

DIH 1.2

ProTrace User Guide

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Chapter 1

About this Help Text

Topics:

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- *About the Diameter Intelligence Hub (DIH).....9*
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Scope and Audience

This online help provides information about ProTrace concepts. It is designed to be a general guide to working with ProTrace to monitor xDRs and KPI sessions for the Diameter Intelligence Hub (DIH).

About the Diameter Intelligence Hub (DIH)

The Diameter Intelligent Hub (DIH) is used to monitor a LTE network. DIH also creates a small hardware "footprint" for customers who administer 3G and 4G diameter networks. The DIH:

- Is a single blade server and storage blade collocated within a single or dual Diameter Signaling Router (DSR) enclosure(s).
- Provides filtering, data feed, tracing, decoding, and SNMP functions.
- Enables the selective collection and storage of diameter traffic within one or more instances of PMF and IXP.
- Provides nodal diameter troubleshooting.
- Provides data export for diameter messages.
- Supports both IPv4 and IPv6 traffic simultaneously.
- Provides KPI tracking using ProTrace application as well as viewing KPIs in graphic format using ProPerf dashboard configured at installation.
- Provides filtering for alarms using ProTraq Cell filter (see system alarms online help).
- Uses diameter protocol exclusively.

Note: The DIH system can use other protocols if the Diameter mode has not been selected and system is in Standard mode. (Default setting is Standard mode. For more information on selecting Diameter mode, see Centralized Configuration Manager Administration online help, "Setting System to Diameter Mode."

The Diameter Protocol

The diameter protocol has evolved from the Radius protocol and enables diameter applications to extend the base protocol by adding new commands and/or attributes, such as those for use of the Extensible Authentication Protocol (EAP).

The diameter protocol provides for an Authentication, Authorization, and Accounting (AAA) framework that overcomes the limitations of RADIUS, (a protocol that handles AAA and EAP), which cannot effectively deal well with remote access, IP mobility and policy control. The Diameter protocol defines a policy protocol used by clients to perform Policy, AAA and Resource Control. This allows a single server to handle policies for many services.

As mentioned above, Diameter protocol provides AAA functionality, but in addition it is made more reliable by using TCP and SCTP instead of UDP. The Diameter protocol is further enhanced by the development of the 3rd Generation Partnership Project (3GPP) IP Multimedia Subsystem (IMS). Through the use of extensions, the protocol was designed to be extensible to support Proxies, Brokers, Strong Security, Mobile-IP, Network Access Servers (NASREQ), Accounting and Resource Management.

User Preferences

All applications that query xDRs, (or observe their status as in Diagnostic Utility), xDRs use a specific User Preferences option. The description outlined goes over the formatting screens.

Note: All screen shots presented here show default values.

Date/Time tab screen

Format the time parameters.

User preferences

Date/Time Directory Mapping Point Code CIC Default Period

Date/Time Formats

Date format:

Time format:

Date and time fields:

Duration fields:

Time zone:

Tips: above fields represents the format that will be applied to different types of fields. Here is an help about authorized values and their meanings. Separators are allowed, and will be restituted "as is". Please note that these formats are case sensitive.

yy or yyyy: Year (number)
 dd: Day in month (number)
 EEE: Day in week (string)
 MM or MMMM: Month in year (respectively number or string)
 aa: AM/PM marker (string)
 HH: Hour in day (0-23)
 hh: Hour in AM/PM (1-12)
 mm: Minute in hour (number)
 ss: Second in minute (number)

Figure 1: Date/Time Tab Screen

Table 1: Time Tab Screen

Field	Description
Date Format	Required field - Sets date format.
Time Format	Required field - Sets time format.
Date and time fields	Required field - Sets the date and time format.
Duration fields	Sets a duration format.
Time Zone	Pull-down list for selecting the desired time zone.
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

Directory tab

Select the **Directory** tab to set the defaults directories used in transport screen.

Preferences

User preferences

Directories

Export Directory: /tmp

Upload Directory: /tmp

Download Directory: /tmp

Warning: above directories must exist on server side. No check is done by application. It is user responsibility to do so.

Reset Reset Tab Apply Cancel

Figure 2: Directory Tab Screen

Table 2: Directory Tab Field Description

Field	Description
Export Directory	Enables you to set the default directory for exporting.
Upload Directory	Enables you to set the default directory for uploads.
Download Directory	Enables you to set the default directory for downloads.
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

Note: The directories must be present on the NSP server side. See warning at the bottom of the Directory tab screen.

Mapping tab

Select the **Mapping** tab to set the xDR display parameters.

Preferences

User preferences

Mapping

XDR display

Translate ENUM values ☒

Point Code to Node Name ☒

Link Short Name to Long Name ☒

Reset Reset Tab Apply Cancel

Figure 3: Mapping Tab Screen

Table 3: Mapping Tab

Field	Description
Translate ENUM values	Selects whether ENUM values are translated or not Default is to select ENUM values translation.
Point Code to Node Name	Select this if you want to use the Node Name instead of the Point Code name in the xDR display. Default is to use Node Name.
Link Short Name to Long Name	Selects whether you can use long name (Eagle) for linksets. Default is to use Long Name.
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

Point Code tab

Select the **Point Code** tab, shown and described in the figure and table.

The screenshot shows the 'Preferences' dialog box with the 'Point Code' tab selected. Under 'Point code', 'Hexadecimal display' is selected with a radio button, and 'Split format' is checked with a checkbox. Under 'Bit groups', the 'Separation' dropdown is set to 'minus [-]'. Below this, there are four input fields for 'Group 0', 'Group 1', 'Group 2', and 'Group 3' with values 3, 8, 3, and 0 respectively. At the bottom, there are four buttons: 'Reset', 'Reset Tab', 'Apply', and 'Cancel'.

Figure 4: Point Code Tab Screen

Table 4: Point Code Tab

Field	Description
Hexadecimal display	European defaults are hexadecimal and display with Group 0-3, Group 1-8, Group 2-3, Group 3-0.
Decimal display	North American defaults are decimal and display with Group 0-7 and Group 1-5.
Split format	Select or deselect Split format .
Separation	Select a Bit Group Separation .
Group 0	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)
Group 1	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)

Field	Description
Group 2	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)
Group 3	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

CIC tab

Select the **CIC** tab to set the parameters for CIC and Bit groups.

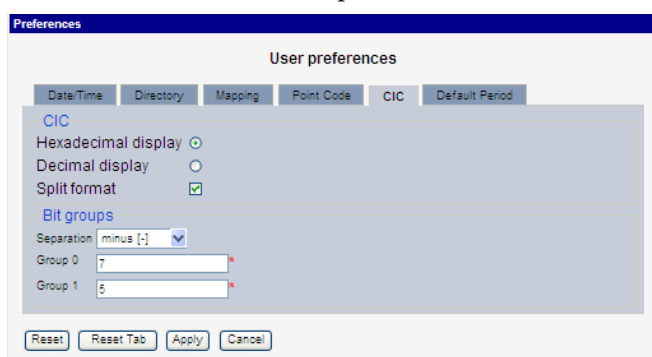


Figure 5: Formatting Rules (CIC) Screen

Table 5: CIC Tab Field Descriptions

Field	Description
Hexadecimal display	European defaults are hexadecimal and display with Group 0-7 and Group 1-5.
Decimal display	European defaults are hexadecimal and display with Group 0-7 and Group 1-5.
Split format	Select or deselect Split format .
Separation	Select a Bit Group Separation : Group 0:8, Group 1:8 .
Group 0	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)
Group 1	Type a value. (0-7 or 1-5 see hexadecimal or decimal display)
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

Default Period tab

Select the **Default Period** tab, for setting the default time period for beginning and ending time for traces (ProTrace only) .

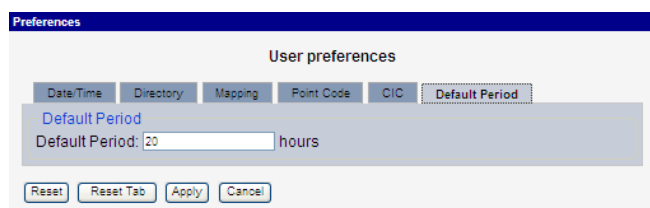


Figure 6: Default Period Tab Screen (ProTrace only)

Table 6: Default Period Tab Field Descriptions

Field	Description
Default Period (in hours)	Sets the default run time period for running traces. Default is 24 hours. Range 1-7200
Reset Button	Resets all the tabs to default values.
Reset Tab Button	Resets to default values for the specific tab.
Apply Button	Applies any changes to the system.
Cancel Button	Exits the screen.

After setting the formatting parameters, click **Next** to move to the next screen in the wizard.

Customer Care Center

The Tekelec Customer Care Center is your initial point of contact for all product support needs. A representative takes your call or email, creates a Customer Service Request (CSR) and directs your requests to the Tekelec Technical Assistance Center (TAC). Each CSR includes an individual tracking number. Together with TAC Engineers, the representative will help you resolve your request.

The Customer Care Center is available 24 hours a day, 7 days a week, 365 days a year, and is linked to TAC Engineers around the globe.

Tekelec TAC Engineers are available to provide solutions to your technical questions and issues 7 days a week, 24 hours a day. After a CSR is issued, the TAC Engineer determines the classification of the trouble. If a critical problem exists, emergency procedures are initiated. If the problem is not critical, normal support procedures apply. A primary Technical Engineer is assigned to work on the CSR and provide a solution to the problem. The CSR is closed when the problem is resolved.

Tekelec Technical Assistance Centers are located around the globe in the following locations:

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1-919-460-2150 (outside continental USA and Canada)

TAC Regional Support Office Hours:

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- **Caribbean and Latin America (CALA)**

Phone:

USA access code +1-800-658-5454, then 1-888-FOR-TKLC or 1-888-367-8552 (toll-free)

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- **Puerto Rico**

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- **Software Solutions**
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- **Asia**
 - **India**
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 - **Singapore**
Phone:
+65 6796 2288
TAC Regional Support Office Hours:
9:00 a.m. through 6:00 p.m. (GMT plus 8 hours), Monday through Friday, excluding holidays

DIH Documentation Library

DIH customer documentation and online help are created whenever significant changes are made that affect system operation or configuration. Revised editions of the documentation and online help are distributed and installed on the customer system. Consult your NSP Installation Manual for details on how to update user documentation. Additionally, a Release Notice is distributed on the Tekelec Customer Support site along with each new release of software. A Release Notice lists the PRs that have been resolved in the current release and the PRs that are known to exist in the current release.

Listed is the entire DIH documentation library of online help.

- Centralized Configuration Manager Administration Online Help

- Alarm Forwarding Administration Online Help
- Diagnostic Utility Administration Online Help
- ProTrace Online Help
- System Alarms Online Help
- ProPerf Online Help
- ProTraq Configuration Online Help
- Data Feed Export Online Help
- System Alarms Online Help

Locate Product Documentation on the Customer Support Site

Access to Tekelec's Customer Support site is restricted to current Tekelec customers only. This section describes how to log into the Tekelec Customer Support site and locate a document. Viewing the document requires Adobe Acrobat Reader, which can be downloaded at www.adobe.com.

1. Log into the [Tekelec Customer Support](#) site.

Note: If you have not registered for this new site, click the **Register Here** link. Have your customer number available. The response time for registration requests is 24 to 48 hours.

2. Click the **Product Support** tab.
3. Use the Search field to locate a document by its part number, release number, document name, or document type. The Search field accepts both full and partial entries.
4. Click a subject folder to browse through a list of related files.
5. To download a file to your location, right-click the file name and select **Save Target As**.

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This product may be covered by one or more of the following U.S. and foreign patents:

U.S. Patent Numbers:

6,456,845; 6,765,990; 6,968,048; 7,043,001; 7,155,512; 7,206,394; 7,215,748; 7,231,024; 7,286,516; 7,286,647; 7,401,360; 7,706,343; 7,844,033; 7,860,799;

Foreign Patent Numbers:

None.

Chapter 2

Introduction to ProTrace

Topics:

- *Introduction to ProTrace.....20*
- *Configuring Network Views for ProTrace.....21*
- *Opening ProTrace.....22*
- *Understanding the ProTrace Interface.....23*
- *xDR Viewer Page.....30*

Introduction to ProTrace

ProTrace is a near real-time, end-to-end, multi-protocol call tracing application. ProTrace has the capability of performing scenario-less traces for in-progress and completed calls, transactions and sessions.

ProTrace traces the calls, transactions and sessions based on xDRs generated by an IXP Subsystem. ProTrace can perform an *in-progress* display of a traced transaction/call/data session. The capability to perform the scenario-less inter-protocol tracing is the ProTrace built-in feature eliminating the need for defining complex scenarios. This section provides the high level architecture of the ProTrace application.

ProTrace is built on the NSP Platform and uses the various NSP common components such as Data Access Layer (DAL) and Centralized Configuration Manager (CCM) for its functionality. The data access layer provides the APIs to access the IXP Oracle database (for xDR sessions) through user-defined filters. CCM provides the configuration elements such as network view constituents (dictionaries, filters, link-sets etc), for the ProTrace application.

ProTrace operates within a network (sessions) context and enables you to manage (create, modify and delete) as well as store queries for a particular network view.

This figure depicts the overall architecture and interaction of ProTrace with the NSP server.

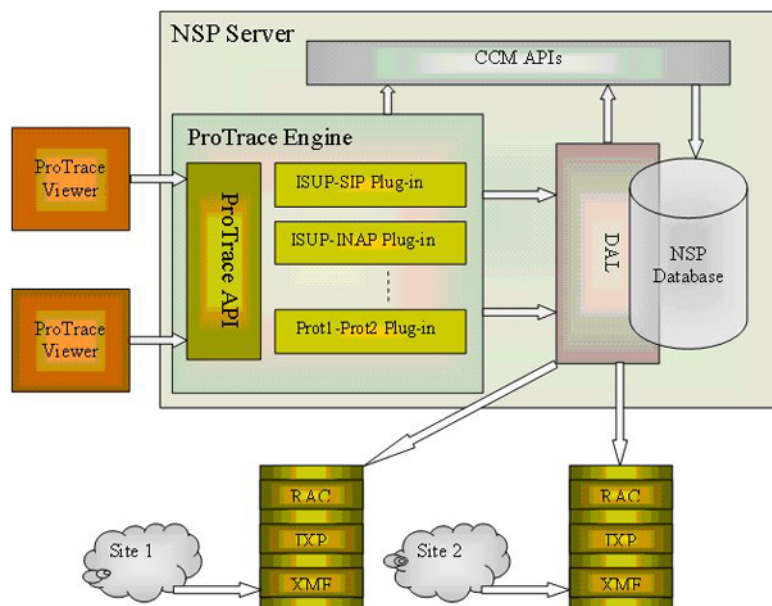


Figure 7: ProTrace Block Diagram

The *ProTrace Engine* and the *ProTrace Viewer* components comprise the ProTrace application. The *ProTrace engine* component provides the logic for inter-protocol call tracing. It also provides the plug-ins that support inter-protocol tracing. These plug-ins provide the mapping of EPIs for co-relating protocols. The *ProTrace engine* supports intra-protocol tracing by utilizing *Transaction Identifiers* generated by the IXP subsystem as well as partial xDRs (xDRs which are generated before the transaction or call is finished). In addition, the *ProTrace engine* also provides the APIs for the *ProTrace viewer* to initiate various operations such as: XDR filtering, initiating Trace, and managing ProTrace Filters.

The *ProTrace viewer* component serves as the end-user interface. This enables you to initiate and view either single or multiple traces (maximum five). Multiple users (the number of users is based on purchased licenses) can connect to ProTrace using a Web interface provided by the NSP platform.

ProTrace provides the following functionality:

- Real-time call in-progress trace display with message sequence diagram as required by the network troubleshooting users, in as many network situations and contexts as possible.
- Off-line tracing on stored data with at least 24HR back-search window capability

Note: The amount of back search available depends on the amount of storage and the call volume of your network.

- Easy tracing in advanced mobile networks or hybrid wireline PSTN/VoIP networks which can be very complex. Short-lived temporary identifiers allocated by networks makes tracing difficult (ex: TMSI, PTMSI) and are replaced in DIH by the identifier *reference number* that is based on a Tekelec patent.
- Optimizes tracing process by taking advantage of enrichment techniques during capture.
- The ability to view transactions using xDR Viewer which can trace both IPv4 and IPv6 addresses.

Configuring Network Views for ProTrace

ProTrace allows you to trace customer calls or transactions over IP-based networks. The application is capable of performing intra-network/protocol as well as inter-network/protocol tracing. The tracing feature of ProTrace is designed to start with a context of a Network View. (For more information on Network Views, see the Centralized Configuration Manager Administration Guide.)

This section provides an overview of configuring network views. The ability to configure ProTrace is limited to a user with the role *NSPConfigManager*. For more details on configuring ProTrace or the DIH System see the *Centralized Configuration Manager Administration Guide*.

