Connectivity - technical requirements

TARGET Instant Payment Settlement

Annex to the Harmonised Conditions

Author	4CB
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TABLE OF CONTENT

1. Technical and operational criteria

The general architecture of the TIPS Platform is set out in the High Level Technical Design document. It describes the platform and defines very high-level requirements for the Connectivity Services required for the remote access to the TIPS Platform. TIPS shall be accessible through the European Single Market Infrastructure Gateway (ESMIG). From a TIPS perspective, the ESMIG is expected to perform basic checks on messages it receives and to route them to the TIPS application. The ESMIG is also expected to have a driver specific for the TIPS application that transforms the received messages before routing them.

This document presents detailed technical criteria for the Connectivity Solution - as defined in the Harmonised Conditions for TIPS - describing network connectivity, messaging services, security services, operational services and implementation. The Solution focuses on the interconnection between TIPS Service Provider (operating the TIPS Platform, hereinafter "the TIPS Operator") and the TIPS Actor.

Thus, the requirements listed below focus on such an interconnection and refer either to the TIPS Actor or to the NSP selected by the former, which remains responsible for the compliance of the latter.

The TIPS Participant shall ensure, on the basis of the Harmonised Conditions for TIPS, that the Connectivity Solution to be provided by the NSP chosen by the same TIPS Participant, his Instructing Parties or Reachable Parties fulfils the following technical and operational requirements, at the time of the TIPS Operator compliance check and afterwards throughout the whole period of connection of the TIPS Actor to the TIPS Platform. The compliance checks carried out by the TIPS Operator under section 5 of this document shall not prejudice this responsibility. The procedures for performing the compliance checks, as well as the consequences in the event of non-compliance, shall be governed by the Harmonised Conditions for TIPS and the appendixes thereto.

1.1. General service description

The TIPS infrastructure is deployed over one geographical Region (Italy) with two Sites which are defined as the TIPS Platform and host the TIPS business applications. To allow continuous operations without service interruptions, the Region consists of a primary and a secondary site which run independently from each other.

An optional extension to a second geographical Region (Germany) with two additional Sites, configured as above, would be possible at a later stage, if deemed necessary by the Eurosystem.

The NSP interconnects the TIPS Actor to the TIPS Platform.

The following pictures represent a model with two NSPs. Nevertheless the total number of NSPs is not limited *a priori*, two NSPs are just an example.

Technical infrastructure

Reference ID	TIPS.UC.TC.11010

The Network Services Provider (NSP) shall deliver a technical infrastructure and necessary software components required to exchange in a secure and reliable manner messages between the TIPS Actor and the TIPS Platform.

Delivery point for Connectivity Services

Reference ID	TIPS.UC.TC.11050

The NSP shall deliver Connectivity Services to each of the TIPS sites. Region 1 and Region 2 (if the latter is implemented) are interconnected through the internal network (4CBNet) which is not in the scope of these requirements.

Location of equipment

Reference ID	TIPS.UC.TC.11060

The NSP shall install inside the TIPS Operator premises (i.e. inside each TIPS Site) all the necessary devices to ensure the connectivity to the TIPS Platform (e.g. routers, VPN devices and Network Gateways as illustrated on the Figure 1[1]).

The NSP shall connect its equipment to the respective TIPS communication endpoints at each TIPS Site.

[1] Location of equipment shown on the Figure 1 has to be considered only as an example.

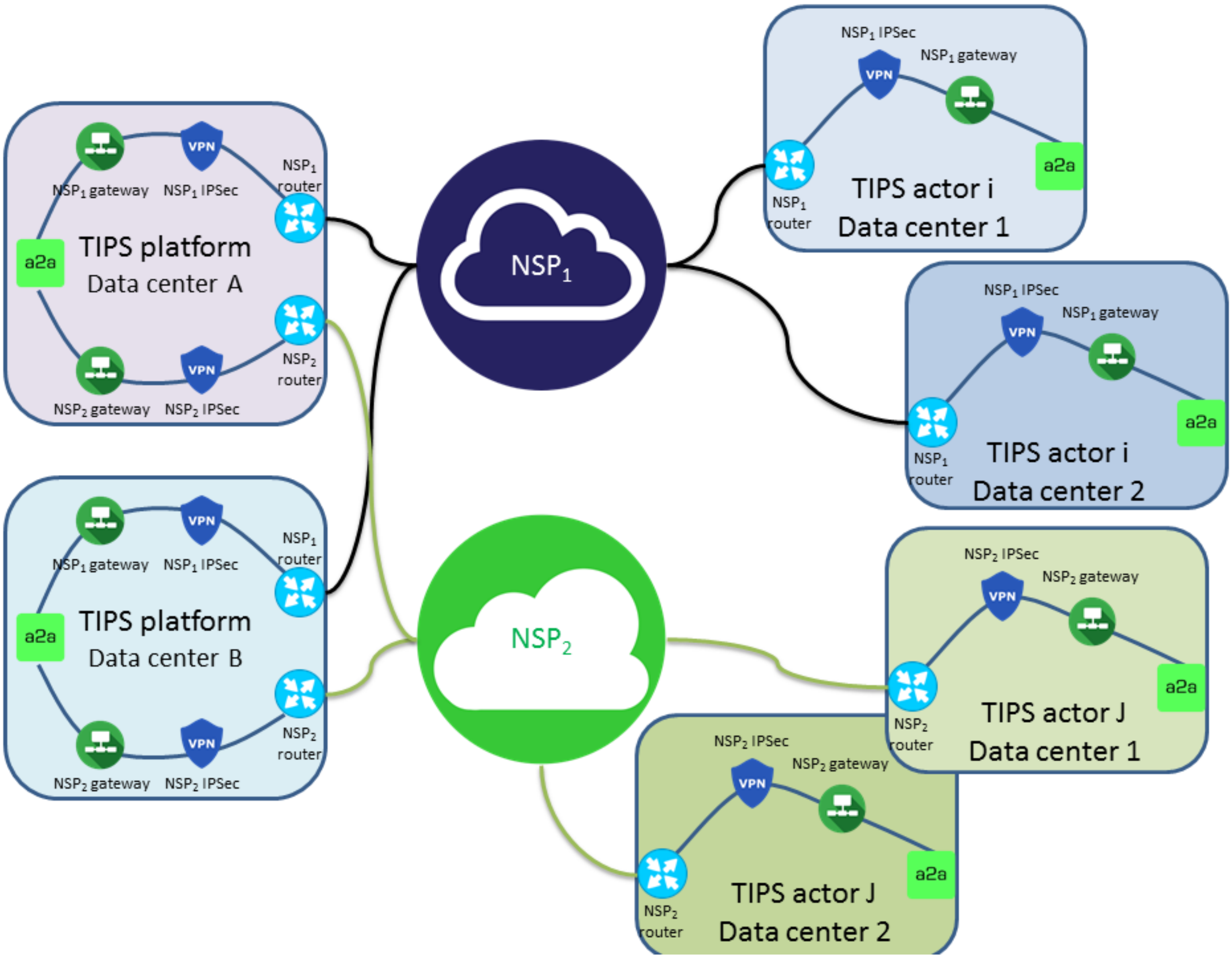


Figure 1 – Location of equipment and NSP demarcation point at the TIPS Platform sites
(on this Figure only one Region is shown, the same configuration shall be implemented on the second one)

Hosting agreement

Reference ID	TIPS.UC.TC.11065

Terms and Conditions for hosting provisioning are detailed in attachment to the Harmonised Conditions for TIPS.

The boundaries of responsibility

Reference ID	TIPS.UC.TC.11070

The demarcation line defining the responsibilities between TIPS Operator and the TIPS Actor shall be the interface between the NSP's VPN devices and the TIPS Platform's safety devices provided by the NSP in a patch panel as described in section 2.1. Interface to the TIPS Platform (between TIPS and NSP) below.

For the avoidance of any doubt, such demarcation line shall define the boundary of responsibility of the TIPS Actor. The latter shall be fully responsible and liable for all NSP’s failures within this boundary.

Chain of trust relationship

Reference ID	TIPS.UC.TC.11080

The TIPS Actor shall be responsible for ensuring that the requirements expressed in this document (e.g. performance, security) are satisfied also inside the NSP domain and in the relation with their NSP.

Independence of interfaces on TIPS and TIPS Actor's sites

Reference ID	TIPS.UC.TC.11090

The NSP shall ensure that the technical solutions it adopts for the interface with the TIPS Actor does not affect technical solution adopted for the interface with its TIPS Platform.

The NSP and its TIPS Actors shall agree on and establish a connectivity interface on their site.

The two interfaces shall be technically decoupled by means of the NSP's services, in the sense that technical choices on one interface shall not affect the other.

Single interface on the TIPS Site

Reference ID	TIPS.UC.TC.11100

The NSP shall comply with the TIPS interface as described in Chapter 3.

NSP will provide connectivity between the TIPS Platform's application and the TIPS Actor's application.

Interface on the TIPS Actor's site

Reference ID	TIPS.UC.TC.11110

The interface on the TIPS Actor's site shall not lower the overall level of compliance of the Connectivity Solution with the TIPS security requirements, and shall not affect by any means the interface on the TIPS Platform site (i.e. shall not require any special handling on the TIPS site).

Security of interface at TIPS Actor's site

Reference ID	TIPS.UC.TC.11115

The NSP shall deliver to the TIPS Operator a detailed description of security aspects of the interface on the TIPS Actor's site in order to allow the check of the compliance with the TIPS security requirements.

