

SMALL CELL PROTOCOL STACK GUIDE

LOG VIEWER TOOL



Revision History

Revision	Date	Change Description
Rev 1.0.0	11/12/15	Initial release
Rev 1.0.1	12/09/15	Add log server start/stop
Rev 1.0.2	05/09/16	Add log analyzer, update to 1.4.2

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Section 1: Introduction

Purpose and Scope

This document describes the log viewer tool for the T&W's LTE small cell protocol stack software. The guide is intended to be used by customers who wish to evaluate T&W's LTE small cell protocol stack software and/or to develop around it.

This document discusses all the components that make up the log viewer tool.



Note: the document is based the current version of the tool, in case of any contradiction between this document and the log viewer tool you have received from T&W, please contact T&W for the latest guide document.



Note: The log viewer tool is developed for the LTE protocol stack software, so for the customers who wish to evaluate and/or use T&W LTE L1 software and hardware only, please use another tool named ePerview. And because the log file format is same, so the Tool can open the log file captured by the ePerview as well as vice versa.

Glossary of Terms

Table 1: Glossary of Terms

Term	Description
LTE	Long Term Evolution
PM	performance management module of protocol stack
KPI	Key Performance Indicator
PS	Protocol Stack
ePerview	Debug tool for BRCM LTE L1 software and hardware
NAS	Non Access Stratum
S1	Interface between Femto cell and MME
X2	Interface between Femto cells
RRC	Radio Resource Control
RLC	Radio Link Control
MAC	Medium Access Control
PDCP	Packet Data Convergence Control
Wireshark	free software to capture/analyze packet, it is used to decode the S1/X2/NAS/RRC message

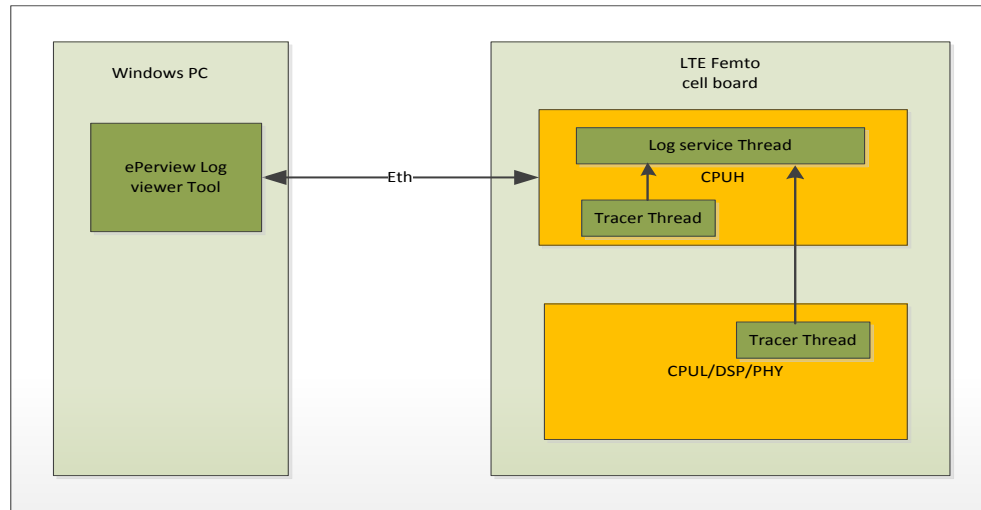
System overview

The log viewer tool application enables debugging, monitoring and validating the T&W LTE Femtocell Protocol stack and L1/DSP/PHY software/hardware. The application is referred to throughout the document as Tool.

The Tool runs on a Windows PC, is connected to the LTE Femto Cell board using an Ethernet connection. The Tool communicates to the log service thread which runs on the CPUH core within the BCM617xx Device.

The Tracer thread runs within CPUH and Tracer thread runs within CPUL collect the log and send the log to the log service thread, the log service thread then sends the log to the Tcp server within the Tool using TCP socket.

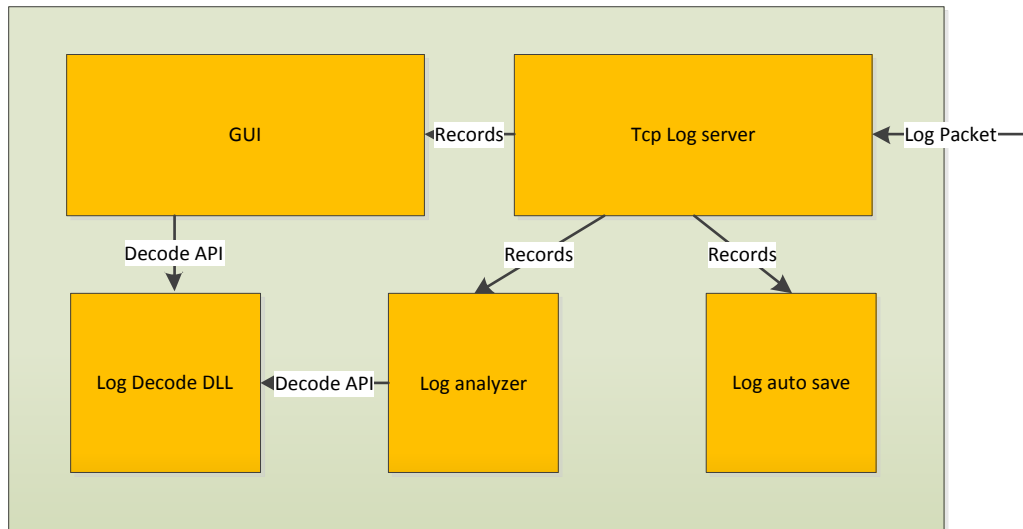
Figure 1: System arch of log viewer tool



The Tool application consists of five main modules:

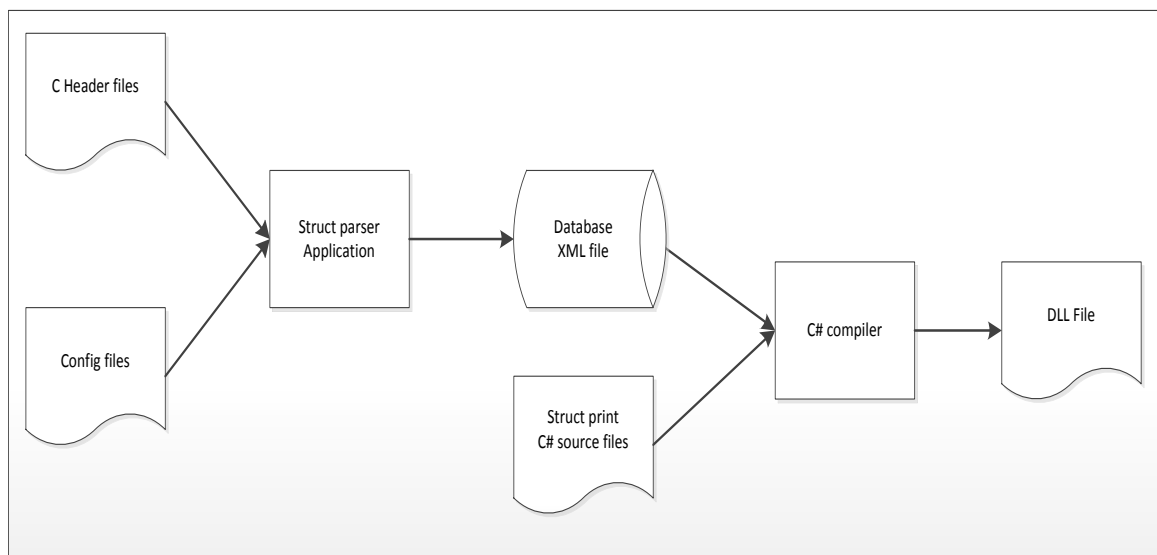
1. GUI module which displays all the user interface elements, such as Menu bar, tool bar, tracer windows and status bar
2. Log server module which listens the TCP port for CPUL tracer connection and CPUH tracer connection. And the module manages multi TCP connections from different boards.
3. Log auto save module which saves the log received from log server to local hard disk or FTP server
4. Log analyzer module which analyze the received log records and generate report according to the pre-defined configuration
5. log decode DLL records all the information of message structure of PS/L1 and it provides the message decode APIs to log view tool

Figure 2: Soft overview of the Tool



The log DLL is generated by the Struct parser application developed with C#. The parser application uses the C header files and Config files as inputs and outputs a XML file which contains the structure information of all the messages. Finally the XML file and the C# API source files are compiled into a single DLL file.

Figure 3: overview of Log DLL



Section 2: Getting started

Installation of Tool

No installer for the Tool, so just copy the release folder to the Windows PC, and run the ePerviewLogViewer.exe file under the release folder.

Multi versions can be run on one PC, no need to uninstall the old version.

Installation of wireshark

To decode the S1/X2/RRC/NAS message, please make sure Wireshark is installed on the PC. If no Wireshark installed, please download latest version from www.wireshark.org and install it on the PC.

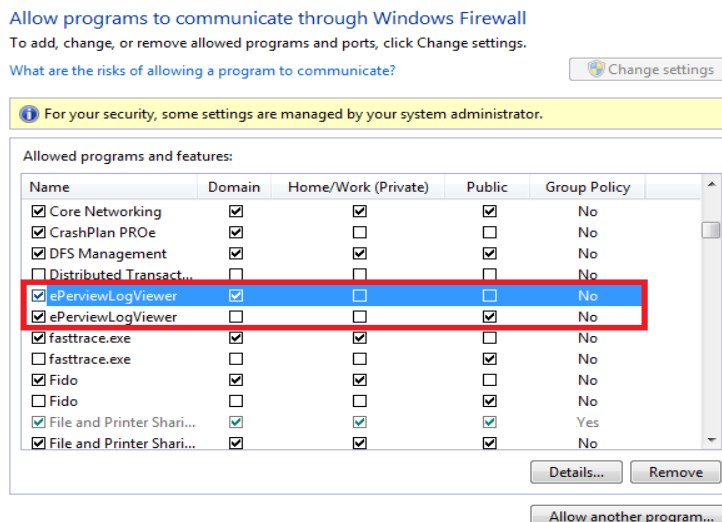
Installation of Microsoft .NET Framework

The Tool needs the Microsoft .NET Framework 4.5 or later version. Please download from the Microsoft website and install it.

Firewall setting

The tool listens the TCP ports 7777/1111/5555 for CPUH, CPUL and Log analyzer. So make sure that the Tool is allowed to communicate through Windows Firewall.

