirement ID	ESMIG.60210

The NSP must offer its A2A mode in compliance with the size limitations described in the Table 2 below. The Table 2 specifies the allowed size range for messages and files, without taking into account the communication protocols overheads.

	MINIMUM LENGTH	MAXIMUM LENGTH
Message channel	1	32 KB (KB=2^{10})
File channel	1	32 MB (MB=2^{20})

Table 2 – Size limit of messages and files

Detailed test procedure:	Send messages with business payload size equal and less than 32 KB. Send files with size equal and less than 32MB. Verify the messages are successfully delivered. Then send messages with business payload size larger than 32 KB. Send files with size larger than 32MB. Verify the messages are not delivered.
Expected result:	The NSP offers A2A services in compliance with the size limitations described in the Technical Requirement document. It is possible to send messages up to 32 KB and files up to 32MB.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A message delivery approach

Requirement ID	ESMIG.60220

The NSP shall deliver messages and files once and only once. In case of error or doubt conditions, a retry mechanism is implemented for store-and-forward traffic, but additional mechanisms to avoid message duplication are in place.

Detailed test procedure:	Send the same message twice. Verify the message in store-and-forward mode is delivered with a retryin case of error in the delivery (for example when the MQ is not accessible). Send the same file twice; verify the file in store-and-forward is delivered with a retry in case of error in the delivery (for example when the MQ is not accessible).
Expected result:	Duplicated messages do not reach the platform. Duplicated files do not reach the platform.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Message against file priority

Requirement ID	ESMIG.60230

The NSP must avoid that massive exchange of files negatively affects messages delivery.

Detailed test procedure:	Send a bulk quantity of files and simultaneously send a bulk quantity of messages. To avoid message queuing starvation in case of bulk file transfers in the Network, the NSP has installed a queuing / prioritising function.
Expected result:	The NSP avoids that massive exchange of files negatively affects the messages delivery.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Message and files retrieval

Requirement ID	ESMIG.60240

The NSP must be able to provide a resending functionality for store-and-forward traffic to the Di.Co.A. and ESMIG. During a predefined period of time (up to five calendar days or two business days), it will be possible for the Di.Co.A. or ESMIG operator to request the NSP to retrieve sent and/or received Store-and-forward traffic for relevant technical address/es.

Detailed test procedure:	Request to the NSP resending of the store-and-forward traffic to the Di.Co.A. emulator the traffic related to a specific timeframe. Request to the NSP resending of the store-and-forward traffic to the ESMIG the traffic related to a specific timeframe.
Expected result:	Verify the Di.Co.A. emulator and the ESMIG receive the store-and-forward traffic related to the specified timeframe.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

Unbalanced workload traffic management for T2S

Requirement ID	ESMIG.60250

A huge amount (unbalanced) workload Di.Co.A., can overload the queues shared with the others. As all the communication path between Di.Co.A. – NSP and T2S is based on queuing messages, the possible unbalanced workload of a specific Di.Co.A. could affect the transmission performance of the others (the messages are transported over the same shared resources - channels and queues).

For this reason, T2S offers the possibility to the NSP, under specific traffic volume conditions and only for CSDs and subject to specific agreement with ESMIG operator, to differentiate the path (channels) of the unbalanced workload traffic, in order to improve manageability.

Detailed test procedure:	Using an unbalanced channel send a bulk quantity of files/messages and simultaneously send a message/file using standard channel. To avoid message queuing starvation between unbalanced and standard channel.
Expected result:	The NSP avoids that massive exchange of messages/files via unbalanced channel negatively affects the messages/files sent via standard channel.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

6.2.1 A2A WebSphere MQ Requirements.

To manage A2A services, the NSP must connect to the WebSphere MQ ("**WMQ**") architecture of ESMIG. The NSP shall comply with the following requirements.

WebSphere MQ channels

Requirement ID	ESMIG.60260

The NSP must connect to at least one ESMIG WMQ channel for each kind of flows:

- Messages real-time
- Files real-time
- Messages store-and-forward
- Files store-and-forward

Detailed test procedure:	1. count the number of WMQ channels available for messages real-time; 2. count the number of WMQ channels available for files real-time; 3. count the number of WMQ channels available for messages store-and- forward; 4. count the number of WMQ channels available for files store-and-forward.
Expected result:	Each kind of flow (1. Messages real-time, 2. Files real-time, 3. Messages store-and-forward, 4. Files store-and-forward) has at least one WMQ channel.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WebSphere MQ message description section – MsgType

Requirement ID	ESMIG.60270

The NSP must manage the WMQ messages having the following MsgType: request, reply, report, datagram.

Detailed test procedure:	Inspect the MsgType in the WMQ messages. Check request, reply, report, and datagram.
Expected result:	The NSP manages the WMQ messages having the following MsgType: request, reply, report, and datagram.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WebSphere MQ message description section – Format

Requirement ID	ESMIG.60280

The NSP must manage the WMQ messages having the following format. The payload data of WMQ messages shall be handled as binary data during transfer. Therefore, the according format header field shall have the value NONE.

Detailed test procedure:	Check the String Format in the WMQ messages.
Expected result:	The NSP manages the WMQ messages having the String Format.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WebSphere MQ message structure

Requirement ID	ESMIG.60290

The NSP shall manage the exchange of message/file based on a WMQ message. A WMQ message is composed by a "Message Description" part (MQMD) and by a "Message Text" part.

The following WMQ message standard MQMD header fields shall be managed by the NSP and ESMIG when a message/file is exchanged:

DATA SECTION	DESCRIPTION
WMQ Message Description	No particular header (e.g. RFH2) are foreseen. • **MQMD.MsgType**: report/datagram values are allowed; • **MQMD.Format**: e.g. MQFMT_NONE; • **MQMD.MsgId** and **CorrelationId**; • **MQMD.Encoding**; • **MQMD**.**ApplIdentity**; • **MQMD**.**Feedback;** • **MQMD.CodedCharacterSetId**; • **MQMD.Report** option: set to the value MQRO_PAN, MQRO_NAN or MQRO_NONE; • **MQMD.Expiry**: this field will be used only for Real-Time Request traffic setting the value equal to the Real-Time time-out timeframe (e.g. 60 seconds). In this way it is possible to avoid the unnecessary management of already expired messages.
WMQ Message Text	• **Exchange Header** section: contains all "service information" needed for the transport layer, exchanged between the Di.Co.A. and the ESMIG to manage message and file flows; • **Business Envelope** for business layer: contains the Business Application Header or the File Application Header with document (or document set) section. • **Digital Signature** contains the signature at DEP level (signature at business level is, if present, inside the Business Envelope)

Detailed test procedure:	A WMQ message is composed by a "Message Description" part (MQMD) and by a "Message Text" part. Supported WMQ message are: MQMD.MsgType, MQMD.Format, MQMD.Enconding, MQMD.CodeCharacterSetId, MQMD.Report option, MQMD.Expiry. Messages are generated for each of the above types and the correct transport and delivery of the messages is verified.
Expected result:	The NSP manages the message / file exchange based on a WMQ message.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

WebSphere MQ general rules

Requirement ID	ESMIG.60300

The general rules summarized in the following table should be applied to WMQ messages. All other fields that are not specifically mentioned here should preserve their default values as defined in the WMQ API or as set as the defaults for the applied WMQ platform.

FIELD IN MQMD	GENERAL RULES	EXCEPTIONS AND FURTHER EXPLAINATIONS
StrucId	MQMD_STRUC_ID	
Version	MQMD_VERSION_1	MQMD_VERSION_2:·Version 2 of MQMD may be used. However, features that need MQMD version 2 are not supported (i.e. grouping or segmentation).
Report	MQRO_NONE	For Request and Response (and DeliveryNotification) DEP primitives (Datagram MsgType), it must be equal to 0; for Technical Ack (Report MsgType), it must be equal to MQRO_PAN (for Positive Technical Ack) or to MQRO_NAN (for Negative Technical Ack).
MsgType	MQMT_DATAGRAM	The message type of all Request and Response (and DeliveryNotification) DEP primitives will be MQMT_DATAGRAM. - For Technical Ack it will be MQMT_REPORT
Expiry	MQEI_UNLIMITED	The Expiry of Real-Time Request messages should be set to the equivalent of 60 seconds (i.e. the numerical value of 600).
Feedback		.Meaningful only for Report MsgType: must be equal to 0 for PAN (Positive Technical Ack), 1000 for NAN (Negative Technical Ack) and 2000 for Pseudo-NAN
Encoding		
CodedCharSetId		
Format	MQFMT_NONE.	
Priority	Default value	WMQ ESMIG queues are defined with default delivery mode in ESMIG as FIFO and the default priority set to 5. Message priority is not honoured unless there is a specific agreement with the connected counterparties. Priority can be set but will not be honoured by ESMIG in case of missing pre-agreement.
Persistence	Default value	WMQ queues in ESMIG are defined with default persistence set to YES. The messages inherit the queue definition. Requirements for deactivation of persistence need to be agreed with ESMIG.
MsgId		

FIELD IN MQMD	GENERAL RULES	EXCEPTIONS AND FURTHER EXPLAINATIONS
CorrelId		In Technical Ack, it must be set to the MQMD.MsgId value of the original Request/Response/Deliverynotification the Technical Ack refers to. In Response, it must be set to the MQMD.MsgId of the original Request the Response refers to.
BackoutCount	0	
ReplyToQ	Blanks	The fields ReplyToQ should never be set and never be checked for answers. All messages will be directed to the message queues that match the nature of that message (i.e. qualified by Real-Time or Store-and-Forward, file or message; data or Ack).
ReplyToQMgr	Blanks	ReplyToQmgr should never be set and never be checked for answers. All messages will be directed to the Queue Manager configured in the communication path.
UserIdentifier		
AccountingToken		
ApplIdentityData	Set to the system identification of the sending application (the counterparty's gateway hostname or the ESMIG hostname).	
PutApplType		
PutApplName		
PutDate	Date when message is sent	
PutTime	Time when message is sent	
ApplOriginData	Blanks	
GroupId		
MsgSeqNumber		
Offset		
MsgFlags		
OriginalLength		

Detailed test procedure:	Send a message and a file from the Di.Co.A. emulator to the ESMIG. Verify incoming MQMD fields are compliant for incoming message and file with the general rules reported in the previous table.
Expected result:	The NSP manages the message / file exchange using the MQMD field in the proper way.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

6.2.2 Protocol Description

A2A primitives

Requirement ID	ESMIG.60310

The NSP must manage the following primitives to exchange messages with the ESMIG:

- Request: The ESMIG uses this message type to send a message/file to a Di.Co.A. and vice versa. This kind of primitive shall be used in both real-time and store-and-forward mode;
- Response: The ESMIG uses this message type to answer to a previously received request. This kind of primitive is used only in real-time mode;
- TechnicalAck: this acknowledgement is provided for each data exchange between the communication counterparties (Di.Co.A. and ESMIG) for the confirmation of the completion of the data exchange. This kind of primitive shall be used both in real-time mode and in store-and-forward mode;
- DeliveryNotification: The NSP's gateway sends a message to inform the ESMIG about the successful/unsuccessful delivery of the original sent message/file. This kind of primitive is used only in store-and-forward mode;
- EnableSnFTraffic: The ESMIG sends to the NSP's gateway the request to enable the exchanging store-and-forward traffic;
- DisableSnFTraffic: The ESMIG sends to the NSP's gateway the request to disable the exchanging store-and-forward traffic;
- QuerySnFTraffic: The ESMIG sends to the NSP's gateway the request to query the status of store-and-forward traffic;
- EnableRTTraffic: The ESMIG sends to the NSP's gateway the request to enable the exchanging real-time traffic;
- DisableRTTraffic: The ESMIG sends to the NSP's gateway the request to disable the exchanging real-time traffic;
- QueryRTTraffic: The ESMIG sends to the NSP's gateway the request to query the status of real-time traffic;
- CloseTrafficChannels: The ESMIG sends to the NSP's gateway the request to inform the NSP about the start the Maintenance Window;
- OpenTrafficChannels: The ESMIG sends to the NSP's gateway the request to inform the NSP about the end of the Maintenance Window;
- QueryTrafficChannels: The ESMIG sends to the NSP's gateway the request to query the status of the Maintenance Window as known by the NSP Gateway.

Detailed test procedure:	The above mentioned primitive are tested using the following technical requirements: ESMIG.60440 ESMIG.60450 ESMIG.60390 ESMIG.60460 ESMIG.60470 ESMIG.60480
Expected result:	Verify all the listed technical requirements are successfully passed.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team_____date____/____/____ NSP testing team_____date____/____/____

A2A Primitives management

Requirement ID	ESMIG.60320

The NSP must manage the primitives to exchange messages/files with the ESMIG.

All these primitives are composed by an "Exchange Header" part and by a "Business Envelope" part.

The function of the Exchange Header (or Technical Envelope) is to provide the information needed to route the object (message or file) to the correct destination and to identify and describe the object type.

