The most important thing we build is trust

TM500 Training for Customer Hanwha Systems

21 Mar 2017

Cobham Wireless Korea

Introduction

TM500

De-facto standard test mobile, used throughout the mobile cellular industry, for testing the radio access interface for GSM, WCDMA & LTE cellular networks.

TM500 is fully compliant to 3GPP, and contains a comprehensive set of test features designed to exercise your network at every level of the protocol stack.

TM500 is able to emulate more than one UE at a time, allowing an eNB and the Core Network to be load tested without requiring an expensive, difficult to obtain and difficult to control suite of real mobiles.

TM500 is easy to control using a GUI application, (TMA) running a script, and or by sending commands using a third party automation system over the control interface.

Agenda

- TM500 Product Family
- Hardware & Software Options
- Main Feature support
- SW Releases & Roadmaps
- Hardware Overview & configuration
- TMA (Test Mobile Application)
- Modes of Operation
- Logging
- Automation
- Real Data Apps (RDA)

TM500 Product History

1999

TM100

3G (R99)

1 UE

2003

TM500 platform A & B

3G (R5, R6)

32 UE's

2008

TM500 platform C

4G (R8) & 3G (R7)

32 UE's

2012

TM500 platform C

4G (R10) & 3G (R10)

1000 UE's

2014

TM500 & E500 Mk3

4G (R11) & 3G (R10)

12x 1000 UE's

2016

TM500 & E500 Mk4.1

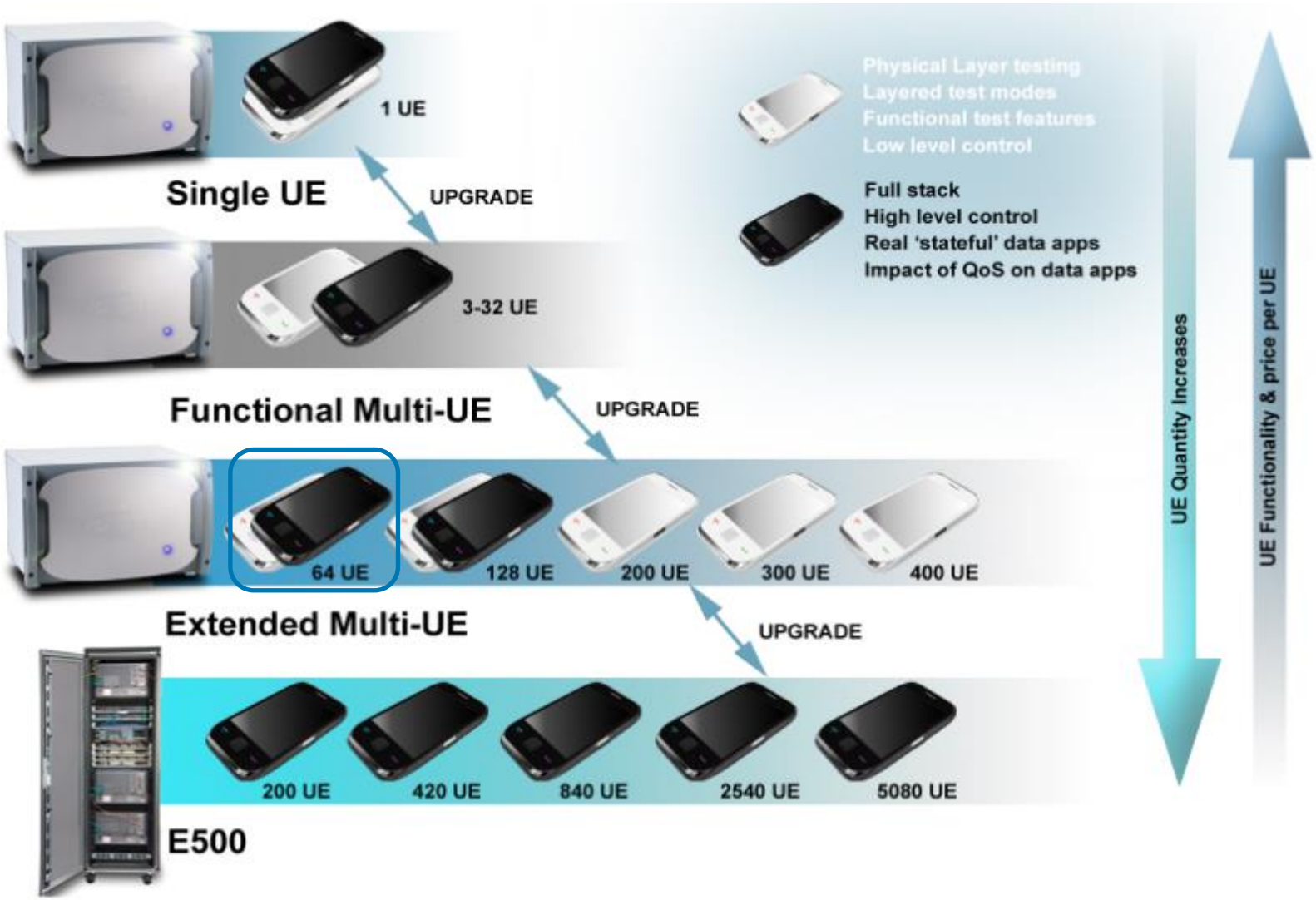
4G (R13)

3G (R10)

2G & Multi-RAT

12x 1500 UE's

TM500 Scalability



Test Mobile Family

COBHAM

TM500 - Functional Test

- Industry Leader - R&D test mobile since 1999
  - Used by every major macro & small cell vendor
  - Use in the lab or for early drive field testing
  - Proven interoperability through years of testing
- Advanced & early 3GPP functionality & roadmap
  - LTE: eICIC, UL MIMO, CA, 8x2, 4x4, 300 Mbps, etc
  - WCDMA: DC-HSUPA, 4C-HSDPA 168Mbps etc.

Proven IOT

EMUE/E500 – Network Performance & Capacity

- Up to 12,000 UE, 12 carriers, any2any mobility
- Validate network performance under loaded conditions
- Multi-Cell 2G, 3G, 4G & Non Cellular technologies
- Suite of test cases proven with network vendors
- Real data generation
- Metrics and Quality KPI generation

TM500 Test Mobile Product Family

- Single UE (SUE)
  - A fully usable mobile device
    - Works in a cabled environment
    - Can be used with a fading channel simulator (FCS)
    - Can be used over the air (OTA)
  - Used for Performance or Functional testing
  - 2 RF Cards can work across to 2 bands (e.g. CA 2CC operation)
  - Handover across 3 cells

TM500 Test Mobile Product Family

- Multi UE (MUE)
  - Simulates 1-32 UEs
    - Currently only used in a cabled environment
    - Assumes 0 cross correlation between RF ports
  - Used for Functional testing
    - Used to test eNB Scheduler
    - Test Functional elements of an eNB or RAN
  - Supports one Cell per radio card

TM500 Test Mobile Product Family

- Extended MUE (or EMUE or Ext-MUE)
  - Supports 64 - 1500 UEs
    - Only used in a cabled environment
    - Assumes 0 cross correlation between RF ports
  - Used for functional or multi-cell load testing
    - Test functional operation & capacity of eNB + RAN
  - Supports 1 cell per RF card (max 3 RF card per TM500 – HW106)

TM500 Test Mobile Product Family

- E500
  - Supports up to 1500 UEs per cell & up to 12 Cells
    - Used in a cabled environment
    - Assumes 0 cross correlation between RF ports
  - Used for Multi-sector load testing
    - Used to heavily load eNBs + RAN
    - Test Functional operations of a RAN
    - Provides signaling and data traffic load (via D500)
  - Contains an Access Concentrator for higher layer functions such as HO.
  - Can be used as a single system by one user or can be used by up to 6 independent users as individual elements

TM500 Test Mobile Product Family

RDA (Real Data Applications)

- Adds traffic generation & analysis capabilities to the TM500
  - End to End traffic & statistics
  - FTP/HTTP/RTSP/VoIP
  - VoLTE Client (SIP and voice packets)
- Allows multiple data sessions for each UE
- D500 HW ~ 1Gbps theoretical max throughput
- D1000 HW ~ 2Gbps theoretical max throughput
- R630 HW ~ 10Gbps theoretical max throughput
- Can be used with any TM500 product configuration
  - SUE – Works in manual mode or external scripting
  - MUE – Works in manual mode or external scripting
  - EMUE – Works in manual mode or automated mode
  - E500 – Should only be used in automated mode

TM500 Test Mobile Product Family

Type	UE Count	Primary Uses
SUE	1 UE	Performance & Functional test Over the air the air, cabled, or FCS operation HO across 3 cells Low level logging
MUE	1-32 UEs	Functional Test RF cabled operation only HO across 2 cells Manual data traffic Low level logging
EMUE	1 -3000 UEs (1500 per cell)	Functional & Capacity test of loaded eNB RF cabled operation only HO across 2 cells Option for automated data traffic Low level logging (1st 32 UE's)
E500	1-18000 UEs 12 cells	Functional & Capacity test of loaded eNB & RAN Multi-cell load testing of eNB & RAN Automated data traffic KPI level logging (lower level logging optional)

UE Functionality & Price per UE

UE Quantity increases

Software Releases & Roadmaps

Software Releases

COBHAM

- LTE SW loads

  SUE: LSE x.x.x

  MUE: LDE x.x.x

  Ext-MUE: LMF 7.x.x

  LMY 7.x.x

- ~~WCDMA SW load~~

  ~~Ext-MUE: WLB x.x.x~~

- ~~GERAN SW load~~

  ~~Ext-MUE: GLA x.x.x~~

- ~~M-RAT SW load~~

  ~~Ext-MUE: MRB x.x.x~~

COBHAM

TM500 LTE FDD/TDD Multi-UE Release LDE1.0.0

Cobham Wireless is
version LDE1.0.0.

This release adds s
- Combined T

Please refer to Sect
A list of resolved is

Note: This release
Contact your local
hardware required.

COBHAM

TM500 LTE FDD/TDD Network Tester Software Release LMY7.10.1

17th March 2017

Cobham Wireless is pleased to announce the release of TM500 LTE Network Tester Software version LMY7.10.1

This is a mainte
given in Sectior

The LMY SW is
4x4 and 8x4. I
functionality (lir

COBHAM

TM500 LTE FDD/TDD Network Tester Software Release LMF7.10.1

17th March 2017

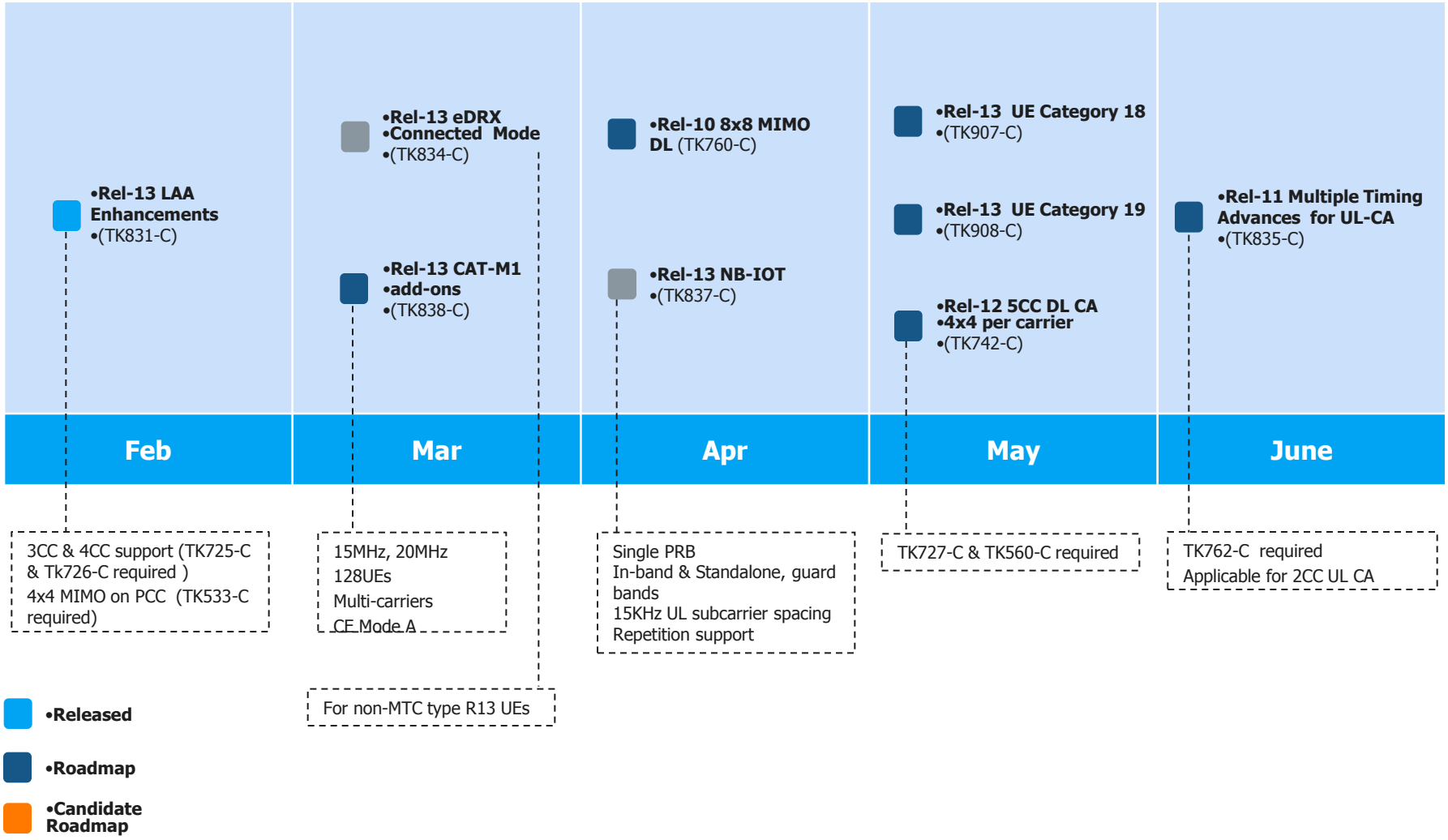
Cobham Wireless is pleased to announce the release of TM500 LTE Network Tester Software version LMF7.10.1

This is a maintenance release and contains fixes. A list of resolved issues is given in Section 3 of the Software Release Notes.

The LMF SW is targeted for 2 Receive Antennas (2Rx) MIMO support – 2x2, 4x2 and 8x2.

Cobham Wireless Network Tester Roadmap

LTE-(A) Rel-10 to Rel-13 3GPP Feature Roadmap

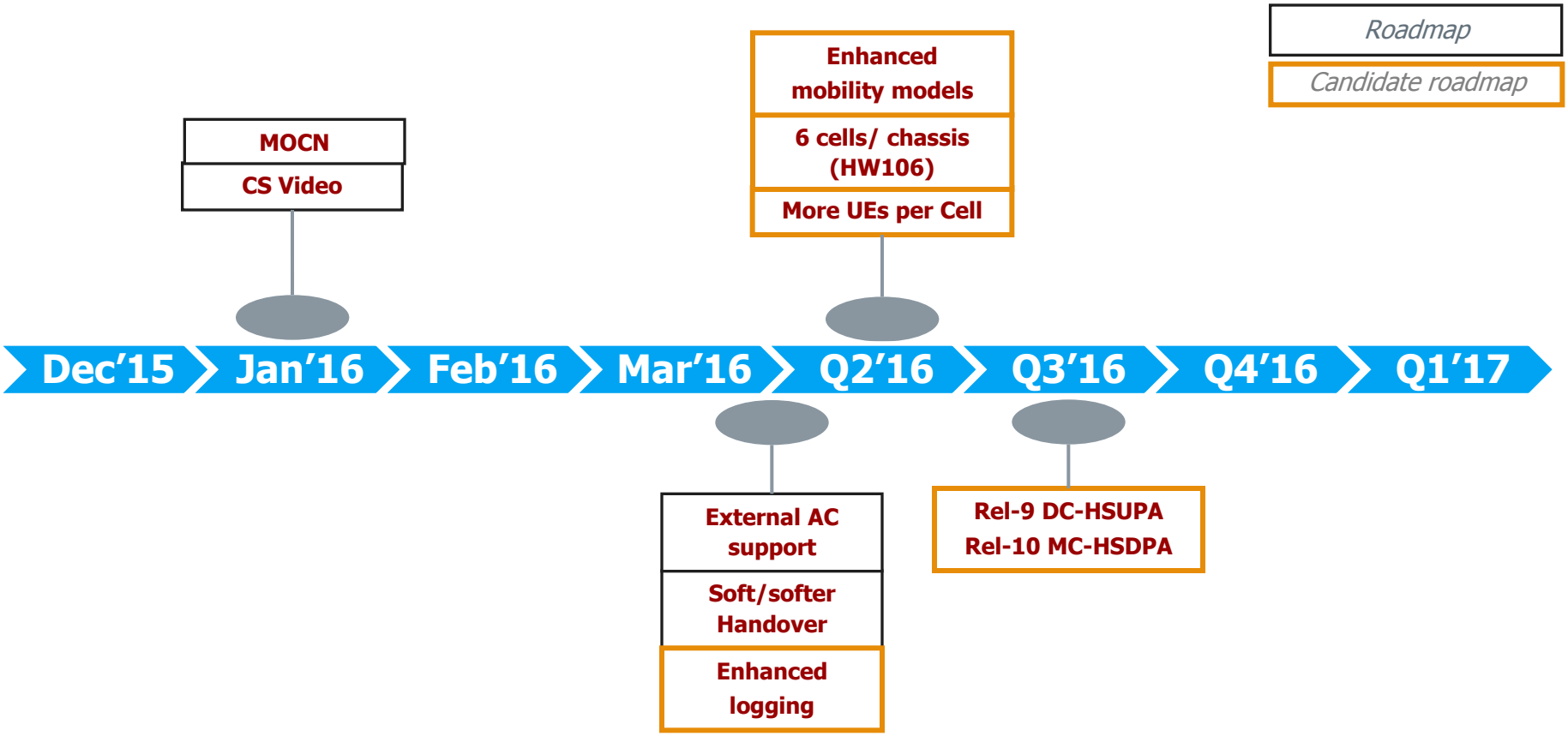


5G Features

Q2-17	Q3-17	Q4-17	H1-18
• **5G (5GTF specs)** • Standalone 5G carrier • 100MHz, 4x100MHz • 2x2MIMO • eMBB • 28 GHz	• **5G (5GTF specs) extensions** • > 4CCs	• **5G NR (Pre-3GPP specs)** • Digital BF • Non-standalone 5G (DC with LTE) • eMBB • Sub-6 GHz and mm-wave	• **5G NR (3GPP specs) extensions** • More carriers • Max throughput

- **•Released**
- **•Roadmap**
- **•Candidate Roadmap**

WCDMA Roadmap



GSM roadmap

Roadmap

Candidate roadmap

GPRS/EDGE
(OPTION)

EC-GSM
(OPTION)

Evolved EDGE

Dec'15 **Jan'16** **Feb'16** **Mar'16** **Q2'16** **Q3'16** **Q4'16** **Q1'17**

24 TRX
(OPTION)

Multi-RAT Roadmap

COBHAM

Released

Roadmap

Candidate roadmap

LTE: 420 UEs,
WCDMA: 128 UEs
GSM: 234 UEs

LTE-WCDMA PS HO
(Option)

LTE-WCDMA CSFB
(Option)

LTE-WCDMA RRC connection release with redirection
(Option)

LTE: 18+ cells
6000+ UEs:
GSM: 12 TRX

LTE-WCDMA vSRVCC

Nov'15 > **Jan'16** > **Feb'16** > **Mar'16** > **Q2'16** > **Q3'16** > **Q4'16** > **Q1'17**

LTE-GSM CSFB
(Option)

Multi-carrier
LTE-GSM-WCDMA

LTE-GSM PS HO

Hardware Overview & Configuration

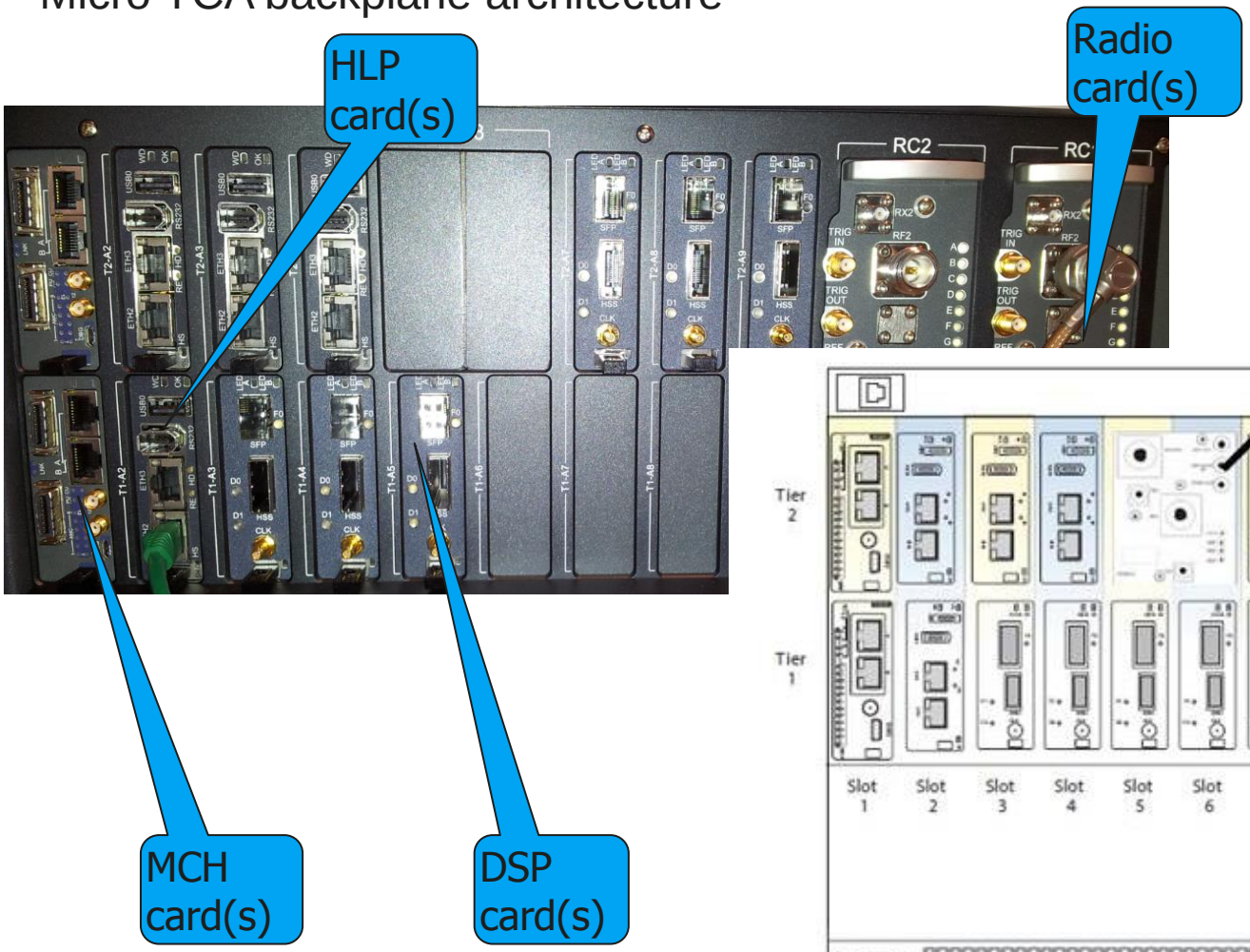
Hardware

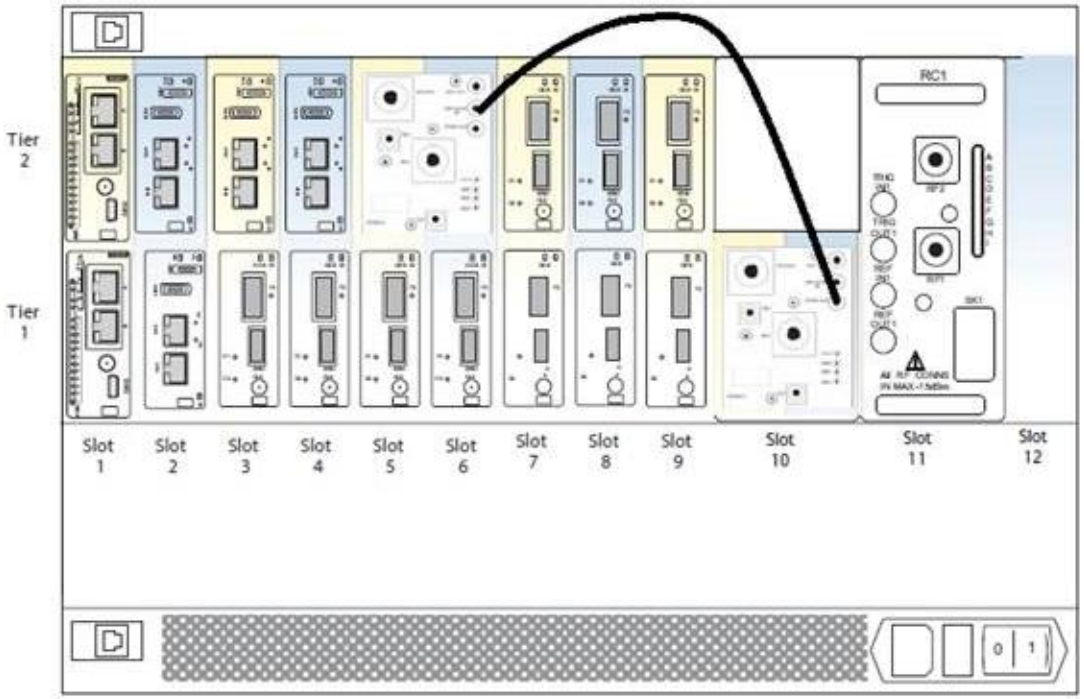
Front – TM500

Hardware

Example card layout (Mk3)

Micro TCA backplane architecture





Hardware

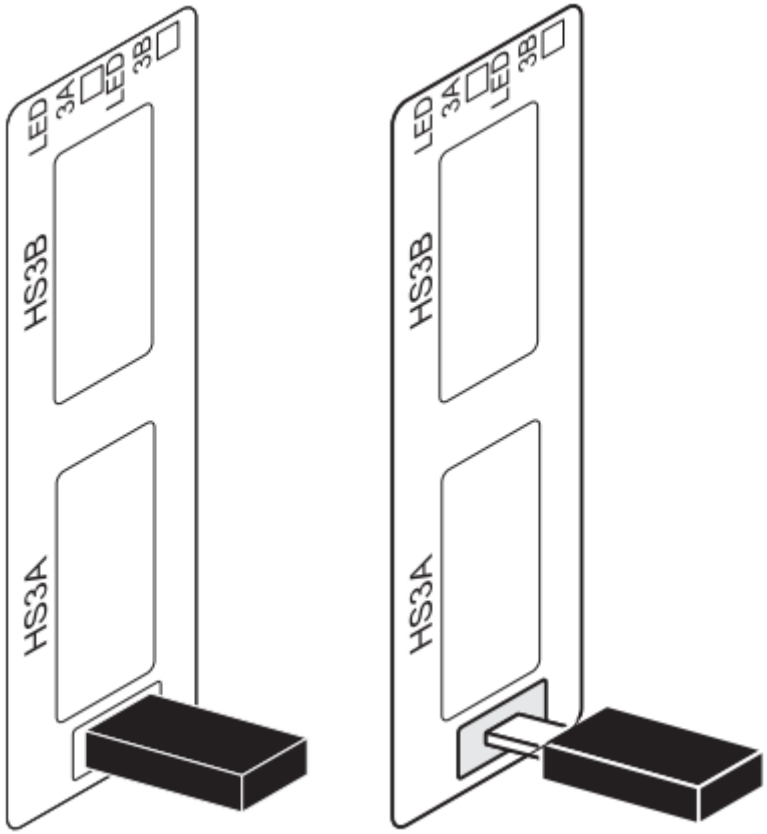
TM500 LED Indicators

They give clues on their operation.

Blue light indicates the card is not in operation.

The tab to the left of the LED acts as an ON / OFF switch.

Temperature overheating will also be indicated by the LED.



'On' position (Left), 'Off' position (right)

Hardware

Back – Fan Tray

- Ventilation / air flow is vital to keep the cards at operational temperature.
- If the TM500 is overheating, the AMC cards thermal cut-off will take place ensuring the cards do not overheat.
- Initial step would be to power down the TM500 and check if the filter has collected debris over a period of time.
  - There are two screw either side of the filter panel. These can be unscrewed and the filter can be removed.

Hardware

Radio Card LED's

Location	Legend	Colour	Indicating
Right side of card	A	Yellow	Hardware assert
	B	—	—
	C	Green	Power input to card OK
	D	—	—
	E	—	—
	F	This LED is only relevant if an external reference clock is used to provide baseband timing to the radio card. See the *TM500 Command Reference Manual* for more information about using this feature.	
		Red	External reference clock signal present but not within range.
		Orange	External reference clock signal present and in range.
	G	Green	External reference signal has been synchronised.
		Green	CON FPGA configured
		Red	CON FGPA not configured
	H	Green	SIG FPGA configured
		Red	SIG FGPA not configured
	I	Red	Software assert

See:
TM500LTE_InstallGuide.pdf

Multi-Band RF cards

Full height or Half height: same functionality.

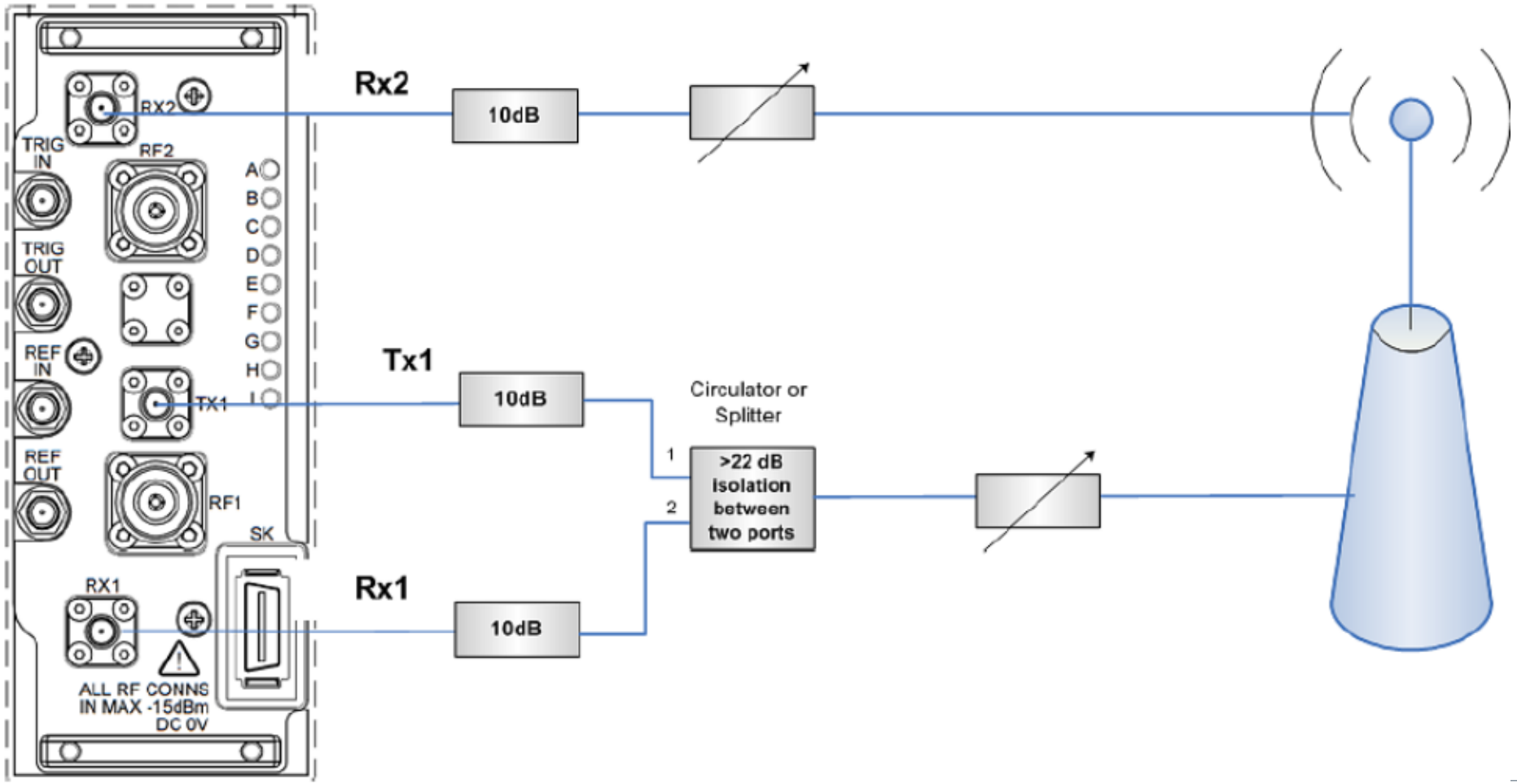
Frequency range supported = 400MHz to 6GHz.