Figure 4: firewall setting



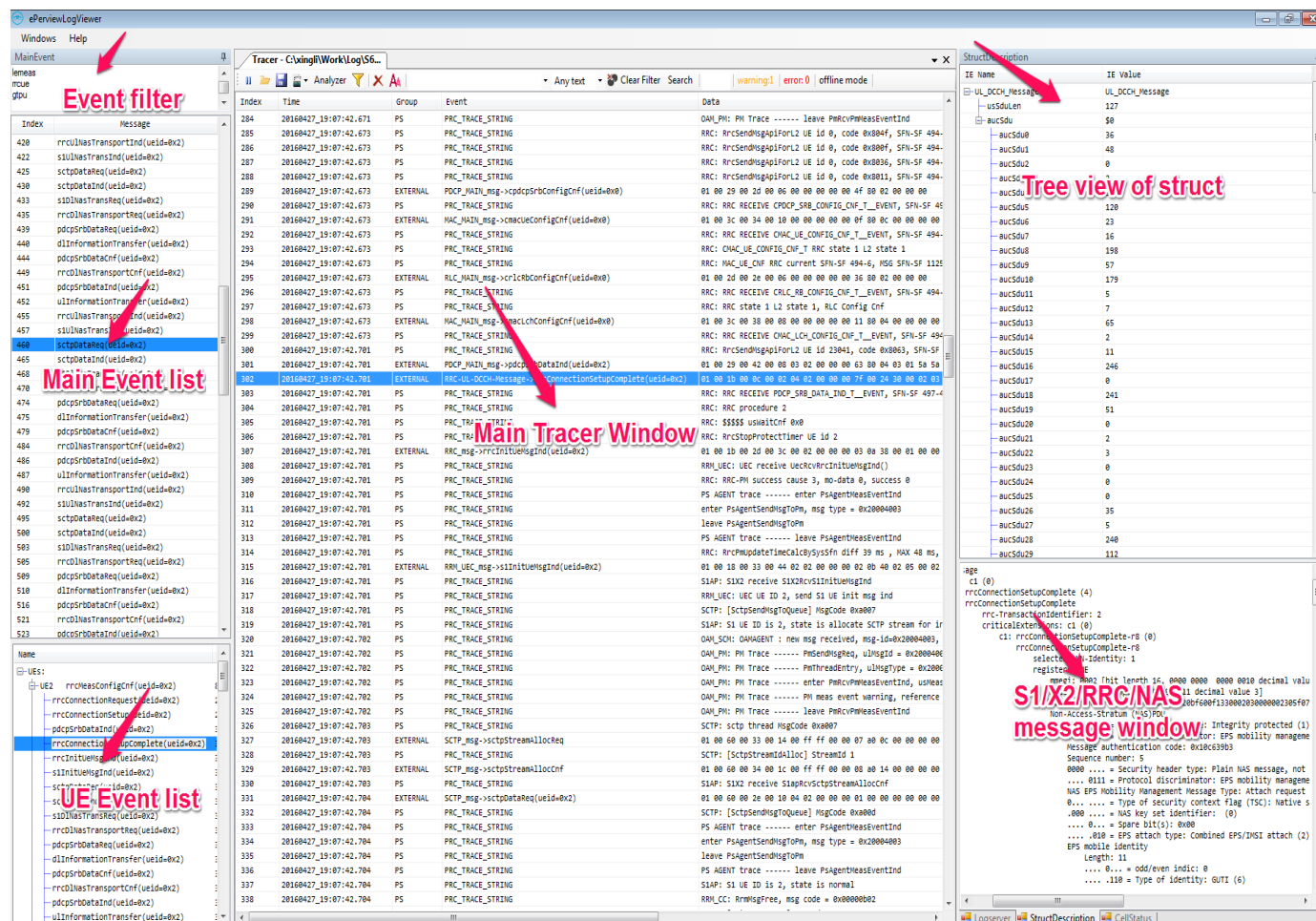
Section 3: Main User interface

The Tool supports multi online and/or offline trace sessions. Online log session is created by the log server automatically. To open a new offline trace session, please click “Windows”->”New Trace windows” menu item.

Each trace session has an independent user interface. Following Figure shows the general log/tracer user interface structure which consists of three areas:

- Main Tracer windows to show the event name along with its index, the time stamp, the SFN counter and the data of the trace string and structured messages
- Main Event windows to show the index and event name of the main events
- Structure Description Window to show the detailed info of the selected message

Figure 5: Main User interface





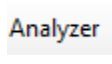




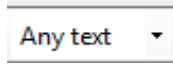
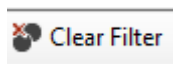


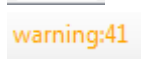
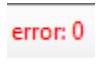
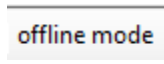


Main Tracer Window

This window is to display all the records included in the Trace/log files.

Toolbar

The tool bar of main tracer windows contains the following buttons:

	Pause or resume online display, for online mode only
	Open one or multi Trace files
	Save trace records to a file
	Open file from recent file list
	Start offline Log analyzer
	Offline filter button
	Clear all records
	Font setting
	Filter select/input box
	Filter option selection list
	Clear Filter
	Search button
	Go to line number box
	Warning numbers in the traces
	Error numbers in the traces
	Offline/online mode status

File open

There are three ways to open one or multi Trace files.

1. Click the File open icon then select one or multi files
2. Drop one or multi files to the Trace window
3. Click the Recent file list icon then select one

The records of opened files will be appended to the end of the current record list.

Records Clear

To clear the current all records, clicking the Clear all button. It clear the displayed records only, the opened files are not cleared.

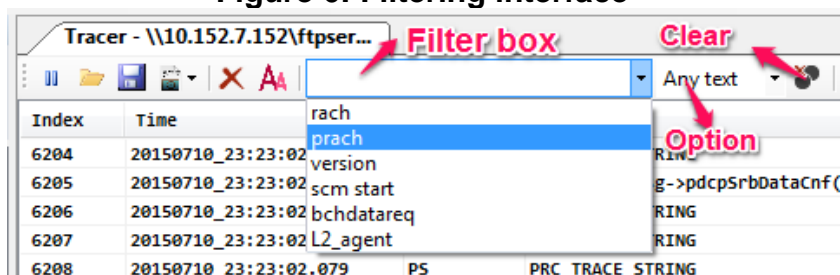
File Save

To save the records of current tracer window, clicking the File save button and select the file name from the File Save Dialog.

Filtering

The filtering tool supports to display the messages match the search text.

Figure 6: Filtering interface



The Clear button is to clear the filtering operation.

The Filter input box can record max 24 history records.

Hotkey: Enter key

Three Filter options:

- Any Text: no any restriction
- Prefix: to search the string start from search text
- Regex: to search with Regex expression

Regex expression is very powerful for the string search. Its detailed guide is out of the scope of this document. Please find the reference of C# Regex expression from the following Microsoft URL:

<https://msdn.microsoft.com/en-us/library/az24scfc.aspx>

Following are the simple examples:

`(req|cnf)$` find the messages end with "Req" or "Cnf"

`(req|cnf)` find the messages contain "Req" or "Cnf"

Tracer - \\10.152.7.152\ftpser...	
(Req/Cnf/\$)	
Regex	Clear Filter Search
warning:41 error:0 offline mode	
Event	Data
55:41.042 RRM_CC_msg->enbRemStartCnf	01 00 17 00 35 00 06 00 ff ff 00 00 31 0d 02 00 50 7a
55:41.055 RRM_CC_msg->enbEutranRenReq	01 00 17 00 40 00 80 25 ff ff 00 00 44 0d 7c 25 00 00 00 00 00 00 00 00 00 00 00 00
55:41.055 REM_msg->xemCphySnifferControlReq	01 00 5e 00 28 00 08 00 ff ff 00 00 05 90 04 00 03 00 ff ff
55:41.055 PRC_TRACE_STRING	RRM_CC: RemSend_CPhysnifferControlReq
55:41.082 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStartReq
55:41.276 PRC_TRACE_STRING	OAM_TR069: <TR69C> readMessageFromSmd(1027) got session start cnf
55:41.523 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStopReq
55:46.342 REM_msg->xemCphylteSnifferCellSearchReq	01 00 5e 00 2e 00 70 00 ff ff 00 00 17 90 6c 00 00 00 d6 06 01 00 00 00 00 00 00 00
55:46.342 PRC_TRACE_STRING	RRM_CC: RemSend_CPhyLteSnifferCellSearchReq
55:49.142 REM_msg->xemCphyLteSnifferReadSib1Req	01 00 5e 00 30 00 0a 00 ff ff 00 00 1b 90 06 00 d6 06 b6 00 14 00
55:49.142 PRC_TRACE_STRING	RRM_CC: RemSend_CPhyLteSnifferReadSib1Req
55:51.944 RRM_CC_msg->enbEutranRenCnf	01 00 17 00 41 00 0c 19 ff ff 00 00 45 0d 08 19 00 00 00 00 00 00 00 00 03 00 d6 06 00
55:51.992 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStartReq
55:52.191 PRC_TRACE_STRING	OAM_TR069: <TR69C> readMessageFromSmd(1027) got session start cnf
55:52.396 PRC_TRACE_STRING	S1AP: S1X2 receive S1X2RcvS1SetupReq
55:52.396 S1AP_msg->s1SetupReq	01 00 15 00 28 00 b4 08 ff ff 00 00 11 0e b0 08 01 00 00 00 00 00 00 09 00 2e 00 00
55:52.396 SCTP_msg->sctpAssociationCreateReq	01 00 60 00 2a 00 3c 00 ff ff 00 00 01 00 00 00 08 42 fe 01 01 00 00 e8 03 00 00 05
55:52.401 SCTP_msg->sctpDataReq	01 00 60 00 2e 00 10 04 ff ff 00 00 00 00 00 00 00 00 00 00 12 00 00 00 3a 00 00 11 00
55:52.524 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStopReq
55:52.551 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStartReq
55:52.746 PRC_TRACE_STRING	OAM_TR069: <TR69C> readMessageFromSmd(1027) got session start cnf
55:52.780 S1AP_msg->s1SetupCnf	01 00 15 00 29 00 fc 01 ff ff 00 00 12 0e f8 01 00 00 00 01 0c 42 52 43 4d 5f 4c 54
55:52.806 RRM_CC_msg->enbRemCellSearchReq	01 00 17 00 3a 3a 36 00 ff ff 00 00 38 0d 32 00 01 00 ee 98 00 00 00 00 00 00 00 00 00
55:52.806 REM_msg->xemCphylteSnifferCellSearchReq	01 00 5e 00 2e 00 70 00 ff ff 00 00 17 90 6c 00 00 00 d6 06 01 00 00 00 00 00 00 00 00
55:52.806 PRC_TRACE_STRING	RRM_CC: RemSend_CPhyLteSnifferCellSearchReq
55:53.008 PRC_TRACE_STRING	OAM_EMA: EMA : find CmeMgmtIndex:0(Tr69c) for SessionStopReq

```
(sctpDataReq\(ueid=0x2\)|sctpDataInd\(ueid=0x2\)|DCCH-Message.*\(ueid=0x2\))$
```

Tracer - \\10.152.7.152\\ftpser...