The NSP shall ensure that the security measures implemented on the TIPS Actor interface is at the same level as the interface implemented at TIPS Platform interface.

Monitoring facilities

Reference ID	TIPS.UC.TC.11130

The NSP shall provide to the TIPS Operator the facilities necessary for continuously monitoring the compliance of the NSP’s technical operations with the requirements set out herein and in the "Operational manual", referred to in requirement TIPS.UC.TC.51020.

Time synchronisation

Reference ID	TIPS.UC.TC.11140

In order to make the data exchange time consistent the NSP shall synchronise the date-time of his devices either with the same date-time source adopted by the TIPS Platform or using a Stratum 1 time source, approved by the TIPS Operator. The synchronisation interval shall be at least every one minute.

The official time of TIPS system will be the ECB time, i.e. the local time at the seat of the ECB.

NSP shall provide time information using Coordinated Universal Time (UTC) format.

2. Network Connectivity

2.1. Physical Connectivity Services

The TIPS Actor will request the NSP to offer a single logical service which can be basically seen as two different Wide Area Networks (WAN): the first between the TIPS Sites and the NSP's sites and the second between NSP's sites and TIPS Actor's sites.

The TIPS Actor will request the NSP to offer a single logical service, which is provided as a link to a NSP managed Wide Area Network where also all the TIPS Actor sites are connected.

2.2. Interface to the TIPS Platform (between TIPS and NSP)

TIPS has two active Sites which are hosted in Region 1 in Rome, Italy. Two additional sites hosted in Region 2 in Frankfurt am Main, Germany could be implemented at a later stage, if deemed necessary by the Eurosystem (together the "TIPS Sites"). The NSP shall connect all active TIPS sites to its Network and provide the number of WAN links required to connect such TIPS Sites to its sites. The following requirements describe what each of the above links has to match.

Requirements are classified by layer in the classification of the ISO Open System Interconnection model (OSI). Layer 1 and 2 requirements apply link-to-link, i.e. between the two WAN link endpoints. All upper requirements (layer 3 to 7) apply end-to-end, i.e. between two service demarcation lines.

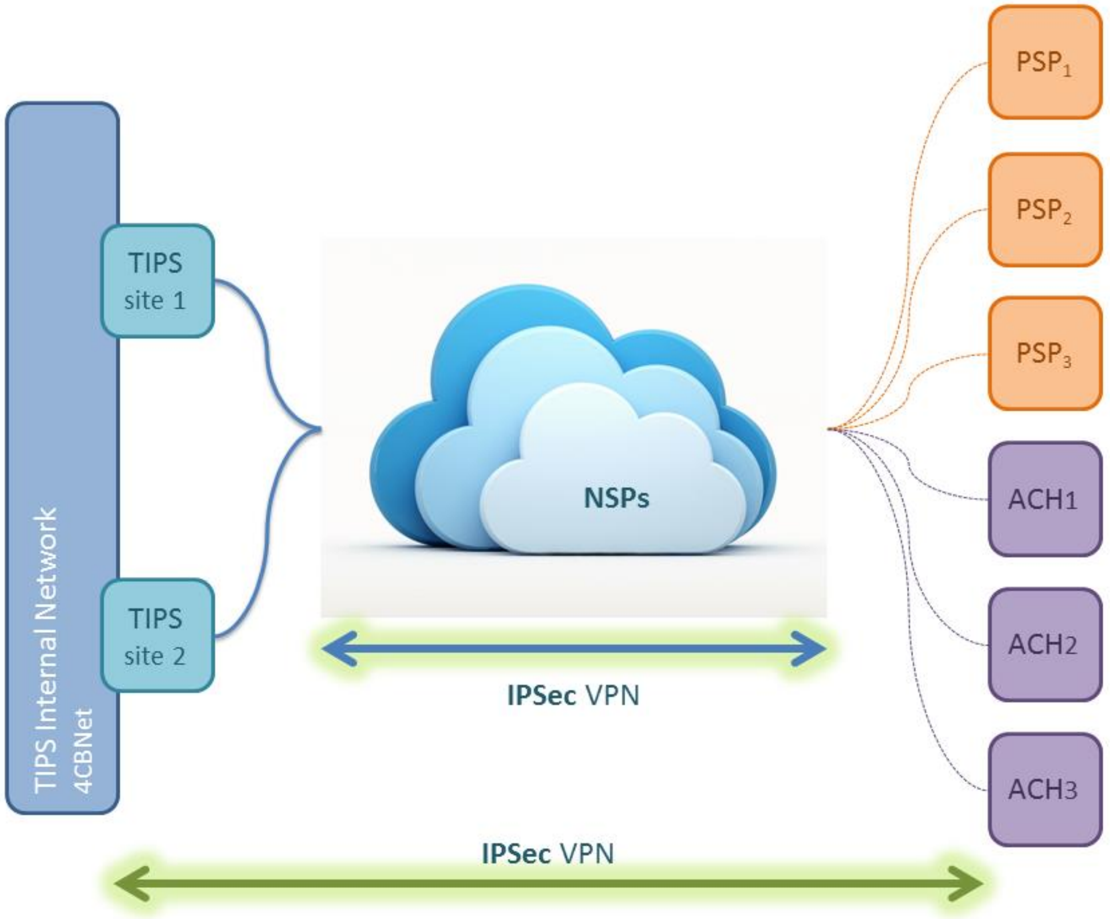


Figure 2 – Links between NSP and TIPS Platform sites

The simplified picture above describes the logical connections provided by NSPs, assuming two network services providers are delivering connectivity services to the TIPS Platform and the TIPS actor (as previously stated, more than two providers are allowed)

Service requirements - **Demarcation line between the NSP and TIPS**

Reference ID	TIPS.UC.TC.20100

The NSP shall deliver at all the TIPS sites one or more network devices (for example DWDM + router + VPN device terminations or DWDM + VPN device terminations), which present an Ethernet interface to the TIPS Platform. The NSP delivers this interface in a patch panel defining the demarcation line between NSP and TIPS.

Service requirements - **Each site is able to work autonomously**

Reference ID	TIPS.UC.TC.20102

The NSP has to ensure that the link bandwidth to each single TIPS site is able to handle the whole traffic. In the case of a site failure within a region the link to the remaining TIPS site shall handle the whole traffic.

Service requirements - **Monitoring**

Reference ID	TIPS.UC.TC. 20105

The proposed infrastructure shall be monitored and maintained by NSP.

Layer 1 requirement - **TIPS sites served by WAN links**

Reference ID	TIPS.UC.TC.20107

All the TIPS Sites are served by the WAN links of the NSP. The NSP shall insure that all sites which it uses to fulfil the overall Service Availability requirements are connected to all TIPS Sites.

The links between NSP PoPs (Point of Presence) and each TIPS Site shall be provided with redundant and direct links with physical diversification. For example, each NSP device installed into a PoP has one or more local links to TIPS Site A and one or more local links to TIPS Site B.

A direct link shall be an optical link deployed with dark fiber or DWDM without any Layer2 and/or Layer3 equipment inserted into the path.

NSP shall specify where each regional PoP is located.

Layer 1 requirement - **Link bandwidth**

Reference ID	TIPS.UC.TC.20108

Each link is initially delivered with a minimum bandwidth of 1Gbps. It is possible to reuse existing interfaces (if any).

Layer 1 requirement - **Link bandwidth scalability**

Reference ID	TIPS.UC.TC.20110

It is possible to upgrade link bandwidth from 1Gbps to 10Gbps; ie. the NSP shall be able to upgrade bandwidth from 1Gbps to 10Gbps each link between TIPS Site and NSP PoPs according with requirement TIPS.UC.TC.20100. "Link aggregation" of multiple links is not acceptable, in order to avoid during a fault event of some links a bandwidth lower than the full available bandwidth.

Layer 1 requirement – **On demand bandwidth**

Reference ID	TIPS.UC.TC.20112

TIPS Platform can dynamically scale bandwidth up or down - based either on the different times of the year (Black Friday, Christmas, etc.) or the expected usage of the TIPS Platform itself – in discrete increases/decreases of 100Mbps. For example, if at time t0 NSP connectivity is delivered to the TIPS Platform via a 1 Gbps interface sized at 500Mbps of available bandwidth, then at time t1 the TIPS Platform can either request an increase up to 700Mbps of available bandwidth or a decrease down to 200Mbps of available bandwidth.

NSPs has to deliver to the TIPS Platform an internet portal where the on demand bandwidth can be requested/released, this flexible bandwidth provisioning is delivered to the network within 30 minutes' time from the request.

Layer 1 requirement - **Link latency**

Reference ID	TIPS.UC.TC.20115

Each link has a one way delay of maximum 40 msec. Each link for the connection between the TIPS Sites and the Actor can be separated in two physical connections: the first one between the Actor site and NSP site and the second one between NSP site and TIPS Sites.

Layer 1 requirement – **Link recovery time**

Reference ID	TIPS.UC.TC.20120

Any link is able to recover a single failure within 50 msec.

Layer 1 requirement - **Link Bit Error Rate (BER).**

Reference ID	TIPS.UC.TC.20125

Each link has a Bit Error Rate (BER) less or equal to 10^{-14}.

Layer 1 requirement - **Link port specification (1Gbps Ethernet local interface)**

Reference ID	TIPS.UC.TC.20135

The NSP delivers to TIPS the connectivity service via network equipment having 1 Gigabit Ethernet ports.

Layer 1 requirement - **Link port scalability (10Gbps Ethernet local interface)**

Reference ID	TIPS.UC.TC. 20137

It is possible to deliver connectivity service via network equipment having 10 Gigabit Ethernet ports. The interface at the TIPS Platform will be upgraded accordingly.

