LTE TotaleNodeB Common Platform

User Guide

1222464 1.0

Contents

1. Preface

1.1 Objective

This document provides a usage description of the LTE TotaleNodeB common platform components designed by Radisys. This document describes the procedure to setup, configure, and demonstrate a single call using common platform components.

1.2 Audience

The target audiences for this document are:

- Developers involved in TotaleNodeB solution
- System Validation of TotaleNodeB solution
- System Engineers of TotaleNodeB solution
- Architects of the TotaleNodeB solution

1.3 Document Organization

This document contains the following sections:

Section	Description
1. Preface	Provides the objective and release details.
2. Introduction	Provides an overview of the product, including the product description and features.
3. Functional Architecture of Platform Components	Describes the Platform Component Architecture.
4. Software Requirements	Describes software required for platform components.
5. Functionality Support	Describes the features supported.
6. Open Source Components Used	Describes the OSS component used in the OAM.
7. Steps to Download and Compile the Open Source Items	Describes the steps to download and compile the OSS items.
8. Building of TeNB with Common Platform Components	Describes the building of common platform components.
9. Execution of Common Platform Components	Describes the execution of common platform components.
10. CLI usage and Commands	Describes the usage of CLI.
11. Building Common Platform Components Separately	Describes how to build common platform components individually.
12. References	Lists the reference documents.

1.4 Release History

The following table lists the history of changes in successive revisions to this document.

Version	Date	Author (s)	Description
1.0	January 22, 2013	Rajaram	Conforms to TotaleNodeB release, version 1.0

2. Introduction

2.1 Product Description

The LTE TotaleNodeB common platform components support the following features:

HeMS

- Support for HeMS discovery, HeNB initialization and registration.

Configuration Management

- As part of configuration management, TotaleNodeB supports the Broadband Forum defined standard interfaces TR-069 between HeMS and HeNB.
- Support for TR 196, TR 98, TR 157, TR 181, and TR 262 data models.
- Support for dynamic updating of parameters.

Performance Management

- Supports various Key Performance Indicators / counters and configurations related to collection intervals, collection periods (TR 262), and so on.
- Support for collection and storing of performance counters.
- Support for reporting of performance counters.
- Support for checking the counters through CLI.

Log Management

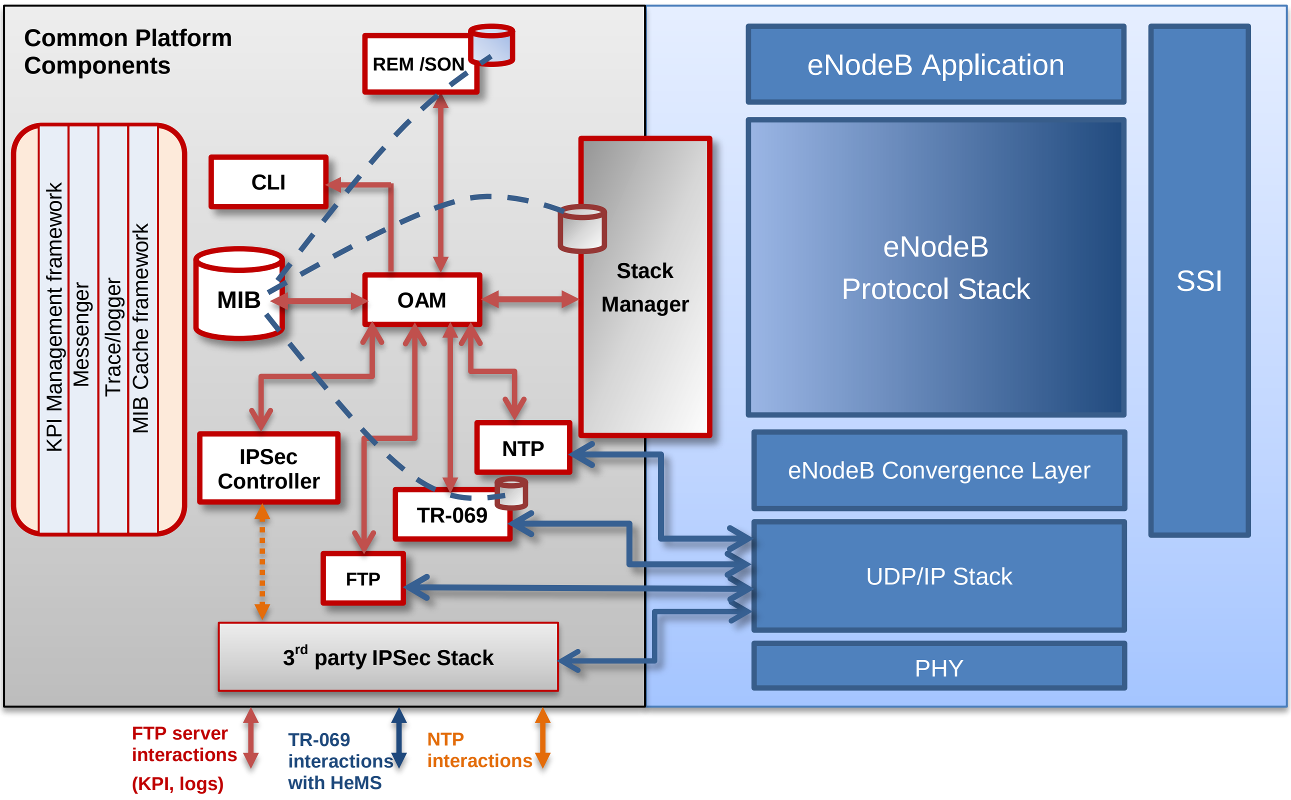
- Support for logging/trace feature that writes trace information to local files and console.