Network Views-Overview

Network views are logical, user-defined groupings of elements in the DIH system and is used to denote some aspect, or perspective, of a customer network. For example, it could be the physical elements comprising a network, or at sub-networks, another carrier's network or a certain type of traffic on the network.

Network views can be nested and contain other network views that themselves may contain network views. Grouping elements together into network views allows you to divide up a network into more manageable units, not only for convenience (elements in a network view can be referred to from other parts of the system as a single unit, by referring to the network view) but also for authorization purposes.

For example, a Network View might consist of all nodes in a particular region. This means that when you start with a context (selection) of that region you are able to trace the calls or transactions that are monitored from the nodes defined within region network view. In case of real-time trace of a mobile call where the location of the mobile is not known, you can select the entire network to start the trace. But if you know the location of the mobile call, you can select the corresponding node in the network view for faster access.

Note: The directionality of a call is in context of whether it is node-centric or eagle-centric. DIH is node-centric and all directionality is based on this orientation.

Types of Network Views

There are three types of network views handled by ProTrace.

- Link views - that cover the management of linksets and links.
- All Sessions - Shows all the sessions
- Session views - that cover management for xDR sessions.

Setting up a Network View

These are the general steps in setting up a Network view for ProTrace.

Note: The ability to set up network and link views in ProTrace is limited to a user with the role *NSPConfigManager*.

Using CCM you:

1. Create a site.
(For more information on creating sites refer to the *Centralized Configuration Manager Administration Guide*.)
2. Create a host on the site.
(For more information on creating hosts refer to the *Centralized Configuration Manager Administration Guide*.)
3. Create link/Session based on network view.
(For more information on creating sites refer to the *Centralized Configuration Manager Administration Guide*.)

Opening ProTrace

Note: NSP only supports versions of IE 7.0 or later and Firefox 3.6 or later. Before using NSP, turn off the browser pop up blocker for the NSP site.

As an application on the NSP platform, ProTrace can be accessed from the NSP *application* board. To open ProTrace you must first log into NSP.

Logging into NSP

To log into NSP, you must first open the *NSP Home Portal*. To open the *NSP Home Portal*, follow these steps:

1. Using a Web browser, type the **IP Address**: `http://<IP Address>/nsp`

Note: Contact your system administrator for the IP Address where NSP and ProTrace reside.

Table 7: NSP Portal Page

Field	Description
User Name	Your system identification for authentication to access NSP
Password	Unique identifier for user authentication

The NSP *Portal* opens.

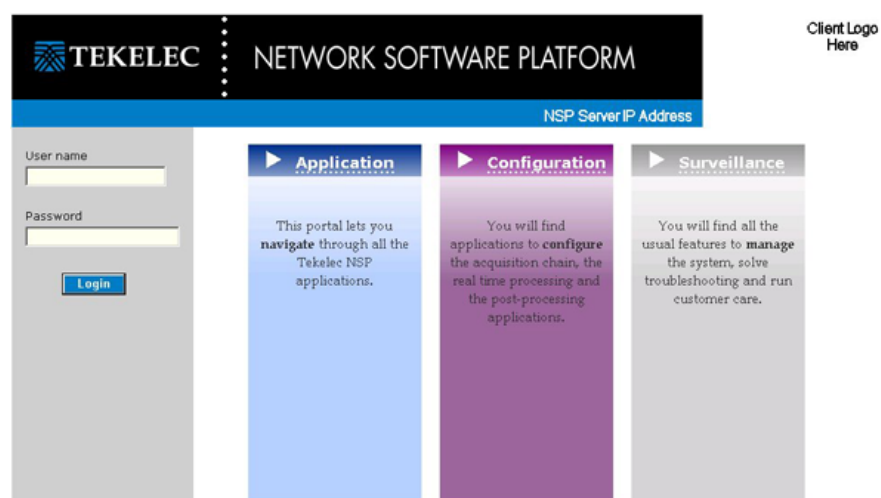


Figure 8: NSP Portal

2. Log into NSP by typing :

- a) Your Userid
- b) Your Password

Note: Check with your system administrator for your userid and password.

3. The NSP *Application Board* opens showing all currently deployed applications.

Click the **ProTrace** icon (located in the *Applications* section) to open the *ProTrace* application. The *ProTrace Home* page opens.

You can now begin using *ProTrace*.

Understanding the ProTrace Interface

The user interface for ProTrace is similar to that of other NSP applications.

Note: Do not use the Function Keys (F1 through F12) when using the NSP. Function keys work in unexpected ways. For example, the F1 key will not open NSP help but will open help for the browser in use. The F5 key will not refresh a specific screen, but will refresh the entire session and will result in a loss of any entered information.

For more information on the ProTrace screens, see:

[The ProTrace Main Screen](#)

[Column Heading Descriptions](#)

[Main Menu](#)

[Menubar](#)

The ProTrace Main Screen

The ProTrace main screen is divided into three main sections:

- Menu - shows application menus
- Network View Tree - lists all the sessions and link-based network views
- Session List - list of current sessions
- Query List - includes application toolbar

Table 8: ProTrace Main Page

Section/Field	Description
Header	<p>This section shows the:</p> <ul style="list-style-type: none"> • Hide Banner feature - that lets you collapse the banner section (see Banner section) • Link to NSP Platform Guide - this link opens the online help on how to use NSP interface and platform • User - shows the user name • Logout option • Client Logo
Banner	<p>This section shows:</p> <ul style="list-style-type: none"> • Application area • Option Menu Bar <p>Note: This section can be hidden by clicking <i>Hide Banner</i>.</p>
Toolbar	This section shows all the feature buttons for each page.
Network Tree	<p>Shows the two Network views</p> <ul style="list-style-type: none"> • Session - shows the xDR sessions in a network view • Link - shows all link-based network views • All sessions - shows all the sessions <p>The Network Tree can be expanded or collapsed by clicking + or -.</p>
Session List	Shows all the sessions for a network view or all sessions.

Section/Field	Description
Query List	Shows all the queries for a network or session element.

Header Section

The *Menu* section provides two menus as well as *User Preferences* and *Logout* functions. The Main menu and the Menubar both are discussed in this section.

Note: For more information on working with *User Preferences*, click the link to the *NSP Platform User Guide*.

Main Menu

The menu section includes a navigation menu on the top left-hand side of the page. [Figure 9: Main Menu](#) shows the *Main* menu part of the *Menu* section



Figure 9: Main Menu

This menu brings you to the various application areas in NSP such as:

- Home - the NSP Home page
- Management/Surveillance - contains Management and Diagnostic Utility, Audit Viewer, Security and System Alarms
- Configuration - contains CCM, ProTraQ Configuration, ProPerf Configuration, Data Feed, etc.
- Applications - contains NSP Applications such as ProPerf, ProAlarm, ProTrace, etc.

Menubar

The *Menubar* is part of the *Banner* section and has five pull-down menus.

Note: This section can be hidden by clicking *Hide Banner* in the Header section.

- File - that contains:
 - Import Trace - allows you to import trace files that were exported
- Views - that contains the main functionality of ProTrace
 - Call Related - switches to Call Related view and displays all Call Related queries for selected Network View
 - Non-Call Related - switches to Non-Call Related view and displays all Non-Call Related queries for selected Network View
 - Display Main Screen - Displays the main ProTrace screen

- Preferences - opens a pop-up window for configuring ProTrace for more information, see [Setting Preferences](#).
- Refresh Network Views - provides a means of refreshing the network views to give the latest information on network views.
- Configuration - that contains:
 - EPI - provides a means of working with EPI configuration (protocols) for more information see [EPI Configuration](#)
 - EPI Rules - enables you to set rules that govern the EPI for more information see [EPI Rules](#)
 - System Parameters - enables you to set various parameters for your traces such as:
 - Flex Matching Prefixes
 - Flex Number Length
 - Network Latency Interval
 - PDU Limit
 - QueryTimeout Limit
 - Refresh Interval
 - Trace Refresh Interval
 - Xdr Limit
- Help - that contains:
 - Help - the online help system for ProTrace
 - About - provides information on the version of ProTrace



Figure 10: ProTrace Menubar

Network view tree Section

The Network View tree section functions as the directory for ProTrace and lists the network views from the Network View perspective. The headings entitled Sessions View shows the network views and the Link View shows all the link-based network views.

Sessions list section

The session list shows either all the sessions as a list, or a list of only those sessions associated with the network view selected:

- **All Sessions** - This list shows all sessions in the system. With this view, you can select a single session and execute a query on the selected session.
- **Sessions View** - This list shows the sessions associated with the selected network view. With this view, the sessions in the session list are not selectable. Any query that is run is executed on all sessions from the selected network view.
- **Links View** - This list shows the sessions associated with the selected link-based network view. The sessions can be associated with a link-based network view in CCM. With this view, the sessions in the session list are not selectable. Any query that is run is executed on all sessions from the selected network view.

The sessions list contains 14 columns. You may need to scroll to see them all. Most of the column headings can be used to sort the displayed sessions list by clicking on the heading. Click once to sort in ascending order and again to sort in descending order for that column.

The column headings are:

- Session - session name.
- Start Date - the start date and time for the session
- End Date - the end date and time session
- Record Count - the number of records in the session
- Size (MB) - the approximate size of the session in the Oracle database
- Dictionary Type - type of the dictionary
- Format - the format of the session
- Protocol - the protocol of the dictionary
- Dictionary - name of the dictionary used
- Subsystem - the subsystem where the session is built and stored
- User Information - any other information about the session
- Owner - the owner of the session
- Creation time - the date the session was created

Some of the columns have a **Quick Filter** pull down you can select to only display sessions with that trait. For example, to only see sessions that use the ISUP ANSI protocol select ISUP ANSI from the **Protocol** pulldown. The columns that can be used for quick filters are:

- Dictionary Type
- Format
- Protocol
- Dictionary
- Subsystem

Note: The Start Date, End Date, Record Count and Size information is not displayed automatically, and these columns may be empty. To get these values, click the Obtain Session Period icon in the session list toolbar. This will not necessarily update the Record size and Record Count information, as that information is only updated during the Oracle nightly job.

Sessions list Toolbar

The toolbar provides a means of selecting and organizing xDR sessions.

Below is a description of each button on the toolbar.



Filter - clicking this button opens the *System Query Dialog* popup where you can filter the list of sessions displayed by the various columns and their values.



First page - clicking this button opens the first page of sessions.



Previous page - clicking this button opens the previous page of sessions.



Next page - clicking this button opens the next page of sessions.



Last page - clicking this button opens the last page of sessions.



Set Size - use this button to set the session list size from 10-20,000 per page.



Refresh - clicking this button re-loads the current screen and shows any changes that have been made.



Export - clicking this button opens up the Export popup window.



Permissions - use this to set the permissions for accessing the sessions. You must be a user with the role *NSPConfigManager* to set permissions.



Obtain Session Period and Size - clicking this button re-loads the current screen and updates the Session Period and Session Size columns.

Note: Obtaining the session period can be time consuming. To improve performance, reduce the number of sessions in the list by using a filter.



Multilink - clicking on this button opens the multilink popup screen where you can select more than one link to filter.



Selected Session or Network view - this icon shows the session or network view you have selected. Hover over the icon to see the type of the selected session or network view.

In addition to these buttons there is also a saved filters pull-down you can use to select a saved filter, and a page count showing what page out of the total sessions pages you are viewing.

Query list Section

The query table contains five columns. The table queries change depending on what view is selected (according to the protocol selected or included in the sessions view) but the columns are constant. Most of the column headings can be used to sort the list by clicking on the heading. Click once to sort in ascending order and again to sort in descending order for that column.

The column headings are:

- Query Name - that shows the name of the query
- Owner - shows the user name that created the query
- Replaced by - shows the user who last modified the query
- Creation time - shows the date the query was created

Query list Toolbar

The toolbar provides a means of selecting and organizing queries.

Below is a description of each button on the toolbar.

Filtering Mode/InProgress Trace - clicking this button toggles between Filtering Mode and In Progress Tracing. The button name will change to reflect this.



Filter - clicking this button opens the *System Query Dialog* page where you can filter out all non-essential queries.



First page - clicking this button opens the first page of queries



Previous page - clicking this button opens the previous page of queries.



Next page - clicking this button opens the next page of queries.



Last page - clicking this button opens the last page of queries.



Set Size - use this button to set the queries list size from 10-500 per page



Refresh - clicking this button re-loads the current screen and shows any changes that have been made.



Export - clicking this button opens up the Export window.



Create - clicking this button opens the Query Dialogue screen to add a specific query.



Modify - clicking this button opens the current query for modification.



Delete - clicking this button deletes the current query.



Add To Hotlist - clicking this button adds a query to the *Hot List*. A hot list is a list of frequently used queries that is separate from the total list of queries.



View - clicking this button enables you to toggle the display mode between all queries and only the Hot List queries. This feature is especially handy when you have very large lists of queries.



Execute query - clicking this button runs the selected query on the selected network view.



Execute link query - clicking this button runs an empty query on the selected link-based network view or on the selected links.



Permissions - clicking this button opens the *Permissions Dialogue* page that shows what privileges you have on the selected query and allows you to manage queries you have permission to access.

In addition to these buttons there is also a queries count showing how many queries are in the list and what range you are viewing.

xDR Viewer Page

The xDR viewer page shows the results of a query. This figure shows xDRs on top section, PDUs next, decode third and Layer Summary at the bottom.

The xDR viewer page can be divided into several different Layouts. (See xDR tool bar for more information on layout configuration.) In DIH the xDR viewer also has the capability to display either IPv4 or IPv6 formats.

- IPv4 is displayed as four group decimal format separated by periods (.) -- xxx.xxx.xxx.xxx
- IPv6 is displayed as eight group hexadecimal format separated by colons (:) --
xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx

Note: No other abbreviations for IPv6 format are supported in this release.

Protocol	Way	UnitsCount	BadStoredUnits	Transport Protocol	Successful	CancellationType	Address Type	IP Source	IP Destination	Source Port
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	SGSN Update Procedure	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	SGSN Update Procedure	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868
DIAMETER	Downlink	2	0	TCP	Yes	-	IP_V6	FD00:DEBA:D97C:F12::8A:8F1B	FD00:DEBA:D97C:F13::8A:8EB7	3868

Figure 11: xDR Viewer Page

If you want to see the PDU and the PDU decode each in a separate window, you can set the xDR viewer layout to single window and double click on an xDR. This will display the list of PDUs in a separate window. Subsequently, you can double click on a PDU to see its decode in a separate window as well.

Note: Only one PDU and decode window can be open at one time.

xDR Viewer Toolbar

Each of the function buttons unique to the xDR viewer toolbar is described separately.



Select Column - enables you to select what columns are displayed in the table as well as what order they appear in.



First row - clicking this button selects the first record row on the page.



Previous row - clicking this button selects the record row directly above the current record.



Next row - clicking this button selects the record row directly below the current record.



Last row - clicking this button selects the last record row on the page.



First page - clicking this button opens the first page of queries



Previous page - clicking this button opens the previous page of queries.



Next page - clicking this button opens the next page of queries.



Reverse Sorting - clicking this button reverses the sort order of the xDR list.



Set xDR Page Size - this shows how many xDRs are displayed per page, you can modify the number of xDRs on the page by typing in another number and clicking the **check** to the right. You can set the page size from 10 to 400 xDRs per page. A larger page size will take longer to display. You can also increase the display speed by reducing the number of columns shown. In addition, when you place the cursor on this icon, you get: the current page, the position (number), how the xDR is sorted and the number of xDRs on a page.



Pause refresh - stops automatic refresh so that you can work on filters or records without data changing.



Cancel - cancels the current process.



Display Main Screen - closes the current query and opens the initial query list page.



Start trace - executes a trace process.



Modify filter - opens the *Query dialog* screen of an existing query.



Recall filter - reruns the query using original filter.



Explain Plan - displays the detailed plan information.



XDR Finder - Opens the XDR Finder window.



Export - opens up the Export window.



Direct Excel Export - Exports directly to Excel.



Search - searches for specific xdr records.



Next search - continues search of xdr records.



Copy PDUs/Decoding - Copies the selected PDU or decoding information.



Change layout - enables you to change the page layout using a variety of combinations. See [Changing the Page Layout](#).



Session/Network view Selected - Shows the session or network view that is selected.



Query selected - clicking on this icon opens a small information pop-up showing the name and description of the query being run (see [Figure 2-11](#) for a view of the query information pop-up).

Column Heading Descriptions

ProTrace xDR page has a rollover function that shows the column description when the cursor is placed on the column heading. The column being described is underlined. The figure shown here shows an example of the rollover feature.