Hereafter is reported an example of a DEP protocol message:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:Request
   xmlns:dep="http://www.ecb.eu/dep-2.0"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
   <dep:ExchangeHeader>
      <dep:Version>2.0</dep:Version>
      <dep:Sender>cn=appl1,o=prod</dep:Sender>
      <dep:Receiver>cn=cust1,o=nsp-name1</dep:Receiver>
      <dep:TechnicalServiceId>service1.nsp-name1.MSGRT.PROD</dep:TechnicalServiceId>
<dep:MessageId>MSGRT.NSPname1.20110101000000.000001</dep:MessageId>
      <dep:SendTimestamp>2018-01-01T00:00:00</dep:SendTimestamp>
      <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
      <dep:ExchangeStatus>OK</dep:ExchangeStatus>
   </dep:ExchangeHeader>
   <dep:BusinessEnvelope>
      <dep:BusinessApplicationHeader>
         <!-- business application header goes here -->
      </dep:BusinessApplicationHeader>
      <dep:BusinessMessage>
         <!-- business message goes here -->
      </dep:BusinessMessage>
   </dep:BusinessEnvelope>
</dep:Request>
```

The "Exchange Header" part shall be managed by the NSP's gateway in order to exchange data with ESMIG.

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:Version *<mandatory tag>*	Version of Data Exchange Protocol. **Enumeration** with fixed value "**2.0**"	<dep:Version> 2.0 </dep:Version>

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:Sender *<mandatory tag>*	Identification for the Technical Sender that sends the message. **Restriction** is set on base type "**string [100]**".	<dep:Sender> cn=appl1, o=prod </dep:Sender>
dep:Receiver *<mandatory tag>*	Identification for the Technical Receiver that receives the message. **Restriction** is set on base type "**string [100]**".	<dep:Receiver> cn=cust1, o=nsp-name1 </dep:Receiver>
dep:TechnicalServiceID *<mandatory tag>*	Name of the technical service used to send messages and files, made up by the Service, the DEP counterpart name, the message pattern and the environment of reference. Specifying a message pattern, it's possible to manage a message or a file as a payload of the DEP message. **Message pattern** means the following: • MSGRT: **Real Time Message**; • MSGSNF: **Store & Forward Message**; • FILERT: **Real Time File**; • FILESNF: **Store & Forward File**. **Restriction** is set on base type "**string [60]**", with expression in the format: <Service>+"."+<NSPName>+ "." + <msg-pattern> + "." + <environment> where <msg-pattern> is one of: MSGRT MSGSNF FILERT FILESNF and <environment> is one of: INTEG,IAC,EAC,UTEST, PROD (additional environment can be added)	<dep:TechnicalServiceId> Service1.nsp-name1.MSGRT.PROD </dep:TechnicalServiceId>

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:RequestType *<mandatory tag>*	Type of request, to classify message content. When there are different request types in the same BusinessEnvelope (multi-message), a multirequest value shall be used as RequestType **Restriction** is set on base type "**string [100]**".	<dep:RequestType> MultiRequest </dep: RequestType >
dep:CommunicationID *<minOccurs="0">*	Unique message identifier assigned by the ESMIG counterpart (at DEP transport level)l **Restriction** is set on base type "**string [100]**".	<dep:CommunicationId> nsp-name1.gtw134567. 20100908185555.123456 </dep:CommunicationId>
dep:ESMIGMessageId *<minOccurs="0">*	Unique message identifier generated by ESMIG **Restriction** is set on base type "**string [100]**".	<dep:ESMIGMessageId> MSGRT.NSPname1.20110101000000.000001 </dep:ESMIGMessageId>
dep:ActorMessageId *<minOccurs="0">*	Unique message identifier generated at Di.Co.A. site **Restriction** is set on base type "**string [100]**".	<dep:ActorMessageId> ActorGateway1.20100908175531.123456 </dep:ActorMessageId>
dep:EntryTimestamp *<minOccurs="0">*	Timestamp of the NSP's gateway reception based on UTC time with the following rule: ▪ the Zulu character shall be present ▪ fractional seconds are optional (maximum 3 digits) ▪ the representation of midnight is 00:00:00Z **Restriction** is set on base type "**dateTime**".	<dep:EntryTimestamp> 2011-01-01T00:00:00Z </dep:EntryTimestamp>

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:SendTimestamp *<mandatory tag>*	Timestamp of the sending of message, based on UTC time with the following rule: ▪ the Zulu character shall be present ▪ fractional seconds are optional (maximum 3 digits) ▪ the representation of midnight is 00:00:00Z **Restriction** is set on base type "**dateTime**".	<dep:SendTimestamp> 2011-01-01T00:00:00Z </dep:SendTimestamp>
dep:ReceiveTimestamp *<minOccurs="0">*	Timestamp of the receiving of message, based on UTC time with the following rule: ▪ the Zulu character shall be present ▪ fractional seconds are optional (maximum 3 digits) ▪ the representation of midnight is 00:00:00Z **Restriction** is set on base type "**dateTime**".	<dep:ReceiveTimestamp> 2011-01-01T00:00:01Z </dep:ReceiveTimestamp>
dep:PDMHistory *<minOccurs="0">*	Only for **Store-and-Forward**, Timestamp's list of the attempts of the delivery of the message, based on UTC time. This list contains a sequence of SendTimestamp entries. It also contains for each timestamp an optional AdditionalInfo. This is a **complex type** tag based on a sequence of maximum occurrences, each one containing two elements: • **TimeStamp**, a mandatory tag with base type **dateTime;** • **AdditionalInfo**, an optional tag with **restriction** set on base type "**string [100]**".	<dep:PDMHistory> <dep:TimeStamp> 2011-01-01T00:00:00Z </dep:TimeStamp> <dep:TimeStamp> 2011-02-14T00:10:01Z </dep:TimeStamp> <dep:AdditionalInfo> Annotation on 2th timestamp entry </dep:AdditionalInfo> </dep:PDMHistory>

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:DeliveryNotification *<minOccurs="0">*	Delivery notification management; this field has to be set only in the case of **Store-and-Forward mode**. The following values are foreseen: • "**YES**": the delivery notification is requested always • "**FAIL**": the delivery notification is requested only in case of failure • "**NO**": the delivery notification is not requested **Restriction** is set on base type "**string**".	<dep:DeliveryNotification> FAIL </dep:DeliveryNotification>
dep: **NonRepudiationExchange** *<mandatory tag>*	Flag that indicates if the non-repudiation is requested or not **Enumeration** with possible values: **YES** or **NO**.	<dep:NonRepudiationExchange> NO </dep:NonRepudiationExchange>
dep:Compression *<mandatory tag>*	Flag that indicates the algorithm used to compress the payload or "NONE" (if compression is not used) **Enumeration** with possible values "**NONE**" or "**ZIP**". The used compression format is ZIP implemented by DEFLATE algorithm into the ZLIB java libraries, moreover Base64 encoding need to be applied.	<dep:Compression> ZIP </dep:Compression>

TAG NAME	TAG DESCRIPTION / ALLOWED VALUES	EXAMPLE
dep:ExchangeStatus *<minOccurs="0">*	Status of the exchange: "OK" for successful exchange "KO" for failure This element must be present in DEP technical ack messages and in Response messages of R-T (message and file) exchange. **Enumeration** with possible values: • "**OK**" in the case of successful exchange • "**KO**" in case of failure	<dep:ExchangeStatus> OK </dep:ExchangeStatus>
dep:ErrorDescription *<minOccurs="0">*	Description of the error occurred during the exchanging process (tag has to be set only if tag dep:ExchangeStatus has value "KO") This is a **complex type** tag based on two elements: • **ErrorCode**, a mandatory tag with base type **string** and a validation pattern "**DEP[0-9]{3}E**". • **AdditionalInfo**, an optional tag with **restriction** set on base type "**string [2000]**".	<dep:ErrorDescription> <dep:ErrorCode> DEP040E </dep:ErrorCode> <dep:AdditionalInfo> Message expired. Receiver has not been connected for 14 days. </dep:AdditionalInfo> </dep:ErrorDescription>
dep:MessageDigest *<minOccurs="0">*	Used only in Technical Ack primitive when the NonRepudiationExchange flag has been set to YES. The digest has to be calculated based on the received DEP Exchange Header and Business Envelope using the same canonicalization and digest methods/algorithms described in requirement ESMIG60450. **Restriction** is set on base type "**string [1024]**".	

Table 3 – Exchange Header

Detailed test procedure:	Send and receive a message and a file using both real-time and store-and-forward exchange and verify all the mentioned tags are correctly used.
Expected result:	The NSP is able to manage DEP Exchange Header tags accordingly to the rules reported in Table 3.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

NSP inbound routing

Requirement ID	ESMIG.60330

The NSP must manage traffic routing related to the business services, each of them made of one or more components, see table below. Components can be specific (dedicated to a business service) or common (shared among different business services).

The NSP must be able, if requested, to route inbound traffic to different MQ queues, using the DEP tag named TechnicalServiceID ("service" field in particular).

The NSP must be able to add/remove component and/or business service if requested.

The following table is a sample describing the relationship between business service, component and TechnicalServiceID.

BUSINESS SERVICE	COMPONENT	TECHNICALSERVICEID (SERVICE FIELD)
T2S	T2S	T2S
T2S	CRDM	T2SCRDM
T2S	…..	T2S….
T2	RTGS	T2RTGS
T2	CLM	T2CLM
T2	CRDM	T2CRDM
T2	……	T2…..
ECMS	ECMS	ECMS

Detailed test procedure:	Send messages and files from the Di.Co.A. emulator to address different TechnicalServiceID.
Expected result:	Verify on ESMIG that based on the different TechnicalServiceID the NSP is able to perform routing of inbound traffic to the correct MQ queue.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Exchange Header management and validation

Requirement ID	ESMIG.60340

The "Exchange Header" shall include all necessary information for the sending and the managing of the data by the NSP and by the counterpart.

The NSP's gateway shall validate the "Exchange Header" of the message/file in order to check that all the required fields are present, in the right format (such as date, Boolean,) and filled in with the appropriate values indicated in the "allowed values" column of the "Exchange Header".

The NSP shall validate the “Exchange Header” for the message/file received from ESMIG and for the message/file that the NSP sends to the ESMIG.

The validation of the Exchange Header shall be based on the the XML Schema Definition (XSD) reported in “Annex 1 - DEP XSD”

Detailed test procedure:	Send from the Di.Co.A. emulator to ESMIG messages and files in real-time and store-and-forward. Send from the ESMIG to Di.Co.A. emulator messages and files in real-time and store-and-forward.
Expected result:	The NSP is able to manage for inbound (building Exchange Header) and outbound (verifying Exchange Header) traffic the Exchange Header based on the provided schema (Annex 2 – DEP XSD).
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____

	NSP testing team _____ date ____/____/____

Compression flag and compression algorithm management

Requirement ID	ESMIG.60350

The NSP must forward the "Compression" fields of the Exchange Header to the receiver. This field will specify the algorithm used to compress the business payload contained in the message. If the payload is not compressed, the compression field will contain the value NONE.

If compression is used the compression format is ZIP implemented by DEFLATE algorithm into the ZLIB java libraries, moreover Base64 encoding need to be applied. The compression field will contain in this case the value ZIP, size of business data after the uncompress operation cannot be more than 99MB.

Detailed test procedure:	Inspect the "Compression" and "Compression algorithm" fields of the technical envelope on one end and inspect the same envelope on the other end, make sure the contents of the two fields are still the same. Verify that uncompressed size of business data is not more than 99MB.
Expected result:	The NSP forwards the "Compression" and "Compression algorithm" fields of the technical envelope to the receiver.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____

	_____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Non-repudiation Exchange flag management

Requirement ID	ESMIG.60360

The NSP must manage the non-repudiation flag on exchanging of incoming and outgoing messages/files. In the following is described the process that the ESMIG and the NSP shall manage in case of non-repudiation.

If the non-repudiation is requested for a message / file:

- the sending part (e.g. ESMIG) shall sign the DEP Request or Response and insert the electronic signature into the Signature element;
- the receiving part (e.g. the NSP) shall verify the validity of the signature and send back an error message (NAN Technical ack) if the check fails (i.e. Code DEP301E), otherwise, the receiving part shall create a PAN Technical Ack;
- the receiving part shall sign the Technical Ack and insert the electronic signature into the Signature element;
- the sending part shall check the validity of the signature added to the Technical Ack and store the message.

The MessageDigest field shall be populated for each Technical ack with the DigestValue of the Reference (URI="") found in the Signature of the DEP Request or Response message acknowledged. In case the DigestValue cannot be found, the MessageDigest of the NAN technical ack contains the value "NOREF".

Signature management is based on the XML Advanced Electronic Signature (XAdES) standard for signature of DEP message/file exchange. In particular, the DEP adopts the BES (Basic Electronic Signature) signature format as defined in version 1.4.2 of the ETSI specification (ETSI TS 101 903 V1.4.2 of 2010-12). For the use within DEP messages, no additional signed properties should be included in the signature.

Additionally, signatures shall follow the manifest signature format of the W3C XML Signature Syntax and Processing recommendation (http://www.w3.org/TR/xmldsig-core/, section 2.3).

The signature shall contain:

- one Reference in the SignedInfo to the KeyInfo element. The KeyInfo must include a ds:X509Data element containing the certificate used to create the signature (not all the certification chain must be included);
- one Reference in the SignedInfo that points to the Manifest;
- a Manifest structure in its Object container. The Manifest itself will contain References as follows:
    - for Technical Ack:
        1. a Reference with empty URI covering the Technical Ack itself containing its DigestValue;
        2. one Reference with absent URI covering the content[2] of the BusinessEnvelope of the message or file for which the technical ack was generated containing its DigestValue, only for Technical Acks related to Request/Response; this Reference is not present in TechnicalAck related to DeliveryNotification.
    - for Request/Response (and DeliveryNotification):
        1. a Reference with empty URI covering the Request/Response (or DeliveryNotification) itself containing its DigestValue.

The algorithms used are:

- For the SignedInfo
    - CanonicalizationMethod must be http://www.w3.org/2001/10/xml-exc-c14n# (omitting XML comments)
    - SignatureMethod must be http://www.w3.org/2001/04/xmldsig-more#rsa-sha256
- For Reference
    - Digest algorithm must be http://www.w3.org/2001/04/xmlenc#sha256
    - Transform algorithm must be must be http://www.w3.org/2001/10/xml-exc-c14n# (omitting XML comments)
    - For Reference with empty URI must have an additional Transform algorithm http://www.w3.org/2000/09/xmldsig#enveloped-signature

[2] The content of the BusinessEnvelope could be defined using the following XPath expression:

```
std:string queryXPath = pathToBusinessEnvelope + "/descendant::*/. | " +
// child nodes
pathToBusinessEnvelope + "/descendant::*/@* | " +
// attributes of child nodes
pathToBusinessEnvelope + "/descendant::*/namespace::* | " +
// namespaces of child nodes
pathToBusinessEnvelope + "/descendant::text()";
// text elements
```

The following sample shows the contents of a Technical Aack signature:

```
<ds:Signature ">
 <ds:SignedInfo>
  <ds:CanonicalizationMethod Algorithm=" http://www.w3.org/2001/10/xml-exc-c14n#"/>
  <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256" />
  <ds:Reference URI="# _b7a1a00e-e449-48ae-9d50-e0f48fc010f2">
   <ds:Transforms>
    <ds:Transform Algorithm=" http://www.w3.org/2001/10/xml-exc-c14n#"/>
   </ds:Transforms>
   <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
   <ds:DigestValue>...</ds:DigestValue>
  </ds:Reference>
  <ds:Reference Type="http://www.w3.org/2000/09/xmldsig#Manifest" URI="#_70f715b4-0330-4895-abb9-
6de4843e78b3">
   <ds:Transforms>
    <ds:Transform Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#"/>
   </ds:Transforms>
   <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
   <ds:DigestValue>...</ds:DigestValue>
  </ds:Reference>
 </ds:SignedInfo>
 <ds:SignatureValue>...</ds:SignatureValue>
 <ds:KeyInfo Id="_b7a1a00e-e449-48ae-9d50-e0f48fc010f2">
  <ds:X509Data>
   <ds:X509Certificate>...</ds:X509Certificate>
  </ds:X509Data>
 </ds:KeyInfo>
 <ds:Object xmlns="http://www.w3.org/2000/09/xmldsig#">
  <ds:Manifest Id=" _70f715b4-0330-4895-abb9-6de4843e78b3">
   <ds:Reference URI="">
    <ds:Transforms>
     <ds:Transform Algorithm=http://www.w3.org/2000/09/xmldsig#enveloped-signature/>
     <ds:Transform Algorithm=" http://www.w3.org/2001/10/xml-exc-c14n#"/>
    </ds:Transforms>
    <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
    <ds:DigestValue>...</ds:DigestValue>
   </ds:Reference>
   <ds:Reference>
    <ds:Transforms>
     <ds:Transform Algorithm=" http://www.w3.org/2001/10/xml-exc-c14n#"/>
    </ds:Transforms>
    <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
    <ds:DigestValue>...</ds:DigestValue>
   </ds:Reference>
  </ds:Manifest>
 </ds:Object>
</ds:Signature>
```

Detailed test procedure:	Inspect the content of the Technical Ack in case of the original message is sent by ESMIG with the "dep:NonRepudiation" field set to YES. The Technical Ack must be signed by the NSP gateway as well as the original message must be signed by the ESMIG.
Expected result:	The NSP manage correctly the non-repudiation flag of the technical envelope.

Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Message and file unique identification

Requirement ID	ESMIG.60370

The NSP must identify all messages and files with a unique identifier according to the format indicated in the "Exchange Header" description section. The NSP shall insert this unique identifier in the envelope (field NSP Communication ID) of all messages and file exchanged. This unique identifier will be used to prove the handover of the message/file between ESMIG and the NSP. The same identifier shall be used in the data exchange with the Di.Co.A..

Detailed test procedure:	Inspect the field NSP Communication ID in the technical envelope, field value is the same both in the path from ESMIG to NSP and from NSP to Di.Co.A..
Expected result:	The NSP identifies all messages and files with a unique identifier according to the format indicated in the "technical envelope" description section.

Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

A2A Message patterns

Requirement ID	ESMIG.60380

The NSP must manage the exchange of messages and files with the ESMIG in accordance with the following workflows.

Messages and files can be exchanged in real-time or in store-and-forward mode.
The NSP shall manage the following message/file patterns:

- Real-time outgoing
- Real-time incoming
- Store-and-forward outgoing
- Store-and-forward incoming

In all these message/file patterns is foreseen a "Technical Acknowledgement" ("**Tech-Ack**" or "**Technical Ack**") message between the NSP's gateway and the ESMIG to confirm the reception of the message/file.

Detailed test procedure:	1. Send message and file in Real-time outgoing pattern; 2. send message and file in Real-time incoming pattern;

	3. send message and file in Store-and-forward outgoing pattern; 4. send message and file in Store-and-forward incoming pattern. Verify that Technical Acknowledgements are received.
Expected result:	The NSP manages message / file exchanges in accordance with the workflows described in the Technical Requirements .
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Technical Acknowledgment management

Requirement ID	ESMIG.60390

A Technical Ack is provided for each exchange between the ESMIG and the NSP for the confirmation of the completion of the exchange.

The NSP shall manage the Technical Acknowledgement as described in the following. The Technical Ack is a WebSphere MQ report message of type PAN (Positive Application Notification) or NAN (Negative Application Notification). This report shall be sent back from the receiving WebSphere MQ application (the ESMIG middleware or the NSP's

gateway function) when the message is taken in charge (e.g. the message is stored or managed). The structure of the "Technical Ack" is the following:

1. In the MQMD.Feedback field of the MQ Message Descriptor the value 0 (zero) in case of PAN or a positive numeric value in case of NAN shall be returned;
2. In the "Application Identity Data" of the MQMD, the system identification of the receiving application (the NSP's gateway hostname or the ESMIG hostname) shall be returned.
3. In the "Correlation Id" field of the MQMD section the "Message Id" value of the original message shall be returned.
4. In the "Message Text" part of the MQ message, the "Exchange Header" of the original message, updated as foreseen in the following message patterns description in the case of a PAN shall be reported. In case of NAN the field "dep:ErrorDescription" must be filled with an error message as described in the requirement ESMIG.60400.
5. In case of store-and-forward sent to the ESMIG the NSP shall forward the full content of the “Message Text” part of the MQ message to the Di.Co.A. in the delivery notification.

The Technical Ack shall be returned to the sender (ESMIG or NSP) within a time-frame of an initial value of 10 minutes (this value could be changed in a flexible way at a later time). For the real-time mode no particular actions are required if this time is exceeded because of the already foreseen time-out mechanism management. For the store-and-forward incoming message flow if the time-frame for the Technical Ack is exceeded, the NSP shall re-send the message including in the ExchangeHeader section the “dep:PDMHistory” element with the delivery time of the previous attempt(s) in the following format:

```
<dep:PDMHistory>
    <dep:TimeStamp>2018-11-12T14:53:52Z</dep:TimeStamp>
    <dep:TimeStamp>2018-11-12T15:03:55Z</dep:TimeStamp>
    <dep:TimeStamp>2018-11-12T15:13:56Z</dep:TimeStamp>
</dep:PDMHistory>
```

As described in requirement ESMIG.60450, after 10 unsuccessful attempts the NSP shall send back to the original sender a “Delivery Notification Failure” and shall suspend the

sending of the store-and-forward messages/files to the ESMIG. An alarm shall be triggered in order to allow to the NSP staff to inform the ESMIG Service Desk that a problem occurred in the store-and-forward channel.

Detailed test procedure:	Verify the structure of the Technical Acknowledgement structure contains: 1. MQMD.Feedback, 2. "Application Identity Data", 3. "Correlation Id", 4. "Message Text" as described in the Technical Requirements.
Expected result:	The NSP manages the Technical Acknowledgement, which can be either Positive Application Notification (PAN) or Negative Application Notification (NAN).
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Negative Technical Acknowledgment – Error description fields

Requirement ID	ESMIG.60400

The NSP and ESMIG must manage the negative message acknowledgement in all cases of error. In this case a NAN must be returned to the originator of the message. The "dep:ExchangeStatus" field must be set to the value "KO" and the "dep:ErrorDescription" field must be set accordingly to the following table:

CATEGORIZATION	CODE	ERROR DESCRIPTION FIELD VALUE	DESCRIPTION
Protocol errors [**DEP1xxE**]	**DEP100E**	Message or file size is not in the allowed size range	Received communication size is bigger then the maximum size allowed for the communication service used
	DEP101E	Field xxxx missing	The field reported in the error text is required for the communication exchange workflow (see DEP protocol description for further information)
	DEP102E	Communicationid/ESMIGMessageId/ActorMessageId not unique	The ID provided in the Request is not unique
	DEP104E	maximum number of retries attempt reached	For the Snf communication service the message has been received 10 times with ‘’PDMHistory’’.
	DEP105E	Timeout occurred	For the RT communication service the timeout condition occurred before receiving the response to the original request (timeout is normally set to 60 seconds)
	DEP106E	Unmatched response	For the RT communication service, the response is received and there are no Request matching (via MQMD.MsgId).

CATEGORIZATION	CODE	ERROR DESCRIPTION FIELD VALUE	DESCRIPTION
Addressing errors [**DEP2xxE**]	**DEP200E**	Wrong sender/receiver or not configured	The DEP sender or receiver fields refer to DN that are not configured at NSP or ESMIG level.
	DEP201E	TechnicalServiceId not correct	The information reported in the TechnicalServiceId is not correct. It could be related to wrong logical environment addressed
	DEP202E	Message in wrong queue	The communication was put into a queue not compatible with the selected messaging service (e.g. the TechnicalServiceId refers to MSGRT service while the communication was put into an MQ queue dedicated to the FILESNF messaging service) or the VA-NSP part of the TechnicalServiceId is unknown
Non-repudiation errors [**DEP3xxE**]	**DEP300E**	NonRepudiationExchange field not set in store-and-forward exchange	The received communication was sent via SNF service but the NonRepudiationExchange field is not set accordingly
	DEP301E	Signature validation failure	The certificate or the signature present in the DEP ExchangeHeader is not valid
Validation errors [**DEP4xxE**]	**DEP400E**	Error during MQMD validation	MQMD content is not compliant with the DEP specification or it is corrupted

CATEGORIZATION	CODE	ERROR DESCRIPTION FIELD VALUE	DESCRIPTION
	DEP401E	XML not well formed	The ExchangeHeader validation fails. It is not compliant with the DEP protocol XSD or the xml is corrupted
Compression errors [**DEP5xxE**]	**DEP500E**	ESMIG does not process decompressed communication which size exceeds 99 MB	The communication after the decompression process is bigger than 99 MB
	DEP501E	The Di.Co.A. sending the inbound A2A communication has not used a compression algorithm supported by ESMIG	An error occurred during the decompression of the communication. The file is corrupted or an algorithm not supported by ESMIG was used to compress it
Generic errors [**DEP9xxE**]	**DEP999E**	Error occurred. Message/File exchange aborted	For all the errors not listed in the available error codes

Table 4 – Error messages

The text presented in the "ERROR DESCRIPTION" column above represents the value to be used for field "AdditionalInfo" in block ErrorDescription". However, each implementation may add, if available and without any obligation, additional free text **after** the “standard” message foreseen in the above table to provide any useful information to further clarify the error condition detected. In any case, DEP counterparties should not process the additional text, setting aside the logging for problem determination support.

Detailed test procedure:	Inspect "dep:ExchangeStatus" and "dep:ErrorDescription" field in case a NAN must be returned to the message originator. Flag differences if the result differs from the expected result. Trigger corrective actions.
Expected result:	In this case a NAN must be returned to the message originator. The "dep:ExchangeStatus" field must be set to the value "KO" and the "dep:ErrorDescription" field must be

	set in accordance with the table in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Pseudo-NAN

Requirement ID	ESMIG.60410

The Pseudo NAN is sent back to the sender in the event of format errors that prevent the correct handling of the DEP protocol.

It is used in the following error conditions:

Validation errors DEP4xxE

- DEP400E Error during MQMD validation
- DEP401E XML not well formed

If the WMQ message being checked does not comply with the expected rules, it is considered a “poisonous” or “garbage” message. If the “garbage” message has been read from a WMQ queue related to Request/Response/DeliveryNotification, a Pseudo-NAN is generated and sent onto the WMQ queue related to Technical Ack. If the “garbage” message has been read from a WMQ queue related to Technical Ack, no Pseudo-NAN is generated.

The MQMD.FEEDBACK field shall be filled with 2000. This information helps the receiver of the NAN to understand that the message refers to a Pseudo NAN so as to apply the correct validation procedure.

Then the message shall be filled with the following information:

• The meaningful fields are:

- ReceiveTimestamp: contains the arrival timestamp of the ''incorrect'' message;
- TechnicalServiceID : possibly built by extracting information from the MQ queue where the message was obtained from;
- SendTimestamp: copied from the ReceiveTimestamp.

• The following fields shall be filled with predefined values as in the example:

- Error description: contains the validation error which occurred;
- NonRepudiationExchange: is always set to NO;
- Compression: is always set to NONE.

Example:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:TechnicalAck
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
  <dep:ExchangeHeader>
    <dep:Version>2.0</dep:Version>
    <dep:Sender>NOREF</dep:Sender>
    <dep:Receiver>NOREF</dep:Receiver>
    <dep:TechnicalServiceId> service1.nsp-name1.MSGRT.PROD  </dep:TechnicalServiceId>
    <dep:RequestType>NOREF</dep:RequestType>
    <deè:CommunicationId>NOREF</dep:CommunicationId>
    <dep:ESMIGActorMessageId>NOREF</dep:ESMIGActorMessageId>
    <dep:SendTimestamp>2019-01-01T12:00:05Z</dep:SendTimestamp>
    <dep:ReceiveTimestamp>2012-01-01T12:00:05Z</dep:ReceiveTimestamp>
    <dep:NonRepudiationExchange>NO</dep:NonRepudiationExchange>
    <dep:Compression>NONE</dep:Compression>
    <dep:ExchangeStatus>KO</dep:ExchangeStatus>
    <dep:ErrorDescription>
      <dep:ErrorCode>DEP401E</dep:ErrorCode>
      <dep:AdditionalInfo>XML not well formed</dep:AdditionalInfo>
    </dep:ErrorDescription>
  </dep:ExchangeHeader>
</dep:TechnicalAck>
```

Detailed test procedure:	Send from the ESMIG to the NSP an invalid Request (real-time and store-and-forward) and verify that the Pseudo-NAN is sent back from the NSP to the ESMIG.
Expected result:	The NSP is able to generate a Pseudo-NAN.

Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.2.3 Real-time Outgoing

Real-time outgoing management

Requirement ID	ESMIG.60420

The NSP must manage the real-time outgoing message pattern as detailed below.

The scenario to be considered is one when the ESMIG sends a message/file in real-time mode to a counterpart. This message pattern is shown in the following figure:

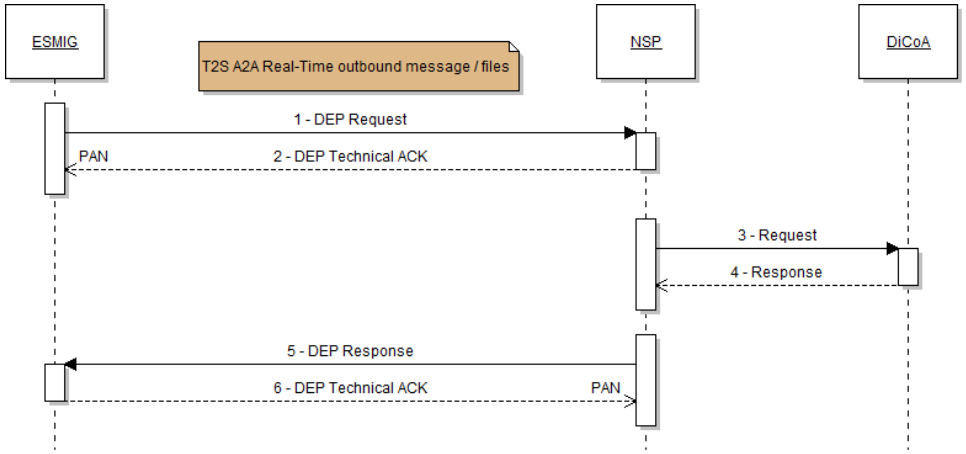


Figure 4 – Real-time outgoing flow

When the ESMIG needs to send a message in real-time mode to a Di.Co.A. it will go through the following steps.

STEP NUMBER	STEP DESCRIPTION
1)	The ESMIG sends a "Request" primitive to the NSP's gateway. The "ESMIGMessageId" field has to be generated by the ESMIG (this identifier shall be unique at ESMIG level).
2)	The NSP's gateway receives the message/file and performs the validation check of the "Exchange Header" part and checks of the size of the message/file. If the validation process fails, then the NSP's gateway sends back to ESMIG a "NAN Technical Ack" setting the error description field with the reason of the failure and the flow is completed. Otherwise, the NSP's gateway saves the message, assigns a unique identification to it, stores this value in the "dep:CommunicationID" field of the "Exchange Header", saves the current timestamp in the "dep:EntryTimestamp" field and sends back to ESMIG a "PAN Technical Ack".
3)	The NSP then sends the message to the Di.Co.A.. If there is an error in the transmission to the final receiver (for instance the receiver is not connected) or the transmission is not completed in the "timeout" timeframe, then the NSP's gateway sends back to the ESMIG a Response message with the "dep:ExchangeStatus" set to "KO" and the "dep:ErrorDescription" field set with the reason of the error occurred and the flow is completed. The business part of the response message in case of error will be not included in the message.
4)	The receiver sends back the response to the NSP's gateway setting in the message header a unique identification of the response generated at receiver site.
5)	The NSP's gateway checks the size of the message coming from the receiver. If the size is outside of the allowed range the message is rejected and an error message is returned to the receiver: in this case a response message is sent to the ESMIG with the "dep:ErrorDescription" field set to "ERROR occurred – Message/File exchange aborted" value. In the case of a successful result of the check the NSP sends the "Response" to the ESMIG setting in the "Exchange Header": • the same "dep:CommunicationID" and "dep:EntryTimestamp" fields used for the original "Request" ; • the field "dep:ActorMessageId" with the unique identification generated at client site; • the field "dep:SendTimestamp" with the time of the sending time (cfr. point 4)
6)	The ESMIG performs the "Exchange Header" validation and sends back to the NSP's gateway a PAN or NAN "Technical Ack".

A set of possible messages for this pattern is reported below as an example.

Message sent by ESMIG to the NSP's gateway at the step no. 1:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:Request
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
```

```
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=appl1,o=prod</dep:Sender>
  <dep:Receiver>cn=cust1,o=nsp-name1</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGRT.PROD</dep:TechnicalServiceId>
  <dep:ESMIGMessageId>MSGRT.NSPname1.20110101000000.000003</dep:ESMIGMessageId>
  <dep:SendTimestamp>2011-01-01T00:00:00</dep:SendTimestamp>
  <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
  <dep:Compression>NONE</dep:Compression>
 </dep:ExchangeHeader>
 <dep:BusinessEnvelope>
  <dep:BusinessApplicationHeader>
   <!-- business application header goes here -->
  </dep:BusinessApplicationHeader>
  <dep:BusinessMessage>
   <!-- business message goes here -->
  </dep:BusinessMessage>
 </dep:BusinessEnvelope>
</dep:Request>
```

Technical Ack (data part) sent by the NSP's gateway to the ESMIG at the step no. 2:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:TechnicalAck
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=appl1,o=prod</dep:Sender>
  <dep:Receiver>cn=cust1,o=nsp-name1</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGRT.PROD</dep:TechnicalServiceId>
  <dep:CommunicationId>nsp-name1.gtw134567.20100908185555.123456</dep:CommunicationId>
  <dep:ESMIGMessageId>MSGRT.NSPname1.20110101000000.000003</dep:ESMIGMessageId>
  <dep:EntryTimestamp>2011-01-01T00:00:00</dep:EntryTimestamp>
  <dep:SendTimestamp>2011-01-01T00:00:01</dep:SendTimestamp>
  <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
   <dep:Compression>NONE</dep:Compression>
  <dep:ExchangeStatus>OK</dep:ExchangeStatus>
 </dep:ExchangeHeader>
</dep:TechnicalAck>
```

Response sent by NSP's gateway to ESMIG at the step no. 5

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:Response
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=cust1,o=nsp-name1</dep:Sender>
  <dep:Receiver>cn=appl1,o=prod</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGRT.PROD</dep:TechnicalServiceId>
  <dep:CommunicationId> service1.nsp-
name1.gtw134567.20100908185555.123456</dep:CommunicationId>
<dep:ActorMessageId>ActorGateway1.20100908175531.123456</dep:ActorMessageId>
  <dep:EntryTimestamp>2011-01-01T00:00:00</dep:EntryTimestamp>
  <dep:SendTimestamp>2011-01-01T00:00:00</dep:SendTimestamp>
  <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
  <dep:Compression>NONE</dep:Compression>
 </dep:ExchangeHeader>
 <dep:BusinessEnvelope>
  <dep:BusinessApplicationHeader>
   <!-- business application header goes here -->
  </dep:BusinessApplicationHeader>
```

```
   <dep:BusinessMessage>
     <!-- business message goes here -->
   </dep:BusinessMessage>
  </dep:BusinessEnvelope>
</dep:Response>
```

Detailed test procedure:	Send a message from ESMIG to Di.Co.A. in real-time mode. Follow the sequence of steps described in the Technical Requirements. Inspect the message sent by the ESMIG to the NSP's gateway at the step #1. Inspect the Technical Acknowledgment sent by the NSP to the ESMIG at the step #2. Inspect the response sent by the NSP to the ESMIG at the step #5. Repeat the test in negative mode. Repeat the same test for a file.
Expected result:	The NSP manages the real-time outgoing message pattern as detailed in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.2.4 Real-time Incoming

Real-time incoming management

Requirement ID	ESMIG.60430

The NSP must manage the real-time incoming message pattern as detailed below.

An incoming real-time message is when the ESMIG receives a message/file in real-time mode from a Di.Co.A.. This message pattern is shown in the following figure.

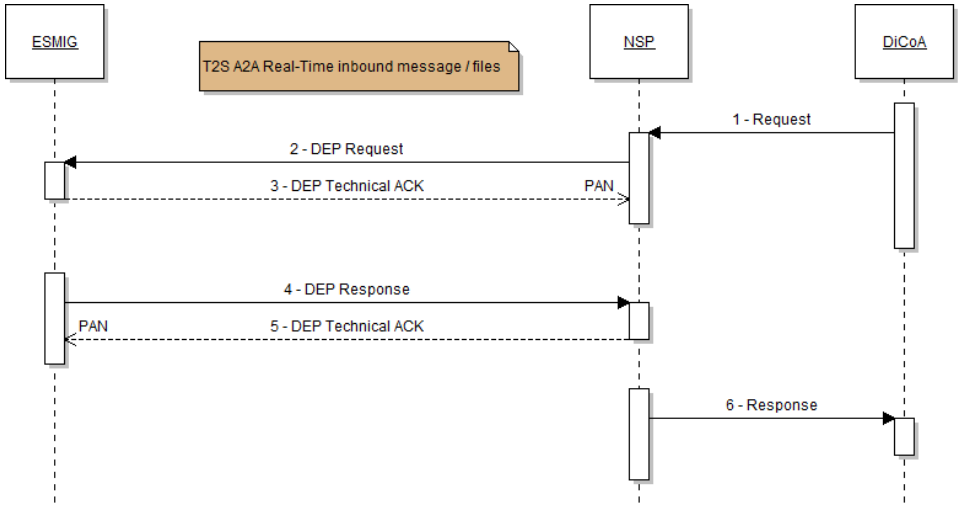


Figure 5 – Real-time incoming flow

When the ESMIG receives a message/file in real-time mode from NSP's gateway it will go through the following steps.

STEP NUMBER	STEP DESCRIPTION
1)	The Di.Co.A. sends a real-time message/file to the NSP's gateway. If the size of the message/file is outside of the allowed range the NSP's gateway must reject the exchange with an error message sent to Di.Co.A.
2)	The NSP's gateway sends a "Request" primitive to the ESMIG. The "CommunicationId" envelope field has to be generated by the NSP (this identifier shall be unique at NSP level). The ActorMessageId has to be set to the unique message identification generated at Di.Co.A. site.

3)	The ESMIG receives the message/file and performs the validation check of the "Exchange Header" and checks the size of the message/file. After the validation of the envelope, the ESMIG sends back to the NSP's gateway a PAN or NAN "Technical Ack" setting the “dep:ReceiveTimestamp” with the receiving time (MQMD.putime field of the WMQ message). If a NAN is returned the flow is completed and the NSP has to inform the counterpart about the failure. If the ESMIG doesn't answer with a response in the timeout timeframe, the NSP shall send a "timeout" information to the sender.
4)	The ESMIG sends the "Response" message to the NSP's gateway, setting in the "Exchange Header" the "dep:ESMIGMessageId" to a unique identifier and keeping all other fields as received in the request.
5)	The NSP's gateway receives the "Response" and performs the validation check of the "Exchange Header" part and of the size. If the validation process fails, or the size of the response is not in the allowed range, then the NSP's gateway send back to the ESMIG a "NAN Technical Ack" setting in appropriate way the "dep:ExchangeStatus" and "dep:ErrorDescription" fields. The NSP informs the Di.Co.A. about the failure with a response error messages. The flow is completed.
6)	The NSP's gateway sends the "Response" to the counterpart including the information of the ESMIGMessageId fields generated at the ESMIG site (cfr step no.4)

The following messages describes, as an example, a set of possible messages for this pattern.

"Request" message received by ESMIG step no. 2

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:Request
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=cust1,o=nsp-name1</dep:Sender>
  <dep:Receiver>cn=appl1,o=prod</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGRT.PROD</dep:TechnicalServiceId>
  <dep:CommunicationId>nsp-name1.gtw134567.20100908185555.123456</dep:CommunicationId>
  <dep:ActorMessageId> 2011-11-01T00:00:25.18476.903847Z</dep:T2SActorMessageId>
  <dep:EntryTimestamp>2011-01-01T00:04:00</dep:EntryTimestamp>
  <dep:SendTimestamp>2011-01-01T00:04:01</dep:SendTimestamp>
   <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
  <dep:Compression>NONE</dep:Compression>
 </dep:ExchangeHeader>
 <dep:BusinessEnvelope>
  <dep:BusinessApplicationHeader>
   <!-- business application header goes here -->
  </dep:BusinessApplicationHeader>
  <dep:BusinessMessage>
   <!-- business message goes here -->
  </dep:BusinessMessage>
 </dep:BusinessEnvelope>
</dep:Request>
```

Detailed test procedure:	The ESMIG receives a message in real-time mode from a Di.Co.A.. It goes through the six steps described in the

	Technical Requirements. Inspect message at step #2. Repeat the test in negative mode. Repeat same test for a file.
Expected result:	The NSP manages the real-time incoming message pattern as detailed in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.2.5 Store-and-Forward Outgoing

Store-and-forward outgoing management

Requirement ID	ESMIG.60440

The NSP must manage the store-and-forward outgoing message pattern as detailed below.

An outgoing store-and-forward message is when the ESMIG sends a message/file in store-and-forward mode to a Di.Co.A.. This message pattern is shown in the following figure:

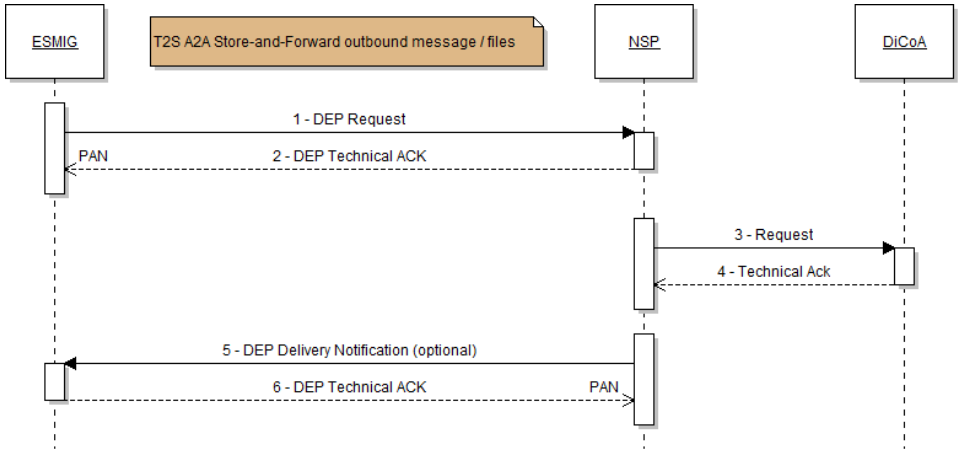


Figure 6 – Store-and-forward outgoing flow

When the ESMIG needs to send a message in store-and-forward mode to its clients, it will take the following steps.

STEP NUMBER	STEP DESCRIPTION
1)	The ESMIG sends a "Request" primitive to the NSP's gateway. The "ESMIGMessageId" envelope field is generated by the ESMIG (this identifier shall be unique at ESMIG level).
2)	The NSP's gateway receives the message/file and performs the validation check of the "Exchange Header" part and the validation of the size of the message/file. If the validation process fails, the NSP's gateway sends back to the ESMIG a "NAN Technical Ack" setting in the "dep:ExchangeStatus" and "dep:ErrorDescription" fields appropriately and the flow is completed. If the validation check is passed, the NSP's gateway sends back to ESMIG a "PAN Technical Ack" setting the "dep:CommunicationId" and the "dep:EntryTimestamp" fields of the Exchange Header.
3)	If the receiving Di.Co.A. is available for store-and-forward traffic, the NSP's gateway shall send the message/file to it.
4)	The receiving Di.Co.A. sends back to the NSP's gateway a "Technical Ack" (if and in the form agreed between the NSP and the Di.Co.A.).
5)	If the delivery of message/file has failed for 10 times when the receiver is available, or the Di.Co.A. is unavailable for store-and-forward traffic for 14 calendar days, the NSP's gateway sends back to the ESMIG a "DeliveryNotif" message with the same "Communication id" of the original request and with the information of the error occurred on the delivery. If in the original request the "dep:DeliveryNotification" field was set to "YES", the NSP shall send a "DeliveryNotifaction" message also in successful condition. When the "DeliveryNotification" is received by the ESMIG, it sends a Technical Ack back to the NSP and the flow is completed.

The following messages describe, as an example, a set of possible messages for this pattern.