2.2 Definitions and Acronyms

Acronym	Description
HeMS	Home eNodeB Management System
OAM	Operations, Administration and Maintenance
PM	Performance Management
CLI	Command line interface
RAN	Radio Access Network
REM	Radio Environment Map
RRM	Radio Resource Management
SSI	System Services Interface
IPsec	IP Security
SON	Self-Organizing Networks
MIB	Management Information Base
NTP	Network Time Protocol
FTP	File Transfer Protocol
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
UDP	User Datagram Protocol
PHY	Physical Layer
FSM	Finite State Machine
NAS	Non-Access-Stratum
KPI	Key Performance Indicators
HeNB	Home eNodeB
CM	Configuration Management
FM	Fault Management

3. Functional Architecture of Platform Components

The following diagram describes the functional architecture of the common platform components.



Common Platform components comprises of:

- Common Framework and Infrastructure components
- OAM FSM and control module
- TR-069 client module
- Command line interface module
- IPSec controller module
- NTP client
- Management Information Base module (Data Model repository)
- REM controller and SON module.

Note: The greyed items are not part of this release.

For details, see Common Platform Software Architecture document.

4. Software Requirements

The common platform components are compiled on 32-bit machines.

For building the platform components, the following development tools must be installed:

- sun-java6 (-bin, -jre and -jdk)
- gcc, g++, gdb, binutils, cpp
- libcppunit (-1.x, -dev and -doc)
- libncurses5-dev
- php5-cli (required for fsmc)
- xsltproc (required for applying xslt stylesheets to xml docs)
- subversion

5. Functionality Support

This section describes the different functions supported.

Feature	Support	Remarks
Static Configuration	Yes	Parameters mentioned in the Radisys_Data_model.pdf are supported (green colored items in the embedded document).
Parameter Validation	Yes	Parameters mentioned in the Radisys_Data_model.pdf are supported (green colored items in the embedded document).
First time bootup (BOOTSTRAP) procedure	Partial	Factory Reset is not supported.
BOOT Procedure	Partial	Rebooting procedure of OAM and UARM are supported. For LARM rebooting MSPD support required.
Dynamic Updating	No	Planned in Phase-2.
Active/Passive Notification	Yes	--
Command line interface (CLI)	Yes	Parameters mentioned in the Radisys_Data_model.pdf are supported (green colored items in the embedded document).
Performance Counters	Partial	Checking through CLI is present. File uploading mechanism is planned in Phase-2. For supported counters list, see the RadisysKPI_Supported.xlsx embedded document.

Radisys_Data_Model.pdf

RadisysKPI_Supported.xlsx

6. Open Source Components Used

This section describes the different open source components used.

