ETSI Plugtests Report V1.0.0 (2020-10)

5th ETSI MCX Plugtests
Remote Event
21 September – 02 October 2020

Keywords
Testing, Interoperability, Mission-Critical, LTE, MCPTT

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Executive Summary

The capabilities of Mission Critical Push to Talk (MCPTT), Mission Critical Data (MCData) and Mission Critical Video (MCVideo) were tested during the fifth MCX Plugtests from 21st September to 2nd October 2020 remotely. More than 1300 test cases were executed between vendors and equipment, based on 3GPP Release-15.

The 5th ETSI MCX Plugtests have concluded with a success rate of 95% of the executed tests in the validation of 3GPP mission critical services vendor interoperability.

These tests are essential to ensure seamless access to mission critical services over 4G networks across different vendors' products and implementations.

The MCX (collectively for MCPTT, MCVideo and MCData services) ETSI Plugtests series is the first independent testing of public safety and other mission critical LTE. For the first time, rail specific features were tested in the 5th MCX Plugtests. The preparations for the fifth Plugtests started in May 2020, were followed by remote testing over the summer and were finalized with a two week remote testing session, held online.

The tests were based on 3GPP Release-15 and more than 1300 tests were executed between the different vendors in more than 170 test sessions. The test cases have been amended with additional test scenarios and will be included in a future version of ETSI TS 103 564 (after the ETSI committee TCCE approval). Besides the MCPTT, MCData and MCVideo Application Servers and Clients, the testing also included devices railways oriented features, IMS (IP Multimedia Subsystem) and eMBMS (Evolved Multimedia Broadcast Multicast Services) components and testing of Floor Control, Affiliation, Mission Critical Bearers handling, Multicast, and Server to Server communication.

The observations from the Plugtests events provide essential feedback to 3GPP Working Groups as work continues on mission critical communication specifications.

This fifth MCX Plugtests was organized by ETSI with the support of the European Commission, EFTA, TCCA and UIC.

The Plugtests event was a pure interoperability testing event and no products were certified.

The next MCX Plugtests event is planned for 2021.

The following equipment was tested by the companies participating in this MCX Plugtests:

MCX Application Servers:

- Airbus
- Alea
- Frequentis
- Havelsan
- Huawei
- Hytera
- Ilmenau University
- Kontron Transportation
- Leonardo
- MCLabs
- Motorola Solutions
- Nemergent Solutions
- Polaris Networks
- Samsung
- Streamwide
- TASSTA
- TD Tech
- Valid8

MCX Clients:

- Alea
- Atos

- Catalyst
- ErvoCom
- Etelm
- Frequentis
- Funkwerk
- Havelsan
- Huawei
- Hytera
- Kontron Transportation
- Leonardo
- Nemergent Solutions
- Polaris Networks
- PRESCOM
- Samsung
- Siemens
- Sigtech
- Softil
- TASSTA
- TD Tech
- Valid8

Evolved Multimedia Broadcast Multicast Services (eMBMS) Components:

- Athonet
- Enensys Expway
- One2many

IP Multimedia Subsystem (IMS):

- Athonet
- Samsung

Test Tool Vendors:

- Expandium
- MCS-TaaSting
- Polaris Networks
- Teraquant
- Valid8


MCX #5 PLUGTESTS Vendors
Atos
AIRBUS
TALKWAY
ALEA S.r.l.®
ATHONET
Bittium
catalyst communications technologies
expandium
a VIAVI Solutions company
ENENSYS Technologies
ErvoCom COMMUNICATIONS SYSTEMS
FREQUENTIS
HAVELSAN
funkwerk
LEONARDO
telm
Hytera
HUAWEI
kontron
mclabs
PRESCOM
Polaris Networks
MCS – TaaSting
Mission Critical Services Testing as a Service
MOTOROLA SOLUTIONS
nemergent solutions
ONE2MANY
AN EVERBRIDGE COMPANY
SAMSUNG
SOFTIL
INNOVATIVE COMMUNICATIONS
STREAMWIDE
SIEMENS
Sigtech
wireless technologies
TASSTA
TECHNISCHE UNIVERSITÄT ILMENAU
TD Tech
Teraquant
www.teraquant.com
Answers, not Data
VALID8.com
© ETSI


MCX #5 PLUGTESTS Observers
astrid
Federal Agency for Public Safety Digital Radio
DOLPHIN TELECOM
ERILLISVERKOT
ESN
Emergency Services Network
dsb
MINISTÈRE DE L'INTÉRIEUR
Liberté
Égalité
Fraternité
FirstNet
Grundy County ETSB
9 1 1
Emergency Telephone System Board
Nordic telecom
NPSTC
orange
MSB
Swedish Civil Contingencies Agency
NC DIT
NSW GOVERNMENT
Telco Authority
TCCA
specialized by stc
AUSTRALASIAN Forum
TCCA
The Critical Communications Association
yic
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1 Introduction

Mission Critical PTT (MCPTT) is a standardized voice service for LTE systems which ensure that LTE and 5G systems support mission-critical communications.

The Global Mission-Critical Communication Market was valued at USD 13.63 Billion in 2018 and is estimated to reach USD 26.66 Billion by 2025 growing at a CAGR of 10.5% during the forecast period 2019–2025, according to the market research. The first nationwide rollouts in the United States, South Korea, the UK, the Middle East and Asian countries are expected to trigger significant large-scale investments in mission-critical LTE.

Mission Critical Push To Talk (MCPTT) was the first of a number of Mission Critical features which was finalized by 3GPP in Release-13. Mission Critical Video and Mission Critical Data were finalized in Release-14. With the standardization of MCX (Mission-Critical PTT, Video & Data), IOPS (Isolated Operation for Public Safety), and other critical communications features by 3GPP, LTE and 5G NR networks are increasingly gaining recognition as an all-inclusive communications platform for public safety, rail and other critical communications sectors.

Preparations for the 5th ETSI MCX Plugtests event started in May 2020 with the registrations of vendors and observers. During bi-weekly conference calls from May to September 2020 the setup of the tests, the test specification and organizational issues were agreed between the participants. Before the main event, the vendors have been done remote pre-testing of their implementations via VPN tunnels which connected their labs to a central exchange hub.

All the information required to organise and manage the 5th MCX Plugtests event was compiled and shared with participants in a dedicated private WIKI which was put in place by ETSI. All participants were provided with credentials that allowed them to access and update their details. All the information presented in this document has been extracted from the 5th MCX Plugtests event wiki: https://wiki.plugtests.net/5th-MCX-Plugtests/index.php/Main_Page (login required). Clause 4 describes the management of the Plugtests event.

The following equipment was tested – please see also clause 5:

- MCX Application Servers (MCX AS)
- MCX Clients
- IP Multimedia Subsystem (IMS)
- Broadcast Multicast Service Center (BMSC)
- MCX Test Tools

This Plugtests railways oriented Application Servers and Clients were evaluated in a dedicated Rail test stream.

A dedicated Test Tools test stream was available for test tool vendors and other vendors to check their tools and the conformance off the implementations with a test tool.

The remote test infrastructure is described in clause 6; the test procedures are described in clause 7.

The vendors and ETSI have set up VPN-Tunnels from the vendors' premises to the ETSI VPN hub. This allowed the vendors to start integration work and pre-testing of MCX services.

For the 5th MCX Plugtests additional test cases were developed by ETSI. In total, the MCX test specification has now more than 200 test cases. See clause 8. An updated version of the test specification will be published as a new version of ETSI document ETSI TS 103 564 (after ETSI TC TCCE approval).

About 1300 tests were conducted by the vendors. 95% of the tests were successful, the remaining 5% failed for various reasons. The detailed results of the tests are available for the involved vendors in these test sessions, but are not disclosed to the other vendors or to the public. All participants had to sign a Non-Disclosure Agreement and Rules of Engagement before joining the Plugtests event. The statistics of the test results are listed in clause 9.

The failed tests give the vendors valuable information to improve their implementations. They also help to discover ambiguities in the standards and to clarify and improve the specifications.

ETSI plan to conduct more MCX Plugtests in the future. The next MCX Plugtests sessions are planned for 2021. Vendors who have not participated in the previous MCX Plugtests events are welcomed and encouraged to join the next MCX Plugtests event.

2 References

The following documents have been used as references in the Plugtests. The participants in the Plugtests agreed on a set of specific documents and Release 15 versions for the fifth MCX Plugtests. Please see also the test specification document for the references.

[1] ETSI TS 103 564: Plugtests scenarios for Mission Critical Services.

[2] 3GPP TS 22.179: Mission Critical Push to Talk (MCPTT) over LTE; , Release 15, Version 15.2.0, December 2017.

[3] 3GPP TS 23.280: Common functional architecture to support mission critical services; Stage 2, Release 15, Version 15.7.0, June 2019

[4] 3GPP TS 23.379: Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2, Release 15, Version 15.6.0, Jun 2019.

[5] 3GPP TS 24.229: IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Release 15, Version 15.9.0, June 2019.

[6] 3GPP TS 24.281: Mission Critical Video (MCVideo) signalling control; Protocol specification, Release 15, Version 15.7.0, December 2019.

[7] 3GPP TS 24.282: Mission Critical Data (MCData) signalling control; Protocol specification, Release 15, Version 15.7.0, September 2019.

[8] 3GPP TS 24.379: Mission Critical Push To Talk (MCPTT) call control; Protocol specification, Release 15, Version 15.7.0, December 2019.

[9] 3GPP TS 24.380: Mission Critical Push To Talk (MCPTT) media plane control; Protocol specification, Release 15, Version 15.5.0, March 2019.

[10] 3GPP TS 24.481: Mission Critical Services (MCS) group management; Protocol specification, Release 15, Version 15.3.0, March 2019.

[11] 3GPP TS 24.482: Mission Critical Services (MCS) identity management; Protocol specification, Release 15, Version 15.0.0, June 2018.

[12] 3GPP TS 24.483: Mission Critical Services (MCS) Management Object (MO), Release 15, Version 15.5.0, December 2019.

[13] 3GPP TS 24.484: Mission Critical Services (MCS) configuration management; Protocol specification, Release 15, Version 15.6.0, March 2019.

[14] 3GPP TS 24.581: Mission Critical Video (MCVideo) media plane control; Protocol specification, Release 15, Release 15, Version 15.4.0, June 2019.

[15] 3GPP TS 24.582: Mission Critical Data (MCData) media plane control; Protocol specification, Release 15, Version 15.0.0, June 2018.

[16] 3GPP TS 26.179: Mission Critical Push To Talk (MCPTT); Codecs and media handling, Release 15, Version 15.0.0, June 2018.

[17] 3GPP TS 26.346: Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs, Release 15, Version 15.4.0, June 2019.

[18] 3GPP TS 29.212: Policy and Charging Control (PCC); Reference points; Release 15, Version 15.9.0, December 2019.

[19] 3GPP TS 29.214: Policy and Charging Control over Rx reference point; Stage 3, Release 15, Version 15.7.0, September 2019.

[20] 3GPP TS 29.468: Group Communication System Enablers for LTE(GCSE_LTE); MB2 reference point; Stage 3, Release 15, Version 15.8.0, December 2019.

[21] 3GPP TS 33.180: Security of the mission critical service, Release 15, Version 15.7.0, December 2019.

[22] IETF RFC 3515: The Session Initiation Protocol (SIP) Refer Method, April 2003.

[23] IETF RFC 3856: A Presence Event Package for the Session Initiation Protocol (SIP), August 2004.

[24] IETF RFC 3903: Session Initiation Protocol (SIP) Extension or Event State Publication, October 2004.

[25] IETF RFC 4488: Suppression of Session Initiation Protocol (SIP) REFER Method Implicit Subscription, May 2006.

[26] IETF RFC 4825: The Extensible Markup Language (XML) Configuration Access Protocol (XCAP), May 2007.

[27] IETF RFC 5366: Conference Establishment Using Request-Contained Lists in the Session Initiation Protocol (SIP), October 2008.

[28] IETF RFC 5373: Requesting Answering Modes for the Session Initiation Protocol (SIP), November 2008.

[29] IETF RFC 5875: An Extensible Markup Language (XML) Configuration Access Protocol (XCAP) Diff Event Package, May 2010.

[30] IETF RFC 6135: An Alternative Connection Model for the Message Session Relay Protocol (MSRP), February 2011.

[31] IETF RFC 6665: SIP-Specific Event Notification, July 2012.

[32] IETF RFC 7647: Clarifications for the use of REFER with RFC6665, September 2015.

[33] OMA. OMA-TS-XDM_Core-V2_1-20120403-A: XML Document Management (XDM) Specification, V2.1, April 2012

[34] OMA. OMA-TS-XDM_Group-V1_1_1-20170124-A: Group XDM Specification, V1.1.1, Jan 2017

[35] IETF RFC 7230: Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing, June 2014.

[36] IETF RFC 5246: The Transport Layer Security (TLS) Protocol Version 1.2., August 2008.

[37] IETF RFC 6101: The Secure Sockets Layer (SSL) Protocol Version 3.0., August 2011.

[38] IETF RFC 4975: The Message Session Relay Protocol (MSRP), September 2007.

3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [27] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [27].

AMR	Adaptative Multi-Rate Audio Codec
AMR-WB	Adaptative Multi-Rate Audio Codec Wideband
APP	Application
AS	Application Server
CMS	Configuration Management Server
CSC	Common Services Core
CSCF	Call Session Control Function
CSK	Client-Server Key
DUT	Device Under Test
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
EPC	Evolved Packet Core
EPS	Evolved Packet System
ETSI	European Telecommunications Standard Institute
EUT	Equipment Under Test
FD	File Distribution
FE	Functional Element
FRMCS	Future Railway Mobile Communication System
GCSE	Group Communication Service Enabler
GMK	Group Master Key
GMS	Group Management Server
iFC	Initial Filter Criteria
IFS	Interoperable Functions Statement
IMPI	IP Multimedia Private Identity
IMPU	IP Multimedia Public identity
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IdMS	Identity Management Server
KMS	Key Management Server
MBMS	Multimedia Broadcast and Multicast Service
MCData	Mission Critical Data
MCPTT ID	MCPTT user identity
MCPTT	Mission Critical Push-To-Talk
MCVideo	Mission Critical Video
MCX	Mission Critical Services (X stands for PTT, Data and Video)
OAM	Operation and Maintenance
OTT	Over the Top
PCC	Policy and Charging Control
PCRF	Policy and Charging Rules Function
PES	Pre-established Sessions
PSI	Public Service Identity
PSTA	Public Safety Technology Association
PTT	Push-To-Talk
ProSe	Proximity-based Services
RAN	Radio Access Network
RTP	Real-time Transport Protocol
SDS	Short Data Service
SIP	Session Initiation Protocol
SPK	Signalling Protection Key
TCCA	The Critical Communications Association
TD	Test Description
TR	Technical Recommendation
TRT	Test Reporting Tool
TS	Technical Specification
UE	User Equipment
UIC	International union of railways (Union Internationale des Chemins de fer)

4 Technical and Project Management

4.1 Scope

The main goal of the fifth MCX Plugtests was testing the interoperability of the MCPTT, MCData and MCVideo ecosystem signalling and media plane at different levels. The railway related functionalities were also tested during the event.

The basic scenario tested comprised MCX application server(s) -both controlling and participating- and MCX clients deployed over a generic SIP/IMS core, LTE access network with and without MCPTT required PCC capabilities with native multicast support (i.e. Release-14 -and higher- eMBMS) and UEs. The following figure (Fig 1) illustrates the basic test infrastructure. Additionally the server-to-server interface between controlling and non-controlling controlling server for temporary groups has been addressed.

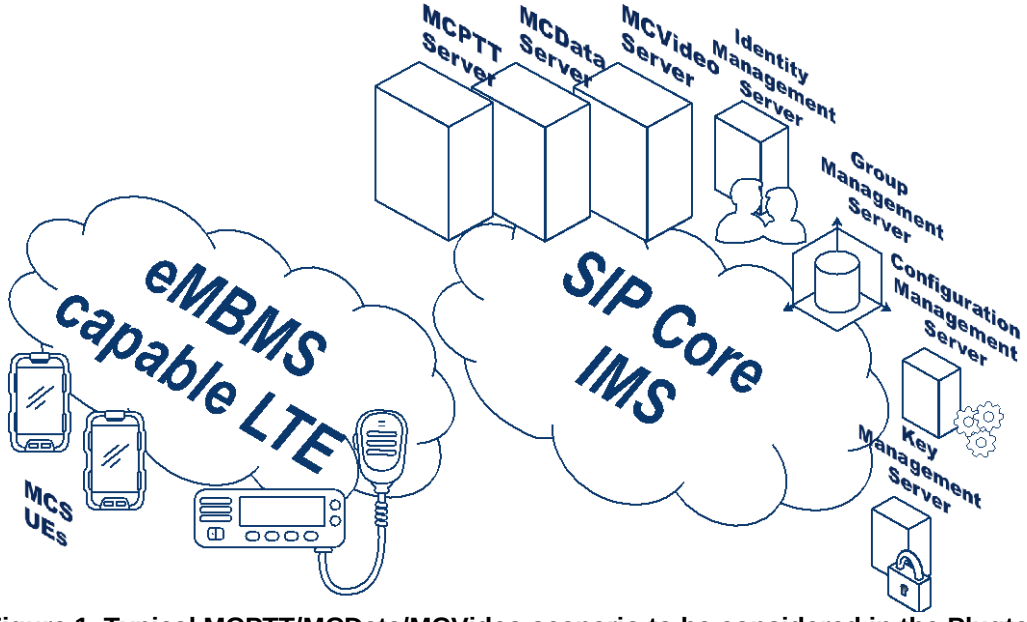

Figure 1. Typical MCPTT/MCData/MCVideo scenario to be considered in the Plugtests

In the scope of this Plugtests event, the following high level test objectives were performed

- **Connectivity (CONN)**: Tests covered basic connectivity between functional elements at different levels including Access Network (LTE), IP Network, SIP/IMS and MCPTT/MCData/MCVideo Application level. At LTE level, unicast and more particularly eMBMS multicast connectivity was evaluated. Tests at IP layer targeted pure OTT connectivity regardless the underlying access network. SIP connectivity tests checked proper deployment of MCX AS over the selected SIP Core/IMS so that all SIP messages were successfully delivered from MCX Clients to Participating/Controlling MCPTT Servers and vice versa. In this 5th Plugtests, again, some AS vendors provided their own builtin SIP/IMS cores so that Clients registered into different cores depending of the specific test session. Application level refers to e2e signalling, media, floor controlling (and other involved) protocols in use. Although for this Plugtests participants were encouraged to carry on CONN tests over Mission Critical LTE for unicast – or UNI-MC-LTE – and Mission Critical LTE with multicast eMBMS-capabilities – so called MULTI-MC-LTE -, most tests used the OTT (i.e. using WIFI / wired connections) one for its flexibility and the possibility of scheduling parallel test easily. Additionally, low level configuration-specific details (i.e. MCPTT. MC QCI and eMBMS bearer management) were considered in the PCC and eMBMS specific objectives.. MCData and MCVideo features were mostly analysed in test cases associated to the CONN objective while sibling procedures (i.e. registration to different MCPTT/MCData/MCVideo servers) were carried out when needed.