Layer 1 requirement - **Path diversification**

Reference ID	TIPS.UC.TC.20140

Paths from the TIPS site to local NSP POPs are served by local loops. Each local loop has a diversified path from the site to the POP. Paths are also diversified from the POP to backbone and throughout the whole path across the backbone itself.

Layer 1 requirement - **Links responsibility**

Reference ID	TIPS.UC.TC.20145

The NSP shall maintain all links and network equipment between all the TIPS Sites and the NSP's sites. Thereby the NSP has to guarantee the full path diversification end-to-end, by knowing and maintaining all physical paths.

Layer 2 requirement - **Layer 2 connectivity at continental distances**

Reference ID	TIPS.UC.TC.20150

Links are able to transport layer 2 protocols end-to-end. A multicast or a broadcast transmitted on one end of the link is received on the other end of the link.

Layer 3 requirement - **IPv4**

Reference ID	TIPS.UC.TC.20155

Internet Protocol (IP) version 4 (IPv4) protocol is used between the TIPS Platform and the TIPS Actor.

Layer 3 requirement - **IP addressing schema**

Reference ID	TIPS.UC.TC.20160

The NSP has to use an IP address range which is "public" in terms of RFC1918. Address Allocation for Private Internets, i.e. 10.0.0.0 - 10.255.255.255 (10/8 prefix), 172.16.0.0 - 172.31.255.255 (172.16/12 prefix), 192.168.0.0 - 192.168.255.255 (192.168/16 prefix) are not accepted.

Layer 3 requirement - **Confidentiality and integrity of data in transit across the public soil**

Reference ID	TIPS.UC.TC.20165

The NSP takes appropriate measures and installs sufficient networking facilities to protect all data in transit between TIPS Sites and the NSP's sites and between the NSP sites and the TIPS Actor's sites. An example of an "appropriate measure" is an IPSec VPN tunnel: IPSec VPN Tunnels starts in TIPS Actor's site and ends in TIPS Sites. All traffic must be encrypted and authenticated.

Only authenticated parties shall be able to access the TIPS Platform.

The links between the NSP and the TIPS Sites shall be closed to traffic from other sources or to other destinations than authenticated parties.

Layer 3 requirement – **Static Routing**

Reference ID	TIPS.UC.TC.20175

Between NSP and TIPS Platform only static routes will be used; no dynamic routing protocols.

Layer 4 requirement - **Load balancing among the two NSP links within a region.**

Reference ID	TIPS.UC.TC.20180

For contingency reasons load balancing of TCP sessions across the two links within the same region shall be possible.

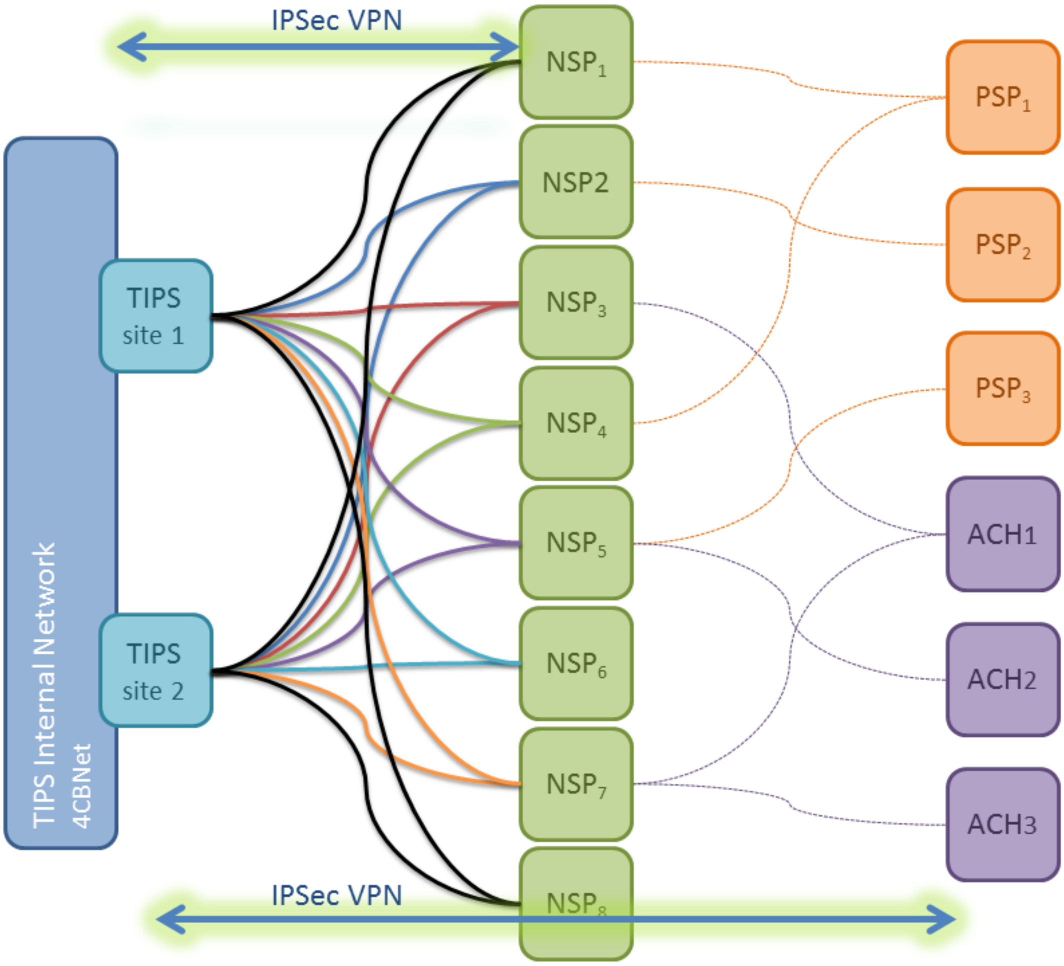
Layer 4 requirement – **TCP/UDP.**

Reference ID	TIPS.UC.TC.20181

End-to-end TCP and UDP communication shall be possible between TIPS and the TIPS Actor.

3. Messaging services

This chapter details the requirements for NSP to comply with the TIPS Platform in order to manage the “application to application” (A2A) and “user to application” (U2A) data flows.



The TIPS Platform can be accessed by the TIPS Actor in A2A mode and U2A mode.

In the A2A mode, two categories of business data will be exchanged:

- "message" - a "message" is a data structure containing a financial instruction or information based on the XML format (ISO20022 standard)
- "file" - a "file" is a data structure containing one or more financial information, either for statistical or accounting or reporting purposes, based on different formats (e.g. flat text, ISO20022 standard, etc).

For the A2A mode, the TIPS Platform communicates with the TIPS Actor with the "instant" transfer mode, where the primary objective is the lowest possible latency in the transfer of the message. The "instant" transfer mode:

- requires that both parties, the sender and the receiver, are available at the same time to exchange the message;
- adopts the "at most once" principle;
- does not envisage any message categorization/prioritization.

Therefore, in the case of an unavailability of the receiver or error in transferring the message, no retry mechanism is foreseen.

For "instant" transfer, data will be exchanged only in "push" mode. The "push" mode refers to the originator of a message pushing it to the final receiver.

For the A2A mode for files, the TIPS Platform communicates with the TIPS Actors with the "store and forward" transfer mode, which enables a sender to transmit files even when a receiver is unavailable. In the case of a temporary unavailability of the receiver, the NSP stores files and delivers them as soon as the receiver becomes available again.

A2A services should be provided by means of decoupling components, i.e. Network Gateways, allowing data exchange without any direct connections between TIPS Actor's application and the TIPS Platform.

In the context of the U2A specification, the TIPS Actor will access the TIPS application via a browser using the HTTPs protocol. Although it is expected that the U2A will be utilised mainly to inquire TIPS data, it can be used also to submit updates.

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

Reference ID	TIPS.UC.TC.30010

The NSP shall offer the data transport services in the A2A and the U2A modes to the TIPS Actor and to the TIPS Platform.

The "application to application" (A2A) mode

Reference ID	TIPS.UC.TC. 30015

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

The "user to application" (U2A) mode

Reference ID	TIPS.UC.TC.30220

The NSP shall support the U2A connectivity enabling HTTPs traffic between the TIPS Actor and the TIPS Platform.

3.1. A2A requirements for "instant" transfer of messages

This paragraph describes the flow performed in the A2A interactions, in the scenario of a TIPS Actor sending an "instant" message to the TIPS Platform:

At TIPS Actor's site:

- The Application of the TIPS Actor sends an "instant" message for the TIPS Platform to its Network Gateway;
- The Network Gateway of the TIPS Actor performs a check against the NSP whether the TIPS Actor is authorised to exchange the requested traffic: the check will be based on a "closed group of users" defined at NSP level;
- If the check is successful, the Network Gateway of the TIPS Actor signs the message using the TIPS Actor digital certificate and forwards the "instant" message and related signature information to the Network Gateway of the TIPS Platform;

At the TIPS Site:

- the Network Gateway of the TIPS Platform receives the signed data and validates the certificate and the signature, thus performing the identification and authentication of the sender TIPS Actor;
- if the signature is verified, the Network Gateway of the TIPS Platform forwards the "instant" message and related signature information to the TIPS Platform;
- in case of successful delivery of the message, the Network Gateway of the TIPS Platform sends back a positive acknowledgment to the Network Gateway of the sender TIPS Actor;
- the TIPS Platform receives the signed data and stores it as an NRO evidence;
- the TIPS Application sends the business response (positive or negative) for every message received.

