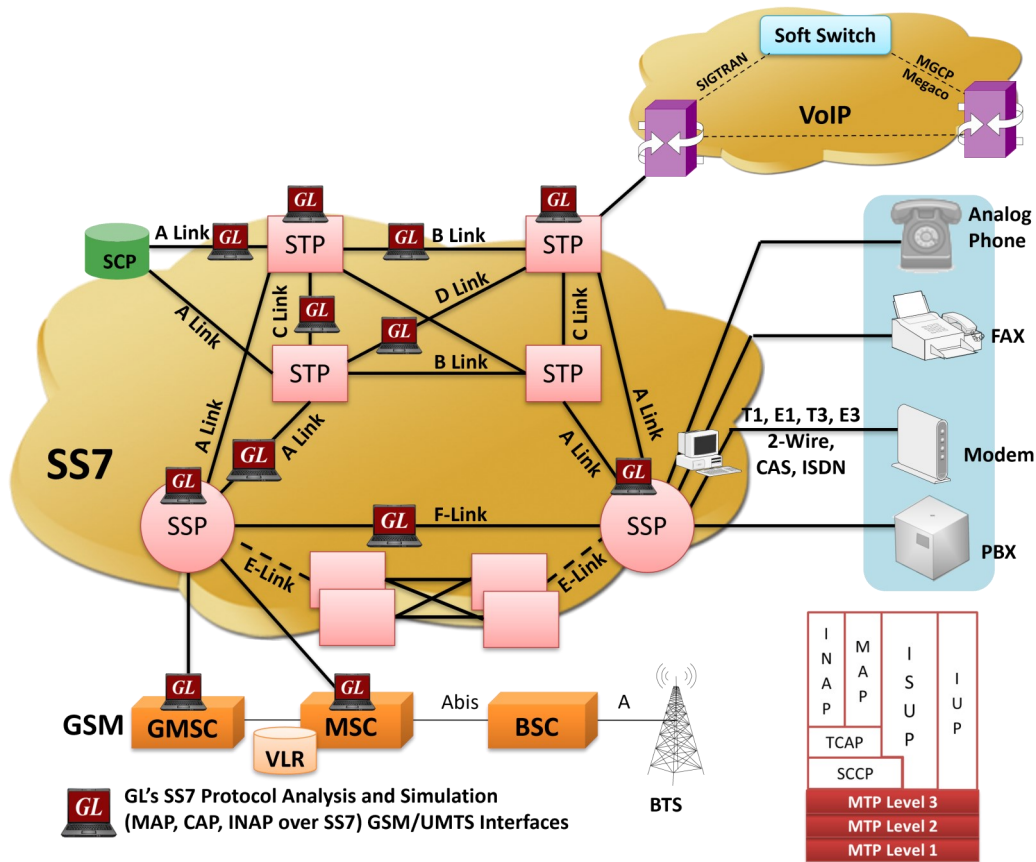# SS7 Protocol Analyzer

Overview

SS7 (Signaling System 7) separates the information required to set up and manage telephone calls in the Public Switched Telephone Network (PSTN) onto a separate packet switched network (Signaling Network). It uses Message Signal Units (MSUs), Link Status Signal Units (LSSUs), and Fill-In Signal Units (FISUs) as signal units. The main protocols include MTP (Message Transfer Part – Level 1 to 3), SCCP (Signaling Connection Control Part), and ISUP (ISDN User Part).

GL's **SS7 Analyzer** supports decoding different SS7 layers like MTP2, MTP3, ISUP, TUP, SCCP, INAP (CS1, CS2), IUP, BICC, BISUP, BTUP and many application layer protocols from GSM/GPRS/UMTS network like MAP, CAMEL(CAP), and so on. The SS7 Analyzer supports decoding of both Low Speed Links (LSL) of 56 kbps or 64 kbps DS0 links or high-speed 1.544 Mbps or 2 Mbps unchannelized T1 E1 High Speed Signaling Links (HSL).