(sctpDataReq(ueid=0x2))sctpDataReq Clear Filter Search warning:41 error:0 offline mode

Index	Time	Event	Data
9104	20151106_17:56:19.365	RRC-UL-DCCH-Message->rrcConnectionSetupComplete(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9125	20151106_17:56:19.366	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9205	20151106_17:56:20.074	SCTP_msg->sctpDataInd(ueid=0x2)	01 00 60 00 2f 00 10 04 02 00 00
9215	20151106_17:56:20.074	RRC-DL-DCCH-Message->d1InformationTransfer(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9236	20151106_17:56:20.215	RRC-UL-DCCH-Message->ulInformationTransfer(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9248	20151106_17:56:20.216	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9291	20151106_17:56:20.254	SCTP_msg->sctpDataInd(ueid=0x2)	01 00 60 00 2f 00 10 04 02 00 00
9301	20151106_17:56:20.284	RRC-DL-DCCH-Message->d1InformationTransfer(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9316	20151106_17:56:20.295	RRC-UL-DCCH-Message->ulInformationTransfer(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9328	20151106_17:56:20.296	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9371	20151106_17:56:20.334	SCTP_msg->sctpDataInd(ueid=0x2)	01 00 60 00 2f 00 10 04 02 00 00
9381	20151106_17:56:20.334	RRC-DL-DCCH-Message->d1InformationTransfer(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9396	20151106_17:56:20.365	RRC-UL-DCCH-Message->ulInformationTransfer(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9408	20151106_17:56:20.366	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9454	20151106_17:56:20.404	SCTP_msg->sctpDataInd(ueid=0x2)	01 00 60 00 2f 00 10 04 02 00 00
9464	20151106_17:56:20.404	RRC-DL-DCCH-Message->d1InformationTransfer(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9479	20151106_17:56:20.435	RRC-UL-DCCH-Message->ulInformationTransfer(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9491	20151106_17:56:20.436	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9560	20151106_17:56:20.487	SCTP_msg->sctpDataInd(ueid=0x2)	01 00 60 00 2f 00 10 04 02 00 00
9576	20151106_17:56:20.488	RRC-DL-DCCH-Message->ueCapabilityEnquiry(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9644	20151106_17:56:20.525	RRC-UL-DCCH-Message->ueCapabilityInformation(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9676	20151106_17:56:20.530	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
9719	20151106_17:56:20.534	RRC-DL-DCCH-Message->securityModeCommand(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9795	20151106_17:56:20.567	RRC-UL-DCCH-Message->securityModeComplete(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9816	20151106_17:56:20.570	RRC-DL-DCCH-Message->ueInformationRequest-r9(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9851	20151106_17:56:20.573	RRC-DL-DCCH-Message->rrcConnectionReconfiguration(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
9954	20151106_17:56:20.606	RRC-UL-DCCH-Message->ueInformationResponse-r9(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9955	20151106_17:56:20.606	RRC-UL-DCCH-Message->rrcConnectionReconfigurationComplete(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
9990	20151106_17:56:20.608	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00
10016	20151106_17:56:20.613	RRC-DL-DCCH-Message->rrcConnectionReconfiguration(ueid=0x2)	01 00 1b 00 0d 00 02 04 02 00 00
10035	20151106_17:56:20.646	RRC-UL-DCCH-Message->rrcConnectionReconfigurationComplete(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
10036	20151106_17:56:20.646	RRC-UL-DCCH-Message->measurementReport(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
10037	20151106_17:56:20.646	RRC-UL-DCCH-Message->ulInformationTransfer(ueid=0x2)	01 00 1b 00 0c 00 02 04 02 00 00
10068	20151106_17:56:20.648	SCTP_msg->sctpDataReq(ueid=0x2)	01 00 60 00 2e 00 10 04 02 00 00

Search Tool

The search tool supports finding string from the displayed event name/trace string and finding a specific field from the structured messages data buffer.

Three options to search a string from the displayed trace string

- Wrap Around: If the string is not found, the search wraps around to the other end of the file and continues the search when next/previous button is pressed
- Rrc asn1: to search the string within RRC message too
- Sctp asn1: to search the string within s1/x2 message too

Figure 9: search string from the displayed event name/trace string

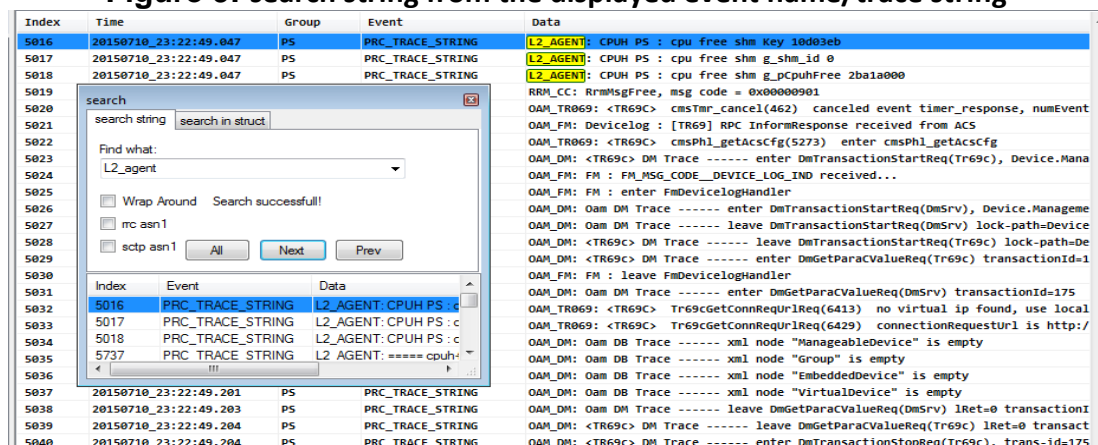
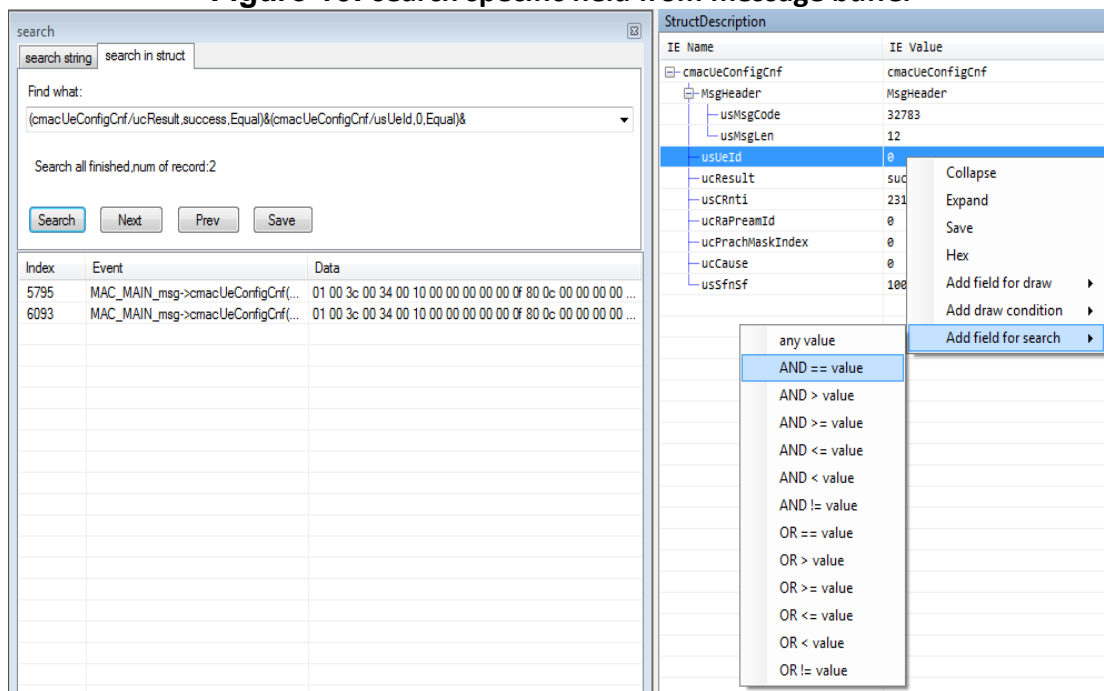


Figure 10: search specific field from message buffer



The search format of field search: [Search path, value, search condition](#)

- Search path: the path of the field in the Struct, start from the Struct name, for example: [PHY_DL_CONFIG_REQ/DciNum](#)
- value: the value of the searched field
- Search condition: only the field satisfy the condition will be displayed
 - ✓ [None](#) : any value is ok, no condition
 - ✓ [Equal](#) : == the selected value
 - ✓ [Greater](#) : > the selected value
 - ✓ [GreaterEqual](#) : >= the selected value
 - ✓ [LessEqual](#) : <= the selected value
 - ✓ [Less](#) : < the selected value
 - ✓ [NotEqual](#) : != the selected value

And Search tool supports multi search fields within one Struct. Multi AND and OR conditions are supported and all the OR conditions are treated as one AND condition. Only the messages that satisfy the conditions will be displayed. The AND condition ends with '&' and OR condition ends with '|'. For example:

[\(PHY_DL_CONFIG_REQ/DciNum,1,GreaterEqual\)& \(PHY_DL_CONFIG_REQ/SfnSf,3845,None\)&](#)

 **Note:** The search Tool does not support to search the fields of different Structs.

Please add the search field from the tree list view window by following steps:

1. Open the message in tree list view
2. Select the field and click the right button of Mouse, then select the "Add field for search"
3. Select one or multi search conditions if exist
4. Modify the search text manually if necessary

Click Search button then the search Tool starts the search processing.

Save button can save all the searched records to a file.

Hot Key:

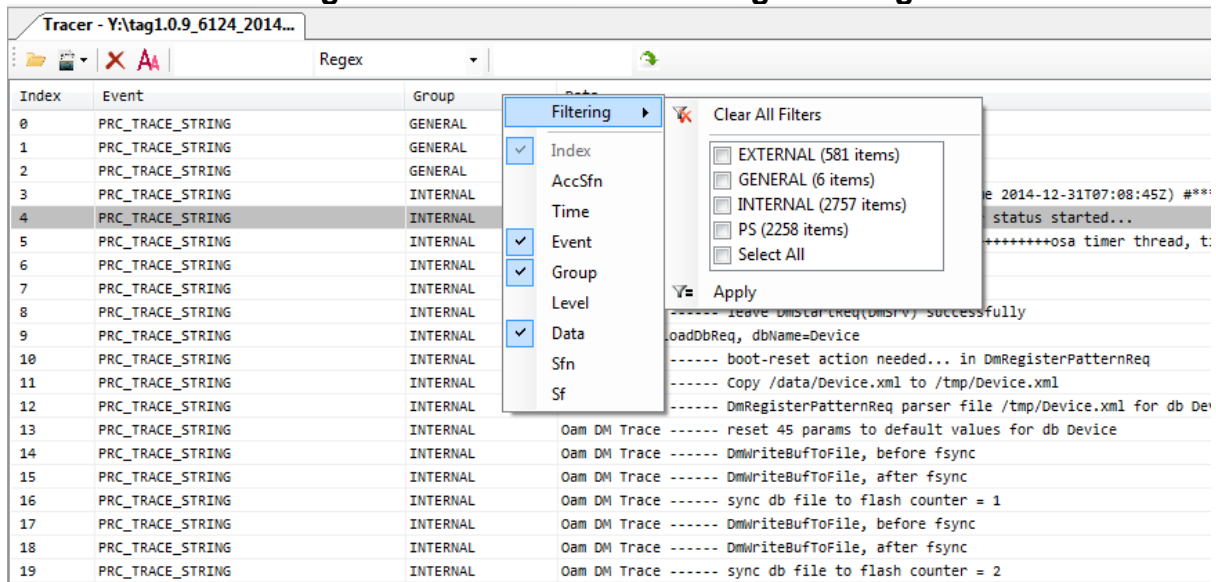
- ctrl+F to open the search window
- F3 to find the next
- Shift + F3 to find the previous

Excel-like column filtering

The Tool supports the excel-like column filtering

- All the columns except Index can be hidden/displayed
- All the messages of every column can be hidden/displayed

Figure 11: column and message filtering



Goto line

The Tool supports to jump to specific line by input line number to the Go to line number box and press Enter key.

Hot Key: Go to line number box will get focus by using ctrl+g or ctrl+G

Line Mark

A line/record can be marked with yellow color and be navigated by the hot keys.

Hot Keys:

- ctrl+m or ctrl+M or ctrl+F2 : mark/clear the current line
- shift+M or shift+m or shift+F2 : jump to the previous marked line
- M or m or F2 : jump to the next marked line

Main Event Window

Main Event is to display the Main Event message included in the Trace/file.

Currently main Events include

- messages between the modules of PS
- messages between PS and L1/DSP

Main Event filter

The main event filter list determines which message will be displayed or which message will not be displayed. So there are two kinds of filters:

- Include filter: only the records which contain the filter text will be displayed. The filter text string starts with prefix "+".