A2A NSP Interface

Reference ID	TIPS.UC.TC. 30230

The NSP shall provide the A2A Interface by means of a Network Gateway supporting the network operations required for the solution, including:

- Identification, authentication and authorization of the NSP participant (TIPS Actor or TIPS Platform)
- Scalability
- High availability
- Load balancing
- Transparent routing
- Flood control

A2A NSP addressing model

Reference ID	TIPS.UC.TC. 30231

The NSP shall support the message 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. TIPS Test #1, TIPS Test #2, TIPS Prod)
- Type of Message Flow, to identify different message typologies (e.g. Message2)

A2A NSP Interface High availability and resiliency

Reference ID	TIPS.UC.TC. 30232

The NSP shall provide the Network Gateways (and network equipment) in high availability, to support the 24x7x365 requirement of the "instant" message exchange.

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

A2A NSP Interface scalability

Reference ID	TIPS.UC.TC. 30233

The NSP shall support horizontal scalability of the Network Gateway, to enable the addition of Network Gateways in case of additional traffic loads requirement. New Network Gateways deployment shall not impact the availability of the service in the involved infrastructure.

A2A NSP Load balancing

Reference ID	TIPS.UC.TC. 30234

The NSP shall provide load-balancing features, supporting the traffic exchange spreading over multiple Network Gateways, with no requirement for any specific application logic to be implemented in the TIPS Platform.

A2A NSP routing independency

Reference ID	TIPS.UC.TC. 30235

The NSP shall provide a location independent routing. The TIPS platform is unaware of the physical location of the TIPS Actor and vice versa. In case the TIPS Actor configuration changes, for example due to disaster recovery procedures, no changes shall be required at the TIPS Platform.

A2A NSP flooding control

Reference ID	TIPS.UC.TC. 30236

The NSP shall implement an anti-flooding (throttling) mechanism to ensure that no single TIPS Actor can affect the availability of the solution at TIPS Platform or at another TIPS Actor.

A2A message size limitations

Reference ID	TIPS.UC.TC. 30237

The NSP shall support the exchange of messages with maximum length set to 10KiB (1 KiB = 1.024 bytes). The maximum length refers to the business content of the transferred message, without taking into account the communication protocol overheads.

A2A message size management

Reference ID	TIPS.UC.TC. 30238

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

The NSP shall reject 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.").

A2A message delivery approach

Reference ID	TIPS.UC.TC. 30239

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

A2A message delivery time

Reference ID	TIPS.UC.TC. 30240

The NSP shall deliver an "instant" message from the Sender to the Receiver in maximum 250 ms. The acknowledgment of the delivery sent back to the sender is not included in the delivery time.

The NSP shall commit on a Service Level of 95% of delivery time within the required delivery time.

A2A messages independency

Reference ID	TIPS.UC.TC. 30241

The NSP shall 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.

A2A user authentication

Reference ID	TIPS.UC.TC.30245

The NSP shall provide to the TIPS Actor the certificates required 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. NSP must keep the cryptographic protocols and key length deployment in line with up-to-date security recommendation (e.g. NIST 800-57) .

A2A closed group of user authorization

Reference ID	TIPS.UC.TC.30250

The NSP shall check the authorization of the TIPS Actors to access the TIPS Platform based on enforced rules at NSP level, supporting segregation of traffic flows between participants.

3.2. A2A IBM MQ requirements

To provide A2A services to the TIPS Platform, the NSP shall connect to the IBM Messaging Queuing (formerly known as WebSphere MQ) infrastructure of TIPS Platform. The NSP shall comply with the following requirements.

WMQ product version

Reference ID	TIPS.UC.TC.30300

The NSP shall connect to the TIPS sites using the IBM Message Queuing ("WMQ") transport protocol. The NSP shall use a WMQ product version compliant with the WMQ version adopted by TIPS Platform.

WMQ channels

Reference ID	TIPS.UC.TC.30305

The NSP shall support the use of multiple channels to connect to the TIPS WMQ infrastructure.

WMQ channels TLS connection

Reference ID	TIPS.UC.TC.30310

WMQ channel connections shall be secured with usage of TLS protocol and digital certificates exchanged by TIPS Platform and NSP. Digital certificates for WMQ channels TLS connection will be provided by the TIPS Operator to the NSP.

WMQ channels type

Reference ID	TIPS.UC.TC.30315

The NSP shall connect to the TIPS WMQ infrastructure using client-server mode (channels SVRCONN located at the TIPS sites). The name of the channels should follow the TIPS naming convention.

WMQ message queues

Reference ID	TIPS.UC.TC.30320

The following type of queues shall be supported:

- *command queues* to control Network Gateway (e.g. to establish communication sessions);
- *traffic queues* to exchange messages within established communication session.

A set of queues shall be set up for each specific flow in the transport protocol between TIPS Platform and the NSP.

The following flows are envisaged:

Queue type	Flow	Flow direction		Description
Command	Request	TIPS Platform	=> NSP's NG	command request
	Response	NSP's NG	=> TIPS Platform	outcome of the command request
	Indication	NSP's NG	=> TIPS Platform	unsolicited notification
Traffic	Send	TIPS Platform	=> NSP's NG	request to send a message to the receiver
	Result	NSP's NG	=> TIPS Platform	outcomes of the sending of a message
	Receive	NSP's NG	=> TIPS Platform	delivery of a message to the receiver

Multiple *command queues* shall be supported for each flow (Request, Response, Indication).

Multiple *traffic queues* shall be supported for each flow (Send, Result, Receive).

The name of queues shall follow the TIPS naming convention.

WMQ messages management - load balancing

Reference ID	TIPS.UC.TC.30325

The NSP shall manage the load balancing across WMQ traffic queues for outgoing messages (sent by the TIPS Platform) and incoming messages (sent by TIPS Actors). For outgoing messages the load balancing mechanism shall be based on traffic queue sharing (i.e. the same traffic queue should be read by multiple Network Gateways). For incoming messages the load balancing mechanism shall be based on a random choice (e.g. round robin mechanism) across the queues dedicated to each kind of flow.

WMQ message description section – CCSID

Reference ID	TIPS.UC.TC.30330

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

WMQ additional headers

Reference ID	TIPS.UC.TC.30335

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

WMQ message structure

Reference ID	TIPS.UC.TC.30340

The NSP shall manage 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 following WMQ message standard MQMD header fields shall be managed by the NSP and the TIPS Platform when a message is exchanged:

- MQMD.MsgType:
- MQMD.Format:
- MQMD.MsgId:
- MQMD.CorrelationId:
- MQMD.CodeCharacterSetId:
- MQMD.Expiry:

In the "Message Text" part there will be:

- eventual additional MQ header (e.g. RFH2)
- the headers of the primitives of the A2A traffic protocol
- the message payload

3.3. A2A message service

A2A traffic primitives management

Reference ID	TIPS.UC.TC.30345

The NSP shall manage the following primitives to exchange messages with the TIPS Platform:

- SendRequest: the TIPS Platform uses this primitive to send a message to the TIPS Actor
- Result: the NSP's Network Gateway uses this primitive to notify a positive/negative outcome of a SendRequest operation to the TIPS Platform
- ReceiveIndication: the NSP's Network Gateway uses this primitive to deliver a message sent from the TIPS Actor to the TIPS Platform

All these primitives are composed by:

- "Local Security" header: this header provides to the NSP Network Gateway all the security information to identify the TIPS Platform (as local message partner) and authenticate the data exchange
- "Network Security" header: this header provides to the NSP Network Gateway all the security information to identify and authenticate the TIPS Platform (as network participant) and authorize the data exchange
- "Exchange" header: this header provides to the NSP Network Gateway the information needed to route the instant message to the correct destination and to identify and describe the "instant" message type.
- "Payload"

Message end to end information transport

Reference ID	TIPS.UC.TC.30350

The NSP shall allow the exchange of end-to-end information from the sender application to the receiver application together with the "instant" message (i.e. from the TIPS Actor to the TIPS Platform and vice versa). The following end-to-end information is envisaged:

- the identifier of the "instant" message
- a timestamp of the creation/submission of the "instant" message
- a Possible Duplicate Message indication
- additional accompanying data

Message unique identification

Reference ID	TIPS.UC.TC.30355

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

3.3.1. A2A traffic protocol description

A2A Protocol description

Reference ID	TIPS.UC.TC.30360

The NSP shall manage the exchange of instant messages with TIPS in accordance with the following workflows.

All messages must be exchanged in "instant" mode with at most once delivery, no retries and certainty of the outcome of the delivery, either positive or negative. In case of doubt on the outcome of the delivery, no notification is needed.

The NSP shall manage the following message patterns:

- Instant message outgoing
- Instant message incoming

In message incoming pattern, the following primitive is foreseen:

- a "ReceiveIndication" primitive from the NSP's Network Gateway to the TIPS platform to deliver an "instant" message sent from the TIPS Actor

In message outgoing pattern, the following primitives are foreseen:

- a "SendRequest" primitive from the TIPS platform to NSP's Network Gateway to send an "instant" message to the TIPS Actor
- a "Notify" primitive from the NSP's Network Gateway to the TIPS Platform to confirm the reception of the message by the NSP's Network Gateway.
- a "Technical Acknowledgement" primitive from the NSP's Network Gateway to the TIPS Platform to confirm the delivery of the message to the TIPS Actor.