GL Communications supports the following types of SS7 analyzers:

- Real-time SS7 Analyzer (Pre-requisites: GL's T1 E1 internal cards or USB T1 E1 external units, required licenses and Windows® Operating System)
- Remote/Offline SS7 Analyzers (Pre-requisites: Hardware dongle and Windows® Operating System)

SS7 Analyzer also supports Packet Data Analyzer with recording capabilities. Packet Data Analysis (PDA) is an outstanding tool for live monitoring of signaling and traffic over TDM. Allowing users to monitor live TDM networks including capture, analysis, and reporting of every call-in detail.

For more details, refer SS7 (C7) Protocol Analyzer webpage.

Main Features

Display Features

- Displays Summary, Detail, Hex-dump, and Statistics Views
- Detail View:
  - Displays decodes of a user-selected frame from the summary view
  - Provides options to display or hide the required protocol layers
  - Contents of this view can also be copied to clipboard
  - Provides option to toggle detail view vertically or horizontally as feasible for the user
- Summary View displays MTP2, MTP3 information, SS7 Message types, Called and Calling number, SCCP message type, SSN, INAP information, IUP information, BICC message type, and more in a tabular format
- Statistics View displays call and MSU statistics at any link or entire link set
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Option to combine data from multiple columns under one column
- Option to create multiple aggregate column groups. These groups can be prioritized as per users requirement to display the summary results efficiently

Supported Protocols

- SS7 ITU, SS7 ANSI, SS7 ETSI, SS7 CHINA, and SS7 UK
- Supports analysis of GSM/UMTS MAP interfaces supported are:
  - **B** (Interface b/w the MSC and its associated VLR); **C** (Interface b/w the HLR and the MSC); **D** (Interface b/w the HLR and the VLR); **E** (Interface b/w MSCs)
  - **F** (Interface b/w MSC and EIR); **H** (Interface between HLR and AuC)
  - **J** (Interface b/w the HLR and the gsmSCF)
- Supports analysis of SSP-STP (A link, E link), STP-STP (B link, C link), and SSP-SSP (F link) interfaces

Filtering / Search

- Advanced filtering and search based on any user selected protocol fields
- Allows the user to automatically create search/filter criteria from the current screen selection

Capturing Streams

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth
- Frames can be transmitted/captured in either 64 kbps, 56 kbps, n x 64 kbps, or n x 56 kbps data channels (hyper-channels)
- Capable of decoding protocols from GSM/GPRS network i.e. MAP, CAP, etc.
- Supports decoding of frames with FCS of 16 bits and 32 bits, or none

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Main Features (*Contd.*)

Export Options

- Exports Summary View information to a comma delimited file for subsequent import into a database or spreadsheet
- Capability to export detailed decode information to an ASCII file

Remote Monitoring

- Remote monitoring capability using GL's Network Surveillance System

Call Detail Record

- Call details recording feature includes data link groups that help in defining the direction of the calls in a given network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links

Packet Data Analyzer (PDA)

- Provides options to capture voice, digits, tones or FAX traffic and segregates, captures, and collects statistics on TDM calls
- Provides graphical representation of call analysis, such as ladder diagrams of protocol

Summary, Detail, and Hex dump Views

The analyzer displays Summary, Detail, and Hex Dump Views in different panes. The Summary View displays Frame Number, Time, Length, BSN, BIB, FSN, FIB, SCCP message type, called / calling number, and so on. The user can select a frame in Summary View to analyze and decode each frame in the Detail View. The Hex dump View displays the frame information in HEX and ASCII octet dump format. Each line in the detail view displays field offset and upon selection of this offset the corresponding hex dump view bytes are highlighted. The contents of detail and hex dump view can also be copied to clipboard.

Summary, Detail, and Hex dump Views

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Real-time and Offline Analysis

Users can capture and analyze SS7 frames using either real-time or remote analyzers, and record all or filtered traffic into a trace file. The recorded trace file can be used for offline analysis or exported to a comma-delimited file, or ASCII file. The raw data capturing requires user to specify timeslots, bit inversion, octet bit reversion, user/network side, FCS, and hyper channel selection options.