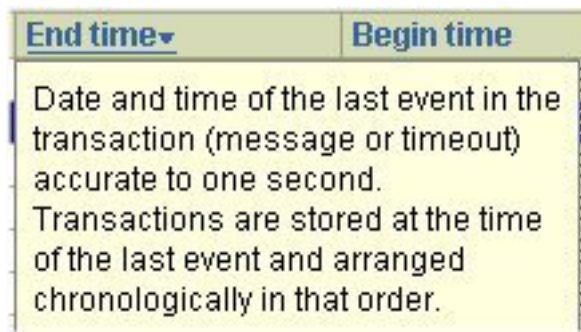


Figure 12: Column Heading Description Feature

Sorting by Columns

In the xDR viewer, you can sort by columns. To sort by column heading place the cursor over the **Column Heading** and click on it. The displayed records for that page (not the entire set) are sorted according that heading. If you click the heading again, the sort order is reversed.

Hidden xDRs, PDUs and Decoding

xDRs, PDUs and PDU decoding can be hidden in ProTrace. The ability to hide xDRs, PDUs and PDU decoding is configured in CCM (for more information see the Centralized Configuration Manager Administration Guide) from the Home page or the Mediation perspective. The following data can be hidden in ProTrace.

Note: For users with role NSPBusinessUser or NSPBusinessPowerUser if Decode layer is set to Hide or Summary, then all hex codes for that layer will be masked (hex numbers replaced by **).

xDR Hiding

Fields

Number of characters (up to total number of characters)

Columns

PDU Hiding

Fields

Number of characters (up to total number of characters)

PDU Summary

PDU Decode Hiding

Hexadecimal values (header of the decoding section)

Columns 1, 3 and 4

PDU decode title (column 2)

Chapter 3

Setting ProTrace Preferences

Topics:

- [Overview.....35](#)
- [Configuring Trace Display Preferences.....35](#)
- [System Parameters.....37](#)
- [EPI Configuration.....39](#)
- [EPI Rules.....43](#)
- [Changing the Page Layout.....45](#)
- [Setting User Preferences.....45](#)

Overview

This chapter provides information on setting *preferences*, *system parameters*, *EPI settings*, and *Page Layout* in *ProTrace*.

Configuring Trace Display Preferences

The *ProTrace View* menu contains a *Preference* option that enables you to configure attributes and decode colors.

Opening the Preference Option

To open the Preference option:

From the menubar Select **View > Preferences**, the Preferences page opens shown in [Figure 13: Preferences Page](#).

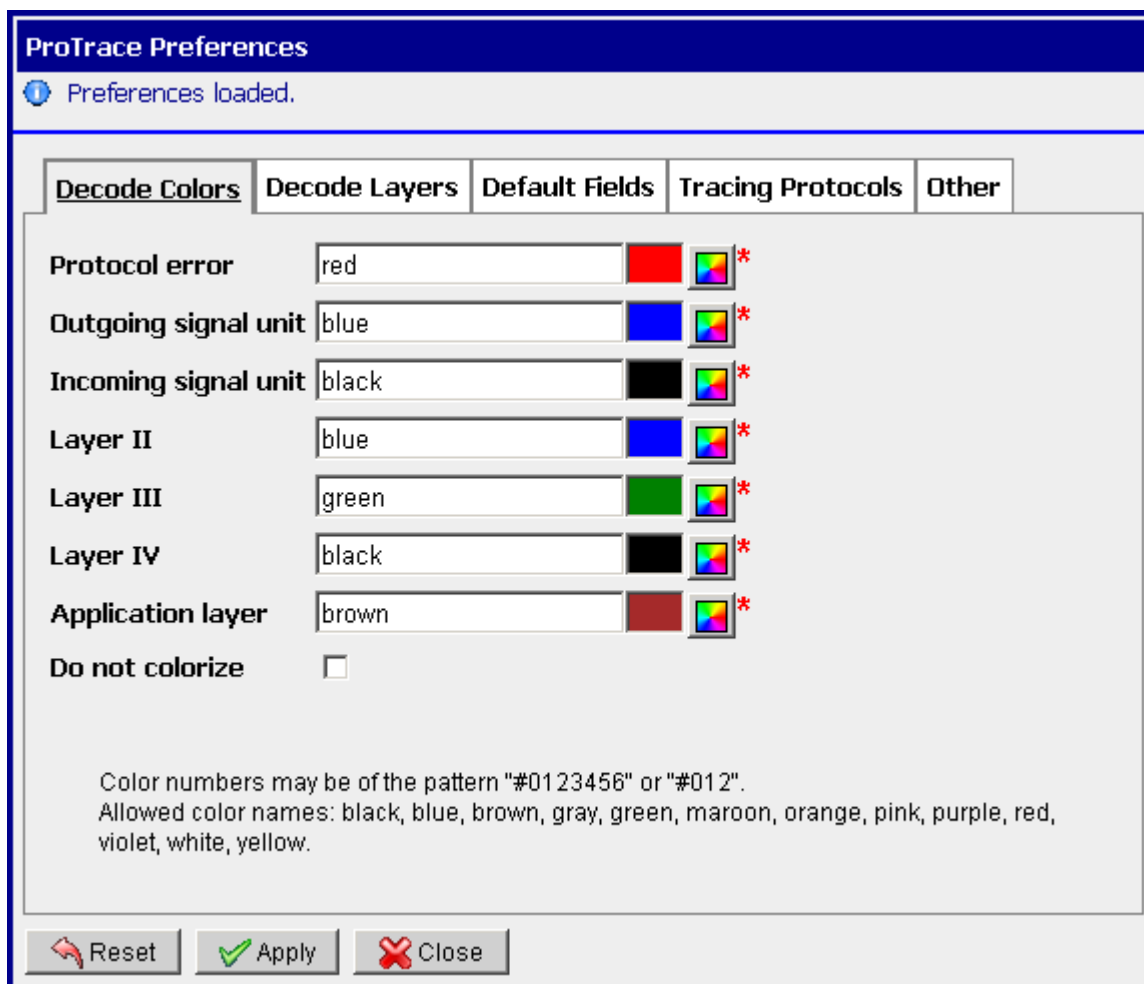


Figure 13: Preferences Page

The Preferences page has five tabs. They are:

- Decode Color - enables you to customize the colors for protocol errors, outgoing signal unit, incoming signal unit, etc.
- Decode Layers - enables you to hide, show a summary or show detail of records
- Default Fields - enables you to select fields for each protocol, that are displayed during filtering
- Tracing Protocols - enables you to specify if the xDRs and PDUs of each protocol will be displayed in trace

Note: In "Trace Viewer" you have an option to modify the "tracing protocols" selection for a particular trace. See [Managing Protocol Filters](#).

- Other - enables you to select the option of enabling flex matching, and to enable a Java Applet for displaying xDR tables.

Setting Preferences

Follow these general steps to set ProTrace preferences.

1. Select **View ->Preferences**, the *Preferences* page opens.
2. Select the **Tab** where modifications are to be made.
3. Make the desired modifications (setting colors or enabling/disabling a feature).
4. Click **Apply**.

The modifications are saved.

Note: To reset the preferences to default settings, click *Reset*.

Note: For users with role NSPBusinessUser or NSPBusinessPowerUser if Decode layer is set to Hide or Summary, then all hex codes for that layer will be masked (hex numbers replaced by **).

Configuring PDU decode Colors

This feature enables you to configure PDU decode color preferences. Follow these steps to configure decode color preferences.

1. From the menu, select **View -> Preferences**.
2. Select the **Decode Colors** tab.
3. Change decode colors in **Layer 1** and **Layer 2**.
4. Click **Apply** the colors are set for this preference.

Enabling and Disabling Flex Matching

This function enables or disables extended matching during tracing. With flex matching you can filter on a subset of address digits.

Flexible Matching is available for all filters and traces, (whether predefined or not), when address digits are involved.

Note: The field (EPI) will be queried by flex matching if the "Flex Matching" function is enabled and if a given EPI is enabled for flex matching. (See [Configuring EPIs](#))

Note: Enabling of flex matching function has a strong impact on performance.

Complete these steps to enable the *Flex matching* feature.

1. From the menu, select **View -> Preferences**.
2. Select the **Other** tab.
3. Click the **Flex matching** check box.
4. Click **Apply**.

Flex matching is enabled.

System Parameters

The *System Parameters* feature enables you to set the following functions:

- Flex Matching Prefixes - (default - none) a semi-colon separated list of prefixes, for example, 0;31;0031 or none if turned off.

- FlexNumber Length - (default - 0) length of the pattern number used for analysis without a prefix, for example, if set to 9, ProTrace will try to find the same pattern of 9 consecutive digits.

Note: These two parameters are related to the Flex Matching function for tracing. When these two parameters are not set (FlexMatching Prefixes=When FlexMatchingPrefixes) and FlexNumberLength is set, then the flex matching is restricted to the prefixes from FlexMatching Prefixes. (See [Enabling and Disabling Flex Matching](#) for more information.

- Network Latency interval - range 5 seconds with no upper limit (default 10 seconds). The time (in seconds) between when the last MSU is captured and the xDR is generated and appears in the database. This is crucial for real-time. The xDRs have timestamp X, but it appears in the database in time X+latency. If the *NetworkLatency* is less than real latency then we may miss some XDRs, if it is dramatically more then the real latency, we have to search a bigger interval and the query may take longer depending on the traffic.
- Trace Latency - (in seconds, default 0) When starting an in-progress call trace, this parameter extends (to the past) the time interval in which ProTrace searches the xDRs from the initial query (the query used when starting the call trace). For example: when Trace Latency is set to 600, and in-progress call trace is started with an ISUP query, ProTrace will extend the search for ISUP calls 10 minutes back into the past. This may result in finding partial xDRs for calls in progress as well as final xDRs of already finished calls.
- PDU Limit - is the maximum number of PDUs allowed to display in the PDU view (the second view) of Trace Viewer. If the number of PDUs exceeds the limit the trace is stopped (default is 5000).
- Query time out limit - (default 600 seconds) provides a time limit for the query to run.
- Refresh interval - (default 10 seconds) the refresh time interval (in seconds) for the XDR Viewer (filter results) in real-time filtering. After this interval the query is re-executed and new results displayed.
- Trace Optimization - (default - 2) defines the Oracle optimization for tracing queries.
 - 0 - Oracle will decide on its own optimization based on internal Oracle indexes.
 - 1 - Oracle will access the rows using TimeTag index instead of field indexes.
 - 2 - Default value, supposed to give the best performances. It uses field indexes when it is possible for all EPIs. If any field is not indexed, then StartDate/TimeTag indexes (TO-1) is automatically used.
- Trace Refresh Interval - the refresh time interval (in mili-seconds) for the Trace Viewer (trace result). In this interval the Trace GUI is updated and displays new xDRs and PDUs which belong to the call/transaction (default 10 seconds).
- Xdr Limit -maximum number of xDRs allowed to display in the XDR view (the first view) of Trace Viewer. If the number of XDRs exceeds the limit (1000) the trace is stopped.

1. To open the *System Parameters* screen, select **Configuration > System Parameters**.

System Parameters	
System Parameters loaded.	
NetworkLatency	10
PduLimit	5000
QueryTimeout	20
RefreshInterval	10
TraceRefreshInterval	5000
XdrLimit	1000

Apply Close

Figure 14: System Parameters Screen

2. To set ProTrace parameters, type in a specific value (number) or time interval, (in seconds or milliseconds), suitable for your traces for each of the parameters and click **Apply**. The changes are saved.

EPI Configuration

End Point Identifiers (EPI) are the fields used in a scenario-less tracing to correlate between different protocols or legs of a call/transaction/session.

Defining a field as an EPI means that the value contained in this field will be taken into account to correlate other records based on this value. This means that an EPI must not be too generic (for example, a Calling SCCP Address is not specifically related to a customer but to many transactions). Also, it is very important to adapt EPI rules to avoid having too many records not related to the trace found by the system. This can happen if a field defined as an EPI (such as an MSISDN) is filled by a “generic” value. In this case, the content of the field should not be kept as a value to use for further queries.

Note: EPI configuration is only available to users with *NSP Administrator* privilege.

Configuring EPIs

Follow these steps to configure EPIs.

1. Select **Configuration > EPI**.

The *EPI* screen opens .

2. Select a **Protocol** from the pull-down menu.

The screen changes to show the parameters for that protocol.

3. Fill in the **Protocol Time Parameters**.

The **Protocol Time Parameters** define the time range used for searching for new xDRs. This time range is related to BEGIN TIME and END TIME of discovered xDRs and uses a Positive and a Negative value.

The range for both positive and negative rules are 2-90000 seconds.

The **Guaranteed length** parameter allows you to enhance the search period to END_TIME + Guaranteed length. This parameter is used for search optimization and corresponds in the to the longest call or transaction the system is guaranteed to find.

4. Select (or de-select), the **EPI** parameters for that protocol.
 - a) Flex - defines whether the "Flex matching" is used for given field (see [Enabling and Disabling Flex Matching](#))
 - b) Enabled - enabling/disabling the particular field as EPI
5. Click **Apply**.
The changes are saved.

EPI Rule Classes

EPI rules should be used to "clean-up" the results of a call trace and limit the hits when tracing a call. Fore instance, an EPI rule can be constructed to exclude some numbers in call tracing, for example, the short number for calling voice mail.

Note: EPI Rules follow Java Regular Expressions.

Rule Classes and Explanations

Character Classes (bracket expression)	
[abc]	a,b or c (simple class)
[^abc]	Any character except a, b or c (negative)
[a-zA-Z]	a through z, or A through Z, inclusive (range)
[a-d[m-p]]	a through d, or m through p: [a-dm-p] (union)
[a-z&& [def]]	d, e or f (intersection)
[a-z&& [^bc]]	a through z, except for b and c: [ad-z] (subtraction)
[a-z&& [^m-p]]	a through z, and not m through p: [a-lq-z] (subtraction)

Predefined Character Classes	
.	Any character (may or may not match line terminators)
\d	A digit: [0-9]

Predefined Character Classes	
\D	A non-digit: [^0-9]
\s	A white space character: [\ t \ n \ x0B \ f \ r]
\S	A non-white space character: [^ \ s]
\w	A word character: [a-zA-Z_0-9]
\W	A non-word character: [^ \ w]

Rule classes combined with meta characters

Meta character	Meaning
X?	X, once or not at all
X*	X, zero or more times
X+	X, one or more times
X{n}	X, exactly n times
X{n,}	X, at least n times
X{n,m}	X, at least n but not more than m times

Protocol Time Parameters for EPI Rules

Protocol time parameters allow some tolerance in the time comparison done in finding matching xDRs.

The time comparison rule for a given EPI "X" found in xDR with start time "S" and end time "E" is:

LOOK for X where TIMETAG between (S;E) OR START_DATE between (S;E)

Note: TIMETAG = End Date

Two examples of protocol time parameter use

- Negative (2-90000) and Positive (2-90000) effect

The time protocol tolerances fields (called here negativeT and positiveT) are used to determine the time range for the search.

The extended rule will be:

LOOK for X where TIMETAG between (S - negativeT; E + positiveT) OR START_DATE between (S - negativeT; E + positiveT)

This comparison of time is based on each xDR from which a new query is launched to find other xDRs (based on EPI values found in the xDR).

- Guaranteed length (-1-90000) effect

The concept of guaranteed length is used to give better guarantee to find "long transactions."

This guaranteed length extends the query to:

LOOK for X where TIMETAG between (S - negativeT; E + positiveT) OR
 [START_DATE between (S - negativeT; E = positiveT) and TIMETAG between (S
 - negativeT; E + positiveT + GUARANTEED_LENGTH)]



Figure 15: Graphical Representation of Guaranteed Length

The goal is to limit the search duration, by giving boundaries for the "end" of the search within an identified limit, as on the one hand, there are possibilities of long transactions, and on the other hand, (because of the data storage mechanism), it optimizes the query efficiency.

The value of this parameter is given in seconds.

The value "-1" means the system takes a default value that is 2 hours (7200 seconds).

EPI Rule Examples

These are two examples of using EPI rules.

In the first example there are two rules stated:

- Do not consider as a valid EPI, all values like FF, FFFF, etc.
- Do not consider as a valid EPI the value 888, for example in a voice mail number.

EPI Rules			
Protocol	EPI Name	Positive	Pattern
*	*	Negative	(FF)+
*	*	Negative	888

Figure 16: Example 1 of EPI Rule Usage

In the second example a rule that states:

- Ignore for all protocols when a B_Number starts with 65 (considered as a prefix) followed or not by several digits.

EPI Rules			
Protocol	EPI Name	Positive	Pattern
*	*	Negative	(FF)+
*	*	Negative	888
*	BNumber	Negative	65[0-9]*

Figure 17: Example 2 of EPI Rule Usage

EPI Rules

ProTrace also provides a means of setting up EPI filtering rules that help you select specific records to trace. The following recommendations apply to EPI rules.

- If the EPI candidate passes the positive rule, it is considered as true EPI and no other rules are checked and the process is finished.
- If the EPI candidate passes the negative rule, it means that the tested EPI is not a real EPI and it is ignored. In both cases if the rule doesn't pass, the next rule is tested.
- If there are no other rules, the candidate is validated as the real EPI (the implicit rule is that every EPI is valid).