Notify management

Reference ID	TIPS.UC.TC.30365

A Notify primitive is provided for each request to send a message between the TIPS Platform and the NSP Network Gateway to notify the outcome of the initial processing performed by the Network Gateway: local security check, addressing resolution, etc. In case of negative result, a description of the error detected is returned. In case of positive result, the unique "network" message identifier and the signature of the message are sent back. In any case, end-to-end data are sent back to the sender for matching purposes.

Technical Acknowledgement management

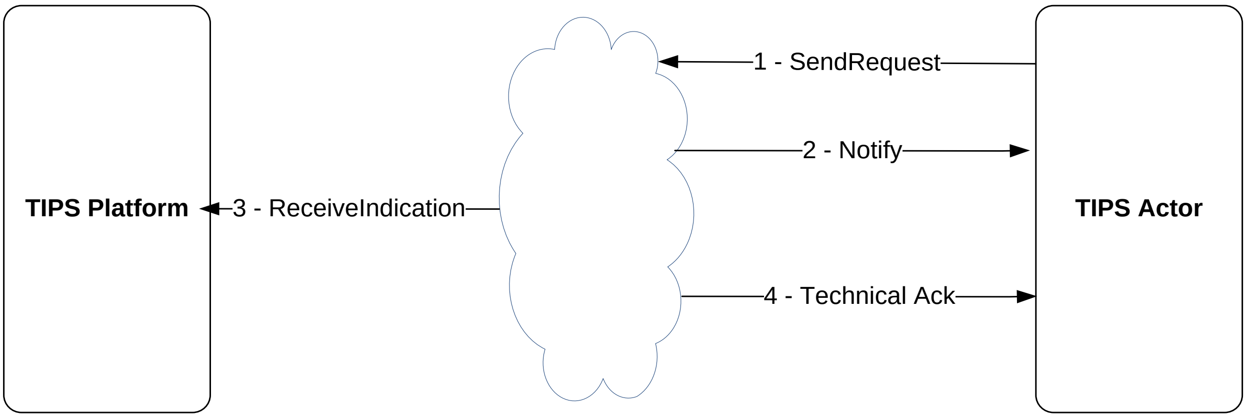
Reference ID	TIPS.UC.TC.30370

A Technical Ack primitive is provided for each request to send a message between the TIPS Platform and the NSP Network Gateway to notify the completion of the exchange. In case of negative result, a description of the error detected is returned. In case of positive result, the unique "network" message identifier, a timestamp of the delivery of the message to the TIPS Actor and the signature of the message are sent back. In any case, end-to-end data are sent back to the sender for matching purposes.

Incoming flow management

Reference ID	TIPS.UC.TC.30375

The NSP shall manage the instant incoming message pattern as detailed in the following picture.



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

1) The TIPS Actor sends the "SendRequest" to its Network Gateway
2) The Network Gateway of the TIPS Actor receives the message and starts processing it. In case of positive processing, the unique "network" message identifier is generated and the message is signed. Then, the Network Gateway of the TIPS Actor attempts the delivery of the message to the Network Gateway of the TIPS Platform.

   In case of error, the Network Gateway of the TIPS Actor sends back to the TIPS Actor a negative Notify and the flow is completed. If the delivery to the Network Gateway of the TIPS Platform is successful, the Network Gateway of the TIPS Actor sends back to TIPS Actor a positive Notify.
3) The Network Gateway of the TIPS Platform receives the message from the Network Gateway of the sender TIPS Actor and performs the validation of the received signature. In case of positive processing, the Network Gateway of the TIPS Platform sends a "ReceiveIndication" primitive to the TIPS Platform. The Network Gateway of the TIPS Platform notifies the Network Gateway of the sender TIPS Actor about the outcome of its processing.

   The TIPS Platform receives the message and performs the validation check of the "Local Security" header, "Network Security" header and "Exchange" header.

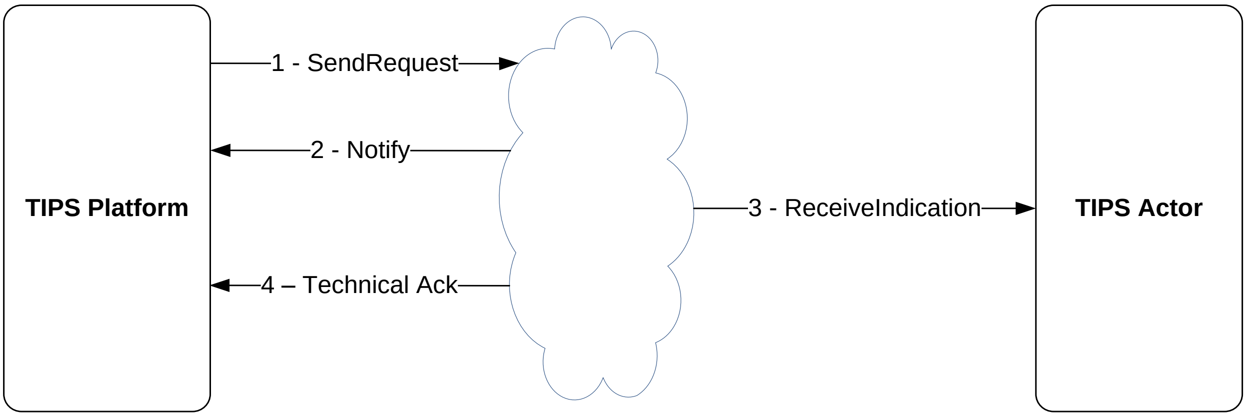
   The message is passed to the TIPS application
4) The Network Gateway of the sender TIPS Actor receives the outcome of the processing from the Network Gateway of the TIPS Platform and sends back a positive/negative Technical Ack to the TIPS Actor depending on:
   - a failure in the validation of the received message performed by the Network Gateway of TIPS Platform

- the outcome (positive or negative) of the delivery of the message from the Network Gateway of the TIPS Platform to the WMQ infrastructure of the TIPS Platform

Outgoing flow management

Reference ID	TIPS.UC.TC.30380

The NSP shall manage the instant outgoing message pattern as detailed in the following picture.



When the TIPS Platform needs to send a message to TIPS Actor it will go through the following steps:

1) The TIPS Platform sends a "SendRequest" primitive to its Network Gateway
2) The Network Gateway of the TIPS Platform receives the message and performs the validation check of the "Local Security" header, "Network Security" header and "Exchange" header. In case of positive validation, the unique "network" message identifier is generated and the message is signed.

   In case of error, the Network Gateway of the TIPS Platform sends back to TIPS Platform a negative Notify and the flow is completed. In case of positive processing, the Network Gateway of the TIPS Platform sends the message to the Network Gateway of the TIPS Actor resulted from the routing mechanism. In case of error in the transmission to the receiver Network Gateway (for instance the receiver is not connected), then the Network Gateway of the TIPS Platform sends back to the TIPS Platform a negative Notify and the flow is completed. If the delivery to the Network Gateway of the TIPS Actor is successful, the Network Gateway of the TIPS Platform sends back to TIPS Platform a positive Notify.
3) The Network Gateway of the TIPS Actor receives the message from the Network Gateway of the TIPS Platform and performs the validation of the received signature.

   In case of positive processing, the Network Gateway of the TIPS Actor sends a "ReceiveIndication" primitive to the TIPS Actor. The Network Gateway of the TIPS Actor notifies the Network Gateway of the TIPS Platform about the outcome of its processing.

4) The Network Gateway of the sender TIPS Platform receives the outcome of the processing from the Network Gateway of the TIPS Actor and sends back a positive/negative Technical Ack to the TIPS Platform depending on:
   - a failure in the validation of the received message performed by the Network Gateway of TIPS Actor
   - the outcome (positive or negative) of the delivery of the message from the Network Gateway of the TIPS Actor to the TIPS Actor

3.3.2. A2A traffic control functionalities

Start/End Local Authentication

Reference ID	TIPS.UC.TC.30385

TIPS Platform shall be allowed to start/end the Local Authentication in order to identify itself (as local message partner) and authenticate the traffic exchange and to avoid non-authenticated traffic exchange with NSP Network Gateway.

Start/End Network Authentication

Reference ID	TIPS.UC.TC.30390

TIPS Platform shall be allowed to start/end the Network Authentication in order to identify itself (as network participant) and authorize the traffic exchange and to avoid non-authorized traffic exchange with the NSP network.

Enable/Disable traffic

Reference ID	TIPS.UC.TC.30395

TIPS Platform shall be allowed to enable/disable the exchanging of traffic in order to avoid the reception of traffic (for example, during the maintenance activities or for particular contingency reason).

Tool for A2A traffic control functionalities

Reference ID	TIPS.UC.TC.30400

The TIPS Operator is the service provider of the TIPS service to the TIPS community. To properly fulfil this role, the following TIPS Platform specific requirements are set.

In order to reduce the impact of managing the functionalities over multiples NSPs the NSP shall provide to TIPS Platform an "easy-to-use" interface implementing the A2A traffic control functionalities.

The TIPS Platform will implement directly only the sending/receiving traffic exchange primitives. All the security aspects must be managed through this "easy-to-use" interface.

NSP shall provide a description of the "easy-to-use" interface, to be approved by the TIPS Operator.

This requirement applies to the TIPS Platform only.

3.3.3. A2A requirements for "store-and-forward" transfer of files

Based on the different business requirements between "instant" messages and "store-and-forward" file transfer, it is envisaged that NSP could provide a different solution for this data exchange.

Store and forward file transfer

Reference ID	TIPS.UC.TC.30405

NSP shall provide a description of the solution for store-and-forward file transfer, to be approved by TIPS Operator.