Reference Item	Reference Source	Objective of Usage	License	Comments
Boost C++	http://www.boost.org	Used by various components like OAM	http://www.boost.org/users/license.html	
libCSOAP/nano HTTP	http://csoap.sourceforge.net	Used by TR069/TR196 modules	GNU LGPLv2	
libXML	http://xmlsoft.org/	Used by TR069/TR196 modules	MIT	
OpenSSL	http://www.openssl.org	Used as a crypto library plugin for strongswan (IPsec client)	OpenSSL and original SSLeay	This is not part of the current delivery.
libgmp	*http://gmplib.org*	Required by strongswan during compilation of strongswan related binaries	GNU LGPLv2	This is not part of the current delivery.
strongswan	www.**strongswan**.org	Version used is strongswan-4.3.4 TotaleNodeB components tenpin and ike-tunnel-ind use strongswan to establish the IPsec tunnel	GNU LGPLv2	This is not part of the current delivery.

7. Steps to Download and Compile the Open Source Component

The steps to download and compilation of open source components are given in this section.

Please follow the instructions in this section, if the open source code is not provided or if the open source component is provided as a separate tar ball with a few exceptions as explained in detail below.

In the following sections, "TotaleNodeB" is the current directory where the source code is extracted.

If the third party source code is delivered, then,

1. cp <*TotaleNodeB*>-thirdparty.tar.gz <*TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
2. *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
3. *tar –zxvf <TotaleNodeB>*-thirdparty.tar.gz
4. Go directly to Section 7.3

7.1. Pre-conditions

1. It is always advised to have the latest (compatible) autoconf version. However, this is not mandatory.
2. If errors occur during libxml2-2.7.2 compilation **(Section 7.3)**, then steps mentioned in **Section 7.2** must be executed, followed by steps mentioned in **Section 7.3.**
3. Set the arm-compiler path in PATH environment variable:
   For example: export PATH=$PATH:/root/arm/bin

7.2. Autoconf Compilation

1. Open the download link: http://ftp.gnu.org/gnu/autoconf/
2. Download version: latest autoconf-latest.tar.gz
3. Execute the following command to copy the tar file to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty* directory
   - ➔ cp –rf autoconf-latest.tar *<TotaleNodeB> /tenb_commonplatform/software/thirdparty/*
   - ➔ cd *<TotaleNodeB> /tenb_commonplatform/software/thirdparty/*

4. Extract the contents by executing the command mentioned as follows:
   - ➔ *tar –xvf autoconf-latest.tar*

5. Copy the script from *<TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_autoconf/configscript_autoconf* to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/autoconf-latest/* by executing the following command:
   - ➔ cp –rf *<TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_autoconf/configscript_autoconf TotaleNodeB/tenb_commonplatform/software/thirdparty/autoconf-latest/*

6. Go to autoconf-latest directory
   - ➔ cd *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/autoconf-latest/*

7. Execute the script with the following command:
   - ➔ *dos2unix configscript_autoconf*
   - ➔ *./configscript_autoconf*

7.3. libxml2-2.7.2

1. If the <TotaleNodeB>-thirdparty.tar.gz source code is delivered, then go to step 6 directly else go to step 2
2. Open the download link: ftp://xmlsoft.org/libxml2/
3. Download version: libxml2-2.7.2.tar.gz
4. Copy the tar file to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty*
   - ➔ *cp –rf libxml2-2.7.2.tar <TotaleNodeB>/tenb_commonplatform/software/thirdparty*
   - ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
5. Extract the contents by executing the following command:
   - ➔ *tar –xvf libxml2-2.7.2.tar*
6. Copy the script from *<TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_libxml2/configscript_libxml2* to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/libxml2-2.7.2/*
   - ➔ *cp –rf <TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_libxml2/configscript_libxml2 <TotaleNodeB>/tenb_commonplatform/software/thirdparty/libxml2-2.7.2/*
7. Go to the libxml2-2.7.2/ directory
   - ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/libxml2-2.7.2/*
   - ➔ *find –exec dos2unix {} \;*
8. Execute the script:
   - ➔ *./configscript_libxml2*