For example:

"+RRC-UL-CCCH-Message" to display UL-CCCH message

"+RRC-DL-CCCH-Message" to display DL-CCCH message

"+RRC-UL-DCCH-Message" to display UL-DCCH message

"+RRC-DL-DCCH-Message" to display DL-DCCH message

"+SCTP_Msg" to display S1/X2 message

- Exclude filter: do not display the records which contain the filter text. The filter text string starts with prefix "-" or no prefix.

For example:

"l2meas" do not display all the records which contain "l1meas"



Note: Include filter has higher priority, if include filters exist, the exclude filter will be ignored.



Note: Input only one filter text string in each line. The new setting will be applied after mouse leaves the Text box area.

Main Event Message list

This area is used to display all or filtered Main event messages with a list.

It is a navigation list of the Main trace window, only index and event name are displayed.

By double clicking on the specific event, the Main trace window will jump to that event.

UE specific Message list

This area is used to display the Main event messages of every UE. It is convenient to trace the procedures of a specific UE.

Struct description Window

The Struct description is to display the decoded content of the one structured event. It consists of two areas: tree view of message and S1/X2/NAS Message decoder.

Tree view of Message

Double clicking a message in Main Event or Main trace window, the detailed decoded description of the message will be displayed in the tree view window and S1/X2/RRC/NAS message windows if exist.

Figure 12: Struct Description Window

StructDescription

IE Name	IE Value
DL_CCH_Message	DL_CCH_Message
usSduLen	21
aucSdu	aucSdu
aucSdu0	120
aucSdu1	18
aucSdu2	155
aucSdu3	110
aucSdu4	32
aucSdu5	31
aucSdu6	32
aucSdu7	6
aucSdu8	1
aucSdu9	176
aucSdu10	1
aucSdu11	1
aucSdu12	1
aucSdu13	4
aucSdu14	9
aucSdu15	0
aucSdu16	2
aucSdu17	1
aucSdu18	6
aucSdu19	8

DL-CCCH-Message

```

message: c1 (0)
  c1: rrcConnectionSetup (3)
    rrcConnectionSetup
      rrcTransactionIdentifier: 3
      criticalExtensions: c1 (0)
      c1: rrcConnectionSetup-r8 (0)
        rrcConnectionSetup-r8
          radioResourceConfigDedicated
            srb-ToAddModList: 1 item
              Item 0
                SRB-ToAddMod
                  srb-Identity: 1
                  rlc-Config: defaultValue (1)
                  logicalChannelConfig: NULL
                  logicalChannelConfig: defaultValue (1)
                  defaultValue: NULL
                  mac-MainConfig: explicitValue (0)
                  explicitValue
                    ul-SCH-Config
                      maxHARQ-Tx: n2 (1)
                      periodicBSR-Timer: sf5 (0)
                      retxBSR-Timer: sf320 (0)
                      ..0. .... ttiBundling: False
                      timeAlignmentTimerDedicated: infinity (7)
                      phr-Config: setup (1)
                        setup
                          periodicPHR-Timer: sf200 (4)
                          prohibitPHR-Timer: sf100 (4)
                          dl-PathlossChange: dB1 (0)
                          sr-ProhibitTimer-r8: 3 SR periods
                      physicalConfigDedicated
                        pdsch-ConfigDedicated
                          p-a: dB0 (4)
                        pucch-ConfigDedicated
                          ackNackRepetition: release (0)

```

Items of the submenu of the Tree view window.


- Collapse: collapse the tree view
- Expand: expand the tree view
- Save: Save the tree view to a XML file
- Hex/Dec: Display the value with Hex or Dec format
- Add field for draw: for User graph draw
- Add draw condition: for User graph draw
- Add field for search: for Field Search in the struct

Hot Key: ctrl+c to save one line of the tree view to system clip board

S1/X2/NAS Message decoder

The s1/X1 included in the sctp data and the NAS message included in the RRC message will be decoded to this window.

Hot Key: ctrl+a to select all the contents and ctrl+c to save the decode contents to the system clip board

 **Note:** It is impossible to decode the ciphered NAS message. So for debug purpose please disable the NAS encryption if possible.

User Graph

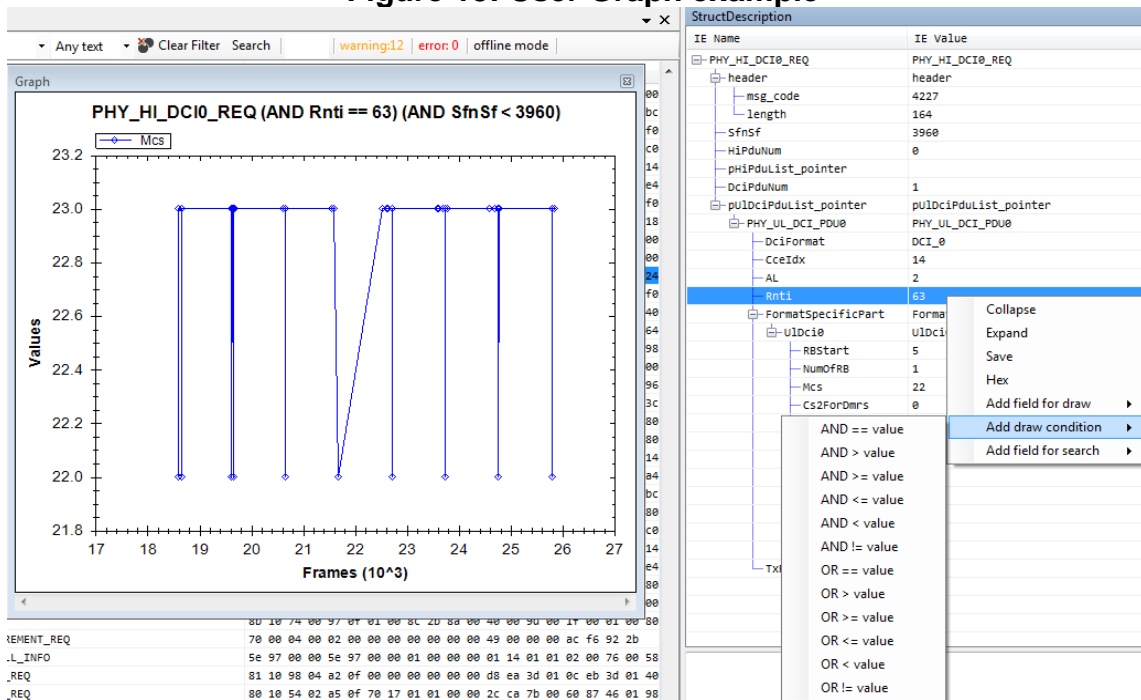
The Tool supports to draw the graph of any fields in an event from struct description window.

Two operations for the user graph draw:

- Add field for draw: the selected field of the records which meet all the condition will be drawn in the graph
- Add draw condition: just add a draw condition, the selected field will not be drawn in the graph

Following is an example in which PHY_UL_DCI_PDU0/Mcs is drawn with the two conditions: rnti==63 and sfnsf <= 3960

Figure 13: User Graph example



Section 4: Log server

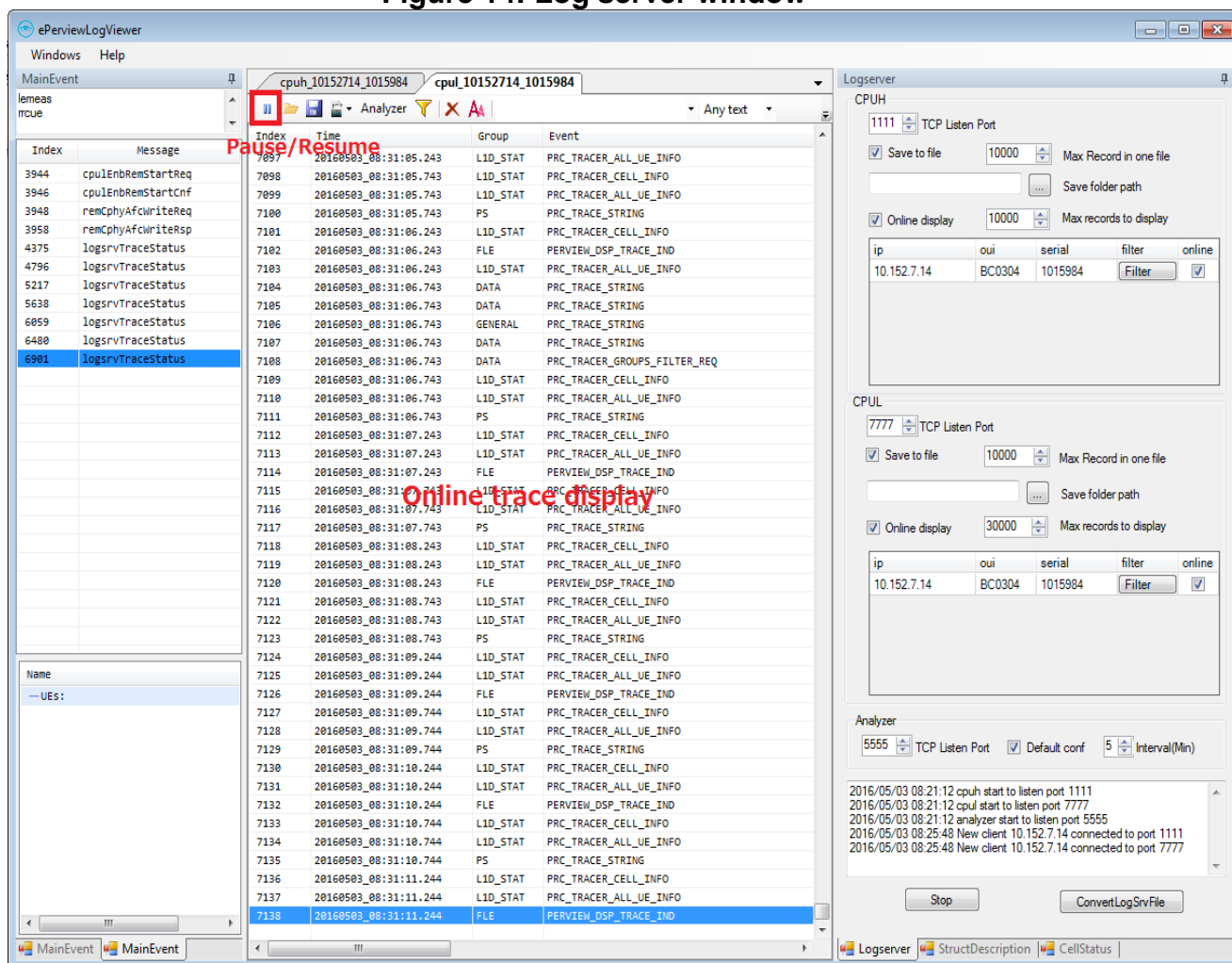
The Tool provides the log server function to manage the connections between the tool and one or multi boards.

Functions of log server

The main features of the log server:

- Support multi connections with many boards simultaneously. The boards should have different OUI + Serial number
- Auto save log to the local files or to remote ftp server
- Support the online display of received logs
- Support the pause/resume of online display
- Support online board filter change

Figure 14: Log server window



Start/Stop log server

To start the log server, click the “Start” button on Log server Tab.

To stop the log server, click the “Stop” button on Log server Tab.

Options of the log server

The log server listen one TCP port defined by the “TCP listen port” for CPUL connection, one TCP port defined by the “TCP listen port” for CPUH connection and one TCP port defined by the “TCP listen port” for the online log analyzer.

