

ISITEP

D4.5.4 – PROTOTYPE TEST REPORT

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REVISION TABLE

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Publishable extended abstract

This deliverable constitutes the test report of the TETRA TETRAPOL mobile gateway prototype developed in ISITEP European FP7 project.

CONTENTS

1. INTRODUCTION	5
1.1 Introduction.....	5
1.2. Document scope	5
1.3. Purpose	5
1.4. Document Overview	5
1.5. Acronyms	5
2. TEST ENVIRONMENT	9
3. TEST PROCEDURE AND REPORT FORM	10
3.1 Interface Requirements	10
3.2 GATEWAY Configuration	11

1. INTRODUCTION

1.1 Introduction

ISITEP aims at achieving the interoperability between legacy PMR networks based on TETRA and TETRAPOL technologies. In order to avoid deeply modifying already deployed networks, ISITEP's partners' strategy consists in the implementation of gateways connected to legacy networks.

IN WP43, a hardware and software solution for ISITEP will be developed to allow interoperability between TETRA and TETRAPOL networks whereas in WP44 a hardware and software solution for ISITEP will be developed to allow interoperability between TETRAPOL and TETRAPOL networks.

WP45 focuses on the development of a deployable TETRA - TETRAPOL gateway with specific constraints and use cases related to unplanned events requiring a hastily formed network and remote control (through satellite IP links for example).

The present document is related to WP45. This system has two main roles in the ISITEP project:

- Allow fast and reliable integration of TETRA-TETRAPOL interface
- Support field deployment of interoperable solutions and roaming in crisis situations where Tetra/Tetrapol radio coverage is not available and therefore low bandwidth scenarios are to be faced. The deployable gateway will be connected through SAT connection to the national networks

1.2. Document scope

This deliverable (D45.4) corresponds to task T4.5.4. and aims at reporting the tests achieved on the TETRA - TETRAPOL Mobile Gateway developed in WP45.

1.3. Purpose

This document provides tests report applicable to the TETRA-TETRAPOL Gateway system.

1.4. Document Overview

The document describes the test procedure and test report form for the GATEWAY.

The document takes the GATEWAY requirements specified in document D45.1 and deduced from operational requirements expressed by end users in WP2.

1.5. Acronyms

Acronym	Definition
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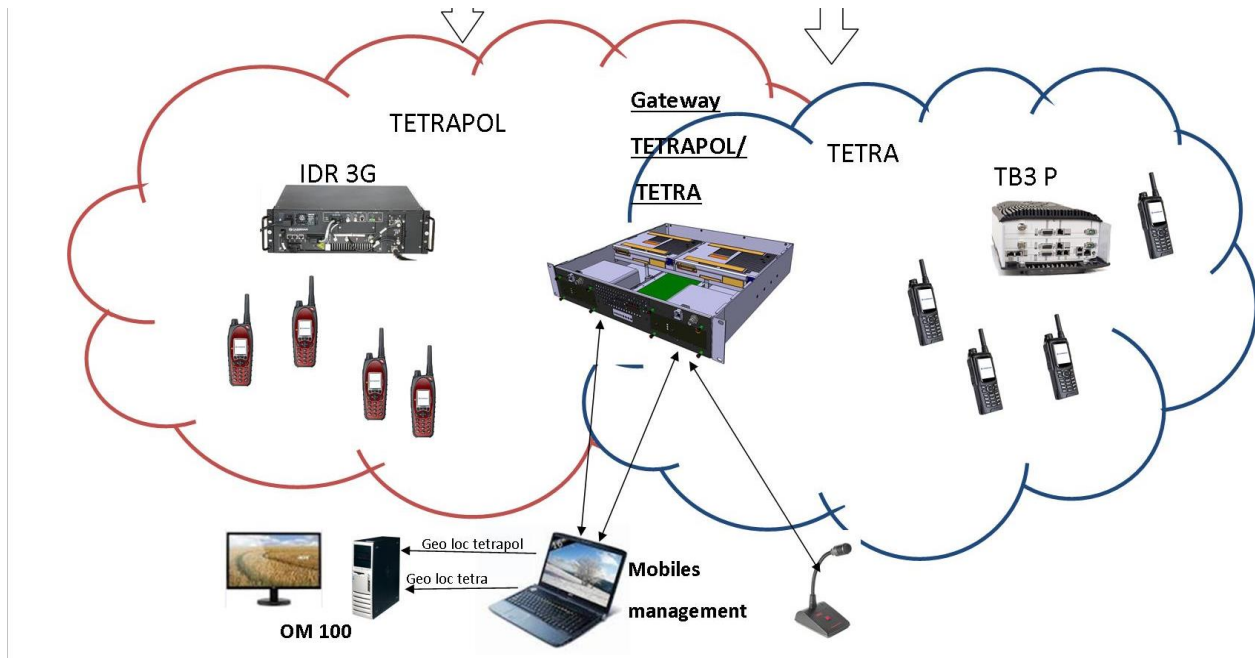
AG	Access Gate
AI	Air Interface
CN	Control Node (TETRAPOL network)
CAN	Code Nature of Address Or Digital Access Board (Allowing of the management of 4 accesses)
CC-API	Control Centre API for TETRAPOL
CMU	Central Management Unit of the GATEWAY
CTL	GATEWAY Controller board
DCS	Dispatch Control Server
DPU	Data Processing Unit : module inside the CMU to manage the GATEWAY
DXT	Digital eXchange TETRA
E1	E1 (a PCM interface G.703 of 30 channels A law G.711)
EMOCH	Emergency Multi site Open Channel
ETH	ETHERnet
EUT	Equipment Under Test
GIU	Graphical Interface Unit
G(T)W	GateWay
HW	HardWare
IP	Internet Protocol
LAG	Line Access Gate
LABS	Line Access Base Station
LATC	Line Access Terminal Controller
LCT	Line Connected Terminal
Li	List bit (=0 if last element in address list)
MD	Mediation Device in charge of Network Management
MMI	Man Machine Interface
MOCH	Multi-site Open Channel
MSW	Main Switch (TETRAPOL network)
NA	Non Applicable
NPI	Numbering Plan Identifier
OA&M	Operation Administration and Maintenance
OMC	Operation & Maintenance Computer
PBM	Product Business Manager
PCM	Pulse Coded Modulation
RN	Regional Network
RSW	Radio Switch (TETRAPOL network)
SSW	Secondary Switch (TETRAPOL network)
SW	SoftWare
ST	System Terminal
TKG	Talk Group
TDM	Time Division Multiplexing
TMP	Technical Management Position

