MulteFire Alliance

Conformance Test Specification

MFA TS MF.502

Version 1.0

April 9th, 2020

REVISION HISTORY

Revision	Date	Comment
1.0	09-APR-2020	Approved by CWG for initial release.

RESTRICTIONS ON USE

1. REFERENCES

MFA TS 24.301 “Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3”

MFA TS 36.211 “Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation”

MFA TS 36.212 “Evolved Universal Terrestrial Radio Access (E-UTRA); MF physical layer; Multiplexing and channel coding”

MFA TS 36.213 “Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures”

MFA TS 36.304 “Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode”

MFA TS 36.306 “Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) Radio Access Capabilities”

MFA TS 36.321 “Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification”

MFA TS 36.331 “Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification”

XGP Forum Document A-GN6.00-01-TS “sXGP (shared XGP) Specification”

2. DOCUMENT SCOPE

The purpose of this document is to define conformance test procedures to verify correct implementation of the MulteFire specifications in BS (eNB) and UE devices. Core LTE functionality is assumed to be covered by existing 3GPP test cases and related certification programs. Since MF devices will be derived from standard LTE implementations, our conformance testing will focus on aspects of MFA that differ from standard LTE.

Automated test systems are not available at the time of this writing, so we have limited ability to induce particular behaviors in the device under test (DUT). Therefore, the test(s) in this initial release are focused primarily on checking that key elements of the messaging protocols are implemented correctly.

The tests apply to either the BS, the UE, or both, as noted in the test description. Where the test applies to both, separate evaluation criteria are provided.

3. ACRONYMS

APN	Access Point Name
BS	Base Station
DL	Downlink

EPS	Evolved Packet Service
MF	MulteFire
MFA	MulteFire Alliance
NHN	Neutral Host Network
OOS	Out Of Service
PDN	Packet Data Network
PLMN	Public Land Mobile Network
RAT	Radio Access Technology
TCP	Transfer Control Protocol (as opposed to UDP)
TDD	Time Division Duplex
UDP	User Datagram Protocol
UE	User Equipment
UL	Uplink

4. TEST EQUIPMENT AND SETUP

The tests in this document focus on the use of a Sanjole WaveJudge system. The WaveJudge sniffs the traffic between the MF BS and UE, either of which may be the device under test (DUT). The WaveJudge software supports MF 1.0 signaling at the time of this writing.

If the DUT is the MF BS (eNB), a MF UE is required to perform the tests. The MF UE must support the same bands as the DUT, and support any features needed for testing on the DUT. Likewise, if the DUT is a MF UE device, a MF BS that supports the same bands and needed features is required.

For tests in this document, tests can be performed with the MF BS and UE either in a conducted mode, or over-the-air. In either case, care must be taken to ensure that the signal into the WaveJudge is at an appropriate level.

Tests should be performed in a shield room or shield box, to prevent interference. However, it is not strictly required, as the currently defined test does not require any measurement of the RF signals.

5. SYSTEM ACCESS AND REGISTRATION

5.1 Attach and Detach

5.1.1 Attach Procedure

Description

The BS and the UE shall successfully perform the “EPS Attach” and “Default EPS Bearer Context Activation” procedures.

Note: This test is derived (copied) from the Attach Procedure test in MF.501 Interoperability Test Procedures (version 1.0). The IOT test can be performed with the WaveJudge capturing the message traffic, and those logs analyzed here.

Note: This test can be combined with the Detach Procedure test as well.

This test applies to both MF BS (eNB) and UE DUTs.

Related core specifications

MFA TS 24.301

Reason for test

To verify the BS and the UE can successfully establish a Default EPS bearer with EPS Attach, and that the DUT uses correctly formed messages.

Initial configuration

BS and UE are configured to not use cyphering.

WaveJudge is configured to capture traffic between the eNB and UE.

UE is powered off.

If the BS supports NHN configure it to be in NHN mode, with a set of at least 36 PSP entries.

If the BS supports OSU, disable OSU for the initial iteration of the test.

Test procedure

1. Power on UE and confirm successful attach procedure.

2. Load a page on the UE embedded browser (or via a tethering connection if embedded browser is not supported).

3. If the BS supports OSU, configure it to use OSU, and repeat the test.

Expected behavior

1. UE sends ATTACH REQUEST to the BS.

BS sends ATTACH ACCEPT and ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST containing the APN and PDN type.

UE sends ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT to the BS.