Recorded trace file can be played back on T1 E1 using the HDLC file Playback application.
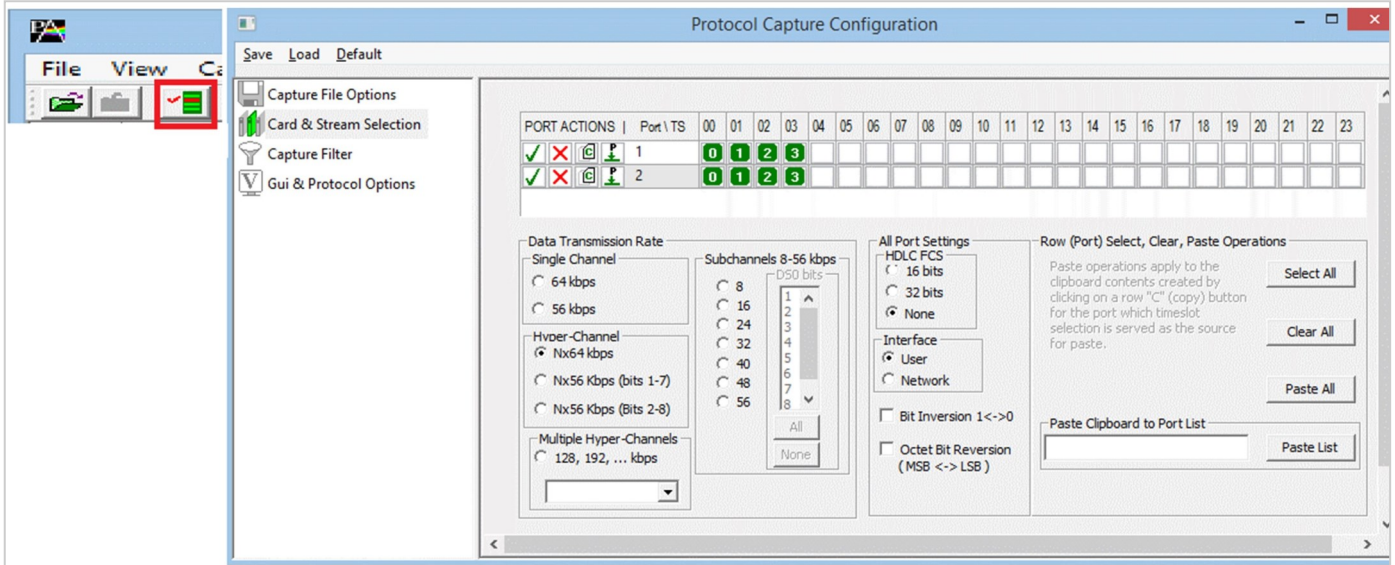
Stream / Interface Selection

Save / Load All Configuration Settings

Protocol Configuration window provides a consolidated interface for all the important settings required in the analyzer. This includes various options such as protocol selection, startup options, stream/interface selection, filter/search criteria and so on. All the configuration settings can be saved to a file and then loaded for future operations, or user may just revert to the default values using the default option.
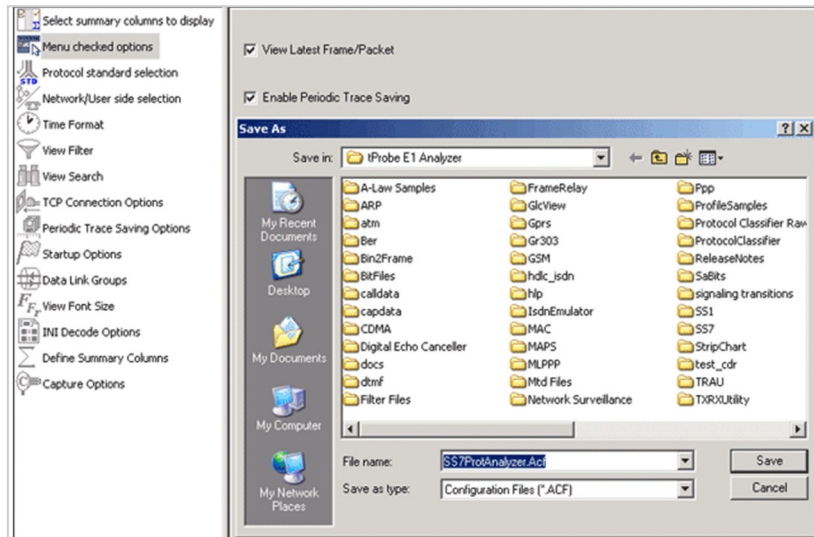
Save / Load Configuration