When a new TCP connection arrives, the Tool opens a new Trace window to display the received the log records if “Online display” option enabled. By changing the “online” check box it possible to disable or enable the online display of a specific connection.

The Tool saves the records to files if “Save to file” option enabled.

The “Max Records in one file” option determines the size of one log file. A new log file will be created after the record number reaches the threshold.

The “Max Records to display” option determines the max size of online display. The main tracer window will clear all the records and start from index 0 after the record number reaches the threshold.

The “Save folder path” option is used to set a default folder for the CPUH/CPUL log files.

Configuration of the board

The path in the Device.xml is /Device/X_OUI_DebugMgmt/Traces/LogServer

Table 2: Parameters for the Tool connection

Parameter	Description
ConnectingPolicy	When to connect to logserver, “Always”: try to connect to log server since power on. “ConfigChanged”:do not connect to log server until new configuration available
IPAddress	IP of Host PC on which the Tool runs
CpuhPort	TCP listen port of CPUH
CpulPort	TCP listen port of CPUL
CpuhDestPath	CPUH Log files save path
CpulDestPath	CPUL Log files save path
CpuhFileSize	unused parameter
CpulFileSize	unused parameter

CPUH or CPUL log file save path can be:

- folder of local windows PC, for example:
`<CpulDestPath>C:\log\cpul\</CpulDestPath>`
- remote folder, for example :
`<CpuhDestPath>\\10.152.7.152\LTE\logs\cpuh\</CpuhDestPath>`
- ftp folder with format ftp://username:password@url, for example:
`<CpuhDestPath>ftp://guest:guest@10.152.7.152/ftpserver/cpuh/</CpuhDestPath>`

How to determine the log save path:

1. If no valid folder is configured in Device.xml, “Save folder path” option apply
2. If no path is configured in “Save folder path” option, log will be saved to the same folder as ePerviewView.exe
3. If the ftp path does not exist or is not reachable, the log will be saved to the same folder as ePerviewView.exe

Priority between LogViewer and log server

The log service thread on the board supports both log viewer tool described in this document and ePerview tool developed by the L1/DSP team.

And the log viewer tool has higher priority the log server, so if the log viewer tool connects to the board, no trace is sent to server.

Open dump log file

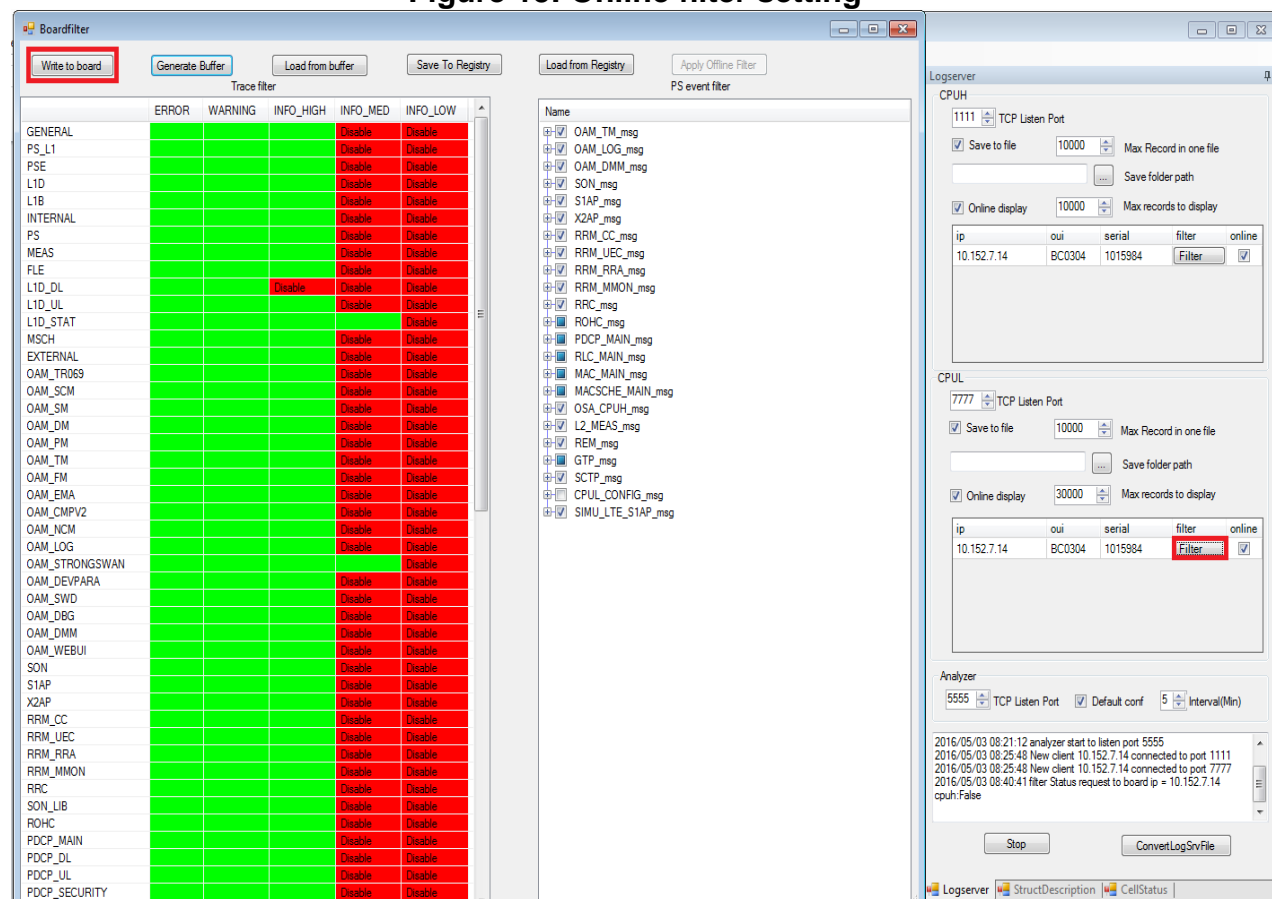
When the board reboot suddenly, the logs in the log buffer will be dumped by the PS and saved to one or more dump log files.

To open the dumped log file, click the “ConvertLogSrvFile” button from the Log Server panel and select the file from the open file dialog. The tool will open a new main trace window to display the records saved in the dump log file.

Online filter setting

The filter setting of online board can be changed by click “Filter” button of CPUH or CPUL. The Tool reads and displays the current board setting, then you can change the filter setting. After changing the filter setting, press “Write to board” button then new setting will be applied.

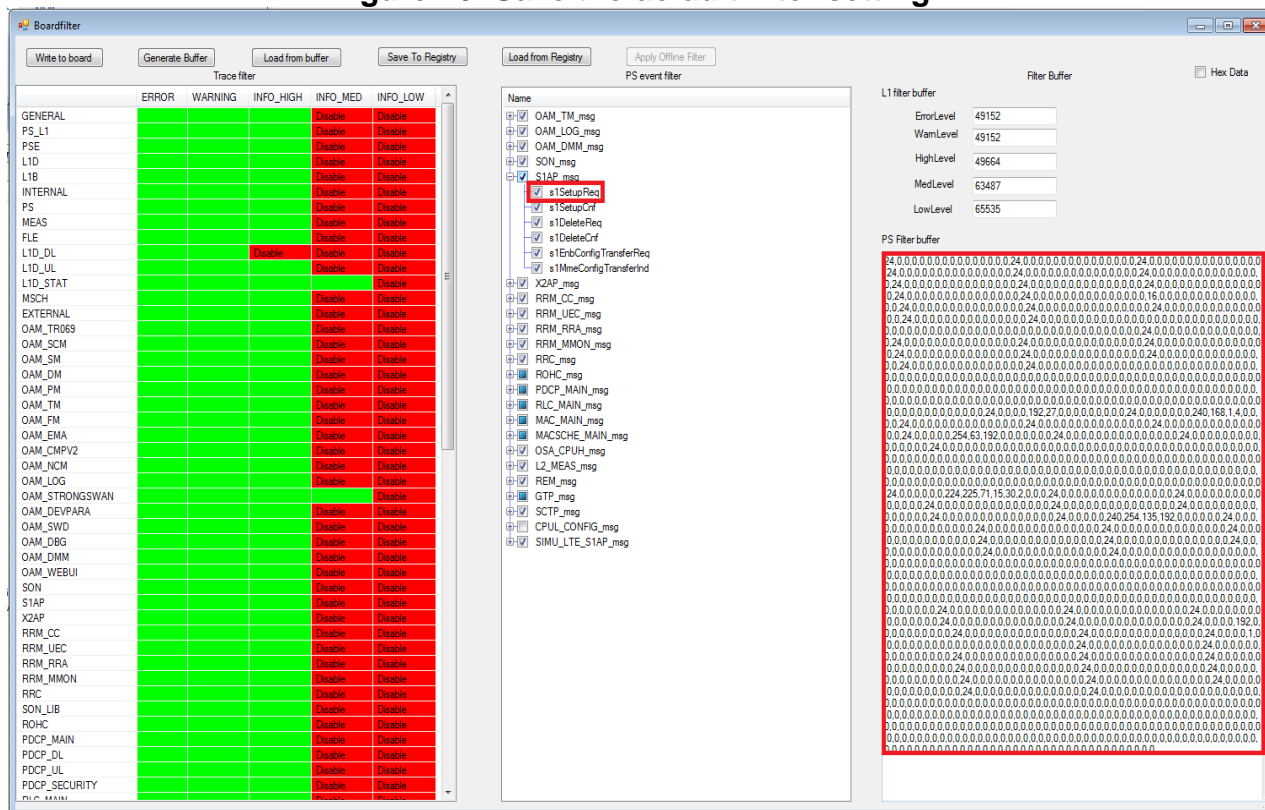
Figure 15: Online filter setting



The default setting of filter is saved in Device.xml, the path is
/Device/X_OUI_DebugMgmt/TraceFilter/PsFilter

The online setting will not be saved to Device.xml, to change the default setting in Data model, press “Generate buffer” button, it will generated the new filter setting buffer and copy it to the PsFilter item in Device.xml.

Figure 16: Save the default filter setting



Section 5: Cell status display

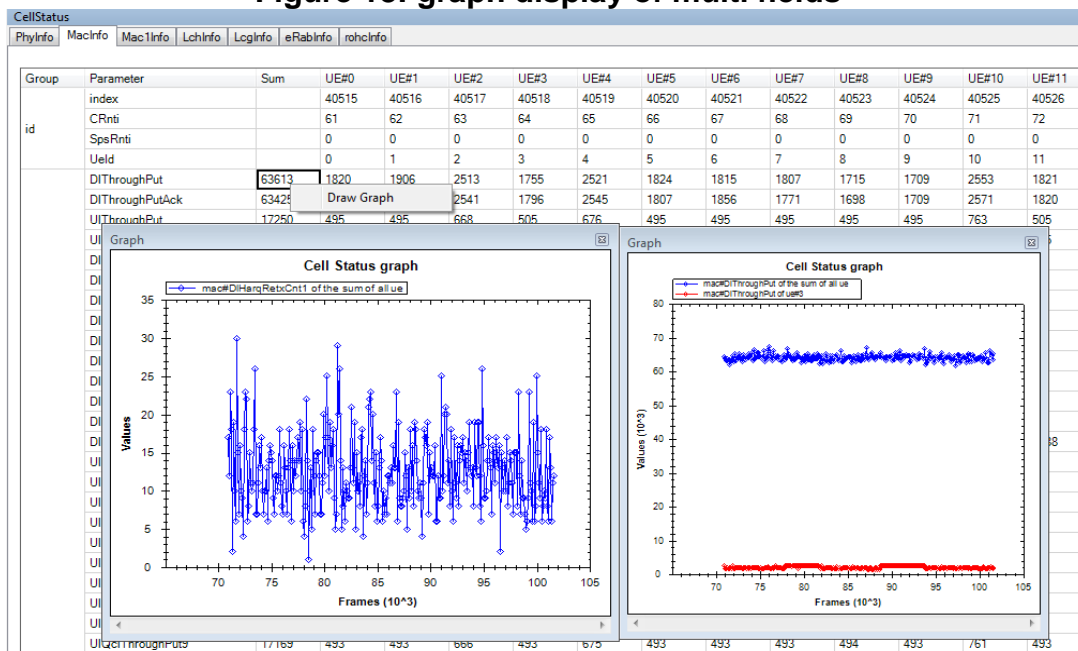
Cell Status window is used to display the statistics information of L1 and L2. There are 6 tab pages to display the Phy, Mac, Mac1, LCH, Erab and ROHC information. Cell#1 of Phy page and Mac1 tab page are for the second cell of carrier aggregation or dual carriers.