- **Floor Controlling (FC):** Apart from the basic Floor Controlling procedures considered during the first CONN objective, FC comprised comprehensive interoperability analysis of more complex interactions, including prioritization and pre-emptive mechanisms. New test cases comprises more advanced floor controlling (i.e. timeouts and revokes) were evaluated.

- **Policing (PCC)**: Comprised specific checking proper LTE dynamic bearer signalling and allocation by eUTRAN/EPC.
- **eMBMS (EMBMS)**: Comprised checking of eMBMS specific signalling both in the MB2-U/C interface and e2e.
- **Registration and authorization (REGAUTH)**: Comprised MCX Client registration.
- **Affiliation (AFFIL)**: Comprised MCX Client explicit and implicit affiliation
- **Location (LOC)**: In the test specification document several location configuration, retrieval and submission procedures were considered.
- **OAM procedures (CSC):** Comprised OAM related IdMS, CMS, GMS and KMS interfacing procedures. Mostly MCPTT mechanisms were evaluated since MCData/MCVideo implementations were not as mature as MCPTT implementations and are also mainly equivalent to MCPTT implementations.
- **Security (SEC):** Comprised security related procedures (including both signalling and media cyphering and key retrieval considered in KMS-related test cases in CSC test cases).
- **MCVideo Transmission Control (TC):** Traditional MCVideo call types and Transmission Control operations covered in previous Plugtests were newly evaluated. Several additional new MCVideo call types were also added for this plugtests.
- **Server-to-server communications (S2S)**: Controlling to non-controlling interface for temporary groups in different trust configurations.
- **FRMCS**: Functional alias (FA), multi-talker floor control and exchange of FA during call signalling and floor control were evaluated.
- **MCData**: SDS and File Distribution mechanisms and newly added emergency alerting mechanisms.
- **IOP**: Interoperability testing oriented complex test cases were added.
- **Observer Test Scenarios**: more complex test scenarios which have been developed by observers during MCX#4 Plugtests.

4.2 Timeline

The preparation was run through different phases as described in the figure below.

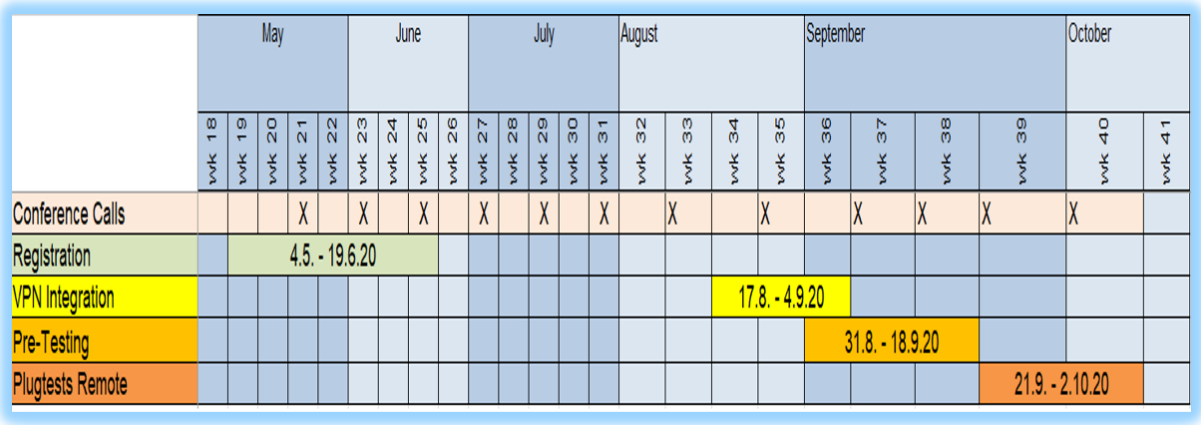

Figure 2. Plugtests event timeline

Registration to the MCX Plugtests event was open from 04th May 2020 to 19th June 2020 to any organisation willing to participate in testing the MCX Services Ecosystem. A total of 173 people were finally involved in the remote Plugtests event.

The following clauses describe the different phases of the Plugtests event preparation. It is worth noting that since the start of the documentation phase until the first week of the Plugtests event, bi-weekly conference calls were run among

organisers and participants to discuss and track the progress, anticipate and solve technical issues, review the test plan, etc.

4.2.1 Documentation

Once the registration to the Plugtests event was closed, the following documentation activities were launched in parallel:

1) EUT Documentation

Participants documented their EUTs, by providing the information directly to the Plugtests event team. The Plugtests event team compiled the final EUT table for all the participating vendors and was appended to the Plugtests event Test Plan,

All the information described above was made available in the Plugtests event WIKI, so that it could be easily maintained and consumed by participants.

2) Test Plan Development

The Test Plan development was led by ETSI Centre for Testing and Interoperability following the methodology defined by 3GPP TSG SA6 and 3GPP TSG CT1. The Test Plan was scoped around 3GPP Test Specification Release-15 capabilities and concentrated on the features supported by the implementations attending the Plugtests event.

The Test Plan was developed and consolidated in an iterative way, taking into account input and feedback received from Plugtests event participants. See details in clause 8.

4.2.2 Remote integration & pre-testing

Participants connected their implementations remotely to the Plugtests event infrastructure, known as HIVE: Hub for Interoperability and Validation at ETSI.

During this phase, up to 40 remote labs connected to HIVE and each of them was allocated a dedicated network. The interconnection of remote labs allowed running integration and pre-testing tasks remotely among any combination of participating EUTs, in order to ensure an efficient use of the f Plugtests event time and smoother Interoperability test sessions.

A VPN connection to HIVE was highly recommended for participants providing MCX Application Servers, MCX Clients and IMS for first connectivity tests, trouble shooting and infrastructure access purposes.

Additional details on the remote test infrastructure, remote integration and pre-testing procedures are provided in Clauses 6 and 7.

During this phase, the bi-weekly conference calls were continued among organisers and participants to synchronise, track progress and get ready for the on-site phase.

4.2.3 Plugtests event

From 21st of September to the 02nd of October 2020, participants connected their equipments with ETSI HIVE infrastructure to collaboratively run the Interoperability Test Sessions.

The following 5 days were dedicated to on-site interoperability test sessions involving all the participating EUTs organised in several parallel tracks, see details in Clause 4.3.2.

The scheduling of individual test combinations was done randomly using ETSI Test Reporting tool with the inputs and requests from the participants. The schedule was adapted during the test session slots on a per need basis.

4.3 Tools

4.3.1 Plugtests event WIKI

The Plugtests event WIKI was the main source of information for the MCX Plugtests event, from logistics aspects to testing procedures. Access to the WIKI was restricted to participating companies.

The main technical information provided in the wiki was organised as follows:

- **Event Information** – Logistics aspects of the Plugtests event.
- **Participants** – List of participants in the event.
- **Company Information** – Main Contact Details, Location and Time Zone of the vendors.
- **Observer Program** – Information about the Observer program during the Plugtests event.
- **Observers** – To manage the demo of Observer Scenarios and IOP test cases during the Plugtests event.
- **Test Tools** – Information from the Test Tool vendors about what kind of tests they are offering for the Plugtests.
- **Network Information** - HIVE connection request tool, and remote connections status overview.
- **Base and Test Specs** - High Level Test Scope including the test specification and reference to 3GPP and IETF specifications.
- **Equipment Registration** - Participating EUTs overview.
- **Testing Information** - Pre-configured parameters for EUTs.
- **Test Reporting Tool** - Documentation of the Test Reporting Tool.
- **Conference Calls** - Calendar, logistics, agendas and minutes of the bi-weekly conference calls run during the remote integration and pre-testing phase.
- **Plugtests Observations** - Issues found during Plugtests event.

In addition, Slack was used among the participants to communicate with each other during the pre-testing phase and Test Sessions, include their remote colleagues (back-office support) in the discussions.

4.3.2 Test Reporting Tool (TRT)

The Test Reporting Tool guides participants through the Test Plan test cases during the pre-testing and main Test Sessions. It allows creating Test Session Reports compiling detailed results for the individual scheduled Test Sessions.

Only the companies providing the EUTs for each specific Test Session combination have access to their Test Session Reports contents and specific results. All companies involved in a specific sessions and who have entered the test results were required to verify and approve the reported results at the end of each session. Only test report which has been approved by all involved parties are considered as valid.

Another interesting feature of this tool is the ability to generate real-time stats (aggregated data) of the reported results, per test case, test group, test session or overall results. These stats are available to all participants and organisers and allow tracking the progress of the testing with different levels of granularity, which is extremely useful to analyse the results.

2020-09-22 08:00	240	Interop VII	Config MCX	Alea - MCX Client Havelsan - MCX AS
2020-09-22 14:00	240	Interop IV	Config MCX	Havelsan - MCX Client Alea - MCX AS
2020-09-23 08:00	240	Interop VIII	Config MCX	Prescom - MCX Client MClabs private limited - MCX AS
2020-09-23 08:00	240	Interop IV	Config MCX	Softil - MCX Client Tassta - MCX AS
2020-09-23 14:00	240	Interop II	Config MCX	Tassta - MCX Client Airbus - MCX AS
2020-09-23 08:00	240	Interop V	Config MCX	Etelm - MCX Client Huawei - MCX AS
2020-09-23 08:00	240	Interop VII	Config MCX	ATOS - MCX Client Havelsan - MCX AS
2020-09-23 08:00	240	Interop X	Config MCX	Sigtech Wireless - MCX Client Airbus - MCX AS

Figure 3. Test Reporting Tool – example screen shot

5 Equipment Under Test

The tables below summarise the different EUTs provided by the Plugtests event participants:

5.1 MCX Application Servers

Organisation	Support
Airbus	MCPTT, MCDATA, MCVIDEO
Alea	MCPTT, MCDATA, MCVIDEO, RAIL
Frequentis	MCPTT, MCDATA, RAIL
Havelsan	MCDATA, MCVIDEO
Huawei	MCPTT, MCDATA, MCVIDEO
Hytera	MCPTT, MCDATA, MCVIDEO
Ilmeanau University	MCPTT, MCDATA, MCVIDEO
Kontron Transportation	MCPTT, MCDATA, MCVIDEO, RAIL
Leonardo	MCPTT, MCDATA, MCVIDEO, RAIL
MCLabs	MCPTT, MCDATA, RAIL
Motorola Solutions	MCPTT, MCDATA, MCVIDEO
Nemergent Solutions	MCPTT, MCDATA, MCVIDEO, RAIL
Polaris Networks	MCPTT
Samsung	MCPTT, MCDATA, MCVIDEO
StreamWide	MCPTT, MCDATA, MCVIDEO
TASSTA	MCPTT, MCDATA
TD Tech	MCPTT, MCDATA, MCVIDEO
Valid8	MCPTT, MCVIDEO

Table 1. MCPTT Application Servers Under Test

5.2 MCX Clients

Organisation	Support
Alea	MCPTT, MCDATA, MCVIDEO, RAIL
Atos	MCPTT
Catalyst	MCPTT, MCDATA
ErvoCom	MCPTT, MCDATA
Etelm	MCPTT, MCDATA
Frequentis	MCPTT, MCDATA, RAIL
Funkwerk	MCPTT, MCDATA, MCVIDEO, RAIL
Havelsan	MCDATA, MCVIDEO
Huawei	MCPTT, MCDATA, MCVIDEO
Hytera	MCPTT, MCDATA, MCVIDEO
Kontron Transportation	MCPTT, MCDATA, MCVIDEO, RAIL
Leonardo	MCPTT, MCDATA, MCVIDEO, RAIL
Nemergent Solutions	MCPTT, MCDATA, MCVIDEO, RAIL
Polaris Networks	MCPTT, MCDATA, MCVIDEO
Prescom	MCPTT, MCDATA, MCVIDEO
Samsung	MCPTT, MCDATA, MCVIDEO
Siemens	MCPTT, RAIL
Sigtech	MCPTT, MCDATA, MCVIDEO
Softil	MCPTT, MCDATA, MCVIDEO, RAIL
TASSTA	MCPTT, MCDATA
TD Tech	MCPTT, MCDATA, MCVIDEO

Organisation	Support
Valid8	MCPTT, MCVIDEO

Table 2. MCX Clients Under Test

5.3 IP Multimedia Subsystem (IMS)

Organisation	Support
Athonet	
Samsung	

Table 3. IP Multimedia Subsystem (IMS) Under Test

5.4 Evolved Multimedia Broadcast Multicast Services (eMBMS) Components

Organisation	Support
Athonet	
Enensys Expway	
One2many	

Table 4. Evolved Multimedia Broadcast Multicast Services (eMBMS) Components Under Test

5.4 Test Tools

Organisation	Support
Expandium	
MCS-TaaSting	
Polaris Networks	
Teraquant	
Valid8	

Table 5. Testers Under Test

6 Test Infrastructure

6.1 Remote Test Infrastructure

The remote testing and pre-testing phase were enabled by the setup as shown in Figure 5:

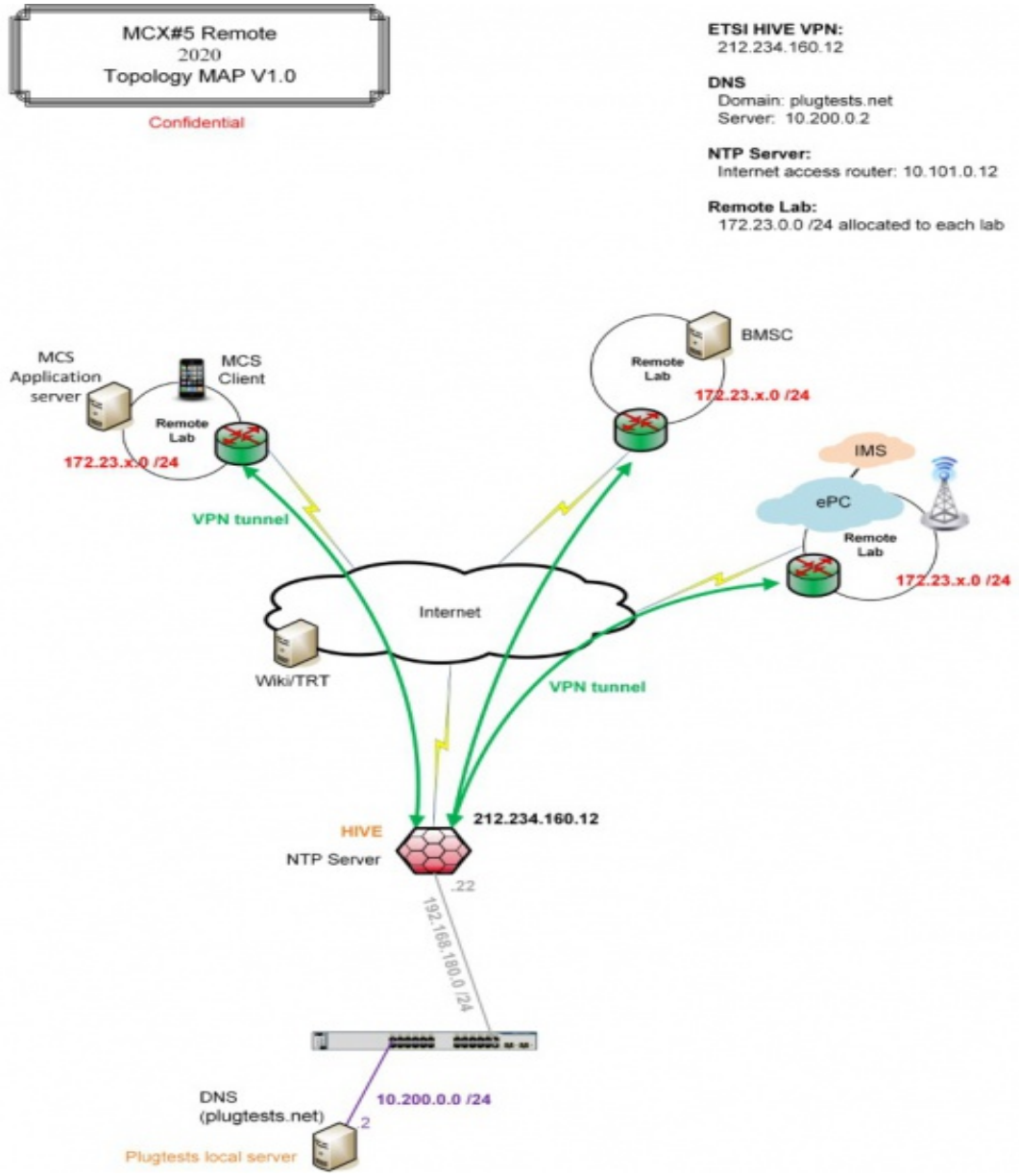

Figure 4. Remote Test Infrastructure

Once HIVE was deployed, a number of VPN tunnels were created to interconnect the equipment of the participants where the EUTs were running.

A total of 40 Remote Labs connected to the setup described above as a participant's lab.

7 Test Procedures

7.1 Remote Integration & Pre-testing Procedure

During the remote integration and pre-testing phase the following procedures were followed by the participating Equipment Under Test. Once the EUT documentation and HIVE connection had been successfully completed, the test cases from the test specifications were executed as part of the pre-testing

The progress of these procedures for the different combinations of EUTs was captured in the reporting function of TRT. The following Pre-Testing configurations were used in the pretesting phase

Config Name	Pre-testing Configuration
Config MCX(Subgroups IdMS, GMS_KMS, SubscriptionToCMS_GMS, MCPTT, MCData, MCVideo, FRMCS)	MCX Client + MCX AS (Participating + Controlling) + IMS / SIP Core

Table 6. Pre-testing Configuration

Subgroups (IdMS. GMS, KMS etc) in the Test Reporting Tool are similar to PICS (Protocol Implementation Conformance Statement) which are defined under the main configuration. To execute the test cases for that subgroup, the PICS should be true for both MCX Client and MCX Server. For example: to run IdMS test cases , MCX Client and server should have support for IdMS i.e. IdMS support was declared during the equipment registration and the subgroup configuration test cases will be visible in TRT for execution.