Choice of Combined Tx/Rx or dedicated Tx & Rx RF ports.

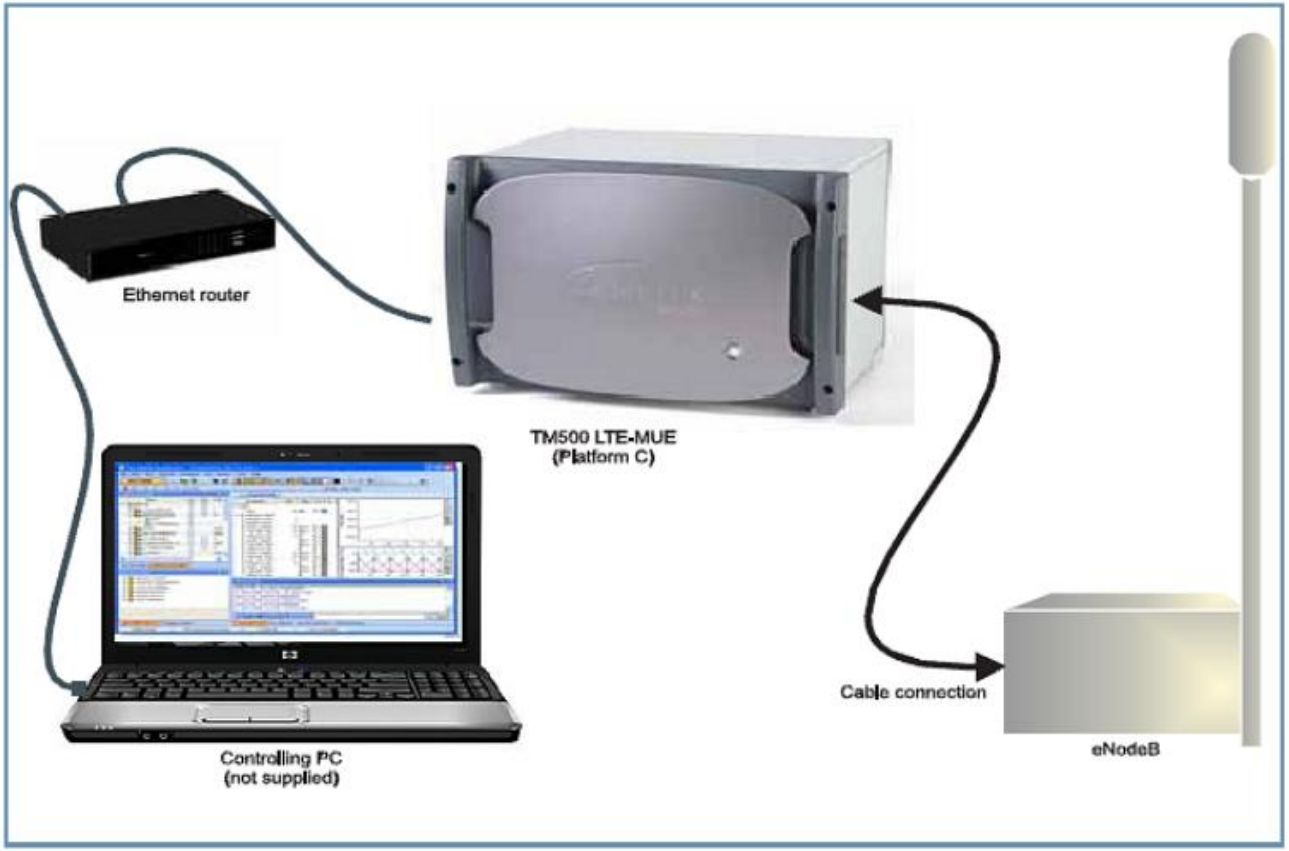
Multi-Band RF card

Optimal connection for max performance.

E.g. Dedicated port connection with external circulator -



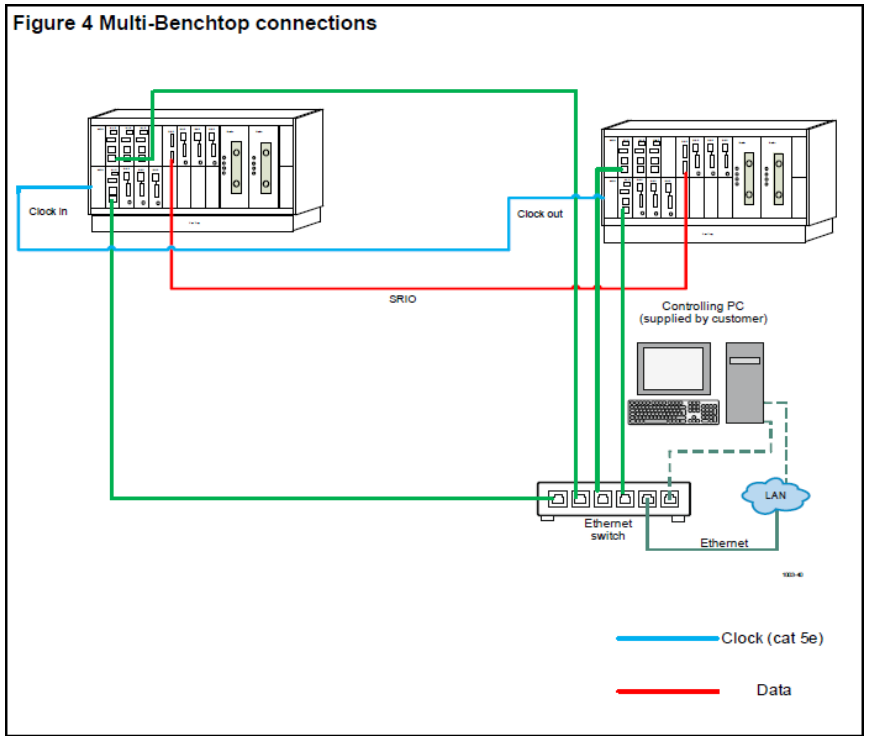
Connection & control



- TM500 is controlled from an external PC, running the TMA application
- 1GHz Ethernet switch (supplied)
- TM500 binary files are loaded on every power up, via FTP server (FileZilla supplied)

TM500/E500 System Control– H/W Platform

Connection – Benchtop system



- ✓ Check Point
  - Once all the system connection correctly connected, ping should be reached to each equipment
  - Example
    - 192.168.10.10 ~ 70 : TM500_1 ~ ~~TM500_AC~~
    - Hub : 192.168.10.2, ~~Power Management : 192.168.10.4~~, ~~ASC : 192.168.10.9~~

Connection & control

Serial interface

```
boot device          : gei
unit number          : 2
processor number     : 0
host name            : BOARD0
file name            : vxWorks.am945x
inet on ethernet (e) : 192.168.10.10:ffff0000
host inet (h)        : 192.168.10.131
user (u)             : tm500
ftp password (pw)    : tm500
flags (f)            : 0x8
startup script (s)   : start_hlc_am945x.txt

Loading... 4365824
Starting at 0xffffffff80408000...
```

```
COM30 - PuTTY

Instantiating /ata00 as rawFs, device = 0x1
Instantiating /ram0 as rawFs,  device = 0x50001
Formatting /ram0 for DOSFS
Instantiating /ram0 as rawFs, device = 0x50001
Formatting...OK.
Master 0 starting
Total lphy memory used = 1052704 bytes
    Local Device Type is configured in h/w as RIO host (P

  RapidIO port trained at 4x
    This device has RIO device ID 0x07
  pca_srio_InitLocalHost(): [BUILT FOR PLATFORMC BACKPLAN
PC8641D
Router Initialised
Total MCI message memory used = 199104 bytes
Total MCI response message memory used = 2002048 bytes

Built at 14:35:27 on Jan 30 2013
Product: LTE FDD MUE
Version: Kernel: 2.0/ad/R10
         App: TM500 LTE VERSION:V2.14.6:REV1:PPC:V2.14.6
```

Configure the TM500 (e) & host (h) ip addresses & set the ftp user & pw

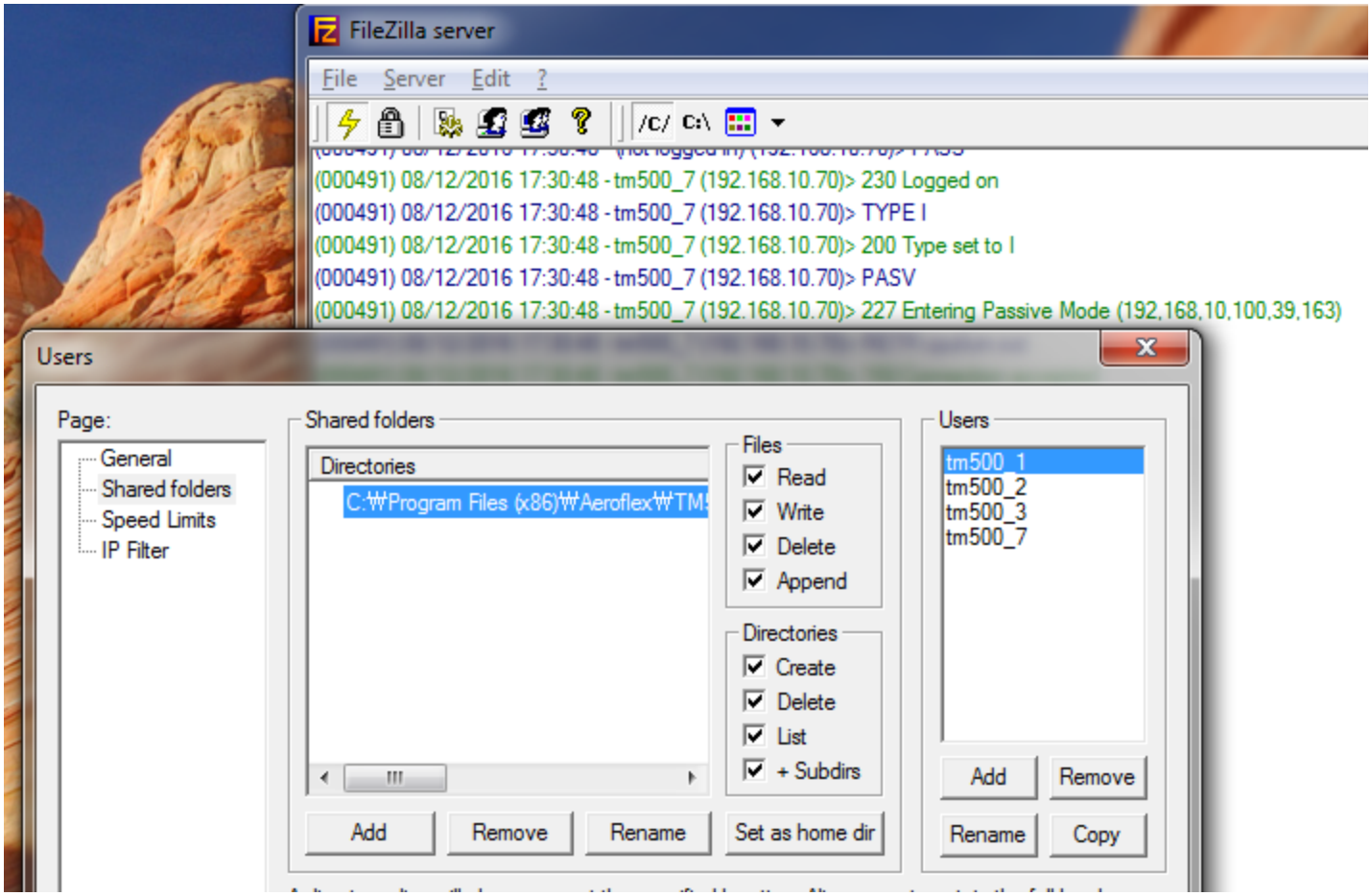
TM500 will continuously look for the ftp path to load its binary files

TM500 is ready to connect to TMA once you see the SW version indicated (TMA will wait for this)

Connection & control

COBHAM

FileZilla FTP server

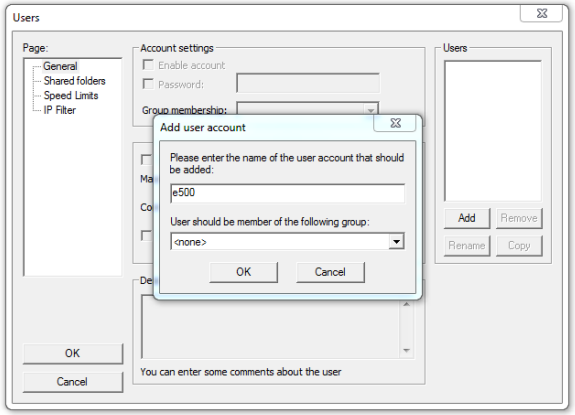


Configure the user & pw

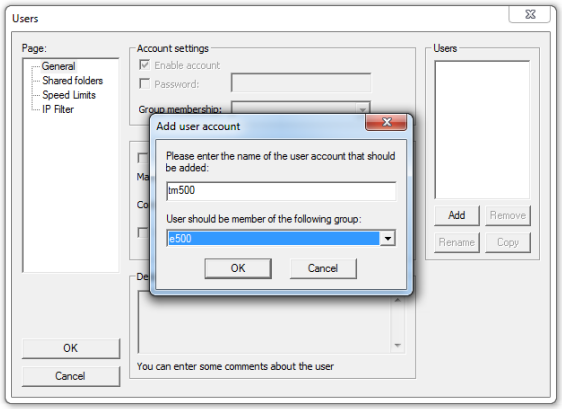
Set the path to the sw release you want to boot

TM500/E500 System Control– S/W Setting

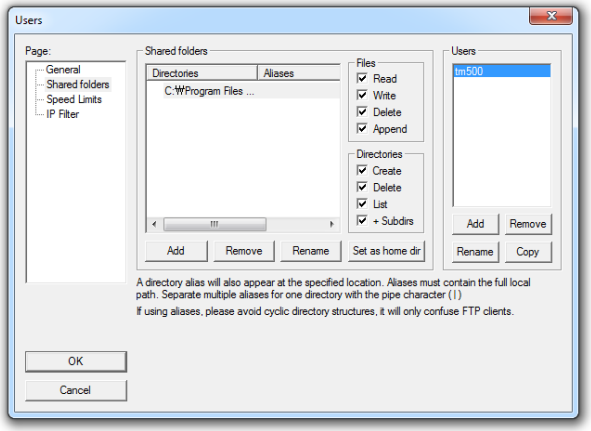
S/W Setting - Filezilla Setting

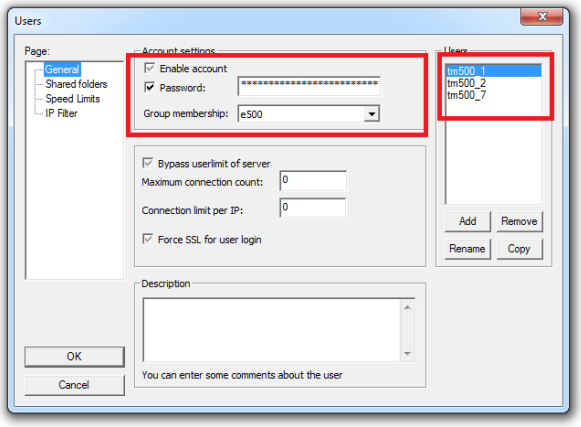


- Make Group for TM500 or E500



- Make TM500s inside E500 Group





- Set the Password

- Set "Shared Folders" to

C:□Program Files (x86)□Aeroflex□TM500□(Version)□ppc_pq□public□ftp_root

and tic all items.

TM500/E500 System Control

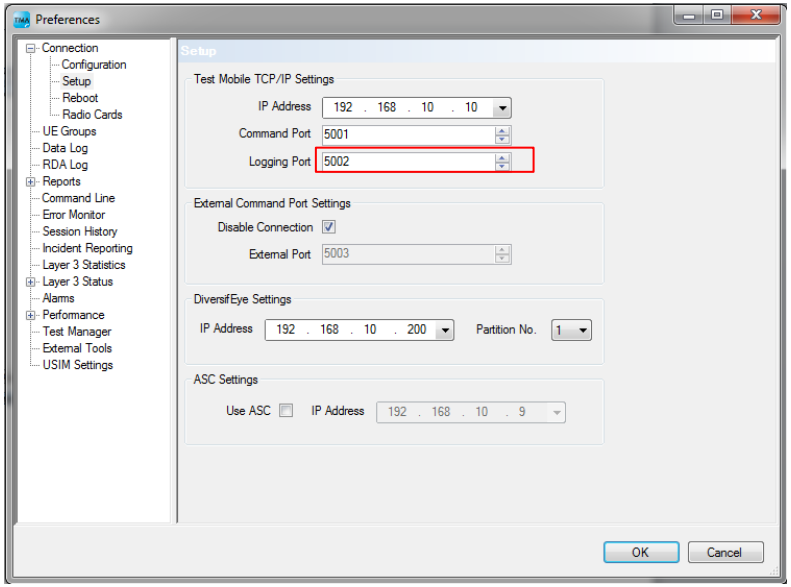
S/W Setting – Filezilla Setting

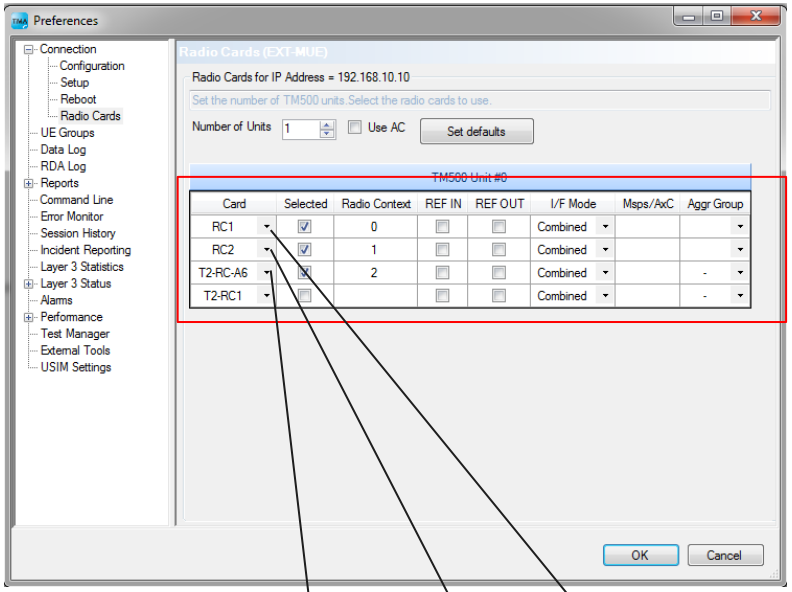
```
Copyright 2001-2009 by Tim Kosse (tim.kosse@filezilla-project.org)
Connecting to server...
Connected, waiting for authentication
Logged on
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> Connected, sending welcome message...
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> 220-FileZilla Server version 0.9.31 beta
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> 220-written by Tim Kosse (Tim.Kosse@gmx.de)
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> 220 Please visit http://sourceforge.net/projects/filezilla/
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> USER tm500_7
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> 331 Password required for tm500_7
(000001) 2015-02-06 오후 20:17:54 - (not logged in) (192.168.10.70)> PASS *****
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> 230 Logged on
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> TYPE I
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> 200 Type set to I
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> PASV
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> 227 Entering Passive Mode (192,168,10,100,192,97)
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> RETR vxWorks.am945x
(000001) 2015-02-06 오후 20:17:54 - tm500_7 (192.168.10.70)> 150 Connection accepted
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> Connected, sending welcome message...
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> 220-FileZilla Server version 0.9.31 beta
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> 220-written by Tim Kosse (Tim.Kosse@gmx.de)
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> 220 Please visit http://sourceforge.net/projects/filezilla/
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> USER tm500_1
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> 331 Password required for tm500_1
(000002) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.10)> PASS *****
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> 230 Logged on
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> TYPE I
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> 200 Type set to I
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> PASV
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> 227 Entering Passive Mode (192,168,10,100,192,102)
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> RETR vxWorks.am945x
(000002) 2015-02-06 오후 20:17:56 - tm500_1 (192.168.10.10)> 150 Connection accepted
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> Connected, sending welcome message...
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> 220-FileZilla Server version 0.9.31 beta
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> 220-written by Tim Kosse (Tim.Kosse@gmx.de)
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> 220 Please visit http://sourceforge.net/projects/filezilla/
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> USER tm500_2
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> 331 Password required for tm500_2
(000003) 2015-02-06 오후 20:17:56 - (not logged in) (192.168.10.20)> PASS *****
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> 230 Logged on
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> TYPE I
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> 200 Type set to I
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> PASV
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> 227 Entering Passive Mode (192,168,10,100,192,103)
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> RETR vxWorks.am945x
(000003) 2015-02-06 오후 20:17:56 - tm500_2 (192.168.10.20)> 150 Connection accepted
(000003) 2015-02-06 오후 20:17:58 - tm500_2 (192.168.10.20)> 226 Transfer OK
(000003) 2015-02-06 오후 20:17:58 - tm500_2 (192.168.10.20)> QUIT
(000003) 2015-02-06 오후 20:17:58 - tm500_2 (192.168.10.20)> 221 Goodbye
(000003) 2015-02-06 오후 20:17:58 - tm500_2 (192.168.10.20)> could not send reply, disconnected.
(000003) 2015-02-06 오후 20:17:58 - tm500_2 (192.168.10.20)> disconnected.
(000001) 2015-02-06 오후 20:18:00 - tm500_7 (192.168.10.70)> 226 Transfer OK
(000001) 2015-02-06 오후 20:18:00 - tm500_7 (192.168.10.70)> disconnected.
(000002) 2015-02-06 ?? 20:18:01 - tm500_1 (192.168.10.10)> 226 Transfer OK
(000002) 2015-02-06 오후 20:18:01 - tm500_1 (192.168.10.10)> QUIT
(000002) 2015-02-06 오후 20:18:01 - tm500_1 (192.168.10.10)> 221 Goodbye
(000002) 2015-02-06 오후 20:18:01 - tm500_1 (192.168.10.10)> could not send reply, disconnected.
(000002) 2015-02-06 오후 20:18:01 - tm500_1 (192.168.10.10)> disconnected.
(000004) 2015-02-06 ¿AEA 20:18:13 - (not logged in) (192.168.10.20)> Connected, sending welcome message...
```

- ✓ Check Point
  - Normal operation is beside picture.
  - Each TM500 downloading binary files.

TM500/E500 System Control

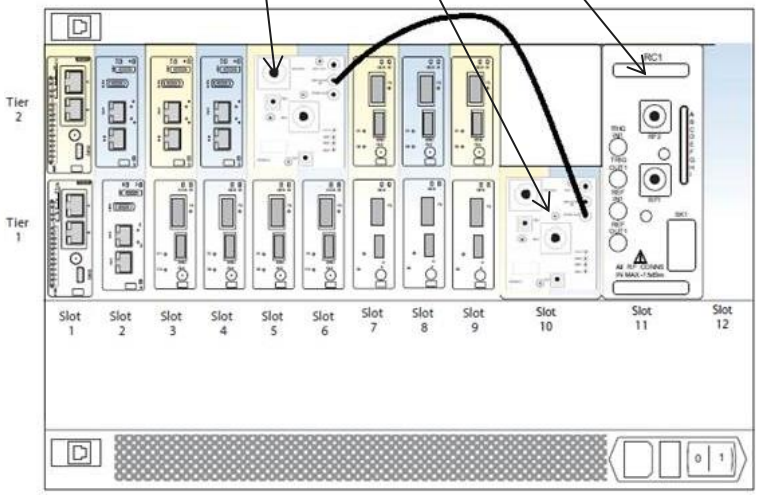
S/W Setting – TMA Setting





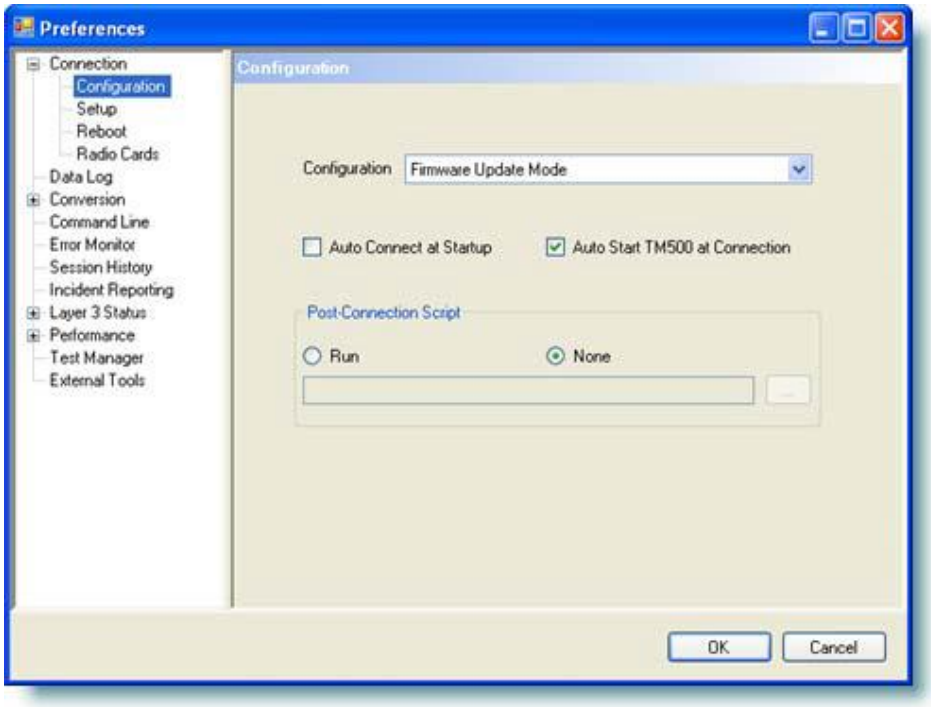
- TM500 IP Address Setting
- ASC IP Address Setting(Optional)

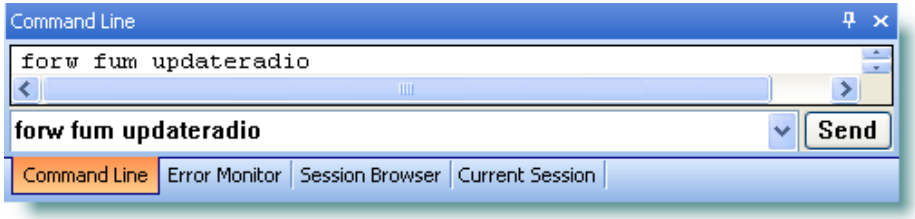
- Radio Card Setting



TM500/E500 System Control

S/W Setting – Firmware update





- Select Firmware update
- Enter the firmware update commend in commend line

  ->forw fum updateradio all
- Firmware update will be taken time, should be careful during firmware update.(Abnormal operation of firmware update is one of main reason to broke radio card)

TM500/E500 System Control

TMA Installation

```
06/02/15 22:41:53:621   C: CONNECT 0x00 ok. Waiting for User to Configure Te:
06/02/15 22:41:53:621   GSTS
06/02/15 22:41:53:621   C: GSTS 0x00 ok Reset
06/02/15 22:41:53:621   ABOT 0 0 1
06/02/15 22:41:53:652   C: ABOT 0x00 ok 0x0000001e
06/02/15 22:41:53:652   MULT 2
06/02/15 22:41:53:668   C: MULT 0x00 ok
06/02/15 22:41:53:668   SELR 0 1 RC1 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 ok
06/02/15 22:41:53:902   EREF 0 0 0
06/02/15 22:41:53:902   C: EREF 0x00 ok
06/02/15 22:41:53:902   SELR 1 1 RC2 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 ok
06/02/15 22:41:53:902   EREF 1 0 0
06/02/15 22:41:53:902   C: EREF 0x00 ok
06/02/15 22:41:53:902   SELR 2 2 RC1 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 ok
06/02/15 22:41:53:902   EREF 2 0 0
06/02/15 22:41:53:902   C: EREF 0x00 ok
06/02/15 22:41:53:902   SELR 3 2 RC2 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 ok
06/02/15 22:41:53:902   EREF 3 0 0
06/02/15 22:41:53:902   C: EREF 0x00 ok
06/02/15 22:41:53:902   GETR
06/02/15 22:41:53:902   C: GETR 0x00 ok
06/02/15 22:41:53:902   Radio cards
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card    : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot    : RC1
06/02/15 22:41:53:902      Chassis: 1
06/02/15 22:41:53:902      Context: 0
06/02/15 22:41:53:902      RF      : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card    : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot    : RC2
06/02/15 22:41:53:902      Chassis: 1
06/02/15 22:41:53:902      Context: 1
06/02/15 22:41:53:902      RF      : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card    : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot    : RC1
06/02/15 22:41:53:902      Chassis: 2
06/02/15 22:41:53:902      Context: 2
06/02/15 22:41:53:902      RF      : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card    : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot    : RC2
06/02/15 22:41:53:902      Chassis: 2
06/02/15 22:41:53:902      Context: 3
06/02/15 22:41:53:902      RF      : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:42:14:997   SCFG MTS_MODE
06/02/15 22:42:51:812   C: SCFG 0x00 ok MTS_MODE
06/02/15 22:42:51:921   LCFG hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
06/02/15 22:42:51:921   C: LCFG 0x00 ok
06/02/15 22:42:51:921   STRT
06/02/15 22:42:53:278   C: STRT 0x00 ok
06/02/15 22:42:53:294   GVER
06/02/15 22:42:53:949   C: GVER 0x00 ok
```

- ✓ Check Point
  - Once firmware update successes then see beside log in MTS/NAS loading step