"Request" message sent by the ESMIG at step no.1

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:Request
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=appl1,o=prod</dep:Sender>
  <dep:Receiver>cn=cust1,o=nsp-name1</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGSNF.PROD</dep:TechnicalServiceId>
<dep:ESMIGMessageId> MSGSNF.NSPname1.20110101000000.000005</dep:ESMIGMessageId>
  <dep:SendTimestamp>2011-01-01T00:04:01</dep:SendTimestamp>
 <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
  <dep:Compression>NONE</dep:Compression>
 </dep:ExchangeHeader>
 <dep:BusinessEnvelope>
  <dep:BusinessApplicationHeader>
   <!-- business application header goes here -->
  </dep:BusinessApplicationHeader>
  <dep:BusinessMessage>
   <!-- business message goes here -->
  </dep:BusinessMessage>
 </dep:BusinessEnvelope>
</dep:Request>
```

Data part of the Technical Ack received by the ESMIG at step no. 2

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:TechnicalAck
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
  <dep:Sender>cn=appl1,o=prod</dep:Sender>
  <dep:Receiver>cn=cust1,o=nsp-name1</dep:Receiver>
  <dep:TechnicalServiceId>service1.nsp-name1.MSGSNF.PROD</dep:TechnicalServiceId>
  <dep:CommunicationId>nsp-name1.gtw134567.20100908185555.123456</dep:CommunicationId>
   <dep:ESMIGMessageId>MSGSNF.NSPname1.20110101000000.000005</dep:ESMIGMessageId>
  <dep:SendTimestamp>2011-01-01T00:04:01</dep:SendTimestamp>
  <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
  <dep:Compression>NONE</dep:Compression>
<dep:ExchangeStatus>OK</dep:ExchangeStatus>
 </dep:ExchangeHeader>
</dep:TechnicalAck>
```

DeliveryNotif failure message received by the ESMIG in the case of a delivery notification failure from the NSP's gateway:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:DeliveryNotification
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:ExchangeHeader>
  <dep:Version>2.0</dep:Version>
```

```
   <dep:Sender>cn=appl1,o=prod</dep:Sender>
   <dep:Receiver>cn=tcust1,o=nsp-name1</dep:Receiver>
   <dep:TechnicalServiceId>service1.nsp-name1.MSGSNF.PROD</dep:TechnicalServiceId>
   <dep:CommunicationId>nsp-name1.gtw134567.20100908185555.123456</dep:CommunicationId>
   <dep:ESMIGMessageId>MSGSNF.NSPname1.20110101000000.000003</dep:ESMIGMessageId>
   <dep:EntryTimestamp>2011-01-01T00:00:00</dep:EntryTimestamp>
   <dep:SendTimestamp>2011-01-01T00:00:01</dep:SendTimestamp>
    <dep:DeliveryNotification>FAIL</dep:DeliveryNotification>
   <dep:NonRepudiationExchange>YES</dep:NonRepudiationExchange>
   <dep:ExchangeStatus>KO</dep:ExchangeStatus>
   <dep:ErrorDescription>
    <dep:ErrorCode>DEP999E</dep:ErrorCode>
    <dep:AdditionalInfo>Error occurred. Message/File exchange aborted</dep:AdditionalInfo>
   </dep:ErrorDescription>
  </dep:ExchangeHeader>
</dep:DeliveryNotification>
```

Detailed test procedure:	In guaranteed delivery (store-and-forward) mode send a message from ESMIG to Di.Co.A.. Inspect message at step #2, and at step #3. Repeat the test in negative mode. Repeat same test for a file.
Expected result:	The ESMIG sends a message in Store-and-forward mode to a Di.Co.A.. The message sequence matches the five steps in the Technical Requirements describing this sequence.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.2.6 Store-and-Forward Incoming

Store-and-forward incoming management

Requirement ID	ESMIG.60450

The NSP must manage the store-and-forward incoming message pattern as detailed below.

An Incoming Store-and-Forward message is when the ESMIG receives a message/file in store-and-forward mode from a Di.Co.A.. This message pattern is shown in the following figure:

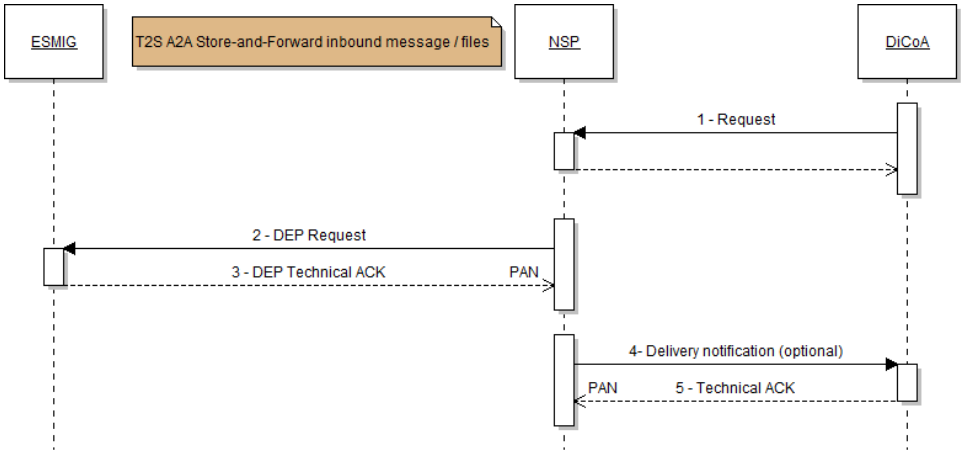


Figure 7 – Store-and-forward incoming flow

When the ESMIG needs to receive a message/file in store-and-forward mode from its clients, it will take the following steps.

STEP NUMBER	STEP DESCRIPTION
1)	The Di.Co.A. sends the message/file to the NSP's gateway
2)	The NSP's gateway sends back to the Di.Co.A. a "Technical Ack" after performing the check on the size of message/file (and rejecting the message if the check fails).
3)	If the ESMIG has enabled the store-and-forward traffic, the NSP's gateway sends the message/file to the ESMIG.

4)	The ESMIG receives the message/file and performs the validation check of the "envelope" part. If the ESMIG doesn't send the Technical Ack within 10 minutes the NSP shall manage the condition as described in the requirement ESMIG.60390. After the validation check, the ESMIG sends back to the NSP's gateway a PAN or NAN "Technical Ack" setting the "dep:ReceiveTimestamp" with the receiving time (MQMD.putime field of the WMQ message). If a NAN is returned, the NSP shall retry for up to 10 times the delivery after which a delivery failure notification is send back to the Di.Co.A. and the flow is completed.
5)	Depending on the connectivity service agreement between the NSP and the Di.Co.A., the NSP sends to the Di.Co.A. a delivery or delivery failure notification including the timestamp of the reception set by ESMIG in the field "dep:ReceiveTimestamp" mentioned above.

Detailed test procedure:	ESMIG receives a message in guaranteed delivery (store-and-forward) mode from a Di.Co.A.. The message goes through a five steps sequence. Verify all five steps are in line with what described in the Technical Requirements document. Repeat the test in negative mode. Repeat the same test for a file.
Expected result:	The NSP manages the Store-and-forward incoming message pattern as detailed in the Technical Requirements document.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.2.7 Maintenance Window primitives

Enable/Disable/Query incoming store-and-forward traffic

Requirement ID	ESMIG.60460

The NSP must manage the store-and-forward incoming "traffic" as detailed below.

ESMIG shall be able to enable/disable the exchanging of store-and-forward traffic in order to avoid the reception of this kind of traffic during the "maintenance window" or for particular contingency reason.

When the ESMIG is ready to manage the store-and-forward traffic it sends an "EnableSnfTraffic" to the NSP's gateway. This is a "services" primitive and doesn't contain the "envelope" used for "business" message exchange. An example of this message is set out below:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:EnableSnfTraffic
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
        <dep:Service>
                <dep:Name>service1.nsp-name1.MSGSNF.PROD</dep:Name>
                <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
                <dep:DestQueueName> NSPNAME1.MSGSNF.INCOMING.L01</dep:DestQueueName>
        </dep:Service>
        <dep:Service>
                <dep:Name>service1.nsp-name1.FILESNF.PROD</dep:Name>
                <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
                <dep:DestQueueName>NSPNAME1.FILESF.INCOMING.L01</dep:DestQueueName>
        </dep:Service>
</dep:EnableSnfTraffic>
```

An example of the response of the NSP's gateway to this message is the following:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:EnableSnfTrafficAck
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:Service>
  <dep:Name>service1.nsp-name1.MSGSNF.PROD</dep:Name>
  <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
  <dep:DestQueueName>NSPNAME1.MSGSNF.INCOMING.L01</dep:DestQueueName>
  <dep:Status>Activated</dep:Status>
  <dep:Reason/>
 </dep:Service>
 <dep:Service>
  <dep:Name>service1.nsp-name1.FILESNF.PROD</dep:Name>
  <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
  <dep:DestQueueName>NSPNAME1.FILESNF.INCOMING.L01</dep:DestQueueName>
  <dep:Status>Failed</dep:Status>
  <dep:Reason>Queue not accessible. MQRC=2035</dep:Reason>
 </dep:Service>
</dep:EnableSnfTrafficAck>
```

Detailed test procedure:	The ESMIG sends an "EnableSnfTraffic/DisableSnFTraffic" to the NSP. Inspect the message, then inspect the response to the message. Verify DisableSnfTraffic stop incoming store-and-forward traffic and EnableSnFTraffic restart it. Use the QuerySnFTraffic during the test to verify the correct status of the NSP.
Expected result:	The NSP manages the store-and-forward traffic as detailed in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Enable/Disable/Query incoming real-time traffic

Requirement ID	ESMIG.60470

The NSP must manage the real-time incoming "traffic" as detailed below.

ESMIG shall be able to enable/disable the exchanging of real-time traffic in order to avoid the reception of this kind of traffic during the "maintenance window" or for particular contingency reason.

When the ESMIG is ready to manage the real-time traffic it sends an "EnableRTTraffic" to the NSP's gateway. This is a "services" primitive and doesn't contain the "envelope" used for "business" message exchange. An example of this message is set out below:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:EnableRTTraffic
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
        <dep:Service>
                <dep:Name>service1.nsp-name1.MSGRT.PROD</dep:Name>
                <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
                <dep:DestQueueName> NSPNAME1.MSGRT.INCOMING.L01</dep:DestQueueName>
        </dep:Service>
        <dep:Service>
                <dep:Name>service1.nsp-name1.FILERT.PROD</dep:Name>
                <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
                <dep:DestQueueName>NSPNAME1.FILERT.INCOMING.L01</dep:DestQueueName>
        </dep:Service>
</dep:EnableRTTraffic>
```

An example of the response of the NSP's gateway to this message is the following:

