SS7 and SIGTRAN Signalling Protocol Software

Aculab offers Signalling System Number 7 (SS7) and SIGTRAN signalling software as part of its extensive range of protocols, allowing users to directly connect switching, media processing and signalling platforms to a carrier's network — via TDM and/or IP-based signalling transport. The SS7 and SIGTRAN protocols are suitable for worldwide deployment using Aculab's complete range of PCI and PCIe boards and the Prosody X 1U chassis.

High performance options consist of suitably configured Prosody X media processing boards or chassis, bringing together DSP-based functions and PSTN connectivity on a cost-effective single platform for both IP and TDM environments. These choices combine to bring tremendous value for developers, systems integrators and telecommunications equipment manufacturers alike. For TCAP applications not requiring media processing functionality, Aculab's SIGTRAN software can be licensed for use in a host PC without an Aculab board.

SS7 and SIGTRAN

Signalling protocol software

Product features

- Fully integrated with Aculab's call control API – using any Prosody X board or chassis fitted with an E1/T1 interface or a non-board, IP-based solution

- A 'single board' TDM solution, combining SS7 signalling and media processing resources, on any form factor

- SS7 protocol support for MTP, ISUP, SCCP and TCAP, presenting ISUP and TCAP APIs

- SIGTRAN support for M3UA over SCTP in both peer-to-peer and gateway modes, offering ISUP and TCAP APIs

- Built-in support for ITU-T, ANSI, China, ETSI and UK variants

- Easily customised for other variants, through user-configurable ISUP message formats

- Direct access to message parameters, through 'flexible ISUP' API extensions, for 'power users'

- Dual resilient MTP3/M3UA for high availability signalling configuration

- ISUP and TCAP can be distributed across multiple (unrestricted) platforms to share call and messaging load and for added scalability

- TCAP API includes optimised ASN.1 codec functions

- Management API for control of signalling links and bearer circuits

- Signalling monitor API for use in lawful intercept and traffic capture applications

- Monitor API can be used in conjunction with media processing functions for bearer channel recording

Product benefits

- Flexibility to meet diverse requirements through choosing and mixing the best platforms and most suitable form factors for optimum price performance and time to market

- Flexibility to meet worldwide signalling requirements over TDM, IP or hybrid TDM/IP transport environments as needed

- Cost-effective, high performance signalling protocol software providing essential redundancy, load sharing and high availability features

- Development investment protection – the same API regardless of underlying transport method

- Proven deployments – Aculab's SS7 signalling software has been deployed in more than 40 countries across 5 continents

- No dependence on expensive 3rd party APIs and toolkits for e.g., CAMEL, GSM-MAP and IS-41 applications

- Scalable, high density intercept, monitoring and call recording solutions can be readily developed for many application scenarios

Target applications

- (0)8**/Freephone services
- Call centre platforms
- Caller ring back tones (CRBT)
- Complex protocol conversion solutions
- Directory assistance and call completion services
- Fixed and mobile SMS applications
- Generation of call detail records incident
- Disaster early warning systems
- Lawful interception solutions
- Local number portability
- Network-based IVR and messaging applications
- Network traffic engineering
- Premium rate services
- Prepaid calling card platforms
- Signalling gateways
- Televoting or mass calling platforms
- Unified messaging
- Welcome/win-over communications generation

The implementation of Aculab's SS7 and SIGTRAN signalling protocol software is intended to assist developers and integrators designing solutions for public telephony networks. These may range from CRBT, signalling gateways, and messaging applications, to prepaid platforms and other added value, revenue generating services. In addition, the SS7 signalling monitor is ideal for lawful interception (LI) mediation and delivery platforms. Many applications also require media processing resources, such as record, playback, DTMF handling and echo cancellation. These functions are available with Aculab's Prosody platforms, which can be combined with SS7 and SIGTRAN on a single board or chassis to deliver powerful, cost-effective, computer-based solutions. Together, these benefits allow operators to offer their customers new, more advanced services at competitive prices.

SS7 and SIGTRAN

Signalling protocol software

Protocol support

Aculab's SS7 and SIGTRAN signalling software supports M3UA (over SCTP), MTP, ISUP, SCCP and TCAP protocol procedures. The availability of the TCAP and SCCP allows multiple network-based application sub-systems to be addressed explicitly, enabling advanced access database query services and global title translation.

SIGTRAN is a stepping stone for cost-effective migration to an IP multimedia subsystem (IMS) at the signalling layer and provides increased capacity over IP – resulting in reduced link quantity requirements, more efficient bandwidth utilisation and reduced transport costs.