Appendix – TM500/E500 System Control

MTS Mod Commend line log

```
06/02/15 22:41:52:950
06/02/15 22:41:53:621   C: CONNECT 0x00 ok. Waiting for User to Configure Test Mobile
06/02/15 22:41:53:621   GSTS
06/02/15 22:41:53:621   C: GSTS 0x00 Ok Reset
06/02/15 22:41:53:621   ABOT 0 0 1
06/02/15 22:41:53:652   C: ABOT 0x00 ok 0x0000001e
06/02/15 22:41:53:652   MULT 2
06/02/15 22:41:53:668   C: MULT 0x00 Ok
06/02/15 22:41:53:668   SELR 0 1 RC1 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 Ok
06/02/15 22:41:53:902   EREF 0 0 0
06/02/15 22:41:53:902   C: EREF 0x00 Ok
06/02/15 22:41:53:902   SELR 1 1 RC2 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 Ok
06/02/15 22:41:53:902   EREF 1 0 0
06/02/15 22:41:53:902   C: EREF 0x00 Ok
06/02/15 22:41:53:902   SELR 2 2 RC1 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 Ok
06/02/15 22:41:53:902   EREF 2 0 0
06/02/15 22:41:53:902   C: EREF 0x00 Ok
06/02/15 22:41:53:902   SELR 3 2 RC2 COMBINED
06/02/15 22:41:53:902   C: SELR 0x00 Ok
06/02/15 22:41:53:902   EREF 3 0 0
06/02/15 22:41:53:902   C: EREF 0x00 Ok
06/02/15 22:41:53:902   GETR
06/02/15 22:41:53:902   C: GETR 0x00 Ok
06/02/15 22:41:53:902   Radio cards
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card   : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot   : RC1
06/02/15 22:41:53:902      Chassis: 1
06/02/15 22:41:53:902      Context: 0
06/02/15 22:41:53:902      RF     : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card   : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot   : RC2
06/02/15 22:41:53:902      Chassis: 1
06/02/15 22:41:53:902      Context: 1
06/02/15 22:41:53:902      RF     : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card   : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot   : RC1
06/02/15 22:41:53:902      Chassis: 2
06/02/15 22:41:53:902      Context: 2
06/02/15 22:41:53:902      RF     : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902   ==============
06/02/15 22:41:53:902   *  Card   : Umbra2 LTE (20MHz)
06/02/15 22:41:53:902      Slot   : RC2
06/02/15 22:41:53:902      Chassis: 2
06/02/15 22:41:53:902      Context: 3
06/02/15 22:41:53:902      RF     : type 200
06/02/15 22:41:53:902      A:  DL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902          UL : 400.0 - 4000.0 MHz
06/02/15 22:41:53:902      B:  DL : 0.0 - 0.0 MHz
06/02/15 22:41:53:902          UL : 0.0 - 0.0 MHz
06/02/15 22:42:14:997   SCFG MTS_MODE
06/02/15 22:42:51:812   C: SCFG 0x00 Ok MTS_MODE
06/02/15 22:42:51:921   LCFG hlc all 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
06/02/15 22:42:51:921   C: LCFG 0x00 Ok
```

```
06/02/15 22:42:53:278   C: STRT 0x00 Ok
06/02/15 22:42:53:294   GVER
06/02/15 22:42:53:949   C: GVER 0x00 Ok
06/02/15 22:42:53:949    PPC-0:
06/02/15 22:42:53:949       BSP: 1.08.02/o
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:PPC:LME3.3.2
06/02/15 22:42:53:949    DSP-0:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0xA000200
06/02/15 22:42:53:949    DSP-1:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-2:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x9000400
06/02/15 22:42:53:949    DSP-3:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-4:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x3010A00
06/02/15 22:42:53:949    DSP-5:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-6:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0xA000200
06/02/15 22:42:53:949    DSP-7:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-8:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x9000400
06/02/15 22:42:53:949    DSP-9:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-10:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x3010A00
06/02/15 22:42:53:949    DSP-11:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-12:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0xA000200
06/02/15 22:42:53:949    DSP-13:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-14:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x9000400
06/02/15 22:42:53:949    DSP-15:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-16:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x3010A00
06/02/15 22:42:53:949    DSP-17:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-18:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0xA000200
06/02/15 22:42:53:949    DSP-19:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-20:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x9000400
06/02/15 22:42:53:949    DSP-21:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949    DSP-22:
06/02/15 22:42:53:949       APP: TM500 LTE VERSION:LME3.3.2:REV1:DSP:LME3.3.2
06/02/15 22:42:53:949       PCB: 0
06/02/15 22:42:53:949      VHDL: 0x3010A00
06/02/15 22:42:53:949    DSP-23:
```

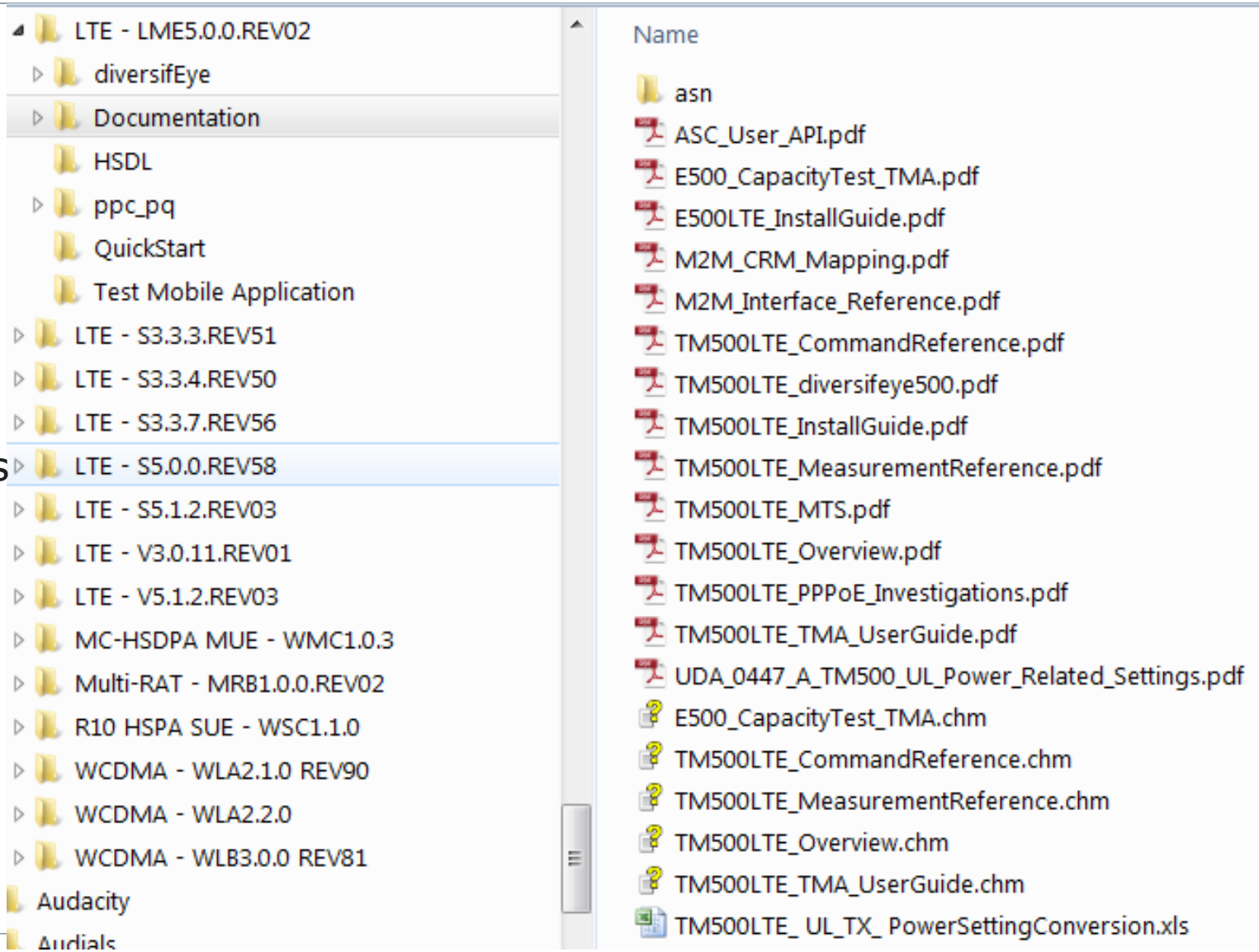
Appendix – TM500/E500 System Control

MTS Mod Commend line log

```
06/02/15 22:42:53:949    UMBRA-0
06/02/15 22:42:53:949       API: 13.3.1  Product: 3
06/02/15 22:42:53:949       APP: 1.0.149  Built: May 12 2014 17:50:04
06/02/15 22:42:53:949       CON: 3.5.0  Build: 0
06/02/15 22:42:53:949       SIG: 2.1.1  Build: 46
06/02/15 22:42:53:949       MMC: 1.7
06/02/15 22:42:53:949       Carrier:  Loc: 13  PCB: 3.0 (OWI: 3.0)  SN: 0x4A000001E2BF9923  BarCode: 25-1501-1460070-0564
06/02/15 22:42:53:949       MOD TX: 0.0.17  Build: 16  Type: 200  PCB: 3.0 (OWI: 3.0)  SN: 0xAC000001679CD523  BarCode: 0000004483073725043 1
06/02/15 22:42:53:949       MOD RX: 0.0.31  Build: 34  PCB: 3.0
06/02/15 22:42:53:949    UMBRA-1
06/02/15 22:42:53:949       API: 13.3.1  Product: 3
06/02/15 22:42:53:949       APP: 1.0.149  Built: May 12 2014 17:50:04
06/02/15 22:42:53:949       CON: 3.5.0  Build: 0
06/02/15 22:42:53:949       SIG: 2.1.1  Build: 46
06/02/15 22:42:53:949       MMC: 1.7
06/02/15 22:42:53:949       Carrier:  Loc: 12  PCB: 3.0 (OWI: 3.0)  SN: 0x07000001AA221923  BarCode: 25-1501-1260070-0388
06/02/15 22:42:53:949       MOD TX: 0.0.17  Build: 16  Type: 200  PCB: 3.0 (OWI: 3.0)  SN: 0x020000167984523  BarCode: 0000004483073725048 5
06/02/15 22:42:53:949       MOD RX: 0.0.31  Build: 34  PCB: 3.0
06/02/15 22:42:53:949    UMBRA-2
06/02/15 22:42:53:949       API: 13.3.1  Product: 3
06/02/15 22:42:53:949       APP: 1.0.149  Built: May 12 2014 17:50:04
06/02/15 22:42:53:949       CON: 3.5.0  Build: 0
06/02/15 22:42:53:949       SIG: 2.1.1  Build: 46
06/02/15 22:42:53:949       MMC: 1.7
06/02/15 22:42:53:949       Carrier:  Loc: 13  PCB: 3.0 (OWI: 3.0)  SN: 0xDD000001E2B09223  BarCode: 25-1502-1460070-0578
06/02/15 22:42:53:949       MOD TX: 0.0.17  Build: 16  Type: 200  PCB: 3.0 (OWI: 3.0)  SN: 0x29000001679A8423  BarCode: 0000004483073700189 2
06/02/15 22:42:53:949       MOD RX: 0.0.31  Build: 34  PCB: 3.0
06/02/15 22:42:53:949    UMBRA-3
06/02/15 22:42:53:949       API: 13.3.1  Product: 3
06/02/15 22:42:53:949       APP: 1.0.149  Built: May 12 2014 17:50:04
06/02/15 22:42:53:949       CON: 3.5.0  Build: 0
06/02/15 22:42:53:949       SIG: 2.1.1  Build: 46
06/02/15 22:42:53:949       MMC: 1.7
06/02/15 22:42:53:949       Carrier:  Loc: 12  PCB: 3.0 (OWI: 3.0)  SN: 0xEB000001E2B10F23  BarCode: 25-1452-1460070-0557
06/02/15 22:42:53:949       MOD TX: 0.0.17  Build: 16  Type: 200  PCB: 3.0 (OWI: 3.0)  SN: 0x2F00000167961D23  BarCode: 0000004483073700187 5
06/02/15 22:42:53:949       MOD RX: 0.0.31  Build: 34  PCB: 3.0
06/02/15 22:42:53:964   SDLI LTE_RADIO_CONTEXT 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
06/02/15 22:42:53:964   C: SDLI 0x00 Ok LTE_RADIO_CONTEXT 0x00000001 0x00000008 0x00000001 0x00000011 0x1db6b9d3 0x96d4328c 0x5b5b5b5b 0x625b5b5b 0x7b824518 0xeaacaeeb 0x1980811d 0x453df1c9 0x3264d6d5 0xd091da91
06/02/15 22:42:53:980   SDLI LTE_L3_NAS_STATS 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
06/02/15 22:42:53:980   C: SDLI 0x00 Ok LTE_L3_NAS_STATS 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
06/02/15 22:42:54:011   SDLI LTE_L3_RRC_STATS 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
06/02/15 22:42:54:011   C: SDLI 0x00 Ok LTE_L3_RRC_STATS 0x00000001 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
06/02/15 22:43:06:683   #$$DISCONNECT
```

Documentation

When the user installs the TMA, documentation in both windows help, & PDF format are installed.



Test Mobile Application (TMA)

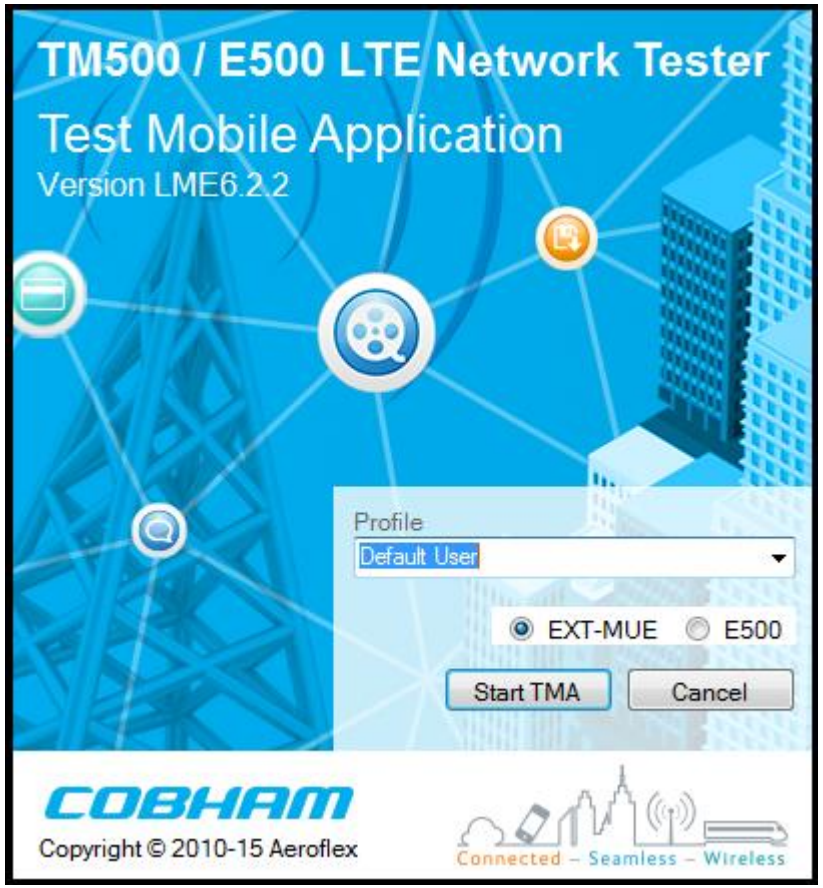
Running the TMA

Start up screen with User profile selection, allowing the user to define a session profile which stores all the scripts and settings for that particular session. Any name can be used.

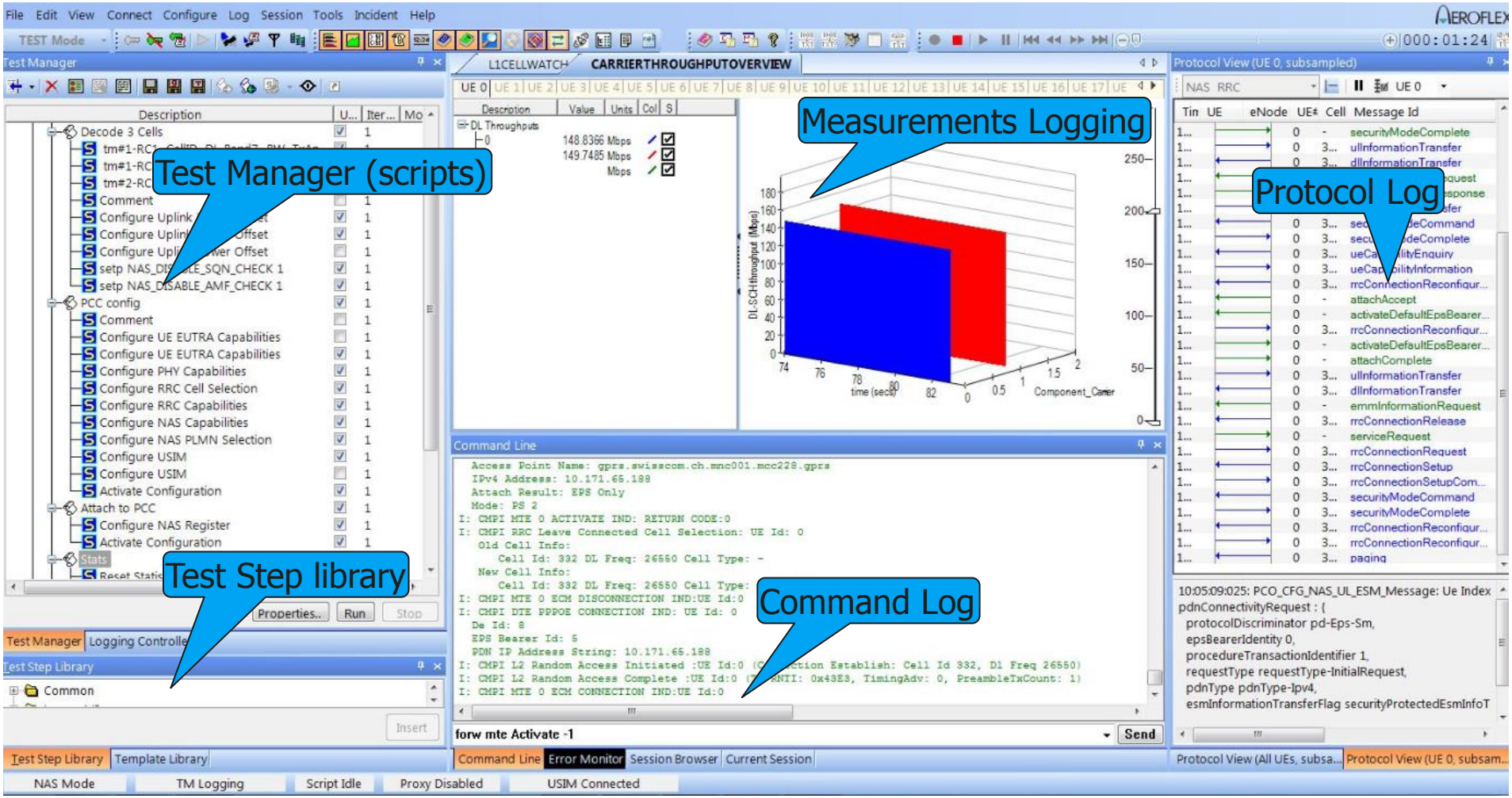
This opening splash screen shows the version of the TMA being used.

The version of the TMA needs to match the version of the TM500 software loaded via FTP server.

Two interfaces are available (Ext-MUE & E500)



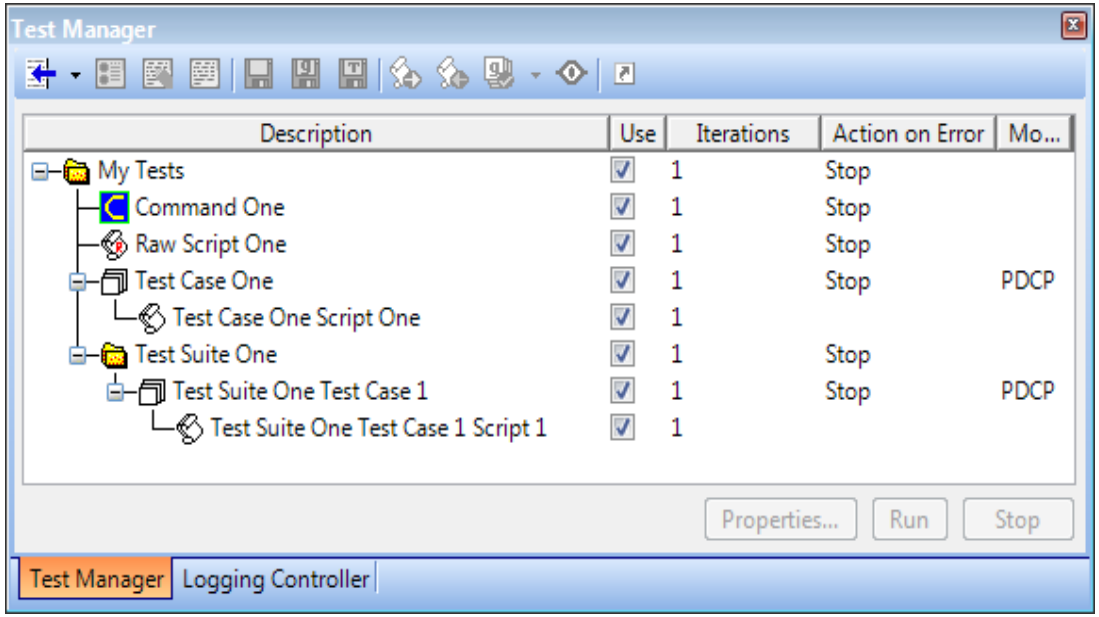
TMA: Ext-MUE Gui



Test Manager

The Test manager is where all the test scripts are placed. It normally sits in the top half of the left hand side of the main window.

Tests are divided into one or more Commands, Raw Scripts, Test Cases and Test Suites. Each Test case contains one or more Test Scripts. A Test Suite can contain the same types of items as a Test. An example is shown here:-



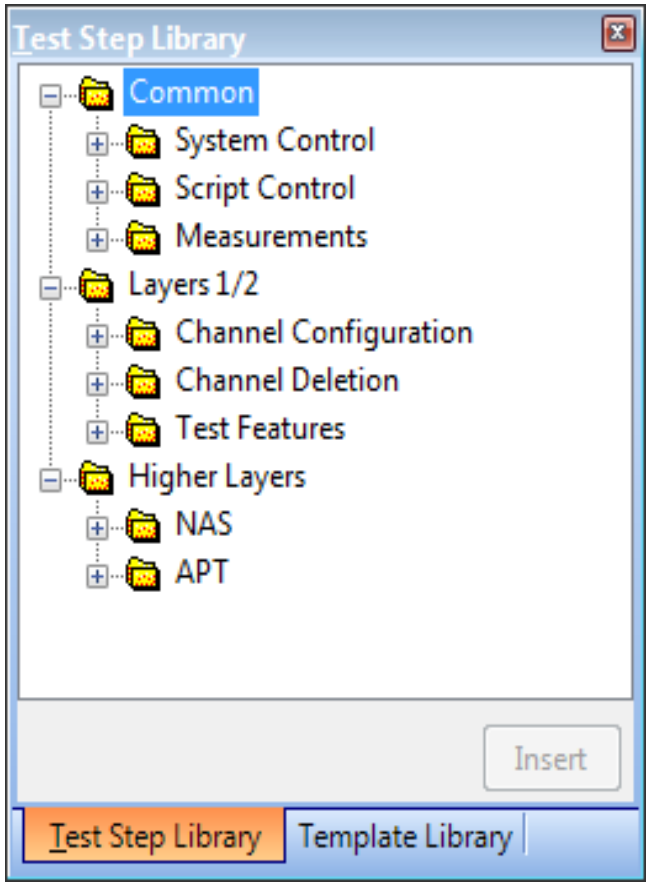
Test Step Library

The Test Step Library can normally be found on the bottom half of the left hand side of the main window.

The Test Step Library is a different way to create scripts, based on the use of dialogues where all the required parameters for a particular scenario are configured in a single place. The resulting script commands can be seen afterwards.

The test step library is divided into three main sections:-

- Common
  - This is where the most commonly used script commands are stored such as the activate command etc
- Layers 1/2
  - This contains dialogues specific to layers 1 and 2 such as the physical channel configuration dialogs or the logical channel configuration dialogues
- High Layers
  - These contain dialogues for RRC and NAS features as well as some Advanced Protocol Test (APT) features. They will not be discussed in detail in this course



Test Step Library - Common Dialogues

COBHAM

The System Control Dialogues

- Common
  - System Control
    - Switch External Reference On/Off
    - Start Mobile
    - Get TestMobile Version
    - Configure PHY Capabilities
    - Set System Bandwidth
    - Perform Cell Search
    - Set Number of eNB Transmit Antennae
    - Configure Radio link monitoring
    - Configure PDCP Capabilities
    - Configure PDCP security
    - Reinitialise Mode
    - Activate Configuration
  - Script Control
  - Measurements
- Layers 1/2
  - Channel Configuration
  - Channel Deletion
  - Test Features
- Higher Layers
  - NAS
  - APT

The Script Control and Measurements Dialogues

- Common
  - System Control
  - Script Control
    - Select Cell
    - Select UEs
    - Wait
    - Comment
    - Raw Text Command
  - Measurements
    - Start GUI Logging
    - Display QoS Statistics
    - Reset QoS Statistics
    - End GUI Logging
    - Perform Binary File Conversion
    - Configure Cell Reporting
- Layers 1/2
  - Channel Configuration
  - Channel Deletion
  - Test Features
- Higher Layers
  - NAS
  - APT

Test Step Library - Layer 1/2 Dialogues

COBHAM

The Channel Configuration Dialogues

- Common
- Layers 1/2
  - Channel Configuration
    - Configure BCH
    - Configure Downlink Signalling
    - Configure Dynamic BCH
    - Configure PCH
    - Configure Downlink SCH
    - Configure Uplink SRS
    - Configure Uplink Signalling
    - Configure RACH
    - Configure Uplink SCH
    - Configure Semi Persistent Scheduling
    - Configure DRX
  - Channel Deletion
    - Delete BCH
    - Delete Dynamic BCH
    - Delete PCH
    - Delete Downlink SCH
    - Delete Uplink SCH
    - Delete Uplink SRS
  - Test Features
- Higher Layers
  - NAS
  - APT

The Test Features Dialogues

- Common
- Layers 1/2
  - Channel Configuration
  - Channel Deletion
  - Test Features
    - Configure Online Mobility Model
    - Configure Path Loss
    - Configure Path Delay
    - Configure Uplink Interference
    - Configure Uplink Power Offset
    - Configure Uplink Timing
    - Force Downlink SCH Errors
    - Force Sync Loss
    - Force Uplink SCH Errors
    - Override Cell Measurements
    - Override Downlink SCH HARQs
    - RACH Contention Resolution Bypass
    - Set AFC
    - Set PBCH Transport Block Size
    - Set PRACH Collision Mode
    - Set RF Receive Gain
- Higher Layers
  - NAS
  - APT

Test Step Library - Higher Layer Dialogues

NAS commands

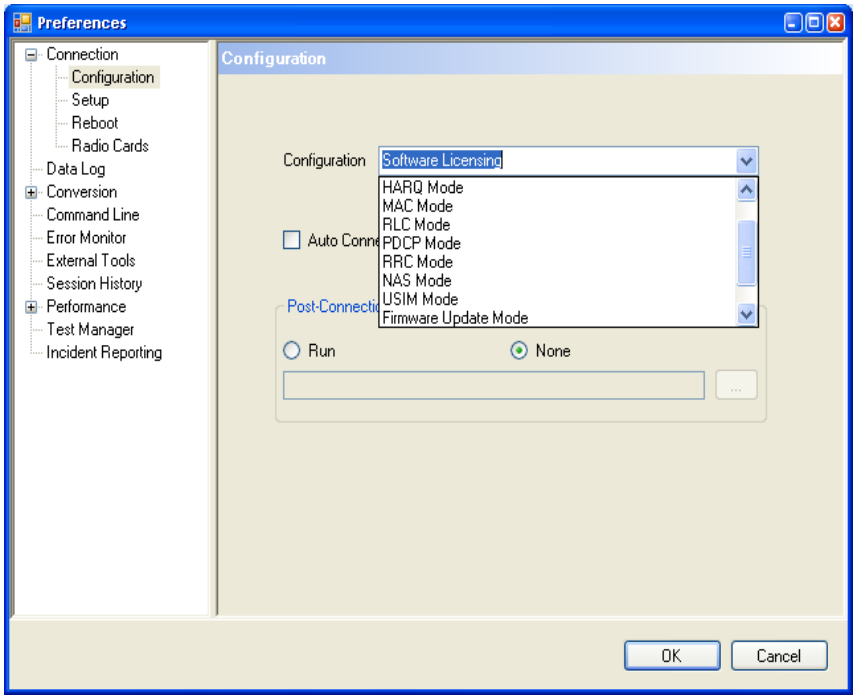
- Common
- Layers 1/2
- Higher Layers
  - NAS
    - Configure NAS Activation
    - Configure NAS Register
    - Configure NAS Deregister
    - Configure USIM
    - Configure PDN
    - Delete PDN
    - Configure EPS Bearer Resource
    - Delete EPS Bearer Resource
    - Override EPS Bearer Data
    - Configure Emergency Call
  - APT

Advanced Protocol Test commands

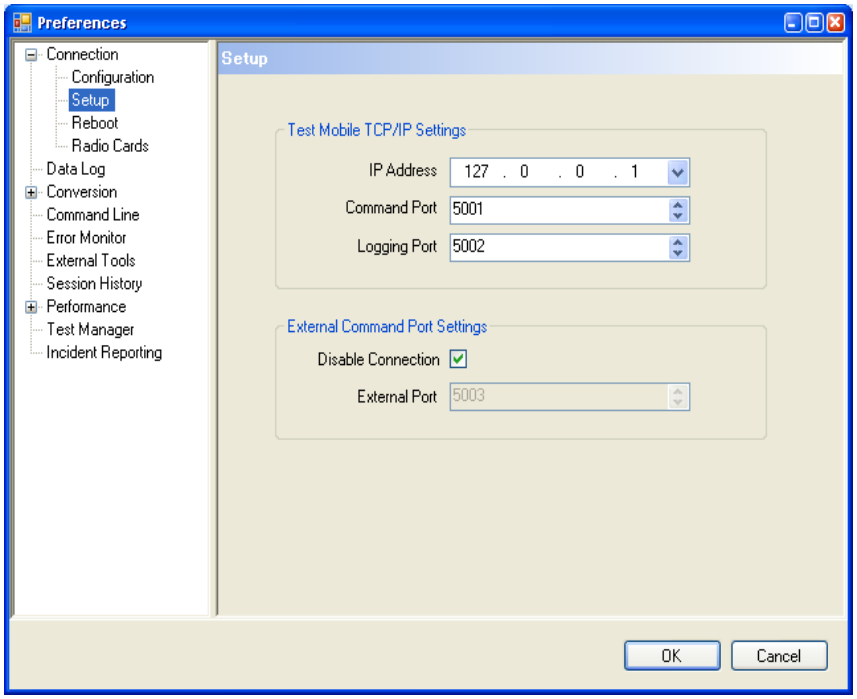
- Common
- Layers 1/2
- Higher Layers
  - NAS
  - APT
    - Configure RRC Capabilities
    - Configure RRC Cell Selection
    - Configure NAS Capabilities
    - Configure NAS PLMN Selection
    - Configure NAS UE Identity
    - Trigger RRC Measurement Event
    - Trigger RRC Connection Reestablishment
    - Trigger Service Request
    - Trigger Tracking Area Update
    - Get RRC Measurement Configuration
    - Override CGI Information
    - Configure UE EUTRA Capabilities
    - Override RRC Band
    - Send CSFB CDMA2000 Parameter Request
    - Send CDMA2000 Data Transfer
    - Trigger Uplink Handover Preparation Transfer
    - Return to EUTRAN
    - Send Extended Service Request

Running a Test - Configuration Preferences

Choose Test Mode for tests to be run

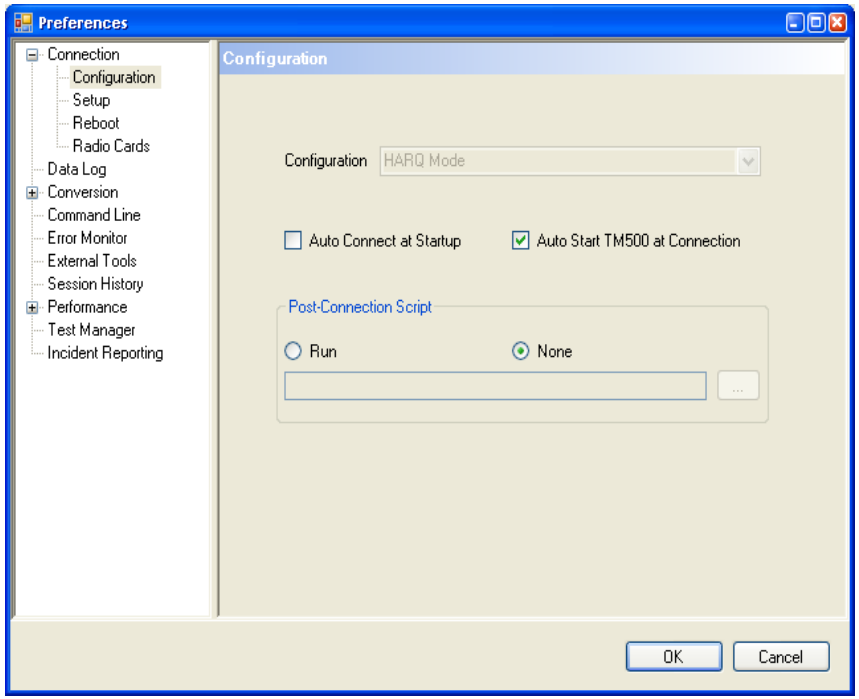


Update the correct IP address

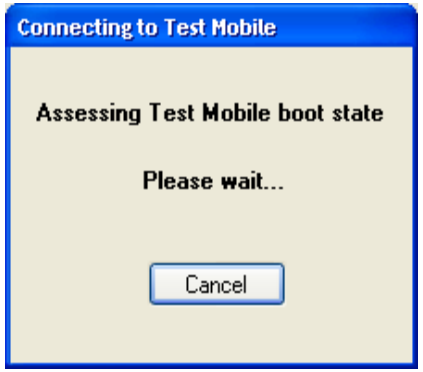


Running a Test - Connecting to the TM500...