7.4. libsoap

1. If the <TotaleNodeB>-thirdparty.tar.gz source code is delivered, then go to step 9 directly else go to step 2
2. Open the download link: http://csoap.sourceforge.net/
3. Download version: libsoap-1.1.0.tar.gz
4. Copy libsoap-1.1.0.tar.gz to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
   - ➔ *cp –rf libsoap-1.1.0.tar.gz <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
5. Extract the contents by executing the following command:
   - ➔ *tar –xvf libsoap-1.1.0.tar.gz*
6. Create a “csoap” directory
   - ➔ *mkdir <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*
   - ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*

7. Copy the contents of libsoap-1.1.0 to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*

   ➔ *cp –rf libsoap-1.1.0/* <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*

8. Remove ONLY the following 3 lines of code at the end of the following file: *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/nanohttp/**nanohttp-logging.h***

```
#ifdef __cplusplus

}

#endif
```

9. Copy the scripts from

   *<TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_csoap/**

   to

   <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/

   ➔ *cp –rf <TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_csoap/* <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*

   ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/csoap/*

   ➔ *find -exec dos2unix {} \;*

10. Execute the scripts with the following command:

    ➔ *./configscript_csoap_1*
    ➔ *./configscript_csoap_2*

11. Edit the generated config.h file:

    ➔ change the HAVE_MALLOC define from 0 to 1 on line#39
    ➔ comment out the malloc define on line#202

12. Execute the script:

    ➔ ./configscript_csoap_build
    ➔ ./configscript_csoap_3

13. Again edit the generated config.h file:

    ➔ change the HAVE_MALLOC define from 0 to 1 on line#39
    ➔ comment out the malloc define on line#202

14. Again execute the script:

    ➔ *./configscript_csoap_build*

7.5. Boost C++ source

1. If the <TotaleNodeB>-thirdparty.tar.gz source code is delivered, then go to step 7 directly else go to step 2
2. Open the download link: http://sourceforge.net/projects/boost/files/boost/1.52.0/boost_1_52_0.tar.gz/download
3. Download version: boost_1_52_0.tar.gz
4. Copy the tar file to *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
   - ➔ *cp –rf boost_1_52_0.tar.gz <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
   - ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*
5. Extract the contents, by executing the following command:
   - ➔ *tar –xvf boost_1_52_0.tar.gz*
6. Create a boost directory in *<TotaleNodeB>/tenb_commonplatform/software/libs/common/include/*
   - ➔ *mkdir <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost*

   Copy the contents of *boost_1_52_0/boost/* to *<TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*

   cp –rf boost_1_52_0/boost/ <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*

   SKIP steps 7 and 8
7. Create a boost directory in *<TotaleNodeB>/tenb_commonplatform/software/libs/common/include/* *mkdir <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*
8. *Copy the **CONTENTS** of <TotaleNodeB>/tenb_commonplatform/software/thirdparty/boost/ to <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*
   - ➔ *cp –rf <TotaleNodeB>/tenb_commonplatform/software/thirdparty/boost/* <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*
   - ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/libs/common/include/boost/*
   - ➔ *find -exec dos2unix {} \;*

7.6. Openssl

1. If the <TotaleNodeB>-thirdparty.tar.gz source code is delivered, then SKIP this section else go to step 2

2. Create a directory by name “origopenssl”
   mkdir <TotaleNodeB>/tenb_commonplatform/software/thirdparty/origopenssl

3. Open the download link:
   http://www.openssl.org/source/openssl-0.9.8r.tar.gz

4. Download version: openssl-0.9.8r.tar.gz

5. Copy the tar file to, *<TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl

- ➔ *cp –rf openssl-0.9.8r.tar.gz <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl
- ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl

6. Extract the contents by executing the following command:

- ➔ *tar –xvf openssl-0.9.8r.tar.gz*

Note: The contents do not get extracted on a mounted device like VmWare, as softlinks are not created. Hence, use a proper Linux machine.

- ➔ **mv** *openssl-0.9.8r/* ../*
- ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl

7. Copy the script from *<TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_openssl/ configscript_openssl* to *TotaleNodeB/tenb_commonplatform/software/thirdparty/*origopenssl by executing the following command:

- ➔ *cp –rf <TotaleNodeB>/tenb_commonplatform/scripts/compilation_scripts/configs_openssl/configscript_openssl <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl/
- ➔ *cd <TotaleNodeB>/tenb_commonplatform/software/thirdparty/*origopenssl/

8. Execute the script by executing the following command:

- ➔ *./configscript_openssl*

Note: Nano http libraries which are built as part of libsoap compilation procedures do not support cookie based authentication.

