

# ISITEP

## D4.1.42 – GATEWAY PROTOTYPE LEONARDO NETWORK FINAL RELEASE

<b>Document Manager:</b>	Claudia Olivieri	LDO	Editor
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Approval Status	
<b>Prepared by:</b>	Claudia Olivieri (LDO)
<b>Approved by (WP Leader):</b>	Claudia Olivieri (LDO)
<b>Approved by (SP Leader):</b>	Jaakko Saijonmaa (ADS FI)
<b>Approved by (Coordinator)</b>	Paolo Di Michele (LDO)
<b>Security Approval (Advisory Board Coordinator)</b>	Etienne Lezaack (BFP)

## CONTRIBUTING PARTNERS

Name	Company / Organization	Role / Title
Federico Frosali	LDO	Contributor
Claudia Olivieri	LDO	Contributor

## DISTRIBUTION LIST

Name	Company / Organization	Role / Title
All Company Project Managers	All involved companies	Members of the Steering Committee
Elina MANOVA	EC DG REA	EC Programme Officer
General Public	NA	NA

## REVISION TABLE

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V1.0	19/01/2017	All	All	Final release

## **Publishable extended abstract**

The ISITEP proposed framework aims to assess and achieve operational interoperability among transnational PPDR operators jointly addressing the regulative, organizational, operational, and technical levels. The Inter-System Interface (ISI) is one of the four components of the ISITEP framework to achieve such a goal.

Leonardo Company and Motorola has addressed the ISI over IP. The use of IP as transport for ISI is one of the innovative aspects sponsored by the ISITEP project.

The IP-based interconnection provides a flexible and efficient connection to end users, since one IP based voice call utilizes 8 kbit/s (codec rate plus IP transport protocol overhead), so for example, an interconnected systems with a capacity of 500 calls need to deploy an IP connection with around 4 Mbit/s bandwidth capacity. The bandwidth utilization in the IP-based connections is traffic dependent.

The E-Carrier connections do not allow for flexibility and efficiency to be obtained as for the IP based system, since the minimum bandwidth available for the E-Carrier systems is E1 which is equal to 2 Mbit/s. Additionally, transmitting over E1 carriers requires huge bandwidth; since one voice call utilizes one 64 kbit/s E1 channel, so for example, an interconnected systems with a capacity of 500 calls need to deploy 16 E1 links (32 Mbit/s E1 bandwidth capacity). The bandwidth allocation in the E1-based connections is static. On the other hand the use of the E-Carrier as transport ensure high audio quality as a circuit-switched connection permanently allocates the capacity for the entire duration of the voice call.

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## 1 INTRODUCTION

In deliverable D 4.1.22 is addressed the Leonardo Company prototype for the ISI-GW.

The Leonardo Company ISI-GW prototype provides ISI interface over IP transport. The use of IP as transport protocol for ISI is not foreseen from the current ETSI standard, Leonardo Company and Motorola are jointly working on the standardisation process is not been completed yet.

In the current document it will be described the Leonardo Company ISI-GW prototype D 4.1.42, the HW and SW design and the list of supported features.

This task has been developed taking as input the ISITEP End-User Requirements [1]. The outcome of this task has been used in WP 4.7 and it will be used in trial demonstrator WP 7.2.