Make sure that "Auto Start" is selected



This status window should then appear:-



Running a Test - TMA Main Window after connection

Note that an automatic GVER is performed after the STRT:-

Test Mobile Application (proxy: 5003) - Connected to TM 10.1.20.119

File Edit View Connect Configure Log Session Tools Incident Help

TEST Mode

000:00:00

Test Manager

Description	Use	Iterati...	Action...	Mo
My Tests	☑	1	Stop	

Properties... Run Stop

Test Manager | Logging Controller

Test Step Library

- Common
- Layers 1/2
- Higher Layers

Insert

Test Step Library | Template Library

Command Line

```
26/02/10 16:16:56:648 #$$CONNECT
26/02/10 16:16:57:492 C:  CONNECT 0x00 ok. Waiting for User to Configure Test Mobile
26/02/10 16:16:57:492 GSTS
26/02/10 16:16:57:492 C: GSTS 0x00 Ok Reset
26/02/10 16:16:57:492 SCFG HARQ_MODE
26/02/10 16:16:57:523 C: SCFG 0x00 Ok HARQ_MODE
26/02/10 16:16:57:523 STRT
26/02/10 16:17:01:883 C: STRT 0x00 Ok
26/02/10 16:17:01:883 GVER
26/02/10 16:17:01:898 C: GVER 0x00 Ok
26/02/10 16:17:01:898  PPC-0:
26/02/10 16:17:01:898     BSP: 2.0/f/R10
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:PPC:C3.12.0
26/02/10 16:17:01:898  DSP-0:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-1:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-2:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-3:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-4:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-5:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-6:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-7:
26/02/10 16:17:01:898     APP: TM500 LTE VERSION:C3.12.0:REV1:DSP:C3.12.0
26/02/10 16:17:01:898  DSP-8:
```

#$$CONNECT Send

Command Line | Error Monitor | Session Browser | Current Session

Protocol view (not receiving -...

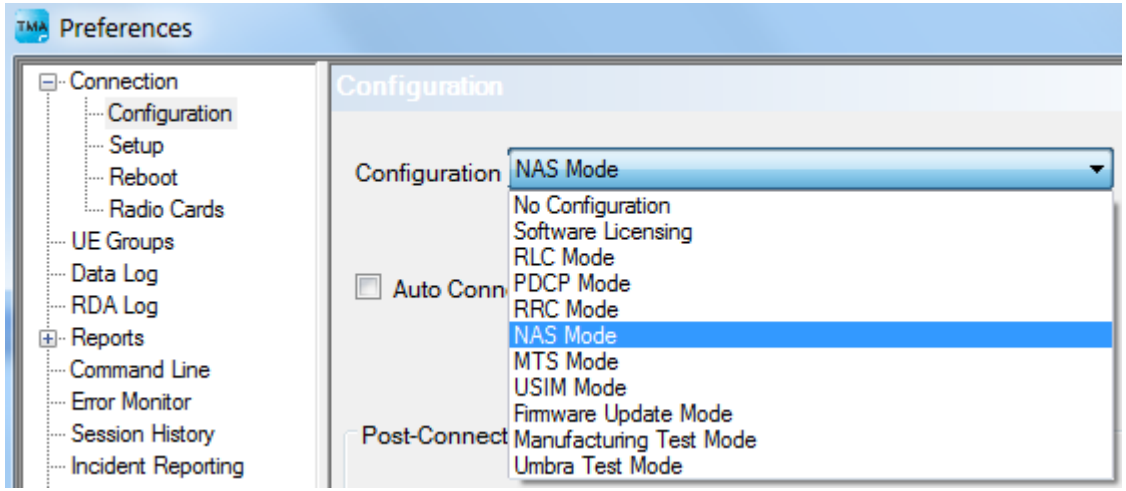
Time	UE	eNodeB

HARQ Mode | TM Components Started | Script Idle | Proxy Disabled

Modes of Operation

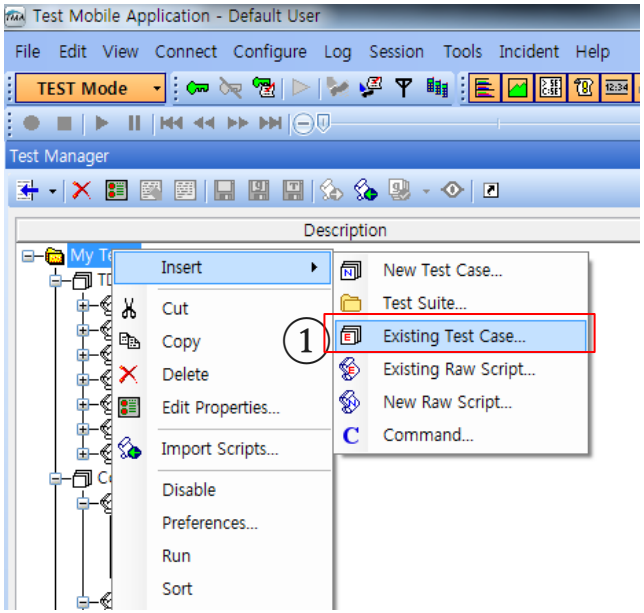
TM500: Test Modes

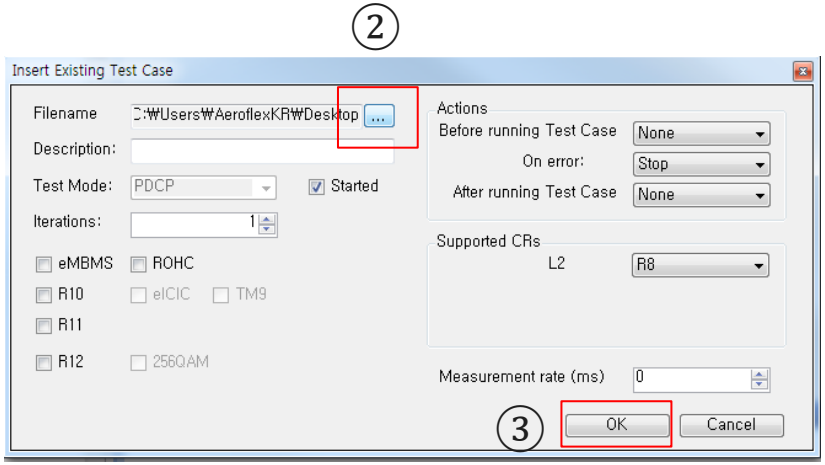
- **TM500 can be driven from any of these layers:**
- HARQ PHY layer with addition of HARQ process (SUE & MUE only)
- MAC (SUE & MUE only)
- RLC (SUE & MUE only)
- PDCP (SUE, MUE & Ext-MUE)
- NAS Full Protocol stack (SUE, MUE & Ext-MUE)
- MTS Full Protocol stack, Choice of Gui (Ext-MUE only)



Scripting - Loading & Saving Existing Test Case

How to load existing test cases





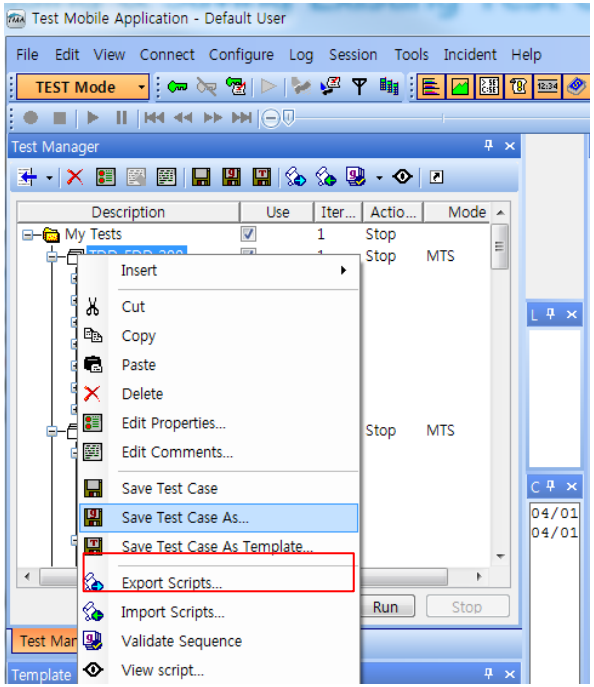
- Mouse right click gives an option to Insert and Existing Test Case.
- User can find Insert Exsing Test Case popup and select Filename
- User also can check R10,R11,R12 version
- Please selcet OK button.
- User can load existing Test Case
- If you have existing test case You can load just using drag and drop.

✓ Check Point

- ✓ Please check script version, mode when user load existing test cases
- ✓ For example NAS mode cases or MTS cases

Scripting - Loading & Saving Existing Test Case

How to saving test cases



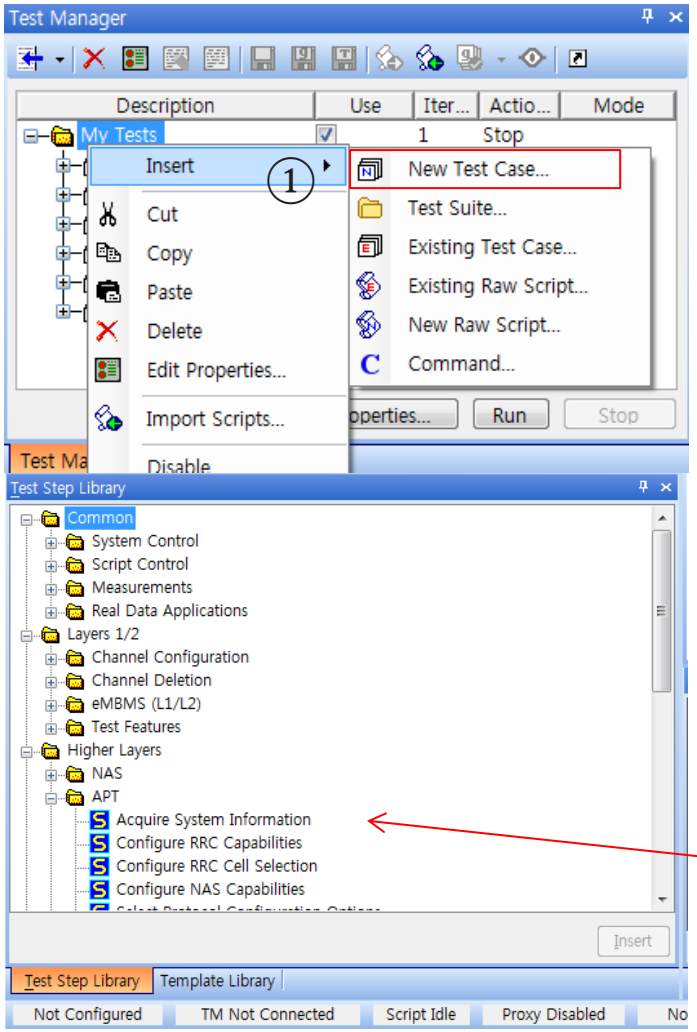
- User simply copy existing test script and paste using mouse right click option (Please save as different name of test script)

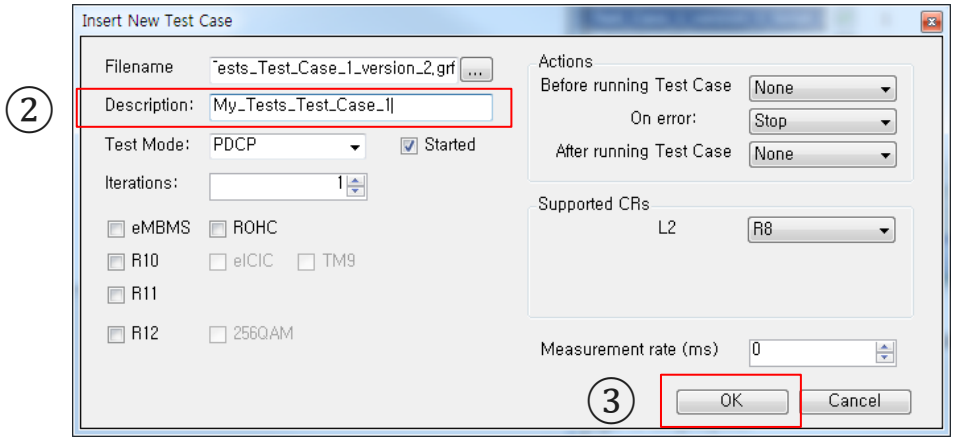
✓ Check Point

- sometimes user cannot open the script, becuase test case version is not valid in current version. Please open up the test case using note pad and changed version number as what other test scrpts are.

Scripting - Creating My Test Case

How to generate a simple script





- Right click the My Tests item, select Insert, and then click New Test Case
- Click OK in the dialog box that apperars to accept the default properties.
- By default each new test case includes a script. To display the script, expand the test case you added in the
- In the **Test Step Library**, navigate to the test steps listed below, and then drag-and-drop each one into your new script

Scripting Contents

Basic Scripting Structure for attach

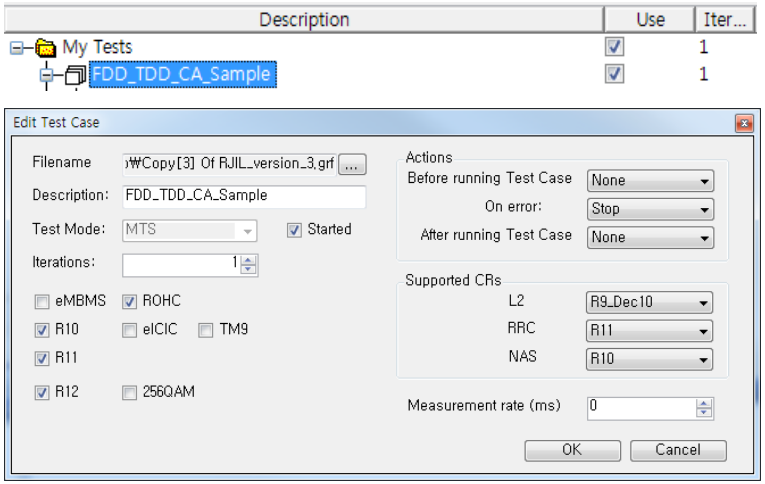
- Edit Test Case
  - User can select RRC, NAS release number & functions
  - ROHC ,eMBMS, eICIC, TM9 & 256QAM
- Cell Info
  - This is used to associate one radio unit(TM500)

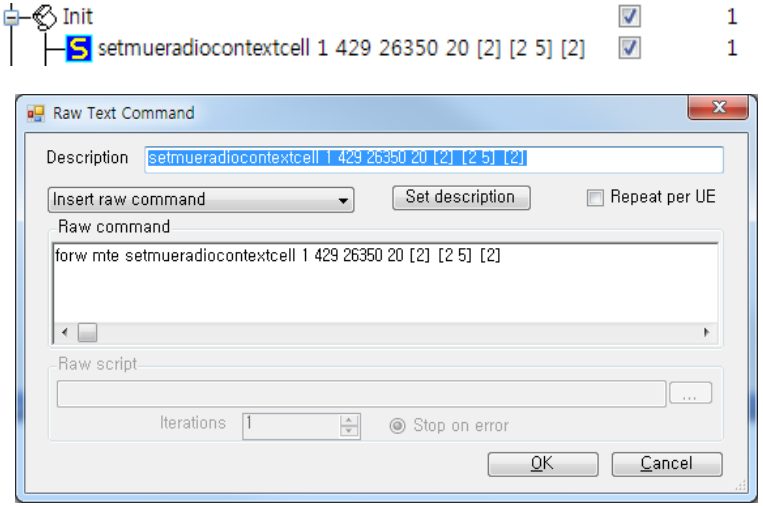
  with a particular cell. Here make sure that the configured

```
                                   1  2    3     4   5   6 7   8
                                   |  |    |     |   |   | |   |
forw mte SetMueRadioContextCell 0 47 21200 20 [2] [2 6] [2]
```

PARAMETERS
1. Radio Context Id
2. Cell Id
3. DL carrier frequency
4. System Bandwidth
5. Number of eNB transmit antennas
6. Subframe Assignment
7. Special Subframe Patterns
8. Number of receive antennas

✓ Check Point
- ✓ FDD example
  - ✓ forw mte SetMueRadioContext 0 47 21250 10 [2]
- ✓ TDD example
  - ✓ forw mte SetMueRadioContext 0 429 26350 20 [2] [2 5] [2]



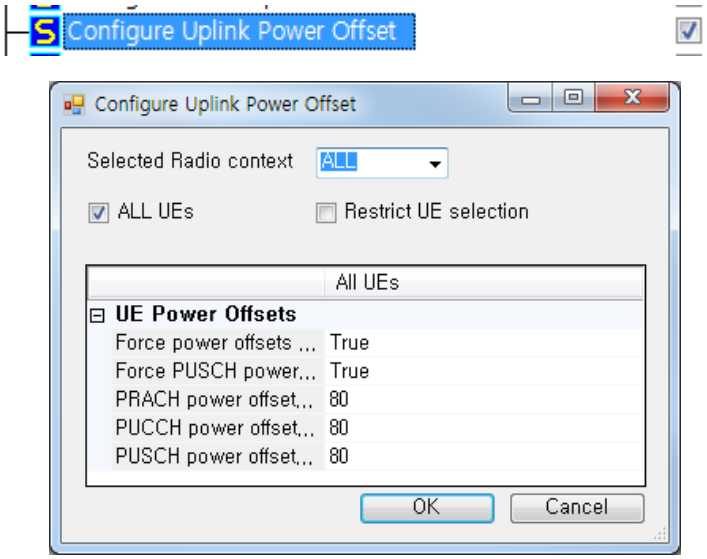


Scripting Contents

Basic Scripting Structure for attach

- Configure Uplink Power Offset
  - This is used for setting UE power offsets like PUCCH, PRACH and PUSCH. In this command user can configure power offsets for each radiocontext.

Parameter name	Type	Min	Max	Default
>PUCCH power offset	Int	0	120	80
	The required power offset in db The default value is applied to all UEs only on initialisation.			
>PRACH power offset	Int	0	120	80
	The required power offset in db The default value is applied to all UEs only on initialisation.			
[> PUSCH power offset]	Int	0	120	0
	The required power offset in db The default value is applied to all UEs on initialisation. If the command is re-issued and this optional parameter is not provided then the same value as the 'PUCCH power offset' is applied. This parameter is an offset to the "Dynamic scheduling nominal PUSCH power(P0_nominal_PUSCH)", i.e. does not apply to MSG3. The MSG 3 power offset is identical to the PRACH offset specified in this command,			
[> SRS power offset] }	Int	0	120	80
	Note that this value is not used. The 'PUSCH power offset' applies also to the SRS.			
[Radio Context]	Int	0	11	All
	The Radio context to which the power offset applies. If omitted the settings will apply to all cells.			




```
                                   1   2 3  4  5   6  7
                                   |   | |  |  |   |  |
forw mte PhyConfigUlPowerOffset  1{-1 80 80 [80] []} [0]
```

PARAMETERS
1. Number of UEs
2. UE Context Id
3. PUCCH Power Offset
4. PRACH Power Offset
5. PUSCH Power Offset
6. SRS Power Offset
7. Radio Context

✓ Check Point
- RSRP = DL Reference Signal Power – Path Loss (Power Offset)
- SIR [dB] = Reference Signal Power – Path Loss – Ioc

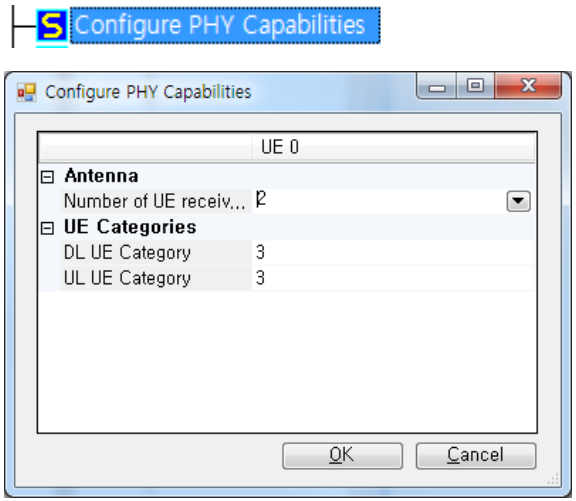
Scripting Contents

Basic Scripting Structure for attach

- Configure PHY capabilities
  - This is used to specify No of UE receiving antenna and UE category (UE PHY capability).

```
                                1 2 3
                                | | |
forw mte PhyConfigSysCap 2 4 4

PARAMETERS
1. Number of UE downlink antennae
2. DL UE category
3. UL UE category
```



✓ Check Point

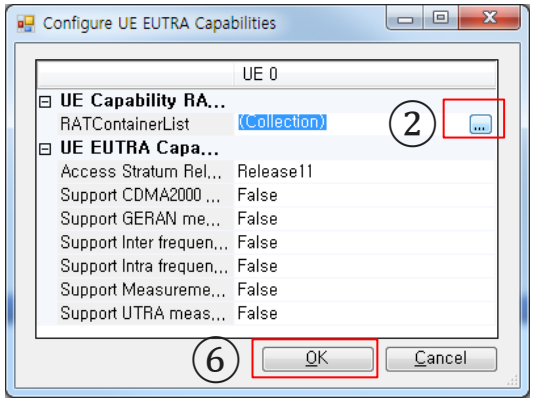
- DL UE category
  - Cat 6 is a Release 10 Category
  - Cat 9 is a Release 11 category
  - Refer to 3GPP 36.306
- Example of 4X4 MIMO Test
  - forw mte PhyConfigSysCap 4 5 5

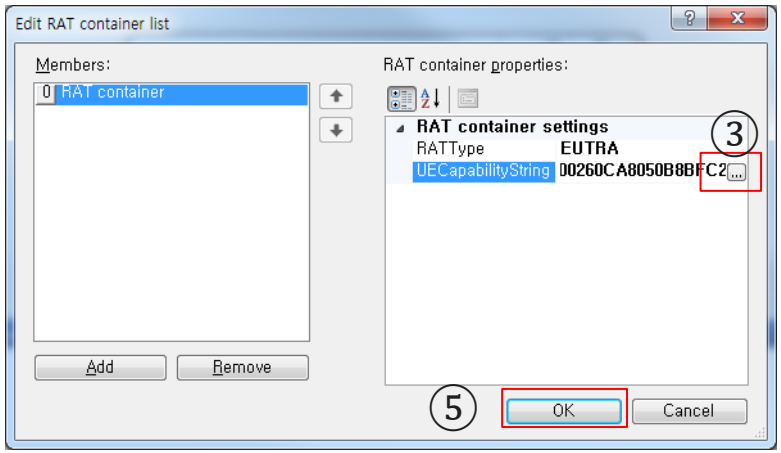
Scripting Contents

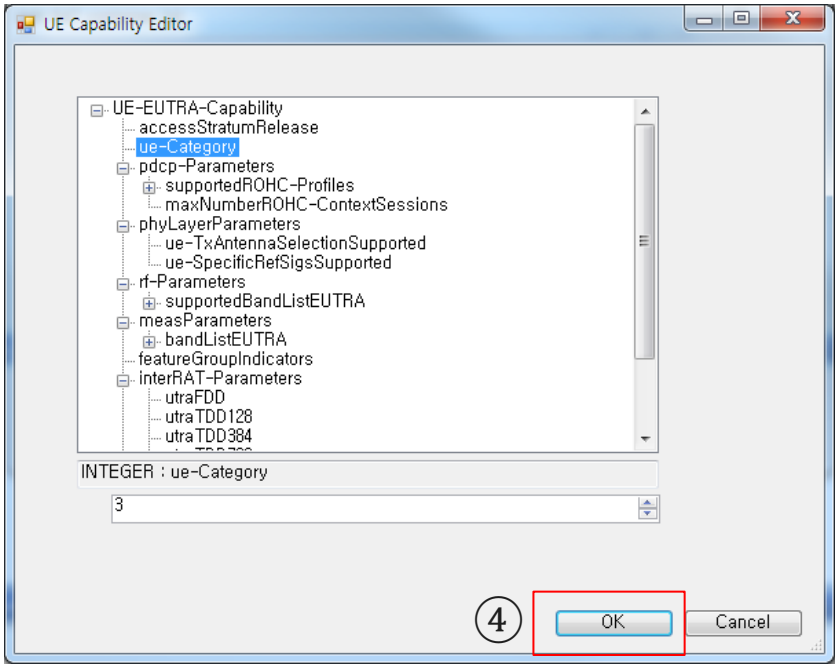
Basic Scripting Structure for attach – UE EUTRA Capabilities

- Configure UE EUTRA Capabilities
  - This is used for setting UE Capability information. Please flow below step.

① Configure UE EUTRA Capabilities





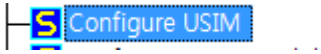


We can change specific parameters

Scripting Contents

Basic Scripting Structure for attach

- Configure USIM
  - This is used to configure USIM parameters like IMSI, Security Key, OP, Security capability etc.
  - Most of parameters defend on EPC environments.
  - Please check IMSI number for before attach

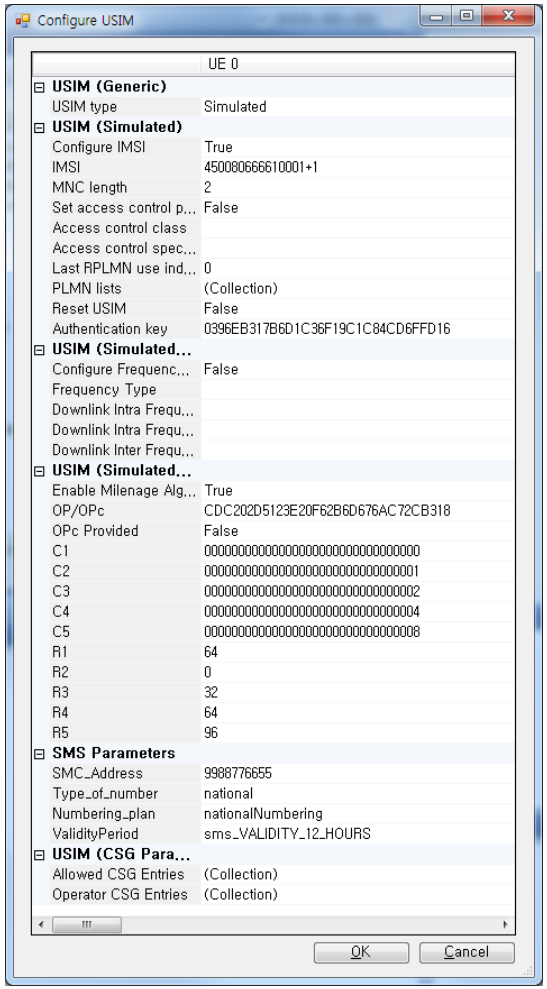


✓ Check Point

- If user see the authentication fail, Please check Authentication Key Value, OP/OPc

PARAMETERS

1. USIM Type
2. IMSI
3. MNC Length
4. Authentication Key
5. OP
6. C1
7. C2
8. C3
9. C4
10. C5
11. R1
12. R2
13. R3
14. R4
15. R5



Scripting Contents

Basic Scripting Structure for attach

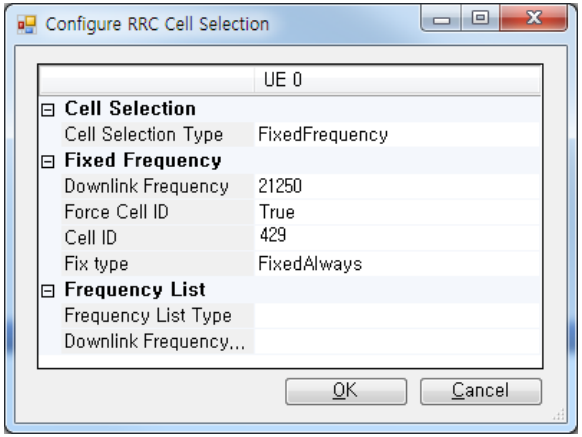
- Configure RRC Cell Selection
  - Using this command we can associate/force a UE to run under a particular cell if Mobility model is not applied.'

Configure RRC Cell Selection

1

forw mte RrcAptConfigCellSelection 21200

PARAMETERS
1. Downlink Carrier Frequency



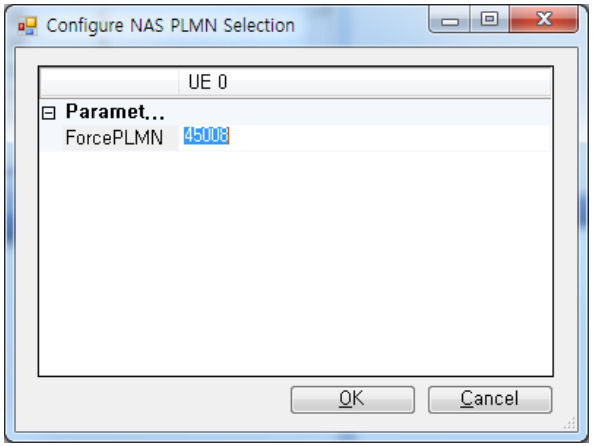
- Configure NAS PLMN Selection
  - Configure NAS to select a particular PLMN during registration.

Configure NAS PLMN Selection

1

forw mte NasAptConfigPlmnSelection 24409

PARAMETERS
1. Force PLMN



Scripting Contents

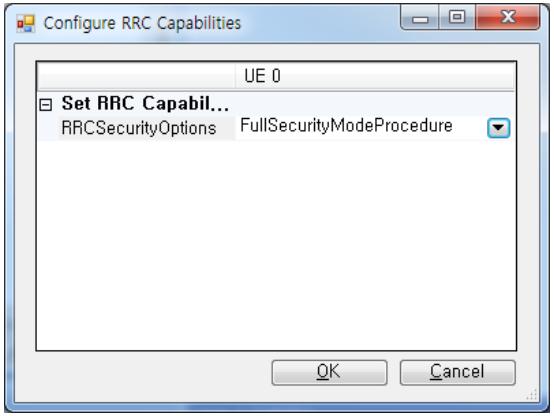
Basic Scripting Structure for attach

- Configure RRC Capabilities
  - Configure RRC capabilities, including security options.

Configure RRC Capabilities

```
                                   1     2
                                   |     |
forw mte NasAptConfigCapability  [] [224] [224]
```

PARAMETERS
1. Supported Ciphering Algorithms
2. Supported Integrity Algorithms

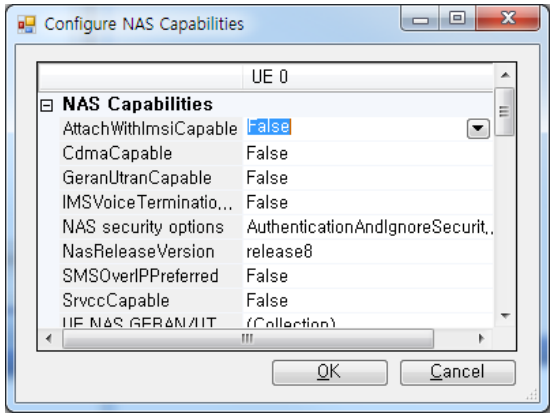


- Configure NAS PLMN Selection
  - Configure NAS capabilities, including authentication and security options.