Note: EPI rules can only be configured, modified or deleted by users with *NSP Administrator* privileges.

Configuring EPI Rules

Complete these steps to configure the EPI rules for your system.

1. Select **Configuration > EPI Rules**.

The *EPI Rules* screen opens shown in [Figure 18: Epi Rules Screen](#).

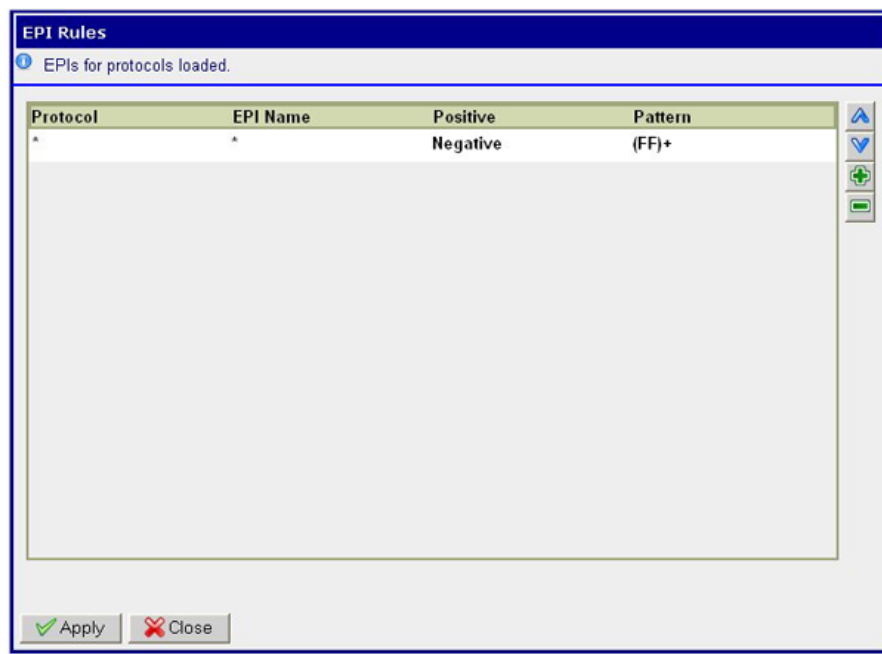


Figure 18: Epi Rules Screen

2. Click **Add**.

The screen change to add another row shown in [Figure 19: Epi Rules Screen Add](#).

Note: Adding a rule provides you with ways to broaden or narrow your traces.

Note: *'s signify wildcards. To specify specific rules you select from the options in each of the fields.

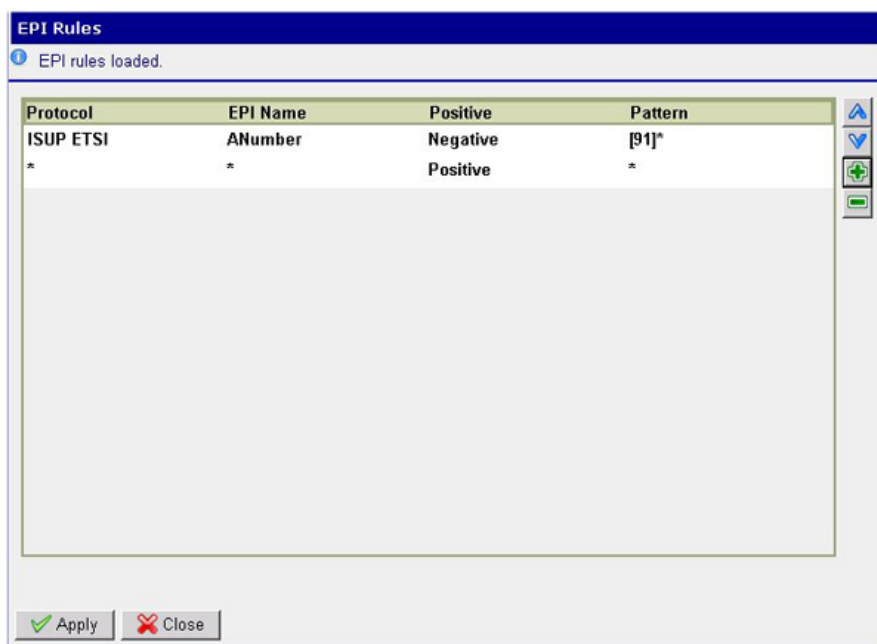


Figure 19: Epi Rules Screen Add

3. Double-click on the row to open the fields.
4. Select the **Protocol** from the pull-down list.
5. Select the **EPI Name** from the pull-down list.
6. Select whether the rule will be **Positive** or **Negative** (see [EPI Configuration](#)).
7. Type in a specific **Pattern** for the rule.

Note: Type a specific Pattern for the rule. The pattern form is defined by "Java Regular Expression" rules. Here is an example:

<http://java.sun.com/docs/books/tutorial/essential/regex/>

8. Click **Apply**.
The rule is saved to the system.
9. Click **Close** to close the screen.

Modifying an EPI Rule

Complete these steps to modify an existing EPI rule.

1. Select **Configuration > EPI Rules**.
2. Select a **rule** and double-click on it.
The record row changes to show pull-down lists. .
3. Make the **appropriate modifications** to the rule.
4. Click **Apply**.

The modifications are saved to the system.

5. Click **Close** to close the screen.

Deleting an EPI Rule

Complete these steps to delete an EPI rule.

1. Select **Configuration > EPI Rules**.
2. Select the **Rule** to be deleted.
3. Click **Delete**.
4. Click **Apply**.

The rule is deleted from the system.

5. Click **Close** to close the screen.

Changing the Page Layout

You can change the page layout of the XDR viewer (or Trace viewer) to re-arrange or hide the xDR, PDU, and Full Decode views. To change the layout follow these steps.

Note: Only users with the NSP Business Manager privileges can change the layout.

1. Click **Change Layout**.

The layout pop-up opens.

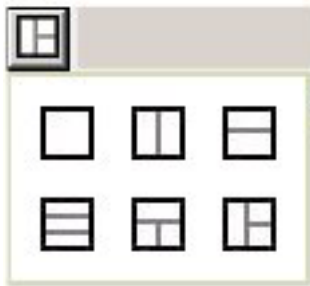


Figure 20: Layout Button With Layout Choices

2. Select a **Layout**.

The page layout changes to match your choice. This will now be the default layout for this session type.

Setting User Preferences

User Preferences feature provides a way to configure the following parameters:

- Time format

- Directory
- Mapping
- CIC settings
- Point Code
- Default Period

Setting Time Format

Follow these steps to set the time format.

1. Click **User Preferences** on the Application board page.
The User Preferences page opens.
2. Select the **Time** tab to open the Time formatting interface .
Note: You can follow the Tips provided on the page to help you configure the time format to your needs.
3. Select the **Date Format** format.
4. Select the **Time Format** format.
5. Select the **Date and time fields** format.
6. (Optional) Select the **Duration fields** format.
7. (Optional) Select the **Time zone**.
Note: You must set the time to the correct location to get correct time.
8. Click **Apply** to save settings.
Note: To reset the time format to default settings, click **Reset Tab**.

Setting Enumeration Preferences

You can set the Mapping settings using the *User Preferences* feature. Mapping is used by xDRs to display the text values instead of numeric values.

Follow these steps to set enumeration Mapping preferences.

1. Click **User Preferences** on the Application board page.
The User Preferences page opens.
2. Select the **Mapping** tab to open the *Directory* interface.
3. Check **Translate ENUM values** if you need to translate values.
4. Click **Apply** to save the changes.
5. (Optional) You can click **Reset Tab** to reset the default values.

Setting Point Code Preferences

The User Preferences feature enables you to set the Point Code preferences for your system. A Point Code is a unique address for a node (Signaling Point), used to identify the destination of a message signal unit (MSU).

Follow these steps to set the Point Code preferences.

1. Click **User Preferences** in the Application board.
The User Preferences page is displayed.
2. Click the **Point Code** tab.
The Point Code page is displayed. The red asterisk denotes a required field.

The screenshot shows the 'User preferences' dialog box with the 'Point code' tab selected. The dialog has a blue header and a light blue body. At the top, there are tabs: 'Time', 'Directory', 'Mapping', 'Point code' (selected), 'CIC', 'Alarms', and 'Privacy'. Below the tabs, the 'Point code' section contains three options: 'Hexadecimal display' (radio button), 'Decimal display' (radio button, selected), and 'Split format' (checkbox, checked). Below this is the 'Bit groups' section, which includes a 'Separation' dropdown menu set to 'minus [-]' and four input fields for 'Group 0', 'Group 1', 'Group 2', and 'Group 3'. The values in these fields are 3, 8, 3, and 0 respectively. Each input field has a red asterisk to its right, indicating it is a required field. At the bottom of the dialog, there are four buttons: 'Reset', 'Save as default', 'Apply', and 'Cancel'. A 'Reset for Point code' button is also present within the 'Bit groups' section.

Figure 21: Point Code Tab

3. Select either **Hexadecimal display** or **Decimal display**.
4. Select or de-select **Split format**.
If **Split format** is checked, the Bit groups settings in the box below are active. If **Split format** is not checked, Bit groups settings are not applicable.
5. If you selected Split format above, go to the next step. If you did not select Split format, go to step [Step 8](#).
6. In the Bit groups panel, use the drop-down box to select the **Separation** type .
7. Type in values for **Groups 0-3**.
8. To reset the point code preferences to default settings, click **Reset for Point code**. (The bottom **Reset** button resets all the tabbed pages to default settings.)
9. Click **Apply** to save your settings.

Setting CIC Preferences

The Circuit Identification Code (CIC) provides a way to identify which circuit is used by the MSU. You can use the User Preferences feature to set the CIC settings for your system.

Follow these steps to set the CIC preferences.

1. Click **User Preferences** on the Application board page.

The User Preferences page opens.

2. Select the **CIC** tab to open the **CIC** interface shown in .
3. Select the type of **CIC** (Hexadecimal, Decimal).
4. Select or de-select **Split format**.
5. Select the **Bit group Separation** (if split format is selected).
6. Type in the values for **Group 0** and **Group 1** values.
7. Click **Apply** to save your settings.

Note: To reset the time format to default settings, click **Reset Tab**.

Note: The North American defaults are:

- a) **CIC** = Decimal display
- b) Bit groups
 - Group 0:8
 - Group 1:8

Setting Directory Preferences

You can use the User Preferences feature to set the Directory preferences for your system.

Follow these steps to set the Directory preferences.

1. Click **User Preferences** on the *Application board* page.
The User Preferences page opens.
2. Select the **Directory** tab to open the *Point Code* interface.
3. Enter the exact path of the **Export Directory**, **Upload Directory**, and/or the **Download directory**.
Note: These directories must exist on the server for the Export, Upload/Download to work correctly.
4. Click **Apply** to save your settings.

Setting Default Period Preferences

The User Preferences feature enables you to set the Default Period preferences for your system.

Follow these steps to set the Default Period preferences.

1. Click **User Preferences** in the Application board.
The User Preferences page is displayed.
2. Click the **Default Period** tab.
The Default Period page is displayed.
3. Enter the Default Period in hours.
4. Click **Apply** to save your settings.

Chapter 4

Transaction/Call/Data Traces

Topics:

- *Trace Overview.....50*
- *Filtering Modes and Managing Queries.....50*
- *xDR Viewer.....69*
- *Exporting Results.....72*

Trace Overview

ProTrace provides you with the ability to perform a trace in order to identify a particular customer or network related problem. You can identify the customer-related problem by starting a trace based on customer-related identifiers. For the historical customer-related trace, you initiate the trace by performing two steps.

The first step is to filter the xDRs based on the user-defined criteria. For example, you create a filter to list all the xDRs whose ANumber = 9192436596. ProTrace lists all the xDRs for completed calls. The second step is to select a particular xDR and start a trace.

For the real time customer related traces, you enter the customer identifier for the protocol(s) to be traced (See EPI). Based on the identifier you specify, ProTrace has the capability of tracing the transactions, calls and data sessions that transcend intra or inter protocols. ProTrace starts the trace in response to the customer/terminal identifier specified by the actor, for example, ANumber, MSISDN, IMSI, IMEI, SIP@, etc.

In addition, you can identify network-related problems by starting a trace based on network-related identifiers. As with historical customer traces, you go through a two-step process to initiate a network-related trace.

The first step, is to filter the xDRs based on the user-defined criteria. For example, you create a filter to list all the xDRs whose CAUSE VALUE = 'Unsuccessful'. ProTrace lists all the xDRs for completed and in-progress calls. In the second step you select a particular xDR and start a trace. Based on the chosen xDR, ProTrace has the capability of tracing the calls, data sessions and transactions that transcend intra or inter-protocols. In achieving a network-related trace you manage (create, modify, delete) protocol filters that enable you to create simple or complex filters. In addition, you can focus on a particular xDR data set and choose the desired xDR for starting a trace. Executing the filter results in an xDR Viewer display enabling you to browse xDRs and choose the desired one for initiating the trace.

Filtering Modes and Managing Queries

You obtain the information you want by creating and managing queries. ProTrace provides a wizard to help you create queries. Once a query is created, you can run, modify or delete the query.

When using ProTrace queries there are two modes available: Filtering Mode and In Progress Tracing, which are selected using the **Filtering Mode/InProgress Trace** toggle button in the Query list toolbar.

When ProTrace is in **Filtering mode**, executing a query will always display the XDR viewer with result of the query.

When ProTrace is in **In Progress Tracing** mode, executing a query will always start a real-time trace in the Trace viewer. In this mode you can only create a trace query with EPI conditions using only the equal operator.

Note: In Progress Tracing may not be available depending on your product licensing and installation.

Note: If an IXP storage server is in "Query" state, no configuration actions can be undertaken. All servers must be in "Active" state when sessions are created for queries on such sessions to be successful.

Otherwise, if a query is launched in ProTrace on a newly created session, a "Unable to execute query: ORA-00942: table or view does not exist." will appear.

Naming and Describing a Query

Complete the following steps to name and describe a query.

1. Select a session from **All Sessions** or **Network View**.
A list of saved queries compatible with the selected session or network view is displayed.
Note: The query list is filtered based on your privacy rights.
2. Click **Create** to create a new query.
The Query dialog opens.
3. Type in the **Name** of the query.
4. (Optional) Type in a **Description** of the filter.
This is useful if the filter is shared with other users.

Adding One or More Dictionaries to a Query

Note: Dictionaries are discovered in CCM and imported into ProTrace.

When creating a query, you can add one or more dictionaries. This enables you to select one or more protocols for your queries. After you have named and described the query, can select one or more Dictionaries for the query. Complete the following steps to add dictionaries to a query.

1. In the **Available dictionaries** field, select the **Dictionary** for the filter.
2. Click the **Add** button beside the Available Dictionaries field.
3. Repeat steps 1 and 2 to add additional dictionaries.
You can add multiple dictionaries. For each dictionary selected, another tab appears with the name of the dictionary.

Query Dialog

Dictionary has been loaded.

Name: Description:

Available dictionaries:

SS7 ISUP ANSI CDR 2.5.0 | Displayed Fields | Split Params

	Field	Operator	Value
<input checked="" type="checkbox"/> A	A-number	>	000-000-0000

Operator: ☒ And ☐ Or ☐ Use Brackets

Expression:

Figure 22: Query With a Dictionary Selected

Creating Conditions for a Query

You can fine-tune your query by creating conditions. Complete these steps to add a condition to your query.

1. Select the **Dictionary** tab for the condition you want to create.

Note: If there are multiple dictionaries for the filter, create the conditions for each dictionary separately.

Query Dialog

Dictionary has been loaded.

Name: Description:

Available dictionaries:

SS7 ISUP ANSI CDR 2.5.0 | Displayed Fields | Split Params

	Field	Operator	Value
--	-------	----------	-------

Operator: ☒ And ☐ Or ☐ Use Brackets

Expression:

Figure 23: Dictionary Screen

2. Click **Add** (located on the bottom section of the screen) to create a condition for the filter.
The condition fields appear on the Dictionary screen.

Query Dialog

Dictionary has been loaded.

Name: Test Query Description: This is a test query

Available dictionaries: [dropdown] [Add] [Remove]

SS7 ISUP ANSI CDR 2.5.0 Displayed Fields Split Params

	Field	Operator	Value
<input checked="" type="checkbox"/> A	A-number	>	000-000-0000

[Add] [Delete] Operator: ☒ And ☐ Or ☐ Use Brackets

Expression: A

[Save] [Save As] [Apply] [Cancel]

Figure 24: Dictionary Screen with one condition for A-number

3. Select a **Field** from the field list.

You can mouse over the question mark icon next to the Field pulldown to see information about the selected field.

Note: Indexed Fields are highlighted in Red.

Select a field ...

Select a field ...

Show all Epi fields ...