## 2 ABBREVIATIONS

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

Acronym	Definition
ANF	Additional Network Feature
CC	Call Control
DGNA	Dynamic Group Number Assignment
ETSI	European Telecommunications Standards Institute
FQDN	Fully Qualified Domain Name
GB	Giga Byte
GC	Group Call
GSSI	Group Short Subscriber Identity
GW	Gateway
HDD	Hard Disk Drive
IC	Individual Call
ISI	Inter System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
MM	Mobility Management
MS	Mobile Station
MT	Mobile Terminal
OS	Operating System
PCI-X	Peripheral Component Interconnect eXtended
PDU	Protocol Data Unit
PEI	Peripheral Equipment Interface
PMR	Private / Professional Mobile Radio
PPDR	Public Protection and Disaster Relief
PSTN	Public Switched Telephone Network
PTT	Push-to-Talk
RAM	Random Access Memory
RAN	Radio Access Network
RTP	Real Time Protocol
SBC	Single Board Computer
SDS	Short Data Service
SIP	Session Initiation Protocol
SwiMi	TETRA Switching and Management Infrastructure
TCCE	TETRA and Critical Communication Evolution
TETRA	Terrestrial Trunked Radio
UE	User Equipment
UDP	User Datagram Protocol
WG	Working Group
WP	Work Package

### 3 DESIGN DESCRIPTION

The Leonardo Company ISI-GW prototype is deployed in the Leonardo Company standard hw platform adopted for all the communication services provided by Leonardo Company. In the following paragraph it is Leonardo Company Communication Service Platform used for the Leonardo Company ISI-GW prototype.

#### 3.1 HW Design

The Leonardo Company Communication Service Platform is a standalone rack-mountable product.

The main HW platform features are:

- SBC Full Size over PCI -X with Intel® Embedded Xeon® Quad Core, 2.33 GHz
- RAM 8 GB
- 2 x HDD 500GB configured in RAID1. (DISK1 and DISK2 are in mirroring configuration if one of the two disks is extracted or is faulty; automatically the other one is used without any service interruption. When the faulted disk is substituted with a new one the mirroring process is automatically re-started on the new disk.)
- 2U Server Form factor.
- PCI-X Internal bus (Compatible with PCI)
- Slots available:
  - 1 x SBC
  - 4 x 64bit@100MHz PCI-X
  - 1 slot PCI-Ex4
- Selex gentoo Linux distribution.
- 8 Gbps peak passing bandwidth.
- 500kpps of maximum IP forwarding throughput.

Keyboard shall be connected to the USB port 2 on the SBC.

The Leonardo Company Communication Service Platform can be powered using 220 VAC or -48 Vdc power supply.