7.2 Interoperability Testing Procedure

During the Plugtests event, a daily Test Session Schedule was produced and shared via the TRT. Test Sessions were organised in several parallel tracks, ensuring that all participants had at least one Test Session scheduled any time. The different test configurations were used for the main event.

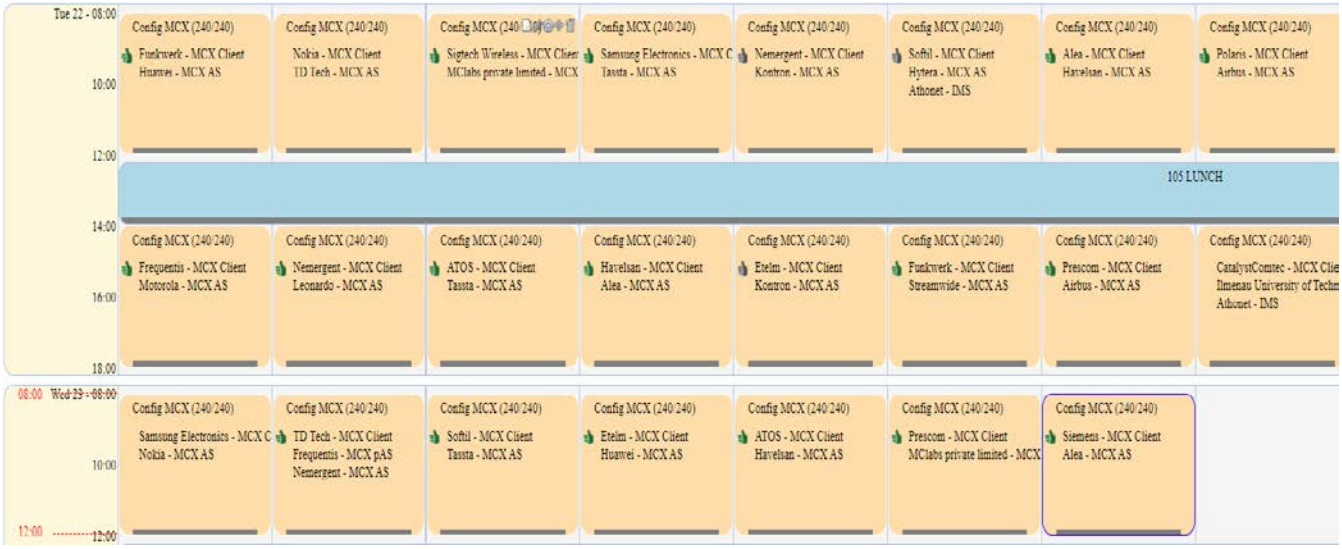

Figure 5. Daily Schedule & Test Sessions – example excerpt

Config Name	Main Test Configuration
Config MCX (Subgroups IdMS, GMS_KMS, SubscriptionToCMS_GMS, MCPTT, MCData, MCVideo, FRMCS)	MCX Client + MCX AS (Participating+Controlling) + IMS + UE + EUTRAN + PCRF
Config_MCX BMSC	BMSC + MCX AS (Participating+Controlling)
Config MCX Tester AS	Tester + MCX AS
Config MCX Tester Client	Tester + MCX Client

Table 7. Main Test Configurations

During each test session, for each tested combinations the Interoperability testing procedure was as follows:

1. The participating vendors opened the Test Session Report and the Test Plan.

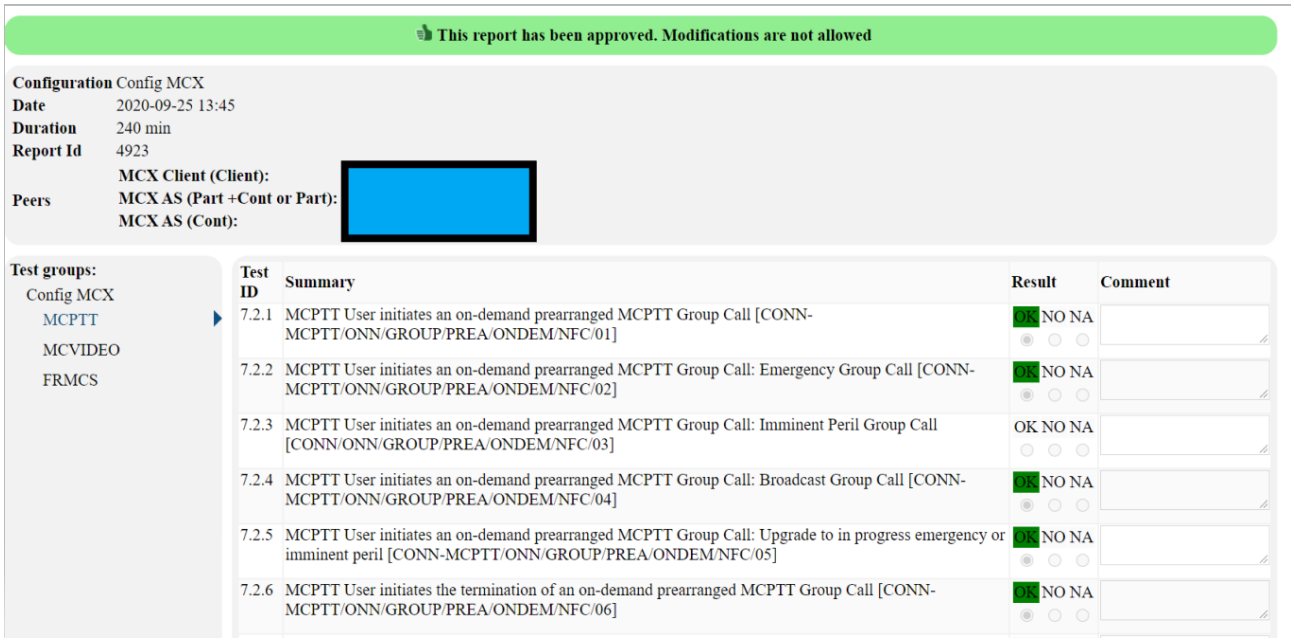

Figure 6. Test Session Report

2. For each Test in the Test Plan:

   a. The corresponding Test Description and EUT Configuration were followed.

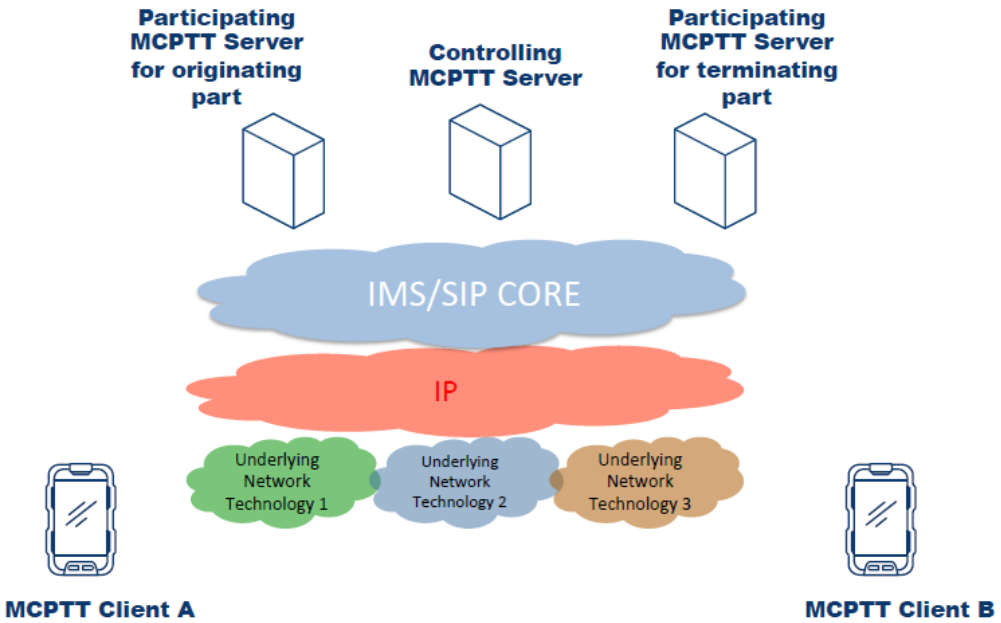

Figure 7. System Under Test (SUT) Configuration – MCPTT example

Interoperability Test Description			
Identifier	CONN/ONN/GROUP/PREA/ONDEM/NFC/01		
Test Objective	Verify IP connectivity, SIP core/IMS configuration and proper routing and SIP signaling of a pre-arranged on demand Group Call		
Configuration(s)	- CFG_ONN_OTT-1 (5.2) - CFG_ONN_UNI-MC-LTE-1 (5.3) - CFG_ONN_MULTI-MC-LTE-1 (5.4)		
References	- SIP (see [n.4] and other references in [n.5]) - MCPT (see [n.6] and other references in [n.5]) - RTP (see [n.4] and other references in [n.5])		
Applicability	- MCPTT-Client_ONN-MCPTT-CALL, MCPTT-Client_AMR-WB, MCPTT-Client_AFFIL, MCPTT-Client_MCPTT-FC (6.2) - MCPTT-Part_ONN-MCPTT-CALL, MCPTT-Part_AFFIL (see NOTE), MCPTT-Part_MCPTT-FC, MCPTT-Part_RX (CFG_ONN_UNI-MC-LTE-1 only), MCPTT-Part_GCSE (CFG_ONN_MULTI-MC-LTE-1 only), (6.5) - MCPTT-Ctrl_ONN-MCPTT-CALL, MCPTT-Ctrl_AFFIL (see NOTE) (6.6)		
Pre-test conditions	- IP connectivity among all elements of the specific scenario - Proper configuration of the SIP core/IMS to forward the signaling to the specific controlling and participating servers - UEs properly registered to the SIP core/IMS and MCPTT system - Calling user is affiliated to the called group		
Test Sequence	**Step**	**Type**	**Description**
	1	stimulus	User 1 (mcptt_id_clientA@example.com) calls mcptt-group-A
	2	check	Dialog creating INVITE received at the MCPTT participating server of mcptt_id_clientA@example.com after traversing SIP core/IMS
	3	check	INVITE received at the MCPTT controlling server
	4	check	The MCPTT controlling server loads the affiliated members of the mcptt-group-A (either preconfigured or retrieved from the GMS) and creates an INVITE per each of the "n" members
	5	check	"n" INVITEs received at the MCPTT participating servers of each mcptt_id_clientX (where X:1..n)
	6	check	"n" INVITEs received at the affiliated mcptt_id_clientX
	7	check	"n" SIP dialogs established
	8	verify	Call connected and multiple media flows exchanged

Figure 8. Test Description example

3. MCX equipment providers jointly executed the different steps specified in the test description and evaluated interoperability through the different IOP Checks prescribed in the Test Description

   b. The MCX equipment provider recorded the Test Result in the Test Session Report, as follows:

      i. OK: all IOP Checks were successful

      ii. NOK: at least one IOP Check failed. A comment was requested.

      iii. NA: the feature was not supported by at least 1 of the involved EUTs. A comment was requested.

4. Once all the tests in the Test Session Report were executed and results recorded, the participants reviewed the Report and approved it.

8 Test Plan Overview

8.1 Introduction

This 5th MCX Plugtests Test Plan was developed following ETSI guidelines for interoperability. Additional test cases were included comprising functional aliases, Multi-talker, MCVideo Transmission Control, server to server in different configurations.

The Test Plan was reviewed and discussed with participants during the preparation and pre-testing phase. Considering the huge number of resulting test cases and difference expected maturity of the implementations and differences from participants in the previous Plugtests event and new companies, vendors selected the subset of test cases to evaluate in a per-testing slot basis.

The following sections summarise the methodology used for identifying the different configuration and test objectives leading to different test cases sub groups.

8.2 Test configurations

The overall MCX ecosystem comprises both controlling and participating MCPTT/MCData/MCVideo application server(s), MCPTT Clients deployed over a generic SIP Core/IMS, LTE access network with and without MCPTT required PCC capabilities and native multicast support (i.e. Release-14 eMBMS). Furthermore, a series of support servers were integrated in the so-called Common Services Core provide configuration, identity, group and key management capabilities. Note, again 3GPP Release-15 compliant On-Network operations only were considered.

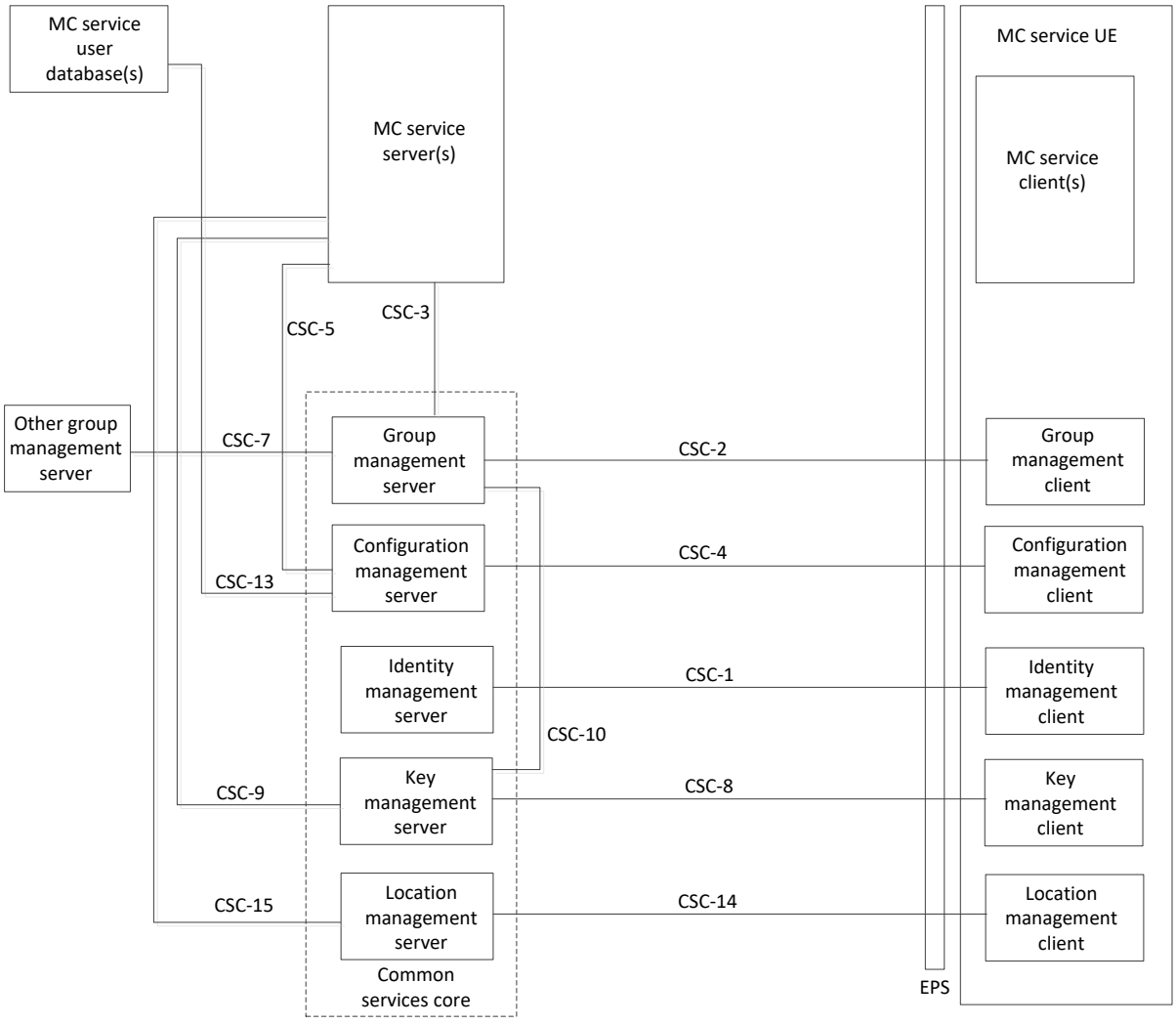

Figure 9. Functional model for application plane Figure 7.3.1-1 in 3GPP TS 23.280 [3].

Figure 7.3.1-1 in 3GPP TS 23.280 [3] describes the overall architecture and the reference points considered for the interoperability testing for any (MCPTT/MCData/MCVideo) MC Service (MCS). As can be seen, the resulting number of functional elements, interfaces and protocols involved is quite large. Furthermore, there are MCPTT/MCData/MCVideo-only specific interfaces and others (like Rx and MB2-C/MB2-U) involving other supporting technologies like LTE EPS. In order to focus on MCS signalling the following three different configuration were initially considered: MCPTT/MCData/MCVideo as an application service over IP networks (Over-the-Top), unicast Mission Critical LTE and multicast Mission Critical LTE (all of them for On-Network calls only).

8.2.1 Over-The-Top Configuration for On-Network calls (CFG_ONN_OTT-1)

This configuration considered On-Network Calls (ONN) with a pure Over-The-Top (OTT) approach. It emulated a scenario where any underlying network (i.e. commercial LTE, WiFi or any wired technology such as Ethernet) would provide a bit-pipe type only access. No QoS/prioritization enforcement neither access-layer multi/broadcasting capabilities would be provided (i.e. nor unicast PCC support or multicast mechanisms in LTE). Therefore, although not usable in a real world Mission Critical environment, it was used for connectivity tests since it did not require any binding between the IMS/SIP Core and the underlying LTE infrastructure and allowed both signalling and media plane parallel testing easily.

8.2.2 Unicast Mission Critical LTE for On-Network calls (CFG_ONN_UNI-MC-LTE-1)

In this configuration the LTE network (both EPC and eUTRAN) provided PCC capabilities and therefore enforced QoS policies in terms of prioritization and pre-emptiveness of Mission Critical unicast bearers. That included new Public Safety QCI 65/69 support in UEs and EPC/eUTRAN, and the availability of a PCRF with MCPTT compliant Rx/MCPTT-5 interface. Specific Rx/MCPTT-5 reference points and unicast bearer setup and update triggering mechanisms were tested using this configuration. Note that, although MCPTT only is mentioned and depicted in the following figure, MCVideo/MCData could follow the same approach.