Fields:

- A-number
- B-number
- Charge Number
- Generic Address Parameter

Figure 25: Example of Indexed Fields

4. Select an **Operator** from the Operator field.

You can mouse over the question mark icon next to the Operator pulldown to see information about the selected operator.

Note: The only operators that are listed are those that can be used with that field.

5. Select or enter a **value** for the condition.

Note: For example, all A-numbers greater than 000-000-0000.

At this stage you can go to the Displayed Fields tab to select the fields you want or you can create more conditions. See [Creating Multiple Conditions for a Query](#) to create multiple conditions.

Note: To find records with a NULL property, make sure to use "equals NULL" condition. For example, MSISDN = NULL.

Creating Multiple Conditions for a Query

ProTrace provides specific Operators that you can use when creating multiple conditions for a query. Complete these steps to create multiple conditions.

Note: If you have multiple dictionaries you can create conditions for each dictionary.

1. Select the **Dictionary** for the condition you want to create.
2. Select the **Operation** to be used for the condition.

You can select any one of three operations .

- And
- Or
- Use Brackets (if you want to tailor your filter for specific operators.)

The figure shows a query with multiple conditions and an operator. The expression for the query is shown in the expression field.

3. To create a new condition, click **Add** (located on the bottom section of the screen).
4. Select a **Field** from the Field list.
5. Select an **Operator** from the Operator field.

Note: The only operators that appear are the ones allowed with the field.

6. Select or enter a **value** for the field.

Note: Acceptable values are validated against the data type of the field. You have an option of entering wild card characters such as: "*" or "?". In addition to wild cards, you can use "~=" for address Digits and enter the subset of digits to use the Flex Matching feature. Lastly, for address fields like CdPN, CGPN, redirecting number, dialed digits and routing number, you also have the option of entering the HEX digits like B, C and D.

Table 9: Field Types and their Values

Type	Format	Multiple Values	Wildcards ("?" for single character, "*" (start) for multiple characters)
BCD_ADDRESS	All hexadecimal characters (0-9, A-B) No prefix needed	Yes	Yes, in all places

Type	Format	Multiple Values	Wildcards ("?" for single character, "*" (start) for multiple characters)
CIC	\$ as prefix for hexadecimal values, none as prefix for decimal, "-" for field separator depending on user preferences, * for wildcard	Yes	Only * (Only at the end)
DUMP	\$ as prefix (With or without space between hexadecimal values) (0-9,A-B)	Yes	No
ENUM	ENUM Integer *, ? for wildcards	Yes	Yes, in all places on label only
HEXADECIMAL	\$ as prefix for hexadecimal (0-9, A-B) values, none as prefix for decimal	Yes	No
INTEGER	All numbers	Yes	No
PERCENT	As a decimal or with % (For example, 90% can be expressed .9 or 90%)	Yes	No
IP_V4	4 numbers (0-255) separated by "."	Yes	No
IP_V6	Hexadecimal	Yes	No
MS	hhh:mm:ss.ms mm:ss.ms ss.ms ms	Yes	No
POINT_CODE	Name of a node (text) \$ for hexadecimal values "-" separator * for wildcards	As CIC	As CIC
STRING	All chars	Yes	Yes
UNIX_TIME	Depending on user preferences	No	No
UNSIGNED	All numbers	Yes	No
UNSIGNED3	All numbers	Yes	No

Type	Format	Multiple Values	Wildcards ("?" for single character, "*" (start) for multiple characters)
VARSTRING	As string	As string	As string

Note: For example, all A-numbers greater than 000-000-0000.

7. Repeat **steps 1-6** to create filter conditions for different fields.
8. Combine the conditions to create a filter condition by using a condition operator such as AND, OR, Use Brackets.

Here is an example of a query with multiple conditions.

The screenshot shows the 'Query Dialog' window. At the top, it says 'Dictionary has been loaded.' Below that, there are fields for 'Name:' (Test Query) and 'Description:' (This is a test query). Under 'Available dictionaries:', there is a dropdown menu showing 'SS7 ISUP ANSI CDR_2.5.0'. Below this, there are tabs for 'Displayed Fields' and 'Split Params'. The 'Displayed Fields' tab is active, showing a table with columns: 'Field', 'Operator', and 'Value'. There are two rows: Row A with 'A-number', '>', and '000-000-0000'; and Row B with 'B-number', '<', and '999-999-9999'. Below the table, there are 'Add' and 'Delete' buttons. To the right, there are radio buttons for 'Operator:' (And, Or) and a checkbox for 'Use Brackets'. Below that, there is an 'Expression:' field containing 'A OR B'. At the bottom, there are 'Save', 'Save As', 'Apply', and 'Cancel' buttons.

Figure 26: Query with Multiple Conditions

At this point you have two options. You can save the filter for future use or you can apply the filter for immediate use.

Note: Applying a filter does not save it. You must use the save function to keep the filter in the system for future use.

Selecting Displayed Fields for a Query

The **Displayed Fields** tab provides three options for selecting fields that are displayed in the query.

- All fields - selecting this option incorporates all fields in the dictionary.
- Common fields - selecting this options enables you to see all common fields if you using multiple dictionaries.
- Custom fields - enables you to select specific fields for the query. This is the default setting.

Selecting the Displayed Fields tab opens the screen. Multiple fields can be selected using the CONTROL and SHIFT keys.

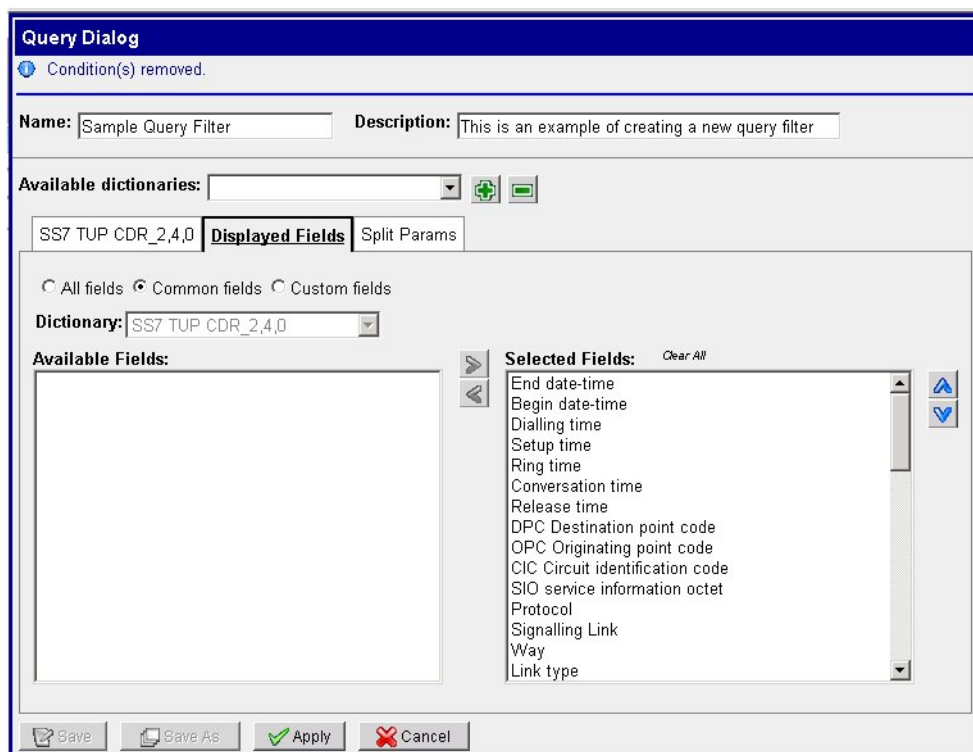


Figure 27: Displayed Fields Screen

Using Split Params Function

The split query function provides a mechanism to split queries executed for a large time duration into a sequence of queries of shorter intervals. This option enables you to get query results faster rather than waiting to process the whole result set. Each query of shorter duration is executed sequentially one after the other as the demand for more results is received.

You execute a query for the time period 10:00:00 A.M to 10:30:00 A.M. If the Split Period is configured as 5 minutes, then this query will be split into 7 queries of shorter duration, for example, 10:00:00 - 10:04:59, 10:05:00 - 10:09:59, 10:10:00 - 10:14:09, 10:15:00 - 10:19:59, 10:20:00 - 10:24:59, 10:25:00 - 10:29:59, 10:30:00 - 10:30:00 The query between 10:00:00 - 10:05:00 is the first query executed and depending on the number of results returned the next query in sequence is initiated.

The figure shown here is an example of a split query screen.

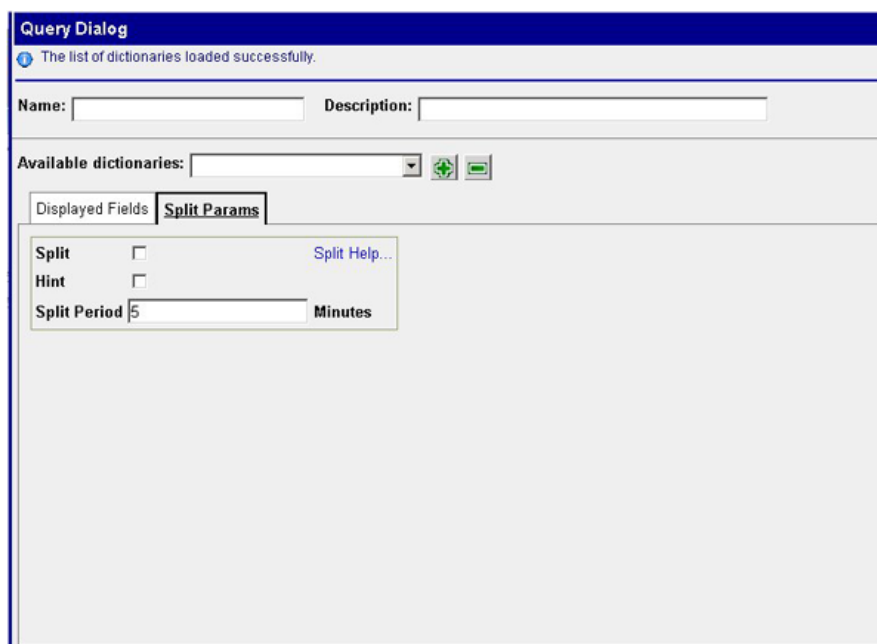


Figure 28: Split Query Screen

Follow these guidelines to create a split query.

- Choose to **split** the query - Clicking this option means that the query will be split. You can also save the query with this information so that the query is split everytime it is executed.
- Select the **Hint** option - this option provides an indication that is submitted with the query and tells the database to perform the split query search in a way that can potentially speed up the query. The option not selected by default and should be changed only after consulting a certified *Tekelec* representative.
- Select a **time interval** - this option defines intervals the query is divided into. If this option is selected, then the query is split into shorter queries with each query's duration equal or similar to the *Split Period* that you define. The *Split Period* can have any value equal to or greater than zero. The value of zero means the query is not split at all. By default, the split period is set to 5 minutes and should be changed only after consulting with a cetified *Tekelec* representative.

Note: The choice of Split Period is normally governed by the cardinality of data with respect to time. A smaller Split Period will be very effective for data that repeats itself almost every second of the time period chosen.

Recommendations for using split query Function

Query splitting is most effective for the queries on fields having low cardinality. Low cardinality means that the fields queried upon have few unique values or are very common. For example, phone number fields have high cardinality as they are unique customer identifiers. But fields like OPC and DPC have low cardinality because many calls will have same OPC and/or DPC. In general, Query Splitting should not be used for queries on phone number fields like A-Number, B-Number and MIN. Here are two general recommendations for using split queries.

- Recommendations on using the Split Query option - In order to be sure whether your query runs faster with or without Query Splitting you can execute the query with Splitting off and then

re-execute it with splitting on. Based on response time, the query can be saved with the desired preference for re-use. This enables you to make the decision once for their subsequent executions.

- Recommendations on setting the Split Period - The system will initiate the queries in split mode until it checks that the page size asked by the user is completely filled. For example, if you have set a preference of 300 records per page, the system will keep on executing the split queries until it finds 300 or more records. This means that a smaller page size can potentially result into faster response to get the first set of data as the system may have to execute less number of split queries in sequence to fill the page.

Saving a Query

You have two choices in saving a query.

- You can click **Save** and the query is saved for future use. The query is added to the list for that Network View or session.
- Or, if the query already exists, you can click **Save as** and save the query with another name.

Using Save As Feature

The query dialog screen has a Save As button to enable you to quickly create variations of a query without having to go through the full process each time.

Applying a Query

Complete these steps to apply a filter for immediate use.

1. Create a query.
2. After creating the query, click **Apply** to validate the condition(s) and set the time period.
3. Specify the **time period** for the filter in the Time/Date tab in the Query Settings screen.
Select **Predefined** and use the pulldown to select a predefined time period or select **RealTime** for a real time query.
 - a) Select **Begin Date and time**.
To select the date and time, you can use the calendar and clock icons beside the fields.
When using the date icon, clicking on << or >> moves the selected year back or forward. Clicking on < or > moves the selected month back or forward. For example, clicking > twice moves the date forward two months.
When using the clock icon, the time interval (hours, minutes, seconds) element changes after selecting the previous interval. For example after selecting the hours, the minutes pop-up opens.
 - b) Select **End Date or time**.
 - c) Select whether the time is to be the local time zone or a specific user preference. (The default is Use preferences timezone).
 - d) (Optional) Refresh the **First time** and **Last time** information using the **Refresh Session Periods** button to show the date and time of the first and last available data.

Note: If a query is being made for data that was stored within a period that includes the Daylight Savings Time change, you must specify the Begin Time before the time change period. If you specify a Begin time that falls within the DST time change period (usually 1 hour), only data that was stored after the clock change will be displayed.

- Click **Execute** to run the query or **Execute in New** to run the query in a new window.

Note: Up to 5 query windows can be open at one time.

Using a parameter to initiate multiple Queries

ProTrace enables you to create a parameterized query. When the query is executed ProTrace prompts you for the parameter. For one parameter it displays one prompt which is then filled into one condition (for example an A-number). This feature enables you to use one prompt for several conditions. For example, to create a query with a single prompt "A-B-C Number:" which would be used for A-number, B-number, and C-number.

- Click the **Create** button on the Query list page.
The *Query Dialog* is displayed.
- Add a **dictionary**.
- Add **several conditions** (for example A-number, B-number, and C-number).

Define the values so that these conditions are parameterized. The value must be in the following format: #{<prompt text>}

You can mix parameterized and non-parameterized conditions in the same query.

Note: To share the prompt, the prompt text has to be the same for all shared parameters.

Note: It is not possible to share prompts for Enumeration fields.

The screenshot shows the 'Query Dialog' window. At the top, it says 'Dictionary has been loaded.' Below this are fields for 'Name:' and 'Description:'. A dropdown for 'Available dictionaries:' is set to 'SS7 ISUP ETSI CDR 2.6.0'. There are tabs for 'Displayed Fields' and 'Split Params'. A table lists conditions:

	Field	Operator	Value
<input checked="" type="checkbox"/> A	A-number	=	#{A-B-C Number:}
<input checked="" type="checkbox"/> B	B-number	=	#{A-B-C Number:}
<input checked="" type="checkbox"/> C	C-number	=	#{A-B-C Number:}

Below the table are 'Add' and 'Delete' buttons. The 'Operator' section has radio buttons for 'And' (selected), 'Or', and a checkbox for 'Use Brackets'. The 'Expression:' field contains 'A AND B AND C'. At the bottom are 'Save', 'Save As', 'Apply', and 'Cancel' buttons.

Note: It is not possible to share prompts for Enumeration fields.

Figure 29: One Parameter For Multiple Queries

- Save the query.

Note: When a parametrized query is executed, the Query Settings dialog contains an additional Parameters tab with the new parameters.

Using Pre-defined Time Intervals for Real-time Traces

You can use pre-defined time intervals in your queries when initiating real-time traces.

Complete these steps when utilizing this option.

1. Create new query or select a query from query list.
2. Click the **Execute** button.

The *Query Settings* screen opens.

3. Select **RealTime**.

The screen options change.

Note: When you select *Real Time* the *Predefined* option is automatically selected and the date and time fields are grayed out.

4. Select a **time interval** (the options range from *the next 5 minutes* all the way to *until canceled*).
5. Click **Apply** to initiate the trace.

Using Save As Feature

The query dialog screen has a Save As button to enable you to quickly create variations of a query without having to go through the full process each time.

Testing a Query Using the Plan Function

Clicking the plan button on the bottom of the Options tab (or in the xDR viewer menu bar) enables you to initiate the plan function. When the test is completed, the screen opens to show the results.