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:EnableRTTrafficAck
 xmlns:dep="http://www.ecb.eu/dep-2.0"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="http://www.ecb.eu/dep-2.0 dep-20.xsd ">
 <dep:Service>
  <dep:Name>service1.nsp-name1.MSGRT.PROD</dep:Name>
  <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
  <dep:DestQueueName>NSPNAME1.MSGRT.INCOMING.L01</dep:DestQueueName>
  <dep:Status>Activated</dep:Status>
  <dep:Reason/>
 </dep:Service>
 <dep:Service>
  <dep:Name>service1.nsp-name1.FILERT.PROD</dep:Name>
  <dep:DestQmanagerName>WQI1</dep:DestQmanagerName>
  <dep:DestQueueName>NSPNAME1.FILERT.INCOMING.L01</dep:DestQueueName>
  <dep:Status>Failed</dep:Status>
  <dep:Reason>Queue not accessible. MQRC=2035</dep:Reason>
 </dep:Service>
</dep:EnableRTTrafficAck>
```

Detailed test procedure:	The ESMIG sends an "EnableRTTraffic/DisableRTTraffic" to the NSP. Inspect the message, then inspect the response to the message. Verify DisableRTTraffic stop incoming real-time traffic and EnableRTTraffic restart it. Use the QueryRTTraffic during the test to verify the NSP status.
Expected result:	The NSP manages the real-time traffic as detailed in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED

	If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Open/Close/Query traffic channel

Requirement ID	ESMIG.60480

The NSP must manage the traffic channel as detailed below.

In order to manage the Maintenance Window (MW), the following commands have to be managed by the NSP:

- CloseTrafficChannels, to inform NSP about the upcoming start of the MW
- OpenTrafficChannels, to inform NSP about the completion of the MW
- QueryTrafficChannels, to query the NSP about the status of the MW as known by the NSP

From the DEP perspective, the following primitives are defined:

- CloseTrafficChannels, sent by ESMIG to NSP's
- CloseTrafficChannelsAck, replied by the NSP's to ESMIG
- OpenTrafficChannels, sent by ESMIG to NSP's
- OpenTrafficChannelsAck, replied by the NSP's to ESMIG
- QueryTrafficChannels, sent by ESMIG to NSP's
- QueryTrafficChannelsAck, replied by the NSP's to ESMIG

Detailed test procedure:	The ESMIG sends an "OpenTrafficChannels/ CloseTrafficChannels" to the NSP. Inspect the message, then inspect the response to the message.

	Use the QueryTrafficChannels during the test to verify the correct status od the NSP.
Expected result:	The NSP manages the OpenTrafficChannels/CloseTrafficChannels/QueryTrafficChannel as detailed in the Technical Requirements.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Usage of CloseTrafficChannels

Requirement ID	ESMIG.60490

ESMIG uses the CloseTrafficChannels command to inform the NSP that the MW is going to start and therefore traffic connection should be stopped.

The normal behavioral pattern envisages ESMIG to:

- first disable all queues related to incoming traffic from Di.Co.A. (i.e. DisableSnfTraffic and DisableRTTraffic). This stops the incoming traffic only while outgoing traffic can still be sent.
- then notify the NSP DEP Gateway for the start of the MW (i.e. CloseTrafficChannels). This indicates that all traffic is stopped

When the NSP receives the CloseTrafficChannels command, the current status of the MW is checked and the CloseTrafficChannelsAck is sent back to the ESMIG.

In case the MW was not already running, an Ack with status CLOSING is returned (normal scenario).

Then, all remaining connections to WMQ queues related to traffic (i.e. all IN.FILE/MSG and OUT.FILE/MSG queues) are closed. Only the connections to the command queues (i.e. IN.CMD and OUT.CMD) remain active, so that NSP is able to get the OpenTrafficChannels or QueryTrafficChannels commands from the ESMIG. In case there is a need to stop also the queue manager (and therefore the command channels as well), the ESMIG Service Desk may inform the NSP, so that the NSP can stop their gateway through an operational command. The NSP may implement a delay in retrying to establish a new connection to the command channel after the CloseTrafficChannels command has been responded to. This delay is at least 60 seconds.

Detailed test procedure:	Send a CloseTrafficChannel from the ESMIG to the NSP and verify that only the connections to the command queues (i.e. IN.CMD and OUT.CMD) remain active.
Expected result:	The NSP is able to manage the CloseTrafficChannel.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Traffic management during MW

Requirement ID	ESMIG.60500

When the MW is started, all IN queues are disabled. Therefore:

- all in flight incoming RT traffic (waiting for Response from ESMIG), if any, is completed with a negative Response generated by the NSP with reason indicating that related ESMIG TechnicalServiceID is not available to receive traffic

- all new incoming RT traffic is immediately completed with a negative Response generated by the NSP with a reason indicating that related ESMIG TechnicalServiceID is not available to receive traffic

- SNF traffic is processed by the NSP but not forwarded to ESMIG, waiting for the EnableSnFTraffic command

With regard to the outgoing traffic sent from ESMIG:

- any Technical Ack related to outgoing traffic and currently being generated by the NSP is discarded and not sent to ESMIG.

Detailed test procedure:	Send messages and files from the Di.Co.A emulator during the MW and verify that the incoming traffic is completed by the NSP with a negative Response (real-time) or queued (store-and-forward).
Expected result:	The NSP is able to manage real-time and store-amd-forward traffic during the MW.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.3 A2A MEPT

MEPT Application to Application (A2A) mode

Requirement ID	ESMIG.60510

The NSP must support exchange of messages in A2A mode via "instant" transfer in "push" mode only. The NSP supports exchange of files in A2A mode via "store-and-forward" transfer in "push" mode only.

Detailed test procedure:	Part I: Send messages (A2A mode) via the "instant" transfer with "push" mode, also check that no other modes are allowed (ie. push only). Part II: Send files (A2A mode) via the "store-and-forward" transfer with "push" mode, also check that no other modes are allowed (ie. push only). Verify that all messages and files have been received.
Expected result:	The NSP exchange messages in the A2A mode via the "instant" transfer and "store-and-forward" file transfer in the "push" mode only.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____

	date ____/____/____ NSP testing team _____ date ____/____/____

MEPT A2A NSP Network Gateway High availability and resiliency

Requirement ID	ESMIG.60520

The NSP must provide the Network Gateways in high availability, to support the 24x7x365 requirement of the "instant" message exchange.

The NSP must support Network Gateways in active-active configuration in the same site and also over multiple sites.

Detailed test procedure:	Check the NSP Technical Solution to verify it is possible to achieve the required service level (desk check). Run some tests from a Di.Co.A. emulator: • Send continuously messages to the ESMIG for 24 hours and check that all messages are delivered to the receiver; • Send messages to the ESMIG during the week-end and check that they are always delivered to the receiver; • Check that it is possible to use all NSP's gateways.
Expected result:	The Network Gateways and network devices provided by the NSP are configured in high availability, active-active mode, and can operate 24x7x365.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____

	_____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

MEPT A2A NSP Load balancing

Requirement ID	ESMIG.60530

The NSP must provide load-balancing features, by supporting the traffic exchange over multiple MEPT Network Gateways, with no requirement for any specific application logic to be implemented in the ESMIG.

Detailed test procedure:	Send a bunch of messages from a test Di.Co.A. and check that all the Network Gateways are used for the delivery to the Platform. Verify that the NSP provides an effective way to check which gateway is sending each message. For example the Network Gateway ID which took care of the message is reported in the message itself.
Expected result:	The traffic is spread among all the available Network Gateways transparently to the ESMIG.

MEPT A2A message delivery approach

Requirement ID	ESMIG.60540

The NSP must deliver messages at most once. In case of error or doubt conditions, no retry mechanism are implemented to avoid any risk of message duplication.

Detailed test procedure:	Send a message from a test Di.Co.A., then check that the message is correctly delivered to the ESMIG. On the MQ Server simulate a communication error (either

	disabling the MQ PUT for the queues used for the incoming traffic or disabling the MQ at channel level), then send a message from a test Di.Co.A.. After a few minutes enable the MQ PUT on the queues and check that the message is not delivered to the ESMIG.
Expected result:	Messages are sent by the NSP to the ESMIG only once; no duplicates and no retry mechanism are carried out.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

MEPT A2A messages independency

Requirement ID	ESMIG.60550

The NSP must manage each "instant" message as an individual message, with no correlation between messages (for example, messages belonging to the same business transaction), thus allowing the message "completing" a business transaction to be delivered through a network access point different from the access point used to send the message initiating the business transaction.

Detailed test procedure:	Send from a Di.Co.A. (using the Di.Co.A. emulator) the same business message several times and verify that each one is

	handled independently, running through different gateways. Send from a Di.Co.A. (using the Di.Co.A.r emulator) several business transactions and verify that the messages belonging to the same transaction are handled by different Network Gateways, (e.g. by checking the Network Gateway ID put in the messages). [on field]
Expected result:	A2A messages can be routed through any of the available NSP network access points regardless the content of the message.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

NSP Network Gateway scalability

Requirement ID	ESMIG.60560

The NSP must support horizontal scalability of the Network Gateway, to enable the addition of Network Gateways in case an additional traffic load is required. The deployment of a new Network Gateway does not impact the availability of the service in the involved infrastructure.

Detailed test procedure:	Send bunches of messages from a Di.Co.A. (using the Di.Co.A. emulator) to the ESMIG while the NSP adds a new Network Gateways. Check that there is no impact to the service availability. For example the NSP could consider to initially deliver two Network Gateways, then – while these two Network Gateways are being used – deploy two additional Network Gateways and verify this horizontal scaling does not impact the service availability. After the deployment, verify the additional Network Gateways are actually in use. [on field]
Expected result:	New Network Gateways can be added to the infrastructure without any impact to the service availability.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

MEPT WMQ message structure

Requirement ID	ESMIG.60570

The NSP manages the exchange of message based on a WMQ message. A WMQ message is composed by a "Message Description" part (MQMD) and by a "Message Text" part. The WMQ message structure is described in the following.

Detailed test procedure:	Inspect the WMQ message and identify the two different parts a "Message Description" (MQMD) and a "Message Text" part. Verify the WMQ message structure is in line with the requirements.
Expected result:	The NSP manages the message based on a WMQ message. Message Descriptions and Message Text are correctly handled system wide.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Message end-to-end information transport

Requirement ID	ESMIG.60580

The NSP allows the exchange of end-to-end information from the sender application to the receiver application together with the “instant” message (i.e. from the Di.Co.A. to the ESMIG and vice versa).

Detailed test procedure:	Generate a set of “instant” messages (i.e. "SendRequest"

	primitive requests), from a test Di.Co.A. emulator to the ESMIG and vice versa. Inspect the generated messages and check the exchange of end-to-end information from the sender application to the receiver application through with the “instant” message.
Expected result:	The NSP is able to exchange end-to-end information from the sender application to the receiver application together with the “instant” message.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Message unique identification

Requirement ID	ESMIG.60590

The NSP must identify each exchanged “instant” message with a universally unique "network" message identifier. The unique "network" message identifier of every exchanged message is provided to the receiver, together with the "instant" message, for diagnose and non-repudiation purposes. The unique "network" message identifier is also notified to the sender, if needed.

Detailed test procedure:	Generate a set of "SendRequest" primitive requests, from a test Di.Co.A. emulator to the ESMIG. Inspect the generated messages. Verify that a unique "network" message identifier

	is provided to the receiver, together with the "instant" message. Verify that a unique "network" message identifier is provided to the sender through Technical ACK and/or Notify primitives, whenever applicable.
Expected result:	The unique "network" message identifier of every exchanged message is provided to the receiver, together with the "instant" message, for diagnose and non-repudiation purposes. Every “instant” message has a unique "network" message identifier.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Gateway control application

Requirement ID	ESMIG.60600

The NSP must provide a control application, running on ESMIG RHEL server, in order to manage the NSP gateways via a GUI interface. Such control will allow:

- To start and stop a gateway (optional feature);

- To disable/enable a gateway from processing traffic (optionally, with the possibility to disable/enable outgoing traffic towards Di.Co.A. and incoming traffic arriving from Di.Co.A.);
- To login/logout of a gateway to/from the network;
- To display the gateway status and to monitor traffic;
- To renew the LAU symmetric key between the ESMIG application and all the gateways;
- To display information about the LAU symmetric key (last renewal time, time left before next renewal, adoption time of last key on each gateway).

Detailed test procedure:	Check the documentation provided by the NSP describing the interface, assess the usability and eventually approve it (desk check). Through the "Gateway control application" instruct control operations toward the NSP gateway (for example start/stop the gateway, renew the LAU symmetric keys, display gateway status, etc.), and verify that the outcome is the expected one.
Expected result:	NSP provides a description of the "easy-to-use" interface, approved by the ESMIG Operator. NSP provides the "Gateway control application".
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

TIPS A2A traffic primitives management

Requirement ID	ESMIG.60610

The NSP must manage the following primitives to exchange messages with the ESMIG:

- *SendRequest*: the ESMIG uses this primitive to send a message to the Di.Co.A.;
- *Notify*: the NSP's Network Gateway uses this primitive to notify a positive/negative outcome of the initial processing of a SendRequest or FileSend operation to the ESMIG;
- *ReceiveIndication*: the NSP's Network Gateway uses this primitive to deliver a message sent from the Di.Co.A. to the ESMIG;
- *Technical Ack*: the NSP's Network Gateway uses this primitive to notify a positive/negative completion of the exchange;
- *FileSend*: the ESMIG uses this primitive to send a file to the Di.Co.A..

Detailed test procedure:	Generate a set of "SendRequest" primitive requests, from a test Di.Co.A. to the ESMIG and vice versa, varying different header properties (for example: notification option, technical ack option, message type, ...). Generate a set of "FileSend" primitive requests, from the ESMIG to a test Di.Co.A., varying different header properties (for example: notification option, FileName, ...). Verify that the related notifications and technical ACKs are correctly generated, when expected. Verify that the NSP correctly delivers the message/file to the specified part, with the correct primitive type, or that a delivery error is generated when expected. Verify that the header properties of the received messages are the expected ones, according to the MEPT specifications.
Expected result:	The NSP manages the primitives to exchange messages in line with the ESMIG.
Outcome:	Please describe the test result: [] PASSED

	[] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.3.1 A2A Instant Messaging

For the A2A instant messaging mode, the ESMIG communicates with Di.Co.A. only using “stateless” messages and it does not support "store-and-forward". This implies that if the receiver is unavailable no retry mechanism is in place.

The communication is in "push" mode, both from the ESMIG to the Di.Co.A. and from the Di.Co.A. to the ESMIG. The expression "push mode” refers to when the originator of a message is pushing it to the final receiver.

The A2A message exchange between ESMIG and the NSP is based on a set of rules named MEPT and described hereafter. The MEPT relies on XML messages, transported over an MQ connection and containing all the relevant information to address and describe messages. The NSP gateways physically hosted in ESMIG datacentres are in charge of the connection between the NSP and the ESMIG.

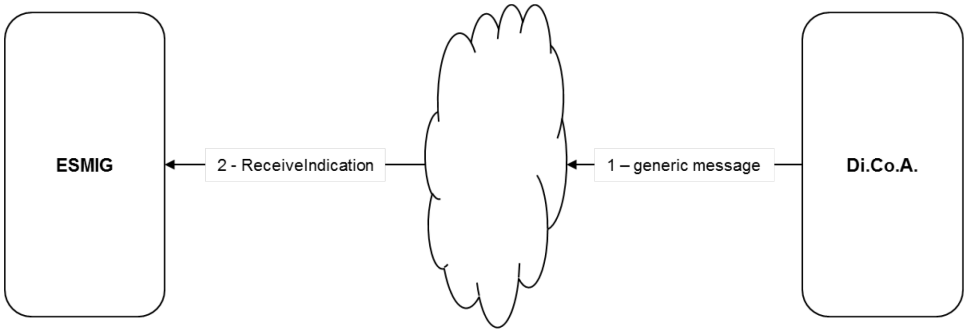
Each NSP offers connectivity services and manages the bi-directional data exchange between his Di.Co.A. and the ESMIG according to the MEPT.

The NSP provides several functionalities: Technical Sender Authentication, CGU, non-repudiation, encryption, NSP protocol transformation to and from MEPT messages.

A2A Instant Messaging - Incoming flow management

Requirement ID	ESMIG.60620

The NSP must manage the instant incoming message pattern as detailed in the following picture:



When the ESMIG receives a message from the NSP's Network Gateway it will go through the following steps:

1) The Di.Co.A. sends the message to the NSP Gateway;
2) The Network Gateway of the ESMIG receives the message from the sender (Di.Co.A.) and performs the validation of the received signature. If the validation process is successful, the Network Gateway running on ESMIG site sends a ReceiveIndication primitive to the ESMIG. The ESMIG receives the message and performs the validation check of the "Local Security" header.

   The message is then passed on to the application.

The primitive used for the incoming message processing is:

A ***ReceiveIndication*** primitive, used whenever a message is delivered from the NSP to the ESMIG. This type of message provides all the information which describes the message itself (such as sender, receiver, signature, etc.) and the transported business message.

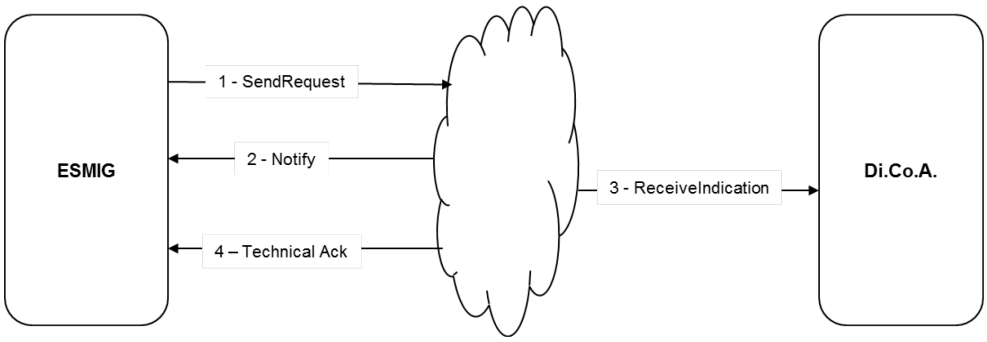
Detailed test procedure:	Part 1: The Di.Co.A. (emulated with the Di.Co.A. Emulator) sends the message to the NSP gateway. The NSP gateway receives and validates the messages. In case of successful validation of the message the NSP gateway sends a ReceiveIndication primitives to the platform. Part 2: Repeat the test with message failing the validation and verify that the NSP gateway send back an error and stops sending .

Expected result:	Verify that the format of ReceiveIndication received at the platform is the expected one (Part 1) and the expected behaviour of NSP gateway(Part 2)
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

A2A Instant Messaging - Outgoing flow management

Requirement ID	ESMIG.60630

The NSP must manage the instant outgoing message pattern as detailed in the following picture:



When the ESMIG needs to send a message to a Di.Co.A. it will go through the following steps:

1) The ESMIG sends a “SendRequest” primitive to its Network Gateway
2) The Network Gateway of the ESMIG receives the message and performs the validation check of the "Local Security" header. If the validation process is successful, a unique network message identifier is generated and the message is signed.

   If there is an error, the Network Gateway of the ESMIG sends a negative Notify back to the ESMIG and the flow is completed. If the processing is successful, the Network Gateway of the ESMIG sends the message to the Di.Co.A.. If the sending to the Di.Co.A. is successful, the Network Gateway of the ESMIG sends a positive Notify back to the ESMIG.
3) The Di.Co.A. receives the message from the Network Gateway of the ESMIG and performs the validation of the received signature.
4) The Network Gateway of the sender (ESMIG) receives the outcome of the processing and sends back a positive/negative Technical Ack to the ESMIG depending on:
   - a failure in the validation, performed on the Di.Co.A. side, on the received message
   - the outcome (positive or negative) of the delivery of the message to the Di.Co.A.

The primitives used for the outgoing message processing are:

A ***SendRequest*** primitive, activated by ESMIG when a message has to be delivered to a Di.Co.A.. This type of message provides the NSP with all the information which describes the message itself (such as sender, receiver, etc.) and the business message to be transported.

A ***Notify*** primitive is provided for each request to send a message or a file between the ESMIG and the NSP Network Gateway in order to notify the outcome of the initial processing performed by the Network Gateway: local security check, addressing resolution, header validation etc. If the result is negative, a reason code for the detected error is returned. If the result is positive, the unique "network" message / file identifier and the signature of the message are sent back.

A ***Technical Ack*** primitive is provided for each request to send a message between the ESMIG and the NSP Network Gateway in order to notify the completion of the exchange. If the result is negative, a reason code for the detected error is returned. If

the result is positive, the unique "network" message / file identifier, a timestamp of the delivery of the message / file to the Di.Co.A. are sent back.

Additionally, for the outbound file transfer, the primitive used in the ESMIG - NSP communication is called ***FileSend*** (further elaborated in a subsequent chapter of this document) and its purpose is to convey the information about the delivery of the file (e.g. the receiver) and not the file itself.

Detailed test procedure:	Generate a set of "SendRequest" primitives from the ESMIG to test both positive and negative cases. Part 1 Send a "SendRequest" from the Platform. The NSP Network Gateway (i) validates the message, (ii) sends back a Notify, (iii) forwards the message to the intended receiver and, (iv) sends back a Technical Ack to the ESMIG. Part 2 Send a faulty "SendRequest" (e.g. with a missing mandatory field or a wrong signature). The message is discarded by the NSP Network Gateway and a negative Notify is returned to the ESMIG. Part 3 Send a "SendRequest" to a receiver that has a local issue (for example it is not connected to the network in that moment). The NSP Network Gateway sends a Notify to the ESMIG and then a negative Technical Ack upon the failed delivery.
Expected result:	Verify that the exchange of the communication primitives (SendRequest, Notify, Technical Ack) correctly happens according to the MEPT protocol.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action:

	_____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

A2A Instant Messaging – Message size

Requirement ID	ESMIG.60640

The NSP must support the exchange of messages which have a maximum length of 10KB (1 KB = 1.024 bytes). The maximum length refers to the business content of the transferred message, without taking into account the communication protocol overheads.

The NSP shall reject as soon as possible any message that is not compliant with the allowed size range.

The NSP shall reject the operation by sending a negative acknowledgement message back to the originator with the explanation of the error (e.g. "Message size out of allowed range.").

Detailed test procedure:	Part 1 Send from a Di.Co.A. emulator and from the ESMIG an Instant Message with size less than 10KB. In both cases the message is accepted by the NSP. Repeat the test with a message of size equal to 10KB. Part 2 Send from a Di.Co.A. emulator and from the ESMIG an Instant Message with size greater than 10KB. The message is discarded by the NSP Network Gateway and an error message is returned to the sender.

Expected result:	Verify that the NSP Network Gateways does not accept oversized messages.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

A2A File store-and-forward

Requirement ID	ESMIG.60650

The file transfer operates in store-and-forward mode and, as such, enables a sender to transmit files even when a receiver is unavailable. If the receiver is temporarily unavailable, the NSP stores the files for 14 calendar days (for PROD environment) and delivers them as soon as the receiver becomes available again.

The maximum size is 1 GB.

File transfer mode is used by the ESMIG only for outgoing exchange, there is no business case that involves the use of such mode for communications from Di.Co.A. to the ESMIG.

When a file has to be sent, as a first step, ESMIG stores it on an dedicated RHEL server (located in the SSP ESMIG perimeter). Then the file transmission starts from ESMIG by sending an MQ message to the Gateway using the same rules (MEPT) described ahead and specifying the primitive name *FileSend*. The message contains the file name and the file system path to be used to get the file. The NSP Gateway, then, has the responsibility to get the file that has been stored beforehand by ESMIG and to send it to the recipient.

The notify primitive is used to indicate to ESMIG that the NSP Gateway has read the file and taken the responsibility to send the file. This allows ESMIG to remove the file.