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Filtering and Search

Users can record all or filtered traffic into a trace file and also can create search/filter criteria automatically from the current screen selection. The filter and search options add a powerful dimension to the SS7 Analyzer that isolates required frames from the captured frames in real-time/remote/offline.

In real-time capturing, filter based on length of frames can be set. The frames can be filtered after completion of capture based on BSN, BIB, FSN, FIB, Status Field, OPC, DPC, SSN, CIC, Called and more.

Similarly, search capability helps user to search for a particular frame based on specific search criteria.

Real-time and Offline Filter
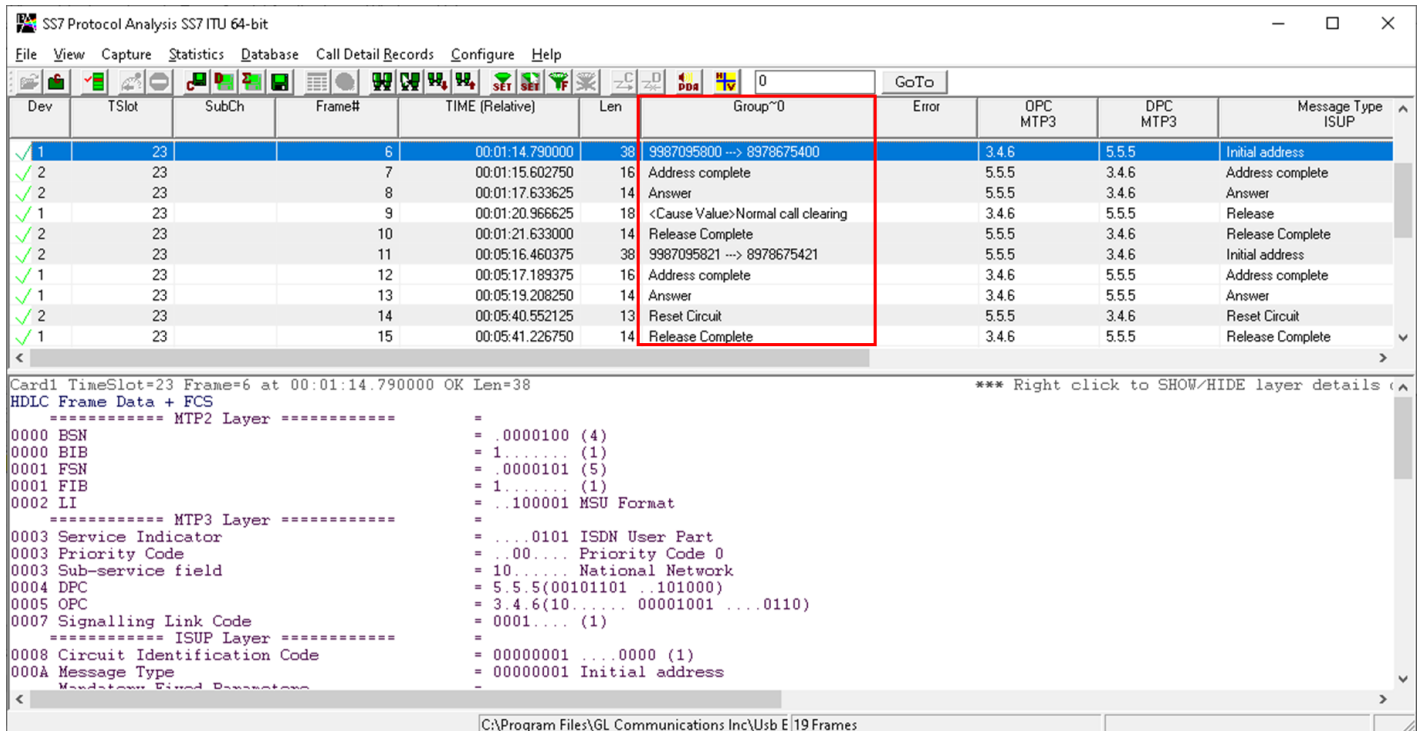
Aggregate Column Group

The enhanced feature of the protocol analyzer is aggregate column groups. The user can also create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results in an efficient way.