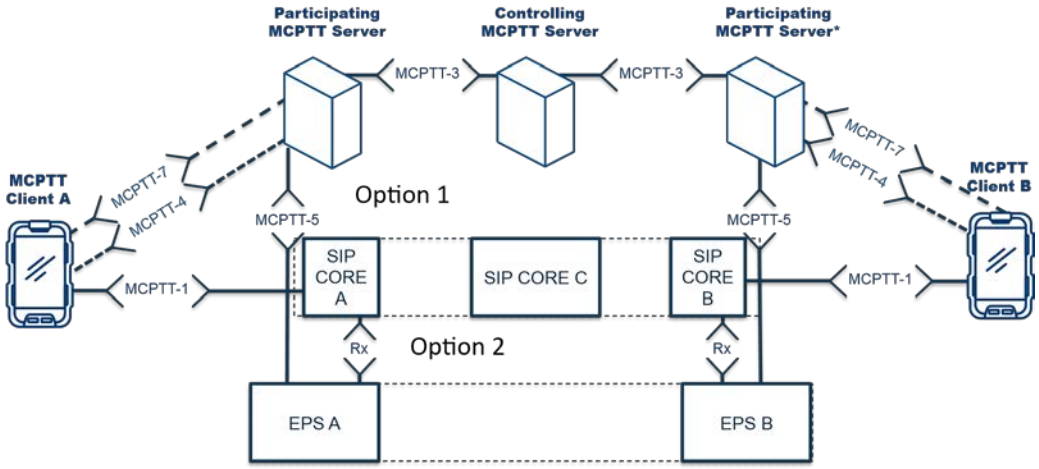

Figure 10. CFG_ONN_UNI-MC-LTE-1 configuration

8.2.3 Multicast Mission Critical LTE for On-Network calls (CFG_ONN_MULTI-MC-LTE-1)

In this configuration LTE provided multicast capability including Rel. 14 (and beyond) LTE-A Pro eMBMS and needed interfaces both in the core side (MB2-C and MB2-U with the BM-SC) and in the eUTRAN/UE side. It was used to test eMBMS bearer setup and update related test cases.

NOTE: In this remote 5th MCX Plugtests the unicast and multicast scenarios were limited to internal deployment due to the remote nature, so that they were not considered as different in the TRT tool.

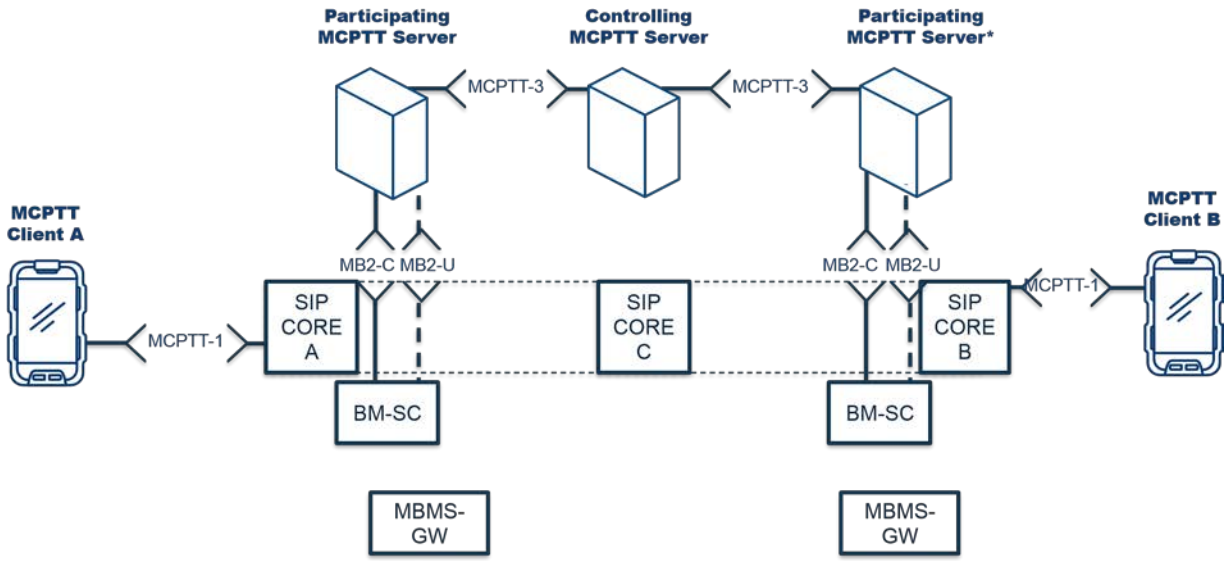

Figure 11. CFG_ONN_MULTI-MC-LTE-1 configuration

Due to specific low level technical constraints (i.e. the availability of joint/split participating and controlling AS, usage of MCPTT-5 interface instead of Rx for the PCC or eMBMS support in the UE) the original configurations led to the ones described in Figure 11 according to the following mapping.

In order to deal with the different test setting according to the three aforementioned configurations and cover specific more complex test configuration involving different clients and Observer test cases, the following configuration modes were defined in the TRT tool.

Configuration	Resulting configuration mode in the Plugtests (TRT)
ONN-OTT	Config MCX (Subgroups IdMS, GMS_KMS, SubscriptionToCMS_GMS, MCPTT, MCData, MCVideo, FRMCS) Config MCX BMSC Config MCX S2S Config MCX Tester AS Config MCX Tester Client

Table 7. Mapping of scenario architecture configurations and Plugtests event practical configurations

8.2.4 Group of test cases

As described in the Subclause 4.1 of this document, different test objectives were considered.

In order to avoid bottlenecks, Connectivity (CONN), Floor Controlling (FC), Registration and authorization (REGAUTH) and Affiliation (AFFIL) objectives were tested on the ONN_OTT configuration only. On the other hand Policing (PCC) related test cases were evaluated using UNI-MC-LTE configuration and eMBMS (eMBMS) used MULTI-MC-LTE configuration.

The following tables collect the test cases grouped by test objective following the structure of the test specification document itself.

Test Id	Test Purpose
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/01	On-demand prearranged MCPTT Group Call (Sections 10.1.1.2.1, 10.1.1.3.1.1 and 10.1.1.4 in)
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/02	On-demand prearranged MCPTT Group Call (Sections 10.1.1.2.1, 10.1.1.3.1.1 and 10.1.1.4 in [9]): Emergency MCPTT Group Call (6.2.8.1.[1-8][13-17] in [9])
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/03	On-demand prearranged MCPTT Group Call (Sections 10.1.1.2.1, 10.1.1.3.1.1 and 10.1.1.4 in [9]): Imminent Peril MCPTT Group Call (6.2.8.1.9-12 in [9])

Test Id	Test Purpose
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/04	On-demand prearranged MCPTT Group Call (Sections 10.1.1.2.1, 10.1.1.3.1.1 and 10.1.1.4 in [9]): Broadcast MCPTT Group Call (6.2.8.2 in [9])
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/05	On-demand prearranged MCPTT Group Call (Sections 10.1.1.2.1, 10.1.1.3.1.1 and 10.1.1.4 in [9] : Upgrade to in-progress emergency or imminent peril (10.1.1.2.1.3, 10.1.2.2.1.4 in [9])
CONN-MCPTT/GROUP/PREA/ONDEM/NFC/06	Termination of an on-demand prearranged MCPTT Group Calls (Sections 10.1.1.2.3.1 and 10.1.1.3.3.1 in [9])
CONN-MCPTT/GROUP/PREA/PRE/NFC/01	Prearranged MCPTT Group Call using pre-established session (Sections 10.1.1.2.2, 10.1.1.3.1.2 and 10.1.1.4 in [9]
CONN-MCPTT/GROUP/PREA/PRE/NFC/02	Termination of a prearranged MCPTT Group Call using pre-established session (Sections 10.1.1.2.3.2 and 10.1.1.3.3.2 in [9])
CONN-MCPTT/GROUP/CHAT/ONDEM/NFC/01	On-demand MCPTT Chat Group Call establishment (Sections 10.1.2.2.1.1, 10.1.2.3.1.1, 10.1.2.3.1.3 and 10.1.2.4.1.1 in [9])
CONN-MCPTT/GROUP/CHAT/ONDEM/NFC/02	Ongoing on-demand MCPTT Chat Group Call upgraded to emergency call (Sections 10.1.2.2.1.4, 10.1.2.2.1.2, 10.1.2.3.1.2, 10.1.2.3.1.4 and 10.1.2.4.1.2 in [9])
CONN-MCPTT/GROUP/CHAT/ONDEM/NFC/03	Ongoing on-demand MCPTT Chat Group Call upgraded to imminent peril (Sections 10.1.2.2.1.4, 10.1.2.2.1.2, 10.1.2.3.1.2, 10.1.2.3.1.4 and 10.1.2.4.1.3 in [9])
CONN-MCPTT/GROUP/CHAT/ONDEM/NFC/04	Cancellation of the in-progress emergency condition of an on-demand MCPTT Chat Group Call (Sections 10.1.2.2.1.3, 10.1.2.2.1.2, 10.1.2.3.1.2, 10.1.2.3.1.4 and 10.1.2.4.1.2 in [9])
CONN-MCPTT/GROUP/CHAT/ONDEM/NFC/05	Cancellation of the in-progress imminent peril condition of an on-demand MCPTT Chat Group Call (Sections 10.1.2.2.1.5, 10.1.2.2.1.2, 10.1.2.3.1.2, 10.1.2.3.1.4 and 10.1.2.4.1.3 in [9])
CONN-MCPTT/GROUP/CHAT/PRE/NFC/01	MCPTT Chat Group Call establishment within a pre-established session (Sections 10.1.2.2.2, 10.1.2.2.1.6, 10.1.2.3.2.1, 10.1.2.3.2.2 and 10.1.2.4.1.1 in [9])
CONN-MCPTT/PRIV/AUTO/ONDEM/WFC/NFC/01	On-demand private MCPTT call with floor control (Section 11.1.1.2.1 in [9]) and automatic commencement mode, see [31])
CONN-MCPTT/PRIV/MAN/ONDEM/WFC/NFC/01	On-demand private MCPTT call with floor control manual mode (Section 11.1.1.2.1 in [9]) and manual commencement mode, see [31])
CONN-MCPTT/PRIV/AUTO/PRE/WFC/NFC/01	Pre-established private MCPTT call with floor control (Section 11.1.1.2.1 in [9]) and automatic commencement mode, see [31])
CONN-MCPTT/PRIV/MAN/PRE/WFC/NFC/01	Pre-established private MCPTT call with floor control manual mode (Section 11.1.1.2.1 in [9]) and manual commencement mode, see [31])
CONN-MCPTT/PRIV/AUTO/ONDEM/WOFC/01	On-demand private MCPTT call without floor control (Section 11.1.1.2.1 in [9]) and automatic commencement mode, see [31])
CONN-MCPTT/PRIV/MAN/ONDEM/WOFC/01	On-demand private MCPTT call without floor control manual mode (Section 11.1.1.2.1 in [9]) and manual commencement mode, see [31])
CONN-MCPTT/PRIV/AUTO/PRE/WOFC/01	Pre-established private MCPTT call without floor control (Section 11.1.1.2.1 in [9]) and automatic commencement mode, see [31])
CONN-MCPTT/PRIV/MAN/PRE/WOFC/01	Pre-established private MCPTT call without floor control manual mode (Section 11.1.1.2.1 in [9]) and manual commencement mode, see [31])
CONN-MCPTT/ONN/FIRST/MANUAL/ONDEM/WFC/NFC/01	MCPTT User initiates an on-demand first-to-answer MCPTT call with floor control (Sections 11.1.1.2.1, 11.1.1.3.1.1 and 11.1.1.4 in [9])
CONN-MCPTT/ONN/FIRST/MANUAL/ONDEM/WOFC/NFC/01	MCPTT User initiates an on-demand first-to-answer MCPTT call without floor control (Section 11.1.2 in [9])

Test Id	Test Purpose
CONN-MCPTT/ONN/FIRST/MANUAL/PRE/WFC/NFC/01	MCPTT User initiates an on-demand first-to-answer MCPTT call with floor control using pre-established sessions (Sections 11.1.1.2.2, 11.1.1.3.1.2, 11.1.3.2.2 and 11.1.1.4 in [9] and [30])
CONN-MCPTT/ONN/FIRST/MANUAL/PRE/WOFC/01	MCPTT User initiates a pre-established first-to-answer MCPTT call in manual commencement mode without floor control
CONN-MCPTT/ONN/CALLBACK/SETUP/01	MCPTT User setups a private-call callback (Sections 11.1.1.2.1, 11.1.1.3.1.1 and 11.1.1.4 in [9])
CONN-MCPTT/ONN/CALLBACK/CANCEL/01	MCPTT User cancels a private-call callback (Section 11.1.2 in [9])
CONN-MCPTT/ONN/CALLBACK/FULFIL/01	MCPTT User fulfils a private-call callback
CONN-MCPTT/ONN/AMBIENT/ONDEM/LOCAL/01	MCPTT User setups locally an on-demand ambient listening call (Sections 11.1.6.2.1.1, 11.1.6.3 and 11.1.6.4 in [9])
CONN-MCPTT/ONN/AMBIENT/ONDEM/LOCAL/02	MCPTT User releases locally an on-demand ambient listening call (Section 11.1.6.2.1.3 in [9])
CONN-MCPTT/ONN/AMBIENT/PRE/LOCAL/01	MCPTT User setups locally an ambient listening call using pre-established session (Section 11.1.6.2.2 in [\ref{nr:3gpp-ts-23379}])
CONN-MCPTT/ONN/AMBIENT/PRE/LOCAL/02	MCPTT User releases locally an ambient listening call using pre-established session (Section 11.1.6.2.2.3 in [9])
CONN-MCPTT/ONN/AMBIENT/ONDEM/REMOTE/01	MCPTT User setups remotely an on-demand ambient listening call (Section 11.1.6.2.1.1 in [9])
CONN-MCPTT/ONN/AMBIENT/ONDEM/REMOTE/02	MCPTT User releases remotely an on-demand ambient listening call (Section 11.1.6.2.1.3 in [9])
CONN-MCPTT/ONN/AMBIENT/PRE/REMOTE/01	MCPTT User setups remotely an ambient listening call using pre-established session
CONN-MCPTT/ONN/AMBIENT/PRE/REMOTE/02	MCPTT User releases remotely an ambient listening call using pre-established session
CONN-MCPTT/ONN/GROUPCHANGE/01	Remote change of selected group (Section 10.1.4 in [9])
CONN-MCDATA/O2O/STANDALONE/SDS/SIP/01	One-to-one standalone SDS over SIP
CONN-MCDATA/O2O/STANDALONE/SDS/MSRP/01	One-to-one standalone SDS over media plane (MSRP)
CONN-MCDATA/O2O/SESSION/SDS/MSRP/01	One-to-one SDS session
CONN-MCDATA/GROUP/STANDALONE/SDS/SIP/01	Group standalone SDS over SIP
CONN-MCDATA/GROUP/STANDALONE/SDS/MSRP/01	Group standalone SDS over media plane (MSRP)
CONN-MCDATA/GROUP/SESSION/SDS/MSRP/01	Group SDS session
CONN-MCDATA/O2O/FD/HTTP/01	One-to-one FD using HTTP
CONN-MCDATA/GROUP/FD/HTTP/01	Group FD using HTTP
CONN-MCDATA/O2O/FD/MSRP/01	One-to-one FD using media plane (MSRP)
CONN-MCDATA/GROUP/FD/MSRP/01	Group FD using media plane (MSRP)
CONN-MCDATA/DISNOT/SDS/01	Standalone SDS with delivered and read notification
CONN-MCDATA/DISNOT/SDS/02	Group standalone SDS with delivered and read notification
CONN-MCDATA/DISNOT/FD/01	One-to-one FD using HTTP with file download completed notification
CONN-MCDATA/DISNOT/FD/02	Group FD using HTTP with file download completed notification
CONN-MCDATA/NET/FD/01	Network triggered FD notifications
CONN MCVIDEO/ONN/PRIV/AUTO/ONDEM/WTC/NTC/01	On-demand private MCVideo call in automatic commencement mode with transmission control
CONN-MCVIDEO/ONN/PRIV/AUTO/ONDEM/WOTC/01	On-demand private MCVideo call in automatic commencement mode without transmission control
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/01	On-demand prearranged MCVideo Group Call
CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/01	On-demand MCVideo Chat Group Call
CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/07	Late call entry of a MCPTT User during an on-demand prearranged MCPTT Group Call
CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/03	Late call entry of a MCPTT User during a prearranged MCPTT Group Call using pre-established session
CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/08	Rejoin of a MCPTT User during an on-demand prearranged MCPTT Group Call