Detailed test procedure:	ESMIG sends a file to the Di.Co.A. emulator (using the MEPT protocol), while the Di.Co.A. emulator is online. The file is correctly delivered and received by the Di.Co.A. emulator. ESMIG sends a file to the Di.Co.A. emulator, while the Di.Co.A. emulator is offline. After 60 minutes the Di.Co.A. emulator returns online and the file is correctly delivered, without any ESMIG involvement. Both files are expected to be correctly received.
Expected result:	The NSP store-and-forward file transfer interacts with ESMIG following the ruleset.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.3.2 Messaging rules – MEPT (Message Exchange Processing for TIPS)

A generic MEPT message is composed by two main sections:

- The **message header**: this section contains all the information that enriches the message but is not strictly related to the message content (routing, signature, etc..)

- the **message payload**: this section contains the ISO business message or the payload of the specific MEPT message such as *TechnicalAck* or *Notification*

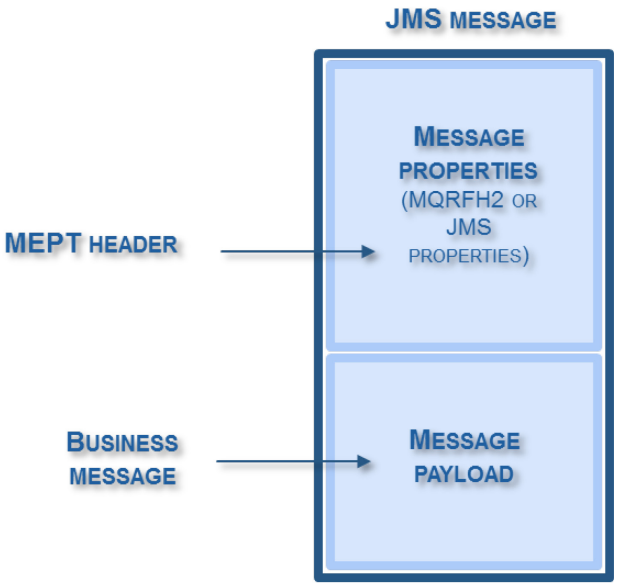


FIGURE 1 – SECTIONS OF A MESSAGE

A2A Message header

Requirement ID	ESMIG.60660

The message header completes a message with a set of information strictly related to the message's lifecycle; IBM WMQ is the target technology for message exchange, the message header is composed by the JMS properties listed in the following table. A message refers to a primitive and all the properties are used or not depending on the primitive. The following table shows which primitive uses each property. The table shows also which property is used in HMAC calculation and which property is stored by ESMIG for "non-repudiation of origin" purposes.

Property	**Description**	**Where it is used**	**Used in HMAC calcula-tion**	**Stored for NRO**
HMAC	Hash Message Authentication Code for Local AUtentication between ESMIG and NSP gateway	In all types of message	No	No

HMACKeyId	Identifier of the bilateral key to be used for HMAC check	In all types of message	No	No
HMAC2	Second (optional) HMAC for Local AUthentication, to be used when the NSP needs to protect the communication beyond the link between ESMIG and the NSP gateway. ESMIG adds HMAC2 only when all the following conditions are met: - The message is a *SendRequest* - *SignatureRequired* = yes - The gateway control application already sent to ESMIG the values for the HMAC2 Key and HMAC2 KeyId	SendRequest	No	No
HMAC2KeyId	Identifier of the bilateral key to be used for (optional) HMAC2 check	SendRequest	No	No
MsgSignature	Message signature (maximum length 3000 bytes)	*ReceiveIndication,* *Notify*	No	No
ProtocolVersion	The MEPT version	In all types of message	Yes	No
Service	The service name (e.g. PRODUCTION, TEST)	In all types of message	Yes	Yes
Sender	The distinguished name of the actor sending the message. For *Notify* and *TechnicalAck* it refers to the original message	In all types of message	Yes	Yes
Receiver	The distinguished name of the actor receiving the message. For *Notify* and *Technical Ack* it refers to the original message	In all types of message	Yes	Yes
PrimitiveType	*SendRequest, ReceiveIndication, Notify, TechnicalAck, FileSend*	In all types of message	Yes	No
MsgType	The ISO message type	*ReceiveIndication,*	Yes	No

		SendRequest *FileSend*		
SendTimestamp	Timestamp from when the message has been retrieved from the sender's gateway (start of the NSP perimeter). It is exposed as YYYY-MM-DDTHH:MM:SS.SSSZ, where **T** is the delimiter between date and time and **Z** is a zone designator for the zero UTC offset. For *Notify* and *TechnicalAck* it refers to the original *SendRequest*	*ReceiveIndication,* *Notify,* *TechnicalAck*	Yes	Yes
ReceiveTimestamp	Timestamp from when the message has been put on the receiver's queue (end of NSP perimeter). It is exposed as YYYY-MM-DDTHH:MM:SS.SSSZ, where **T** is the delimiter between date and time and **Z** is a zone designator for the zero UTC offset. For *TechnicalAck* it refers to the original *SendRequest*	*ReceiveIndication,* *TechnicalAck*	Yes	No
MsgBizIdentifier	Unique business identifier assigned by the sender. For business messages it is a copy of the message identifier transported in the payload. For *Notify* and *TechnicalAck* it refers to the original *SendRequest message*	In all types of message	Yes	No
MsgNetworkIdentifier	Unique message identifier assigned by the NSP. For *Notify* and *TechnicalAck* it refers to the original *SendRequest message*	*ReceiveIndication,* *Notify,* *TechnicalAck*	Yes	Yes
FileName	Full path to the file to be sent to the receiver	*FileSend*	Yes	No
FileDigest	Digest of the file used in HMAC	*FileSend*	Yes	No
PDMFlag	Possible duplicate message flag	*SendRequest,* *ReceiveIndication* *FileSend*	Yes	No

SignatureRequired	Flag asking to add the signature to the message	*SendRequest*	Yes	No
NotificationRequired	Requires a *Notify*. "A" ⇔ always, "N" ⇔ "Never", "E" ⇔ only in case of errors	*SendRequest,* *FileSend*	Yes	No
TechnicalAckRequired	Requires a *TechnicalAck*. "A" ⇔ always, "N" ⇔ "Never", "E" ⇔ only in case of errors	*SendRequest* *FileSend*	Yes	No
SignatureAddInfo	Additional information included in the signature calculation (optional). This information are is only stored by the ESMIG for NRO purposes (maximum length 400 bytes)	*ReceiveIndicati on* *FileSend*	Yes	Yes
CompressionAlgo	Algrorithm used for compression of the message payload if used	*FileSend*	Yes	No
PrimitiveReturnCode	Return code of the ESMIG primitive The return codes are: OK (if successful) KO (in case of failures)	*TechnicalAck,* *Notify*	Yes	No
PrimitiveReasonCode	Reason code of the TIPS primitive The following list of reason codes is not exhaustive and some others can be added by the NSPs: TIPS.UnknownHMACKeyId TIPS.UnknownHMAC2KeyId TIPS.InvalidHMAC TIPS.MissingProperty.<Property> TIPS.InvalidProperty.<Property> TIPS.FailedDelivery TIPS.FileNotFound NSP errors are prefixed by the NSP id and agreed with ESMIG platform.	*TechnicalAck,* *Notify*	Yes	No

From a technical point of view, note that for IBM MQ all the properties will be inserted into the RFH2 part of the message.

Detailed test procedure:	Part 1 Generate a "SendRequest" from a Di.Co.A. Emulator towards the ESMIG and viceversa. Generate a "FileSend" from the ESMIG towards a Di.Co.A. Emulator. Inspect the WMQ Message Description block for all the primitives exchanged between the ESMIG and the NSP Network Gateway. All the required fields must be present. Part 2 Send some "SendRequest" and "FileSend" primitives from the ESMIG to the NSP Network Gateway by removing some mandatory fields. The Gateway must discard the messages.
Expected result:	Verify that all the required fields are present in all the primitives exchanged between the ESMIG and the NSP Network Gateway.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

HMAC check strings

Requirement ID	ESMIG.60670

All messages are subject to **Local AUtentication (LAU)** via a message authentication code computed with a symmetric key (HMAC).

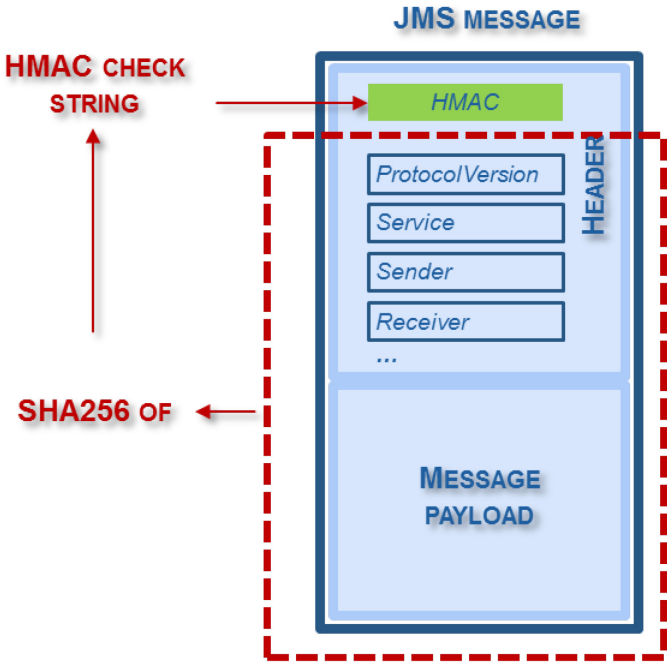


Figure 2 – Calculation of HMAC for Local AUthentication

The HMAC code is calculated using the header properties listed as specified in the last column of the table from the previous paragraph plus the full payload (plus the HMAC symmetric key as required by the HMAC technique).

The values of the properties shall be concatenated with no names or delimiters in the order of the list above, using the actual values and suppressing all trailing blanks.

The HMAC2 code is optional, it is calculated and added to the header only when the ESMIG is sending a message (*SendRequest* primitive) that must be signed by the NSP gateway (*SignatureRequired* = yes). Additionally, the NSP gateway control application must have communicated in advance to the ESMIG this additional key and its Key Id.

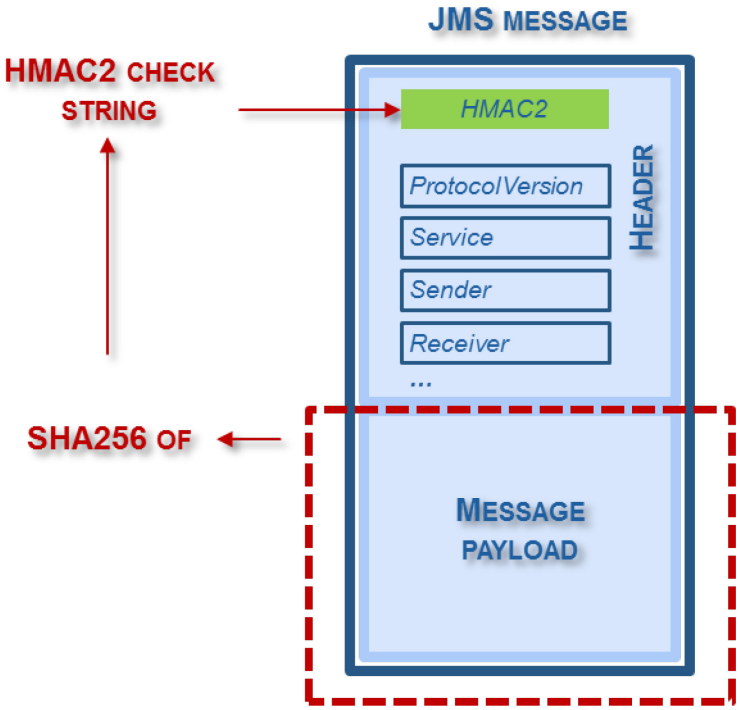


Figure 3 – Calculation of HMAC2

The HMAC2 code is calculated using only the message payload (with no header information).

The assignment and renewal of the symmetric keys is described in the paragraph dedicated to LAU. The hash function used for the HMAC calculation is SHA256. The HMAC code is computed by ESMIG when sending a message and passed to the NSP gateway in the HMAC and HMAC2 fields of the message header. The NSP is responsible for checking these hashes in order to ensure that they refer to the transported message and to the two most recent symmetric keys previously exchanged (in order to smoothly manage the renewal of the symmetric key).

For incoming messages, the gateway is responsible for computing and adding the HMAC field while ESMIG checks the hash to ensure that it refers to the transported message payload and to one of the two most recent symmetric keys previously exchanged.

The HMAC an HMAC2 fields are encoded as a base64 value.

Detailed test procedure:	Part I: A new session is opened from a Di.Co.A. with no LAU or a wrong LAU and verify the NSP's Network Gateway rejects the session.

	Part II: A new session is opened from a Di.Co.A. with the correct LAU and verify the NSP's Network Gateway accepts the session. Part III: When a message is exchanged, the NSP is in charge of verifying the integrity of the message by checking the HMAC(s) field(s). Depending on the direction of the flow, HMAC(s) are either generated from the NSP itself or from the Di.Co.A. or from the ESMIG. During the tests the teams will first inspect the message header and verify the HMAC(s) field(s) is(are) there; then the originator of the message will manipulate either the message or the HMAC(s) field(s) to ensure the NSP is rejecting the manipulated content.
Expected result:	Every time a new session is opened the NSP authenticates both the Di.Co.A. and the ESMIG (through the A2A NSP's Network Gateway). The NSP has set up an appropriate measure, for example HMAC based (with a periodical keys renewal). NSP successfully completes the message partners authentication, for example using a Local AUthentication key (LAU).
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____

	date ____/____/____

Gateway-backend channel security (LAU)

Requirement ID	ESMIG.60680

The Local authentication between ESMIG and the NSP gateways provides both message integrity and authentication. Optionally, the communication beyond the NSP gateway can be protected by a further HMAC code (HMAC2).

HMAC must be calculated and provided to the other side. The calculation of the HMAC starts from the message payload, part of the header and the symmetric keys stored on both sides.

HMAC2, when used, must be calculated and provided from the ESMIG to the NSP. The calculation of the HMAC2 starts from the message payload and the dedicated symmetric keys stored on both sides.

The receiver repeats the calculation using the key that they own and checks that the HMAC provided in the header is equal to the value just calculated.

The symmetric keys specifically identified within the message header must be used for HMAC/HMAC2 verification. During the asynchronous renewal of a key both the Gateway and the application will update the Key-Id to store the reference of the currently valid symmetric key.

Calculation and renewal of the symmetric key(s) is done by the **gateway control application** and the communication to TIPS and to the gateway must use a secure technique to protect the key exchange and to prevent its disclosure.

The length of the symmetric key must be minimum 160 bits.

The key renewal process starts with the calculation of an integer value for the key and assigning to this key a Key-Id; this is done by the gateway control application. Then the process invokes synchronously a specific ESMIG component (Java method invocation) to pass the values for the key and Key-Id. Finally, the Gateway and the application start using the new key by using the new Key-Id on each message sent to the counterparty.

The steps to be executed for the key renewal process are summarized in the following list:

1. The gateway control application triggers the key renewal functions
2. The gateway control application calculates the new key and assigns to it a new Key-Id

3. The gateway control application communicates the new key and its id to the gateway(s) in a secure way; The NSP gateway stores the new key internally but it doesn't start using it yet
4. The gateway control application provides the ESMIG with the new key and the id
5. From this moment (just after the ESMIG has been successfully invoked) the NSP gateway and ESMIG can use the new key when sending message. The old key is still valid and it can be used when sending messages and it must be considered as valid when receiving messages.

Detailed test procedure:	Part I: Perform the key renewal using the GCA. A new session is opened from ESMIG with the old LAU (key1) and verify the NSP's Network Gateway accepts the session. A new session is opened from ESMIG with the new LAU (key2) and verify the NSP's Network Gateway accepts the session. Part II: Perform again the key renewal using the GCA (generate key3, overwriting key1). A new session is opened from ESMIG with the old LAU (key1) and verify the NSP's Network Gateway rejects the session. New sessions are opened from ESMIG with the old LAUs key2 and the new LAU key3 and verify the NSP's Network Gateway accepts both the sessions.
Expected result:	Verify that NSP has setup an effective procedure for LAU key renewal.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____

	_____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

TIPS Signature

Requirement ID	ESMIG.60690

A signature is expected on all incoming business messages to ESMIG and in some outgoing messages sent by ESMIG.

The following figure shows which are the signed messages for an SCT-Inst payment[3]:

a. Signature by the Originator Di.Co.A. is necessary for the input pacs.008 (number 2 below) for payment orders sent to TIPS;

b. Signature by TIPS is necessary for the output pacs.008 (number 3 below) – message forwarded to the beneficiary Di.Co.A.;

c. Signature by the Beneficiary Di.Co.A. is necessary for the input authorization of the Beneficiary Di.Co.A. for pacs.002 (number 4 below);

d. No signature is necessary on confirmation messages sent by ESMIG (pacs.002 number 5 and 7) to the originator Di.Co.A. and beneficiary Di.Co.A. as final confirmation.

[3] In any case, as far as MEPT is concerned, the decision to sign a message sent by the ESMIG is instructed by the SignatureRequired field in the header.

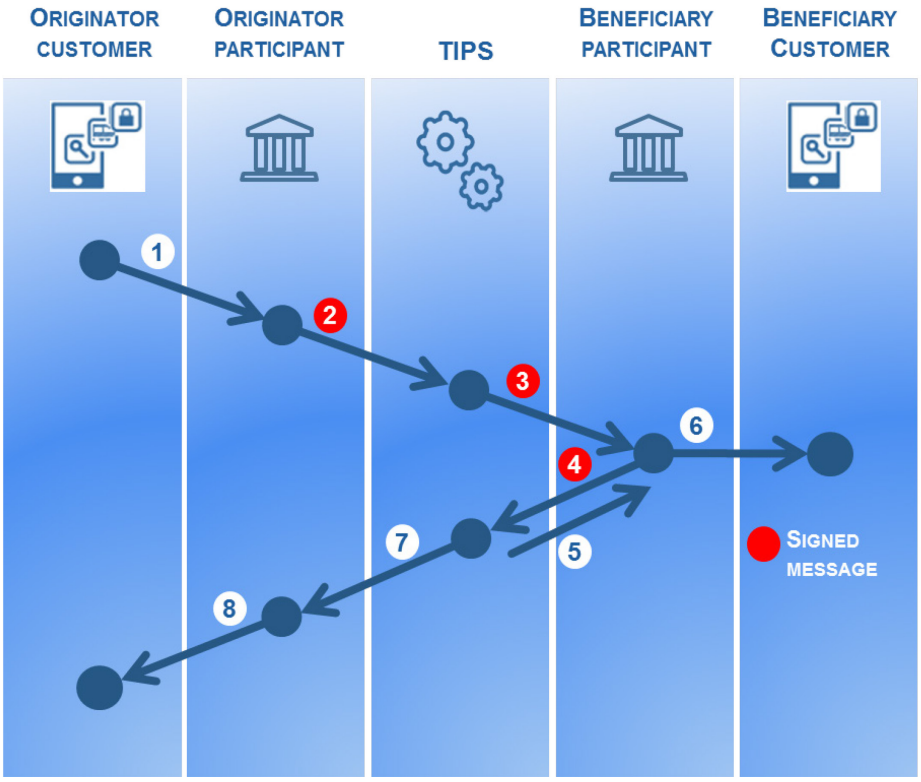


Figure 4 – Signatures

The message payload and, optionally, some of the header properties are signed and the signature is included in the message header.

The header properties that the NSP can use when it calculates the signature are the ones that the ESMIG stores for Non-Repudiation of Origin (NRO), specified in the header description (cfr 3.1). The NSP can include these values into the signature calculation or it can use only some of them or it can decide to sign only the payload; in any case the ESMIG stores all these signature-eligible properties in order to be allow the NSP to perform, on demand, a re-calculation of the signature.

If the NSP signature requires additional fields not included in the header, the NSP can provide the needed values to ESMIG using the SignatureAddInfo header property; this optional field is stored by ESMIG for NRO purposes.

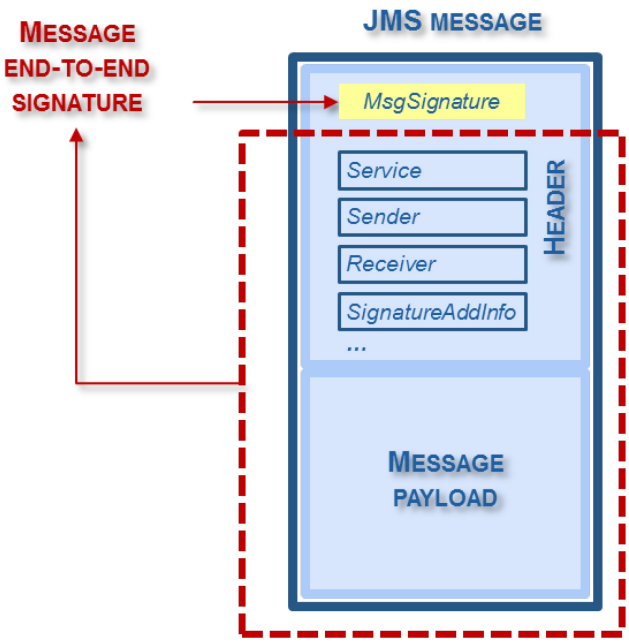


Figure 5 – Message signature

In outgoing communication, the signature is added by the NSP gateway on behalf of ESMIG, using ESMIG' private key.

In incoming communication, the signature has to be added by the NSP gateway on behalf of Di.Co.A. using a NSP certificate and its validity is checked by the NSP gateway on behalf of ESMIG.

The NSP will put in place all the necessary activities related to the digital signature, e.g. signing, verification of signature, checks against directory services (such as CRL and/or CSL).

The certificates used are issued by the NSP PKI for both outgoing and incoming cases and belong to a specific certificate class with a strong level of authentication and non-repudiation. The validity period of these certificates is 24 months.

Detailed test procedure:	Part 1 Send an Instant Message from a Di.Co.A. to the ESMIG. The signature is added by the NSP Gateway on behalf of Di.Co.A. using a NSP certificate and its validity (including CRL check) is checked by the NSP gateway on behalf of ESMIG. Part 2 Send an Instant Message from the ESMIG to a Di.Co.A.. The signature is added by the NSP gateway on behalf of ESMIG, using ESMIG' private key.

Expected result:	Verify that the signature is correctly inserted on the message header on both cases.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Message payload

Requirement ID	ESMIG.60700

The message payload transported by the MQ message contains information that depends on the MEPT primitive the message refers to. The following table specifies the information transported by the message payload.
If the primitive refers to a business message (ISO message), no further information shall be included in such a payload other than the business message itself.

TIPS primitive	**Payload content**
SendRequest	The ISO message to be sent by TIPS, e.g. pacs.008, pacs.002.
ReceiveIndication	The ISO message received from TIPS, e.g. pacs.008, pacs.002.
TechnicalAck	Empty payload. Other relevant information for *TechnicalAck* are stored in the header (e.g. message identifiers, PrimitiveReasonCode)
Notify	Empty payload. Other relevant information for *Notify* are stored in the

	header (e.g. MsgSignature, message identifiers, PrimitiveReasonCode)
FileSend	Empty payload

Detailed test procedure:	Analyze one message for each primitive type
Expected result:	Check that the payload format is the expected one for each primitive
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

MQMD descriptor usage

Requirement ID	ESMIG.60710

The following table shows fields used in the MQMD:

MQMD field	**SendRequest/ ReceiveIndication/FileSend**	**Notify/Technical Ack**
MQMD.MsgType	DATAGRAM	REPORT
MQMD.Format	MQFMT_RF_HEADER_2	MQFMT_NONE
MQMD.MsgId	Present Used as CorrelId for Notify	Present

MQMD field	SendRequest/ ReceiveIndication/FileSend	Notify/Technical Ack
MQMD.CorrelId	Absent	Equal to MQMD.MsgId of the message it corresponds to (only for Notify)
MQMD.ReportOption	0	MQRO_PAN for positive Notify/TechnicalAck MQRO_NAN for negative Notify/TechnicalAck
MQMD.Feedback	MQFB_NONE	0 for MQRO_PAN 1000 for MQRO_NAN 2000 for MQRO_NAN when garbage was received
MQMD.CodedCharSetID	1208 (UTF-8)	1208 (UTF-8)
MQMD.Expiry	MQEI_UNLIMITED	MQEI_UNLIMITED at the beginning. It will be possible to set the property by assigning a value that will prevent the TIPS Platform from being overwhelmed by "old" messages that will be timed out.
MQMD.ApplIdentityData	Not used – ignored	Not used -ignored
MQMD.Encoding	MQENC_NATIVE	MQENC_NATIVE
MQMD.ReplyToQ	Empty	Empty
MQMD.ReplyToQMgr	Empty	Empty
MQMD.AccountingToken	MQACT_NONE	MQACT_NONE
MQMD.Persistence	MQPER_NOT_PERSISTENT	MQPER_NOT_PERSISTENT

The MQMD.CorrelId will be used only if it is not possible to generate a Notify or Technical Ack that contains the RFH2 field MsgBizIdentifier to be used for reconciliation of the Notify or Technical Ack.

In this case the only way to reconcile is to use the MQMD.CorrelId. If this is the case, then the value of the MQMD.Feedback property will be 2000.

The fields in the RFH2 for such Notify or Technical Ack would not include any unknown fields but would indicate what fields are filtered out in the ReasonCode.

Detailed test procedure:	Part I For each primitive type received by the platform analyse the MQMD format directly on the WMQ server Part II Put directly in WMQ queue (with mqm samp utility) a wrongly formatted message to generate the Corrid scenario
Expected result:	Verify the MQMD content on both cases
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

MQ queues, MQ channels and affinity

Requirement ID	ESMIG.60720

There is a set of queues containing SendRequest, a set of queues containing ReceiveIndication, a set of queues containing SendFile and a set of queues containing Notify and TechnicalAck.
It is possible to configure the same queue used for ReceiveIndication to be used for Notify and TechnicalAck.

The set of queues can be over multiple Queue Managers running on different hosts. Each NSP gateway will establish MQI connections to each of the Queue Managers.

There is no affinity between SendRequest queues and queues containing Notify and TechnicalAck. It is possible that a Notify is put on a queue of a different Queue Manager than the Queue Manager of the queue from which the request was taken.

The Queue Manager is dedicated for a given Service.

Detailed test procedure:	Send from the ESMIG a set of SendRequest
Expected result:	Verify that the various Notify and Technical Ack are not necessarily put on the same WMQ instance and queue where the related SendRequest was sent.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

6.4 U2A

User to Application (U2A) mode

Requirement ID	ESMIG.60730

The NSP must support the U2A connectivity enabling HTTPs traffic between the Di.Co.A. and the ESMIG.

Detailed test procedure:	Open an U2A HTTPs session from the Di.Co.A. to the ESMIG (via the NSP). Verify that the connection is successfully established (for example using the "netstat –a" on the https server). Verify that is not possible to establish a connection in plain HTTP.
Expected result:	The NSP supports the U2A mode interactions through the web access using HTTPs protocol to the ESMIG Platform.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

U2A user authentication

Requirement ID	ESMIG.60740

The NSP must distribute to the end users the credential to access the web interface of the ESMIG. The NSP must deliver the certificates for the U2A access to the end users.

U2A authentication message flow is as follow:

- the NSP performs a check whether the end user is authorised to access the requested URL: the check will be based on the "closed group of users";
- if the check is successful, the end user is able to establish an HTTPs session with the ESMIG;
- the ESMIG will perform the identification and authentication of the end user based on client certificate provided in the HTTPs request;
- the ESMIG checks NSP's PKI for certificate validation (CRL, CSL);
- the ESMIG sends an acknowledgement via HTTPs session.

Detailed test procedure:	Verify that the ESMIG Services Operator and a Di.Co.A. cooperating in the test (if available) has received valid credential - from the NSP - in form of a smart-card / USB token / remote HSM and the certificates stored in such device are valid for the authentication respectively against the ESMIG Services U2A interface.
Expected result:	The NSP produced and distributed to the end users the credential, stored in a smart-card, USB token or remote HSM, to access the U2A interface of the ESMIG.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____

	NSP testing team _____ date ____/____/____

U2A closed group of user authorisation

Requirement ID	ESMIG.60750

The NSP must check the authorisation of the end users to access the ESMIG. The end user is requested to open a VPN connection (performing identification and authentication) with the NSP in order to be able to establish a HTTPs session with the ESMIG.

Detailed test procedure:	1. Check that the end user connection to the ESMIG can be established via HTTPs by using an authentication token whose certificate belongs to the ESMIG U2A CGU; the connection must be successful. 2. Try to open an HTTPs tunnel with a certificate not belonging to the CGU; the connection must fail.
Expected result:	The end user is able to establish a HTTPs session with the ESMIG Platform only after the VPN connection with the NSP is established and only if the U2A certificate is part of the relevant CGU.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____

	date ____/____/____ NSP testing team _____ date ____/____/____

U2A Alternative access

Requirement ID	ESMIG.60760

The NSP must provide U2A alternative access to Di.Co.A.; thus each Di.Co.A. might have an U2A access in addition to the A2A and U2A solution described in ESMIG.60010. The two solutions must be provided by different NSPs.

The NSPs guarantees a service level in line with ESMIG.30340

Detailed test procedure:	The NSP offers to the Di.Co.A a connectivity package with only the U2A to be used for alternative access. [desk check]
Expected result:	The NSP is able to provide U2A alternative Access.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Low volume U2A access

Requirement ID	ESMIG.60770

The NSP must provide, in U2A mode only, a cost-effective access for low volume Di.Co.A.. The NSPs must guarantee ease of access for U2A low volume mode as well as the service level described in ESMIG.30340

Detailed test procedure:	The NSP offers to the Di.Co.A a connectivity package with only the U2A to be used for low volume Di.Co.A.. [desk check]
Expected result:	The NSP is able to provide U2A Low volume access.
Outcome:	Please describe the test result: [] PASSED [] FAILED If failed, then description of the follow up action: _____ _____ _____ _____
Formal acceptance:	ESMIG testing team _____ date ____/____/____ NSP testing team _____ date ____/____/____

Annex 1 - Common definitions

- Desk Check: some tests are run on the field, while other tests are run as a desk check. A desk check in the Compliance Check Procedure focuses on the formal availability of the documentation. The evaluation is usually done as a paper based proofreading. It aims at identifying errors and gaps at an early stage of evaluation. A desk check assumes the testing engineers make sure to have traversed through all possible paths and make use of every scenario has been assessed.

- On field: practical test have to be run on the environment.

- Eurosystem - The European System of Central Banks (ESCB) consists of the European Central Bank (ECB) and the national central banks (NCBs) of all 28 member states of the European Union (EU).

- Region 1 includes ESMIG site A and B.

- Region 2 includes ESMIG site C and D.

- Di.Co.A. Emulator: message routing software emulating a real Di.Co.A.

- ESMIG Operator is synonym of Eurosystem.

- ESMIG is the infrastructure run by the ESMIG Operator and hosted in region 1 and region 2

- 4CBNet the internal network interconnecting eight data centres in four regions

Annex 2 - DEP XSD