Figure 17: Cell status display

CellStatus		
PhyInfo	MacInfo	Mac1Info
LchInfo	LogInfo	eRabInfo
rohInfo		
<input checked="" type="checkbox"/> Enable Cell status display <input type="button" value="SaveToFile"/>		
Parameter	cell#0	cell#1
dl_eaifcn	38750	
ul_eaifcn	38750	
dl_freq(GHz)	2.31	
ul_freq(GHz)	2.31	
band	40	
bandwidth	20	
dl_rf	TDD Tx LTE	
ul_rf	TDD Rx LTE	
cellid	1	
antenna_num	2	
subframe_assignment	1	
board_temperature	30.5	
junction_temperature	49	
core_voltage	0.96135	
cpufree_core0	66	
cpufree_core1	69	
cpufree_core2	72	
cpufree_core3	53	
RachTotalNumGroupA	0	
RachContSuccNumGroupA	0	
RachContFailNumGroupA	0	
RachTotalNumGroupB	0	
RachContSuccNumGroupB	0	
RachContFailNumGroupB	0	
RachTotalNumNonCont	0	
RachNonContSuccNum	0	
RachNonContFailNum	0	
RachFalseDetectNum	0	
RachPowerMax	-128	
RachPowerMin	-128	
RachPowerAverage	-128	
RachTaMax	0	
RachTaMin	19	
RachTaAverage	22	

And the Tool supports the graph draw of one or multi-fields of one page (except PHY page), right-click the mouse then select Draw graph, then the graph will be displayed. Graph works on online mode and offline mode.

Figure 18: graph display of multi fields



Section 6: PM report

The tool supports the PM report file analyze.

The main features are:

- Supports to open one or multi PM report files one time: Windows->Open PM report and select one or multi PM report files from the Open file dialog.
- Supports multi sessions/parser in parallel
- Support text filter: only the PM counters which contain the text will be displayed
- Support filter file: a collection of text filter, the last selected filter file will be loaded automatically next time. To disable the filter file, please clear the file name and click filter button.
- Analyze the Max/Min/Sum of each PM counter from all the PM report files
- Copy to clip board by ctrl-c
- Save result to an excel file

Figure 19: PM report analyze window

Type	Max	Min	Sum	Ave	Count	A2015...	A2015...	A2015...	A2015...	A2015...	A2015...
RRQ.ConnEstabAtt.mo-Signalling	20	0	43	3	14	20	2	2	2	2	2
RRQ.ConnEstabAtt.mo-Data	3	0	6	0	14	0	2	0	3	0	0
RRQ.ConnEstabSucc.mo-Signalling	20	0	43	3	14	20	2	2	2	2	2
RRQ.ConnEstabSucc.mo-Data	3	0	6	0	14	0	0	0	3	0	0
RRQ.ConnEstabFail.mo-Signalling	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnEstabFail.mo-Data	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabAtt.reconfigurationFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabAtt.handoverFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabAtt.otherFailure	3	0	3	0	14	0	0	0	0	0	0
RRQ.ConnReEstabSucc.reconfigurationFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabSucc.handoverFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabSucc.otherFailure	2	0	2	0	14	0	0	0	0	0	0
RRQ.ConnReEstabFail.reconfigurationFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabFail.handoverFailure	0	0	0	0	14	0	0	0	0	0	0
RRQ.ConnReEstabFail.otherFailure	1	0	1	0	14	0	0	0	0	0	0
RRQ.ConnMean	14	0	180	12	14	12	14	14	14	14	14
RRQ.ConnMax	15	0	195	13	14	15	15	15	15	15	15

Section 7: KPI analyze

The KPIs are formulated to measure the network performance in terms of Accessibility, Integrity, Mobility, Retainability and Subscriber perceived quality.

Functions of KPI analyze module

The main features of the KPI analyze module:

- Manage the KPI template
- Check the KPI result
- Manage multi KPI test results

KPI template management

A KPI item is defined with a KPI template which includes a name, the description and a formula. The formula indicates how to calculate the KPI value based on some PM counters.

For different test cases, the thresholds of each KPI item are different, so the template defines the thresholds for every test case. For example, for the FDD 3M case the MAC downlink throughput range is [15000,23000]kbps and for the FDD 20M case the pass range is [135000,15000]kbps.

Figure 20: KPI template example

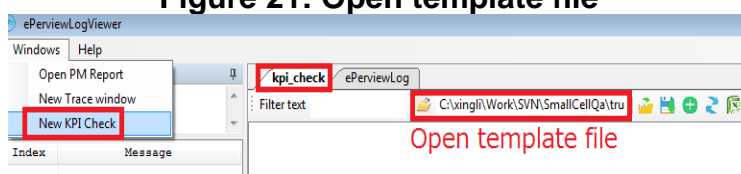
KPI	Description	Paramter(s)/Formula	FDD_3M_Default_Thp	FDD_20M_Default_Thp
reboot	Counter of board reboot	number of board reboot	0,0	0,0
rrc_mo-signalling_succ_rate	RRC setup success rate for MO-signalling	RRC.ConnEstabSucc.mo-Signalling/,RRC.ConnEstabAtt.mo-Signalling	1,1	1,1
rrc_mo-data_succ_rate	RRC setup success rate for MO-data	RRC.ConnEstabSucc.mo-Data/,RRC.ConnEstabAtt.mo-Data	1,1	1,1
rrc_mt-access_succ_rate	RRC setup success rate for MT-access	RRC.ConnEstabSucc.mt-Access/,RRC.ConnEstabAtt.mt-Access	1,1	1,1
rrc_reestab_other	RRC conn reestablishment because of other failure	RRC.ConnReEstabAtt.otherFailure	0,0	0,0
rrc_reestab_succ_rate	RRC conn reestablishment success rate	(,RRC.ConnReEstabSucc.reconfigurationFailure,+,RRC.ConnReEstabSucc.reconfigurationSuccess)/RRC.ConnReEstabAtt.otherFailure	N/A	N/A
processor_usage_cpu_h_mean	mean cpuh processor usage	EQPT.MeanProcessorUsage.CPU-H-0	0,50	0,75
processor_usage_cpu_l0_mean	mean cpul0 processor usage	EQPT.MeanProcessorUsage.CPU-L-0	0,50	0,75
processor_usage_cpu_l1_mean	mean cpu1 processor usage	EQPT.MeanProcessorUsage.CPU-L-1	0,50	0,75
gtpu_thp_dl	DL throughput of Gtpu	GTPU.ThroughputDI	15000,23000	135000,150000
gtpu_thp_ul	UL throughput of Gtpu	GTPU.ThroughputUI	4000,7000	40000,50000
rlc_thp_dl	DL throughput of RLC	RLC.ThroughputDI	15000,23000	135000,150000
rlc_thp_ul	UL throughput of RLC	RLC.ThroughputUI	4000,7000	40000,50000
mac_thp_dl	DL throughput of MAC	MAC.ThroughputDI	15000,23000	135000,150000
mac_thp_ul	UL throughput of MAC	MAC.ThroughputUI	4000,7000	40000,50000

The KPI templates are managed with an Excel file. The Tool imports the Excel file and analyzes the template items for the KPI result check.

To open a new KPI check Window, please click Windows -> New KPI check menu.

To open a KPI template file, please click the Open File toolbar and select the Excel file, the Tool will import the templates.

Figure 21: Open template file



Check the KPI

The Tool reads the PM report files generated and uploaded by the board and checks the KPI result with specific KPI check items. And the Tool supports the PM report files generated by the log analyzer too.

To add one KPI check item, please click the Add button on the toolbar, following form will be displayed. There are two pages: “Add one item” is used to add one check item manually and “Batch Add” is used to add multi check items automatically.

Figure 22: Add a KPI item

The screenshot shows a Windows-style dialog box titled "AddKpiItem". It has two tabs: "Add one item" (selected) and "Batch Add". In the "Add one item" tab, there is a "Select Template" dropdown menu currently showing "FDD_20M_Attach_Detach". Below it is an "Input Title" text box containing "Tag123". There are two spin boxes: "Ignore first files:" set to 0 and "Ignore last files:" set to 0. At the bottom of the tab are three buttons: "Select PM files", "Add Item", and "Cancel". Below the buttons is a list box containing a long list of file paths, all of which are identical: "C:\xingli\Work\SVN\LogFortest\Tag123\FDD_20M_Attach_Detach".

Steps to add a KPI check

1. Select a specific template from the list, for example “FDD_20M_Attach_Detach”
2. Input a title for the item, for example “Tag123”
3. Select PM report files
4. Click “Add item” button, the KPI check result will be add to the Tab page “FDD_20M_Attach_Detach”

Figure 23: Result of the KPI check

Type	KPI	algo...	prio...	Threshold	tag123	Tag122
pmpara	rrc_mo-signalling_succ_rate	sum	critical	[0.99,1]	1510/1510=1	1561/1561=1
pmpara	rrc_restab_reconfigfail	sum	critical	[0,0]	0	0
pmpara	rrc_restab_other	sum	critical	[0,0]	0	0
pmpara	rrc_conn_esttime_mean_mo_sig	ave	critical	[0,60]	48	48
pmpara	rrc_conn_esttime_mean_mo_data	ave	critical	[0,60]	0	0
pmpara	rrc_conn_esttime_mean_mt_access	ave	critical	[0,60]	0	0
pmpara	rrc_conn_esttime_max_mo_sig	max	normal	[0,100]	103	67
pmpara	rrc_conn_esttime_max_mo_data	max	normal	[0,100]	0	0
pmpara	rrc_conn_esttime_max_mt_access	max	normal	[0,100]	0	0
pmpara	ue_context_abnormal_rel	sum	critical	[0,0]	0	0
pmpara	erab_qci9_setup_succ_rate	sum	critical	[0.99,1]	1510/1510=1	1561/1561=1
pmpara	erab_qci9_estab_time_mean	ave	critical	[0,150]	134	184
pmpara	erab_qci9_estab_time_max	max	normal	[0,200]	155	636
pmpara	s1_conn_succ_rate	sum	critical	[1,1]	1510/1510=1	1561/1561=1
pmpara	processor_usage_cpuh_mean	ave	critical	[0,40]	26	26
pmpara	processor_usage_cpul0_mean	ave	critical	[0,40]	8	8
pmpara	processor_usage_cpul1_mean	ave	critical	[0,40]	10	9
pmpara	processor_usage_cpul2_mean	ave	critical	[0,40]	8	7
pmpara	processor_usage_cpul3_mean	ave	critical	[0,40]	8	9
pmpara	processor_usage_cpuh_max	max	normal	[0,85]	71	69
pmpara	processor_usage_cpul0_max	max	normal	[0,85]	8	10
pmpara	processor_usage_cpul1_max	max	normal	[0,85]	11	12
pmpara	processor_usage_cpul2_max	max	normal	[0,85]	9	9
pmpara	processor_usage_cpul3_max	max	normal	[0,85]	9	10