Test Id	Test Purpose
CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/04	Rejoin of a MCPTT User during an on-demand prearranged MCPTT Group Call using pre-established session
CONN-MCPTT/ONN/GROUP/CHAT/ONDEM/SUBCONF/01	Subscription to Conference Event package
CONN-MCPTT/ONN/PRIV/AUTO/ONDEM/WFC/NFC/02	MCPTT User initiates an on-demand private MCPTT emergency call in automatic commencement model with floor control
CONN-MCPTT/ONN/EMERG-ALERT/MSG/01	MCPTT User initiates an emergency alert by sending a SIP MESSAGE
CONN-MCPTT/ONN/EMERG-ALERT/MSG/02	MCPTT User cancels an emergency alert by sending a SIP MESSAGE
CONN-MCPTT/ONN/EMERG-ALERT/MSG/03	MCPTT User cancels an emergency alert originated by other user by sending a SIP MESSAGE
CONN-MCPTT/ONN/EMERG-ALERT/MSG/04	MCPTT client receives a notification of entry into a group geographic area
CONN-MCPTT/ONN/EMERG-ALERT/MSG/05	MCPTT client receives a notification of exit from a group geographic area
CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/09	MCPTT User exits an ongoing an on-demand prearranged MCPTT Group Call upon de-affiliation to this group
CONN-MCDATA/ONN/O2O/FD/HTTP/02	Receive O2O FD request with mandatory download
CONN-MCDATA/ONN/O2O/FD/HTTP/03	Receive O2O FD request without mandatory download
CONN-MCDATA/ONN/DEFER/01	Request a list of deferred group communications
CONN-MCDATA/ONN/GROUP/STANDALONE/SDS/SIP/02	Send an enhanced status to an MCData group
CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/02	MCVideo User upgrades an ongoing on-demand Chat Group Call to emergency call
CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/03	MCVideo User upgrades an ongoing on-demand Chat Group Call to imminent-peril call
CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/04	MCVideo User cancels the emergency condition of an on-demand Chat Group Call
CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/05	MCVideo User cancels the imminent-peril condition of an on-demand Chat Group Call
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/02	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Emergency Group Call
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/03	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Imminent Peril Group Call
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/04	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Broadcast Group Call
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/05	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Upgrade to in progress emergency or imminent peril
CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/06	MCVideo User initiates the termination of an on-demand prearranged MCVideo Group Call
CONN-MCVIDEO/ONN/PRIV/MANUAL/ONDEM/WOTC/NTC/01	MCVideo User initiates an on-demand private MCVideo call in manual commencement mode without transmission control
CONN-MCVIDEO/ONN/PRIV/MANUAL/ONDEM/WTC/NTC/01	MCVideo User initiates an on-demand private MCVideo call in manual commencement mode with transmission control
CONN-MCVIDEO/ONN/AMBIENT/ONDEM/LOCAL/01	MCVideo User setups locally an on-demand ambient viewing call
CONN-MCVIDEO/ONN/AMBIENT/ONDEM/LOCAL/02	MCVideo User releases remotely an on-demand ambient viewing call
CONN-MCVIDEO/ONN/AMBIENT/ONDEM/REMOTE/01	MCVideo User setups remotely an on-demand ambient viewing call
CONN-MCVIDEO/ONN/AMBIENT/ONDEM/REMOTE/02	MCVideo User releases remotely an on-demand ambient viewing call
CONN-MCVIDEO/ONN/ONE-TO-ONE/VIDEOPULL/01	MCVideo User initiates a one-to-one video pull in automatic commencement mode with transmission control
CONN-MCVIDEO/ONN/ONE-FROM-SERVER/VIDEOPULL/01	MCVideo User initiates a one-from-server video pull in automatic commencement mode with transmission control

Test Id	Test Purpose
CONN-MCVIDEO/ONN/ONE-TO-ONE/VIDEOPUSH/01	MCVideo User initiates a one-to-one video push in automatic commencement mode with transmission control
CONN-MCVIDEO/ONN/ONE-TO-SERVER/VIDEOPUSH/01	MCVideo User initiates a one-to-server video push in automatic commencement mode with transmission control
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/01	MCVideo User initiates an emergency alert by sending a SIP MESSAGE
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/02	MCVideo User cancels an emergency alert by sending a SIP MESSAGE
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/03	MCVideo User cancels an emergency alert originated by other user by sending a SIP MESSAGE
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/04	MCVideo client receives a notification of entry into a group geographic area
CONN-MCPTT/ONN/PRIV/AUTO/ONDEM/WFC/NFC/02	MCPTT User initiates an on-demand private MCPTT emergency call in automatic commencement model with floor control
CONN-MCPTT/ONN/EMERG-ALERT/MSG/01	MCPTT User initiates an emergency alert by sending a SIP MESSAGE
CONN-MCPTT/ONN/EMERG-ALERT/MSG/02	MCPTT User cancels an emergency alert by sending a SIP MESSAGE
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/03	MCVideo User cancels an emergency alert originated by other user by sending a SIP MESSAGE
CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/04	MCVideo client receives a notification of entry into a group geographic area

Table 8. Test Group for the Connectivity (CONN) objective

Test Id	Test Purpose
FC/BASIC/01	Basic FC functionality (Subclause 6 in 3GPP TS 24.380 [10])
FC/BASIC/02	Basic FC functionality. Effect of Priorities (following A.3.5 example in 3GPP TS 24.380 [10]
FC/ADV/01	Floor control revoking upon expires (T2)
FC/ADV/02	Floor control revoking upon release
FC/ADV/03	Floor control revoking upon revoke
FC/FA/BASIC/01	Sharing/Display of FA during basic FC operations
FC/MT/BASIC/01	Multi-talker basic operation

Table 9. Test Group for the Floor Controlling (FC) objective

Test Id	Test Purpose
REGAUTH/IDMSAUTH/01	MCPTT Client authentication and tokens retrieval using IdMS 3GPP TS 24.482 [12]
REGAUTH/3PRTYREG/REGISTER/01	MCPTT Client registration using 3rd party register (Subclauses 7.2.1 and 7.3.2 in 3GPP TS 24.379 [9])
REGAUTH/PUBLISH/REGISTER/01	MCPTT Client registration using SIP PUBLISH (Subclauses 7.2.2 and 7.3.3 in 3GPP TS 24.379 [9])

Table 10. Test Group for the Registration and Authorization (REGAUTH) objective

Test Id	Test Purpose
PCC/BEARERSETUP/01	Unicast MC Bearer Setup by SIP Core/IMS (Sections 4.4.1 and 4.4.2 in [21])
PCC/BEARERSETUP/02	Unicast MC Bearer Setup by MCPTT Participating AS (Sections 4.4.1 and 4.4.2 in [21])
PCC/BEARERUPDATE/01	Unicast MC Bearer Update by SIP Core/IMS due to a change in the Call characteristics

Test Id	Test Purpose
PCC/BEARERUPDATE/02	Unicast MC Bearer Update by MCPTT Participating AS due to a change in the Call characteristics
PCC/BEARERSETUP/03	Unicast MC Bearer Setup by SIP Core/IMS using pre-established sessions (Sections 4.4.1 and 4.4.2 in [21])
PCC/BEARERSETUP/04	Unicast MC Bearer Setup by MCPTT Participating AS using pre-established sessions (Sections 4.4.1 and 4.4.2 in [21])

Table 11. Test Group for the Policing (PCC) objective

Test Id	Test Purpose
EMBMS/ACTIVATEBEARER/WPRETMGI/01	Use of dynamically established MBMS bearers in prearranged MCPTT group calls with pre-allocated TMGIs (Subclauses 5.2.1 and 5.3.2 in 3GPP TS 29.468 [23])
EMBMS/ACTIVATEBEARER/WOPRETMGI/01	Use of dynamically established MBMS bearers in prearranged MCPTT group calls without pre-allocated TMGIs
EMBMS/PREBEARER/WPRETMGI/01	Use of pre-established MBMS bearers in prearranged group calls with pre-allocated TMGIs
EMBMS/PREBEARER/WOPRETMGI/01	Use of pre-established MBMS bearers in prearranged group calls without pre-allocated TMGIs
EMBMS/MODIFYBEARER/01	Modification of MBMS bearers upon reception of emergency upgrade request
EMBMS/DEACTIVBEARER/WTMGIDEA/01	Deactivation of MBMS bearers after termination of a prearranged MCPTT group call with TMGI deallocation
EMBMS/DEACTIVBEARER/WOTMGIDEA/01	Deactivation of MBMS bearers after termination of a prearranged MCPTT group call without TMGI deallocation
EMBMS/SWITCHTOUNITMGIEXP/01	Switching to unicast bearer after TMGI expiration

Table 12. Test Group for the eMBMS (eMBMS) objective

Test Id	Test Purpose
AFFIL/DET/01	Determining self affiliation (Subclauses 9.2.1.3 and 9.2.2.2.4 in 3GPP TS 24.379 [9])
AFFIL/DET/02	Determining affiliation status of another user (Subclauses 9.2.1.3 and 9.2.2.2.4 in 3GPP TS 24.379 [9])
AFFIL/CHANGE/01	Affiliation status change triggered by the MCPTT User itself (Subclauses 9.2.1.2 and 9.2.2.2.3 in 3GPP TS 24.379 [9])
AFFIL/CHANGE/02	Affiliation status change triggered by another MCPTT User in mandatory mode (Subclauses 9.2.1.2, 9.2.2.3.3 in 3GPP TS 24.379 [9])
AFFIL/CHANGE/03	Affiliation status change triggered by another MCPTT User in negotiated mode (Subclauses 9.2.1.4 and 9.2.1.5 in 3GPP TS 24.379 [9])

Table 13. Test Group for the Affiliation (AFFIL) objective

Test Id	Test Purpose
LOC/3PRTYREG/CONFIG/01	MCPTT Client Configuration upon 3rd party register (Subclauses 13.2.2 and 13.3.2 in 3GPP TS 24.379 [9])
LOC/REQUEST/01	Request for Location Report to the MCPTT Client (Subclauses 13.2.3 and 13.3.3 in 3GPP TS 24.379 [9])
LOC/SUBMISSION/01	MCPTT Client Sends location upon trigger (Section 13.3.4 in 3GPP TS 24.379 [9])

Table 14. Test Group for the Location (LOC) objective

Test Id	Test Purpose
CSC-CMS/UECONF/UE/01	Subscription and UE configuration document retrieval from the MC UE (Sections 6.3.3 and 6.3.13 -specifically 6.3.13.2.2a and 6.3.13.3.2.3f- in [14]), OMA XDM mechanisms and procedures in [29])
CSC-CMS/UPROCONF/UE/01	Subscription and user profile configuration document retrieval from the MC UE
CSC-CMS/SERVCONF/UE/01	Subscription and service configuration document retrieval from the MC UE
CSC-CMS/SERVCONF/MCSSERV/01	Subscription and service configuration document retrieval from the MCS server
CSC-GMS/GROUP/UE/01	Subscription and group document retrieval from the MC UE
CSC-GMS/GROUP/MCSSERV/01	Subscription and group document retrieval from the MCS Server
CSC/MULTIPLESUBS/UE/01	Subscription and retrieval of multiple documents from the CMS using subscription proxy
CSC/MULTIPLESUBSGMSGROUP/UE/01	Subscription and retrieval of multiple documents from the GMS using subscription proxy

Table 15. Test Group for the OAM Procedures (CSC) objective

Test Id	Test Purpose
SEC/KEYMDOWNLOAD/WPROXY/01	Key material download from KMS to MCPTT client (CSC-8) with proxy
SEC/KEYMDOWNLOAD/WPROXY/02	Key material download from KMS to MCPTT server (CSC-9) with proxy
SEC/KEYMDOWNLOAD/WPROXY/03	Key material download from KMS to MCPTT GMS (CSC-10) with proxy
SEC/KEYMDOWNLOAD/WOPROXY/01	Key material download from KMS to MCPTT client (CSC-8) without proxy
SEC/KEYMDOWNLOAD/WOPROXY/02	Key material download from KMS to MCPTT server (CSC-9) without proxy
SEC/KEYMDOWNLOAD/WOPROXY/03	Key material download from KMS to MCPTT GMS (CSC-10) without proxy
SEC/KEYDIST/CSK/01	Key management from MC client to MC server (CSK upload)
SEC/KEYDIST/GMK/01	Key management for group communications (GMK)
SEC/KEYDIST/MUSIK/01	Key management from MC server to MC client (Key download MuSiK)
SEC/ENCRYPTION/PRIVATE/01	Encryption of MCPTT private calls (use of derived encryption keys from PCK for the audio and CSK for floor control and RTCP reports)
SEC/ENCRYPTION/GROUP/01	Encryption of MCPTT group calls (use of derived encryption keys from GMK for the audio and CSK for floor control and RTCP reports)
SEC/ENCRYPTION/GROUPEMBMS/01	Encryption of MCPTT group calls using eMBMS (use of derived encryption keys from MuSIK for the floor control and MSCCK for eMBMS control)
SEC/XMLENCRYPT/PRIVATE/01	XML contents encryption in MCPTT private calls (mcptt-info and resource-lists)
SEC/XMLENCRYPT/GROUP/01	XML contents encryption in MCPTT group calls (mcptt-info)
SEC/XMLENCRYPT/AFFIL/01	XML contents encryption in affiliation procedure
SEC/XMLENCRYPT/LOC/01	XML contents encryption in location procedure
SEC/XMLENCRYPT/REGAUTH/01	XML contents encryption in registration and authorization procedures

Table 16. Test Group for the Security (SEC) objective

Test Id	Test Purpose
TC/BASIC/01	Basic TC functionality

Test Id	Test Purpose
TC/BASIC/02	Effect of maximum number of transmitters
TC/BASIC/03	Effect of maximum number of receivers
TC/BASIC/04	Basic TC functionality. Maximum number of transmitters and pre-emptive priority request

Table 17. Test Group for the MCVideo Transmission Control (TC) objective

Test Id	Test Purpose
S2S/ONN/GROUP/PREA/ONDEM/TEMP/01	On-demand prearranged MCPTT Group Call to temporary group in trusted mode
S2S/ONN/GROUP/PREA/ONDEM/TEMP/02	On-demand prearranged MCPTT Group Call to temporary group in untrusted mode

Table 18. Test Group for the Server-to-server communications (S2S) objective

Test Id	Test Purpose
FA/CHANGE/01	MCPTT user requests to activate one or more functional aliases
FA/CHANGE/02	MCPTT user requests to deactivate one or more functional aliases
FA/CHANGE/03	MCPTT user refreshes the interest on one or more functional aliases
FA/CHANGE/04	MCPTT user takes over a functional aliases
FA/LOCCHANGE/01	MCPTT user requests to activate one or more functional aliases upon entering a location area
FA/LOCCHANGE/02	MCPTT user requests to deactivate one or more functional aliases upon entering a location area
FA/DET/01	MCPTT user determines the functional aliases successfully activated
FA/DET/02	MCPTT user determines the functional aliases successfully activated for another user

Table 19. Test Group for the Functional Aliasing (FA) objective

Test Id	Test Purpose
IOP/01	Effect of (de)affiliating another user during an ongoing group call
IOP/02	GEOFENCING
IOP/03	Complete group-regrouping procedure
IOP/04	Effect of adding a user to a group and CSC subscriptions
IOP/05	Missed call and private call callback
IOP/06	EMBMS switch from unicast to multicast and back to unicast
IOP/07	one-to-server video push & one-from-server video pull operation

Table 20. Test Group for the Interoperability (IOP) objective

Test Id	Test Purpose
OS1	Emergency call
OS2	Emergency call handling
OS3	Encrypted private call
OS4.1	eMBMS MCPTT
OS4.2	eMBMS MCVideo
OS5	Switching on
OS6	Encrypted MCPTT group call
~~OS7.1~~	~~Enhanced status~~ NA in this Plugtests

Test Id	Test Purpose
OS7.2	MCDATA SDS
OS8	Encrypted MCVideo Group Call
OS9	Parallel MCPTT and MCVIDEO

Table 21. Observers test cases

8.2.5 Mapping of Test Cases to Test Case Numbers

Number	Name
7.2	**Connectivity (CONN)**
7.2.1	MCPTT User initiates an on-demand prearranged MCPTT Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/01]
7.2.2	MCPTT User initiates an on-demand prearranged MCPTT Group Call: Emergency Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/02]
7.2.3	MCPTT User initiates an on-demand prearranged MCPTT Group Call: Imminent Peril Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/03]
7.2.4	MCPTT User initiates an on-demand prearranged MCPTT Group Call: Broadcast Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/04]
7.2.5	MCPTT User initiates an on-demand prearranged MCPTT Group Call: Upgrade to in progress emergency or imminent peril [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/05]
7.2.6	MCPTT User initiates the termination of an on-demand prearranged MCPTT Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/06]
7.2.7	MCPTT User initiates a prearranged MCPTT Group Call using pre-established session [CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/01]
7.2.8	MCPTT User initiates the termination of a prearranged MCPTT Group Call using pre-established session [CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/02]
7.2.9	MCPTT User initiates an on-demand Chat Group Call [CONN-MCPTT/ONNGROUP/CHAT/ONDEM/NFC/01]
7.2.10	MCPTT User upgrades an ongoing on-demand Chat Group Call to emergency call [CONN-MCPTT/ONN/GROUP/CHAT/ONDEM/NFC/02]
7.2.11	MCPTT User upgrades an ongoing on-demand Chat Group Call to imminent-peril call [CONN-MCPTT/ONN/GROUP/CHAT/ONDEM/NFC/03]
7.2.12	MCPTT User cancels the emergency condition of an on-demand Chat Group Call [CONN-MCPTT/ONN/GROUP/CHAT/ONDEM/NFC/04]
7.2.13	MCPTT User cancels the imminent-peril condition of an on-demand Chat Group Call [CONN-MCPTT/ONNGROUP/CHAT/ONDEM/NFC/05]
7.2.14	MCPTT User initiates a Chat group Call using pre-established session [CONN-MCPTT/ONNGROUP/CHAT/PRE/NFC/01]
7.2.15	MCPTT User initiates an on-demand private MCPTT call in automatic commencement model with floor control [CONN-MCPTT/ONN/PRIV/AUTO/ONDEM/WFC/NFC/01]
7.2.16	MCPTT User initiates an on-demand private MCPTT call in manual commencement mode with floor control [CONN-MCPTT/ONN/PRIV/MANUAL/ONDEM/WFC/NFC/01]
7.2.17	MCPTT User initiates a pre-established private MCPTT call in automatic commencement mode with floor control [CONN-MCPTT/ONN/PRIV/AUTO/PRE/WFC/NFC/01]
7.2.18	MCPTT User initiates a pre-established private MCPTT call in manual commencement mode with floor control [CONN-MCPTT/ONN/PRIV/MANUAL/PRE/WFC/NFC/01]
7.2.19	MCPTT User initiates an on-demand private MCPTT call in automatic commencement mode without floor control [CONN-MCPTT/ONN/PRIV/AUTO/ONDEM/WOFC/01]
7.2.20	MCPTT User initiates an on-demand private MCPTT call in manual commencement mode without floor control [CONN-MCPTT/ONN/PRIV/MANUAL/ONDEM/WOFC/01]
7.2.21	MCPTT User initiates a pre-established private MCPTT call in automatic commencement mode without floor control [CONN-MCPTT/ONN/PRIV/AUTO/PRE/WOFC/01]
7.2.22	MCPTT User initiates a pre-established private MCPTT call in manual commencement mode without floor control [CONN-MCPTT/ONN/PRIV/MANUAL/PRE/WOFC/01]
7.2.23	MCPTT User initiates an on-demand first-to-answer MCPTT call with floor control [CONN-MCPTT/ONN/FIRST/MANUAL/ONDEM/WFC/NFC/01]
7.2.24	MCPTT User initiates an on-demand first-to-answer MCPTT call without floor control [CONN-MCPTT/ONN/FIRST/MANUAL/ONDEM/WOFC/01]
7.2.25	MCPTT User initiates an on-demand first-to-answer MCPTT call with floor control using pre-established sessions [CONN-MCPTT/ONN/FIRST/MANUAL/PRE/WFC/NFC/01]
7.2.26	MCPTT User initiates a pre-established first-to-answer MCPTT call in manual commencement mode without floor control [CONN-MCPTT/ONN/FIRST/MANUAL/PRE/WOFC/01]
7.2.27	MCPTT User setups a private-call callback [CONN-MCPTT/ONN/CALLBACK/SETUP-/01]
7.2.28	MCPTT User cancels a private-call callback [CONN-MCPTT/ONN/CALLBACK/CANCEL-/01]
7.2.29	MCPTT User fulfils a private-call callback [CONN-MCPTT/ONN/CALLBACK/FULFIL-/01]