Oracle Query Explain Plan						
Explain plan successful.						
Id	Operation	Name	Rows	Bytes	TempSpc	Cost
0	SELECT STATEMENT		59	8319		6
1	PARTITION RANGE ITERATOR		59	8319		6
* 2	TABLE ACCESS BY LOCAL INDEX ROWID	NETAUDIT_TUP	59	8319		6
3	BITMAP CONVERSION TO ROWIDS					
4	BITMAP OR					
5	BITMAP CONVERSION FROM ROWIDS					
6	SORT ORDER BY				15M	
* 7	INDEX RANGE SCAN	I_15571_6				
8	BITMAP CONVERSION FROM ROWIDS					
9	SORT ORDER BY					
* 10	INDEX RANGE SCAN	I_15571_5				

Predicate Information (identified by operation id):

```

2 - filter("D1"."TIMETAG">=1232547422 AND "D1"."TIMETAG"<=1232551022)
7 - access("D1"."BNUMBER_"<'555-555-5555')
  filter("D1"."BNUMBER_"<'555-555-5555')
10 - access("D1"."ANUMBER_">'000-000-0000')
     filter("D1"."ANUMBER_">'000-000-0000')

```

Close

Figure 30: Plan function screen - test completed

The screen shows all the planned steps for completing the query.

When finished, click **Close** to close the screen.

Using Flex Matching in Queries

With flex matching filters, you can also use the `~=` operator between fields. This operator allows you to filter on a subset of address digits and eliminates the need for an early determination on whether the address digits include an area code, country code or trailing characters.

The following rules apply to flex matching filters:

- The minimum length of the match must be more than half the length of the longer number. For example, if the target is a thirteen digit number, a number which matches it will have to be at least seven digits long. A filter match for 4119194605500 will match 4605500, but will not match 605500, because 605500 is not longer than half of the filter target.
- The minimum length of the match must also be at least five digits in length. For example, A filter match for 4605500 will not match 5500 because it is not at least five digits.
- Flexible Matching is available for all filters and traces (whether predefined or not) when address digits are involved unless overridden by Wildcard Matching.

Note: The field (EPI) will be queried by flex matching if the "Flex Matching" function is enabled and if a given EPI is enabled for flex matching. (See [Configuring EPIs](#))

Note: Enabling of flex matching function has a strong impact on performance.

Using the Multiprotocol Function

You can run your query using multiple protocols when you select the multiprotocol function in the Options tab. In Multi-Protocol tracing other protocols may be examined to find other legs or transactions of the trace.

Complete this step when using multiprotocol option.

1. Select **Options** tab.
2. Select **Use Multiprotocol** shown here.

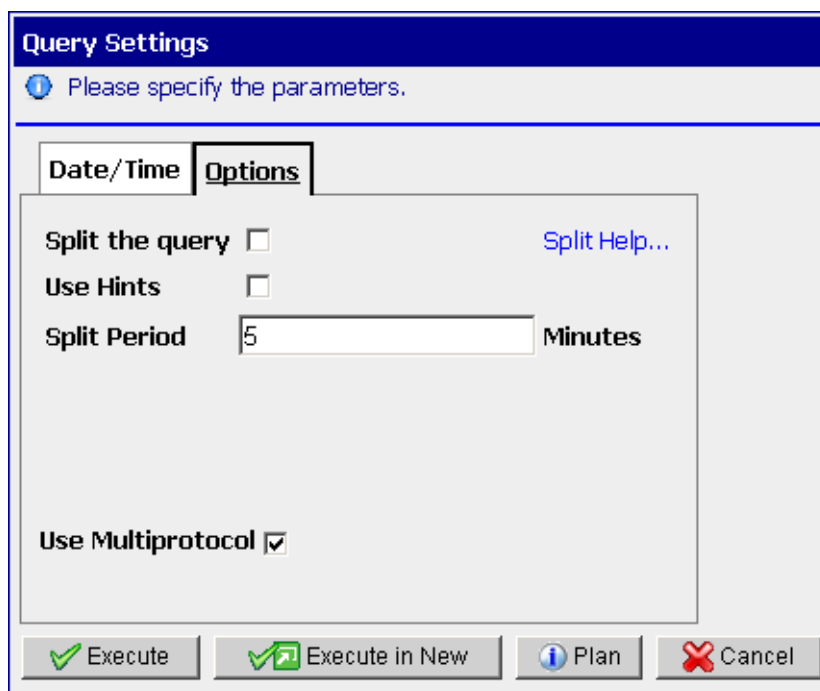


Figure 31: Options Tab With Multiprotocol Selected

3. Click **Execute** to run the query.

The query is initiated and a status bar appears that shows the progress of the query.

Note: You can cancel the query by clicking Cancel under the progress bar. Only those records that have been completed up to the time of cancelling will appear.

The xDR viewer is displayed with the filter criteria and xDRs for each of the filtered protocols. The filtered protocols appear at the bottom table. In the case of real-time queries, all results are updated every five seconds by default.

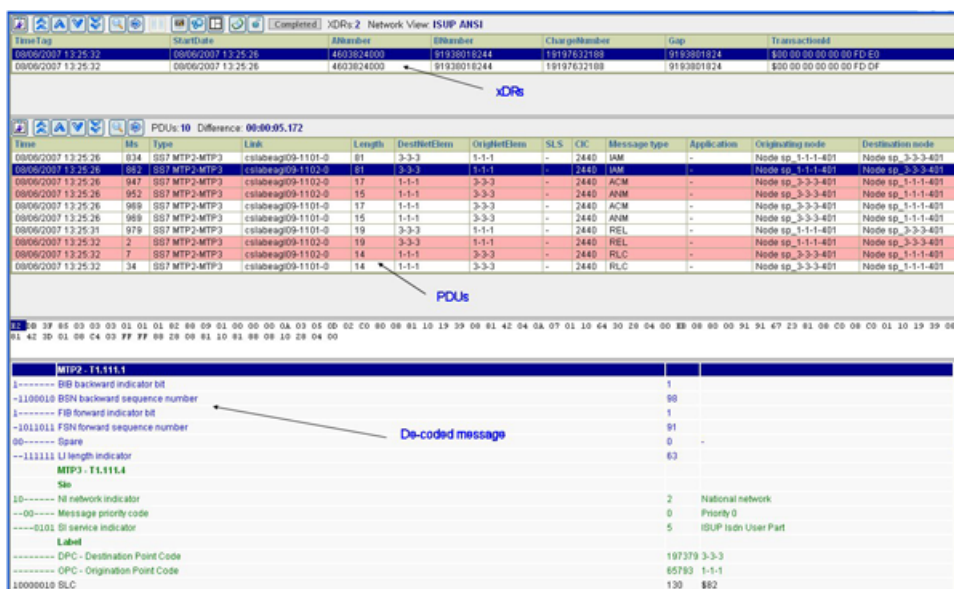


Figure 32: Trace View Screen

You can save the filter for future use. The filter will be added to the list for that Network view.

Note: The directionality of a call is in context of whether it is node-centric or eagle-centric.

PDU Delete Prompt

If there have been some configuration changes that result in PDUs being deleted from the system, a screen prompt appears when the trace is completed. The figure shown here shows a completed trace with the prompt located at the bottom of the screen.

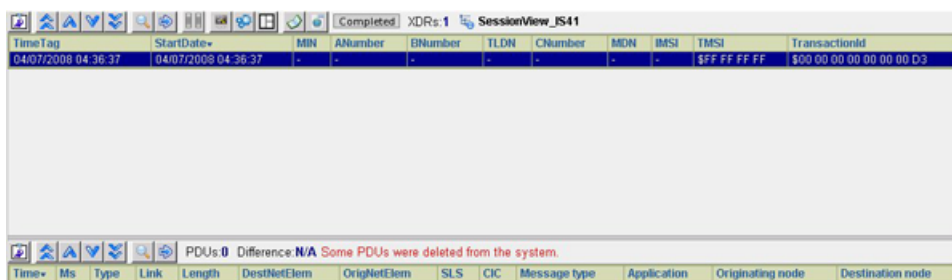


Figure 33: Deleted PDU Prompt

How to Display Time Difference for PDUs

This function enables you to display the time difference between two PDUs. Complete these steps to display the PDU time difference.

1. Select a **PDU**.
2. Move the **cursor** over another PDU.

- ProTrace shows a time difference in the PDU view toolbar in form of HH:MM:SS.sss (HH – hours, MM – minutes, SS – seconds, sss – milliseconds).

The figure below shows a PDU difference.

Rec No	Time	Ms	Type	Link	Length	Destination	Origin	SLS	CIC	Message type	Application
1	12/07/2008 19:59:59	866	8	my_clli-9996-3	37	340245	67074	22	\$A-7	IAM	-
2	12/07/2008 19:59:59	833	8	my_clli-9993-2	17	340245	67074	19	\$A-7	ACM	-
3	12/07/2008 19:59:59	833	8	my_clli-9994-0	17	340245	67074	19	\$A-7	ACM	-
4	12/07/2008 20:00:00	0	8	my_clli-9993-3	15	340245	67074	19	\$A-7	ANM	-
5	12/07/2008 20:00:00	0	8	my_clli-9994-1	15	340245	67074	19	\$A-7	ANM	-
6	12/07/2008 20:00:00	166	8	my_clli-9991-0	15	340245	67074	19	\$A-7	ANM	-
7	12/07/2008 20:00:00	166	8	my_clli-9994-2	15	340245	67074	19	\$A-7	ANM	-

Figure 34: Time Difference Between PDUs

Modifying a Filter

Complete these steps to modify an existing filter.

- In the initial page, select a **Network view** or **Session** from the query list (left section).
- Select a **Filter** from the list.

In this example the filter selected is *Answered*.

Query Name	Query Description	Owner	State	Replaced By	CreationTime
Answered	Filters Answered Calls	telelec	N		08/03/2007

Figure 35: Selected Filter

- Click **Modify** button on the toolbar.

The *Query Dialog* opens with the existing filter shown in [Figure 36: Filter Opened For Modification](#).

Query Dialog

Query has been loaded successfully.

Name: Sample Query Description: This is an example of a Sample Query

Available dictionaries: [Dropdown] [Add] [Remove]

SS7 IS41 TDR_2.6.6 Displayed Fields

	Field	Operator	Value
<input type="checkbox"/> A	A-number	>	111-111-1111

[Add] [Delete] Operator: ☒ And ☐ Or ☐ Use Brackets

Expression: A

[Save] [Save As] [Apply] [Cancel]

Figure 36: Filter Opened For Modification

4. Make the necessary modifications.
In this example a *Description* is added.

Query Dialog

Query has been loaded successfully.

Name: Sample Query Description: This is an example of a Modified Sample Query

Available dictionaries: [dropdown] [Add] [Remove]

SS7 IS41 TDR_2.6.6 Displayed Fields

	Field	Operator	Value
<input type="checkbox"/> A	A-number	>	111-111-1111
<input type="checkbox"/> B	C-number	=	444-444-4444

[Add] [Delete] Operator: ☐ And ☒ Or ☐ Use Brackets

Expression: A AND B

[Save] [Save As] [Apply] [Cancel]

Figure 37: Filter Modification - Description Added

5. Click **Save**.

The filter is validated and changes are saved.

Note: If there is an error in the validation, you are shown the error.

Note: If you want to save the modifications as a new query use the *Save As* option.

Deleting a Filter

Follow these steps to delete an existing filter.

1. Select the **Filter** to be deleted.
2. Click **Delete**.
3. Click **OK** at the prompt.

The filter is deleted.

Multi-link Filter and Traces

You can use the multi-link filter trace feature to filter/trace several links or linksets at once. Complete these steps to use this feature.

1. Select a **link-based network** in the network tree.
(Left-hand section of initial page.)
2. Click **Multi-link**.

The multi-selection screen opens.

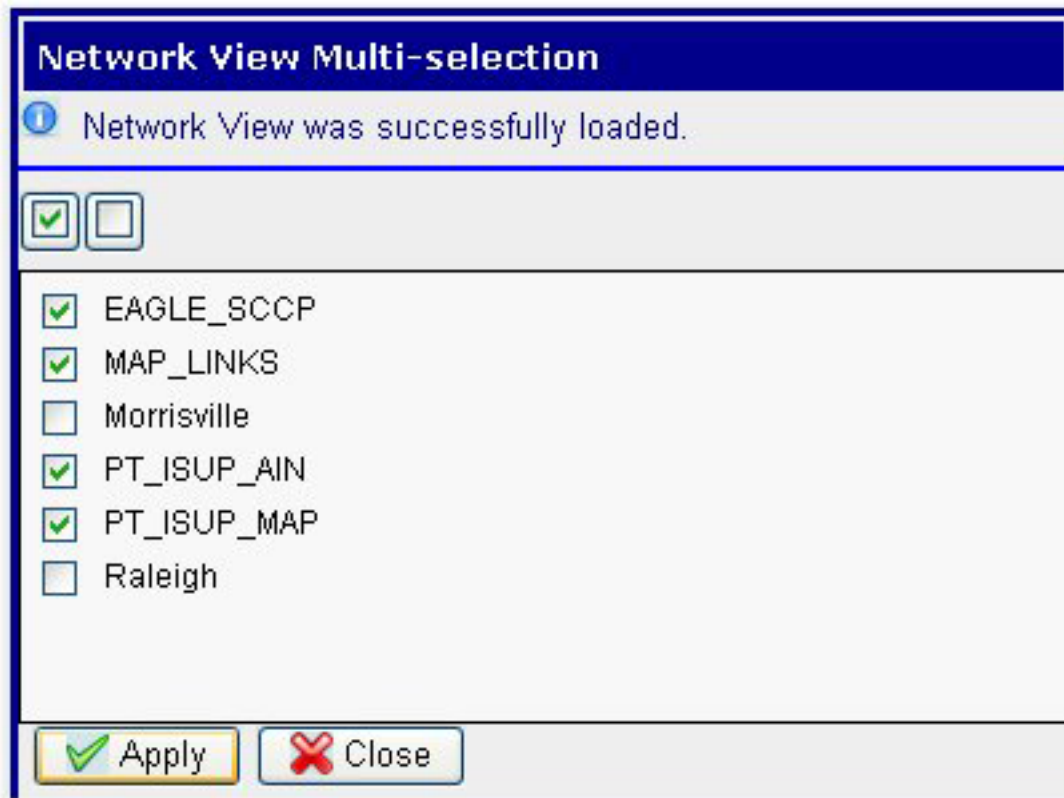


Figure 38: Multi-Selection Screen

3. Select the **linksets or links** to be included in the trace.

Note: Click the Check box to select all the linksets/links in the list or click the empty box to select none of the linksets/links.

4. Click **Apply**.

The selection is used in the query and tracing.

Note: Multi-link selections cannot be saved.

Note: The multi-link selection is cancelled by selecting another link-based or session-based network view.

xDR Viewer

You can view specific xDRs using the xDR Viewer. Using the xDR Viewer you can choose a specific xDR in order to initiate a trace. This view is used for both Filtering and In Progress Traces. The xDR Viewer can display three different views:

- xDR display
- PDU display

- Decoding display

Using xDR Viewer

The XDR Viewer in ProTrace enables you to choose a desired xDR in order to view the corresponding PDUs (as a list and individual decode) and to initiate the trace. Complete these steps to launch a trace using an xDR.

Note: The Start Trace feature is may not be available depending on your product license and installation. PDUs and decode are only available to the Business Manager role.

1. Create or select an existing **Query** for a network view.
See [Filtering Modes and Managing Queries](#) for more information.
2. Execute the **Query**.

The xDR viewer page opens.