Configure NAS Capabilities

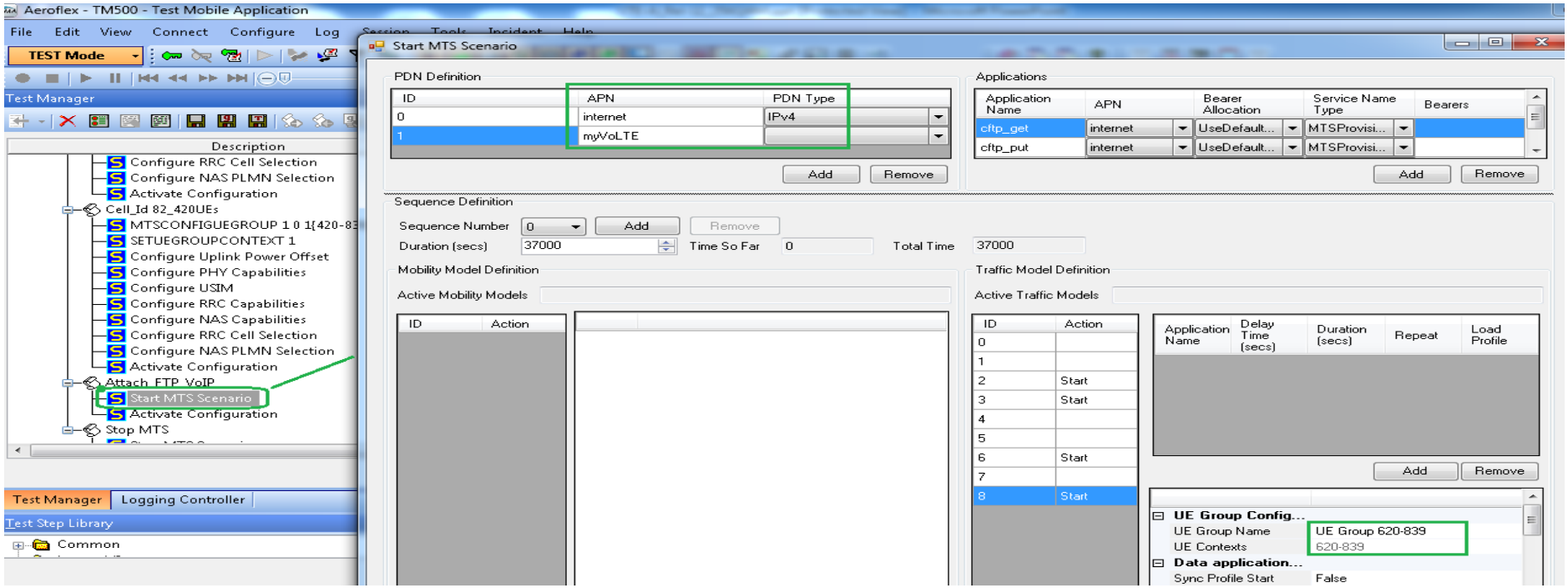
```
                                   1
                                   |
forw mte RrcAptConfigCapability  [2]
```

PARAMETERS
1. Supported Ciphering Algorithms



Scripting Contents

UE Attach (APN, IP Type, Traffic condition)



- Test Block Start MTS Scenario
  - Set APN (Multiple PDNs are supported)
  - Define UE Group
  - UE detach (Power off)

✓ Check Point
  - APN must be given by Core Network, otherwise no ideal traffic or rejection from network
  - Total bearers are up to 8 bearers per UEs

Scripting Contents

Traffic Model

Application Name	APN	Bearer Allocation	Service Name Type	Bearers
cftp_get	test.com	UseDefaultBearer	MTSProvisioned	
cftp_put	test.com	UseDefaultBearer	MTSProvisioned	
cvoip	test.com	NWAllocated	MTSProvisioned	

Add Remove

Traffic Model Definition

Active Traffic Models

ID	Action
0	Start
1	Start
2	Start
3	Start
4	
5	
6	Start
7	
8	Start

Application Name	Delay Time (secs)	Duration (secs)	Repeat	Load Profile
cftp_get	0	Continuous	False	
cvoip	30	Continuous	False	

Add Remove

UE Group Config...	
UE Group Name	UE Group 200-319
UE Contexts	200-319
Data application...	
Sync Profile Start	False
Start Profile Delay (s...	
Attach Sync Timeou...	
Traffic Model Se...	
Attach Start Delay (s...	0
Attach Duration (secs)	3600
Detach Duration (se...	0
Time Distribution (se...	-1
Stagger Time (ms)	1000
Maintain Connection	False
Update period (secs)	5
Detach Type	SwitchOff

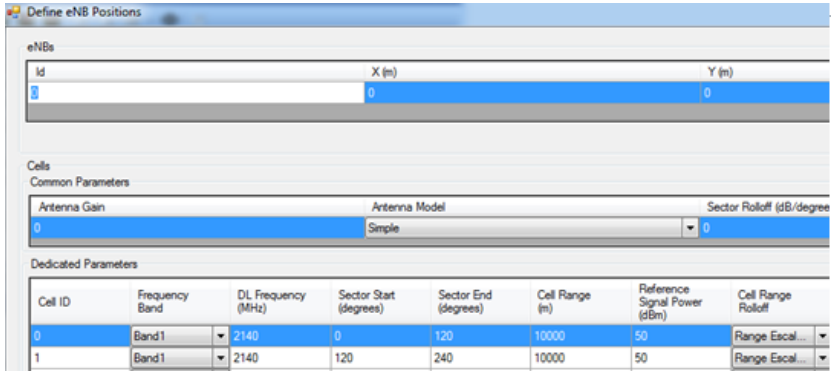
- Definition for data traffic autoamtion
- Need to match Application name eg. cftp_get = cftp_get_0001 (UE ID 1) in Application tab in D500 client
- Define each traffic bearer types

- Once above traffic definition is done, user choose traffic model to each UE group with duration/repeatation condition

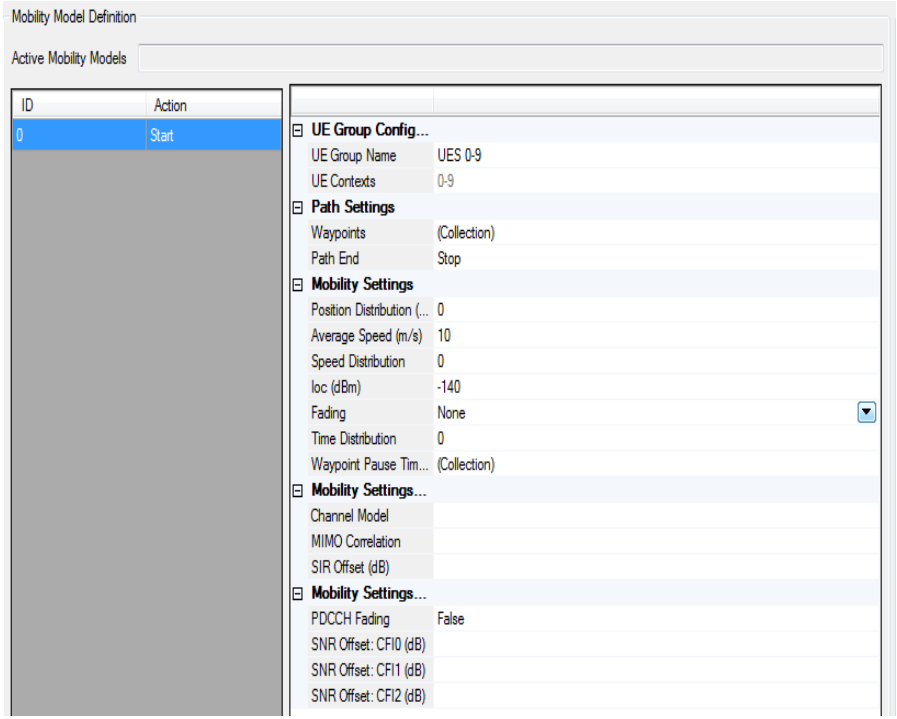
- User can create number of UE groups much as can
- Each UE group has different condition
- Stagger timer : attach time gap between Ues (Please set -1 in Time distribution parameter)
- Attach duration : detach after time period
- Detach duration : reattach after time period

Scripting Contents

Mobility Model



- To enable mobility, user must inseart and define eNB definition. User can create eNBs and Cells much as can



- User can create number of UE groups much as can
- Way Point : Where selected UE groups to start (x=1000m, Y=2000) and where to stop (x=-2000m, y= 0m)
- Path End: One time movement, circle around between two points, or move number different points and come back
- Position Distribution : Randomly UEs lare ocated in selected boundry (Max 300m around)
- IOC: SNR [dB] = Reference Signal Power – Path Loss(P_offset) – Ioc
- Fading: Optional for AWGN or Fading model. Fading only able to configure 128 UEs per cell (radio card).User applies DL only, UL only or UL & DL together fading.

Scripting Contents

Optional Script

- forw mte getstats <PARAMETERS>
  - This command is used to retrieve statistical information from a requested 3GPP layer or all layers.
  - The stats are reset on SCFG and via the ClearStats command.
  - The values can be prevented from updating between calls using the FreezeStats command.

Parameter name	Type	Min	Max	Default
[Service type]	Enum	0	6	0
	String	'PHY', 'HARQ', 'MAC', 'RLC',' 'PDCP', 'ALL', 'EXT-STATS'		'ALL'
	Layer type 0 = ALL 1 = PHY 2 = HARQ 3 = MAC 4 = RLC 5 = PDCP 6 = EXT-STATS The EXT-STATS is not included if "ALL" is selected.			

Parameter name	Type	Min	Max	Default
[UE context Id]	Int	0 -1	17999	All active UEs are listed
	String	All', 'Combined', List of UE Ids		All active UEs are listed

Scripting Contents

Test Cases exceptions

- UE Reference Signal
  - Normal Status

```
forw mte getstats [6][0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0]
UE ID: 0   (Radio Context: 0   Cell ID: 249   DL Freq: 3530.2 MHz)
RSSI: -51.4 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -75 dBm/SC   SIR:  38 dB   RSRQ:   -10 dB   RSSI: -54.4 dBm
Reference Signal: (Tx1,Rx2) RSRP:  -123 dBm/SC   SIR:  -9 dB   RSRQ:   -48 dB   RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx1) RSRP:  -123 dBm/SC   SIR:  -9 dB   RSRQ:  -48.6dB  RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx2) RSRP:  -75 dBm/SC   SIR:  38 dB   RSRQ:   -10 dB   RSSI: -54.4 dBm
```

✓ Check Point

- ✓ Abnormal Status. Please check RRH Antenna mapping
  - Example 1

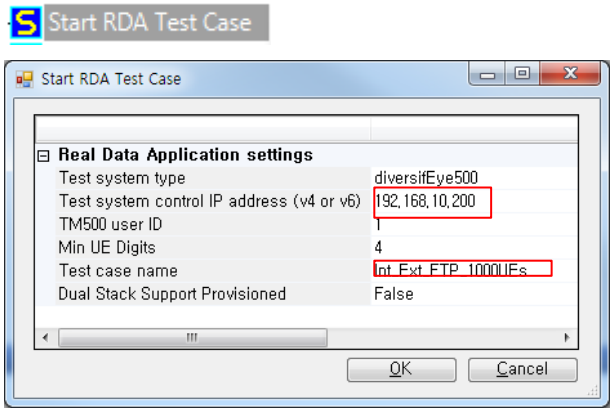
```
forw mte getstats [6][0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0]
UE ID: 0   (Radio Context: 0   Cell ID: 249   DL Freq: 3530.2 MHz)
RSSI: -51.4 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -123 dBm/SC   SIR:  -9 dB   RSRQ:  -48.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx1,Rx2) RSRP:  -81 dBm/SC   SIR:  33 dB   RSRQ:   -6.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx1) RSRP:  -81 dBm/SC   SIR:  33 dB   RSRQ:   -6.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx2) RSRP: -123 dBm/SC   SIR:  -8 dB   RSRQ:  -48.6 dB   RSSI: -54.4 dBm

forw mte getstats [6][0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0]
UE ID: 0   (Radio Context: 0   Cell ID: 249   DL Freq: 3530.2 MHz)
RSSI: -51.4 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -81 dBm/SC   SIR:  33 dB   RSRQ:   -6.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx1,Rx2) RSRP:  -81 dBm/SC   SIR:  33 dB   RSRQ:   -6.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx1) RSRP: -123 dBm/SC   SIR:  -9 dB   RSRQ:  -48.6 dB   RSSI: -54.4 dBm
Reference Signal: (Tx2,Rx2) RSRP: -123 dBm/SC   SIR:  -8 dB   RSRQ:  -48.6 dB   RSSI: -54.4 dBm
```

Operation

D500 Automation

- Start RDA Test Case –Automation from E500 Script



- Select RDA Test Case
- IP has to be physical IP address of D500 client
- User ID is the partition of D500 client
- UE Digits : PPPoE_**0000**_0_0
- Target Shenick script to run
- Single D500 blade system of dual D500 system

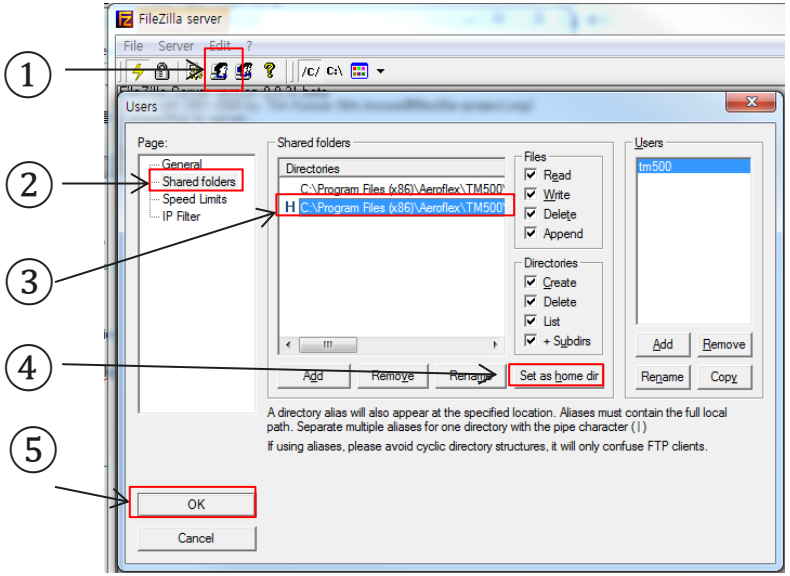
Troubleshooting

Scripting & User Operation

System

- grf version is mismatching
  - User changes the version number in the script

- TMA Version is not matching against firmware version
  - Check FileZilla
    - Please matched TMA version to FileZilla shared folders



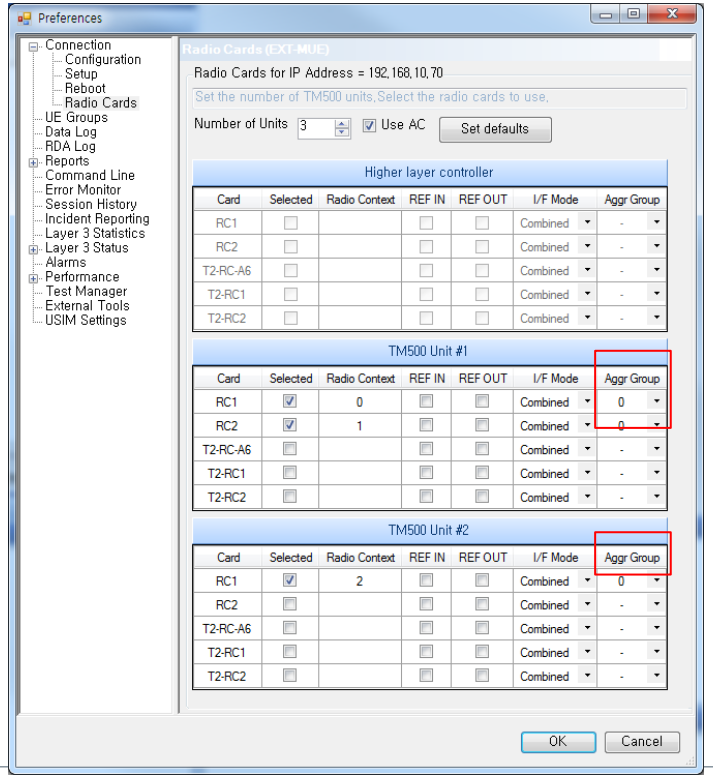
Q&A

Scripting & User Operation

- Carrier aggregation
  - What pre-request in my script (UE Capability) ?
    - Need to match radio context cell id and frequency

```
init                                                  ☑   1
  setmueradiocontextcell 0 412 8790 10 [2]            ☑   1
  setmueradiocontextcell 1 190 18200 20 [2]           ☑   1
  setmueradiocontextcell 2 181 21250 10 [2]           ☑   1
```

  - How do I know S-Cell is configured (Protocol log Scell information for Reconfiguration, logging in) ?
    - Please use same number of Aggr Group for 3CA or 4CA



Q&A

Scripting & User Operation

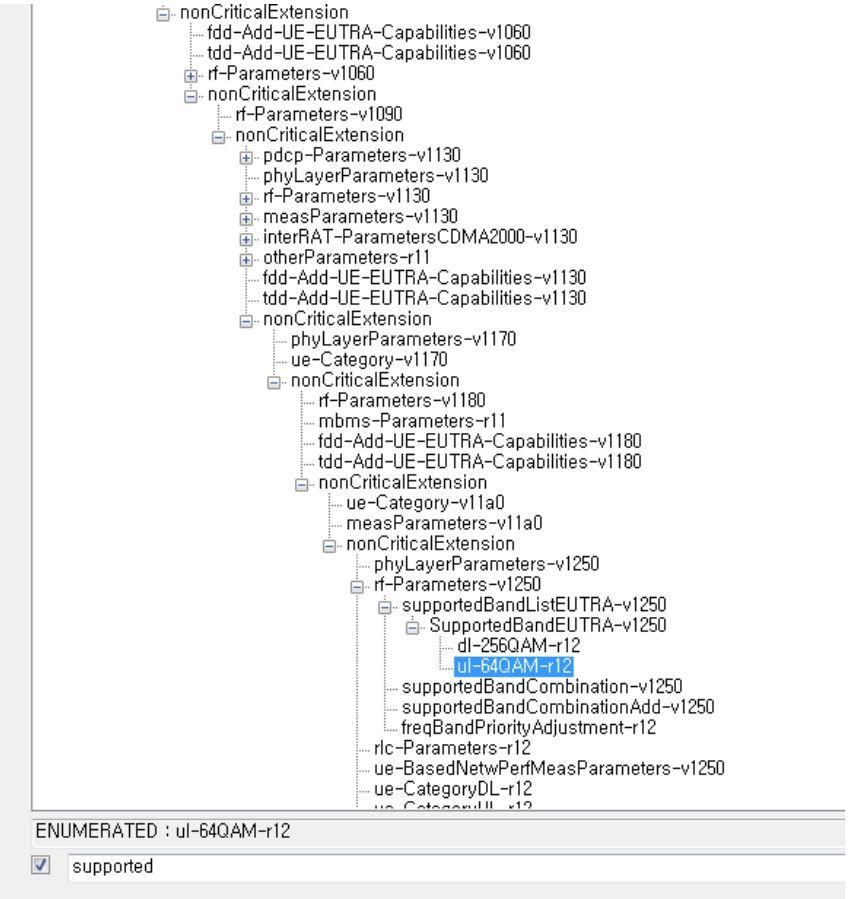
- 4x4 MIMO
  - What pre-request in for testing 4x4?
    - Please ensure TMA Version for testing 4x4
      - LMZ, LMY : TMA LMZ & LMY version for Ext Multi UE (E500)
      - K : TMA K x.x.x version is for TDD Single UE (TM500)
      - C : TMA C x.x.x version is for FDD Single UE (TM500)
  - How do I setting 4Rx mode?
    - forw mte setmueradiocontextcell 0 159 26050 20 [4] [2 7] [4]
    - SETP RRC_NUM_DL_ANTENNAS 4
    - forw mte PhyConfigSysCap 4 5 5
  - How do I know 4 Rx are OK (forw getstatus [UE ID] [Layer]) ?
    - Please checked reference signal before attach
    - Please turn off virtual mapping function at eNB for E500 4x4 testing

```
forw mte getstats [6] [0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0, 1]
UE ID: 0   (Radio Context: 0   Cell ID: 184   DL Freq: 1840.0 MHz)
RSSI: -29.2 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -63 dBm/SC   SIR:  37 dB   RSRQ:   -7.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx1,Rx2) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx1,Rx3) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.6 dB   RSSI: -35.4 dBm
Reference Signal: (Tx1,Rx4) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.8 dB   RSSI: -35.2 dBm
Reference Signal: (Tx2,Rx1) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx2,Rx2) RSRP:  -63 dBm/SC   SIR:  37 dB   RSRQ:   -7.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx2,Rx3) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.6 dB   RSSI: -35.4 dBm
Reference Signal: (Tx2,Rx4) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.8 dB   RSSI: -35.2 dBm
Reference Signal: (Tx3,Rx1) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx3,Rx2) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx3,Rx3) RSRP:  -63 dBm/SC   SIR:  36 dB   RSRQ:   -7.6 dB   RSSI: -35.4 dBm
Reference Signal: (Tx3,Rx4) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.8 dB   RSSI: -35.2 dBm
Reference Signal: (Tx4,Rx1) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx4,Rx2) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.9 dB   RSSI: -35.1 dBm
Reference Signal: (Tx4,Rx3) RSRP: -140 dBm/SC   SIR:  50 dB   RSRQ:  -84.6 dB   RSSI: -35.4 dBm
Reference Signal: (Tx4,Rx4) RSRP:  -63 dBm/SC   SIR:  37 dB   RSRQ:   -7.8 dB   RSSI: -35.2 dBm
```

Q&A

Scripting & User Operation

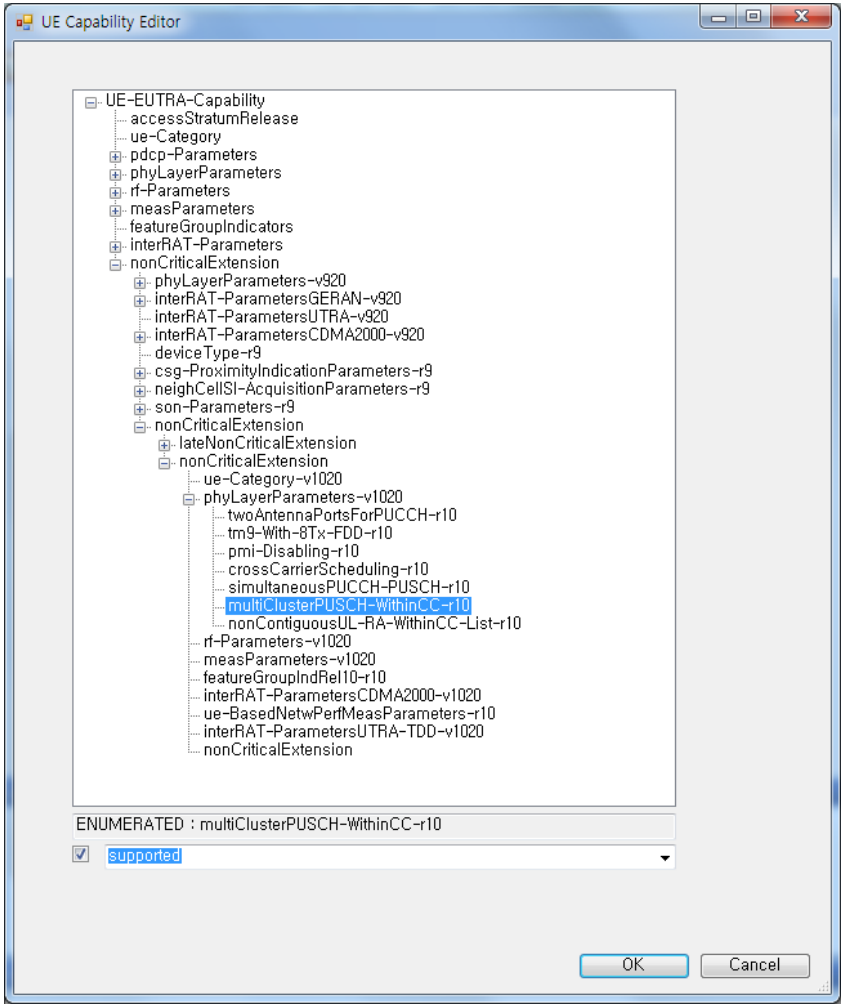
- DL256QAM & UL64QAM
  - How do I setting DL256QAM and UL 64QAM
    - Please enable dl-256QAM-r12 and ul-64QAM-r12 of UE Capability



Q&A

Scripting & User Operation

- Multi cluster PUSCH
  - Please enable muticlusterPUSCH-WithinCC-r10



NAS Mode

NAS

RRC

+

PDCP

RLC

MAC

PHY

NAS Mode

Example MUE test case

Cell Parameters

Configure RRC Security

Configure NAS Security

Override UE capability

Configure USIM (Simulated or real) with NW Security parameters

Attach 1st UE (Default bearer established)

Attach other UE's sequentially

Attach other UE's in a group simultaneously

Trigger cell handover

Override the CQI

Setup a Dedicated bearer

Detach all UE from Network

- UE Configure
  - SETP RRC_NUM_DL_ANTENNAS
  - Configure Uplink Power Offset
  - Set PRACH Collision Mode
  - Select UES 0-31
  - Configure RRC Cell Selection
  - Configure RRC Capabilities
  - Configure NAS Capabilities
  - Configure NAS PLMN Selection
  - Configure PHY Capabilities
  - Configure UE EUTRA Capabilities
  - Configure USIM
  - Activate Configuration
- Attach_UE0
  - Select UE 0
  - Configure NAS Register
  - Activate Configuration
  - Wait
- Attach_UE1
- Attach_UE2
- Attach_UE3
- Attach_UE4
- Attach_UE5
- Attach_UE0-5
- Stats
- Handover
  - Override Cell Measurements
  - Activate Configuration
- CQI
  - Override CQI
- Dedicated bearer
  - Configure EPS Bearer Resource
  - Activate Configuration
- Detach_UE
  - Select UES 0-31
  - Configure NAS Deregister
  - Activate Configuration

Test case flow

Global overrides

SETP commands override default 3gpp behaviour:

- A SETP (Set Parameter) command is a raw text string that allows an override of some system level parameters and procedures.

- Details of the available commands and their capability can be found in the Command reference manual.

Example L3 override:

SETP RRC_PUCCH_CLOSE_LOOP_POWER_CONTROL 0

Disables closed loop power control

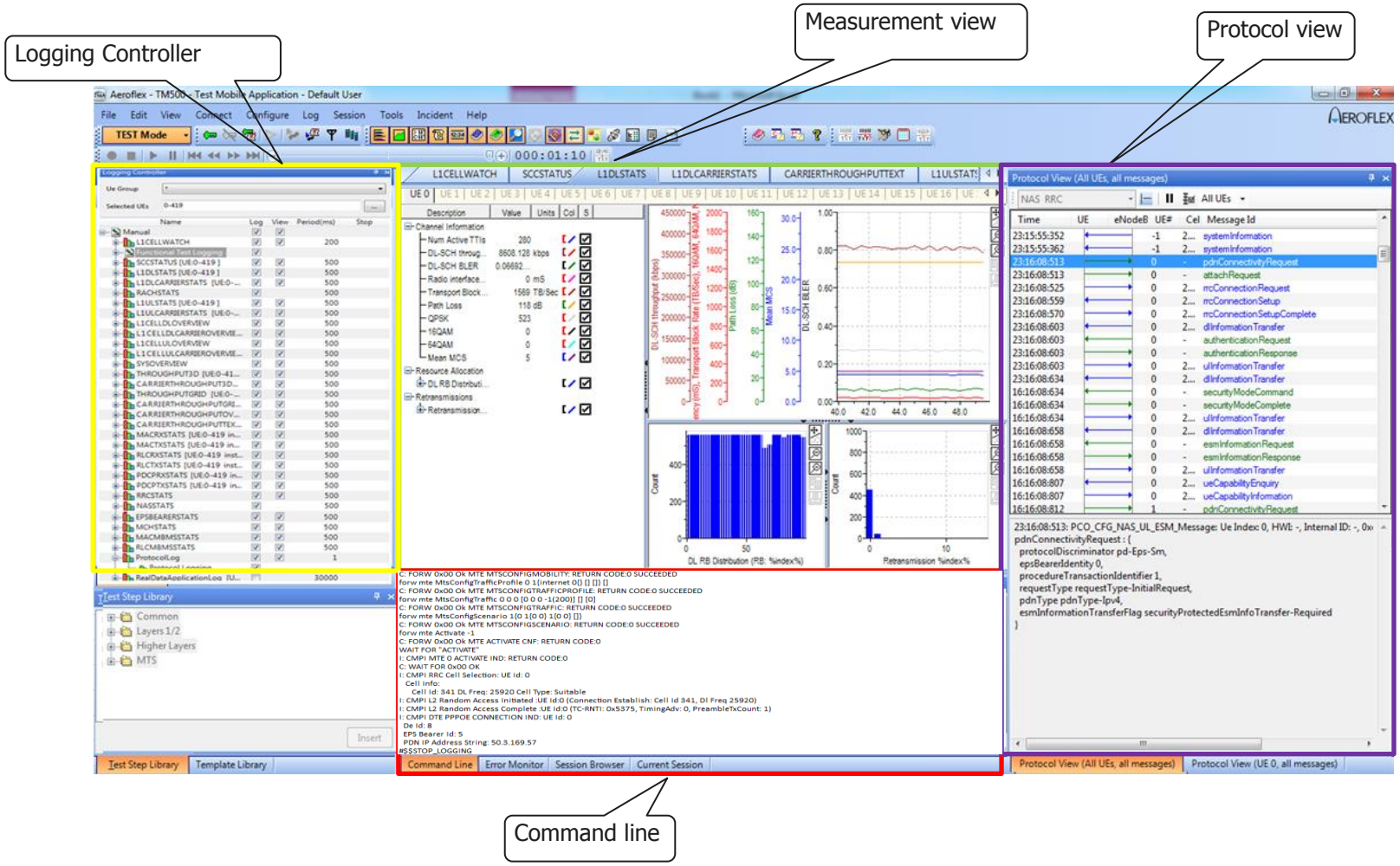
User Data Option

COBHAM

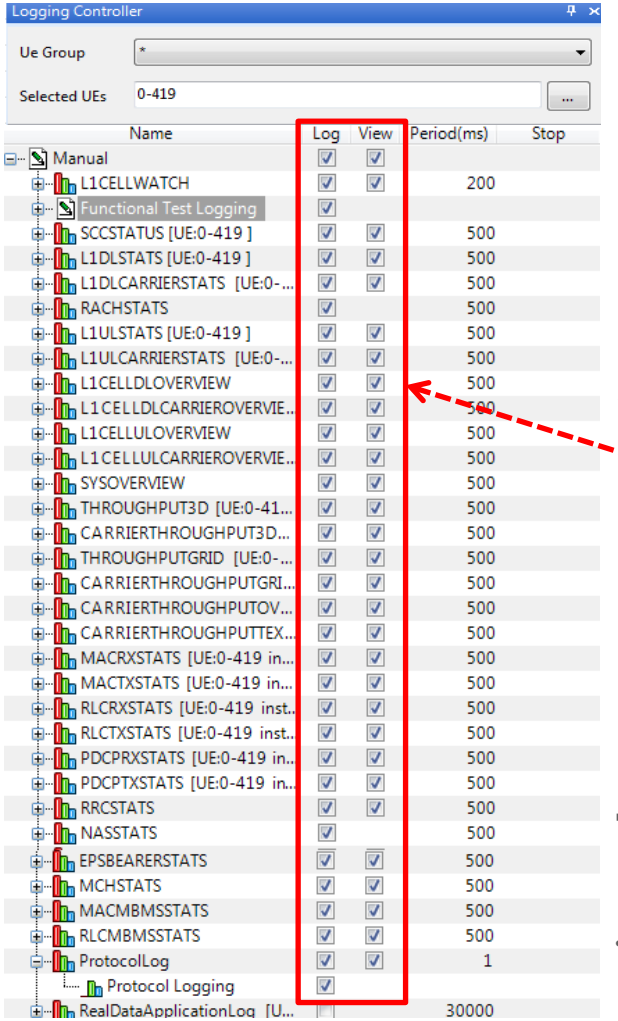
- Real Data Application (RDA)
  - D500/D1000 through PPPoE
  - Automated with TM500 RDA commands
  - Real life data application
  - FTP/HTTP/VoLTE
- Internal
  - PN9/15 (pseudo random sequences)
  - Fixed frame (predefined byte sequences)
- External
  - UDP/IP ('live' data)
  - TCP/IP ('live' data)
  - IP Driver
  - PPPoE connection

Logging

Logging & Measurement – Overall



Logging – Description of Logging controller



- Items of logging Controller
  - Cell ID/RSRP/RSRQ from "**L1CELLWATCH**" ,
  - DL/UL MCS/BLER/RI/CQI from "**L1DLSTATS/ L1ULSTATS**"
  - T-Put from **"SYSOVERVIEW/ THROUGHPUT3D/ L1DLSTATS/L1ULSTATS"**
  - Each Layer info from "**MACRXSTATS/ RLCRXSTATS/PDCPRXSTATS**"
  - Detail TTI info from **"Functional Test logging"**
  - APN/default/dedicate Bearer info from "**EPSBEARERSTATS**"

✓ Check Point
  - To View Measurement the combo box must be checked
  - To Get the log data the combo box must be checked.
  - The FTL(Functional test logging) Support up to 32UEs(0~31UEs)
  - The UE Measurement of logging support up to 420 UEs(0~419 UEs)
  - Description meaning from"**TM500LTE_MeasurementReference.pdf**"
  - <u>after installation TMA S/W , User can find the document folder as below</u>

  C:□Program Files (x86)□Aeroflex□TM500□LTE - LME 6.2.0□Documentation.