If the user has five different aggregate columns and wants to prioritize some columns, the user can create a group of aggregate columns with the highest priority and will display only the columns of chosen priority. If the values are null, then the next group values are displayed. The aggregate columns comprising a group will have the same prefix and suffix index as ~0, ~1 … ~N. The **group~0** is the root aggregate group that has the highest priority.
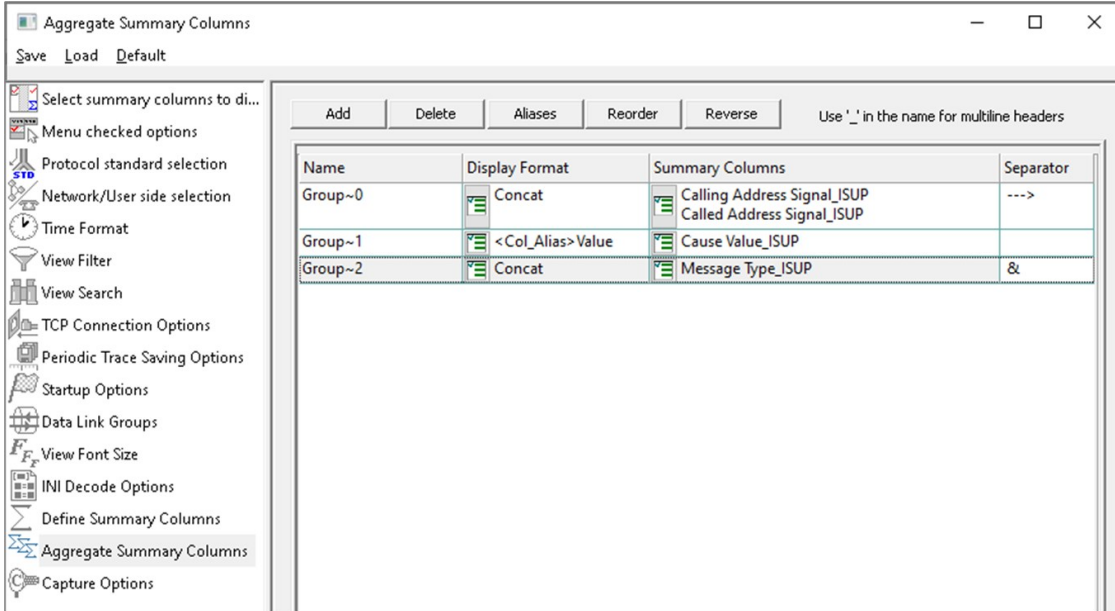
Aggregate Column Group

The updated results are as shown in the figure below. Here the root aggregate group~0 summary columns are displayed first and then Group~1 and Group~2 as per the assigned priority if the higher group values are null.

Display of Aggregate Column Group in Summary View

Call Detail Record and Statistics View

Important call specific parameters like Call Id, Calling No, Called No, Call duration, status of each call (i.e. active/completed along with the messages), OPC, DPC, CIC, and more are calculated based on signaling messages and displayed in Call Detail Record View. Additionally, users are provided with the option to search a particular call detail record from the captured traces. Call Detail Recording feature includes data link groups that help in defining the direction of the calls in a given network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links.

Various statistics can be obtained to study the performance and trend in the Frame Relay network based on protocol fields and parameters.

Statistics and Call Detail Record Views

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Detail Packet Analysis (PDA)

Packet Data Analysis (PDA) is an outstanding tool for live monitoring of signaling and traffic over TDM. Packet Data Analysis (PDA) is distributed with GL's CAS, ISDN, SS7, and GSM protocol analyzer. Allowing users to monitor live TDM networks including capture, analysis, and reporting of every call-in detail.