Number	Name
7.2.30	MCPTT User setups locally an on-demand ambient listening call [CONN-MCPTT/ONN/AMBIENT/ONDEM/LOCAL/01]
7.2.31	MCPTT User releases locally an on-demand ambient listening call [CONN-MCPTT/ONN/AMBIENT/ONDEM/LOCAL/02]
7.2.32	MCPTT User setups locally an ambient listening call using pre-established session [CONN-MCPTT/ONN/AMBIENT/PRE/LOCAL/01]
7.2.33	MCPTT User releases locally an ambient listening call using pre-established session [CONN-MCPTT/ONN/AMBIENT/PRE/LOCAL/02]
7.2.34	MCPTT User setups remotely an on-demand ambient listening call [CONN-MCPTT/ONN/AMBIENT/ONDEM/REMOTE/01]
7.2.35	MCPTT User releases remotely an on-demand ambient listening call [CONN-MCPTT/ONN/AMBIENT/ONDEM/REMOTE/02]
7.2.36	MCPTT User setups remotely an ambient listening call using pre-established session [CONN-MCPTT/ONN/AMBIENT/PRE/REMOTE/01]
7.2.37	MCPTT User releases remotely an ambient listening call using pre-established session [CONN-MCPTT/ONN/AMBIENT/PRE/REMOTE/02]
7.2.38	Remote change of selected group [CONN-MCPTT/ONN/GROUPCHANGE/01]
7.2.39	One-to-one standalone SDS over SIP [CONN-MCDATA/ONN/O2O/STANDALONE/SDS-/SIP/01]
7.2.40	One-to-one standalone SDS over media plane (MSRP) [CONN-MCDATA/ONN/O2O/STANDALONE/SDS/MSRP/01]
7.2.41	One-to-one SDS session [CONN-MCDATA/ONN/O2O/SESSION/SDS/MSRP/01]
7.2.42	Group standalone SDS over SIP [CONN-MCDATA/ONN/GROUP/STANDALONE/SDS-/SIP/01]
7.2.43	Group standalone SDS over media plane (MSRP) [CONN-MCDATA/ONN/GROUP/STANDALONE/SDS/MSRP/01]
7.2.44	Group SDS session [CONN-MCDATA/ONN/GROUP/SESSION/SDS/MSRP/01]
7.2.45	One-to-one FD using HTTP [CONN-MCDATA/ONN/O2O/FD/HTTP/01]
7.2.46	Group FD using HTTP [CONN-MCDATA/ONN/GROUP/FD/HTTP/01]
7.2.47	One-to-one FD using media plane (MSRP) [CONN-MCDATA/ONN/O2O/FD/MSRP/01]
7.2.48	Group FD using media plane (MSRP) [CONN-MCDATA/ONN/GROUP/FD/MSRP/01]
7.2.49	Standalone SDS with delivered and read notification [CONN-MCDATA/ONN/DISNOT/SDS/01]
7.2.50	Group standalone SDS with delivered and read notification [CONN-MCDATA/ONN/DISNOT/SDS/02]
7.2.51	One-to-one FD using HTTP with file download completed notification [CONN-MCDATA/ONN/DISNOT/FD/01]
7.2.52	Group FD using HTTP with file download completed notification [CONN-MCDATA/DISNOT/FD/02]
7.2.53	Network triggered FD notifications [CONN-MCDATA/NET/FD/01]
7.2.54	MCVideo User initiates an on-demand private MCVideo call in automatic commencement mode with transmission control [CONN-MCVIDEO/ONN/PRIV/AUTO/ONDEM/WTC/NTC/01]
7.2.55	MCVideo User initiates an on-demand private MCVideo call in automatic commencement mode without transmission control [CONN-MCVIDEO/ONN/PRIV/AUTO/ONDEM/WOTC/01]
7.2.56	MCVideo User initiates an on-demand prearranged MCVideo Group Call [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/01]
7.2.57	MCVideo User initiates an on-demand prearranged MCVideo Chat Group Call [CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/01]
7.2.58	Late call entry of a MCPTT User during an on-demand prearranged MCPTT Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/07]
7.2.59	Late call entry of a MCPTT User during a prearranged MCPTT Group Call using pre-established session [CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/03]
7.2.60	Rejoin of a MCPTT User during an on-demand prearranged MCPTT Group Call [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/08]
7.2.61	Rejoin of a MCPTT User during an on-demand prearranged MCPTT Group Call using pre-established session [CONN-MCPTT/ONN/GROUP/PREA/PRE/NFC/04]
7.2.62	Subscription to Conference Event Package [CONN-MCPTT/ONN/GROUP/CHAT/ONDEM/SUBCONF/01]
7.2.63	MCPTT User initiates an on-demand private MCPTT emergency call in automatic commencement model with floor control [CONN-MCPTT/ONN/PRIV/AUTO/ONDEM/WFC/NFC/02]
7.2.64	MCPTT User initiates an emergency alert by sending a SIP MESSAGE [CONN-MCPTT/ONN/EMERG-ALERT/MSG/01]
7.2.65	MCPTT User cancels an emergency alert by sending a SIP MESSAGE [CONN-MCPTT/ONN/EMERG-ALERT/MSG/02]
7.2.66	MCPTT User cancels an emergency alert originated by other user by sending a SIP MESSAGE [CONN-MCPTT/ONN/EMERG-ALERT/MSG/03]
7.2.67	MCPTT client receives a notification of entry into a group geographic area [CONN-MCPTT/ONN/EMERG-ALERT/MSG/04]

Number	Name
7.2.68	MCPTT client receives a notification of exit from a group geographic area [CONN-MCPTT/ONN/EMERG-ALERT/MSG/05]
7.2.69	MCPTT User exits an ongoing an on-demand prearranged MCPTT Group Call upon de-affiliation to this group [CONN-MCPTT/ONN/GROUP/PREA/ONDEM/NFC/09]
7.2.70	Receive O2O FD request with mandatory download [CONN-MCDATA/ONN/O2O/FD/HTTP/02]
7.2.71	Receive O2O FD request without mandatory download [CONN-MCDATA/ONN/O2O/FD/HTTP/03]
7.2.72	Request a list of deferred group communications [CONN-MCDATA/ONN/DEFER/01]
7.2.73	Send an enhanced status to an MCData group [CONN-MCDATA/ONN/GROUP/STANDALONE/SDS/SIP/02]
7.2.74	MCVideo User upgrades an ongoing on-demand Chat Group Call to emergency call [CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/02]
7.2.75	MCVideo User upgrades an ongoing on-demand Chat Group Call to imminent-peril call [CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/03]
7.2.76	MCVideo User cancels the emergency condition of an on-demand Chat Group Call [CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/04]
7.2.77	MCVideo User cancels the imminent-peril condition of an on-demand Chat Group Call [CONN-MCVIDEO/ONN/GROUP/CHAT/ONDEM/NTC/05]
7.2.78	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Emergency Group Call [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/02]
7.2.79	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Imminent Peril Group Call [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/03]
7.2.80	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Broadcast Group Call [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/04]
7.2.81	MCVideo User initiates an on-demand prearranged MCVideo Group Call: Upgrade to in progress emergency or imminent peril [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/05]
7.2.82	MCVideo User initiates the termination of an on-demand prearranged MCVideo Group Call [CONN-MCVIDEO/ONN/GROUP/PREA/ONDEM/NTC/06]
7.2.83	MCVideo User initiates an on-demand private MCVideo call in manual commencement mode without transmission control [CONN-MCVIDEO/ONN/PRIV/MANUAL/ONDEM/WOTC/NTC/01]
7.2.84	MCVideo User initiates an on-demand private MCVideo call in manual commencement mode with transmission control [CONN-MCVIDEO/ONN/PRIV/MANUAL/ONDEM/WTC/NTC/01]
7.2.85	MCVideo User setups locally an on-demand ambient viewing call [CONN-MCVIDEO/ONN/AMBIENT/ONDEM/LOCAL/01]
7.2.86	MCVideo User releases remotely an on-demand ambient viewing call [CONN-MCVIDEO/ONN/AMBIENT/ONDEM/LOCAL/02]
7.2.87	MCVideo User setups remotely an on-demand ambient viewing call [CONN-MCVIDEO/ONN/AMBIENT/ONDEM/REMOTE/01]
7.2.88	MCVideo User releases remotely an on-demand ambient viewing call [CONN-MCVIDEO/ONN/AMBIENT/ONDEM/REMOTE/02]
7.2.89	MCVideo User initiates a one-to-one video pull in automatic commencement mode with transmission control [CONN-MCVIDEO/ONN/ONE-TO-ONE/VIDEOPULL/01]
7.2.90	MCVideo User initiates a one-from-server video pull in automatic commencement mode with transmission control [CONN-MCVIDEO/ONN/ONE-FROM-SERVER/VIDEOPULL/01]
7.2.91	MCVideo User initiates a one-to-one video push in automatic commencement mode with transmission control [CONN-MCVIDEO/ONN/ONE-TO-ONE/VIDEOPUSH/01]
7.2.92	MCVideo User initiates a one-to-server video push in automatic commencement mode with transmission control [CONN-MCVIDEO/ONN/ONE-TO-SERVER/VIDEOPUSH/01]
7.2.93	MCVideo User initiates an emergency alert by sending a SIP MESSAGE [CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/01]
7.2.94	MCVideo User cancels an emergency alert by sending a SIP MESSAGE [CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/02]
7.2.95	MCVideo User cancels an emergency alert originated by other user by sending a SIP MESSAGE [CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/03]
7.2.96	MCVideo client receives a notification of entry into a group geographic area [CONN-MCVIDEO/ONN/EMERG-ALERT/MSG/04]
7.3	**Floor Controlling (FC)**
7.3.1	Basic FC functionality [FC/BASIC/01]
7.3.2	Basic FC functionality. Effect of Priorities [FC/BASIC/02]
7.3.3	Advanced FC functionality. Floor control revoking upon expires (T2) [FC/ADV/01]
7.3.4	Advanced FC functionality. Floor control queueing upon release [FC/ADV/02]
7.3.5	Advanced FC functionality. Floor control queueing upon revoke [FC/ADV/03]
7.3.6	Sharing/Display of FA during basic FC operations [FC/FA/BASIC/01]
7.3.7	Multi-talker basic operation [FC/MT/BASIC/01]

Number	Name
7.4	**Registration and Service Authorization (RegAuth)**
7.4.1	MCPTT User authenticates to the IdMS [REGAUTH/IDMSAUTH/01]
7.4.2	MCPTT User gets registered and authorized using third-party registration [REGAUTH/3PRTYREG/REGISTER/01]
7.4.3	MCPTT User gets authorized using PUBLISH mechanism [REGAUTH/PUBLISH/REGISTER/01]
7.5	**Policing (PCC)**
7.5.1	Setup of a Unicast MC Bearer by SIP Core/IMS [PCC/BEARERSETUP/01]
7.5.2	Setup of a Unicast MC Bearer by MCPTT Participating AS [PCC/BEARERSETUP/02]
7.5.3	Update of a Unicast MC Bearer by SIP Core/IMS [PCC/BEARERUPDATE/01]
7.5.4	Update of a Unicast MC Bearer by MCPTT Participating AS [PCC/BEARERUPDATE/02]
7.5.5	Setup of a Unicast MC Bearer by SIP Core/IMS using pre-established sessions [PCC/BEARERSETUP/03]
7.5.6	Setup of a Unicast MC Bearer by MCPTT Participating AS using pre-established sessions [PCC/BEARERSETUP/04]
7.6	**eMBMS (EMBMS)**
7.6.2	Use of dynamically established MBMS bearers in prearranged MCPTT group calls with pre-allocated TMGIs [EMBMS/ACTIVATEBEARER/WPRETMGI/01]
7.6.3	Use of dynamically established MBMS bearers in prearranged MCPTT group calls without pre-allocated TMGIs [EMBMS/ACTIVATEBEARER/WOPRETMGI/01]
7.6.4	Use of pre-established MBMS bearers in prearranged group calls with pre-allocated TMGIs [EMBMS/PREBEARER/WPRETMGI/01]
7.6.5	Use of pre-established MBMS bearers in prearranged group calls without pre-allocated TMGIs [EMBMS/PREBEARER/WOPRETMGI/01]
7.6.6	Modification of MBMS bearers upon reception of emergency upgrade request [EMBMS/MODIFYBEARER/01]
7.6.7	Deactivation of MBMS bearers after termination of a prearranged MCPTT group call with TMGI deallocation [EMBMS/DEACTBEARER/WTMGIDEA/01]
7.6.8	Deactivation of MBMS bearers after termination of a prearranged MCPTT group call without TMGI deallocation [EMBMS/DEACTBEARER/WOTMGIDEA/01]
7.6.9	Switching to unicast bearer after TMGI expiration [EMBMS/SWITCHTOUNITMGIEXP/01]
7.7	**Affiliation (AFFIL)**
7.7.1	MCPTT User subscribes to its own affiliation [AFFIL/DET/01]
7.7.2	MCPTT User subscribes to the affiliation of another user [AFFIL/DET/02]
7.7.3	MCPTT User requests its affiliation to a set of groups [AFFIL/CHANGE/01]
7.7.4	MCPTT User requests the affiliation of other User to a set of groups in mandatory mode [AFFIL/CHANGE/02]
7.7.5	MCPTT User requests the affiliation of other User to a set of groups in negotiated mode [AFFIL/CHANGE/03]
7.8	**Location (LOC)**
7.8.1	MCPTT Client Configuration upon 3rd party register [LOC/3PRTYREG/CONFIG/01]
7.8.2	Explicit Location reporting request sent to the MCPTT Client [LOC/REQUEST/01]
7.8.3	MCPTT Client Location submitted upon some trigger [LOC/SUBMISSION/01]
7.9	**OAM procedures (CSC)**
7.9.1	Subscription and UE configuration document retrieval from the MC UE [CSC-CMS/UECONF/UE/01]
7.9.2	Subscription and user profile configuration document retrieval from the MC UE [CSCCMS/UPROCONF/UE/01]
7.9.3	Subscription and service configuration document retrieval from the MC UE [CSCCMS/SERVCONF/UE/01]
7.9.4	Subscription and service configuration document retrieval from the MCS Server [CSCCMS/SERVCONF/MCSSERV/01]
7.9.5	Subscription and group document retrieval from the MC UE [CSC-GMS/GROUP/UE-/01]
7.9.6	Subscription and group document retrieval from the MCS Server [CSC-GMS/GROUP/MCSSERV/01]
7.9.7	Subscription and retrieval of multiple documents from the CMS using subscription proxy [CSC/MULTIPLESUBS/UE/01]
7.9.8	Subscription and retrieval of multiple documents from the GMS using subscription proxy [CSC/MULTIPLESUBSGMSGROUP/UE/01]
7.10	**Security mechanisms (SEC)**
7.10.1	Key material download from KMS to MCPTT client (CSC-8) with proxy [SEC/KEYMDOWNLOAD/WPROXY/01]
7.10.2	Key material download from KMS to MCPTT server (CSC-9) with proxy [SEC/KEYMDOWNLOAD/WPROXY/02]
7.10.3	Key material download from KMS to MCPTT GMS (CSC-10) with proxy [SEC/KEYMDOWNLOAD/WPROXY/03]
7.10.4	Key material download from KMS to MCPTT client (CSC-8) without proxy [SEC/KEYMDOWNLOAD/WOPROXY/01]
7.10.5	Key material download from KMS to MCPTT server (CSC-9) without proxy [SEC/KEYMDOWNLOAD/WOPROXY/02]