API support

With Aculab's consistent approach to APIs, on a per call/transaction basis, the user has access to and control of many of the ISUP or TCAP protocol parameters. The ISUP API also provides a lower level of access to message parameters. For power users requiring more complex control, direct access to raw data ISUP parameters, through 'flexible ISUP' extensions to the generic call control API, is provided.

A standard TCAP API is presented to developers to support both TCAP structured and unstructured dialogues, as required by CAMEL or GSM-MAP applications, for example. The TCAP API includes ASN.1 codec 'helper' functions, which obviate the need for expensive, 3rd party APIs, compilers or toolkits.

ISUP and TCAP present the same APIs, whether they are to be used over MTP in a TDM scenario or via SIGTRAN M3UA in an IP-based network. Beneficially, this means applications in either environment or indeed in a hybrid environment (e.g., ISUP over TDM and TCAP over IP) without the need for rework, protecting development investments.

Signalling monitor API

The SS7 signalling monitor API can be used to produce sophisticated monitoring and data capture applications for use in SS7 networks. The API provides developers with a powerful means of creating a variety of critical applications to increase ARPU, improve customer satisfaction and meet lawful intercept obligations.

Maintenance API

An SS7 maintenance API provides user functions for the activation and deactivation of any configured link and the maintenance block/unblock of configured circuits, in addition to retrieval of essential state information from all configured hosts.

Additional APIs

An MTP3 API can be licensed for use with Aculab's SS7 boards. Contact Aculab for more information on this and other options.

Capacities

Connection to a TDM network is supported by any Prosody X board or chassis fitted with a primary rate trunk interface, which carries user-defined 64/56kbit/s timeslots for signalling links. Timeslots that are not used for signalling are available as voice/data bearer circuits, thereby leading to maximum cost efficiency. Prosody X variants can support up to 128 signalling links, which can be freely allocated over the trunks on the board.

SS7 and SIGTRAN

Signalling protocol software

The software supports an unrestricted number of ISUP and TCAP hosts, including an unrestricted number of E1/T1 bearer circuits. Whether for traditional SS7 over TDM or using IP transport with SIGTRAN, Aculab offers an ideal option for high throughput messaging applications such as SMS and prepaid using CAMEL, GSM-MAP or ANSI 41 D (IS-41D).

Signalling scalability and resilience

Signalling links can operate in fully associated signalling mode (F-links) or quasi-associated (A-links) mode and form one or more link sets. Signalling links within the same link set can reside on more than one Aculab board within a system, ensuring that a single board level failure does not cause a loss of signalling connectivity to the SS7 network. Because of this, the product can be connected to one or more service switching points (SSPs) or one or more signal transfer points (STPs) in the network and resilience is achieved in that there is no reliance on a single delivery trunk from the network.

For added reliability, a dual redundant MTP3 allows an active/active, auto-failover, load sharing configuration, with the signalling links split between boards in two chassis, appearing as a single network node – and local point code. A single link set can be split between the two MTP3 systems or separate link sets used to connect each system to a different STP.

The dual redundant architecture applies equally to M3UA configurations, with signalling associations established via SCTP to adjacent network nodes from each host. The dual M3UA hosts provide the same high level of resilience expected of traditional SS7 network connections with the advantages of greater bandwidth and reduced transport costs.

In addition, for large systems, the ISUP and TCAP architecture allows boards providing bearer channel terminations to be installed or implemented in multiple, distributed chassis/nodes, each sharing a single point code. The distributed architecture applies to both ISUP and TCAP applications in TDM environments and IP or hybrid TDM/IP configurations. All of which enables excellent scalability and application resilience, because problems with a single ISUP/TCAP node won't affect the operation of the rest of the system.

Signalling monitor

SS7 signalling can be monitored to detect call placement and/or service or feature interaction, and to determine parameters such as caller ID (CLI/ANI), circuit identification code (CIC), dialled number, point code (DPC/OPC), redirection number, and time stamp information. This is particularly important for mobile calls, which are substantially more difficult to tap into than fixed networks, because usage could be anywhere where the home operator and its roaming partners provide service.

The SS7 signalling monitor also assists in call surveillance, and results in decoded and filtered message data being extracted by an application to trigger local recording (fully associated signalling) or remote recording (quasi-associated/mobile calls) of calls when filtering criteria has been met. The media processing resources of Prosody X can be used to record such calls. Importantly, this enables lawful intercept requirements for capture of both signalling data and call content to be met.

Configuration options

The SS7 signalling monitor software can be used with any Prosody X board or chassis fitted with an appropriate trunk module. Configurations are available to enable the dynamic capture and monitoring of signalling information in up to 64 bi-directional links, carried within up to 8 software selectable E1/T1 trunks per board. The 1U HA chassis with 16 trunks fitted can support 128 bi-directional links, 64 on the first 8 trunks and 64 on the second block of 8 trunks.