- Select the logging information to be displayed in chart format or additionally to be recorded in a log file.

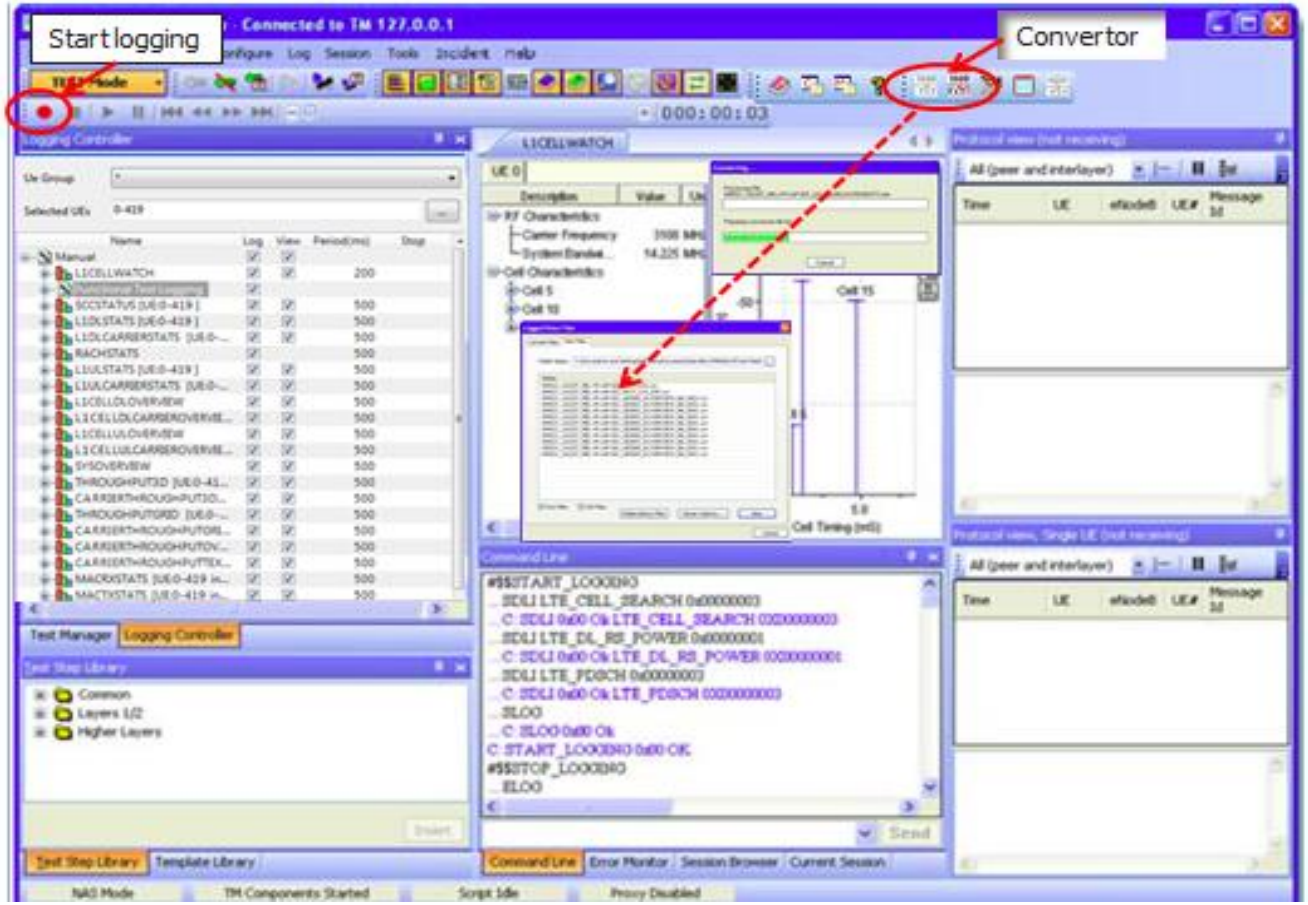
- The information stored in the log files is in a proprietary binary format, but can be converted to text format or CSV file format.

Logging –How to work the logging controller

- Process to get log

  -Select logging item ->Click the Strat logging -> Running and test -> Stop the Start logging botton.

  -> Click the logging convertor -> Export the log data as Excel/txt



Logging – Description of converted logdata

- Description
  - There are .dat file and CSV file which is converted the.dat file
  - whole information of the each UE as below

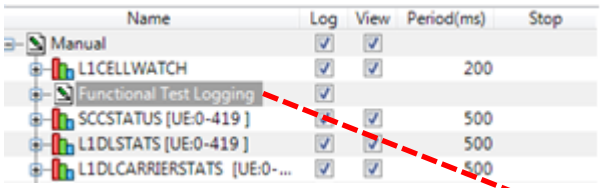
151209_200529_CJK_#2_FTL.dat
151209_200529_CJK_#2_LDI_ALLMEASUREMENTS.dat
151209_200529_CJK_#2_PROT_LOG_NAS_RRC.dat
151209_200529_CJK_#2_PROT_LOG_NAS_RRC.idx
151209_200529_CJK_#2_PROT_LOG_NAS_RRC_ALL.csv
151209_200529_CJK_#2_PROT_LOG_NAS_RRC_ALL.log
151209_200529_CJK_#2_PROT_LOG_NAS_RRC_ALL_HWI0.csv
151209_200529_CJK_#2_PROT_LOG_NAS_RRC_ALL_UE00000.csv
151209_200529_CJK_FTL.dat
151209_200529_KRA-LT-R9ETH99_EPSBEARERSTATS_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_EPSBEARERSTATS_00-1_0001.csv
151209_200529_KRA-LT-R9ETH99_L1CELLDLCARRIEROVERVIEW_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_L1CELLDLOVERVIEW_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_L1CELLULOVERVIEW_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_L1CELLWATCH_NA_0001.csv
151209_200529_KRA-LT-R9ETH99_NASSTATS_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_NASSTATS_00-1_0001.csv
151209_200529_KRA-LT-R9ETH99_RRCSTATS_0000_0001.csv
151209_200529_KRA-LT-R9ETH99_RRCSTATS_00-1_0001.csv
151209_200529_KRA-LT-R9ETH99_SYSOVERVIEW_NA_0001.csv
151209_200529_KRA-LT-R9ETH99_UE0_CARRIERTHROUGHPUTTEXT_NA_0001.csv
151209_200529_KRA-LT-R9ETH99_UE0-31_L1L2FTL_NA_0001.csv

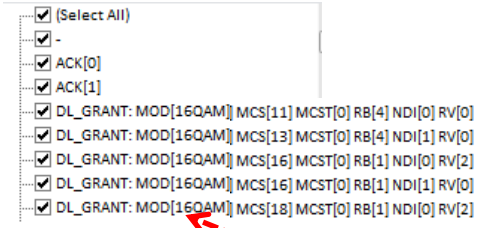
151209_200529_KRA-LT-R9ETH99_UE0-419_L1DLSTATS_NA_0001.csv

Cell Freque	RAT	Num Activ	DL-SCH throughput	DL-SCH BLER	Radio inter	Transport E	Path Loss((	QPSK	16QAM	64QAM
2592	TDD	284	8955.5	0.060998	0	1623	118	541	0	0
2592	TDD	287	8784.7	0.071038	0	1647	118	549	0	0
2592	TDD	282	8638.8	0.065177	0	1611	118	537	0	0
2592	TDD	286	8647.2	0.056569	0	1644	118	548	0	0
2592	TDD	282	8604.1	0.065789	0	1596	118	532	0	0
2592	TDD	287	8912.7	0.06422	0	1635	118	545	0	0
2592	TDD	281	8735.4	0.061914	0	1599	118	533	0	0
2592	TDD	286	9076	0.055046	0	1635	118	545	0	0
2592	TDD	284	8765.9	0.062963	0	1620	118	540	0	0
2592	TDD	289	8788.2	0.069982	0	1629	118	543	0	0
2592	TDD	280	8608.1	0.066922	0	1569	118	523	0	0
2592	TDD	287	8906.5	0.060329	0	1641	118	547	0	0
2592	TDD	283	8834.4	0.053704	0	1620	118	540	0	0
2592	TDD	286	8940.2	0.069217	0	1647	118	549	0	0
2592	TDD	283	8703.8	0.065056	0	1614	118	538	0	0
2592	TDD	287	8784	0.067766	0	1638	118	546	0	0
2592	TDD	287	8754.2	0.06055	0	1635	118	545	0	0
2592	TDD	285	8990.8	0.06044	0	1638	118	546	0	0
2592	TDD	282	8659.9	0.059369	0	1617	118	539	0	0
2592	TDD	292	9117	0.065954	0	1683	118	561	0	0
2592	TDD	283	8893.9	0.062847	0	1623	118	541	0	0
2592	TDD	283	8914.1	0.058716	0	1635	118	545	0	0
2592	TDD	284	8746.3	0.068392	0	1623	118	541	0	0
2592	TDD	284	8715.5	0.061224	0	1617	118	539	0	0
2592	TDD	287	8901.7	0.053016	0	1641	118	547	0	0

Logging – FTL(Functional test logging)

- Description
  - Show per TTI information at the physical layer(and minimal MAC information) for a limited Number(32UEs) of UEs
  - Show the Detail information as DCI, UCI, CRC, etc. and channel state(PRACH,PDCCH,PDSCH,PUCCH..)
  - Filter using Excel, User can check what UE and subframe happened some issue.
  - meaning of FTL into the file " **TM500LTE_MeasurementReference.Pdf**"



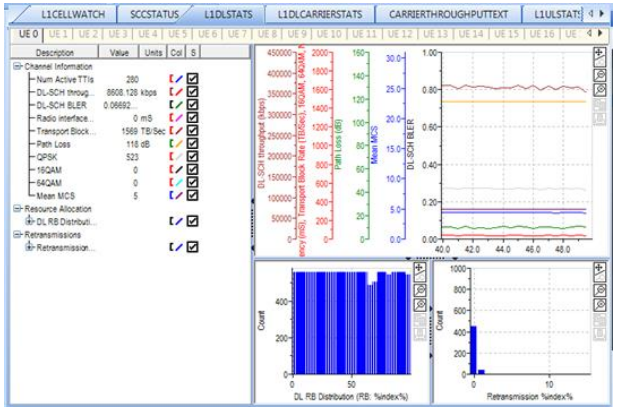


#State	Time	UE ID	FN	Subframe	Cell ID	Cell Freque	RAT	RC	UE	MULTIPOI	Channel	Carrier	DRX	Type	TB_SIZE	HARQ	RETRY	CRC	RNTI	DCI	UCI	RB_ALLOC	RB_ALLOC	MAC	Error
0	13:06:15:3	0	374	5	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I__	DYN	7992	6	0	1	0xd36c	DL_GRAN	-	0xffffff00f	-	-	-
0	13:06:15:3	0	374	6	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_I__	DYN	6712	1	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:3	0	374	6	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I__	DYN	6712	1	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:3	0	374	7	341	2592	TDD	0	0	-	PUCCH	PCC	_I__	-	-	-	-	-	-	-	FMT[1B] C	0x400000	0x000000	-	-
0	13:06:15:4	0	374	8	341	2592	TDD	0	0	-	PUSCH	PCC	_I__	DYN	6968	1	0	-	0xd36c	UL_GRAN	ACKo[1 1]	0x000000	-	-	-
0	13:06:15:4	0	374	9	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_I_U_	DYN	10296	3	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	374	9	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I_U_	DYN	10296	3	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	375	0	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_I__	DYN	8760	5	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	375	0	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I__	DYN	0	5	0	0	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	375	1	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_I_U_	DYN	6712	0	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	375	1	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I_U_	DYN	6712	0	0	1	0xd36c	DL_GRAN	-	0xffffffffff	-	-	-
0	13:06:15:4	0	375	2	341	2592	TDD	0	0	-	PUCCH	PCC	_I__	-	-	-	-	-	-	-	FMT[1B] C	0x400000	0x000000	-	-

Measurement –Measurement view

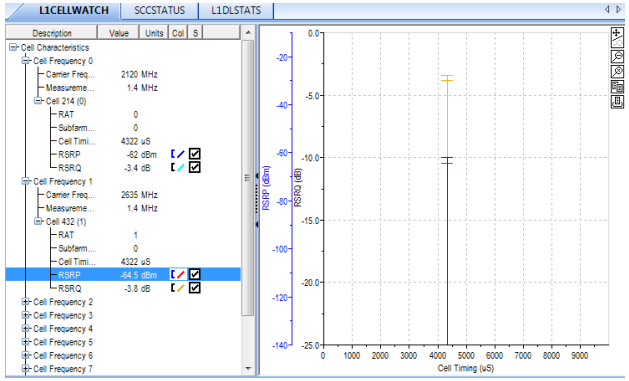
- Description
  - meaning of Whole measurement items into the file " **TM500LTE_MeasurementReference.Pdf**"

• L1DLSTATS



Channel Information			
DL-SCH throughput	Float	0..3x10^5 Kbps	DL-SCH HARQ Transport Block throughput, consisting of the total number of correctly received (i.e. successfully acknowledged) Transport Blockbits divided by the reporting period.
DL-SCH BLER	Float	0..1.0000	Ratio of DL-SCH Transport Block CRC errors to Transport Blocks received.
Mean Rank (signalled) DEPRECATED	Float	0.0..2.0	Mean MIMO rank allocation In transmissions during the reporting period. "-" if not MIMO.
Radio Interface latency	ms	0..1000	Mean time elapsed from the first transmission to the first CRC PASS
Transport Block Rate	TB/Sec	0..2000	Number of Transport Blocks received in the reporting period divided by the reporting period
Path Loss	dBm	0..160	Mean Path Loss over reporting period
QPSK	Int	0..1000	Number of times QPSK used as modulation scheme in reporting period
16QAM	Int	0..1000	Number of times 16QAM used as modulation scheme in reporting period
64QAM	Int	0..1000	Number of times 64QAM used as modulation scheme in reporting period
256QAM	Int	0..1000	Number of times 256QAM used as modulation scheme in reporting period 256QAM products only
Mean number of Code Words	Float	0.0..2.0	The mean number of codewords for all the transmissions in the reporting period

• L1CellWatch

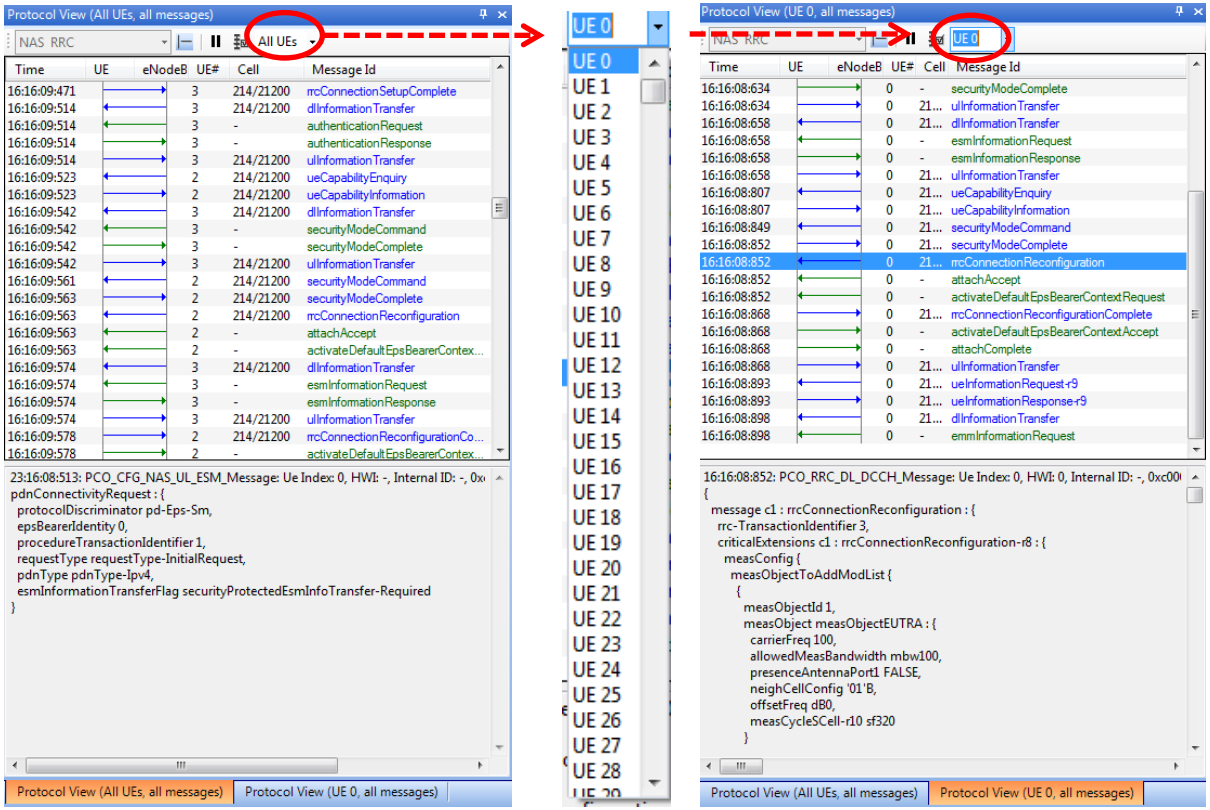


Measurement Item	Unit	Range	Description
>> RAT	Enum	0..1	The Radio Access Technology of the measured cell 0 = FDD 1 = TDD
>> CP Length	Enum	0..1	The Cyclic Prefix length in use by the cell 0 = Normal CP 1 = Extended CP
>> Subframes reserved for MBSFN	Bool	0..1	Shows whether Cell will send multi-cast information
>> Cell Timing	ms	0..10.0	Cell frame timing. Provides the relative frame timing of the cell with respect to the internal TM500 system timebase.
>> RSRP	dBm	-140..0	RSRP
>> RSRQ	dB	-30..0	Measure of cell quality derived from RSRP and RSSI. Note: This item is currently not supported.

Measurement –Protocol View

COBHAM

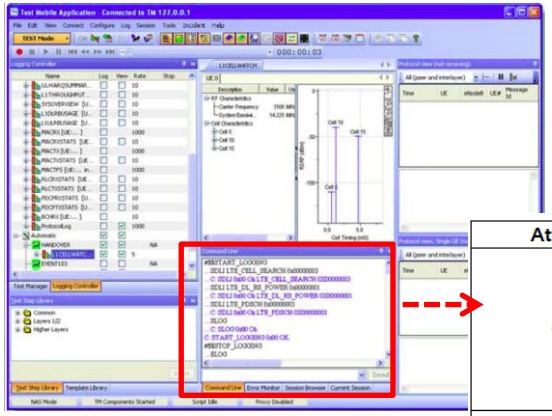
- Description
  - Filtering UE Number of RRC/NAS Signaling msg
  - Distinguish the RRC/NAS Signaling msg by the different Color (Green: NAS, blue: RRC)
  - Detail msg of RRC/NAS msg after decode
  - Stop and Start, Resume the RRC/NAS msg



Measurement –Command line

COBHAM

- Description
  - every situation happened of each UE->Attach process, RRC reestablishment, RACH, RLC retransmission, SR max exceed, as well as TMA Command state.
  - meaning of This indication into the file " **TM500LTE_CommandReference.Pdf**"



Attach process	Indication of command line
Cell Search	05/09/14 15:44:37:066 I: CMPI RRC Cell Selection: UE Id: 71 05/09/14 15:44:37:066 Cell Info: 05/09/14 15:44:37:066 Cell Id: 444 DL Freq: 18200 Cell Type: Acceptable 05/09/14 15:44:37:066 I: CMPI RRC Cell Selection: UE Id: 71 05/09/14 15:44:37:066 Cell Info: 05/09/14 15:44:37:066 Cell Id: 444 DL Freq: 18200 Cell Type: Suitable
RACH	05/09/14 15:44:37:082 I: CMPI L2 Random Access Initiated :UE Id:71 (Connection Establish: Cell Id 444, Dl Freq 18200) 05/09/14 15:44:37:113 I: CMPI L2 Random Access Complete :UE Id:71 (TC-RNTI: 0x6070, TimingAdv: 9, PreambleTxCount: 1)
RRC connection	05/09/14 15:44:37:129 I: CMPI MTE 0 ECM CONNECTION IND:UE Id:71
EPS bearer acquisition	05/09/14 15:44:37:456 I: CMPI MTE 0 EMM REGISTER IND:UE Id:71 05/09/14 15:44:37:456 Selected PLMN: 45005F 05/09/14 15:44:37:456 Pdn Id: 0 05/09/14 15:44:37:456 EPS Bearer Id: 5 05/09/14 15:44:37:456 Access Point Name: seo.data2.mnc005.mcc450.gprs 05/09/14 15:44:37:456 IPv4 Address: 132.1.0.72 05/09/14 15:44:37:456 Attach Result: EPS Only 05/09/14 15:44:37:456 Mode: PS 2 05/09/14 15:44:37:628 I: CMPI MTE 0 NAS PDN CONNECTION IND:UE Id:71 05/09/14 15:44:37:628 Pdn Id:1 05/09/14 15:44:37:628 Default EPS Bearer Id:6 05/09/14 15:44:37:628 Access Point Name: seo.voice2.mnc005.mcc450.gprs 05/09/14 15:44:37:628 IPv4 Address: 133.1.0.72

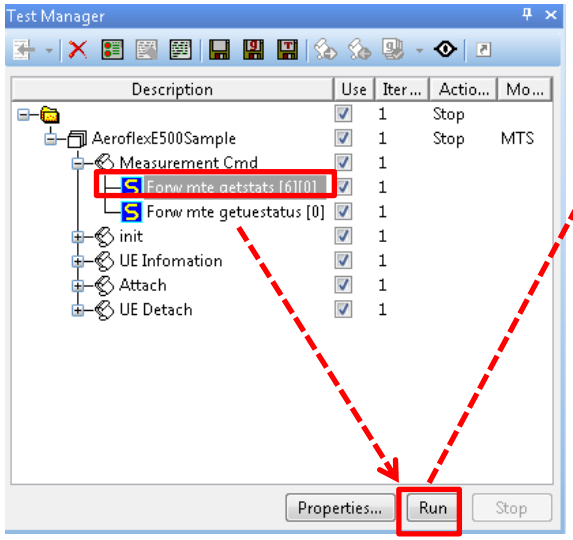
Measurement – Measurement command

ex) Forw mte getstats

- Description
  - Run this command on the test manger or enter on the command line directly in testing
  - **Forw mte getstats [6][0]** -> ex) [6] is layer Type , [0] is UE Number
  - RF signal (RSRP,SIR,RSRQ,RSSI) /MCS level/CQI, Total TX/PUSCH/PUCCH/SRS Power
  - Ex)The (TX1,RX1) is main antenna and The (TX2, RX2) is sub antenna in case of 2x2 MIMO.
  - The meaning of This command into " **TM500LTE_CommandReference.Pdf**"

✓ Check Point

- First, easily User can check the RF Signal and overall information how to adjust correctly using this command.
- (Tx1,Rx2) and (TX2,Rx1) are opposite value. Don't care these Value.



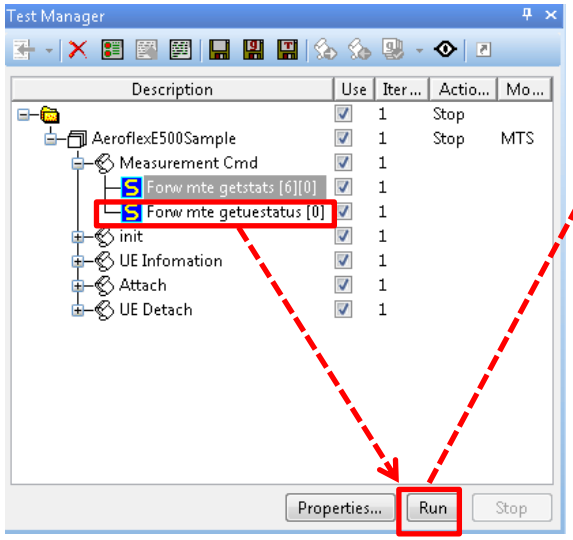

```
forw mte getstats [6][0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0]
UE ID: 0  (Radio Context: 0  Cell ID: 129  DL Freq: 2315.0 MHz)
RSSI: -40.7 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -63 dBm/SC   SIR:  38 dB   RSRQ:   0.7 dB   RSSI: -43.7 dBm
Reference Signal: (Tx1,Rx2) RSRP: -111 dBm/SC   SIR:  -3 dB   RSRQ:  -47.4 dB   RSSI: -43.6 dBm
Reference Signal: (Tx2,Rx1) RSRP: -110 dBm/SC   SIR:  -2 dB   RSRQ:  -46.3 dB   RSSI: -43.7 dBm
Reference Signal: (Tx2,Rx2) RSRP:  -62 dBm/SC   SIR:  38 dB   RSRQ:   1.6 dB   RSSI: -43.6 dBm
DL Modulation: Average MCS: 24.10  Average Bits/Symbol: 5.97
UL Modulation: Average MCS: 22.88  Average Bits/Symbol: 4.00
UL RLC SDU Latency: 16.78 ms
DL RLC Lost Packets: 0
PATH_LOSS_MEAS:  15 dB   PATH_LOSS_SIM: 10 dB CQI_CW0: 15    CQI_CW1: -
TOTAL_TX_POWER: -13.5 dBm   PUSCH: -20.5 dBm   PUCCH: -50.5 dBm   SRS: -17.5 dBm
```

Measurement – Measurement command

ex) Forw mte getuestatus

- Description
  - Run this command on the test manger or enter on the command line directly in testing
  - **Forw mte getuestatus [0]** -> [0] is UE Number
  - RRC/NAS STATE, APN,Pass loss/RSRP/RSRQ/SIR/CQI
  - The meaning of This command into the" **TM500LTE_CommandReference.Pdf**"

✓ Check Point
  - This information is for mobility test as Handover and Path loss simulation testing
  - To show this information, Previously the e-NB positon should be set using the cmd "forw mte MtsConfigEnb"

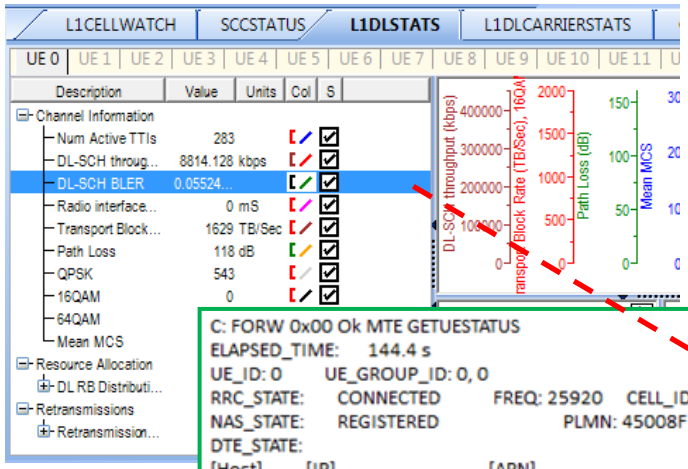



```
forw mte getuestatus [0]
C: FORW 0x00 Ok MTE GETUESTATUS
ELAPSED_TIME:     172.2 s
UE_ID: 0      UE_GROUP_ID: 0, 0
RRC_STATE:     CONNECTED        FREQ: 25920    CELL_ID: 341
NAS_STATE:     REGISTERED                PLMN: 45008F
DTE_STATE:
[Host]      [IP]                    [APN]                        [App]
pppoe_00000_0  50.3.195.89              internet-mnc050-mcc440  gprs
MTS_MOBILITY_STATE:
MM_ID: 0  PATH_ID: 0  POS: (27000, 0)  V: 0.0  NEXT_WP: (27000, 0)
[FREQ]  [CELL_ID]  [R]  [PL]  [RSRP]  [RSRQ]  [SIR]  [CQI]
25920   341        40000  118   -108    -12.8   2.3    5
```

Example Analysis

Check Low Throughput and BLER

- Description
  - Check the T-Put and BLER on "**L1DLSTATS**" -> Send The command **"Forw mte getuestatus"** on command line ->Convertor logdata "**L1L2FTL(Functional test logging**)" -> check the TTI info as DCI/CRC/RV



Low T-put->increase BLER % -> the cause is low RF Signal as RSRP -108 and SIR 2.3 -> the CRC Fail.

```
C: FORW 0x00 Ok MTE GETUESTATUS
ELAPSED_TIME:     144.4 s
UE_ID: 0      UE_GROUP_ID: 0, 0
RRC_STATE:     CONNECTED      FREQ: 25920    CELL_ID: 341
NAS_STATE:     REGISTERED                PLMN: 45008F
DTE_STATE:
[Host]      [IP]                  [APN]                    [App]
pppoe_00000_0  50.3.140.185          internet-mnc050-mcc440  gprs
MTS_MOBILITY_STATE:
MM_ID: 0  PATH_ID: 0  POS: (27000, 0)  V: 0.0  NEXT_WP: (27000, 0)
[FREQ]  [CELL_ID]  [R]  [PL]  [RSRP]  [RSRQ]  [SIR]  [CQI
25920   341        40000 118  -108    -12.8   2.3    5
MTS_TRAFFIC_STATE:
[TM_ID]  [TM_STATE]    [TP]  [SERVICES]
```

***TM500LTE_MeasurementReference.Pdf**

CRC	Int	0..1	CRC for the DL decode (DL only "-" where not appropriate) CRC result: 0=Fail, 1=Pass

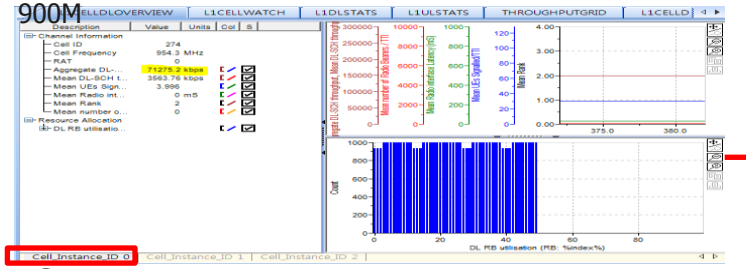
UE ID	SFN	Subframe	Cell ID	Cell Freque	RAT	RC	UE	MULTIPOI	Channel	Carrier	DRX	Type	TB_SIZE	HARQ	RETRY	CRC	RNTI	DCI	UCI	RB_ALLOC	RB_ALLOC	MAC	Error
0	645	5	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_I__	DYN	0	0	0	0	0xd36c	DL_GRANT	-	0x000000	-	-	-
0	645	5	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_I__	DYN	0	0	0	0	0xd36c	DL_GRANT	-	0x000000	-	-	-
0	646	9	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_IR__	DYN	0	0	1	0	0	DL_GRANT	-	0x000000	-	-	-
0	646	9	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_IR__	DYN	0	0	1	0	0	DL_GRANT	-	0x000000	-	-	-
0	647	9	341	2592	TDD	0	0	-	PDSCH	PCC TB1	_IR__	DYN	0	0	2	0	0	DL_GRANT	-	0x000000	-	-	-
0	647	9	341	2592	TDD	0	0	-	PDSCH	PCC TB2	_IR__	DYN	0	0	2	0	0	DL_GRANT	-	0x000000	-	-	-