Number	Name
7.10.6	Key material download from KMS to MCPTT GMS (CSC-10) without proxy [SEC/KEYMDOWNLOAD/WOPROXY/03]
7.10.7	Key management from MC client to MC server (CSK upload) [SEC/KEYDIST/CSK/01]
7.10.8	Key management for group communications (GMK) [SEC/KEYDIST/GMK/01]
7.10.9	Key management from MC server to MC client (Key download MuSiK) [SEC/KEYDIST/MUSIK/01]
7.10.10	Encryption of MCPTT private calls (use of derived encryption keys from PCK for the audio and CSK for floor control and RTCP reports) [SEC/ENCRYPTION/PRIVATE/01]
7.10.11	Encryption of MCPTT group calls (use of derived encryption keys from GMK for the audio and CSK for floor control and RTCP reports) [SEC/ENCRYPTION/GROUP/01]
7.10.12	Encryption of MCPTT group calls using eMBMS (use of derived encryption keys from MuSIK for the floor control and MSCCK for eMBMS control) [SEC/ENCRYPTION/GROUPEMBMS/01]
7.10.13	XML contents encryption in MCPTT private calls (mcptt-info and resource-lists) [SEC/XMLENCRYPT/PRIVATE/01]
7.10.14	XML contents encryption in MCPTT group calls (mcptt-info) [SEC/XMLENCRYPT/GROUP/01]
7.10.15	XML contents encryption in affiliation procedure [SEC/XMLENCRYPT/AFFIL/01]
7.10.16	XML contents encryption in location procedure [SEC/XMLENCRYPT/LOC/01]
7.10.17	XML contents encryption in registration and authorization procedures [SEC/XMLENCRYPT/REGAUTH/01]
7.11	**MCVideo Transmission Control (TC)**
7.11.1	Basic TC functionality [TC/BASIC/01]
7.11.2	Basic TC functionality. Maximum number of transmitters [TC/BASIC/02]
7.11.3	Basic TC functionality. Maximum number of receivers [TC/BASIC/03]
7.11.4	Basic TC functionality. Maximum number of transmitters and pre-emptive priority request [TC/BASIC/04]
7.12	**Server-to-Server communications (S2S)**
7.12.1	On-demand prearranged MCPTT Group Call to temporary group in trusted mode [S2S/ONN/GROUP/PREA/ONDEM/TEMP/01]
7.12.2	On-demand prearranged MCPTT Group Call to temporary group in untrusted mode [S2S/ONN/GROUP/PREA/ONDEM/TEMP/02]
7.13	**Functional Alias (FA)**
7.13.1	MCPTT user requests to activate one or more functional aliases [FA/CHANGE/01]
7.13.2	MCPTT user requests to deactivate one or more functional aliases [FA/CHANGE/02]
7.13.3	MCPTT user refreshes the interest on one or more functional aliases [FA/CHANGE/03]
7.13.4	MCPTT user takes over a functional aliases [FA/CHANGE/04]
7.13.5	MCPTT user requests to activate one or more functional aliases upon entering a location area [FA/LOCCHANGE/01]
7.13.6	MCPTT user requests to deactivate one or more functional aliases upon entering a location area [FA/LOCCHANGE/02]
7.13.7	MCPTT user determines the functional aliases successfully activated [FA/DET/01]
7.13.8	MCPTT user determines the functional aliases successfully activated for another user [FA/DET/02]
7.14	**Interoperability Scenarios (IOP)**
7.14.1	Effect of (de)affiliating another user during an ongoing group call [IOP/01]
7.14.2	GEOFENCING [IOP/02]
7.14.3	Complete group-regrouping procedure [IOP/03]
7.14.4	Effect of adding a user to a group and CSC subscriptions [IOP/04]
7.14.5	Missed call and private call callback [IOP/05]
7.14.6	EMBMS switch from unicast to multicast and back to unicast [IOP/06]
7.14.7	one-to-server video push & one-from-server video pull operation [IOP/07]
8	**eMBMS complementary test cases**
8.2.1	TMGI allocation management [EMBMS-ADDITIONAL/MB2C/FUNCT/ALLOCTMGI/01]
8.2.2	TMGI deallocation management [EMBMS-ADDITIONAL/MB2C/FUNCT/DEALLOCTMGI-/01]
8.2.3	Successful bearer activation [EMBMS-ADDITIONAL/MB2C/FUNCT/ACTIVATEBEARER-/01]
8.2.4	Successful bearer deactivation [EMBMS-ADDITIONAL/MB2c/FUNCT/DEACTBEARER-/01]
8.2.5	Successful bearer modification [EMBMS-ADDITIONAL/MB2C/FUNCT/MODBEARER/01]
8.2.6	Management of TMGI expiration [EMBMS-ADDITIONAL/MB2C/FUNCT/TMGIEXP/01]
8.2.7	Management of aggregated requests [EMBMS-ADDITIONAL/MB2C/FUNCT/AGGREQUEST-/01]
8.2.8	Management of Bearer Pre-emption [EMBMS-ADDITIONAL/MB2C/PRIO/PREEM/01]
8.2.9	Management of Bearer Resumption [EMBMS-ADDITIONAL/MB2C/PRIO/RESUM/01]

Number	Name
8.2.10	MB2-C security using TLS over TCP [EMBMS-ADDITIONAL/MB2C/SECURITY/TLS-/01]
8.2.11	MB2-C security using DTLS over SCTP [EMBMS-ADDITIONAL/MB2C/SECURITY/DTLS-/01]
8.2.12	Restoration procedure management [EMBMS-ADDITIONAL/MB2C/ROBUSTNESS/RES-TORATION/01]
8.2.13	TMGI allocation failure [EMBMS-ADDITIONAL/MB2C/ROBUSTNESS/ALLOCATE/TMGI-/01]
8.2.14	TMGI deallocation failure [EMBMS-ADDITIONAL/MB2C/ROBUSTNESS/DEALLOCATE/TMGI/01]
8.2.15	Bearer activation failure [EMBMS-ADDITIONAL/MB2c/ROBUSTNESS/ACTIVATE/BEARER-/01]
8.2.16	Bearer deactivation failure [EMBMS–ADDITIONAL/MB2C/ROBUSTNESS/DEACTIVATE-/BEARER/01]
8.2.17	Bearer modification failure [EMBMS-ADDITIONAL/MB2C/ROBUSTNESS/MODIFY/BEARER-/01]
8.2.18	Multiple GCS-AS management [EMBMS-ADDITIONAL/MB2C/LOAD/MUL-TIPLEGCS-/01]
8.2.19	Activation of multiple (100) bearers [EMBMS-ADDITIONAL/MB2C/LOAD/100BEARER-/01]
9	**Observers scenarios**
9.3	Emergency call [OS1]
9.4	Emergency call handling [OS2]
9.5	Encrypted private call [OS3]
9.6	eMBMS MCPTT [OS4.1]
9.7	eMBMS MCVideo [OS4.2]
9.8	Switching on [OS5]
9.9	Encrypted MCPTT group call [OS6]
9.10	Enhanced status [OS7.1]
9.11	MCDATA SDS [OS7.2]
9.12	Encrypted MCVideo Group Call [OS8]
9.13	Parallel MCPTT and MCVIDEO [OS9]

Table 22. Mapping of Test Case Numbers to Test Case Names

9 Interoperability Results

9.1 Overall Results

During the Plugtests event, a total of 178 Test Sessions were run: that is, 178 different combinations based on different configurations in Test Scope: MCX Client, MCX Server (Participating and Controlling), BMSC and IMS/SIP Core were tested for interoperability. Overall, 1339 test executions were conducted and reported interoperability results.

The table below provides the overall results (aggregated data) from all the Test Cases run during all the Test Sessions with all the different combinations of Equipment Under Test from all the participating companies.

Among the executed Test Cases, the possible results were “OK”, when interoperability was successfully achieved and “NO” (Not OK) when it was not.

Interoperability		Totals
OK	**NO**	**Run**
1266 (94.5%)	73(5.5%)	1339

Table 23. Overall Results

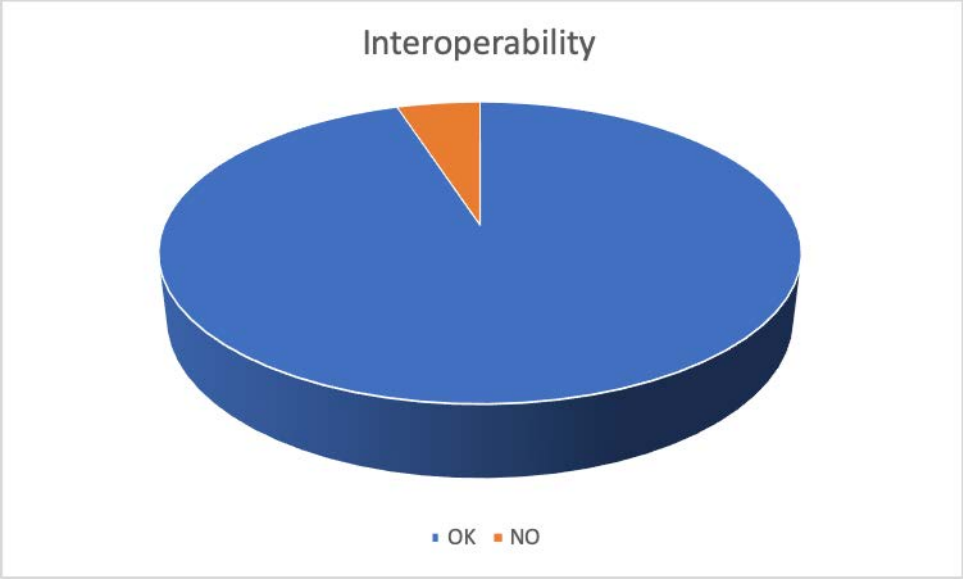

Figure 12. Overall results (%)

A overall interoperability success rate of 94.5% was achieved, which indicates a very high degree of compatibility among the participating implementations (EUTs) in the areas of the Test Plan where features were widely supported and the test cases could be executed in most of the Test Sessions. In the next clauses, we will see that this high rate is also a consequence of the good preparation and involvement of participants during the remote integration and pre-testing phase of the Plugtests.

9.2 Results per Test Configuration

The table below provides the results for each test configuration in the scope of the Plugtests event. The below configurations are defined in clause 7.2.

	Interoperability		Total
Configurations in TRT	**OK**	**NO**	**Run**
Config MCX Tester Client	6 (66.7%)	3 (33.3%)	9
Config MCX	148 (97.4%)	4 (2.6%)	152
Config MCX Tester AS	0 (0.0%)	0 (0.0%)	0
Config MCX BM-SC	7 (100.0%)	0 (0.0%)	7
MCPTT	759 (97.4%)	20 (2.6%)	779
MCDATA	136 (94.4%)	8 (5.6%)	144
MCVIDEO	32 (100.0%)	0 (0.0%)	32
FRMCS	32 (80.0%)	8 (20.0%)	40
IdMS	111 (81.6%)	25 (18.4%)	136
GMS-KMS	5 (100.0%)	0 (0.0%)	5
SUB-To-CMS-GMS	30 (85.7%)	5 (14.3%)	35
Config MCX S2S	0 (0.0%)	0 (0.0%)	0

Table 24. Results per Test Configuration

The table shows that very high execution and interoperability rates for different Test Configurations were achieved.

9.3 Results per Test Case

The table below provides the results for each test case in the scope of the Plugtests event. Test Cases numbering is referred from ETSI TS 103 564.

	Interoperability		Total
Test Cases	**OK**	**NO**	**Run**
7.2.1	68 (93.2%)	5 (6.8%)	73
7.2.2	46 (100.0%)	0 (0.0%)	46
7.2.3	28 (100.0%)	0 (0.0%)	28
7.2.4	11 (100.0%)	0 (0.0%)	11
7.2.5	6 (100.0%)	0 (0.0%)	6
7.2.6	56 (100.0%)	0 (0.0%)	56
7.2.7	1 (100.0%)	0 (0.0%)	1
7.2.8	0 (0.0%)	0 (0.0%)	0
7.2.9	26 (96.3%)	1 (3.7%)	27
7.2.10	0 (0.0%)	0 (0.0%)	0
7.2.11	0 (0.0%)	0 (0.0%)	0
7.2.12	0 (0.0%)	0 (0.0%)	0
7.2.13	0 (0.0%)	0 (0.0%)	0

	Interoperability		Total
Test Cases	OK	NO	Run
7.2.14	0 (0.0%)	0 (0.0%)	0
7.2.15	49 (98.0%)	1 (2.0%)	50
7.2.16	54 (96.4%)	2 (3.6%)	56
7.2.17	0 (0.0%)	0 (0.0%)	0
7.2.18	1 (50.0%)	1 (50.0%)	2
7.2.19	38 (100.0%)	0 (0.0%)	38
7.2.20	63 (98.4%)	1 (1.6%)	64
7.2.21	0 (0.0%)	0 (0.0%)	0
7.2.22	0 (0.0%)	0 (0.0%)	0
7.2.23	4 (100.0%)	0 (0.0%)	4
7.2.24	2 (66.7%)	1 (33.3%)	3
7.2.25	0 (0.0%)	0 (0.0%)	0
7.2.26	0 (0.0%)	0 (0.0%)	0
7.2.27	1 (100.0%)	0 (0.0%)	1
7.2.28	1 (100.0%)	0 (0.0%)	1
7.2.29	0 (0.0%)	0 (0.0%)	0
7.2.30	5 (100.0%)	0 (0.0%)	5
7.2.31	5 (100.0%)	0 (0.0%)	5
7.2.32	0 (0.0%)	0 (0.0%)	0
7.2.33	0 (0.0%)	0 (0.0%)	0
7.2.34	5 (100.0%)	0 (0.0%)	5
7.2.35	5 (100.0%)	0 (0.0%)	5
7.2.36	0 (0.0%)	0 (0.0%)	0
7.2.37	0 (0.0%)	0 (0.0%)	0
7.2.38	0 (0.0%)	0 (0.0%)	0
7.2.39	47 (90.4%)	5 (9.6%)	52
7.2.40	0 (0.0%)	0 (0.0%)	0
7.2.41	0 (0.0%)	0 (0.0%)	0
7.2.42	37 (92.5%)	3 (7.5%)	40
7.2.43	0 (0.0%)	0 (0.0%)	0
7.2.44	0 (0.0%)	0 (0.0%)	0
7.2.45	0 (0.0%)	0 (0.0%)	0
7.2.46	0 (0.0%)	0 (0.0%)	0

	Interoperability		Total
Test Cases	OK	NO	Run
7.2.47	0 (0.0%)	0 (0.0%)	0
7.2.48	0 (0.0%)	0 (0.0%)	0
7.2.49	34 (100.0%)	0 (0.0%)	34
7.2.50	18 (100.0%)	0 (0.0%)	18
7.2.51	0 (0.0%)	0 (0.0%)	0
7.2.52	0 (0.0%)	0 (0.0%)	0
7.2.53	0 (0.0%)	0 (0.0%)	0
7.2.54	7 (100.0%)	0 (0.0%)	7
7.2.55	23 (100.0%)	0 (0.0%)	23
7.2.56	0 (0.0%)	0 (0.0%)	0
7.2.57	0 (0.0%)	0 (0.0%)	0
7.2.58	8 (100.0%)	0 (0.0%)	8
7.2.59	0 (0.0%)	0 (0.0%)	0
7.2.60	10 (100.0%)	0 (0.0%)	10
7.2.61	0 (0.0%)	0 (0.0%)	0
7.2.62	0 (0.0%)	0 (0.0%)	0
7.2.63	8 (100.0%)	0 (0.0%)	8
7.2.64	0 (0.0%)	0 (0.0%)	0
7.2.65	0 (0.0%)	0 (0.0%)	0
7.2.66	0 (0.0%)	0 (0.0%)	0
7.2.67	0 (0.0%)	0 (0.0%)	0
7.2.68	0 (0.0%)	0 (0.0%)	0
7.2.69	1 (100.0%)	0 (0.0%)	1
7.2.71	0 (0.0%)	0 (0.0%)	0
7.2.72	0 (0.0%)	0 (0.0%)	0
7.2.73	0 (0.0%)	0 (0.0%)	0
7.2.74	0 (0.0%)	0 (0.0%)	0
7.2.75	0 (0.0%)	0 (0.0%)	0
7.2.76	0 (0.0%)	0 (0.0%)	0
7.2.77	0 (0.0%)	0 (0.0%)	0
7.2.78	0 (0.0%)	0 (0.0%)	0
7.2.79	0 (0.0%)	0 (0.0%)	0
7.2.80	0 (0.0%)	0 (0.0%)	0

	Interoperability		Total
Test Cases	OK	NO	Run
7.2.81	0 (0.0%)	0 (0.0%)	0
7.2.82	0 (0.0%)	0 (0.0%)	0
7.2.83	2 (100.0%)	0 (0.0%)	2
7.2.84	0 (0.0%)	0 (0.0%)	0
7.2.85	0 (0.0%)	0 (0.0%)	0
7.2.86	0 (0.0%)	0 (0.0%)	0
7.2.87	0 (0.0%)	0 (0.0%)	0
7.2.88	0 (0.0%)	0 (0.0%)	0
7.2.89	0 (0.0%)	0 (0.0%)	0
7.2.90	0 (0.0%)	0 (0.0%)	0
7.2.91	0 (0.0%)	0 (0.0%)	0
7.2.92	0 (0.0%)	0 (0.0%)	0
7.2.93	0 (0.0%)	0 (0.0%)	0
7.2.94	0 (0.0%)	0 (0.0%)	0
7.2.95	0 (0.0%)	0 (0.0%)	0
7.2.96	0 (0.0%)	0 (0.0%)	0
7.3.1	61 (98.4%)	1 (1.6%)	62
7.3.2	37 (100.0%)	0 (0.0%)	37
7.3.3	29 (100.0%)	0 (0.0%)	29
7.3.4	6 (100.0%)	0 (0.0%)	6
7.3.5	7 (100.0%)	0 (0.0%)	7
7.3.6	1 (100.0%)	0 (0.0%)	1
7.3.7	0 (0.0%)	0 (0.0%)	0
7.4.1	54 (77.1%)	16 (22.9%)	70
7.4.2	130 (95.6%)	6 (4.4%)	136
7.4.3	43 (81.1%)	10 (18.9%)	53
7.5.1	0 (0.0%)	0 (0.0%)	0
7.5.2	1 (100.0%)	0 (0.0%)	1
7.5.3	0 (0.0%)	0 (0.0%)	0
7.5.4	0 (0.0%)	0 (0.0%)	0
7.5.5	0 (0.0%)	0 (0.0%)	0
7.5.6	0 (0.0%)	0 (0.0%)	0
7.6.2	1 (100.0%)	0 (0.0%)	1

	Interoperability		Total
Test Cases	OK	NO	Run
7.6.3	2 (100.0%)	0 (0.0%)	2
7.6.4	0 (0.0%)	0 (0.0%)	0
7.6.5	0 (0.0%)	0 (0.0%)	0
7.6.6	1 (100.0%)	0 (0.0%)	1
7.6.7	3 (100.0%)	0 (0.0%)	3
7.6.8	0 (0.0%)	0 (0.0%)	0
7.6.9	0 (0.0%)	0 (0.0%)	0
7.7.1	58 (100.0%)	0 (0.0%)	58
7.7.2	1 (100.0%)	0 (0.0%)	1
7.7.3	40 (93.0%)	3 (7.0%)	43
7.7.4	0 (0.0%)	0 (0.0%)	0
7.7.5	0 (0.0%)	0 (0.0%)	0
7.8.1	16 (100.0%)	0 (0.0%)	16
7.8.2	8 (88.9%)	1 (11.1%)	9
7.8.3	12 (100.0%)	0 (0.0%)	12
7.9.1	5 (71.4%)	2 (28.6%)	7
7.9.2	7 (87.5%)	1 (12.5%)	8
7.9.3	6 (85.7%)	1 (14.3%)	7
7.9.4	5 (100.0%)	0 (0.0%)	5
7.9.5	2 (100.0%)	0 (0.0%)	2
7.9.6	1 (100.0%)	0 (0.0%)	1
7.9.7	3 (75.0%)	1 (25.0%)	4
7.9.8	1 (100.0%)	0 (0.0%)	1
7.10.1	2 (100.0%)	0 (0.0%)	2
7.10.2	0 (0.0%)	0 (0.0%)	0
7.10.3	0 (0.0%)	0 (0.0%)	0
7.10.4	2 (100.0%)	0 (0.0%)	2
7.10.5	0 (0.0%)	0 (0.0%)	0
7.10.6	0 (0.0%)	0 (0.0%)	0
7.10.7	0 (0.0%)	0 (0.0%)	0
7.10.8	1 (100.0%)	0 (0.0%)	1
7.10.9	0 (0.0%)	0 (0.0%)	0
7.10.10	0 (0.0%)	0 (0.0%)	0