The following messages are sent by the BS, and are NOT flagged as having an error by the WaveJudge, and that the following elements correspond to the configuration as provided by the BS maker:

- MasterInformationBlock-MF
  - dl-BandWidth-R1 – n50, n100
- SystemInformationBlockTypeMF1 (contains SIB1 and SIB2)
  - RadioResourceConfigCommonSIB-MF
    - rach-ConfigCommon-R1
      - ra-ResponseWindowSize-R1: sf2, sf3…sf20 (as given by BS maker)
    - commonTimingAdvanceOffset-R1: cta0…cts13 (as given by BS maker)

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    - psp-InfoSIB-MF1--R1 (Optional – required if the BS supports feature A.4 – NHN)
        - plmn-PSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
        - oid-PSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
        - hashPSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
- SystemInformationBlockTypeMF2 (If the BS supports NHN.)
    - psp-InfoSIB-MF2--R1
        - plmn-PSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
        - oid-PSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
        - hashPSP-InfoList-R1 (Array of PLMN-PSP-Info-MF) (Optional)
            - psp-Identity-R1 – 24-bit string (as given by BS maker)
            - s2a-Support-R1 – TRUE or not present (as given by BS maker)
- SystemInformationBlockTypeMF3 (if BS (eNB) DUT supports Neutral Host Networks)
    - nhn-Name-R1 – String as given by BS maker.
    - osu-Support-R1 – TRUE
- RRCConnectionSetup-MF (rrcConnectionSetup-R1 as extension to rrcConnectionSetup)
    - radioResourceConfigDedicated-R1 (Optional)
        - physicalConfigDedicated-R1
            - lbt-Config-R1
                - maxEnergyDetectionThreshold-R1 – Integer -85 to -52 (as given by BS maker)
            - spucch-NumInterlaces-R1 – Integer 1 or 2 (as given by BS maker)
            - epucch-NumInterlaces-R1 – Integer 1 or 2 (as given by BS maker)
        - schedulingRequestConfig-R1
            - setup
                - sr-SPUCCH-ResourceIndex-R1 – Integer 0 to 479 (any valid value)
                - sr-Trigger0-Window-R1 – Integer 0 to 9 (as given by BS maker)
- UECapabilityEnquiry-MF

The following messages are sent by the UE, and are NOT flagged as having an error by the WaveJudge, and the messages contain the proper values as indicated in the device's documentation (ICS):

- UECapabilityInformation-MF
  - accessStratumRelease – mf100, mf110, etc.
  - PhyLayerParameters-MF
    - twoStepSchedulingTimingInfo-R1 – nPlus1, nPlus2, nPlus3
    - monitorTwoSF-Scramblings-R1 – Supported (absent if not supported)
    - pucch-OnAllServCells-R1 – Supported (absent of not supported)
    - multipleSR-Opportunity-R1 – Supported (absent of not supported)
  - mobilityParameters-R1
    - mobilityToEUTRA-Support-R1 – mfToTddOnly, mfToFddOnly, mfToTddOrFdd)
    - mobilityToOtherMF-BandSupport-R1 – Supported (absent of not supported)
  - ue-EUTRA-LikeCapabilityies-R1 – Octet string.
  - nonCriticalExtension – UE-Capability-MF-V102 (Optional)
    - PhyLayerParameters-MF-V102
      - uss-BlindDecodingAdjustment-R1 – Supported (absent if not supported)
      - uss-BlindDecodingReduction-R1 – Supported (absent if not supported)
      - outOfSequenceGrantHandling-R1 – Supported (absent if not supported)

2. Page is loaded successfully to confirm data connection.

ANNEX A: TEST APPLICABILITY

This section contains applicability of test cases depending on features supported by Base Station and User Equipment. Features are listed in Annex B.

Section	Name	Applicable to Base Station	Applicable to User Equipment
5.1.1	Attach Procedure	C01	C01

Applicability conditions:

R	Required
N/A	Not Applicable
C01	If A.1.2 OR A.1.3, then R, else N/A. (If DUT is a MF 1.0 or 1.1 device.)

ANNEX B: FEATURES

This section contains features supported by Base Station and User Equipment.

Feature	Name
A.1	Technologies
A.1.1	MF 1.9 GHz
A.1.2	MF 1.0
A.1.3	MF 1.1
A.1.4	MF 1.1 NB-IoT
A.1.5	MF 1.1 BL/CE
A.1.6	MF IR
A.2	Bands
A.2.1	sXGP (MF 1.9 GHz) (1880 MHz to 1920 MHz) (Band 39)
A.2.2	Band 240 (5150 MHz to 5925 MHz) (Band 46)
A.2.3	Band 250 (3550 MHz to 3700 MHz) (Band 48)
A.3	Device Capabilities
A.3.1	Non-Mobile System (Does not support mobility.)
A.3.2	Mobile System, No Inter-RAT Capability
A.3.3	Mobile System, Inter-RAT Capable
A.4	NHN Mode Support
B.1	Basic Features
B.1.1	Supports multiple frequencies
B.1.2	Supports Carrier Aggregation
B.2	Back-Off Timer Configuration
B.2.1	Use Back-Off Timer
B.2.2	Use Device Policy

ANNEX C: LOGGING TOOLS

Logging of RRC/NAS messages exchanged between BS and UE is required in order to perform those tests that include the verification of sequence of messages, or contents of specific messages.

The preferred tool for performing these tests is the Sanjole WaveJudge (Model 4900 or later), with the appropriate software modules for supporting MulteFire operation.

If the WaveJudge is not available, the test can also be performed using logging tools provided by the UE or BS (eNB) vendor. The logging tools must provide the ability to view the individual messages, and the contents of each field.