Example Analysis

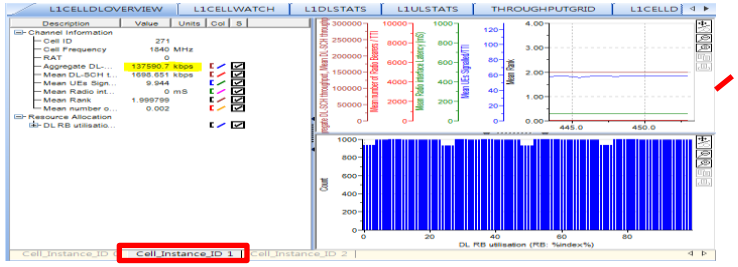
Max 3CC Throughput

- Description
  - In Case of 3CC, User can see the each band Throughput on each Cell instance ID on "**L1Celloverview**"
  - User can check the added Scell information in RRC reconfiguration msg on the "**protocol view**"

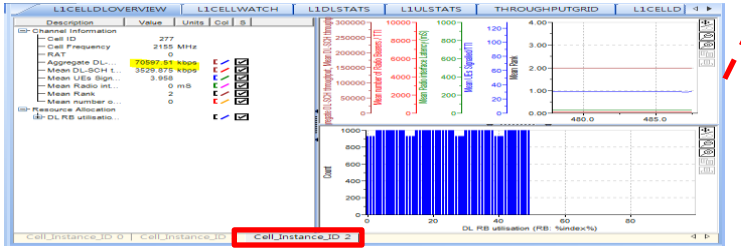
•① 900M



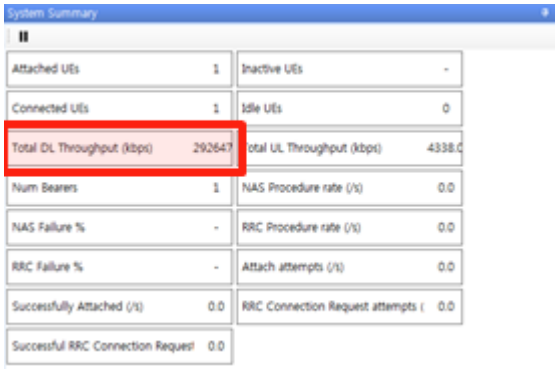
•② 1.8G

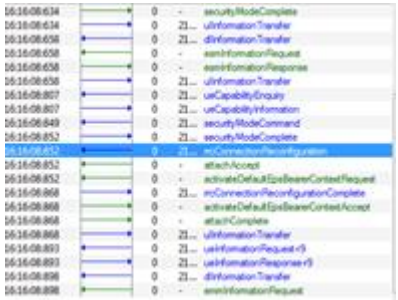


•③ 2.1G



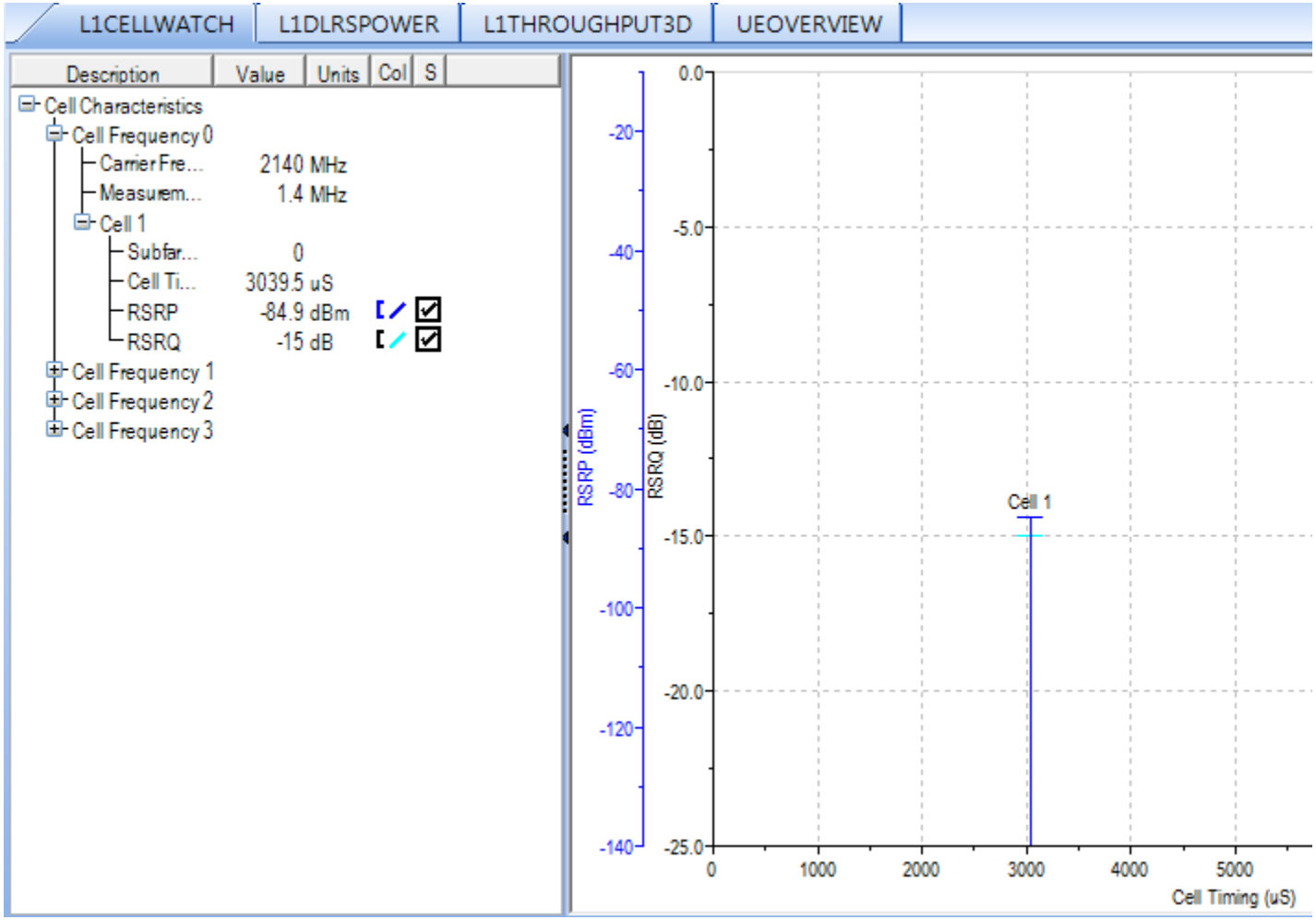
•④ Total Result



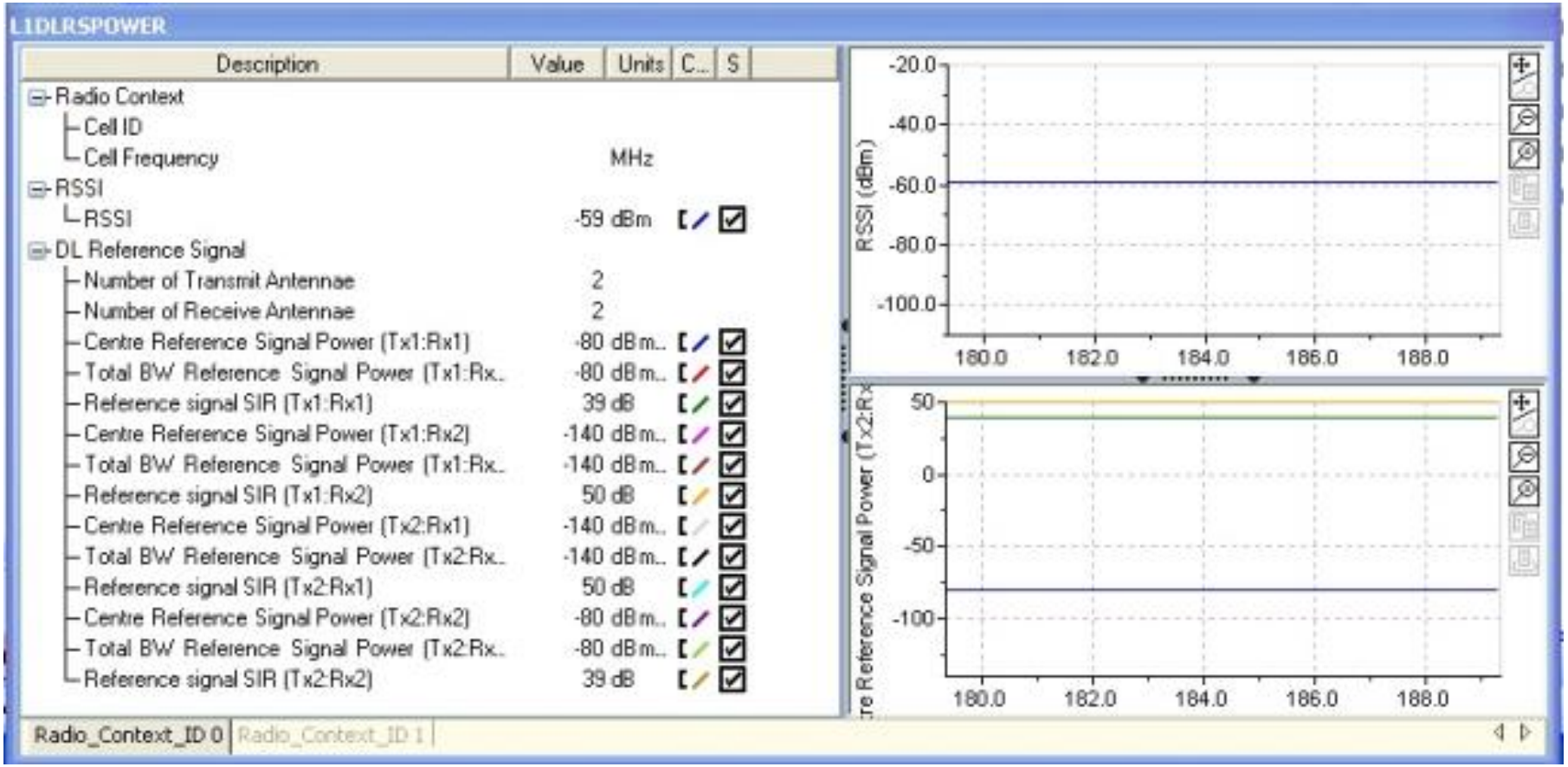


```
nonCriticalExtension {
 nonCriticalExtension {
  nonCriticalExtension {
   sCellToAddModList-r10 {
    {
     sCellIndex-r10 1,
      cellIdentification-r10 {
       physCellId-r10 274,
       dl-CarrierFreq-r10 3743
    }
    {
     sCellIndex-r10 2,
      cellIdentification-r10 {
       physCellId-r10 277,
       dl-CarrierFreq-r10 450
```

L1CELLWATCH



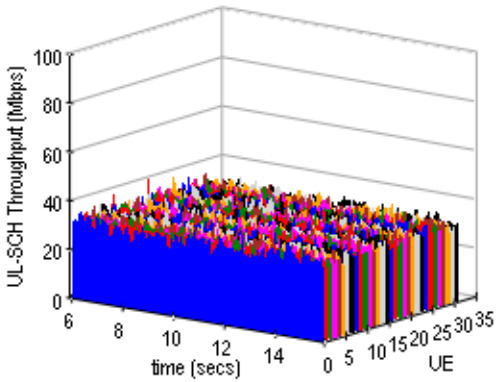
L1 DL RS Power

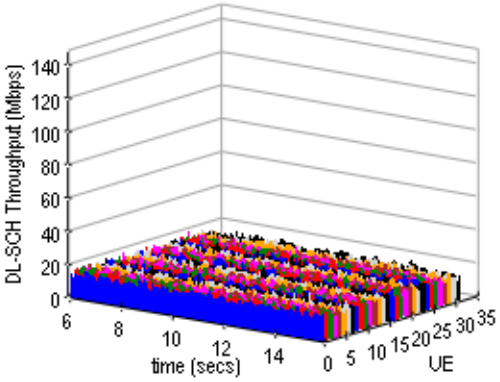


L1 Throughput 3D

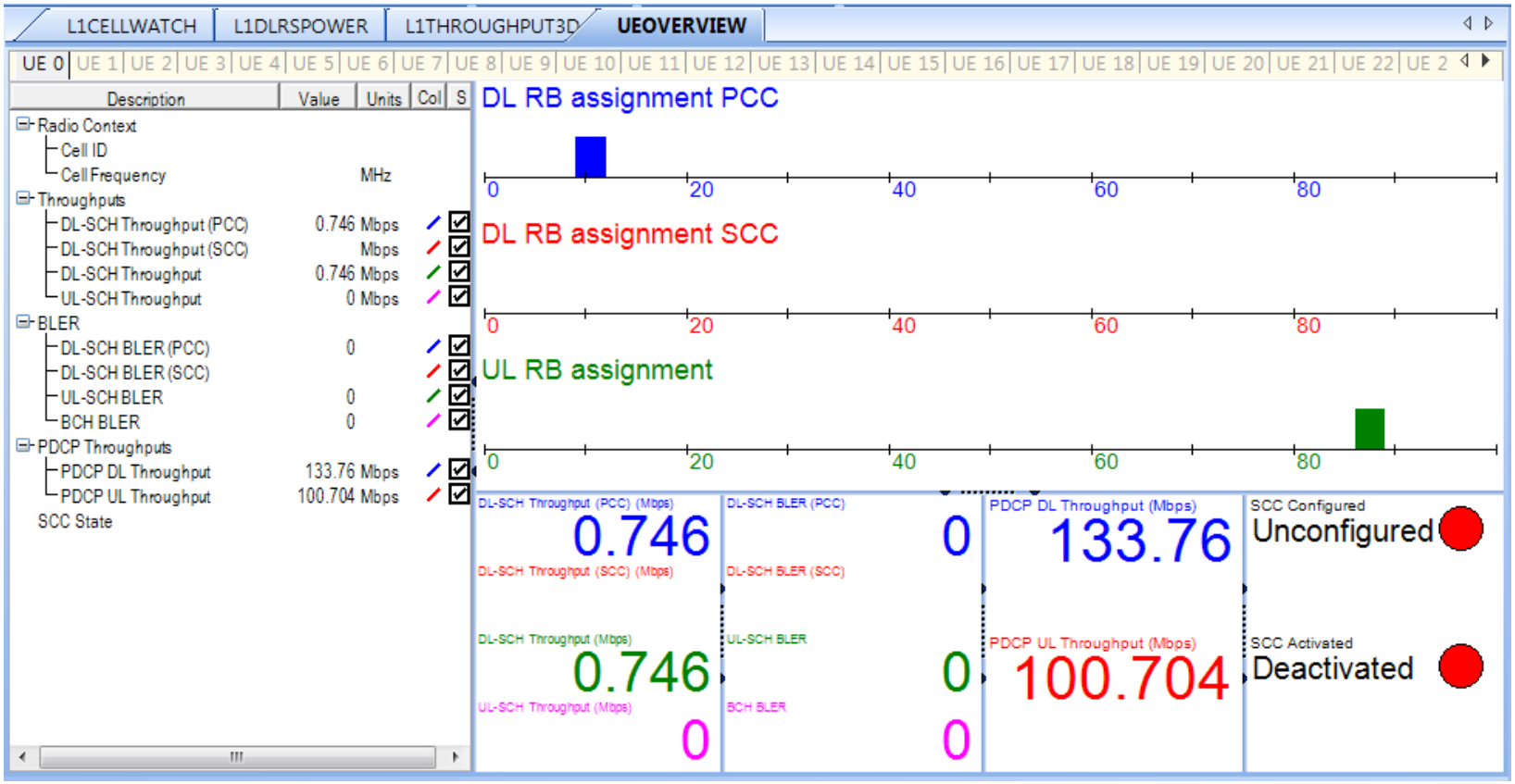
L1CELLWATCH | L1DLRSPOWER | L1THROUGHPUT | **L1THROUGHPUT3D**

Description	Value	Units	Col	S
L1 Throughput DL				
0	16.973	Mbps		
1	14.748	Mbps		
2	15.303	Mbps		
3	13.883	Mbps		
4	15.776	Mbps		
5	16.106	Mbps		
6	14.437	Mbps		
7	16.518	Mbps		
8	15.791	Mbps		
9	16.645	Mbps		
10	14.239	Mbps		
11	13.777	Mbps		
12	16.034	Mbps		
13	17.325	Mbps		
14	13.46	Mbps		
15	14.982	Mbps		
16	13.908	Mbps		
17	12.795	Mbps		
18	12.218	Mbps		
19	15.537	Mbps		
20	16.187	Mbps		
21	16.922	Mbps		
22	14.171	Mbps		
23	17.94	Mbps		
24	15.87	Mbps		
25	16.467	Mbps		
26	12.517	Mbps		
27	14.678	Mbps		





UEOVERVIEW


L1CELLWATCH
L1DLRSPOWER
L1THROUGHPUT3D
UEOVERVIEW
UE 0 UE 1 UE 2 UE 3 UE 4 UE 5 UE 6 UE 7 UE 8 UE 9 UE 10 UE 11 UE 12 UE 13 UE 14 UE 15 UE 16 UE 17 UE 18 UE 19 UE 20 UE 21 UE 22 UE 2
Description
Value
Units
Col
S
Radio Context
Cell ID
Cell Frequency
MHz
Throughputs
DL-SCH Throughput (PCC)
0.746 Mbps
DL-SCH Throughput (SCC)
Mbps
DL-SCH Throughput
0.746 Mbps
UL-SCH Throughput
0 Mbps
BLER
DL-SCH BLER (PCC)
0
DL-SCH BLER (SCC)
UL-SCH BLER
0
BCH BLER
0
PDCP Throughputs
PDCP DL Throughput
133.76 Mbps
PDCP UL Throughput
100.704 Mbps
SCC State
DL RB assignment PCC
0
20
40
60
80
DL RB assignment SCC
0
20
40
60
80
UL RB assignment
0
20
40
60
80
DL-SCH Throughput (PCC) (Mbps)
0.746
DL-SCH BLER (PCC)
0
PDCP DL Throughput (Mbps)
133.76
SCC Configured
Unconfigured
DL-SCH Throughput (SCC) (Mbps)
DL-SCH BLER (SCC)
DL-SCH Throughput (Mbps)
0.746
UL-SCH BLER
0
PDCP UL Throughput (Mbps)
100.704
SCC Activated
Deactivated
UL-SCH Throughput (Mbps)
0
BCH BLER
0

Layer 3 Statistics

Layer 3 Statistics

Preferences ... Clear Statistics

ATTACH	250	10	250	0	1017	
DETACH_UE_INIT	50	0	50	0	22	
DETACH_NW_INIT	0	0	0	0	-	
SERVICE_REQUEST_MO	305	0	287	18	177	
NAS:ESM_OVERVIEW	Count	Retry	Success	Failure	Mean Time	
BEARER_RESOURCE_ADD	50	0	100	0	199	
PDN Bearer Stats	Total Bearers	Active Bearers	DL Packet Count	DL Throughput	UL Packet Count	UL Throughput
0 (DEFAULT)	244	244	4427814	52839.7	3157562	1061.4
0 (DEDICATED)	50	0	1366630	822.4	1366467	822.3
1 (DEFAULT)	-	-	-	-	-	-
1 (DEDICATED)	-	-	-	-	-	-
2 (DEFAULT)	-	-	-	-	-	-
2 (DEDICATED)	-	-	-	-	-	-
3 (DEFAULT)	-	-	-	-	-	-
3 (DEDICATED)	-	-	-	-	-	-
Total	294	244	5794444	53662.0	4524029	1883.7
RRC:RRC_PROCEDURE	Count	Success	Failure	Mean Time		
RRC_CONNECTION_REQUEST	537	537	0	78		
RRC_CONNECTION_REESTABLISHMENT	0	0	0	-		
RRC_HANDOVER	120	120	0	147		
RRC_CONNECTION_RELEASE	345					
MEASUREMENT_REPORT	120					
RRC:CELL_OVERVIEW	Count					
CONNECTED_UES	192					
IDLE_UES	6					
Cell 47 (2120.0 MHz)						

Command Line | Error Monitor | Session Browser | Current Session | Layer 3 Status | Layer 3 Statistics

Show Rows and Columns

- NAS:EMM_PROCEDURE
  - ATTACH
  - DETACH_UE_INIT
  - DETACH_NW_INIT
  - TAU_NORMAL
  - TAU_PERIODIC
  - SERVICE_REQUEST_MO
  - SERVICE_REQUEST_MT
  - AUTHENTICATION
  - SERVICE_MODE_CMD
- NAS:ESM_OVERVIEW
  - PDN_CONNECTIVITY
  - PDN_DISCONNECT
  - BEARER_RESOURCE_ADD
  - BEARER_RESOURCE_DELETE
  - BEARER_RESOURCE_MODIFY
  - NW_ACTIVATE_DEDICATED_BEA
  - NW_MODIFY_BEARER
  - NW_DEACTIVATE_BEARER
- NAS:NAS_SIGNALLING_RATE
  - NAS_DOWNLINK
  - NAS_UPLINK
- PDN Bearer Stats
  - PDN
- RRC:RRC_PROCEDURE
  - RRC_CONNECTION_REQUEST
  - RRC_CONNECTION_REESTABLIS
  - RRC_HANDOVER
  - RRC_CONNECTION_RELEASE
  - PAGING_REQUEST
  - MEASUREMENT_REPORT
- RRC:CELL_OVERVIEW
  - CONNECTED_UES

All the test Statistics can be seen here.
We can customize our results by clicking on Preference button.

Higher layer logging

MSC view

NAS & RRC layer messages in real time

Click on a message to see the ASN1 decoded information

Captured logs can be re-loaded by switching from TEST Mode to ANALYSE Mode

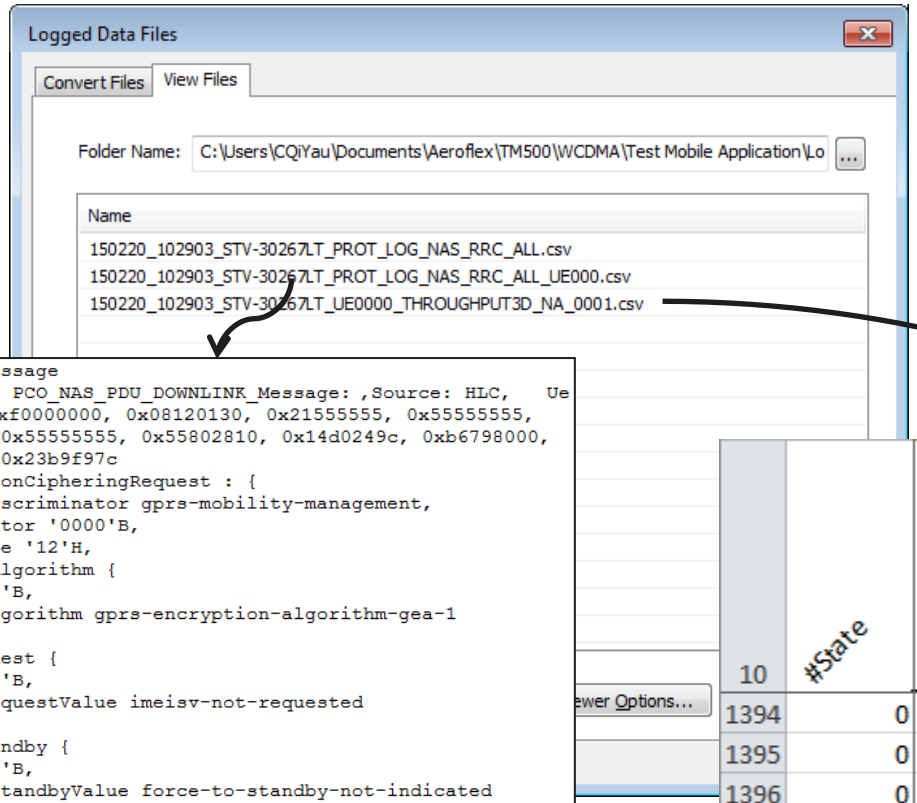
Corresponding CSV file is also produced

Time	UE	eNodeE	UE#	Cell	Message Id
14:42:01:...	←		0	9...	masterInformationBlock
14:42:01:...	←		0	9...	systemInformationBlockType1
14:42:01:...	←		0	9...	systemInformation
14:42:01:...	←		0	9...	systemInformation
14:42:01:...	→		0	-	pdnConnectivityRequest
14:42:01:...	→		0	-	attachRequest
14:42:01:...	→		0	-	rrcConnectionRequest
14:42:01:...	←		0	9...	rrcConnectionSetup
14:42:01:...	←		0	9...	rrcConnectionSetup
14:42:01:...	→		0	-	rrcConnectionSetupComplete
14:42:01:...	←		0	9...	rrcConnectionReconfiguration
14:42:01:...	→		0	-	rrcConnectionReconfigurationCo...
14:42:01:...	←		0	9...	dlInformationTransfer
14:42:01:...	←		0	-	authenticationRequest
14:42:01:...	→		0	-	authenticationResponse
14:42:01:...	→		0	-	ulInformationTransfer
14:42:01:...	←		0	9...	dlInformationTransfer
14:42:01:...	←		0	-	securityModeCommand
14:42:01:...	→		0	-	securityModeComplete
14:42:01:...	→		0	-	ulInformationTransfer
14:42:01:...	←		0	9...	ueCapabilityEnquiry
14:42:01:...	→		0	-	ueCapabilityInformation

```
14:42:01:464:      PCO_RRC_BCCH_DL_SCH_Message: UE Index: 0, HWI: 0, 0xc0000
{
 message c1 : systemInformation : {
  criticalExtensions systemInformation-r8 : {
   sib-TypeAndInfo {
    sib2 : {
     radioResourceConfigCommon {
      rach-Config {
       preambleInfo {
        numberOfRA-Preambles n56
       },
       powerRampingParameters {
        powerRampingStep dB6,
        preambleInitialReceivedTargetPower dBm-104
       },
       ra-SupervisionInfo {
        preambleTransMax n3,
        ra-ResponseWindowSize sf3,
        mac-ContentionResolutionTimer sf64
```

Logging

Offline logs, Post analysis




```
} DL-DCCH-Message
10:29:12:736 PCO_NAS_PDU_DOWNLINK_Message: ,Source: HLC,   Ue
Index: 0,  0xf0000000, 0x08120130, 0x21555555, 0x55555555,
0x55555555, 0x55555555, 0x55802810, 0x14d0249c, 0xb6798000,
0xd0726e87, 0x23b9f97c
authenticationCipheringRequest : {
  protocolDiscriminator gprs-mobility-management,
  skipIndicator '0000'B,
  messageType '12'H,
  cipheringAlgorithm {
    spare '0'B,
    typeOfAlgorithm gprs-encryption-algorithm-gea-1
  },
  imeisvRequest {
    spare '0'B,
    imeisvRequestValue imeisv-not-requested
  },
  forceToStandby {
    spare '0'B,
    forceToStandbyValue force-to-standby-not-indicated
  },
  a-cReferenceNumber {
    acReferenceValue '0011'B
  },
  authParameterRAND {
    iei '21'H,
    rand '55555555555555555555555555555555'H
  },
  cipheringKeySequenceNumber {
    iei '1000'B,
    spare '0'B,
    keySequence '000'B
  },
```

Saved data can be converted and viewed in more detail.