SS7 and SIGTRAN

Signalling protocol software

Usefully, protocol variants (e.g., ITU-T, ANSI, China) are configurable on a per link basis, and traffic from multiple signalling links can be merged into a single TCP/IP connection to an application. Multiple boards can be used for distributed, scalable, high density traffic monitoring, filtering, analysis and recording systems.

Capture and decode

Three capture modes are provided; the non-invasive mode requires a high impedance line tap for passive interception of signalling traffic on E1/T1 trunks, the active pass through mode provides a cost effective alternative, and a local traffic mode allows the capture of data from a co-existing signalling application.

Three decode levels are also presented and the developer has the option of adding user-defined decoders. Choosing raw HDLC presents Level 2 MSU data directly to an application with no MTP3 or user part decode. An auto-decode buffers the MTP3 payload, and can be set for all traffic, or for explicit decode of selected messages. And the ISUP decoder presents ISUP message data to the application, either automatically, or via API control. A powerful search and filter capability can be used to specify which messages an application needs to capture from within each monitored traffic stream.

Multi-threaded applications

The Aculab TCAP API includes supporting software that enables easy construction of multi-threaded applications, with mechanisms that automatically manage thread pools and route TCAP traffic to individual threads for processing. In addition, many of the system facilities required for a multi-threaded application that are normally operating system specific, such as threads libraries, are presented in an operating system independent interface. This makes for easier portability of applications between platforms.

Protocol standards

Aculab is continually expanding its coverage of SS7 and SIGTRAN protocol standards and country-specific variants. In addition to general market requirements, a request for change process is used to manage customer priorities for modifications to functionality. Contact Aculab for more information about protocol development plans and individual feature requests.

Recommended reading

All SS7 related user and API guides are freely available to download from Aculab's website at any time. All documentation, including a useful SS7 developer's guide, can be viewed from the documentation pages.

Download now

With the exception of SIGTRAN, which is licensed, all protocols, including SS7, are readily available from Aculab's website via the Aculab installation tool (AIT) software download utility. Developers can simply collect the protocol firmware, free of charge, when they need it, gaining a distinct advantage in terms of system cost and value per channel.

SS7 and SIGTRAN

Signalling protocol software

Technical summary

SS7 capability		
Operating systems supported	Operating system support for Linux and Windows; see http://www.aculab.com/downloads for more details	
Software availability	Protocol software may be downloaded from Aculab's website	
Aculab hardware options supported	Prosody X PCIe board	1, 2, 4 or 8 E1/T1 trunks on board, integral SS7
	Prosody X 1U chassis	1, 2, 4, 8 or 16 E1/T1 trunks, integral SS7
Signalling and bearer channel details		
Load sharing	Supports load sharing for both ISUP and TCAP messages	
Bearer circuits	The software supports an unrestricted number of E1/T1 bearer circuits	
	Bearers can be distributed across multiple chassis sharing a single point code	
ISUP and TCAP hosts	The software supports an unrestricted number of ISUP or TCAP hosts	
Signalling mode	Fully or quasi-associated	
Signalling links	Up to 64 user-defined 64kbits/s timeslots per PCIe board; up to 128 for the Prosody X 1U chassis[1]	
	Signalling links can be distributed across Aculab hardware[1]	
Link sets	Up to 128 link sets distributed across Aculab hardware[1]	
Error correction	Basic and PCR error correction methods are supported	
MTP3/M3UA	Dual resilient MTP3/M3UA – signalling connections can be split across two chassis	
SIGTRAN (M3UA/SCTP)	Peer-to-peer and gateway modes supported	
M3UA capacity	Licensed from 100 to 25600 transmit messages per second	
LUDT (broadband) messages	Transmit and receive	
Protocol conformance		
TCAP (transaction capabilities application part)[2] [3]	ITU Q.771-Q.774 (1997/white book); ANSI TCAP T1.114 1996; China TCAP GF011-95	
SCCP (signalling connection control part)[2] [3]	ITU Q.711-Q.714 (1996/white book); ANSI SCCP T1.112 1996; China SCCP GF010-95	
ISUP (ISDN user part)[2]	ITU-T ISUP (1999/white book); ANSI ISUP T1.113 (1995); Q.767 International ISUP; China ISUP YDN-038 (1997); ETSI ISUP V4 (2001); UK ISUP (2001); user definable variants[4]	
MTP3 (message transfer part layer 3)[2]	Q.704 (1996/white book); ANSI T1.111 (1996); China GF001-9001 (1990)	
MTP2 (message transfer part layer 2)[2]	Q.703 (1996/white book); ANSI T1.111 (1996); China GF001-9001 (1990)	
M3UA (message transfer part 3 user adaptation layer)[5]	IETF RFC 4666; ETSI TS 102 142 V1.1.1 (2003-05)	
SCCP (stream control transmission protocol)	IETF RFC 2960; RFC 3257; RFC 4166	