GL's Packet Analyzers can capture TDM traffic over different transmission lines, including T1, E1, T3, E3, and OC-3 STM-1 / OC-12 STM-4. PDA then processes the captured frames, identifies, and segregates calls based on signaling parameters to generate reports.

Performance metrics for each call includes Caller & Callee id information, call duration, status, call-initiated time, call established time, call stop time, call terminator, call failure reason, and total signaling frames. Graphs are provided for key values to give a pictorial representation of the statistics.
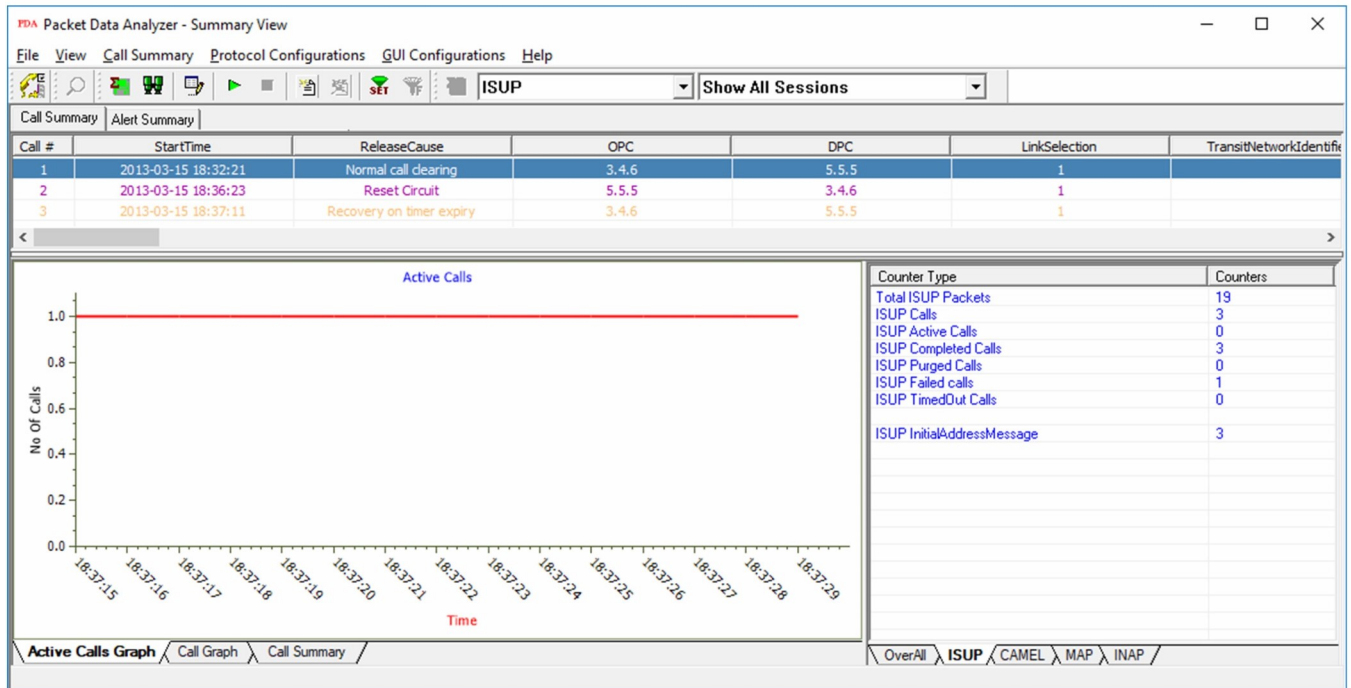
Call Capture Option with PDA

Scripted ISUP Emulation using MAPS™

GL's MAPS-SS7 is an advanced protocol simulator/tester for ISUP simulation over TDM (T1 E1). MAPS-SS7 can simulate Service Switching Point (SSP) and ISUP Signaling specification as defined by the ITU-T standards. MAPS-SS7 functionality covers the ITU and ANSI variant of SS7 implementing MTP2, MTP3, and ISUP protocols.