	Interoperability		Total
Test Cases	OK	NO	Run
7.10.11	0 (0.0%)	0 (0.0%)	0
7.10.12	0 (0.0%)	0 (0.0%)	0
7.10.13	0 (0.0%)	0 (0.0%)	0
7.10.14	0 (0.0%)	0 (0.0%)	0
7.10.15	0 (0.0%)	0 (0.0%)	0
7.10.16	0 (0.0%)	0 (0.0%)	0
7.10.17	0 (0.0%)	0 (0.0%)	0
7.11.1	0 (0.0%)	0 (0.0%)	0
7.11.2	0 (0.0%)	0 (0.0%)	0
7.11.3	0 (0.0%)	0 (0.0%)	0
7.11.4	0 (0.0%)	0 (0.0%)	0
7.12.1	0 (0.0%)	0 (0.0%)	0
7.12.2	0 (0.0%)	0 (0.0%)	0
7.13.1	7 (77.8%)	2 (22.2%)	9
7.13.2	5 (100.0%)	0 (0.0%)	5
7.13.3	3 (75.0%)	1 (25.0%)	4
7.13.4	4 (100.0%)	0 (0.0%)	4
7.13.5	2 (66.7%)	1 (33.3%)	3
7.13.6	2 (100.0%)	0 (0.0%)	2
7.13.7	5 (62.5%)	3 (37.5%)	8
7.13.8	3 (75.0%)	1 (25.0%)	4
7.14.1	0 (0.0%)	0 (0.0%)	0
7.14.2	0 (0.0%)	0 (0.0%)	0
7.14.3	0 (0.0%)	0 (0.0%)	0
7.14.4	0 (0.0%)	0 (0.0%)	0
7.14.5	0 (0.0%)	0 (0.0%)	0
7.14.6	0 (0.0%)	0 (0.0%)	0
7.14.7	0 (0.0%)	0 (0.0%)	0
8.2.1	0 (0.0%)	0 (0.0%)	0
8.2.2	0 (0.0%)	0 (0.0%)	0
8.2.3	0 (0.0%)	0 (0.0%)	0
8.2.4	0 (0.0%)	0 (0.0%)	0
8.2.5	0 (0.0%)	0 (0.0%)	0

	Interoperability		Total
Test Cases	OK	NO	Run
8.2.6	0 (0.0%)	0 (0.0%)	0
8.2.7	0 (0.0%)	0 (0.0%)	0
8.2.8	0 (0.0%)	0 (0.0%)	0
8.2.9	0 (0.0%)	0 (0.0%)	0
8.2.10	0 (0.0%)	0 (0.0%)	0
8.2.11	0 (0.0%)	0 (0.0%)	0
8.2.12	0 (0.0%)	0 (0.0%)	0
8.2.13	0 (0.0%)	0 (0.0%)	0
8.2.14	0 (0.0%)	0 (0.0%)	0
8.2.15	0 (0.0%)	0 (0.0%)	0
8.2.16	0 (0.0%)	0 (0.0%)	0
8.2.17	0 (0.0%)	0 (0.0%)	0
8.2.18	0 (0.0%)	0 (0.0%)	0
8.2.19	0 (0.0%)	0 (0.0%)	0
9.3	7 (100.0%)	0 (0.0%)	7
9.4	1 (100.0%)	0 (0.0%)	1
9.5	0 (0.0%)	0 (0.0%)	0
9.6	0 (0.0%)	0 (0.0%)	0
9.7	0 (0.0%)	0 (0.0%)	0
9.8	1 (100.0%)	0 (0.0%)	1
9.9	0 (0.0%)	0 (0.0%)	0
9.10	0 (0.0%)	0 (0.0%)	0
9.11	4 (100.0%)	0 (0.0%)	4
9.12	0 (0.0%)	0 (0.0%)	0
9.13	0 (0.0%)	0 (0.0%)	0

Table 25. Results per Test Case

10 Plugtests Observations

As a result of the Plugtests event activities some issues in 3GPP Technical Specifications (TSs) and related standards were identified together with practical deployment problems that may demand some clarification or feedback from the related SDOs. We have classified those aspects into the following two categories:

- **Observations to MCX Standards**: Missing, erroneous or ambiguous definition of procedures in 3GPP's MCPTT TSs.
- **Technical constraints**: Related to implementation issues, not covered by the standards, but which need to be faced by MCX vendors in most deployments.

The reader should note that 3GPP Release 15 TS approved by December 2019 were considered for the fifth Plugtests event.

The 5th MCPTT Plugtests event team wants to thank all the participants in the Plugtests for kindly sharing the following lessons learned. Specific actions towards pushing this feedback to relevant TSGs in 3GPP have already been started at the time of the release of this report.

10.1 Standards issues

10.1.1 Ambiguity in mcptt-request-uri in notification entry/exit group area

An inconsistency has been identified in subclause 6.3.3.1.22 in ETSI TS 124 379 regarding the value of <mcptt-request-uri> being either the MCPTT ID of the user or the group ID.

10.1.2 Need to affiliate to a MCPTT group upon entering a pre-defined geographic group area

ETSI TS 124 379 Section 6.3.3.1.22 states that "request to notify an MCPTT client that it has entered a pre-defined group geographic area or exited from a pre-defined group geographic area requiring affiliation to or de-affiliation from a group". However, in Section 12.1.1.4 only the de-affilition is mentioned during step 2b) "iii) shall execute the procedure in subclause 9.2.1.2 to de-affiliate from the group indicated by the participating MCPTT function." but not the affiliation process (that should be in the counterpart 2a and would be needed for geofencing-like operations).

10.1.3 Ambiguity regarding the use of MCPTT user ID vs. MCPTT client ID in functional alias related pidf formatting

Subclauses 9A.2 and 9A.3 (coding) in ETSI 124 379 (Release 15.7.0) mismatch in terms of the id to be included in the tuple element of the PIDF (fixed in Release 16 to the MCPTT Client ID and not the User ID) in the for per-user information and the id in the per-functional one (fixed in Release 16 to the MCPTT ID and not the FA).

The behaviour of the Participating server regarding the client ID is not properly described even in Rel16 and such fixes have not been ported to 15.8.0.

10.1.4 FA activation refresh operation

In Subclause 9A.2.1.1 in ETSI TS 124 379 the use of SIP PUBLISH mechanism to refresh the interest on a FA is defined. The TS however only defines the use of full SIP PUBLISH for activation (with mcptt-info and pidf+xml bodies) while the refresh mechanism in RFC 3903 makes use of empty body PUBLISH with SIP-if-match: previously received ETAG.

10.1.5 Determination of the FAs activated for another user

From the Subclause 9A.2.1.3 in ETSI TS 124 379 the mcptt-request-uri in the SUBSCRIBE can be either the own one of another user's. Later, it states:

"3) if the Request-URI of the SIP SUBSCRIBE request contains the public service identity identifying the terminating participating MCPTT function serving the MCPTT user, shall identify the originating MCPTT ID in the <mcptt-calling-user-id> element of the application/vnd.3gpp.mcptt-info+xml MIME body of the SIP SUBSCRIBE request;"

That would mean that "somehow" the terminating participating MCPTT functions receives a SUBSCRIBE with the mcptt-calling-user-id fulfilled. It looks like it would be the originating participating (serving the initial user) the one including such information and forwarding it (but it's not explicitly specified in step 2 of the Subclause).

During the plugtest the equivalent approach to the that covered in test case "[AFFIL/DET/02]: subscription to the the affiliation status of other user" was agreed.

In fact step 4 in 9A.2.2.2.4 Receiving subscription to functional alias status procedure would look like an error since it refers to the change of status, not to determination.

"4) if the originating MCPTT ID is different than the served MCPTT ID and the originating MCPTT ID is not authorized to modify functional alias status of the served MCPTT ID, shall send a SIP 403 (Forbidden) response and shall not continue with the rest of the steps; and"

10.1.6 Inclusion of the “status” attribute of the <functionalAlias>

According to ETSI TS 124 379 Subclause 9A.2.1.2 the client "shall not include the "status" attribute and the "expires" attribute in the <functionalAlias> element". However, in the participating part, Subclause 9A.2.2.2.6 only states that "The MCPTT server shall not include the "expires" attribute in the <functionalAlias> element". Although later the controlling has no specific logic to process such attribute the reference to the need to include the “status” attribute has been removed.

10.1.7 Missing privateCallList -and probably others- element in MCVideo user profile

Although Section 6.2.8.3.9 in ETSI TS 124 281 states that "…shall search for the <entry> element of the <PrivateCallURI> element of the <PrivateCallList> element entry of the <Common> element of the MCVideo user profile document (see the MCVideo user profile document in 3GPP TS 24.484 [50]) containing the identified MCVideo ID;..." there is no privateCallList in the MCVideo user profile XSD in ETSI TS 124 484 even in latest Release 16.

10.1.8 (Non)mandatory download and HTTP in MCData

In 10.2.1.1 in ETSI TS 124 282 the following procedure for the MCData Client regarding mandatory download is defined:

“1) shall follow the procedures in subclause 11.1 for transmission control; and

2) if the procedures in subclause 11.1 are successful:

a) if requiring to send data without mandatory download, shall follow the procedures in subclause 10.2.4; and

b) if requiring to send data with mandatory download, shall follow the the procedures in subclause 10.2.5.”

Where 10.2.4 refers to the use of SIP MESSAGE and HTTP while 10.2.5 refers to SIP/MSRP. However, even in 6.2.2.2 Generating an FD Message for FD using HTTP, it states "9) if requiring mandatory download at the recipient side, shall include a Mandatory download IE as specified in subclause 15.2.16 set to the value of "MANDATORY DOWNLOAD";"

Furthermore, the Controlling could decide to include a previously not set mandatory download feature in the payload upon checking 11.2 conditions, resulting on FD request using HTTP arriving at the client with the MANDATORY DOWNLOAD ie set.

In the Plugtest it was agreed to assume that a FD request using HTTP arrives at the MCData Client w/wo the mandatory download i.e. FD signalling payload regardless who has included the i.e. and to act accordingly.

10.1.9 Value of Accept-Contact for the request of a list of deferred group communications

Section 11.3 in ETS TS 124 282 refers to 6.2.4.1 for building the initial SIP message for requesting the list of deferred group communications. However only SDS messages, SDS disposition notification and FD messages, disposition notifications of FD MSF discovery messages are listed. Therefore the type of Accept-Contact for this request is not explicitly mentioned.

10.1.10 Role of controlling and participating in the deferred group communications list retrieval

Section 11.3.3 in ETSI TS 124 282 describes the behaviour of the participating MCData function upon receiving a request to access the list of deferred group communications. However, it looks like the role of the controlling is missing while the participating mentions forwarding messages back/from the controlling.

Upon receipt of a "SIP MESSAGE request for the list of deferred group communications", the participating MCData function:

1) shall generate a SIP 200 (OK) response according to 3GPP TS 24.229 [5];

2) shall send SIP 200 (OK) response towards MCData server according to 3GPP TS 24.229 [5]; and

3) shall follow the procedure described in subclause 11.3.3.2 to send response.

A role of the controlling can be extrapolated but it is not explicitly mentioned.

10.1.11 Gaps in regrouping mechanism

Ambiguous claim regarding the need for affiliation to the super group in A.1.3 in ETSI TS 124 379 The following precondition is stated: "1) the temporary group mcptt-group-A-B is already created and all members are affiliated to the group".

However, the mcptt-group-A-B has only other (sub)groups as members. Furthermore, even in that case untrusted model is considered so that any mechanism for affiliation to the supergroup by users would be anyway troublesome.

10.1.12 “Unsolicited” NOTIFY (or updates to new -unsubscribed before-documents)

From Subclause 5.7.3 in ETSI TS 133 180 there are two possible options considered for the associated possible subscription to group document:

“When users are added to a new or existing group they may be implicitly affiliated to that group” in which case “the user is automatically subscribed to group configuration updates from the GMS”. The user shall be authorised for group management services to the GMS before the GMS provides the associated group management records and the GMK. Once the user is authorised, the GMS sends the group management record as well as the GMK to the UE.

"When the user configuration record indicates the user has been added to a new or existing group but is required to explicitly affiliate to the group", the user shall be authorised for group management services to the GMS followed by a subscription to group updates from the GMS. The user shall be authorised for group management services and the subscription shall be validated before the GMS provides group management records and the GMK. Once the user is authorised and the subscription processed by the GMS, the GMS sends the group management record and the GMK to the UE.

In the first case, how the NOTIFY will be processed by the MCPTT Client without prior subscription and no Access Token to be used for Authorisation is unclear.

10.1.13 Bindings between group membership information in CMS (user profile) and GMS (groups)

Similarly to the previous observation, the sequence diagram of the procedures triggered by the addition of a user to a group or creation of new groups is not clear . More precisely, who keeps the consistency of the membership information distributed between the CMS and GMS is lacking. Furthermore, there's no reference to collections in GMS (which would allow subscription to any/all groups).

10.1.15 Location based FA Activation/De Activation

Paragraph 9A.2.1.4 of TS 124 379 V16.5.0 (the function is not present in Rel 15) specifies that the initiation of the Location Based FA Activation/Deactivation procedures is managed by the client without any coordination described with Participating Server.

I this would be the case that would imply that the mechanism would use a vendor specific procedure jeopardizing interoperability.

10.1.16 SDPs in private calls without floor control using pre-established sessions

ETSI TS 124 379 does not clearly state how full duplex (without floor control) private calls are performed over pre-established sessions. Current references only describe procedures for on demand sessions (without floor control), where the SDP media line associated to the floor control is just removed. In ETSI TS 103 564, where plugtest scenarios are described, this same solution was initially adopted: "Check clause 7.2.17 but with an SDP with no m=application XXXX udp MCPTT media floor control entity. ". However, removing this MCPTT specific application line would not be a valid solution as long as this application connection is necessary to exchange MCPC messages while the original pre-established session is active.

10.1.17 Key exchanging mechanism in first-to-answer pre-established session calls

One of the modifications that were introduced in Rel.16 to ETSI TS 124 379 comprised adapting the key exchange for first-to-answer on demand sessions. Instead of sending the mikey-sakke message with the key material in the initial INVITE, according to Rel 16 the "first to answer" destination shall introduce mikey-sakke message with the key material in the 200 OK. This solution was necessary as long as the caller would not know who the other party of the private call will be (so the caller can not generate the appropriate key material) till somebody actually answers. So, in this specific case the callee is the responsible of generating the appropriate key material for media encryption.

During the 5th MCX Plugtest a discussion took place regarding whether this solution should be adapted for pre-established session scenarios. Currently first-to-answer and other private calls over pre-established sessions share the same key exchanging procedures. As it has been already appreciated by CT1 (in the on demand session solution) first-to-answer calls key exchanging has to be adapted from other private calls procedures. With the current core specs status first-to-answer calls over pre established sessions could not be performed with media encryption.

10.1.18 (Bootstrapping) provision and configuration of the client_id in IDMS

According to TS 33.180, chapter B.4.2.2, the 'client_id' should be known on the IdMS server before the Authentication Request:

There may 2 possible ways to achieve it:

- either statically or out of band provided client-ids (and client-secrets);
- follow the "Dynamic Client Registration" procedure of OpenId Connect (https://openid.net/specs/openid-connect-registration-1_0.html).

Furthermore, ETSI TS 124 379, chapter 4.10, mandates that the ‘MCPTT client ID' should be generated client-side, so that the provisioning should be UE to IdMS.

In both cases there are some values that should be configured beforehand (in case 2, a "Registration Endpoint" is needed), but neither of them could be found in standard configuration documents.

10.2 Technical Constraints

Most of the observations are related with possible enhancements to 3GPP’s TS that, even not being strictly needed from a functional point of view, would help partners in their implementations.

10.2.1 Drawbacks of using binary encoding for MCData Payloads transport in SIP MIME bodies

As defined in ETSI TS 124 282, the SIP SDS signaling payload message and Data Payload message are in binary format, but IETF SIP is a text-based protocol, and IETF has defined several encodings for MIME body like base64 that would make parsing probably easier for general purpose SIP stacks. However, it seems clear that the 3GPP core specs mandate binary format and there are RFCs i.e. https://tools.ietf.org/html/rfc5621#section-3.2 (not specific of multipart but the “capability to handle binary data”) and others that suggest using binary format in SIP would be possible (even convenient) according to sip standards.

10.2.2 Same SUBSCRIBE for functional alias and group affiliation

Functional Alias determination specified in ETSI TS 124 379 does not apparently provide an explicit mechanism to distinguish from the server perspective a functional alias-related SUBSCRIBE from a group affiliation-related one.

11 Observer Program

The observers organised a presentation program during MCX#5 Plugtests event which was held virtual as a series of presentations on 2 days during the Plugtests weeks.

Presentations in the observer program and the Questions & Answers are available on the Plugtests WIKI.

Presentations included:

Program	Organisation
Evolvement of Mission Critical Communication	TCCA
TCCA Testing & Certification Activities Status Update	TCCA
Status of IWF feature	TCCE/Erillisverkot
FRMCS standardization status	UIC
TCCA Control Room activities status update	TCCA
Broadway PCP update	PSC-Europe
LMR - LTE Integration and Interoperability	NPSTC
FirstNet status update	FirstNet
Update of MC Broadband in New Zealand	Public Safety Network New Zealand
Update of MC Broadband in Germany	BDBOS
3GPP MCX Conformance	ETSI
Update of MC Broadband in France	French Ministry of Interior
Update of MC Broadband in the UK	UK Home Office
Update of MC Broadband in Belgium	ASTRID
Update of MC Broadband in Norway	DSB
Update of MC Broadband in the Netherlands	Police of the Netherlands
Update of Virve 2.0 development in Finland	Erillisverkot

Table 26. Observer Program

History

Document history		
V0.0.0	14/10/2020	First Draft
V0.1.0	15/10/2020	MCX#5 Plugtests results added
V0.2.0	20/10/2020	Update on Test Cases and Observations
V0.3.0	21/10/2020	Stable Draft
V0.4.0	26/10/2020	Test Case mapping and observer program information added
V0.5.0	28/10/2020	Final draft
V1.0.0	30/10/2020	Final report published