8. Building of TeNB with Common Platform Components

This section describes the compilation, build and execution of common platform components.

8.1. Build Options in Linux

- Use Linux server which supports the software requirements mentioned in Section 4 for compilation.
- Go to ***enbapp/build*** folder and execute one of the below commands based on the requirement.

Compilation Command	Description
make lnxe2e	Linux compilation
make lnxe2e_oam	Linux compilation with OAM feature enabled
make lnxclean	Clean LNX object files

8.2. Build Options in Mindspeed

- Go to ***enbapp/build*** folder and execute one of the following commands based on the requirement.

Compilation Command	Description
make mse2e	ARM (MSPD) compilation
make mse2e_oam	ARM (MSPD) compilation with OAM feature enabled
make msclean	Clean MSPD object files

- After compilation, go to enbapp/build directory and execute the *TeNBCP_build* script.

  Usage:

  ```
  ./TeNBCP_build mspd
  ```

  The above command creates the following directory structures:

  rsys/bin

  rsys/config

  rsys/lib

  rsys/nmmscripts

  rsys/setup

- Please tar the binaries before taking into any server/setup.

9. Execution of Common Platform Components

9.1. Execution of Common Platform Components

The steps mentioned below describe the steps to be followed for executing common platform components.

1) Customize the TeNBCP_env script to suit the setup, which is available under "rsys/setup" path

2) Set the date and time in board (date -s "2 OCT 2012 18:00:00")

3) Execute the script **"setup_TeNB"**
   Note*:* Use ". setup_TeNB" and DO NOT use ./ or sh as the env path is not set otherwise. This is ONE time only.

4) Since the environment files are shell specific, to execute the binaries in a different shell, execute the TeNBCP_env file in that shell also. Verify the environment variables set via TeNBCP_env file.

5) Run ". start_TeNB" script present in rsys/setup directory.
   Note: Please check whether customization is required for start_TeNB script.

6) Run ./cli to change the values required for configuration in another shell after executing TeNBCP_env

9.2. OAM Libraries Cleanup

Go to the following directory – enbapp/build

Execute the respective clean command for Linux or ARM.

Linux: *make lnxclean_oam*

ARM: *make msclean_oam*

10. CLI Usage and Commands

This section describes the CLI usage. CLI is used for the following purposes:

1. Setting the LTE parameters

   Command: *oam.set <param_name> <value>* - Set the parameter

2. Getting the LTE parameters

   Command: *oam.getwild <Parameter Name>*

   For example, to get the current admin state the command must be as given as follows:

   oam.getwild LTE_FAP_ADMIN_STATE

   To get all the parameters following command is used:

   *oam.getwild LTE_**

3. Retrieving the Performance Counter

   Command: *oam.pollkpis interval*

   Counters are redirected to OAM-sm trace file, which is put into /opt/trace/*

4. Retrieving PM files

   Command: *tr69.gen.pm.file <filename>*

   File is generated in the place where CLI is running.

The list of LTE parameters supported is embedded here.

LTE_Parameters.xlsx

Following mandatory list of parameters to be set via CLI:

1. MANAGEMENT_SERVER
2. FEMTO_GATEWAY_IP_ADDRESS_1ST
3. FEMTO_GATEWAY_SERVER_1
4. IKE_IPSEC_ENABLE
5. LTE_PLMNID_1 (primary PLMN id)
6. LTE_PRIMARY_PLMN_1
7. LTE_SIGLINK_SERVER_LIST (MME IP)

10.1. MME IP Updating from CLI

This section describes the configuration of MME IP from CLI.

For Single MME:

```
oam.set LTE_SIGLINK_SERVER_LIST "172.27.4.216"
```

For Multiple MMEs:

```
oam.set LTE_S1CON_MODE All
oam.set LTE_SIGLINK_SERVER_LIST "172.27.4.216","172.27.4.219","172.27.4.220”
```

10.2. DRX Feature Settings from CLI

This section describes the mapping of the values to be set from CLI for the DRX feature.