3.4. U2A requirements

User to Application (U2A) is delivered through a HTTPs connection.

This paragraph describes the flow performed in the U2A interactions:

At end user site:

- The NSP performs a check whether the end user is authorised to access the requested URL: the check will be based on a "closed group of users" at network level principle;
- If the check is successful, the end user is able to establish an HTTPs session with the TIPS Platform
- The TIPS Platform will perform the identification and authentication of the end user based on client certificate provided in the HTTPs request;

At the TIPS Site the TIPS Platform sends a (business) acknowledgement via HTTPs session.

U2A user authentication

Reference ID	TIPS.UC.TC.30245

The NSP shall distribute to the end users the credential to access the interface to the TIPS Platform. The NSP shall deliver the certificates for U2A to the end users (with a smart-card or a USB token).

U2A closed group of user authorisation

Reference ID	TIPS.UC.TC.30250

The NSP shall check the authorisation of the end users to access the TIPS Platform based on the Network level. The IP of the end user access point is checked by the NSP to authorise the access to the requested

TIPS URL. The end user is requested to open a VPN connection (performing identification and authentication) with the NSP to be able to establish a HTTPs session with the TIPS Platform.

3.5. TIPS Actor Emulator

TIPS Actor Emulator Access Point

Reference ID	TIPS.UC.TC.30255

The NSP shall provide to the TIPS Platform only a "TIPS Actor Emulator access point" to perform testing/monitoring (continuous and/or specific after change implementation) in order to ensure proper operational behaviour of the connectivity infrastructure of the TIPS Platform.

The TIPS Actor Emulator access point shall include:

- a connectivity infrastructure at one of the TIPS sites. The connectivity infrastructure shall be of the same type provided to the TIPS Actor
- 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 TIPS Actor

The TIPS Operator should be able to use the TIPS Actor Emulator software without the need of any prior notice to the NSP.

4. Security services

Security is of paramount importance for TIPS, as very sensitive information will be exchanged between the TIPS Platform and its users. The NSP plays a fundamental role in maintaining high protection levels of such information. The following paragraphs describe the security requirements of the security services to be provided by the NSP in order to guarantee:

- a high-quality managed security service;
- the integrity and confidentiality of the information exchanged;
- the implementation of the need-to-do principle in access control mechanisms;
- the non-repudiation of the messages;
- the auditable of the security components and processes;
- the monitoring of the security components and processes;
- the availability of PKI services, such as the issuing of the end user certificates, the CRL/OCSP interface and the interface to the TIPS Identity Manager.

Technology and organisational processes

Reference ID	TIPS.UC.TC.41010

The NSP shall offer state-of-the-art technology and organisational processes to support in an effective and efficient way the security of the TIPS infrastructure and information.

In this context, the NSP shall comply with the ISO27001:2013 standard.

Security Platform as a service

Reference ID	TIPS.UC.TC.41020

The NSP shall deliver the necessary technical infrastructure and software components to the TIPS Actor and to the TIPS Platform which allows the management of the TIPS security. The NSP shall ensure compliance with the TIPS security requirements set out in following sections.

Operational readiness

Reference ID	TIPS.UC.TC.41030

The NSP guarantees the operational readiness of all relevant security devices and components of its security platform according to the relevant service levels.

Encryption of all incoming and outgoing traffic

Reference ID	TIPS.UC.TC.42040

The NSP shall ensure confidentiality of all TIPS traffic over its Network.

The NSP shall ensure that its staff and other parties cannot access or copy data exchanged over its network except when subject to access controls, secure logging and reporting to TIPS.

Segregation of data

Reference ID	TIPS.UC.TC.42050

The NSP shall ensure that the TIPS Actor can access only its own incoming and outgoing traffic. No other party (including the NSP and its subcontractors) shall be able to access data without such access being under access control, secure logging and reported to the TIPS Operator.

Digest algorithms

Reference ID	TIPS.UC.TC.43060

The TIPS Actor shall use only strong and not deprecated digest (hash) algorithms for its Solution.

SHA-256 is the minimum required algorithm for digest computation.

Integrity of traffic

Reference ID	TIPS.UC.TC.43070

The NSP shall not interfere with the integrity of all traffic exchanged between its TIPS Actor and the TIPS Platform.

Integrity of software components

Reference ID	TIPS.UC.TC.43090

The NSP shall ensure the integrity of its software components providing Connectivity Services and the security features for TIPS.

The NSP shall automatically detect every planned and unplanned (intentional and accidental) modification and alert the TIPS Operator without undue delay. The NSP shall ensure the protection against malicious codes.

Integrity of audit logs

Reference ID	TIPS.UC.TC.43100

The NSP shall ensure and control the integrity of all TIPS related audit logs.

Audit log

Reference ID	TIPS.UC.TC.46240

All network devices provided by the NSP shall use logging functionality. The NSP shall agree with the TIPS Operator which audit logs have to be stored on the TIPS storage devices and which may remain on the NSP's devices. NSP shall provide to the TIPS Operator the security policy applied to these audit logs. Analogous document shall be provided whenever the NSP changes the mentioned policy, within one month after such changes are implemented.

Audit logging

Reference ID	TIPS.UC.TC.46250

The NSP shall log each data session established between the TIPS Actor and the TIPS Platform.

The NSP shall securely log all network component changes, access attempts and security attacks/breaches on the network components.

Monitoring facilities

Reference ID	TIPS.UC.TC.47260

The NSP shall deliver to the TIPS Operator the necessary facilities to monitor NSP's network components which provide security features from an operational and a configuration point of view. In particular, the NSP shall deliver features to monitor the configuration of the security providing components.

The NSP shall implement mechanisms to monitor its infrastructure for security vulnerabilities, breaches and attacks and shall ensure quick updates of all devices whenever security patches are available. The NSP shall report immediately all issues to the TIPS Operator using collaboration tools (such as e-mail, instant messages, smartphones).

Automated alerts

Reference ID	TIPS.UC.TC.47270

The NSP shall install alerts which are automatically triggered in the event of a device failure, breach or attempted breach. The alerts shall be sent by the NSP immediately to the TIPS Operator, using SNMP protocol (version 3 required).

Change management

Reference ID	TIPS.UC.TC.47280

The NSP shall apply a strict change management procedure to its network components that provide security features for the TIPS Platform.

Network encryption failure

Reference ID	TIPS.UC.TC.47290

The NSP shall design and implement procedures determining Network encryption failures which might not be identified by TIPS. The NSP shall design and implement procedures resuming the encryption functionality in such circumstances. The NSP shall notify to the TIPS Operator these procedures and any subsequent change thereto, upon implementation.

Encryption algorithms

Reference ID	TIPS.UC.TC.48300

The NSP shall implement the AES encryption algorithm with a minimum length of 128 bit for symmetric encryption keys and 2048 bit for asymmetric encryption keys.

Encryption devices

Reference ID	TIPS.UC.TC.48310

The NSP shall install encryption devices in all TIPS Sites. The NSP shall install encryption devices in all TIPS Actor’s sites of interconnected with the TIPS Platform.

The encryption devices shall comply with security specifications stated herein.

Management of encryption devices

Reference ID	TIPS.UC.TC.48320

The NSP shall manage all its encryption devices relevant to the TIPS Actor under its own responsibility. In case of failure or disaster, the NSP shall have a possibility to manage these devices in a highly secure remote way.

Regarding the connection to the TIPS platform, the management of the keys shall not fall under the responsibility of the NSP. The TIPS Operator will be responsible for the key management.

The NSP shall enable secure and resilient management of all encryption devices from all the TIPS Sites. Management of these devices shall be possible from a secondary site in case of component failure or disaster at the main site.

Unique identification of users

Reference ID	TIPS.UC.TC.44120

The NSP shall identify the TIPS Actor and the TIPS Platform in a unique way. The NSP shall guarantee the identification via digital certificates.

A2A Identification

Reference ID	TIPS.UC.TC.485100

The NSP shall identify the TIPS Actor and the TIPS Platform every time they open a new session with the NSP's Network Gateway for A2A traffic. There is no end-to-end session. The NSP shall transfer to the receiver the identity of the sender. The NSP shall include this information in the network envelope provided to the receiver together with the message.

A2A Local Authentication

Reference ID	TIPS.UC.TC.485110

The NSP shall authenticate as local message partner the TIPS Actor and the TIPS Platform every time they open a new session with the NSP's Network Gateway for A2A traffic exchange. The NSP shall use appropriate mechanism for this purpose. An example of an "appropriate measure" is the use of HMAC algorithm. In case of use of HMAC, the symmetric key should be periodically renewed.

A2A Network Authentication

Reference ID	TIPS.UC.TC.485120

The NSP shall authenticate as network participant the TIPS Actor and the TIPS Platform every time they open a new session with the NSP's Network Gateway for A2A traffic exchange. The NSP shall base this mechanism on availability of digital keys stored in a Secure Store accessible by the NSP's Network Gateways for this purpose.

The NSP shall always check validity of digital certificate issued for keys used to authenticate the TIPS Actor and the TIPS Platform. The digital keys used for authentication purpose shall be used for digital signature.

A2A Non Repudiation support

Reference ID	TIPS.UC.TC.485125

The NSP shall manage the non-repudiation of emission on instant messages sent by a sender to a receiver.

The Network Gateway (or the back-office application) of the sender party shall sign on behalf of the network participant (either TIPS Platform or TIPS Actor) using the appropriate private key stored in the HSM and referred by a valid security context (established during the Network authentication phase).