#### 3.2 Physical Layout

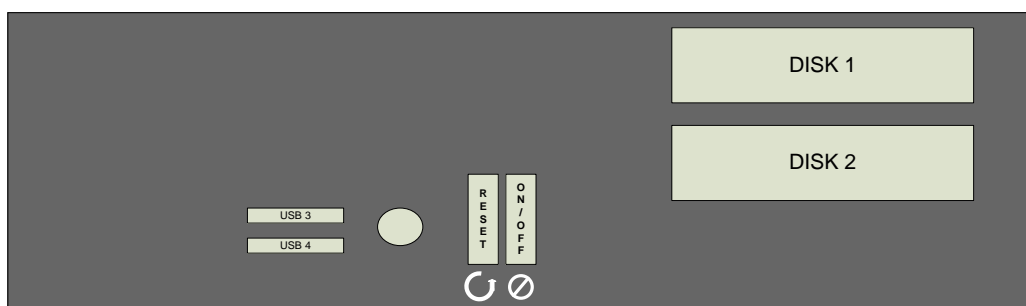


Figure 1 Front View schema

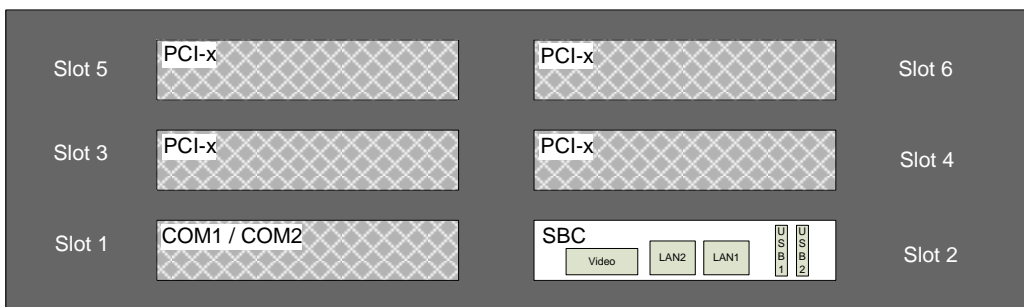


Figure 2 Rear View Schema

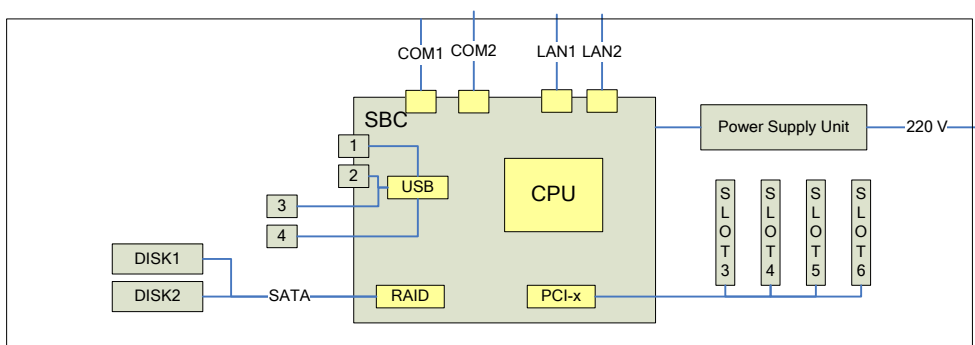


Figure 3 CSP internal View schema



Figure 4 Product Front view





Figure 5 Product front and internal view

### 3.3 Technical Specifications

Physical dimensions	Height: 88 mm (2 U) Width: 483 mm (standard 19" rack) Depth: 450 mm
Weight ( <i>fully equipped</i> )	About 10 kg
Protection degree	IP20
Cooling system	Air forced cooling system front to rear
Power Supply	90 - 264 VAC, 50-60 Hz
Power consumption ( <i>fully equipped</i> )	Max. 150 W
<b>Environmental Conditions</b>	
Storage	ETSI ETS 300 019-1-1 class 1.2
Transportation	ETSI ETS 300 019-1-2 class 2.2
Operation	ETSI ETS 300 019-1-3 class 3.1 (+5 : +40C)
EMC	Compliant to the standard EN 300 386. This standard concerns both emissions and immunity requirements. Emissions limits shall be those of the standard EN 55022 class A.
Safety	Compliant to the standard CENELEC EN 60950-1

### 3.4 SW Design

In the following figure the SW architecture of the Leonardo Company ISI gateway has been provided.