Note: The Red items are the Fail items, the orange items are the Warning items

Note: Multi versions are supported for one template

Figure 24: Batch add items

Steps to add a “batch” check

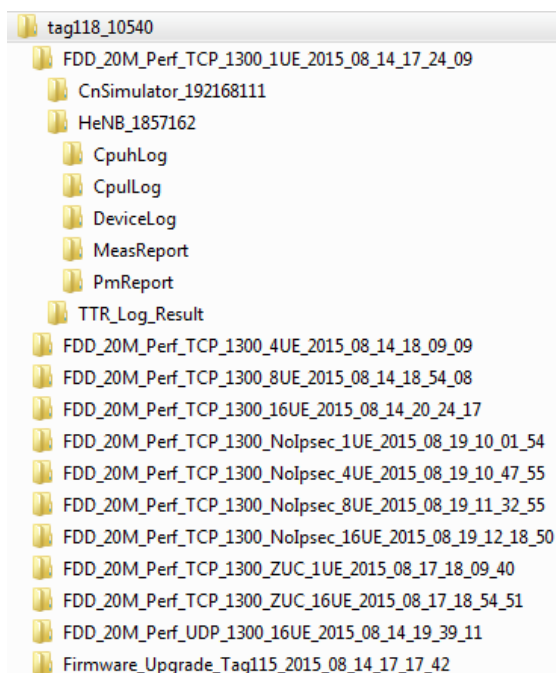
1. Select the root log folder
2. Check/uncheck Process PM report or/and Process log Report
3. Click “Add item” button, the test items under the root log folder will be added

To generate test report automatically with Tool, please follow the log folder naming rules:

1. The top level is the version: for example tag123_rev14996
2. The folder name of each test case should start with KPI title(For example:
FDD_20M_Perf_TCP_1300_1UE_2015_08_14_17_24_09)
3. Some additional information elements can be added to the folder name
 UE number: _16ue_
 No Ipsec: _noipsec_ or _no_ipsec_
 AES algorithm: _aes_
 ZUC algorithm: _zuc_
 UDP: _udp_
 Any other customized info: _specialname_
4. Folder name end with date (_20***)
5. The HeNB folder start with HeNB(like HeNB_1857162) or eNodeB (like eNodeB_2051837)
6. The PM Report folder start with PmReport

Example of batch log folder:

Figure 25: Log folder example for batch process

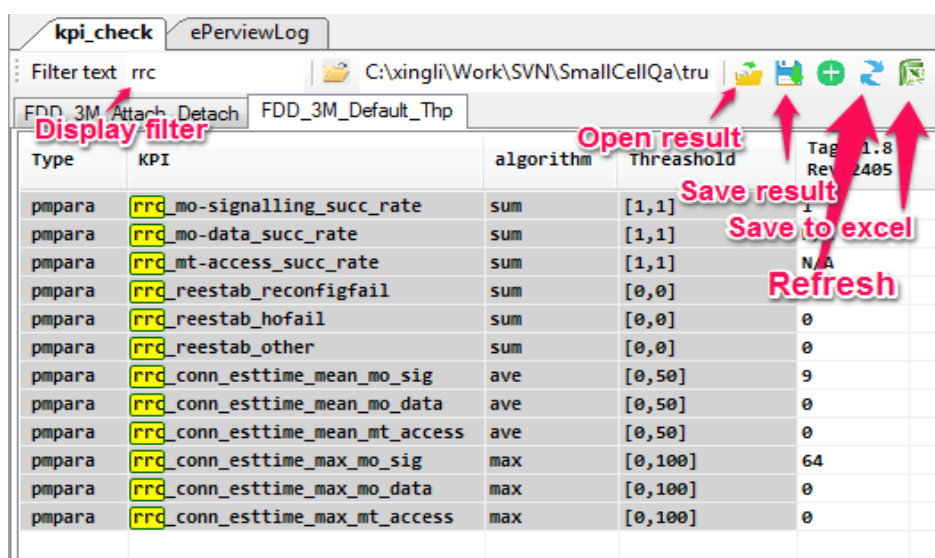


Management of KPI test results

The Tool supports

- multi KPI templates and multi KPI check items of one template
- refresh the result with new KPI Excel template file
- save the results to a XML file
- open the results from a XML file
- display filter
- save the results to an excel file

Figure 26: KPI result management



When the result is saved to the Excel file, the summary of the report will be generated. The report includes the KPI check result summary, the critical KPI result and the detailed KPI result of each test case. It will jump to the detailed result by clicking the 'Click me' cell.

Figure 27: Kpi result summary

KPI check result summary													
Category	Test Case	tag123_14996											
		Duration(m)	UE Num	Pass	Fail	Warn	Detail						
Service	TDD_SF1_20M_Attach_Detach	125	Unknown	52	0	1	Click me						
	TDD_SF1_20M_Default_Thp	125	Unknown	49	3	1	Click me						
	TDD_SF1_20M_Default_Volte	135	Unknown	45	3	5	Click me						
	TDD_SF1_20M_HO_Inter_Freq_s1_default_volte	160	Unknown	42	8	3	Click me						
Critical kpi result of tag123_14996													
Category	Test Case	Duration(m)	UE Num	FDD/TDD	BS(Mhz)	IPSec	Cipher	Traffic	Pkt size	rrc_mo-signalling_succ_rate	rrc_mo-data_succ_rate	rrc_mt-access_succ_rate	
Service	TDD_SF1_20M_Attach_Detach	125	Unknown	TDD SF1	20	Enable	SNOW-3G	TCP	1300	1510/1510=1	N/A	N/A	
	TDD_SF1_20M_Default_Thp	125	Unknown	TDD SF1	20	Enable	SNOW-3G	TCP	1300	32/32=1	N/A	N/A	
	TDD_SF1_20M_Default_Volte	135	Unknown	TDD SF1	20	Enable	SNOW-3G	TCP	1300	33/33=1	N/A	N/A	
	TDD_SF1_20M_HO_Inter_Freq_s1_default_volte	160	Unknown	TDD SF1	20	Enable	SNOW-3G	TCP	1300	57/59=0.966	106/112=0.946	5/5=1	

Section 8: Log analyzer

Log analyzer is a module which analyses the received log records and generate report according to the pre-defined configuration. It is the core component of the automation test setup.

Functions of Log analyzer

The main features of the log analyzer module:

- Flexible configuration
- Online mode to receive configuration and generate report
- Offline mode to analyze one log folder
- Offline mode to analyze multi log folders
- Integrate with PM report analyzer module
- Integrate with KPI check module

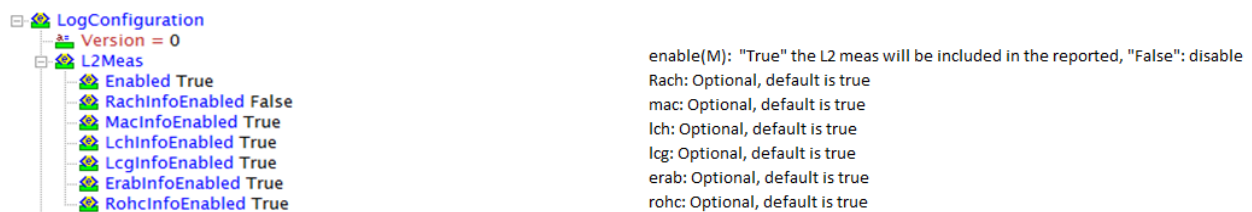
Configuration of Log analyzer

The configuration is saved in an xml file. It contains the configuration of L2 measurement configuration and counters configuration.

L2 Measurement configuration

In default, the CPUL outputs the L1/L2 statistics information to log Tool per second. The L2 configuration defines which measurement metrics are enabled for log analysis. It includes the RACH info, MAC info, LCH Info, LCG info, ERAB info and ROHC info. The L2 configuration is for U-plane KPI check (for example, throughput, delay, CQI, PHR...) and only valid for CPUL log.

Figure 28:L2 measurement configuration example



Counter Measurement configuration

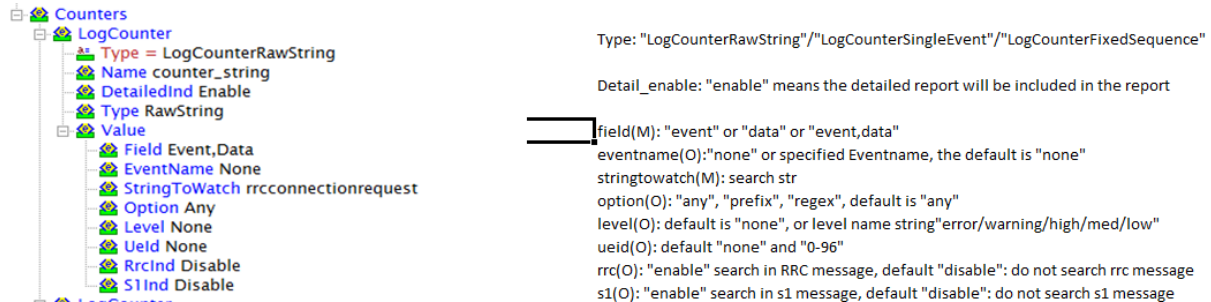
Counter is for C-plane KPI check, for example RRC connection SUCC rate. There are three kinds of counter:

- String
- Event
- Sequence

String type counter

String type counter is for the counter of a specific string.

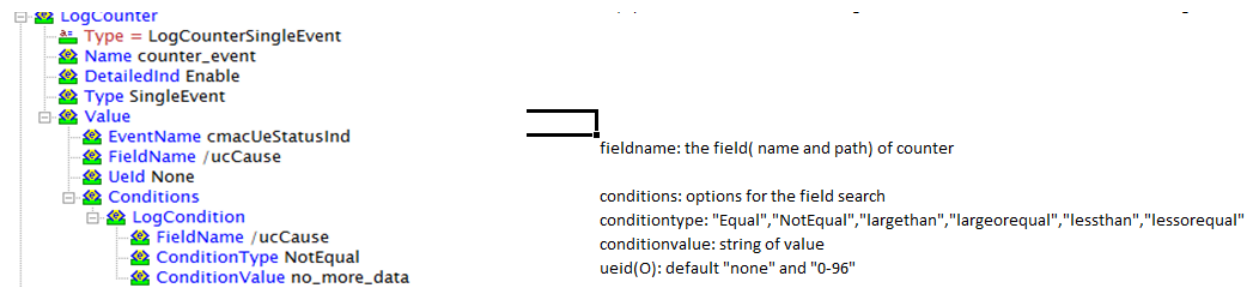
Figure 29: String type counter configuration example



Event type counter

Event type counter is for the counter of a specific field in a structure. And one or multi-conditions can be added to the counter.