TPA	Talking Party Address
TPOL	TETRAPOL
TPS	Terminal Programming Station
TRS	Technical Requirements Specification

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2. TEST ENVIRONMENT

The gateway is attached to two tactical PMR networks respectively endowed with TETRA and TETRAPOL technology.



Mobile TETRA and TETRAPOL terminals are used for end-to-end test communications and simulated location. An AVL server is used to control the functionalities linked to the establishment of a common operational picture.

The tests are classified into two categories:

- **Prototyping (P):** Verification of operational features while the equipment under test is powered on. These tests include direct observation of the equipment or results in the HMI.
- **Functions (F):** Verification of functional features that can be accessed directly or indirectly via a specific test context like some engaged communications.

3. TEST PROCEDURE AND REPORT FORM

3.1 Interface Requirements

CC-API and TETRA command

Platform: TETRA – TETRAPOL GATEWAY	Scenario: 0100	Test Location: Airbus FR premises
Tested Functions: GATEWAY manages TETRAPOL CC-API server	Requirement: SYS_GATEWAY_010	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate		
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Check that CC-API and DCS communicate	No DCS(CC-API) alarm	OK

Platform: TETRA – TETRAPOL GATEWAY	Scenario: 0110	Test Location: Airbus FR premises
Tested Functions: GATEWAY manages TETRA AT command	Requirement: SYS_GATEWAY_010	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT		
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Check that TCS and DCS communicate	No DCS(TCS) alarm	OK

AG links

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0120	Test Location: Airbus FR premises
<p>Tested Functions: GATEWAY manages the link interfaces for voice: TETRAPOL analog AGs, S0 AGs</p> <p>Test Configuration: Factory</p> <p>Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate</p>	Requirement: SYS_GATEWAY_020	
	TEST REPORT	
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
In GIU, select the 'Parameters' menu. Enter the 'Boards' submenu. Verify that each card slot can home an analog or S0 AG	OK	OK

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0130	Test Location: Airbus FR premises
<p>Tested Functions: GATEWAY manages the link interfaces for voice: TETRA DXT E1 AGs</p> <p>Test Configuration: Factory</p> <p>Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT</p>	Requirement: SYS_GATEWAY_020	
	TEST REPORT	
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Verify that each card slot can home an E1 AG	OK	OK

3.2 GATEWAY Configuration

Remote Configuration

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0200	Test Location: Airbus FR premises
Tested Functions: GATEWAY can be remotely configured and monitored and maintained via IP	Requirement: SYS_GATEWAY_050, TCH_GATEWAY_040, TCH_GATEWAY_140, TCH_GATEWAY_150	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate		
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Use a PC with GIU client installed on it		
Configured the PC with LAN IP address 192.168.4.50		
Run GIU	A connection window opens	OK
Enter IP address of CMU1: 192.168.4.1 or CMU2: 192.168.4.2		
Click on 'Connect'	An authentication window opens	OK
Enter password 'XXXXXX'	The GIU main window opens	OK
Check that the 'Parameters' and 'Monitoring' and 'Maintenance' menus are available	Menus are available	OK