For example:

If LongDrxCycleGbr value to be given is 1, then as per TR-196, the value to be given from CLI is 20.

The mapping is as below:-

<range minInclusive="10" maxInclusive="10" />	enum value = 0
<range minInclusive="20" maxInclusive="20" />	enum value = 1
<range minInclusive="32" maxInclusive="32" />	enum value = 2
<range minInclusive="40" maxInclusive="40" />	enum value = 3
<range minInclusive="64" maxInclusive="64" />	enum value = 4
<range minInclusive="80" maxInclusive="80" />	enum value = 5
<range minInclusive="128" maxInclusive="128" />	enum value = 6
<range minInclusive="160" maxInclusive="160" />	enum value = 7
<range minInclusive="256" maxInclusive="256" />	enum value = 8
<range minInclusive="320" maxInclusive="320" />	enum value = 9
<range minInclusive="512" maxInclusive="512" />	enum value = 10
<range minInclusive="640" maxInclusive="640" />	enum value = 11
<range minInclusive="1024" maxInclusive="1024" />	enum value = 12
<range minInclusive="1280" maxInclusive="1280" />	enum value = 13
<range minInclusive="2048" maxInclusive="2048" />	enum value = 14
<range minInclusive="2560" maxInclusive="2560" />	enum value = 15

Default value of LongDrxCycleGbr is 1 (which is 20 when viewed from CLI)

Default value of LongDrxCycleNonGbr is 3 (which is 40 when viewed from CLI)

11. Building Common Platform Components Separately

To build platform code on Linux, the software mentioned in Section 4 must be installed.

The compilation is done only on 32-bit for now.

To clean the directories:

make clean PRODUCT=generic HARDWARE=generic BUILD=i686-linux

To build individual components:

make PRODUCT=generic HARDWARE=generic BUILD=i686-linux

To build all the components:

cd Master_MSPD_LIB/tenb_commonplatform/software/products/fap/hbs2/hbs2-iu/

make distro PRODUCT=generic HARDWARE=generic BUILD=i686-linux

After building the libraries and binaries, all these are fetched at one shot with the script **"TeNBCP_linux_load/TeNBCP_arm_load"** which is found in the

Master_MSPD_LIB/tenb_commonplatform/scripts/ directory.

After placing the config files, libraries and binaries in a common path, execute the "setup_TeNB" script once.

Note: Convert all the config files and scripts using dos2unix command.
setup_TeNB script MUST be executed only once in a lifetime (until the test machine or the laptop on which it is executing is changed).

For arm compilation, use the following command instead of the Linux command:
make PRODUCT=hbs2-iu HARDWARE=hbs2-4 BUILD=arm-none-linux-gnueabi

12. Appendix

12.1 ACSLite Setup

ACSLite is used as a HeMs simulator for end-to-end testing. The steps mentioned below describe the steps to be followed for ACSLite setup.

1. Through “vncviewer” login to 172.27.4.244:6

   Give the password as, *lte@sqa1*

   Note: Also *“:7” (password:lte@sqa2) and “:8” (password: lte@sqa3) can be used.*

2. Once logged in, from an internet browser connect to the following mentioned URL:

   http://172.27.4.244/management

3. Use the following user name and password to log in:

   User Name: *lte.sqa1*

   Password: *lte@sqa1*

   Note 1: Also *“lte.sqa2”* is used as the user name and password as “*lte@sqa2”*.

   Note 2: The 172.27.4.244 IP must be pingable from the eNodeB (add required routes at eNodeB as well as ACSLite).

4. In “Managed Devices” tab at ACSLite,
   - The following username and password is supported and must be used.

     Username: *cpe*

     Password: *cpe*
   - Under *“HTTP Authentication Method*”, select only *“BASIC”.*
   - The *“HTTPS Authentication Method”,* must be left as *“DEFAULT”.*

5. Refer to the ACSLite usage documents embedded here for details.

ACSLite Users Guide
v2.0.0.doc

Note: ACSLite is used as a simulator for HeMS, by Radisys internally.

13. References

Refer to the following documents for more information.

1. Radisys_LTE_Common_Platform_SwArch, Software Architecture of Common Platform in TeNB, 11th September 2012.
2. LTE_TotaleNodeB_Solution_User_Guide_05_10.

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