```
<?xml version="1.0" encoding="utf-8"?>
<schema targetNamespace="http://www.ecb.eu/dep-2.0"
                    xmlns="http://www.w3.org/2001/XMLSchema"
                    xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
                    xmlns:dep="http://www.ecb.eu/dep-2.0"
                    elementFormDefault="qualified"
>
<import
                    namespace="http://www.w3.org/2000/09/xmldsig#"
                    schemaLocation="xmldsig-core-schema.xsd"
/>

 <!-- SIMPLE TYPE DEFINITION -->
 <simpleType name="VersionType">
  <restriction base="string">
   <enumeration value="2.0" />
  </restriction>
 </simpleType>
 <simpleType name="DistinguishedNameType">
  <restriction base="string">
   <minLength value="1" />
   <maxLength value="100" />
  </restriction>
 </simpleType>
 <simpleType name="TechnicalServiceIdType">
  <restriction base="string">
   <maxLength value="60" />
   <pattern
value=".+(MSGRT|MSGSNF|FILERT|FILESNF)\.(INTEG|IAC|EAC|UTEST|PROD)" />
  </restriction>
 </simpleType>
 <simpleType name="SnFTechnicalServiceIdType">
  <restriction base="string">
   <maxLength value="60" />
   <pattern value=".+(MSGSNF|FILESNF)\.(INTEG|IAC|EAC|UTEST|PROD)" />
  </restriction>
 </simpleType>
 <simpleType name="RTTechnicalServiceIdType">
          <restriction base="string">
           <maxLength value="60" />
           <pattern value=".+(MSGRT|FILERT)\.(INTEG|IAC|EAC|UTEST|PROD)" />
          </restriction>
 </simpleType>
 <simpleType name="CommunicationIDType">
  <restriction base="string">
```

```
    <minLength value="1" />
    <maxLength value="100" />
  </restriction>
</simpleType>
<simpleType name="ESMIGMessageIdType">
  <restriction base="string">
    <minLength value="1" />
    <maxLength value="100" />
  </restriction>
</simpleType>
<simpleType name="CompressionIndicatorType">
  <restriction base="string">
    <enumeration value="NONE" />
    <enumeration value="ZIP" />
  </restriction>
</simpleType>
<simpleType name="TimestampType">
  <restriction base="dateTime" />
</simpleType>
<simpleType name="SnFQueueManagerNameType">
  <restriction base="string">
    <minLength value="1" />
    <maxLength value="48" />
  </restriction>
</simpleType>
<simpleType name="SnFQueueNameType">
  <restriction base="string">
    <minLength value="1" />
    <maxLength value="48" />
  </restriction>
</simpleType>
<simpleType name="SnFStatusType">
  <restriction base="string">
    <enumeration value="FAILED" />
    <enumeration value="ACTIVATED" />
    <enumeration value="DEACTIVATED" />
  </restriction>
</simpleType>
<simpleType name="NonRepudiationType">
  <restriction base="string">
    <enumeration value="YES" />
    <enumeration value="NO" />
  </restriction>
</simpleType>
<simpleType name="ReasonType">
  <restriction base="string">
    <minLength value="1" />
    <maxLength value="100" />
  </restriction>
```

```
</simpleType>
<simpleType name="ErrorCodeType">
 <restriction base="string">
  <pattern value="DEP[0-9]{3}E" />
 </restriction>
</simpleType>
<simpleType name="AdditionalInfoType">
 <restriction base="string">
  <minLength value="1" />
  <maxLength value="2000" />
 </restriction>
</simpleType>
<simpleType name="ActorMessageIdType">
 <restriction base="string">
  <minLength value="1" />
  <maxLength value="100" />
 </restriction>
</simpleType>
<simpleType name="MessageDigestType">
 <restriction base="string">
  <minLength value="1" />
  <maxLength value="1024" />
 </restriction>
</simpleType>
<simpleType name="ExchangeStatusType">
 <restriction base="string">
  <enumeration value="OK" />
  <enumeration value="KO" />
 </restriction>
</simpleType>
<simpleType name="PDMAnnotationType">
 <restriction base="string">
  <minLength value="1" />
  <maxLength value="100" />
 </restriction>
</simpleType>
<simpleType name="DeliveryNotificationMode">
 <restriction base="string">
  <enumeration value="YES" />
  <enumeration value="NO" />
  <enumeration value="FAIL" />
 </restriction>
</simpleType>
<simpleType name="RequestType">
 <restriction base="string">
  <minLength value="1" />
  <maxLength value="30" />
 </restriction>
</simpleType>
```

```
<simpleType name="EnvType">
                <restriction base="string">
                        <maxLength value="5" />
                        <pattern value="(INTEG|IAC|EAC|UTEST|PROD)" />
                </restriction>
        </simpleType>
        <simpleType name="MWStatusType">
                <restriction base="string">
                        <enumeration value="FAILED" />
                        <enumeration value="CLOSING" />
                        <enumeration value="CLOSED" />
                        <enumeration value="OPEN" />
                </restriction>
        </simpleType>
 <!-- COMPLEX TYPE DEFINITION -->
 <complexType name="SnFServiceType">
  <sequence>
   <element name="Name" type="dep:SnFTechnicalServiceIdType" />
   <element name="DestQmanagerName" type="dep:SnFQueueManagerNameType"
/>
   <element name="DestQueueName" type="dep:SnFQueueNameType" />
  </sequence>
 </complexType>
 <complexType name="SnFQueryServiceType">
  <sequence>
   <element name="Name" type="dep:SnFTechnicalServiceIdType" />
  </sequence>
 </complexType>
 <complexType name="SnFServiceAckType">
  <complexContent>
   <extension base=" dep:SnFServiceType">
    <sequence>
     <element name="Status" type=" dep:SnFStatusType" />
     <element name="Reason" type=" dep:ReasonType" minOccurs="0" />
    </sequence>
   </extension>
  </complexContent>
 </complexType>
 <complexType name="SnFTrafficCommandType">
  <sequence>
   <element name="Service" type=" dep:SnFServiceType" maxOccurs="unbounded" />
  </sequence>
 </complexType>
 <complexType name="SnFTrafficQueryCommandType">
  <sequence>
   <element name="Service" type=" dep:SnFQueryServiceType" />
  </sequence>
 </complexType>
 <complexType name="SnFTrafficCommandAckType">
```

```
  <sequence>
   <element name="Service" type=" dep:SnFServiceAckType"
maxOccurs="unbounded" />
  </sequence>
 </complexType>
        <!--  RT -->
        <complexType name="RTServiceType">
                <sequence>
                        <element name="Name" type="
dep:RTTechnicalServiceIdType" />
                        <element name="DestQmanagerName" type="
dep:SnFQueueManagerNameType" />
                        <element name="DestQueueName" type="
dep:SnFQueueNameType" />
                </sequence>
        </complexType>
        <complexType name="RTTrafficCommandType">
                <sequence>
                        <element name="Service" type=" dep:RTServiceType"
maxOccurs="unbounded" />
                </sequence>
        </complexType>

        <complexType name="RTTrafficQueryCommandType">
                <sequence>
                        <element name="Service" type=" dep:RTQueryServiceType"
/>
                </sequence>
        </complexType>
        <complexType name="RTQueryServiceType">
                <sequence>
                        <element name="Name" type="
dep:RTTechnicalServiceIdType" />
                </sequence>
        </complexType>
        <complexType name="RTServiceAckType">
                <complexContent>
                        <extension base=" dep:RTServiceType">
                                <sequence>
                                        <element name="Status" type="
dep:SnFStatusType" />
                                        <element name="Reason" type="
dep:ReasonType" minOccurs="0" />
                                </sequence>
                        </extension>
                </complexContent>
        </complexType>
        <complexType name="RTTrafficCommandAckType">
                <sequence>
```

```
                        <element name="Service" type=" dep:RTServiceAckType"
maxOccurs="unbounded" />
                </sequence>
        </complexType>

        <!--  MW -->
        <complexType name="MWType">
                <sequence>
                        <element name="Env" type=" dep:EnvType" />
                </sequence>
        </complexType>
        <complexType name="MWAckType">
                <complexContent>
                        <extension base=" dep:MWType">
                                <sequence>
                                        <element name="Status" type="
dep:MWStatusType" />
                                        <element name="Reason" type="
dep:ReasonType" minOccurs="0" />
                                </sequence>
                        </extension>
                </complexContent>
        </complexType>
 <complexType name="ErrorDescriptionType">
  <sequence>
   <element name="ErrorCode" type=" dep:ErrorCodeType" />
   <element name="AdditionalInfo" type=" dep:AdditionalInfoType" minOccurs="0" />
  </sequence>
 </complexType>
 <complexType name="PDMType">
  <sequence minOccurs="1" maxOccurs="10">
   <element name="TimeStamp" type=" dep:TimestampType" />
   <element name="AdditionalInfo" type=" dep:PDMAnnotationType" minOccurs="0"
/>
  </sequence>
 </complexType>
 <complexType name="ExchangeHeaderType">
  <sequence>
   <element name="Version" type=" dep:VersionType">
    <annotation>
     <documentation>Version of Data Exchange Protocol</documentation>
    </annotation>
   </element>
   <element name="Sender" type=" dep:DistinguishedNameType">
    <annotation>
     <documentation>Identification for the Technical Sender that sends the
     message</documentation>
    </annotation>
   </element>
```

```
    <element name="Receiver" type=" dep:DistinguishedNameType">
     <annotation>
      <documentation>Identification for the Technical Receiver that receives the
      message</documentation>
     </annotation>
    </element>
    <element name="TechnicalServiceId" type=" dep:TechnicalServiceIdType">
     <annotation>
      <documentation>Name of the service used to send messages and files
&lt;Service&gt;+”.”+NSP Name+ "." + &lt;msg-pattern&gt; + "." + &lt;environment&gt;
where &lt;msg-pattern&gt; is one
       of: MSGRT MSGSNF FILERT FILESNF and &lt;environment&gt; is one of:
       INTEG,IAC,EAC,UTEST,PROD.</documentation>
     </annotation>
    </element>
    <element name="RequestType" type=" dep:RequestType">
     <annotation>
      <documentation>Type of the request, to classify message content. In case of
different
       request types in the same BusinessEnvelope, the "MultiRequest" value shall be
used as
       RequestType</documentation>
     </annotation>
    </element>
    <element name="CommunicationId" type=" dep:CommunicationIDType"
minOccurs="0">
     <annotation>
      <documentation>Unique message identifier assigned by the ESMIG counterpart
(at DEP
       transport level).</documentation>
     </annotation>
    </element>
    <element name="ESMIGMessageId" type=" dep:ESMIGMessageIdType"
minOccurs="0">
     <annotation>
      <documentation>Unique message identifier generated by
ESMIG</documentation>
     </annotation>
    </element>
    <element name="ActorMessageId" type=" dep:ActorMessageIdType"
minOccurs="0">
     <annotation>
      <documentation>Unique message identifier generated at Di.Co.A.
site</documentation>
     </annotation>
    </element>
    <element name="EntryTimestamp" type=" dep:TimestampType" minOccurs="0">
     <annotation>
      <documentation>Timestamp of the NSP's gateway reception, based on UTC
```

```
        time</documentation>
      </annotation>
    </element>
    <element name="SendTimestamp" type=" dep:TimestampType">
      <annotation>
        <documentation>Timestamp of the sending of message, based on UTC
time</documentation>
      </annotation>
    </element>
    <element name="ReceiveTimestamp" type=" dep:TimestampType" minOccurs="0">
      <annotation>
        <documentation>Timestamp of the receiving of message, based on UTC
time</documentation>
      </annotation>
    </element>
    <element name="PDMHistory" type=" dep:PDMType" minOccurs="0">
      <annotation>
        <documentation>Timestamp's list of the attempting of the delivery of the
message, based
        on UTC time. This list contains a sequence of SendTimestamp
entries.</documentation>
      </annotation>
    </element>
    <element name="DeliveryNotification" type=" dep:DeliveryNotificationMode"
minOccurs="0">
      <annotation>
        <documentation>Delivery notification management. This field has to be set only
in the
        case of store-and-forward mode. The following values are foreseen: YES: the
delivery
        notification is requested always FAIL: the delivery notification is requested only in
        case of failure NO: the delivery notification is not requested (this is the DEFAULT
        value)</documentation>
      </annotation>
    </element>
    <element name="NonRepudiationExchange" type=" dep:NonRepudiationType">
      <annotation>
        <documentation>Flag that indicates if the non-repudiation is requested or
        not</documentation>
      </annotation>
    </element>
    <element name="Compression" type=" dep:CompressionIndicatorType">
      <annotation>
        <documentation>Flag that indicates the algorithm used to compress the payload
or "NONE"
        (if compression is not used)</documentation>
      </annotation>
    </element>
```

```
    <element name="ExchangeStatus" type=" dep:ExchangeStatusType"
minOccurs="0">
      <annotation>
        <documentation>Status of the exchange: "OK" in the case of a successful
exchange "KO" in
        case of failure This element must be present in DEP technical ack messages and in
        Response messages of R-T (message and file) exchange.</documentation>
      </annotation>
    </element>
    <element name="ErrorDescription" type="dep:ErrorDescriptionType"
minOccurs="0">
      <annotation>
        <documentation>Description of the error occurred during the
exchanging</documentation>
      </annotation>
    </element>
    <element name="MessageDigest" type=" dep:MessageDigestType" minOccurs="0">
      <annotation>
        <documentation>Digest of the Message/File exchanged (The digest has to be
applied to the
        DEP Exchange Header and to the Business Envelope) This element is used only in
Technical
        Ack primitive, when DEP:NonRepudiationExchange flag has been set. The digest
has to be
        based on the received DEP Exchange Header and Business
Envelope.</documentation>
      </annotation>
    </element>
  </sequence>
 </complexType>
 <complexType name="BusinessEnvelopeType">
  <complexContent>
   <extension base="anyType" />
  </complexContent>
 </complexType>
 <complexType name="ExchangeEnvelopeType">
  <sequence>
   <element name="ExchangeHeader" type=" dep:ExchangeHeaderType" />
   <element name="BusinessEnvelope" type=" dep:BusinessEnvelopeType" />
   <element ref="ds:Signature" minOccurs="0" />
  </sequence>
 </complexType>
 <complexType name="TechnicalAckType">
  <sequence>
   <element name="ExchangeHeader" type=" dep:ExchangeHeaderType" />
   <element ref="ds:Signature" minOccurs="0" />
  </sequence>
 </complexType>
 <complexType name="DeliveryNotificationType">
```

```
  <sequence>
    <element name="ExchangeHeader" type=" dep:ExchangeHeaderType" />
    <element ref="ds:Signature" minOccurs="0" />
  </sequence>
</complexType>

<!-- ELEMENT TYPE DEFINITION -->
<element name="Request" type=" dep:ExchangeEnvelopeType" />
<element name="Response" type=" dep:ExchangeEnvelopeType" />
<element name="TechnicalAck" type=" dep:TechnicalAckType" />
<element name="DeliveryNotification" type=" dep:DeliveryNotificationType" />
<element name="EnableSnfTraffic" type=" dep:SnFTrafficCommandType" />
<element name="DisableSnfTraffic" type=" dep:SnFTrafficCommandType" />
<element name="EnableSnfTrafficAck" type=" dep:SnFTrafficCommandAckType" />
<element name="DisableSnfTrafficAck" type=" dep:SnFTrafficCommandAckType" />
<element name="QuerySnfTraffic" type=" dep:SnFTrafficQueryCommandType" />
<element name="QuerySnfTrafficAck" type=" dep:SnFTrafficCommandAckType" />
<element name="EnableRTTraffic" type=" dep:RTTrafficCommandType" />
<element name="DisableRTTraffic" type=" dep:RTTrafficCommandType" />
<element name="EnableRTTrafficAck" type=" dep:RTTrafficCommandAckType" />
<element name="DisableRTTrafficAck" type=" dep:RTTrafficCommandAckType" />
<element name="QueryRTTraffic" type=" dep:RTTrafficQueryCommandType" />
<element name="QueryRTTrafficAck" type=" dep:RTTrafficCommandAckType" />
<element name="OpenTrafficChannels" type=" dep:MWType" />
<element name="OpenTrafficChannelsAck" type=" dep:MWAckType" />
<element name="CloseTrafficChannels" type=" dep:MWType" />
<element name="CloseTrafficChannelsAck" type=" dep:MWAckType" />
<element name="QueryTrafficChannels" type=" dep:MWType" />
<element name="QueryTrafficChannelsAck" type=" dep:MWAckType" />
 </schema>
```

Annex 3 - DEP maintenance window primitive samples

CloseTrafficChannels primitive

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:CloseTrafficChannels xmlns:dep="http://www.ecb.eu/dep-2.0">
  <dep:Env>INTEG</dep:Env>
</dep:CloseTrafficChannels>

 <!--
  MQMD.Expiry=-1
  MQMD.GroupID=
  MQMD.CodeCharacterSetId=1208
  MQMD.MsgType=Datagram
  MQMD.MessageID=414D5120444550514D4752534348524FF383185302E92620
  MQMD.Report=MQRO_NONE
  MQMD.Format=NONE
 -->
```