Rec #	End time	Begin time	DPC	OPC	SIO	Link	Way	Link type	Hb units	DR Type	Cause value	Cause family	Released by
1	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	1 No route to specified transit network	CFL call failure	Calling Party
2	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Outgoing	Intermediate LSL	5	Complete xDR	2 No route to specified transit network	CFL call failure	Calling Party
3	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	3 No route to destination	CFL call failure	Calling Party
4	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Outgoing	Intermediate LSL	5	Complete xDR	3 No route to destination	CFL call failure	Calling Party
5	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	4 Send special information tone	SST send special tone information	Calling Party
6	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Outgoing	Intermediate LSL	5	Complete xDR	4 Send special information tone	SST send special tone information	Calling Party
7	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	5 Misdialed trunk prefix	MPR misdialed trunk prefix	Calling Party
8	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Outgoing	Intermediate LSL	5	Complete xDR	5 Misdialed trunk prefix	MPR misdialed trunk prefix	Calling Party
9	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	6 Preemption	CFL call failure	Calling Party
10	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Outgoing	Intermediate LSL	5	Complete xDR	6 Preemption	CFL call failure	Calling Party
11	08/08/2007 15:21:15	08/08/2007 15:21:09	3-3-3	1-1-1	805	*d09	Incoming	Intermediate LSL	5	Complete xDR	9 Preemption - circuit reserved for reuse	CFL call failure	Calling Party

Rec No	Time	Ms	Type	Link	Length	Description	Originator	SLS	CIC	Message type	Application
1	08/08/2007 15:21:09	199	SS7 MTP3-MTP3	cs1abeag09-1101-0	16	3-3-3	1-1-1	-	8009	IAM	-
2	08/08/2007 15:21:09	959	SS7 MTP3-MTP3	cs1abeag09-1101-0	17	1-1-1	3-3-3	-	8009	ACM	-
3	08/08/2007 15:21:09	959	SS7 MTP3-MTP3	cs1abeag09-1101-0	15	1-1-1	3-3-3	-	8009	ANM	-
4	08/08/2007 15:21:14	964	SS7 MTP3-MTP3	cs1abeag09-1101-0	19	3-3-3	1-1-1	-	8009	REL	-
5	08/08/2007 15:21:15	29	SS7 MTP3-MTP3	cs1abeag09-1101-0	14	1-1-1	3-3-3	-	8009	RLC	-

Hex	ASCII
1F 3F 85 03 03 01 01 01 74 69 22 01 00 00 0A 03 05 00 02 C0 80 08 81 30 39 08 71 92 04 0A 07 01 10 64 30 27 09 00 C5 03 21 09 00 8B 08 00 91 91 67 23 81 08 C0 08	
01 10 19 39 08 71 92 10 01 09 C4 03 7F 7F 69 28 08 81 10 81 08 08 10 27 09 00	

Field	Value
1----- B8 backward indicator bit	1
0011110 B8N backward sequence number	30
1----- F8 forward indicator bit	1
1111001 F8N forward sequence number	121
00----- Spare	0
1111111 L1 length indicator	63
MTP3 - 1.1.11.4	
Sio	
10----- N1 network indicator	2 National network
00----- Message priority code	0 Priority 0
0101 S1 service indicator	5 ISUP Isdn User Part
Label	
----- DPC - Destination Point Code	197379 3-3-3
----- OPC - Origin Point Code	85783 1-1-1

Figure 39: Xdr Viewer Page

3. Select an xDR record (in this example the first record is selected).
4. Click **Start Trace**.

The trace viewer page opens showing Trace records, calls per trace and de-coded traces.

Note: The PDUs appear in two different colors. The pink PDUs belong to the currently selected xDR. The PDUs that belong to unselected xDRs appear with a white background.

Note: You can open up to five traces from the xDR Viewer screen.

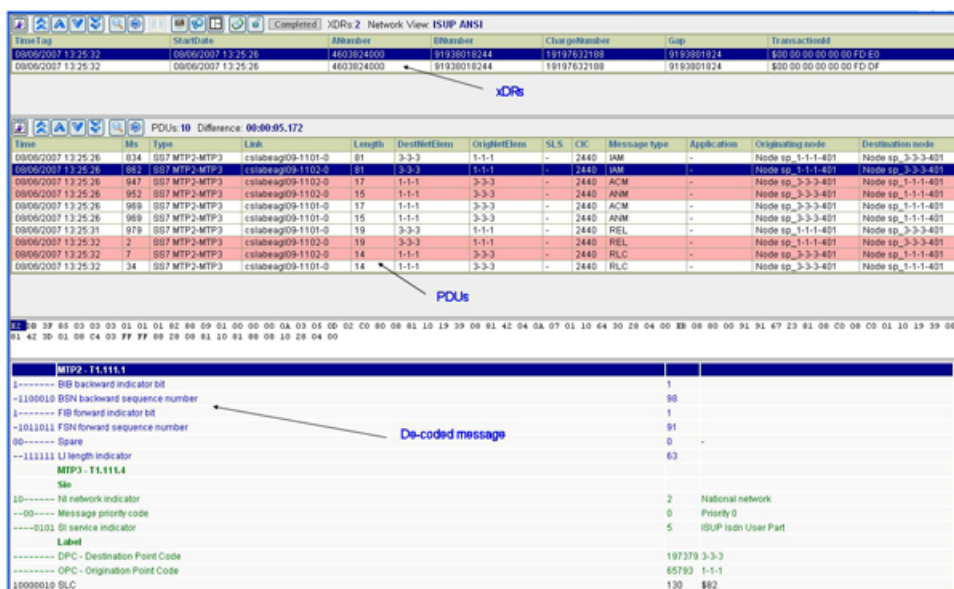


Figure 40: Trace Viewer Page

5. You can now export the xDR's and PDU's.

Using Drill Down with Statistical Sessions

When viewing Statistical sessions (from ProTraQ), you can use the drill down feature to view the list of xDRs that were used to calculate the KPI along with the associated protocol decoding.

To do this:

1. Right click on a session in the sessions list.

Two buttons will appear next to the selection, **Drill Down** and **Add Condition**.

2. Click on the **Drill Down** button.

The xDR information is displayed. If the sessions are also sessions generated using ProTraQ, you can drill down further.

Note: This feature is only available when viewing statistical sessions from ProTraQ and it must be configured in ProTraQ. See the *ProTraQ User Guide* for more information.

xDR Finder Option

ProTrace comes with an *xDR search* feature. Clicking the **xDR Finder** icon (next to the Export icon) on the xDR viewer page opens the xDR Finder screen. There are several options to limit the search results that you can select before initiating an xDR search.

Possible Search Parameters

- The **Text** field is for the xDR name or other text.
- Limit the search by selecting **Case Sensitive**.
- Limit the search to a specific xDR by selecting **Search within xDRs**.

- Limit the search by selecting **Search within Frames**.
- Limit the search by selecting **Search within Full Decoding**.
- Limit the search by selecting **Search within Frame Bytes**.
- The **Record Limit** field allows you to limit the search to the first n records where n is a number.

Search Results

The xDR search results are presented in a table format. You can page through the results with the page arrows and you can set the number of records per page in the Set Size (check icon) text box.

Table 10: xDR Search Results Columns

Column	Description
xDR Number	The xDR number.
SU Number	The frame number for this xDR.
Decoding Number	The line number in full decoding.
Found Text	The complete line where the string was found. It can be an xDR, a frame, a line in full decoding, or the complete hexadecimal. The searched string is highlighted.

Copying xDR information

When viewing xDRs you can copy the information for the currently selected xDR, it's PDUs, and full decodes as text information. To do this click the Copy button on the xDR viewer toolbar. The information will be available in the system clipboard.

Note: This feature is only available when viewing statistical sessions from ProTraQ and it must be configured in ProTraQ. See the *ProTraQ User Guide* for more information.

Exporting Results

You can export any list of sessions, list of queries, or xDR results by using the **Export** facility of ProTrace. You can export to the following file formats:

- XML
- XLS
- CSV
- HTML
- TXT

You will also be able to export SU and Full Decoding and to ZIP when exporting xDR results.

You can also export xDR information directly to Excel format using the **Direct Excel Export** button in the xDR list window.

Note: Direct to Excel export will export all xDR information except the number of PDUs and the decode information.

System Export Limits

The table shows the system export limits for each format.

Table 11: System Export Format Limits

Format	Max. # of xDRs for Interactive Exports
ZIP	100,000
TXT	10,000
XML	1,000
HTML	1,000
CSV	650,000
XLS	65535

Exporting

To open the *Export* screen, click the **Export** icon in the sessions list or query list toolbars for to export sessions or query lists. Use the Export icon in the toolbar of the query results window to export results.

Exporting Files

Complete these steps to export a file.

1. Select the data to be exported.

You can choose:

- a) Current page
- b) All results
- c) First records

Note: If you select *First records* type in a number for the number of records that will be exported. For example, entering the number 100 designates that only the first 100 records are to be exported.

2. Type in the file name in the **Enter a filename** field.
3. (Optional) You can select whether to have the title inserted at the beginning of the exported file by selecting the option by the **Enter a title** field.
4. (Optional) You can type a comment or description in the **Comment** field.

Note: The file is saved in the same extension type as in the list.

5. Select the format type in the Export Type section. You can choose:
 - a) XML
 - b) XLS
 - c) CSV
 - d) HTML
 - e) TXT

f) ZIP

Note:

- ZIP is only available for users with NSP Business Power User role.
- ZIP is not available for the current page option.
- ZIP is available for single dictionary queries only.
- The SU and Full Decoding options are only available for users with NSP business Manager Role.
- The **Stored in the NSP database** option is only available for users with NSP Business Power User role.

6. Select what to do with the exported data. **Download now** (default) or **Stored in the NSP database**.
7. Click **Export** to export the file.

Note: If the export will take longer than the current allotted time for exports (currently 30 minutes) it will automatically be canceled and you will receive a error message. This can happen when the query is too large or the IXP is overloaded. You can resolve this by running the export at a later time or using the Split Query option.

Chapter 5

Analyzing Traces

Topics:

- [Overview.....76](#)
- [Analyzing Traces.....76](#)

Overview

ProTrace provides the ability to analyze the trace results returned by historical and in-progress traces. You can choose to view the trace in historical mode or real time mode. You are able to view the incoming trace messages for both real-time and historical trace. For real-time trace the application checks for new messages every 5 seconds (by default) starting from the current time.

Note: Tracing is supported for Network views only. It is not available for single sessions or archives.

Analyzing Traces

You can view the trace results returned sorted by time-stamp. You can initiate 5 different traces, thus troubleshooting more than one problem at the same time. For enhanced troubleshooting you are provided with all PDUs for a selected record from the summary and detailed protocol decoding for the selected PDU. You can also export the trace results in html and binary formats for offline troubleshooting. You can then import them back into ProTrace using the *Import* option.

Note: When viewing xDRs, PDUs and PDU decodes some sensitive information may be hidden using the "*" character (except for the Business Manager user). This hiding may be present for some PDUs but not for others depending on the configuration parameters. This functionality is configured in the CCM. See the *Centralized Configuration Manager Administration Guide* for more information.

Viewing Real-time Traces

Complete this step to view a real-time trace.

Launch a **trace**. The records are displayed and the Trace Summary page opens where you can see the summary of all the traces displayed in chronological order in real time. From the summary page you can view the following elements and perform the following actions:

- In the PDU display you can view the PDUs returned by the trace. Even those PDUs that may not be related to an xDR/TDR but are retrieved from the related interface.
- Level 4 messages (Circuit Blocking, Reset) can be viewed as part of a normal call-related trace, in order to correlate events occurring during a call, or shown separately.
- The PDU decoding section is displayed where you can view the Decoding for each trace PDU.
- You can browse through the Trace PDUs and the decoding section automatically displays the decoding for the currently selected PDU.
- New trace messages are scanned every 5 seconds from current time and displays them to you. You are able to view new PDUs arriving while browsing the already displayed PDUs.
- The trace stops when the time period configured expires.

Viewing Historical Traces

Complete this step to view historical traces.

Launch a **trace**. The records are displayed and the Trace Summary page opens where you can see the summary of all the traces displayed in chronological order in begin time. From the Summary page you can view the following elements and perform the following functions.

- In the PDU display you can view the PDUs returned by the trace. Even those PDUs that may not be related to an xDR/TDR but are retrieved from the related interface.
- Non-call messages are displayed (e.g Circuit blocking, Reset).
- The PDU decoding section is displayed where you can view the Decoding for each trace PDU.
- You can browse through the Trace PDUs and the decoding section automatically displays the decoding for the currently selected PDU. New trace messages are scanned and displayed.

Managing Protocol Filters

You can select displayed protocols for executed traces. Complete these steps to select protocols for a trace.

1. Select the **xDR** to be traced.
2. Click **Start Trace** to begin new trace.
3. Click **Display filter** on the toolbar.

The *Protocol Filter Dialog* opens.

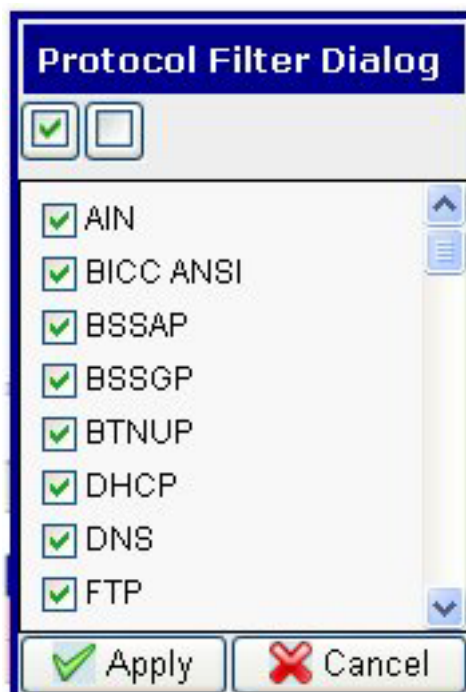


Figure 41: Filter Selection Dialog

4. Select or de-select the desired **Protocols**.

Note: To select ALL protocols check the left-hand check box located at the top of the dialog. To de-select ALL protocols click the right-hand check box located at the top of the dialog.

5. Click **Apply** to display the trace with the selected protocols.

Viewing a Message Sequence

ProTrace enables you to view the sequence of messages in the graphical format for the selected trace. Each node is represented in the form of a vertical line in the diagram. If a node has multiple IP Addresses or Point Codes, there are two options of sequencing:

- If there is no access to a database giving the list of IP Addresses or Point Codes per Node, ProTrace uses one vertical line per IP Address or Point Code, that can make the diagram difficult to read
- If there is an access to a database with the list of IP Addresses or Point Codes for each node represented by a Label, ProTrace uses one vertical line per Node (using the Label), and the IP Addresses or Point Codes appear in the messages arrows between the nodes.

The Message Sequence Diagram (MSD) feature is developed for real-time as well as historical traces. It can be used for PDUs. There are some useful features to the MSD layout.

- Graphic layout for easy viewing - can view details of PDU in graphic instead of tabular format
- Associated decode and background views - select a PDU and the associated background information and decode information is shown.
- Time difference indicator - cursor over a selected PDU and time difference is shown

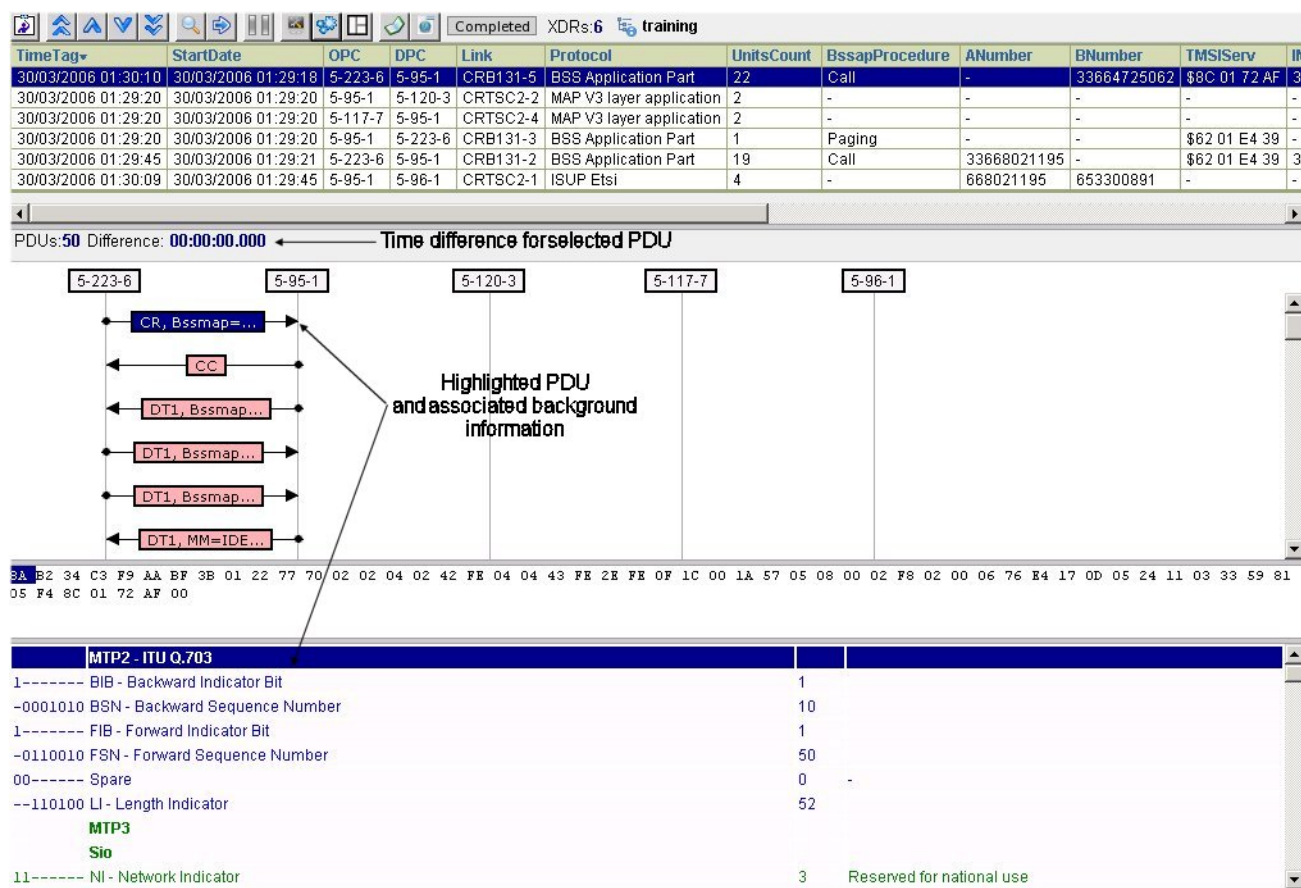


Figure 42: MSD Layout Screen

These features include:

Viewing MSDs

You have the option to toggle between the display of MSDs and PDUs.