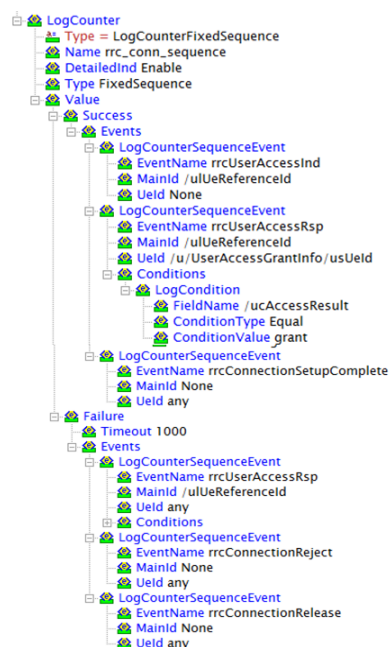
Figure 30: Event type counter configuration example



Sequence type counter

Sequence type counter is for the counter of a specific message sequence. The success and fail conditions have to be configured. The main id or UE ID is used to identify a sequence.

Figure 31: Sequence type counter configuration example



For sequence, the success sequence and failure condition have to be configured.

mainid is the ID for the Sequence
ueid: "none" means no condition. "any" means the sequence should have same UE id if configured and UE id is got from message header if path is configured (for example: /u/UserAccessGrantInfo/usUeId), UE id is got from message body, "0-96" means specified ueid

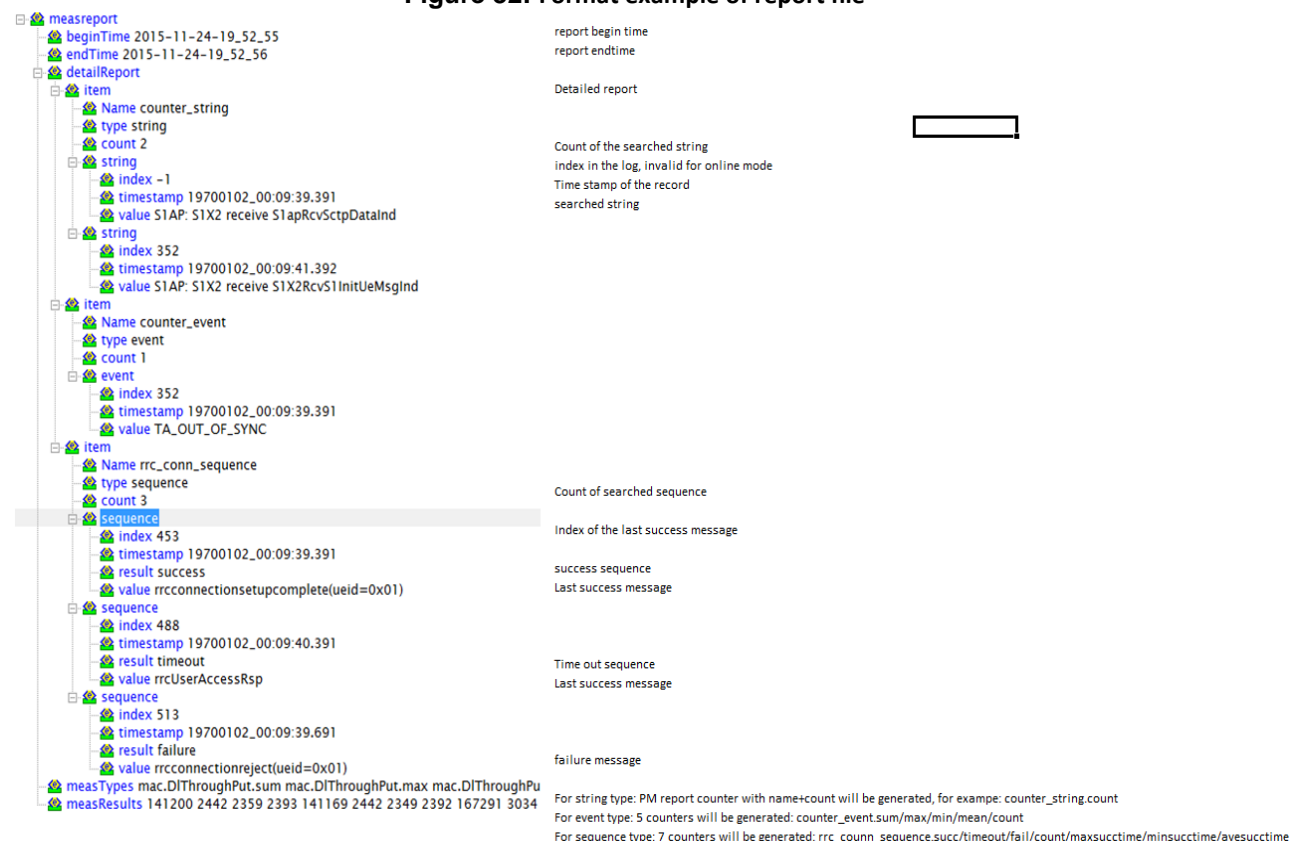
optional conditions

for the sequence failure

Report generation of Log analyzer

Log analyzer generates a report file when required by external module or generates a report file periodically. The XML report file includes the counters and detailed report if configured.

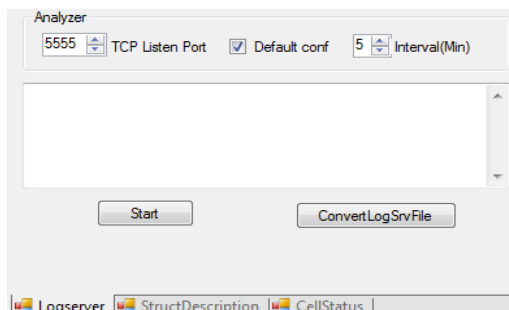
Figure 32: Format example of report file



Online control of the analyzer

When the Tool runs with online mode, the analyzer can analyze the log records and generate the reports with the default configuration file and specific interval. The generated report files will be saved to the same folder of CPUH or CPUL log.

Figure 33: Online server setting



And after the “Start” button of log server is clicked, the analyzer listens a TCP port (Default port is 5555) to receive the control commands. The received configuration will overwrite the default configuration.

Commands send from TTR to log analyzer:

- Set command to set/reset URL of configuration file. A session is defined with OUI + Serial +CPUH/L
Example: `set,BC0304,1839196,cpuh,ftp://admin:admin@192.168.0.100/ftpsrvr/config_cpuh.xml`
- Get command to require report file
Example: `get,BC0304,1839196,cpul,ftp://admin:admin@192.168.0.100/ftpsrvr/result_cpul.xml`
- Reset command to restart the log analyzer(only the saved results are cleared)
Example: `reset,BC0304,1839196,cpul`
- Delete command to remove the configuration and to stop the session of analyzer
Example: `delete,BC0304,1839196,cpul`

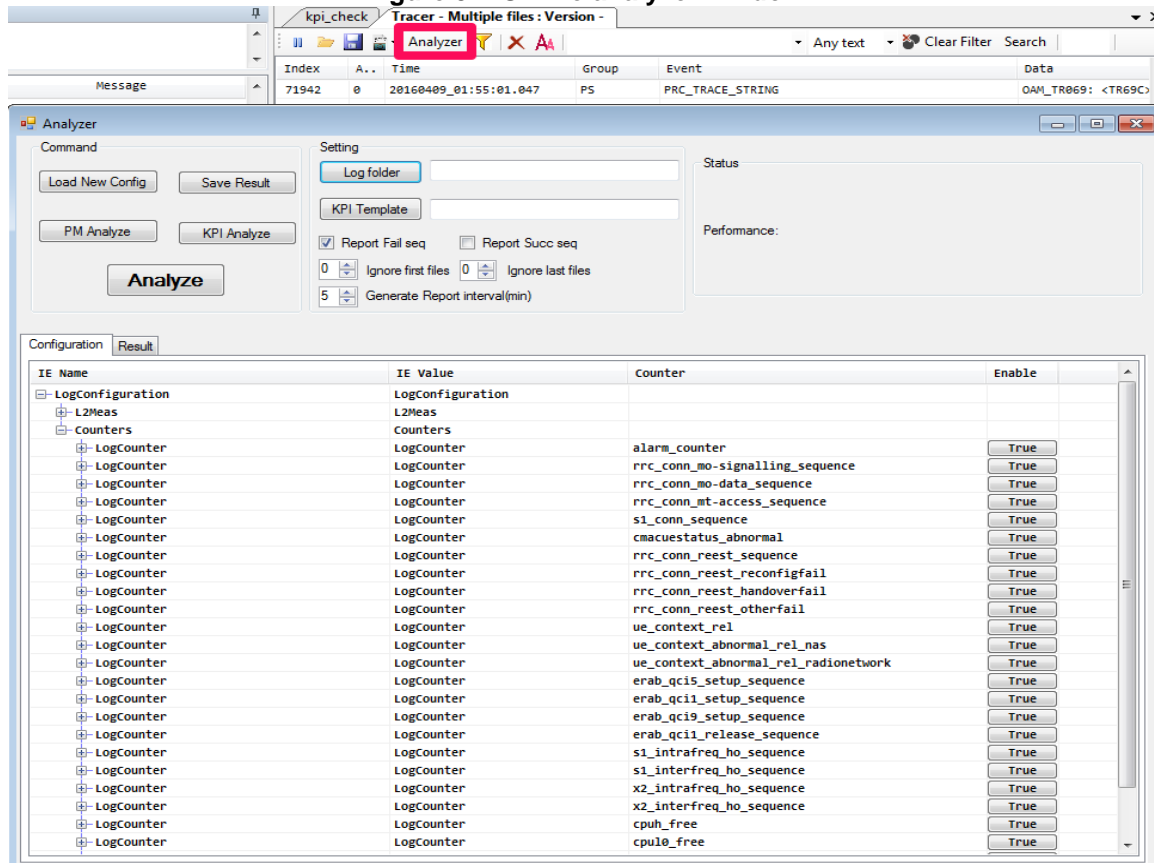
Response commands send from analyzer to TTR:

- Set response:
Success example: `set,BC0304,1839196,cpuh,ok`
Fail example: `set,BC0304,1839196,cpuh,failed`
- Get response
Success example: `get,BC0304,1839196,cpuh,ok`
Fail example: `get,BC0304,1839196,cpuh,failed`
- Reset response
Success example: `reset,BC0304,1839196,cpuh,ok`
Fail example: `reset,BC0304,1839196,cpuh,failed`
- Delete response
Success example: `delete,BC0304,1839196,cpuh,ok`
Fail example: `delete,BC0304,1839196,cpuh,failed`
- Unknown command response
Example: `error,unknown command, set,BC0304,1839196,cpu`

Offline control of the analyzer

The analyzer can analyze the opened log records or saved log files too. The Analyzer window will be showed when you click the “Analyzer” button.

Figure 34: Offline analyzer window



“Load New Config”: load a specific configuration file to replace the default configuration.

The items are showed in the “Configuration” page and it is possible to enable/disable an item.

“Log folder”: Set the log folder.

If a single folder is selected, the log files under the folder will be analyzed

If a batch folder (Figure 25: Log folder example for batch process) is selected, the log files of all the case folders will be analyzed

If no folder selected, the displayed records will be analyzed

“Analyze ”: Begin to analyze

“Save result”: Save the result to a XML file

“PM Analyze”: Open PM analyzer window to analyze the result

“KPI Template”: Select the KPI template excel file, valid for batch process only

“KPI Analyze”: Open KPI analyzer window to check the KPI, valid for batch process only

“Report succ seq”/“Report fail seq”: Display the succ sequence and/or failed sequence in Result page

“Ignore first files”/“Ignore last files”: Skip the first and/or last reports

“Generate report interval”: The interval in minutes to generate the report.

Value “0” means to generate one report file only. This option is valid if a log folder is selected. If the report is generated with the displayed log records, then the index of the record will be displayed in the detailed report item. Double click the “Index” line, the Tool will jump to that log record.

Figure 35: Jump to the record