SS7 and SIGTRAN

Signalling protocol software

SS7 monitoring software capability		
Hardware options	Prosody X PCIe	Prosody X 1U chassis
Appropriate trunk module	1, 2, 4 or 8 trunks on main board	1, 2, 4, 8 or 16 E1/T1 trunks
Trunks containing signalling links	1,2 or 4 E1/T1 trunks[6]	1, 2, 4, 8 or 16 E1/T1 trunks[6]
Signalling links (64kbits/s timeslots)	Up to 32[7]	Up to 64[7]
Capture modes	Non-invasive mode – high impedance (Hi-Z) line tap (not supplied); active pass through mode; local traffic mode	
Protocols supported	SS7 and other HDLC-based protocols	
SS7 protocol variants (e.g., ` ITU-T, ANSI, China)	Configurable on a per link basis	
Monitor and decode	Raw HDLC (Level 2 MSU); MTP3; ISUP; user-defined	
Bearer channel traffic capture	Via DSP-based media processing on Prosody X boards or Prosody X 1U chassis	

Physical and environmental			
Hardware options	Prosody X PCIe	Prosody X 1U chassis	
		Enterprise	High availability
I/O options	Front panel I/O only	Front panel I/O only, power at rear	
Network connectors (BNC via adapter – not supplied)	1, 2 or 4 off RJ45/RJ48C	1, 2, 4, 8 or 16 off RJ45/RJ48C	
Adapter cables (supplied)	1, 2 or 4 RJ45/RJ48C cable adapters (single plug to dual socket)	Not applicable	
Network terminations	Software selectable E1/T1 and line impedance (75R, 100R or 120R)		
Card format	Full size, single slot PCIe board	19" 1U rack-mount chassis	
		210mm deep	550mm deep
Bus type	PCISIG 1.1; electrical/mechanical x4	Not applicable	
Ethernet interfaces	Dual redundant 10/100 BASE-T or single Gigabit Ethernet via RJ45 connector	Dual redundant 10/100BASE-T Ethernet via RJ45 connectors	Dual redundant Gigabit Ethernet via RJ45 connectors
CT board interconnections	H.100	None	H.100
Board/Chassis/API control	Host-based via PCIe bus or remote via Ethernet	Remote (from application server) via Ethernet	
Remote board management	Aculab ACT and remote control toolset	Aculab ACT	HPI Manager, including SNMP V2c; and Aculab ACT
Power consumption	20W max.	55W max. 25W typ.	250W max. 125W typ.
Operating environment	Operating temperature: 0 to +50°C	Operating temp: 0 to +40°C	
	Storage temperature: -20 to +70°C; humidity: 10 to 95% RH non-condensing; altitude: 0 to 2500m		
EMC standards	Meets all mandatory international standards		
Safety standards	Meets all international certification schemes e.g., CB, UL, CUL		
RoHS compliance	Fully compliant		

SS7 and SIGTRAN

Signalling protocol software

Notes:

1. System capacity depends on the hardware types used – contact your Account Manager for details.
2. These signalling protocols are offered under a cost free licence when used with Aculab's PCIe boards or the Prosody X 1U chassis.
3. The software supports the practical combination of mixed stack layers, such as, for example, ANSI TCAP with ITU SCCP (and vice versa).
4. Aculab's SS7 software enables user-configurable ISUP message formats through which other national and international variants can be defined to meet specific needs.
5. M3UA signalling software is offered for a fee under the terms of a software licence for use on a per host basis.
6. Bi-directional, receive and transmit sides.
7. Figures given are the maximum number of concurrent links that can be monitored per board or chassis using the appropriate hardware option for the number of trunks containing signalling links.
8. Preliminary figures

For more information, please contact your Account Manager or view our website: http://www.aculab.com

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About Aculab

Aculab is an innovative company that offers deployment proven technology for any telecoms related application. Its enabling technology serves the evolving needs of automated and interactive systems, whether on-premise, data centre hosted, or cloud-based.

Over 1000 customers in more than 80 countries worldwide, including developers, integrators, and solutions and service providers, have adopted Aculab's technology for a wide variety of business critical services and solutions.

Aculab offers development APIs for voice, data, fax and SMS, on hardware, software and cloud-based platforms, giving a choice between capital investment and cost-effective, 'pay as you go' alternatives.

For more information

To learn more about Aculab Cloud and Aculab's extensive telephony solutions visit:

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