Associations of Group Communications

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0210	Test Location: Airbus FR premises
Tested Functions: GATEWAY allows user to define an association between TETRAPOL and TETRA networks	Requirement: SYS_GATEWAY_210, SYS_GATEWAY_240	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT		
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Using GIU on a PC, open 'Exploitation' menu		
Enter IDR sub-menu and complete channel number and TKG number for TETRA part	The 'List of Associations' window opens	OK
Check that an association can be edited, altered, deleted	The list is updated accordingly. No GATEWAY restart is required	OK
On editing an association, check parameters are provided to define TETRAPOL and TETRA networks	OK	OK

3.3 Managing Group Communications

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0300	Test Location: Airbus FR premises
Tested Functions: Audio signal quality is not impaired when processed by GATEWAY	Requirement: SYS_GATEWAY_210, SYS_GATEWAY_240	
Test Configuration: Factory Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT Several static group communications are configured	TEST REPORT	
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
Send message to GATEWAY to open the RB1 side of a static association RB1 - TETRA	AG(RB1) selected	OK
Transmit voice with TETRAPOL terminal on that group		
Verify that voice is received on TETRA terminal on that group	OK	OK
Transmit voice on a TETRA Group Call		
Check that an AG(RB1) is selected	OK	OK
Verify that the TETRAPOL terminal receives voice	OK	OK

3.4 Performance

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0400	Test Location: Airbus FR premises
Tested Functions: Audio signal quality is not impaired when processed by GATEWAY	Requirement: SYS_GATEWAY_540, TCH_GATEWAY_130	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT		
At least one group communication is established between RB1 and TETRA		
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
Activate PTT on one access related to RB1 and input a speech signal into that access at the same time		
Check quality output by GATEWAY on associated digital TETRA access	No signal loss No audible distortion No significant level change	OK
Activate PTT via messaging on AT command or hard PTT and input a speech signal into the related digital access at the same time		
Check quality output by GATEWAY on associated RB1 access	No signal loss No audible distortion No significant level change	OK

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0410	Test Location: Airbus FR premises
Tested Functions: AG switching time	Requirement: SYS_GATEWAY_030, SYS_GATEWAY_040, SYS_GATEWAY_420, SYS_GATEWAY_560, SYS_GATEWAY_580, SYS_GATEWAY_590	
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT		
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
Send message to GATEWAY to activate the RB1 side of a dynamic association		
In the DCS trace, check that the AG of RB1 was selected within 200ms	Time delay < 200ms	OK
In the DCS trace, check that the TETRA AG was selected within 200ms	Time delay < 200ms	OK
Send TETRA PTT-on message to GATEWAY		
Check that an AG was selected on RB1 side for the corresponding association	OK	OK
In the DCS trace, check that the AG of RB1 was selected within 200ms	Time delay < 200ms	OK
Increase number of established associations Keep some AGs as free		
Send message to GATEWAY to activate the RB1 side of a dynamic association		
In the DCS trace, check that the AG of RB1 was selected within 200ms	Time delay < 200ms	OK
In the DCS trace, check that the TETRA AG was selected within 200ms	Time delay < 200ms	OK
Send TETRA PTT-on message to GATEWAY		
Check that an AG was selected on RB1 side for the corresponding association	OK	OK
In the DCS trace, check that the AG of RB1 was selected within 200ms	Time delay < 200ms	OK

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0420	Test Location: Airbus FR premises
Tested Functions: PTT transfer delay	Requirement: SYS_GATEWAY_140, SYS_GATEWAY_230, SYS_GATEWAY_570, SYS_GATEWAY_590	
Test Configuration: Factory Initial State: Operational GATEWAY attached to TCS & DXT & CC-API & LCT At least one group communication is established between RB1 and TETRA	TEST REPORT	
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
Consider an established association between RB1 and TETRA Send RD on analog AG(RB1) or RD-on message on S0 AG(RB1)		
In the DCS trace, check that the PTT is send to TETRA within 100ms	Propagation time < 100ms	OK
Send a TETRA PTT-on message to DCS		
In the DCS trace, check that the PTT is send to AG(RB1) within 100ms	Propagation time < 100ms	OK
Increase number of established associations Generate a well-defined large number of PTT activity		
In the DCS trace, count the number of PTT messages transferred through associations	Number of transferred PTT messages equals number of PTT messages injected	OK