The signature shall include at least the following information:

- relevant end-to-end information (identifier of the message, timestamp, etc) and the (digest of) message payload provided by the sending application
- relevant network related information (addressing, unique "network" message identifier, timestamp, etc) used/added by the Network Gateway

The signature data shall be delivered to the receiver together with the "instant" message. The Network Gateway of the receiver checks the validity of the certificate involved in signature and verifies the signature using the public key certificate of the signer.

The receiver should store signature related information, as well as all signed data, for non-repudiation purposes.

The NSP shall provide a non-repudiation support service to verify the signature of a message. The service can be requested by TIPS participants in order to help in case of dispute or claim.

The TIPS participant shall provide the signature and all signature-related information and the traffic data to be validated required by the NSP to perform again the signature verification. The NSP shall be able to retrieve the certificate and the certificate status at the time of the signature.

The non-repudiation service shall be available up to three months after the traffic exchange took place.

4.1. Closed groups of users ("CGU")

Logically segregated groups of users

Reference ID	TIPS.UC.TC.45210

The NSP shall allow creation and removal of logically segregated groups of TIPS Actors or end users. The NSP shall manage all groups. In particular, the NSP shall create and manage the groups of TIPS Actors or end users for the production environment and for the test & training environments, one group for each environment..

The subscription to a group of users, and any subsequent modification to such subscription, shall be arranged through an electronic workflow on the Internet. All the electronic forms shall be authorised by the relevant National Central Bank.

The activation date for the subscriptions shall be set at latest within two weeks following the form's approval by the TIPS Operator; the new subscription shall be scheduled and activated ensuring the availability of the service (e.g. adopting the "rolling update" approach).Upon request from the TIPS Operator, the NSP shall withdraw from the CGU a TIPS Actor or an end user within one hour.

Segregation of traffic

Reference ID	TIPS.UC.TC.45220

The NSP shall ensure segregation of data traffic between different groups of user. TIPS Actors belonging to different groups cannot exchange data with each other. In particular, the end users and TIPS Actors belonging to test & training groups shall not be able to send or receive messages from the production environment.

Physical and logical access control of the NSP's infrastructure

Reference ID	TIPS.UC.TC.45230

The NSP shall protect essential network components used for its Solution with physical and logical access controls. In particular, the NSP shall protect access to its administration interfaces.

The NSP shall adopt a "need to work" principle to allow access to its infrastructure components.

4.2. Key management

Key management is the process that manages the life cycle of all the digital keys used in the encryption devices, for the TIPS Actor authentication mechanisms (i.e. digital certificates), and in signing off the configuration of the software components. It involves the use of both symmetric and asymmetric algorithms and the setup of an infrastructure able to store digital keys (i.e. PKI). TIPS Actors should use keys and certificate provided by NSP.

Public Key Infrastructure

Reference ID	TIPS.UC.TC.48330

The NSP shall deliver a Public Key be Infrastructure ("PKI") that shall comply with X.509 version 3 standard for the digital certificates.

The provided infrastructure shall provide the following components:

- Certification Authority,
- Hardware Security Modules.

Certification Authority

Reference ID	TIPS.UC.TC.48340

The NSP shall deliver Certification Authority (CA) functions to the TIPS Actor and the TIPS Platform. The provided functions shall support the generation, management, storage, deployment and revocation of public key certificates. The NSP shall ensure that these functions work within the context of the Certificate Policy and function operationally in accordance with the Certificate Practices Statement.

Certificate Policy

Reference ID	TIPS.UC.TC.48350

The NSP shall deliver to the TIPS Operator the Certification Policy for the CA functions it will perform. A certificate policy shall focus on certificates and the NSP (CA) responsibilities regarding these certificates. It shall define certificate characteristics such as usage, enrolment, issuance and revocation procedures, as well as liability issues.

Certificate Practices Statement

Reference ID	TIPS.UC.TC.48360

The NSP shall deliver to the TIPS Operator the Certificate Practices Statement for the CA functions it will perform. The Certificate Practice Statement shall concentrate on the operational procedures related to the certification authority functions.

Hardware Security Modules

Reference ID	TIPS.UC.TC.48370

The NSP shall provide tamper-proof HSM for storing all digital keys used for A2A. The HSM(s) shall be compliant at minimum with FIPS 140-2 Level 3 or Common Criteria EAL 4+ and they will be installed in the TIPS Sites.

Smart Cards or USB token

Reference ID	TIPS.UC.TC.48371

The smart cards or USB token, provided by the NSP, shall comply at least with FIPS 140 for the security level 3 or Common Criteria EAL4+.

Smart Card Readers

Reference ID	TIPS.UC.TC.48372

The smart card readers, provided by the NSP, shall 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.

Public Key Certificates

Reference ID	TIPS.UC.TC.48380

The NSP shall deliver to the TIPS Operator a description of the format for the public key certificates it is going to use. The certificates format shall be based on the X.509 standard and shall include detail semantic profile of its public key certificates.

Certificate Extensions

Reference ID	TIPS.UC.TC.48390

The NSP shall deliver to the TIPS Operator a description of the certificates extensions it is going to use, if any.

Digital signature certificates must have the Non-Repudiation bit set in the "Key usage" extension.

Certificate revocation list

Reference ID	TIPS.UC.TC.48395

The NSP shall provide to the TIPS Operator the CRL in the HTTP, LDAP and OCSP formats. The TIPS Platform will choose the protocol the most appropriate for the intended performance.

Digital Signature management

Reference ID	TIPS.UC.TC.48396

The sender of a message will use the certificate provided to him by the NSP to digitally sign the message, through the relevant services provided by the NSP. The receiver of the message shall be able to check the validity of the signature by using the associated certificate (public key) of the sender, through the relevant services provided by the NSP.

Responsibilities for management of cryptographic keys

Reference ID	TIPS.UC.TC.48398

The management of cryptographic keys dedicated to the TIPS Platform shall remain under the sole responsibility of the TIPS Operator, which shall be the only institution having key management duties and physical access to its key storage devices (HSM) delivered by the NSP. The NSP may have logical access to the key storage devices only to perform administrative and operational tasks on the device (monitoring, initialization, software updates, etc.). NSP may have physical access to the key storage devices only to perform hardware replacement.

Administration of symmetric and asymmetric cryptographic keys

Reference ID	TIPS.UC.TC.48410

The NSP shall ensure the following administration functions for symmetric and asymmetric cryptographic keys.

- *Generation*: The NSP shall ensure secure generation of keys/key pairs.
- *Distribution*: The NSP shall ensure secure electronic distribution of keys/public keys, i.e. encrypted.
- *Renewal*: The NSP shall ensure the renewal of the keys. However, only the TIPS Operator shall define the frequency of exchange and the minimum length of keys used.
- *Renewal:* The NSP shall ensure that keys renewal does not interfere with its services.
- *Storage*: The NSP shall ensure that keys/private keys are stored securely.
- *Revocation*: The NSP shall ensure immediate revocation of the key/public key certificate if it is considered compromised.

Certificate independence

Reference ID	TIPS.UC.TC.48420

The certificates issued by the PKI shall be distributed and used without any constraint or reference about the physical location which will host the TIPS production environment.

Security framework (adopted or proposed)

Reference ID	TIPS.UC.TC.49430

The NSP shall provide to the TIPS Operator the security framework adopted for as the security assessment (security threats & risk analysis, improvement guidelines), security strategy (adaptive security process), deployment, management, audit (external and internal health check analysis).

An assessment on the security of the NSP services can be performed, and the NSP shall apply the recommendations issued in the context of such security assessment.

The action plan would have to be agreed either with the TIPS Operator, within the context of a third party assessment (i.e. for receiving a SSAE 16 certification) on the basis of the criticality of the highlighted risks.

5. Operational services

5.1. Service Catalogue and manuals

Connectivity service catalogue

Reference ID	TIPS.UC.TC.51010

The NSP has to develop a catalogue of Connectivity Services as part of the TIPS overall service catalogue to the TIPS Operator and the TIPS Actors. The content of the Connectivity Services catalogue, at the least, shall include description of detailed services and service levels (such as detailing performance, availability, support commitments).

The content of the Connectivity Services catalogue shall include the network providers the NSP uses to offer connectivity to TIPS, and the services the NSP offers including:

- Detailed Services,
- Service Levels, detailing performances, availability and support commitments,
- Volume related services,
- Dedicated connectivity solutions,
- Backup/Alternative network access solutions,
- Procedures to assure the continuity of the business
information about configuration and operation of the services

Operation and Escalation manual

Reference ID	TIPS.UC.TC.51020

The NSP shall provide the TIPS Operator with the following documents:

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

The NSP will be the owner of its manuals and is responsible for any updates. The TIPS Operator may submit its observations and comments to the NSP in order to ensure the accuracy of the manuals.

5.2. Support and Incident/Problem Management

5.2.1. Support Teams

The NSP shall ensure to the TIPS Actor that there is a Service Desk available for the TIPS Actor and the TIPS Operator.

Reference ID	TIPS.UC.TC.52030

The TIPS Operator and the TIPS Actor shall be able to contact the NSP Support Teams 24 hours a day, seven days a week, all year around. The NSP Support Teams shall be able to trigger the procedure described in the Escalation Manual agreed on with the TIPS Operator.

5.2.2. Trouble ticketing system

Trouble ticketing management

Reference ID	TIPS.UC.TC.52040

The NSP shall record all actions, as well as the timestamp (time and date) at which the actions occur, in its central trouble ticketing system. Such system shall be accessible by the TIPS Actor and by the TIPS Operator via Internet.