10	#State	Time	SFN	R99 DL throughput(kbps)	R99 UL Throughput(kbps)
1394	0	10:17:56:8	139	1.34	67.2
1395	0	10:17:57:3	189	1.34	67.2
1396	0	10:17:57:8	239	1.34	67.2
1397	0	10:17:58:3	289	2.02	67.2
1398	0	10:17:58:8	339	1.34	67.2
1399	0	10:17:59:3	389	1.34	67.2
1400	0	10:17:59:8	439	1.34	67.2

150220_100559_STV-30267LT_UE000

Statistics reporting via the command log

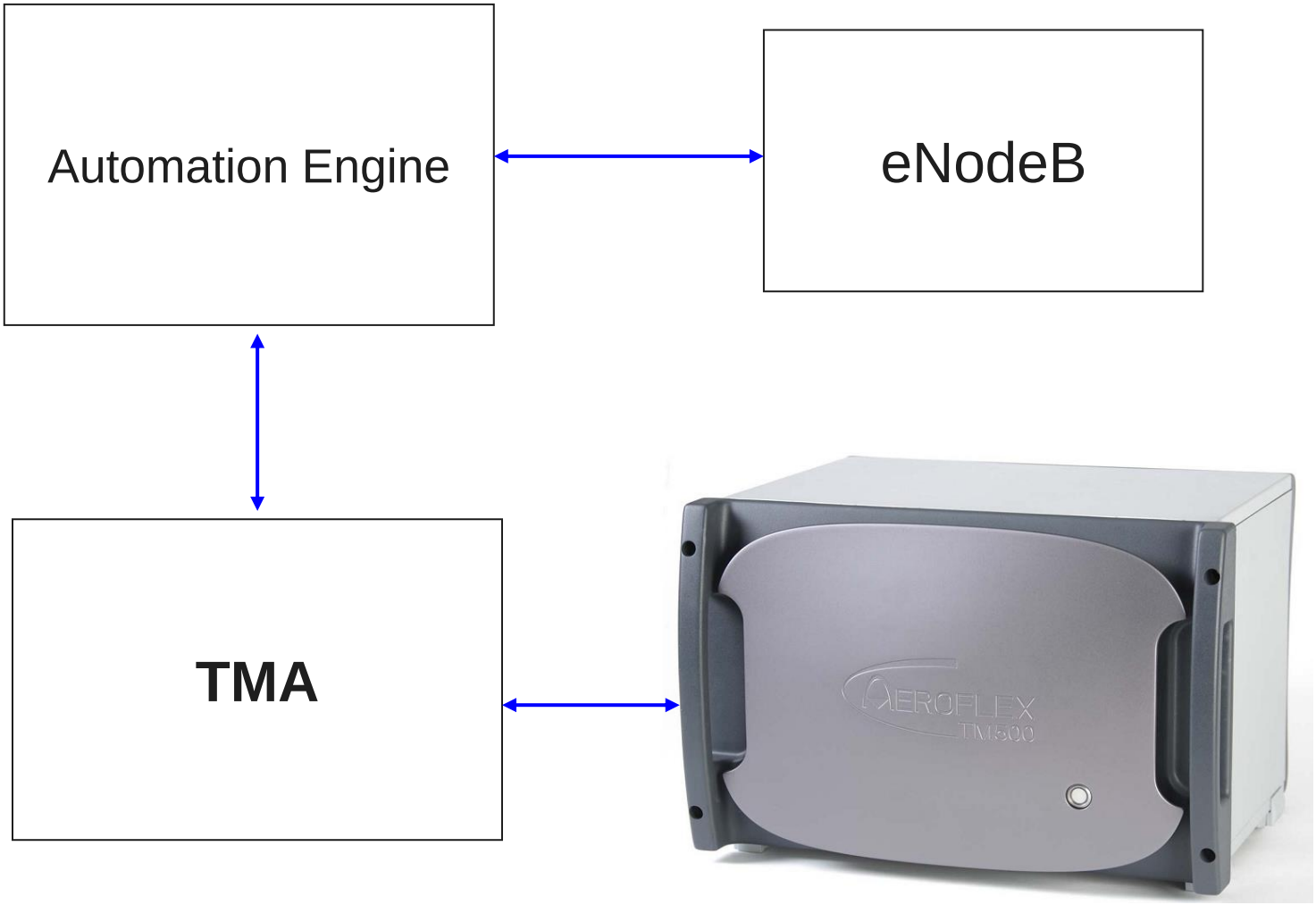
The GetStats command is an additional means of getting statistical information from the TM500:

```
Display QoS Statistics
forw mte GetStats [PHY] [0]
C: FORW 0x00 Ok MTE GETSTATS [PHY] [0] [0, 1, 2]
UE ID: 0   (Radio Context: 0   Cell ID: 332   DL Freq: 2655.0 MHz)
BCH NO DATA
DBCH NO DATA
PCH NO DATA
RACH
Detects: 00000000000000  Non-Detects: 00000000001900
[NumTBs]       [NumTBErrors]   [BLER]       [Total Bits]    [Total Bit Errors] [BER]
000000000000000 000000000000000  0.0000000000 000000000000000  -                  -
DL-SCH (PCC)
Detects: 00000000001900  Non-Detects: 00000000000000  Non-DL TTIs: 00000000000000  DRX: 00000000000000
Throughput: 149781440  Average: 142181640  Min: 119601660  Max: 149781440
Codeword: 0
[NumTBs]       [NumTBErrors]   [BLER]       [Total Bits]    [Total Bit Errors]   [BER]
000000000001900 000000000000000  0.0000000000 00000142181640  -                    -
Codeword: 1
[NumTBs]       [NumTBErrors]   [BLER]       [Total Bits]    [Total Bit Errors]   [BER]
000000000001900 000000000000000  0.0000000000 00000142181640  -                    -
UL-SCH
Throughput: 00121160  Average: 00117268  Min: 00099200  Max: 00124700
[NumTBs]       [NumTBsNack]    [NumTBsAck]     [NumBits]       [NumBitsAck]    [BLER]        [NumTBsNewlyTransmitted]   [NumTBsRetransmitted]
000000000000189 000000000000000  000000000000189  000000000234536 000000000234536  0.0000000000  000000000000189            000000000000000


forw mte GetStats [EXT-STATS] [0]
C: FORW 0x00 Ok MTE GETSTATS [EXT-STATS] [0] [0, 1, 2]
UE ID: 0   (Radio Context: 0   Cell ID: 332   DL Freq: 2655.0 MHz)
RSSI: -45.5 dBm
Reference Signal: (Tx1,Rx1) RSRP:  -79 dBm/SC    SIR:  36 dB    RSRQ:  -10.2 dB    RSSI: -48.8 dBm
Reference Signal: (Tx1,Rx2) RSRP: -126 dBm/SC    SIR:  -9 dB    RSRQ:  -57.8 dB    RSSI: -48.2 dBm
Reference Signal: (Tx2,Rx1) RSRP: -126 dBm/SC    SIR:  -9 dB    RSRQ:  -57.2 dB    RSSI: -48.8 dBm
Reference Signal: (Tx2,Rx2) RSRP:  -79 dBm/SC    SIR:  36 dB    RSRQ:  -10.8 dB    RSSI: -48.2 dBm
DL Modulation: Average MCS: 28.00  Average Bits/Symbol: 6.00
UL Modulation: Average MCS: 18.02  Average Bits/Symbol: 4.00
UL RLC SDU Latency: 23.00 ms
DL RLC Lost Packets: 0
PATH_LOSS_MEAS:   -       PATH_LOSS_SIM: 10 dB CQI_CW0: 15     CQI_CW1: -
TOTAL_TX_POWER: -16.5 dBm   PUSCH: -0.5 dBm    PUCCH: -17.0 dBm   SRS:   -
```

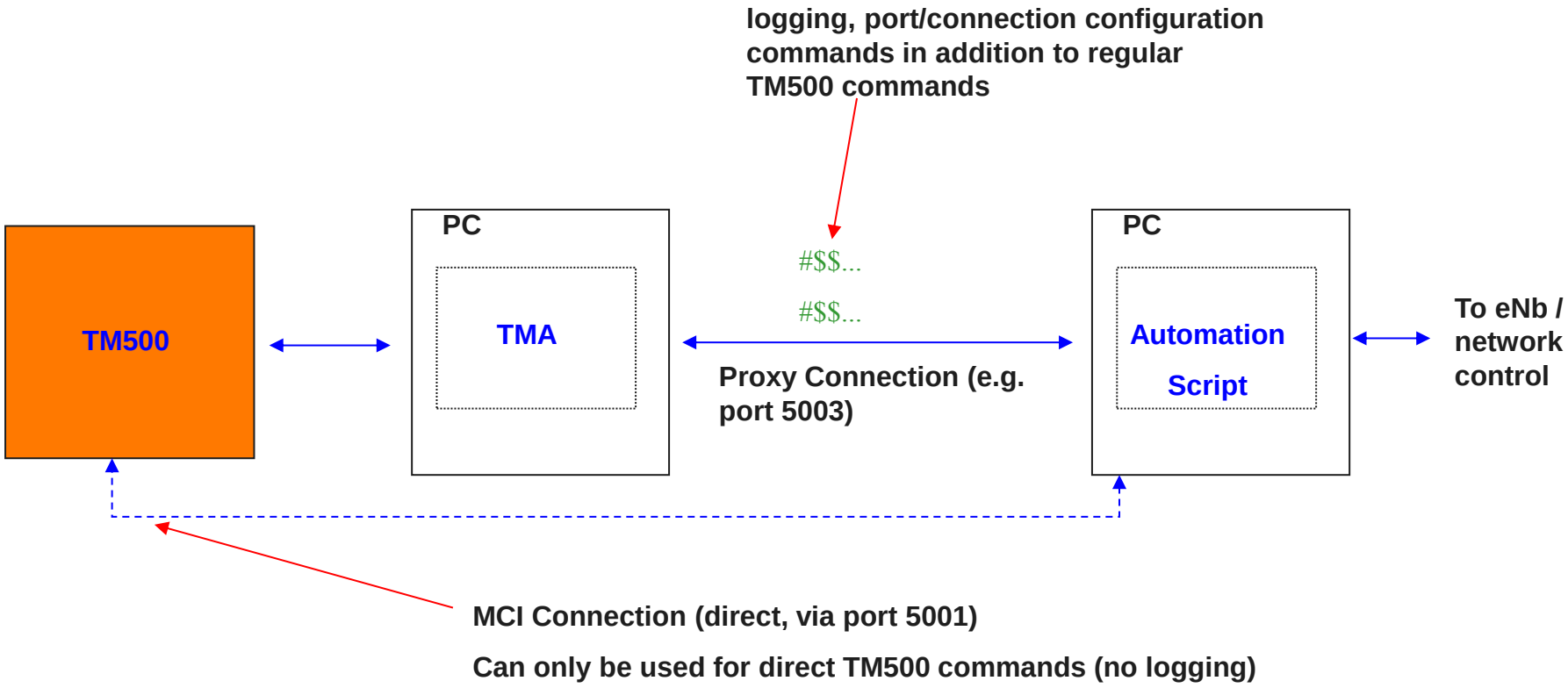
Automation

Test Automation



Test Automation

Connection Diagram



Test Automation

Proxy Command Examples

- PORT *Configure TM500 connection*

  #$$PORT 10.8.5.3 5001 5002 5003

- CONNECT *TM500 Connect*

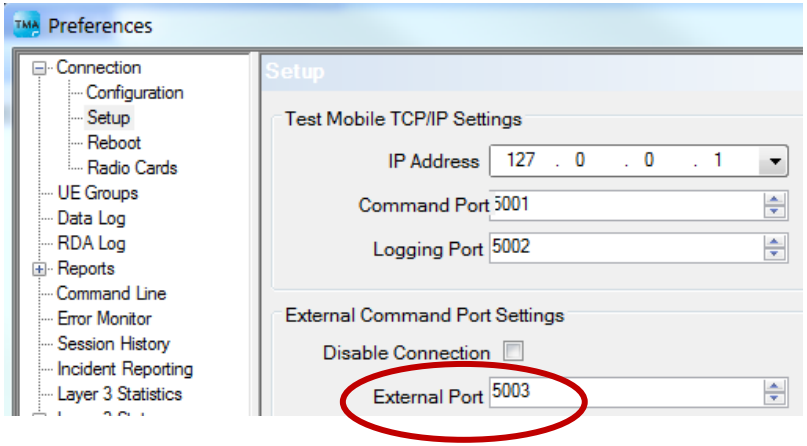
  #$$CONNECT

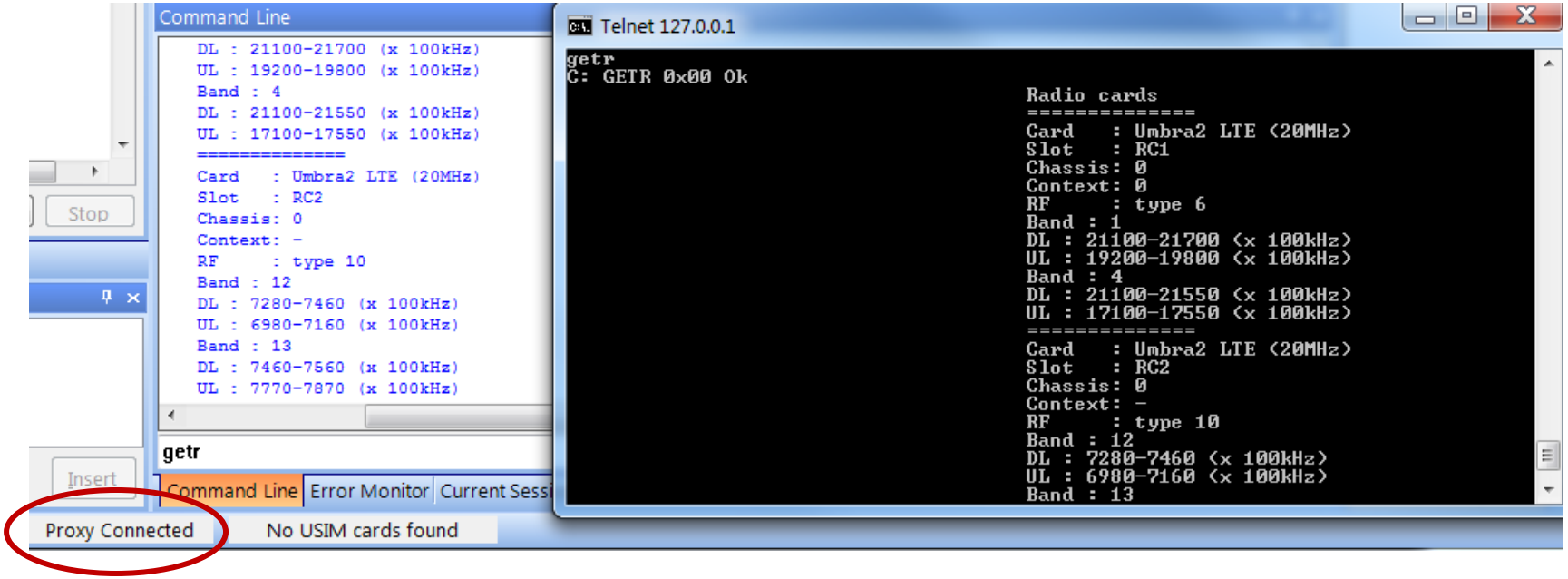
- Regular TM500 Commands can be sent to the proxy port without the preceding '#$$'

  forw mte PhyCellSearch 21400 19500

Test Automation

Proxy Connection





Proxy Example – Logging Commands

- This example converts all the files in the directory called *C:\My Documents\TMA\Data\Binary Files* and retains the binary files for further use:
  - #$$CONVERT_TO_TEXT 0 “C:\My Documents\TMA\Data\BinaryFiles”

Starting the TMA from a command prompt

If you want to start the TMA from a command line, then it is also possible to set the proxy mode settings at the same time:-

Syntax:-

```
TMAApplication.exe </u USERNAME> </c PROXY_MCI_STARTUP> </p PROXY_MCI_PORT> </a
    AUTODISCONNECT>
```

Where:

USERNAME is the profile name to be used

PROXY_MCI_STARTUP is y or n

PROXY_MCI_PORT should be a number from 5003 onwards

AUTODISCONNECT is y or n

Example:-

```
TMAApplication.exe /u “Default User” /c y /p 5003 /a y
```

Commands and Responses

Just like the MCI, control of the TMA over the RCI is achieved through the use of commands and responses. The main difference is that all the RCI Commands are all prefixed with an escape sequence to separate them from the standard MCI commands which can also be sent over the RCI. The command syntax is as follows:-

- #$$Command <REQUEST_STRING>

The TMA sends back a confirmation of every command received along with a status code the form:-

- C: #$$Command RETURN_CODE RETURN_TEXT <CONFIRMATION STRING>

Any asynchronous indications will be forwarded onto the RCI

Real Data Apps (RDA): Concept

Real Data Generation

RDA Traffic Generator

- Data generation and analysis tool.
  - Supports multiple data applications for each UE. Capable of supporting thousands of UE.
    - Various forms of traffic can be sent over the network. Types of traffic includes HTTP, FTP, UDP, TCP, RTSP, P2P applications etc…
  - Passive analysis on traffic pattern for each UE, based on real time media received and computing a score based (End-to-End) on the user quality.
    - Latency
    - MOS score
    - Jitter
  - Connection to TM500 via PPPoE interface.

Real Data Apps Product Structure

Overview

Application Options

- Thresholding
- Passive Analysis
- SMS over IMS
- Voice services
- Video services
- TeraFlow
- TWAMP

Traffic Generation Options

- 3.6Gbps DL Traffic – R630
- 2.7Gbps DL Traffic – R630
- 1.8Gbps DL Traffic – R630 or d1000 Edge+Core
- 900Mbps DL Traffic – d500 Edge+Core
- 450Mbps DL Traffic – d500 Edge

HTTP, FTP, eMail, Ping

Hardware Platforms

d500 | d1000 | R630

RDA Platform Overview

Dell Server blade

D500

- I/O – 1x 1Gbps
- Fixed VLANs per User
  - SGi Servers I/O use VLAN tags
- Number of UEs
  - 6 000
- Number of Applications
  - 24 000 provisioned application clients
  - 12 000 concurrent application clients
- Number of PDN connections
  - 12 000
- Number of fine statistics
  - 500 entities

D1000

- I/O – 2x 1Gbps
- Fixed VLANs per User
  - SGi Servers I/O use VLAN tags
- Number of UEs
  - 12 000
- Number of Applications
  - 48 000 provisioned application clients
  - 24 000 concurrent application clients
- Number of PDN connections
  - 24 000
- Number of fine statistics
  - 500 entities

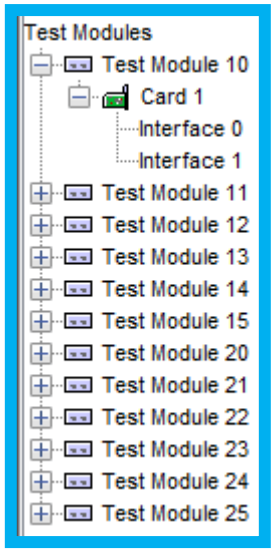
R630

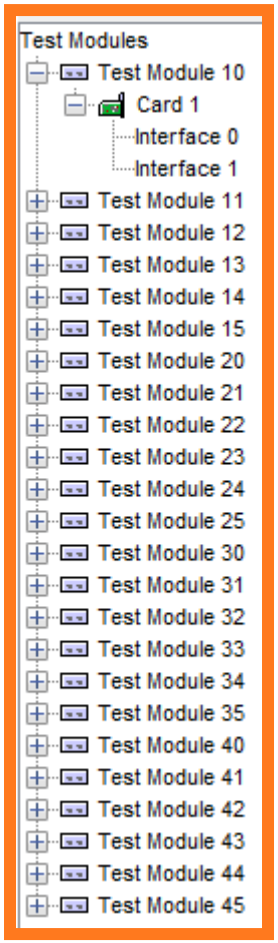
- I/O – 2x 10Gbps
- Configurable VLANs per User
  - SGi Servers can be used without VLAN tags
- Number of UEs
  - 36 000
- Number of Applications
  - 288 000 provisioned and concurrent application clients
- Number of PDN connections
  - 72 000
- Number of fine statistics
  - 24 000 entities
- Near-real time Streaming of statistics

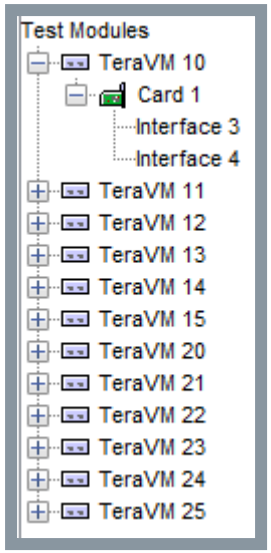
• E500 Mk3	E500 Mk3, Mk4	E500 Mk4.1

RDA Platform Differences

D500 – D1000 – R630







RDA Statistics

D500 – D1000 – R630

COBHAM

D500 – D1000 – R630

- Single Line Entities Stats
  - Stored in the dB after test run can be extracted with saveStats after the test run has been stopped
- Scaled Entities Stats
  - Stored in the SSD during test run. Stats can be extracted during the test run or by pausing the test case and then extracting the stats

R630 Only

- Supports streaming of statistics to TMA via specified API during test execution

Mk4.1 (TeraVM) Impact on RDA provisioning

Minimal Impact Scenario

TM500 Initialisation

- Change to MULT command parameters
  - Only if ASC is not previously supported

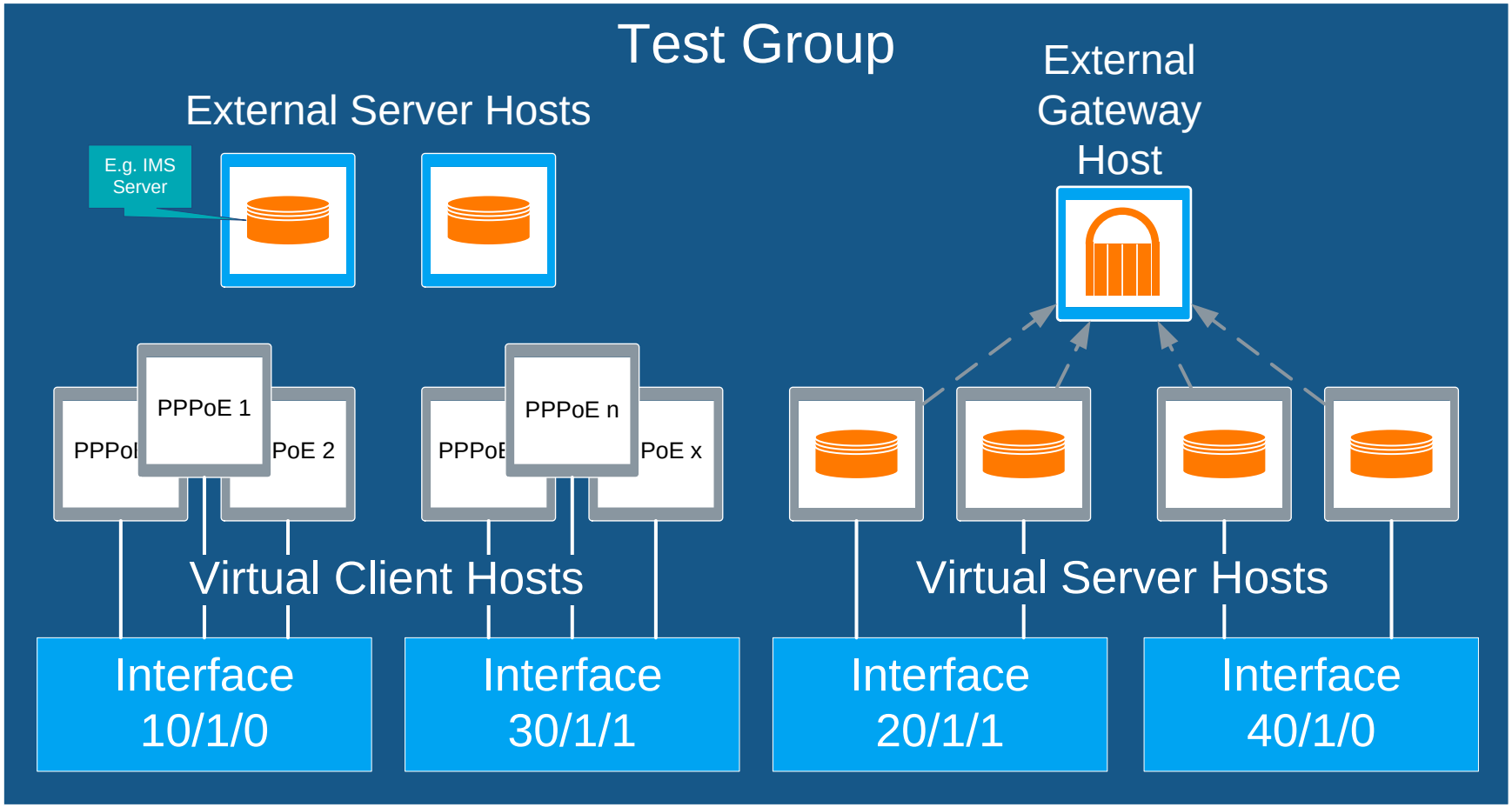
RDA

- Test Execution
  - No Change, if manually or pre-provisioned no changes in automation needed
- Change to Provisioning
  - When done via MCI provisioning
    - Change RDA (diversifEye) type to TeraVM
    - If needed add VLAN tagging to SGi Server hosts
  - When done manually
    - Add VLAN tagging to UE Hosts
      - Same scheme as with d500 / d1000
    - If needed add VLAN tagging to SGi Server hosts
    - Change PPPoE clients to use the DTE IP address in the service name

Optional RDA interfaces: DiversifEye Gui & CLI

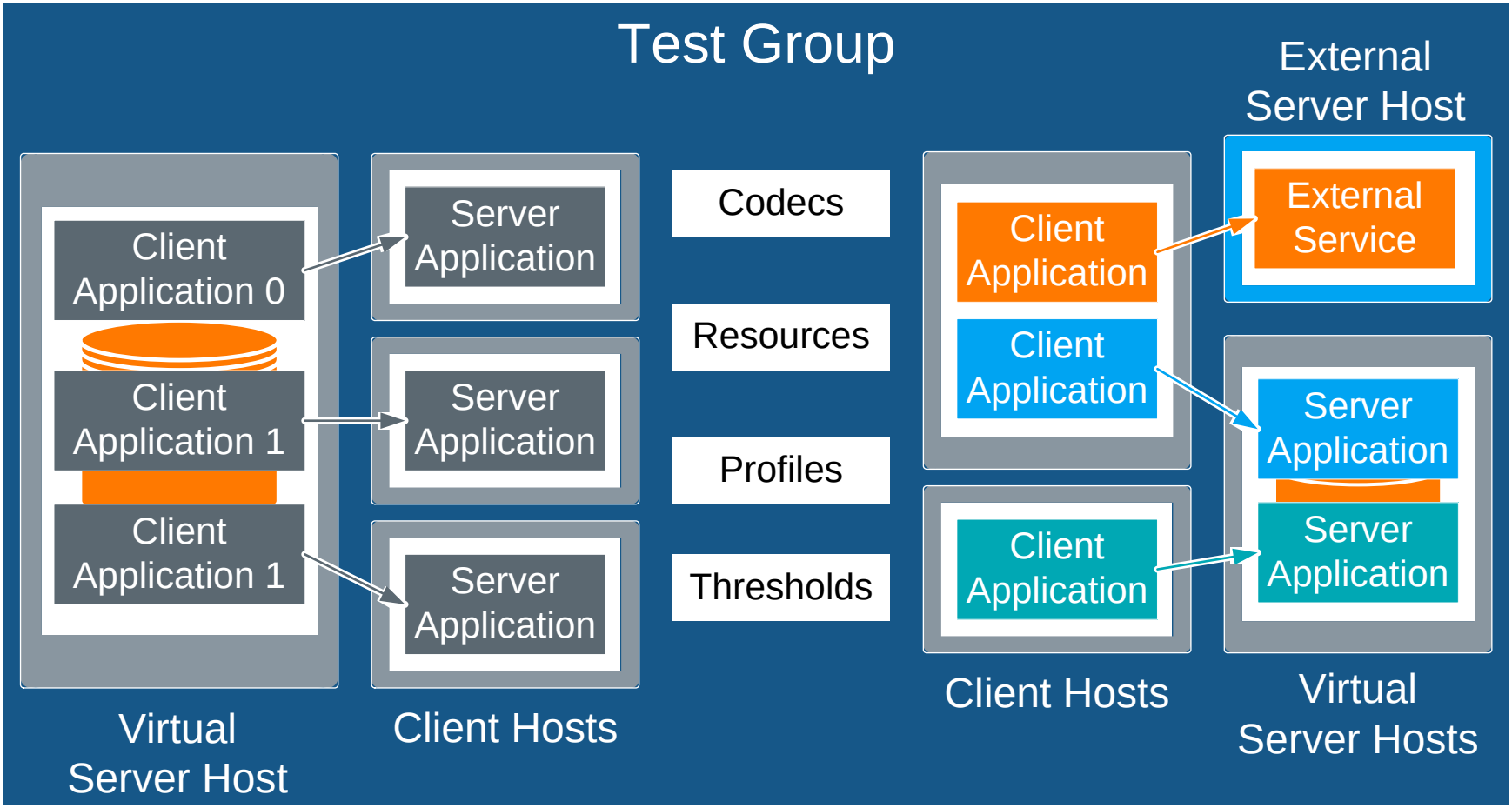
Hosts

Conceptual

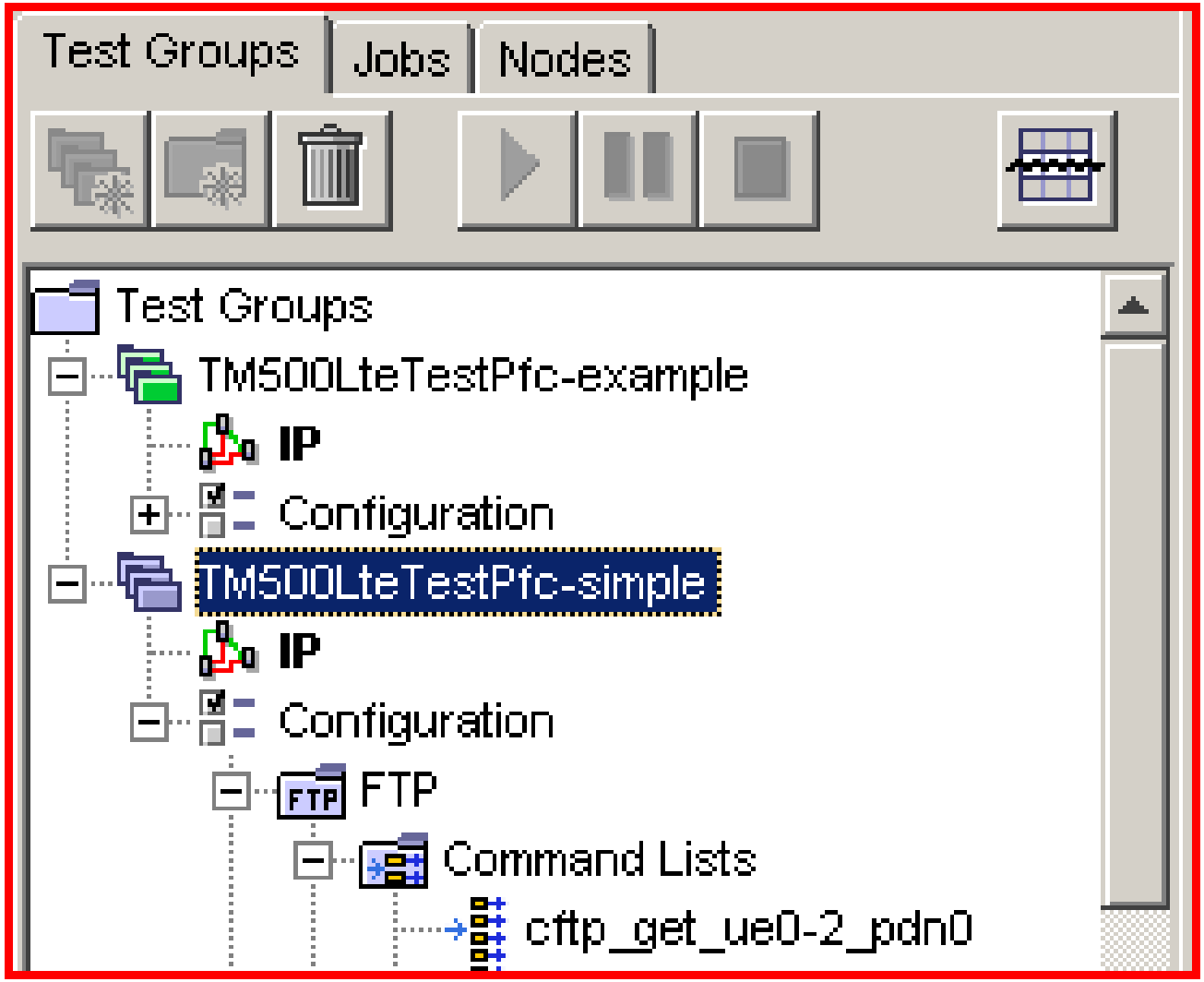


Applications

Conceptual



Test Groups


Test Groups
Jobs
Nodes
Test Groups
TM500LteTestPfc-example
IP
Configuration
TM500LteTestPfc-simple
IP
Configuration
FTP
Command Lists
cftp_get_ue0-2_pdn0

Hosts

diversifEye GUI

Applications | Hosts | Statistic Groups | Thresholds

Name	Inte...	IP Assignm...	IP Address	G/W Host	G/W IP Addre...	Type
ExtFTPServer		Static	10.119.4.37			External Host
Gateway		Static	10.203.6.254			External Host
Host_10.203.6.129	10/1	Static	10.203.6.129/16	Gateway	10.203.6.254	Virtual Host
Host_10.203.6.130	10/1	Static	10.203.6.130/16	Gateway	10.203.6.254	Virtual Host
IntPingServer	10/1	Static	10.203.6.129/16	Gateway	10.203.6.254	Virtual Host
pppoe_0000_0	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host
pppoe_0000_1	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host
pppoe_0001_0	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host
pppoe_0001_1	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host
pppoe_0002_0	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host
pppoe_0002_1	10/0	PPPoE/IPv4CP	0.0.0.0			Virtual Host

Applications

diversifEye GUI

Applications | Hosts | Statistic Groups | Thresholds

Name	...	Type	Host	Association	Host IP
ExtFTPServer_ftp		External FTP Ser...	ExtFTPServer		10.119.4.37
IntFTPServer_ftp		FTP Server	Host_10.203.6.129		10.203.6.129/16
IntHTTPServer_http		HTTP Server	Host_10.203.6.130		10.203.6.130/16
sping_IntPingServer_0000_0		Ping Application	IntPingServer		10.203.6.129/16
sping_IntPingServer_0000_1		Ping Application	IntPingServer		10.203.6.129/16
sping_IntPingServer_0002_0		Ping Application	IntPingServer		10.203.6.129/16
sping_IntPingServer_0002_1		Ping Application	IntPingServer		10.203.6.129/16
sping_IntPingServer_0001_0		Ping Application	IntPingServer		10.203.6.129/16
sping_IntPingServer_0001_1		Ping Application	IntPingServer		10.203.6.129/16
cping_0000_0		Ping Application	pppoe_0000_0		0.0.0.0
cping_Ip0_0000_0		Ping Application	pppoe_0000_0		0.0.0.0
bgping_0000_0		Ping Application	pppoe_0000_0		0.0.0.0
cftp_get_Ip0_0000_0		FTP Client	pppoe_0000_0	ExtFTPServer_ftp	0.0.0.0
cftp_get_0000_0		FTP Client	pppoe_0000_0	IntFTPServer_ftp	0.0.0.0
chttp_0000_1		HTTP Client	pppoe_0000_1	IntHTTPServer_http	0.0.0.0

Connected – Seamless – Wireless