3.5 Reliability

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0500	Test Location: Airbus FR premises
Tested Functions: Automatic service recovery after a fault	Requirement: SYS_GATEWAY_610, SYS_GATEWAY_620, SYS_GATEWAY_630, SYS_GATEWAY_650	SYS_GATEWAY_620, SYS_GATEWAY_640,
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate		
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
Power off the GATEWAY		
Power on the GATEWAY	System init time < 5min.	OK
Power supply board have lights on	OK	OK
CTL and CAN lights are blinking	OK	OK
Using GIU on a PC, verify checksums of firmware and software with respect to the reference profile	Checksums OK	OK
Verify DCS is connected to CC-API and AT command	Connected	OK
Verify GATEWAY is operational (no operator action required)	No alarm in the system	OK
Cut the link to an AG involved in a static association		
Verify GATEWAY shows the AG as faulty. Verify GATEWAY automatically selected a new free AG for the association and shows it in the association list	OK	OK

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0510	Test Location: Airbus FR premises
Tested Functions: GATEWAY redundancy	Requirement: SYS_GATEWAY_610, SYS_GATEWAY_620, SYS_GATEWAY_630, SYS_GATEWAY_650	SYS_GATEWAY_620, SYS_GATEWAY_640,
Test Configuration: Factory	TEST REPORT	
Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate		
At least one group communication is established		
CTL1 is the master CTL board		
CMU1 is Leading as shown in SVIP		
Checking Method: F		
ACTIONS	EXPECTED RESULTS	RESULTS
<i>Power supply modules</i>		
Switch off power supply board 1		
In GIU, check the PS1 alarm is active	OK	OK
Verify the group comm. remains operational	OK	OK
Switch-on PS1 board then switch-off PS2 board		
In GIU, check the PS2 alarm is active	OK	OK
Verify the group comm. remains operational	OK	OK
Switch-on PS2 board		
<i>Control boards (CTL)</i>		
Unplug CTL1/IP link #1		
In GIU, check CTL1 alarm is active	OK	OK
In GIU, check CTL2 changes to Master	OK	OK
In SVIP, check link 1-01 is shown faulty	OK	OK
Plug CTL1/IP link #1 again		
Verify no alarm is shown any longer	OK	OK
Unplug CTL2/IP link #1 (CTL2 is Master)		
In GIU, check CTL2 alarm is active	OK	OK
In GIU, check CTL1 changes to Master	OK	OK
In SVIP, check link 2-01 is shown faulty	OK	OK
Plug CTL2/IP link #1 again		
Verify no alarm is shown any longer	OK	OK
Unplug CTL1/IP link #2		
In SVIP, check link 1-02 is shown faulty	OK	OK
Plug CTL1/IP link #2 again		

Verify no alarm is shown any longer	OK	OK
Unplug CTL2/IP link #2		
In SVIP, check link 2-02 is shown faulty	OK	OK
Plug CTL2/IP link #2 again		
Verify no alarm is shown any longer	OK	OK
<i>Central Management Units (CMU)</i>		
Shut-down CMU1 (Leading)		
Check CMU2 changes from Following to Leading state	OK	OK
Check SVIP on CMU2 shows the four IP links faulty with CMU1	OK	OK
Restart CMU1		
Verify no alarm is shown any longer	OK	OK
Shut-down CMU2 (Leading)		
Check CMU1 changes from Following to Leading state	OK	OK
Check SVIP on CMU1 shows the four IP links faulty with CMU2	OK	OK
Restart CMU2		
Verify no alarm is shown any longer	OK	OK
<i>Ethernet switches</i>		
Power-off switch 1		
Check CMU2 changes to Leading	OK	OK
Check SVIP (on CMU1 and CMU2) shows an alarm for all links going through switch 1	OK	OK
Power-on switch 1		
Verify no alarm is shown any longer	OK	OK
Power-off switch 2		
Check CMU1 changes to Leading	OK	OK
Check SVIP (on CMU1 and CMU2) shows an alarm for all links going through switch 2	OK	OK
Power-on switch 2		
Verify no alarm is shown any longer	OK	OK
<i>Manual failover of CMUs</i>		
Click on 'CMU Failover' in SVIP on CMU2 (Following)		
In SVIP, check CMU2 changes to Leading within 2min.	OK	OK
Click on 'CMU Failover' in SVIP on CMU1 (Following)		

In SVIP, check CMU1 changes to Leading within 2min.	OK	OK
Check no service outage occurred during CMU failover	N/A	OK

3.6 Maintenance

Platform: TETRA - TETRAPOL GATEWAY	Scenario: 0600	Test Location: Airbus FR premises
Tested Functions: HTML support	Requirement: SYS_GATEWAY_710	
Test Configuration: Factory Initial State: Operational GATEWAY attached to mobile & AT command & CC-API & radio access gate	TEST REPORT	
Checking Method: P		
ACTIONS	EXPECTED RESULTS	RESULTS
Install the GATEWAY'S MIB into the Network Manager PC	MIB format accepted	OK

4. CONCLUSION

This document presented the test suite and report to check the developed gateway meets ISITEP requirements from D45.1. This document only applies to TETRA-TETRAPOL mobile gateway.