For more details, visit MAPS™ SS7 Protocol Emulator webpage.

Scripted MAP Emulation using MAPS™

GL's MAPS™ MAP (Mobile Application Part) Emulator is an advanced protocol simulator to simulate MAP messages and signaling over D & H interface in GSM/UMTS networks as defined by 3GPP standards.

For more details, visit MAPS™ MAP Emulator webpage.

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Supported Protocol Standards

The supported protocol standards in SS7 analyzer are SS7 ITU, SS7 ANSI, SS7 ETSI, SS7 CHINA, and SS7 UK.

Supported Protocols	Specification Used
MTP2 (ITU)	ITU-T Q.703
MTP3 (ITU)	ITU-T Q.704
MTP2, MTP3 ANSI	T1.111.4-1996
ISUP ITU / ANSI / ETSI / UK / CHINA	ITU - Q.761, Q.762, Q.763 and Q.764 / ANSI - T1.113.1 to T1.113.4 / EN 300 356 -1 V3.2.2(1998-08) Part 1/ ND1007:2007/01 TSG/SPEC/007 / Ministry of Posts and Telecommunications of the People's Republic of China, Technical Specification of ISUP, 1996
Test & Network Management Messages (ITU, CHINA / ANSI)	ITU-T Q.703, Q.704 / ANSI T1.111.4, ANSI T1.111.7
SCCP ITU / ANSI / ETSI	ITU-T Q.711-Q.714 / ANSI rec. T.112 (1996), T1.116.2 (1996) / EN 300 009 -1, Sept 1996, 3rd edition
CNAM	GR-1188-CORE Issue 3, April 2009
TCAP ANSI IS-41	TIA/EIA, IS41.1-C / IS-41.5-C
TUP ITU	T-REC-Q.723-11/1988
TCAP ITU / ANSI / ETSI	ITU-T Q.771 to Q.775 / T1.114-2000 / ETSI ETS 300 134
INAP CS1 ITU / ETSI	Q1218 (10 / 95) and ETSI 300 374 1, Sept, 1994
INAP CS2 ITU / ETSI	INAP - Capability Set 2. (Q.1228) / INAP - Capability Set 2. (EN 301 140-1-v1.3.4-1999-06)
CAMEL V3 / CAMEL V6	3GPP TS 29.078 V3.15.0 (2003-03) / 3GPP TS 29.078 6.3.0 (2004-09)
MAP R99 / MAP R4	3GPP TS 09.02 V7.14.0 (2003-09) / 3GPP TS 29.002 V4.18.0 (2007-09)
BISUP	Q.2763, Q.2931, Q.2933, Amendment 2 of Q.2931, Q.2941.1 etc.
BICC	T-REC-Q.1902.1-200107 T-REC-Q.1902.2-07/2001, T-REC-Q.1902.3-07/2001 T-REC-Q.1902.4-200107 (pl-080r1),
IUP ITU (BTUP) Proprietary Extensions To C7 Interconnect User Part (IUP).	ND1006:2005/02 PNO-ISC/SPEC/006/ ND1104:2004/11 PNO-ISC/INFO/004

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Buyer's Guide

Item No	Product Description
XX120	SS7 Analyzer Software
XX121	Call Capture Option for SS7 Protocol with PDA
OLV120	Offline SS7 Analyzer Software

Item No	Related Software
XX600	Basic Client/Server Scripted Control Software (Included with Basic Software)
PKS130	MAPS™ SIGTRAN
XX648	MAPS™ ISDN

Item No	Related Hardware
PTE001	tProbe™ Dual T1 E1 Laptop Analyzer (Require Basic Software)
FTE001	QuadXpress T1 E1 Main Board (Quad Port)
ETE001	OctalXpress T1 E1 Daughter boards (Octal Port)
TTE001	tScan16™ T1 E1 Boards
XTE001	Dual Express (PCIe) T1 E1 Boards

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more details, refer SS7 (C7) Protocol Analyzer webpage.

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