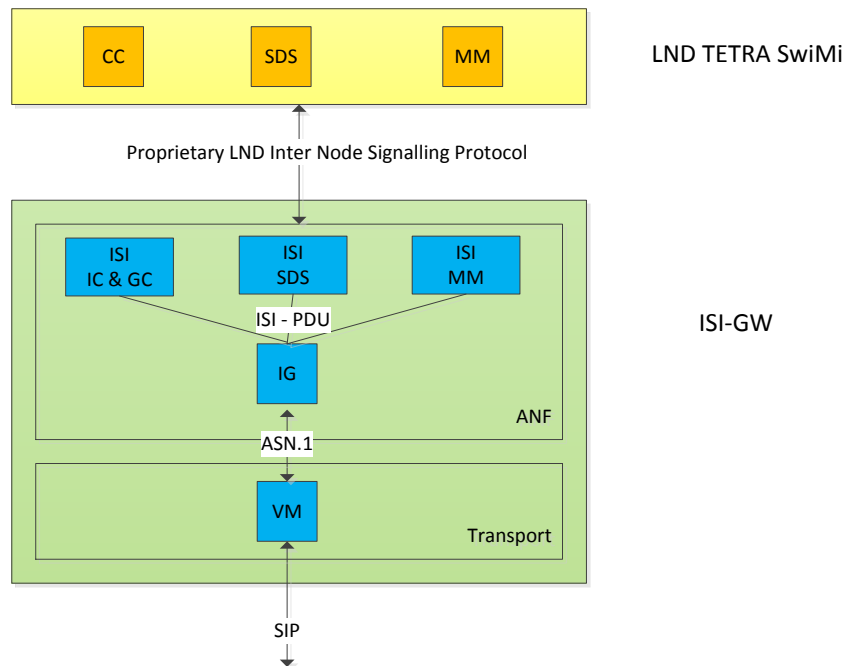


Figure 6 ISI-GW Sw architecture

The main components deployed inside the ISI Gateway are:

**ISI IC & GC:** this task realizes the call control functions both for Individual and Group Speech Call according to the ETSI ANF-ISIIC [5] and ANF-ISIGC [6].

**ISI SDS:** this task realizes the short data service according to the ETSI ANF-ISISDS [7].

**ISI MM:** this task realizes the mobility management services according to the ETSI ANF-ISIMM [8].

**IG:** the ISI Gateway task is responsible to format the TETRA ISI PDUs received from the ISI-ANF tasks into an ASN.1 byte sequence [2] introducing the identities for the Source and Destination SwiMi.

**VM:** the VoIP Mediation component encapsulates the ASN.1 byte sequence received from the ISI Gateway task inside SIP messages converting the byte sequence into an ASCII string according to RFC 3204 [3], the same mechanism that is used to encapsulate the Qsig inside SIP messages. The VM is responsible also to establish the SIP sessions toward the remote SwiMIs following the guidelines agreed with Motorola and submitted to the ETSI TCCE WG3 with the TTCE document [4]. With respect to document [4] the ISI-GW D4.1.42 prototype supports only SIP over UDP and addressing in SIP header fields does not use FQDNs. VM is also responsible to set any RTP session in order to permit audio communication between SwiMIs involved in a call.

## 4 LEONARDO COMPANY ISI-GW PROTOTYPE CAPABILITIES

The Leonardo Company ISI-GW provides the capability to interface a Leonardo Company Nation-Wide TETRA IP Network with a TETRA Network from another manufacturer using ISI over IP.

The Leonardo Company ISI-GW prototype D4.1.42 provides almost the full set of end-user requirements described in D 2.3.2 [1].

In the following paragraph the feature list is reported.

### 4.1 Feature list

In the Leonardo Company ISI-GW D4.1.42 prototype the following features are available:

- Visited network is able to register visiting terminals having the same ISSI's as local ones.
- Pre-provisioning of the visiting ITSI ranges
- Authentication of the visiting ITSI by its home network
- Air Interface Encryption (AIE)
- Individual Voice Call simplex and full duplex
- Voice group call using linked group
- Emergency call to the statically linked group
- Voice group call using local group
- Locally sending/removing, by DGNA, a local GSSI to a visiting ITSI
- Short Data Service, Status Messages
- System Provisioning

The following feature are not available in the final release of the ISI-GW prototype:

- Individual speech call to and from PSTN.
- and Positioning

## 5 REFERENCES

- [1] ISITEP D2.3.2 V 1.1 End-User Requirements, November 2014
- [2] ITU-T Recommendation X.690: "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)"
- [3] RFC 3204 "MIME media types for ISUP and QSIG Objects"
- [4] TCCE03(14)000015 – Realization of ISI over IP
- [5] ETSI EN 300 392-3-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 2 Additional Network Feature Individual Call (ANF-ISIIC)
- [6] ETSI EN 300 392-3-3: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 3 Additional Network Feature Group Call (ANF-ISIGC)
- [7] ETSI EN 300 392-3-4: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 4 Short Data Service (ANF-ISISDS)
- [8] ETSI EN 300 392-3-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Interworking at the Inter-System Interface (ISI); Sub-part 5: Additional Network Feature for Mobility Management (ANF-ISIMM)".