Trouble ticketing report

Reference ID	TIPS.UC.TC.52050

The NSP shall provide to the TIPS Operator on a monthly basis a list of all severe, blocking and major incidents handled during the reporting period, including incidents where only TIPS Actors are impaired. This table shall include at least the following information: case creation date/time, case closure date/time, impaired TIPS Actors, severity of the incident and incident description and reason for closure. Further details are recorded and available to the TIPS Operator upon request.

5.2.3. Operational incident management and escalation

The NSP maintains jointly with the TIPS Operator the Escalation Manual. This document shall contain the management escalation process and the NSP's contact details.

Incident management and escalation

Reference ID	TIPS.UC.TC.52060

The NSP shall start resolving each incident within 15 min after the incident has been reported and shall provide the first update to the TIPS Operator within 30 min.

The NSP shall produce and deliver an incident report to the TIPS Operator within 24 hours as of the incident time. Such a report shall be produced also for violations of the service requirements set out in the Service level specification (TIPS.UC.TC.55020), when the criticality of the fault episode may be classified as *high*, according to the definition given therein.

The NSP shall inform the TIPS Operator in advance of known problems and any corrective measures to be taken.

5.2.4. Escalation of connectivity failures to NSP's subcontractors

The NSP shall monitor the status of the TIPS network connectivity of the TIPS Platform. Upon detection of a connectivity failure by NSP or notification of a connectivity failure by the TIPS Operator or the TIPS Actor, the NSP shall investigate the incident as set out below:

1. upon detection of a connectivity failure, the NSP shall immediately contact the TIPS Operator and/or the TIPS Actor and shall as soon as possible provide an initial analysis of the incident;
2. depending on the results of this analysis, the NSP may request the assistance of the TIPS Operator/TIPS Actor, provided the NSP and the TIPS Actor have agreed on such assistance, in performing a number of basic checks of the connectivity equipment at the TIPS Operator/TIPS Actor premises;
3. if the analysis shows that the incident is related to the NSP subcontractors, the NSP shall escalate the problem to the NSP's Subcontractors without any undue delay and notify TIPS Operator/TIPS Actors of the time and date. Such a notification shall be recorded in the NSP's central trouble ticketing system;
4. The NSP shall record all actions, as well as the timestamp at which the actions occur, in its central trouble ticketing system. This information shall be made available to the TIPS Operator upon request as part of the incident review activity.

Escalation of connectivity failures

Reference ID	TIPS.UC.TC.52070

NSP shall have sound processes to detect, notify escalate and resolve connectivity failure.

5.3. Monitoring of the connection

Proactive monitoring

Reference ID	TIPS.UC.TC.53080

The NSP shall proactively monitor all permanent connections to the TIPS platform. The complete list of monitored elements and the details of their monitoring is documented in the Operation Manual.

Availability and bandwidth utilization report

Reference ID	TIPS.UC.TC.53090

The NSP shall, on a monthly basis, report to the TIPS Operator the availability of the monitored communication elements and the connections bandwidth utilization.

5.4. Business Continuity services

The NSP shall provide a reliable service, taking into account the TIPS architecture and the rotation of the TIPS Sites.

5.4.1. TIPS Business Continuity and Rotation

Imperceptibility of the TIPS Business Continuity towards the TIPS Actors

Reference ID	TIPS.UC.TC.54100

The NSP shall support the TIPS Business Continuity imperceptibly to the TIPS Actor i.e. without any necessary intervention or impact on their technical configuration.

Periodic rotations of the TIPS Platform

Reference ID	TIPS.UC.TC.54110

The NSP shall support the TIPS Business Continuity in compliance with the TIPS-specified service levels, the periodic rotations (if needed) and backup procedures.

The NSP shall support traffic routing for periodic site rotations and backup procedures for the Business Continuity imperceptibly for the TIPS Actor. The end users shall not perceive in which site the TIPS application is running. The rotation shall be fully invisible to the TIPS Actor and to the inter-connected market infrastructures, i.e. no configuration changes in the TIPS Actor's systems shall be necessary.

TIPS Business Continuity time objectives

Reference ID	TIPS.UC.TC.54120

The NSP shall support the TIPS Business Continuity with the following time objectives:

- in the case of an intra-region recovery, between primary and secondary Site in the same region, on request of the TIPS Operator, the NSP shall switch the traffic between the sites in less than 15 minutes;
- should the second Region be implemented:
    - ○

- in the case of an inter-region recovery (on request of the TIPS 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.

No single point of failure

Reference ID	TIPS.UC.TC.54130

The NSP shall design and implement the technical infrastructure of its Solution for the TIPS Platform and shall configure its network components on each of the TIPS Sites in a way that avoids a single point of failure (SPOF). Any additional software or hardware components shall be redundant.

DNS functionalities for Business Continuity

Reference ID	TIPS.UC.TC.54140

The NSP shall connect to the TIPS Platform Domain Name System to obtain in automatic mode the current location of the services and URL for U2A. The TIPS Platform will communicate 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.

The NSP's Business Continuity

Reference ID	TIPS.UC.TC.54150

The NSP shall manage its disaster recovery solution, which affects the TIPS Connectivity Services, with the following objectives. In the case of the NSP recovery, the NSP shall support the traffic exchange through its back-up site automatically within 15 minutes.

5.5. Operation, administration and management

5.5.1. Service Availability

The Connectivity Services shall be available 24 hours per day, seven days per week.

5.5.2. Availability indicators

Two types of indicators shall be used to measure the availability of the Connectivity Services:

1. the Connection Availability, measuring the availability of the connection of the TIPS Actor to the TIPS system.
2. Service availability measuring the availability of the services A2A.

The **Connection Availability** is the percentage of time that the connection for the TIPS Actors is considered to be operational. It is calculated using the following formula.

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

Where:

1. Total Outage time is the product of the outage time in minutes in the reporting period and the number of affected TIPS Actors; in case the outage impacts the connection with the TIPS backend application all the TIPS Actors are considered to be affected by the outage;
2. Total Service Time is the product of the total number of the TIPS Actors 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.

The **Service Availability** is the percentage of the time that the A2A services are available to the TIPS Actors to send and receive messages. It is calculated with the following formula:

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

Where:

3. Outage time is the sum of the outage time in minutes in the reporting period;
4. Service Time is the expected availability time in minutes in the reporting period.

The **Service Availability** shall not be less than 99,98 calculated on a monthly basis.

For both indicators the NSP shall describe in detail how the measurements of the outage times are calculated.

Service requirements - **Service Level specification**

Reference ID	TIPS.UC.TC.55020

NSP guarantees a fault clearance within the times defined in the following table, depending on the criticality of the identified fault:

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

Table 1 – Service level specification

In order to establish its priority, the criticality of each fault episode may be classified as *high, medium* or *low.*

The definition of the related levels is the following:

1. *high* (both TIPS Sites in a single region are down, or a single sites is down – the region has a reduced bandwidth since a link is interrupted, or WAN service parameters are strongly degraded),
2. *medium* (a WAN component is faulty or a link has failed),
3. *low* (fault has only slight impact on operations or it is a requests for information).

The three metrics MxTTI, MxTTR and SNI are defined as follows:

- Status Notification Interval (SNI): The TIPS Operator is informed about fault status and 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[2].

5.5.3. Service Compliance Meeting

The compliance of the NSP's Service with the requirements set out in this document will be monitored continuously. The specific procedure for monitoring compliance will be established at a later stage, and shall be read in conjunction with the Harmonised Conditions for TIPS that will contain the legal obligations of the TIPS Participant to ensure compliance with those requirements.

Such compliance shall be discussed and reviewed in a monthly Service Compliance Meeting hosted by the TIPS Operator. For this purpose the NSP shall appoint a Service Manager that shall act as unique point of contact for all the Service Compliance related issue.

[2] MxTTR is temporarily suspended by the following events: 1. TIPS is not available to support or provision access to the faulty components, or 2. TIPS refuses to permit contractor personnel to enter the site, or *force majeure* (a circumstance is 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).

6. Implementation

NSP infrastructure sizing

Reference ID	TIPS.UC.TC.61030

The NSP shall size its infrastructure based on its expected market share and to ensure it meets performance and volume requirements.

For TIPS Platform, NSP shall size the infrastructure to support the full traffic load (standard and peaks) managed by a single TIPS site, in case of maintenance or failure of one of the TIPS sites.

6.1. Project management

Connectivity Managers

Reference ID	TIPS.UC.TC.64040

The NSP must appoint a Connectivity Manager (CM) who is the responsible central contact person coordinating all required activities and communicating with the TIPS Operator.

The TIPS Operator will also appoint a CM (the "**TIPS CM**").

NSP Connectivity Manager Duties

Reference ID	TIPS.UC.TC.64050

The CM will have the following duties:

- Maintenance of the relations with the TIPS CM;
- Coping with all the issues relating to the NSP service provisioning and optionally escalating the problem to the person(s) responsible in the NSP's organisation;
- identification of the NSP's personnel in charge of the performance of services with an impact on security and written notification of their identities (names, picture ID, reserved information accessed) to the TIPS Operator immediately after their determination;
- identification of the NSP's personnel involved in the implementation who need access to restricted areas on the TIPS Sites and written notification of their identities (names, picture ID, restricted areas to access, dates) to the TIPS Operator at the latest three (3) Business days before the installation of the necessary equipment at the TIPS premises;
- preparation of a monthly project progress report on the NSP installation schedule for the NSP service provisioning;
- submission of a final closure report at the end of implementation;

- monitoring and controlling the deadlines of the implementation schedule;
- regular meetings with the TIPS Operator.