CloseTrafficChannelsAck primitive

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:CloseTrafficChannelsAck xmlns:dep="http://www.ecb.eu/dep-2.0" >
  <dep:Env>INTEG</dep:Env>
  <dep:Status>CLOSING</dep:Status>
</dep:CloseTrafficChannelsAck>

<!--
MQMD.ApplIdData=SIA-COLT-22000JSSCHRO
MQMD.Encoding=273
MQMD.Feedback=0
MQMD.Expiry=-1
MQMD.PutDateTime=16/02/2015 18:13:47.260
MQMD.CodeCharacterSetId=1208
MQMD.GroupID=
MQMD.MsgType=4
MQMD.MessageID=414D5120444550514D4752534348524FF383185303E82620
MQMD.Report=0
MQMD.Format=null
MQMD.CorrelationID=414D5120444550514D4752534348524FF383185302E92620
-->
```

OpenTrafficChannels

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:OpenTrafficChannels xmlns:dep="http://www.ecb.eu/dep-2.0" >
  <dep:Env>INTEG</dep:Env>
</dep:OpenTrafficChannels>

 <!--
  MQMD.Expiry=-1
  MQMD.GroupID=
  MQMD.CodeCharacterSetId=1208
  MQMD.MsgType=Datagram
  MQMD.MessageID=414D5120444550514D4752534348524FF383185302E92623
  MQMD.Report=MQRO_NONE
  MQMD.Format=NONE
 -->
```

OpenTrafficChannelsAck

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:OpenTrafficChannelsAck xmlns:dep="http://www.ecb.eu/dep-2.0" >
  <dep:Env>INTEG</dep:Env>
  <dep:Status>OPEN</dep:Status>
</dep:OpenTrafficChannelsAck>
 <!--
  MQMD.ApplIdData=xxxx-yyyy
  MQMD.Encoding=273
  MQMD.Feedback=0
  MQMD.Expiry=-1
  MQMD.PutDateTime=16/12/2018 18:13:47.260
  MQMD.CodeCharacterSetId=1208
  MQMD.GroupID=
  MQMD.MsgType=4
  MQMD.MessageID=414D5120444550514D4752534348524FF383185303E82621
  MQMD.Report=0
  MQMD.Format=null
  MQMD.CorrelationID=414D5120444550514D4752534348524FF383185302E92623
 -->
```

QueryTrafficChannels

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:QueryTrafficChannels xmlns:dep="http://www.ecb.eu/dep-2.0" >
  <dep:Env>INTEG</dep:Env>
</dep:QueryTrafficChannels>

 <!--
  MQMD.Expiry=-1
  MQMD.GroupID=
  MQMD.CodeCharacterSetId=1208
  MQMD.MsgType=Datagram
  MQMD.MessageID=414D5120444550514D4752534348524FF383185302E92623
  MQMD.Report=MQRO_NONE
  MQMD.Format=NONE
 -->
```

QueryTrafficChannelsAck

```
<?xml version="1.0" encoding="UTF-8" ?>
<dep:QueryTrafficChannelsAck xmlns:dep="http://www.ecb.eu/dep-2.0" >
   <dep:Env>INTEG</dep:Env>
   <dep:Status>CLOSED</dep:Status>
</dep:QueryTrafficChannelsAck>
 <!--
  MQMD.ApplIdData=xxxx-yyyy
  MQMD.Encoding=273
  MQMD.Feedback=0
  MQMD.Expiry=-1
  MQMD.PutDateTime=16/12/2018 18:13:47.260
  MQMD.CodeCharacterSetId=1208
  MQMD.GroupID=
  MQMD.MsgType=4
  MQMD.MessageID=414D5120444550514D4752534348524FF383185303E82621
  MQMD.Report=0
  MQMD.Format=null
  MQMD.CorrelationID=414D5120444550514D4752534348524FF383185302E92623
 -->
```

Annex 4 - MEPT examples

Instant payment request from the originator

```
<rfh2>
   <HMAC>dGhpcyBpcyBub3QgYSBzaWduYXR1cmUK...</HMAC>
   <HMACKeyId>1234</HMACKeyId>
   <MsgSignature>
      <Signature ...
      </Signature>
   </MsgSignature>
   <ProtocolVersion>1</ProtocolVersion>
   <Service>TIPS-TEST</Service>
   <Sender>cn=originator-dn,ou=...,o=...</Sender>
   <Receiver>cn=tips-dn,ou=...,o=...</Receiver>
   <PrimitiveType>ReceiveIndication</PrimitiveType>
   <MsgType>pacs.008.001.02</MsgType>
   <SendTimestamp>2016-12-19T12:00:01.222Z</SendTimestamp>
   <ReceiveTimestamp>2016-12-19T12:00:01.777Z</ReceiveTimestamp>
   <MsgBizIdentifier>MSG001</MsgBizIdentifier>
   <MsgNetworkIdentifier>NWX000001</MsgNetworkIdentifier>
</rfh2>
<Document                    xmlns="urn:iso:std:iso:20022:tech:xsd:pacs.008.001.02"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:iso:std:iso:20022:tech:xsd:pacs.008.001.02">
   <FIToFICstmrCdtTrf>
      <GrpHdr>
         <MsgId>MSG001</MsgId>
         <CreDtTm>2016-12-19T12:00:01.222Z</CreDtTm>
         <NbOfTxs>1</NbOfTxs>
         <TtlIntrBkSttlmAmt Ccy="EUR">123.45</TtlIntrBkSttlmAmt>
         <IntrBkSttlmDt>2016-12-19</IntrBkSttlmDt>
         <SttlmInf>
            <SttlmMtd>INDA</SttlmMtd>
         </SttlmInf>
         <PmtTpInf>
            <SvcLvl>
               <Cd>SEPA</Cd>
            </SvcLvl>
            <LclInstrm>
               <Cd>INST</Cd>
            </LclInstrm>
         </PmtTpInf>
         <InstgAgt>
            <FinInstnId>
               <BIC>ORIGINATOR-BIC</BIC>
            </FinInstnId>
         </InstgAgt>
         <InstdAgt>
            <FinInstnId>
               <BIC>BENEFICIARY-BIC</BIC>
            </FinInstnId>
```

```
        </InstdAgt>
      </GrpHdr>
      <CdtTrfTxInf>
        <PmtId>
          <EndToEndId>ENDTOEND001</EndToEndId>
          <TxId>TRX001</TxId>
        </PmtId>
        <IntrBkSttlmAmt Ccy="EUR">123.45</IntrBkSttlmAmt>
        <AccptncDtTm>2016-12-19T12:00:01.222Z</AccptncDtTm>
        <ChrgBr>SLEV</ChrgBr>
        <DbtrAgt>
          <FinInstnId>
            <BIC>ORIGINATOR-BIC</BIC>
          </FinInstnId>
        </DbtrAgt>
        <CdtrAgt>
          <FinInstnId>
            <BIC>BENEFICIARY-BIC</BIC>
          </FinInstnId>
        </CdtrAgt>
      </CdtTrfTxInf>
    </FIToFICstmrCdtTrf>
</Document>
```

Instant payment request validated and to be forwarded to the beneficiary

```
<rfh2>
   <HMAC>dGhpcyBpcyBub3QgYSBzaWduYXR1cmUK...</HMAC>
   <HMACKeyId>1234</HMACKeyId>
   <ProtocolVersion>1</ProtocolVersion>
   <Service>TIPS-TEST</Service>
   <Sender>cn=tips-dn,ou=...,o=...</Sender>
   <Receiver>cn=beneficiary-dn,ou=...,o=...</Receiver>
   <PrimitiveType>SendRequest</PrimitiveType>
   <MsgType>pacs.008.001.02</MsgType>
   <MsgBizIdentifier>MSG001</MsgBizIdentifier>
   <SignatureRequired>Y</SignatureRequired>
   <NotificationRequired>E</NotificationRequired>
   <TechnicalAckRequired>E</TechnicalAckRequired>

</rfh2>
<Document                    xmlns="urn:iso:std:iso:20022:tech:xsd:pacs.008.001.02"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:iso:std:iso:20022:tech:xsd:pacs.008.001.02">
   <FIToFICstmrCdtTrf>
      <GrpHdr>
        <MsgId>MSG001</MsgId>
        <CreDtTm>2016-12-19T12:00:01.222Z</CreDtTm>
        <NbOfTxs>1</NbOfTxs>
        <TtlIntrBkSttlmAmt Ccy="EUR">123.45</TtlIntrBkSttlmAmt>
        <IntrBkSttlmDt>2016-12-19</IntrBkSttlmDt>
        <SttlmInf>
          <SttlmMtd>INDA</SttlmMtd>
        </SttlmInf>
```

```
        <PmtTpInf>
          <SvcLvl>
            <Cd>SEPA</Cd>
          </SvcLvl>
          <LclInstrm>
            <Cd>INST</Cd>
          </LclInstrm>
        </PmtTpInf>
        <InstgAgt>
          <FinInstnId>
            <BIC>ORIGINATOR-BIC</BIC>
          </FinInstnId>
        </InstgAgt>
        <InstdAgt>
          <FinInstnId>
            <BIC>BENEFICIARY-BIC</BIC>
          </FinInstnId>
        </InstdAgt>
      </GrpHdr>
      <CdtTrfTxInf>
        <PmtId>
          <EndToEndId>ENDTOEND001</EndToEndId>
          <TxId>TRX001</TxId>
        </PmtId>
        <IntrBkSttlmAmt Ccy="EUR">123.45</IntrBkSttlmAmt>
        <AccptncDtTm>2016-12-19T12:00:01.222Z</AccptncDtTm>
        <ChrgBr>SLEV</ChrgBr>
        <DbtrAgt>
          <FinInstnId>
            <BIC>ORIGINATOR-BIC</BIC>
          </FinInstnId>
        </DbtrAgt>
        <CdtrAgt>
          <FinInstnId>
            <BIC>BENEFICIARY-BIC</BIC>
          </FinInstnId>
        </CdtrAgt>
      </CdtTrfTxInf>
    </FIToFICstmrCdtTrf>
</Document>
```

Positive response from the beneficiary

```
<rfh2>
  <HMAC>dGhpcyBpcyBub3QgYSBzaWduYXR1cmUK...</HMAC>
  <HMACKeyId>1234</HMACKeyId>
  <MsgSignature>
    <Signature ...
    </Signature>
  </MsgSignature>
  <ProtocolVersion>1</ProtocolVersion>
  <Service>TIPS-TEST</Service>
  <Sender>cn=originator-dn,ou=tips,o=...</Sender>
```

```
   <Receiver>cn=tips-dn,ou=tips,o=...</Receiver>
   <PrimitiveType>ReceiveIndication</PrimitiveType>
   <MsgType>pacs.002.001.03</MsgType>
   <SendTimestamp>2016-12-19T12:00:01.222Z</SendTimestamp >
   <ReceiveTimestamp>2016-12-19T12:00:01.777Z</ReceiveTimestamp >
   <MsgBizIdentifier>MSG002</MsgBizIdentifier>
   <MsgNetworkIdentifier>NWX000002</MsgNetworkIdentifier>
</rfh2>
<Document                    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="urn:iso:std:iso:20022:tech:xsd:pacs.002.001.03">
   <FIToFIPmtStsRpt>
      <GrpHdr>
         <MsgId>MSG002</MsgId>
         <CreDtTm>2016-12-19T12:00:01.222Z</CreDtTm>
         <InstgAgt>
            <FinInstnId>
               <BIC>BENEFICIARY-BIC</BIC>
            </FinInstnId>
         </InstgAgt>
         <InstdAgt>
            <FinInstnId>
               <BIC>TIPS-BIC</BIC>
            </FinInstnId>
         </InstdAgt>
      </GrpHdr>
      <OrgnlGrpInfAndSts>
         <OrgnlMsgId>MSG001</OrgnlMsgId>
         <OrgnlMsgNmId>pacs.008.001.02</OrgnlMsgNmId>
         <OrgnlCreDtTm>2016-12-19T12:00:01.222Z</OrgnlCreDtTm>
         <GrpSts>ACCP</GrpSts>
      </OrgnlGrpInfAndSts>
      <TxInfAndSts>
         <StsId>MSG001</StsId>
         <OrgnlEndToEndId>ENDTOEND001</OrgnlEndToEndId>
         <OrgnlTxId>TRX001</OrgnlTxId>
         <TxSts>ACCP</TxSts>
         <AccptncDtTm>2016-12-19T12:00:01.222Z</AccptncDtTm>
         <OrgnlTxRef>
            <IntrBkSttlmAmt Ccy="EUR">123.45</IntrBkSttlmAmt>
            <DbtrAgt>
               <FinInstnId>
                  <BIC>ORIGINATOR-BIC</BIC>
               </FinInstnId>
            </DbtrAgt>
            <CdtrAgt>
               <FinInstnId>
                  <BIC>BENEFICIARY-BIC</BIC>
               </FinInstnId>
            </CdtrAgt>
         </OrgnlTxRef>
      </TxInfAndSts>
   </FIToFIPmtStsRpt>
</Document>
```

Instant Payment completed

Response to be sent to the originator

```
<rfh2>
   <HMAC>dGhpcyBpcyBub3QgYSBzaWduYXR1cmUK...</HMAC>
   <HMACKeyId>1234</HMACKeyId>
   <ProtocolVersion>1</ProtocolVersion>
   <Service>TIPS-TEST</Service>
   <Sender>cn=tips-dn,ou=tips,o=...</Sender>
   <Receiver>cn=originator-dn,ou=tips,o=...</Receiver>
   <PrimitiveType>SendRequest</PrimitiveType>
   <MsgType>pacs.002.001.03</MsgType>
   <MsgBizIdentifier>MSG001@00001@dbtr</MsgBizIdentifier>
   <SignatureRequired>N</SignatureRequired>
   <NotificationRequired>E</NotificationRequired>
   <TechnicalAckRequired>E</TechnicalAckRequired>
</rfh2>
<Document                    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="urn:iso:std:iso:20022:tech:xsd:pacs.002.001.03">
   <FIToFIPmtStsRpt>
      <GrpHdr>
         <MsgId>MSG001@00001@dbtr</MsgId>
         <CreDtTm>2016-12-19T12:00:01.222Z</CreDtTm>
         <InstgAgt>
            <FinInstnId>
               <BIC>TIPS-BIC</BIC>
            </FinInstnId>
         </InstgAgt>
         <InstdAgt>
            <FinInstnId>
               <BIC>ORIGINATOR-BIC</BIC>
            </FinInstnId>
         </InstdAgt>
      </GrpHdr>
      <OrgnlGrpInfAndSts>
         <OrgnlMsgId>MSG001</OrgnlMsgId>
         <OrgnlMsgNmId>pacs.008.001.02</OrgnlMsgNmId>
         <OrgnlCreDtTm>2016-12-19T12:00:01.222Z</OrgnlCreDtTm>
         <GrpSts>ACCP</GrpSts>
      </OrgnlGrpInfAndSts>
      <TxInfAndSts>
         <StsId>MSG001</StsId>
         <OrgnlEndToEndId>ENDTOEND001</OrgnlEndToEndId>
         <OrgnlTxId>TRX001</OrgnlTxId>
         <TxSts>ACCP</TxSts>
         <AccptncDtTm>2016-12-19T12:00:01.222Z</AccptncDtTm>
         <OrgnlTxRef>
            <IntrBkSttlmAmt Ccy="EUR">123.45</IntrBkSttlmAmt>
            <DbtrAgt>
               <FinInstnId>
                  <BIC>ORIGINATOR-BIC</BIC>
               </FinInstnId>
            </DbtrAgt>
            <CdtrAgt>
               <FinInstnId>
```

```
                <BIC>BENEFICIARY-BIC</BIC>
              </FinInstnId>
            </CdtrAgt>
          </OrgnlTxRef>
        </TxInfAndSts>
    </FIToFIPmtStsRpt>
</Document>
```

Response to be sent to the beneficiary

```
<rfh2>
   <HMAC>dGhpcyBpcyBub3QgYSBzaWduYXR1cmUK...</HMAC>
   <HMACKeyId>1234</HMACKeyId>
   <ProtocolVersion>1</ProtocolVersion>
   <Service>TIPS-TEST</Service>
   <Sender>cn=tips-dn,ou=tips,o=...</Sender>
   <Receiver>cn=beneficiary-dn,ou=tips,o=...</Receiver>
   <PrimitiveType>SendRequest</PrimitiveType>
   <MsgType>pacs.002.001.03</MsgType>
   <MsgBizIdentifier>MSG001@00001@cdtr</MsgBizIdentifier>
   <SignatureRequired>N</SignatureRequired>
   <NotificationRequired>E</NotificationRequired>
   <TechnicalAckRequired>E</TechnicalAckRequired>

</rfh2>
<Document                    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="urn:iso:std:iso:20022:tech:xsd:pacs.002.001.03">
   <FIToFIPmtStsRpt>
      <GrpHdr>
         <MsgId>MSG001@00001@cdtr</MsgId>
         <CreDtTm>2016-12-19T12:00:01.222Z</CreDtTm>
         <InstgAgt>
            <FinInstnId>
               <BIC>TIPS-BIC</BIC>
            </FinInstnId>
         </InstgAgt>
         <InstdAgt>
            <FinInstnId>
               <BIC>BENEFICIARY-BIC</BIC>
            </FinInstnId>
         </InstdAgt>
      </GrpHdr>
      <OrgnlGrpInfAndSts>
         <OrgnlMsgId>MSG001</OrgnlMsgId>
         <OrgnlMsgNmId>pacs.008.001.02</OrgnlMsgNmId>
         <OrgnlCreDtTm>2016-12-19T12:00:01.222Z</OrgnlCreDtTm>
         <GrpSts>ACCP</GrpSts>
      </OrgnlGrpInfAndSts>
      <TxInfAndSts>
         <StsId>MSG001</StsId>
         <OrgnlEndToEndId>ENDTOEND001</OrgnlEndToEndId>
         <OrgnlTxId>TRX001</OrgnlTxId>
         <TxSts>ACCP</TxSts>
```

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        <AccptncDtTm>2016-12-19T12:00:01.222Z</AccptncDtTm>
        <OrgnlTxRef>
          <IntrBkSttlmAmt Ccy="EUR">123.45</IntrBkSttlmAmt>
          <DbtrAgt>
            <FinInstnId>
              <BIC>ORIGINATOR-BIC</BIC>
            </FinInstnId>
          </DbtrAgt>
          <CdtrAgt>
            <FinInstnId>
              <BIC>BENEFICIARY-BIC</BIC>
            </FinInstnId>
          </CdtrAgt>
        </OrgnlTxRef>
      </TxInfAndSts>
    </FIToFIPmtStsRpt>
</Document>
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Technical Ack received on Response sent to Beneficiary

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<rfh2>
  <HMAC>odinf90sUSKDoUSLLio5S4d5VdWpoad4...</HMAC>
  <HMACKeyId>1234</HMACKeyId>
  <ProtocolVersion>1</ProtocolVersion>
  <Service>TIPS-TEST</Service>
  <Sender>cn=tips-dn,ou=tips,o=...</Sender>
  <Receiver>cn=beneficiary-dn,ou=tips,o=...</Receiver>
  <PrimitiveType>TechnicalAck</PrimitiveType>
  <SendTimestamp>2016-12-19T12:00:01.222Z</SendTimestamp>
  <MsgBizIdentifier>MSG001@00001@cdtr</MsgBizIdentifier>
  <MsgNetworkIdentifier>NWX000005</MsgNetworkIdentifier>
  <PrimitiveReturnCode>KO</PrimitiveReturnCode>
  <PrimitiveReasonCode>TIPS.FailedDelivery</PrimitiveReasonCode>
</rfh2>
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