Complete these steps to view the message sequence.

1. Select the **xDR** or **PDU** you want to view.

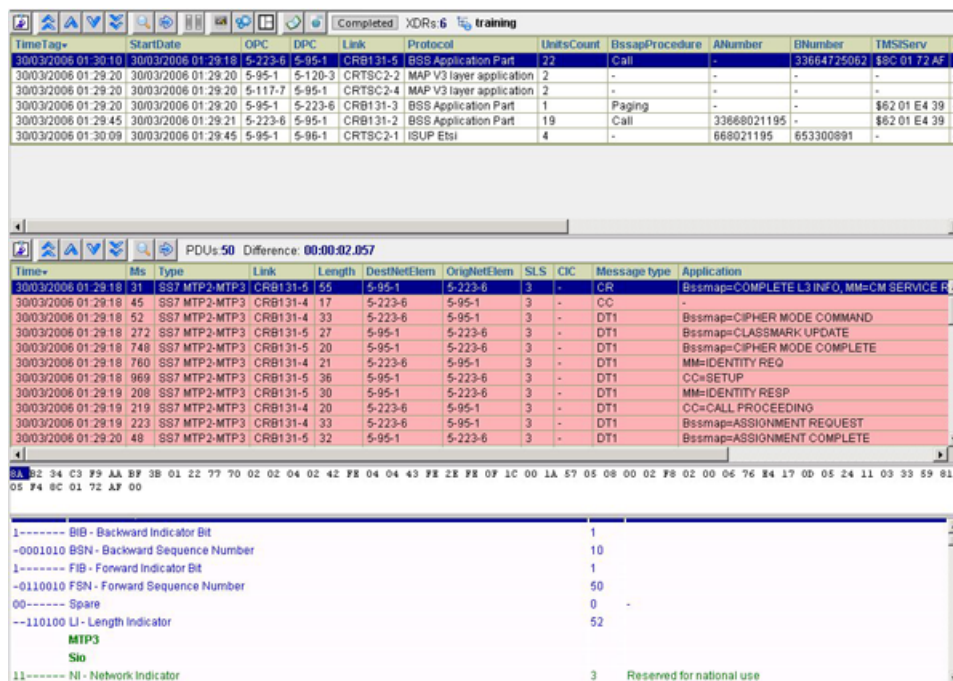


Figure 43: xDR Viewer with xDR And PDU Selected

- 2.

Click the **Execute** button



The page layout changes to show the view sequence.

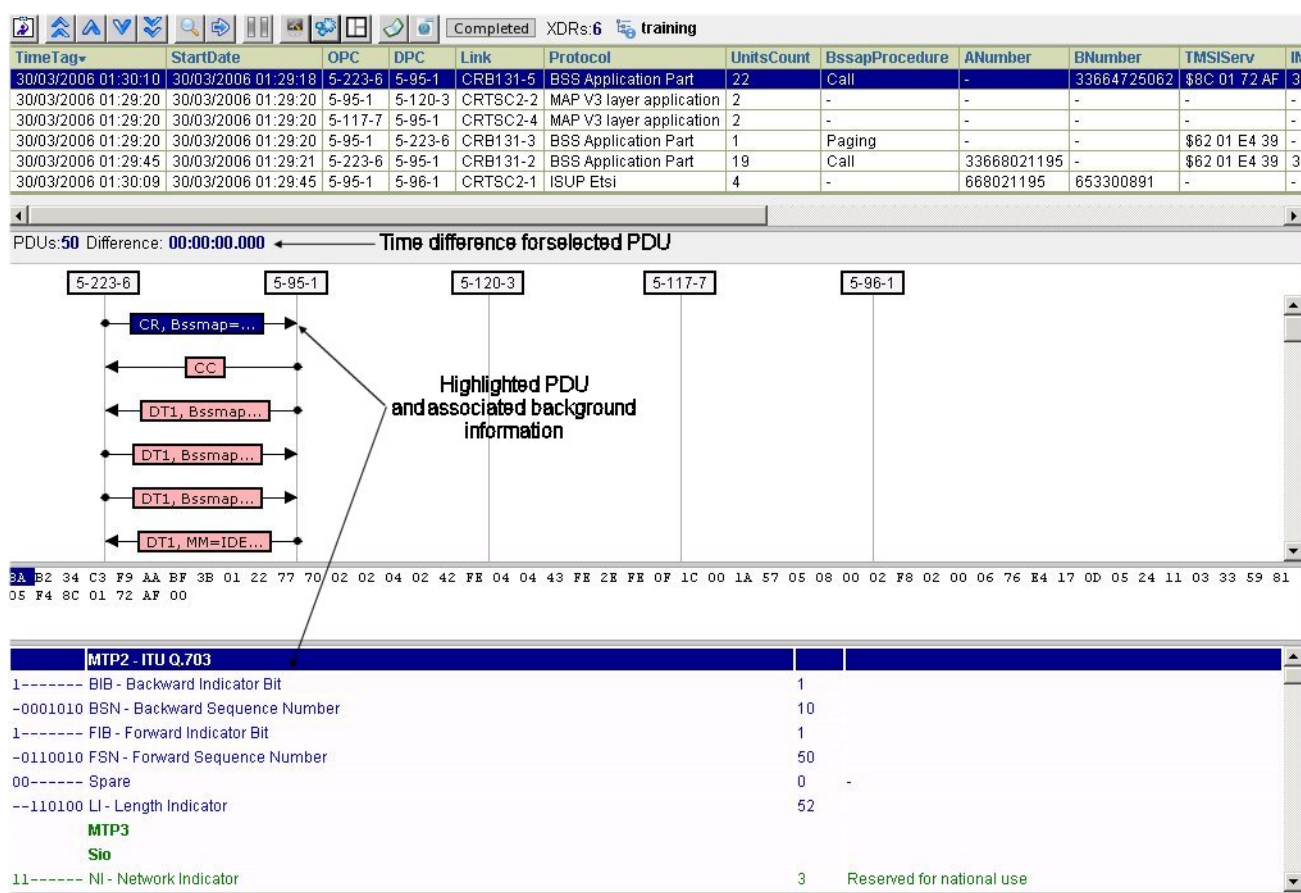


Figure 44: Message Sequence View

Viewing Real-time Message Sequences

Complete these steps to view real-time message sequences.

1. Click **Message Sequence Diagram** to initiate the display.
The application responds by displaying all the messages as a message sequence diagram.
2. You can then browse through the diagram displaying the trace.

Viewing Historical Message Sequences

Complete these steps to view historical message sequences.

1. Click **Message Sequence Diagram** to initiate the display.
ProTrace displays all the messages as a Message sequence diagram.
2. You can browse through the diagram displaying the trace.

About Exporting Traces

ProTrace enables you to export the trace. You can export the trace in either html or binary format. See [Exporting a Trace File](#) for more information.

Exporting a Trace File

Once you have created a filter, run the filter query, selected a record to trace, the Trace Viewer screen opens. Complete these steps to export trace files.

1. Click **Export** to initiate the export of trace results.

You are prompted to either *Save* (export) or *Open* the file.

- a) Click **Export** to create a zip file with Binary format.
- b) Click **Export HTML** to create a zip file with HTML format.

Note: You have two buttons on the Trace viewer page. Export and Export HTML. Click the button appropriate to your needs.

Note: When you export a Binary or HTML file, the a progress bar appears showing the progress of the export and the time remaining for the export to finish.



Note: To cancel the export, click the red “X” located on the right-hand side of the export bar. A prompt opens stating that the export process has been canceled.

Figure 45: Export Progress Bar

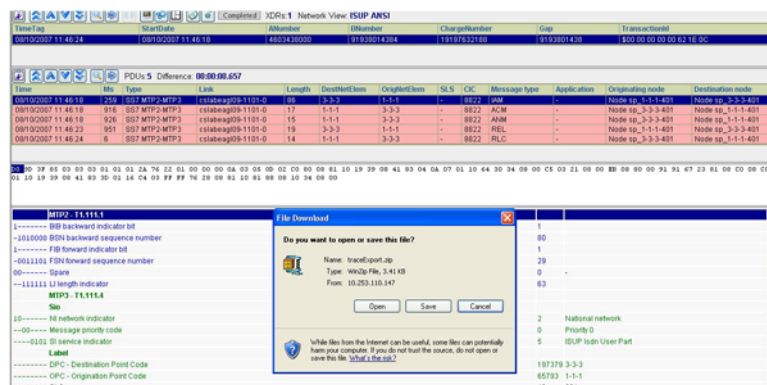


Figure 46: Export Screen

2. To export the file, click **Save**.

The PDUs are exported in the desired file format and stores it at the path you specified.

3. To open the file, click **Open** and your Zip application opens.

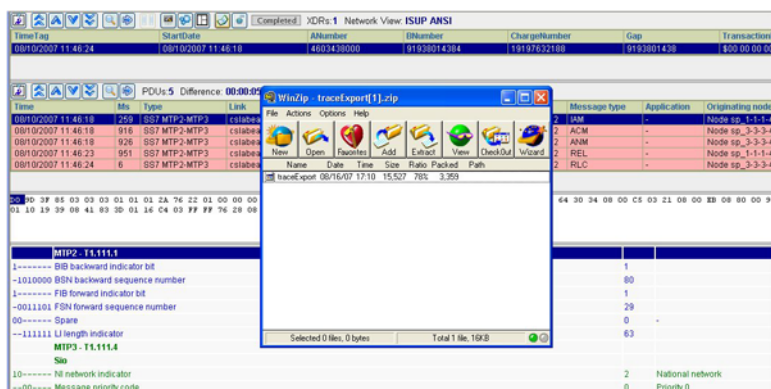


Figure 47: Winzip File Screen

Importing a Trace File

You can import a trace file that has been exported to a directory by using the Import function. Complete these steps to import a trace file.

1. Select **File > Import Trace**.

The import screen opens.

2. Browse for the **file** you want.
3. Click **Import**.

The file is imported and shows up on the Trace viewer page.

Note: Only files initially exported in ZIP format will be browsable after they are subsequently imported.

Appendix A

Master Data Information

Topics:

- *About Master Data Information.....84*
- *Supported Protocols.....84*

About Master Data Information

ProTrace provides the ability to perform a trace to identify non-call related issues. It can trace various MTP3 (Network Management) messages.

Note: You must have the L2/L3 protocol builder installed in order trace non-call related issues.

This appendix provides information on the supported protocols and protocol combinations for In-Progress calls.

Supported Protocols

This table shows the list of supported protocols used by ProTrace.

Table 12: Suported Protocols

Protocol A		Protocol B
AIN	<->	BICC ANSI
AIN	<->	ISUP ANSI
AIN	<->	TUP
BICC ANSI	<->	AIN
BICC ANSI	<->	BICC ANSI
BICC ANSI	<->	CLASS
BICC ANSI	<->	INAP
BICC ANSI	<->	IS41 ANSI
BICC ANSI	<->	LIDB
BICC ANSI	<->	MAP ETSI
BICC ETSI	<->	BICC ETSI
BICC ETSI	<->	BSSAP

Protocol A		Protocol B
BICC ETSI	<->	INAP
BICC ETSI	<->	IS41 ANSI
BICC ETSI	<->	LIDB
BICC ETSI	<->	MAP ETSI
BSSAP	<->	BICC ETSI
BSSAP	<->	BSSAP
BSSAP	<->	ISUP ANSI
BSSAP	<->	ISUP ETSI
BSSAP	<->	MAP ETSI
CLASS	<->	BICC ANSI
CLASS	<->	CLASS
CLASS	<->	ISUP ANSI
Gprs Gb	<->	Gprs Gb
Gprs Gb	<->	Gprs Gn
Gprs Gb	<->	GSM MAP
Gprs Gb	<->	IPMultimedia
Gprs Gb	<->	IPRadius
Gprs Gn	<->	Gprs Gb
Gprs Gn	<->	Gprs Gn
Gprs Gn	<->	GSM MAP
Gprs Gn	<->	IPMultimedia

Protocol A		Protocol B
Gprs Gn	<->	IPRadius
INAP	<->	BICC ANSI
INAP	<->	BICC ETSI
INAP	<->	INAP
INAP	<->	ISUP ETSI
INAP	<->	MAP ETSI
IP Multimedia	<->	Gprs Gb
IP Multimedia	<->	Gprs Gn
IP Multimedia	<->	IPMultimedia
IP Multimedia	<->	IPRadius
IP Radius	<->	Gprs Gb
IP Radius	<->	Gprs Gn
IP Radius	<->	IPMultimedia
IP Radius	<->	IPRadius
IS41	<->	MAP ETSI
IS41 ANSI	<->	BICC ANSI
IS41 ANSI	<->	BICC ETSI
IS41 ANSI	<->	IS41 ANSI
IS41 ANSI	<->	IS41 SERVICES
IS41 ANSI	<->	ISUP ANSI
IS41 ANSI	<->	ISUP ETSI

Protocol A		Protocol B
IS41 SERVICES	<->	IS41 ANSI
IS41 SERVICES	<->	IS41 SERVICES
IS41 SERVICES	<->	ISUP ANSI
IS41 SERVICES	<->	ISUP ETSI
IS41 WIN services ANumber	<->	GSM MAP MSISDN
IS41 WIN services BNumber	<->	GSM MAP BMSISDN
IS41 WIN services CNumber	<->	GSM MAP CMSISDN
IS41 WIN services MIN/IMSI	<->	GSM MAP IMSI
IS41 WIN services CgSccpAdd	<->	GSM MAP CgSccpAdd
IS41 WIN services CdSccpAdd	<->	GSM MAP CdSccpAdd
IS41 WIN services MDN	<->	GSM MAP MSISDN
IS41 WIN services TLDN	<->	GSM MAP CMSISDN
ISUP ANSI	<->	AIN
ISUP ANSI	<->	BSSAP
ISUP ANSI	<->	CLASS
ISUP ANSI	<->	INAP
ISUP ANSI	<->	IS41 ANSI
ISUP ANSI	<->	IS41 SERVICES
ISUP ANSI	<->	ISUP ANSI
ISUP ANSI	<->	ISUP ETSI
ISUP ANSI	<->	LIDB

Protocol A		Protocol B
ISUP ANSI	<->	MAP ETSI
ISUP ANSI	<->	MAP SMS
ISUP ANSI	<->	VOIP MGCP
ISUP ANSI	<->	VOIP SIP
ISUP ANSI	<->	VOIP SIPT
ISUP ANSI	<->	MGCP CDR
ISUP ANSI	<->	VOIP Q931
ISUP ETSI	<->	BSSAP
ISUP ETSI	<->	INAP
ISUP ETSI	<->	IS41 ANSI
ISUP ETSI	<->	IS41 SERVICES
ISUP ETSI	<->	ISUP ANSI
ISUP ETSI	<->	ISUP ETSI
ISUP ETSI	<->	MAP ETSI
ISUP ETSI	<->	MAP SMS
ISUP ETSI	<->	VOIP MGCP
ISUP ETSI	<->	VOIP SIP
ISUP ETSI	<->	VOIP SIPT
ISUP ETSI	<->	VOIP Q931
LIDB	<->	BICC ANSI
LIDB	<->	BICC ETSI

Protocol A		Protocol B
LIDB	<->	ISUP ANSI
LIDB	<->	LIDB
LIDB	<->	TUP
MAP ETSI	<->	BICC ANSI
MAP ETSI	<->	BICC ETSI
MAP ETSI	<->	BSSAP
MAP ETSI	<->	INAP
MAP ETSI	<->	ISUP ANSI
MAP ETSI	<->	ISUP ETSI
MAP ETSI	<->	MAP ETSI
MAP ETSI	<->	MAP SMS
MAP SMS	<->	ISUP ANSI
MAP SMS	<->	ISUP ETSI
TUP	<->	AIN
TUP	<->	LIDB
TUP	<->	TUP
VOIP MGCP	<->	ISUP ANSI
VOIP MGCP	<->	ISUP ETSI
VOIP Q931	<->	ISUP ANSI
VOIP Q931	<->	ISUP ETSI
VOIP SIP	<->	ISUP ANSI

Protocol A		Protocol B
VOIP SIP	<->	ISUP ETSI
VOIP SIP	<->	VOIP SIP
VOIP SIPT	<->	ISUP ANSI
VOIP SIPT	<->	ISUP ETSI
VOIP SIPT	<->	VOIP SIPT
VoipH245	<->	VoipQ931
VoipH248	<->	VoipQ931
VoipQ931	<->	VoipH245
VoipQ931	<->	VoipH248
VoipQ931	<->	VoipQ931
VoipQ931	<->	VoipRas
VoipRas	<->	VoipQ931