3GPP TSG CN Plenary **Tdoc NP-000679**
Meeting #10, Bangkok, Thailand
6th – 8th December 2000

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Title: #7 Signalling over IP in Core Network

Agenda item: 8.19 any other R00 Work Item

Document for: INFORMATION

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1. Introduction

This document briefly describes the architecture to transfer #7 signalling over IP defined by the SIGTRAN group within the IETF.

The intention of this document is to provide background information to the proposed new Work Item "#7 Signalling over IP in Core Network". It shows technical details on how a seamless transfer of for example MAP and CAP over IP can be accomplished by the SIGTRAN architecture.

The document is for information only and its contents should not be discussed in CN#10.

2. Description

When IP is used as transport technology, there is a need to transfer #7 signalling (MAP, etc) over IP. In the IETF there is a working group, SIGTRAN, that is working out Internet drafts for this.

The architecture defined by SIGTRAN, (RFC 2719), consist on a modular, extensible structure with a common reliable transport protocol SCTP.
SCTP, (Stream Control Transmission Protocol), is an application-level datagram transfer protocol operating on top of IP.

The following way to access SCTP has been defined:

On top of SCTP there is an adaptation module, xUA, that is a layer between the SCN, (Switched Circuit Network), signalling system being carried and SCTP. The adaptation module allows keeping the signalling protocol unchanged.

Protocols that need to be adapted for being transported over SCTP/IP are:

- MTP3 users (SCCP and its users, ISUP): SIGTRAN has defined a standard adaptation layer M3UA (MTP3 Users Adaptation layer) to allow a seamless, or as seamless as possible operation of MTP3 user in the SS7 and IP domains.

- SCCP users (TCAP, RANAP): As it is indicated in the previous point, SCCP users can use SCCP over M3UA to access SCTP services. SIGTRAN has also defined a standard adaptation layer SUA (SCCP Users Adaptation layer) to access directly to SCTP.

However, it is proposed not to take in account the SUA approach for Release 4, as the SUA protocol is not enough stable yet and M3UA can provide the same services provided by SUA layer.

2.1 Concepts

Application Server (AS): a logical entity serving a specific Routing Key. An example of an Application Server is a virtual switch element handling all call processing for a unique range of PSTN trunks, identified by an SS7 DPC/OPC/CIC range. Another example is a virtual database element, handling all HLR transactions for a particular SS7 DPC/OPC/SCCP_SSN combination. The AS contains a set of one or more unique Application Server Processes, of which one or more is normally actively processing traffic.

Application Server Process (ASP): a process instance of an Application Server. An Application Server Process serves as an active or standby process of an Application Server (e.g., part of a distributed virtual switch or database). Examples of ASPs are processes, (or process instances of), MGCs, IP SCPs or IP HLRs. An ASP contains an SCTP end- point and may be configured to process signalling traffic within more than one Application Server.

IP Server Process (IPSP): A process instance of an IP-based application. An IPSP is essentially the same as an ASP, except that it uses MU3A in a peer-to-peer fashion. Conceptually, an IPSP does not use the services of a signalling gateway.

2.2 Stream Control Transmission Protocol (SCTP)

SCTP is a Common Signalling Transport Protocol that supports a common set of reliable transport functions for signalling transport.
It is connection-oriented in nature, but comparing to the TCP connection, the SCTP association is a broader concept. SCTP provides means for each SCTP endpoint to provide the other with a list of transport addresses during association start-up.

Through the transport addresses the SCTP endpoint can be reached and from which it will originate messages.
The association spans transfers over all of the possible source/destination combinations which may be generated from the two endpoint lists.

Within each SCTP association, traffic can be assigned to different streams. On the receiving side, SCTP ensures that messages are delivered to SCTP user in sequence within a given stream. The use of multiple streams within an association has one advantage: while one stream may be blocked for waiting the next in-sequence user message, delivery from other stream can proceed

2.3 MTP3-User Adaptation Layer (M3UA)

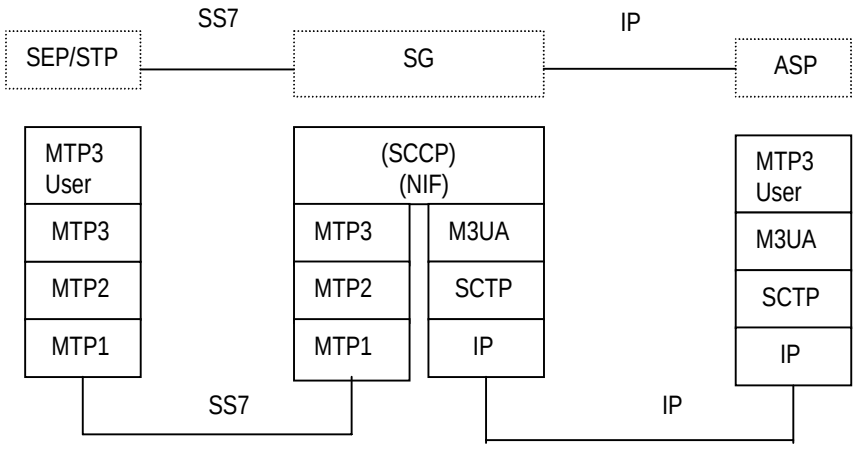
M3UA is an adaptation layer sitting on top of SCTP. It defines a protocol for the transport of any SS7 MTP3-User signalling (e.g., ISUP and SCCP messages) over IP using the SCTP.

According to M3UA draft, (ref. [1]), the M3UA layer can be used by three different signalling processes: ASP, SGP and IPSP. Each of them with its own scenario, functionality and implementation.

In an **ASP-SG scenario**, M3UA provides the transport of data across an established SCTP association between the SG and the ASP.

At the ***ASP***, M3UA layer provides the equivalent set of primitives as provided by MTP3 to its local users at an SS7 Signalling End Point. In this way the MTP3 user at an ASP is unaware that the expected MTP3 services are offered remotely from an MTP3 layer at an SG, and not by a local MTP3 layer.

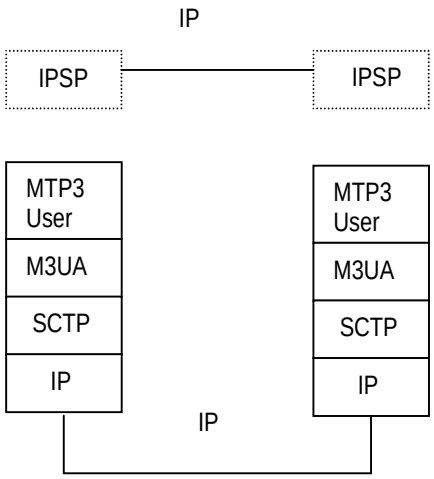
At the ***SG***, M3UA layer provides a seamless operation of MTP3 user peers in the SS7 and IP domains, allowing the transference of data between both type of networks and providing inter-working with MTP3 management functions.



Model 1. Transport between ASP and SG

To support this message distribution, the ***SG*** must maintain the equivalent of a network address translation table, mapping incoming SS7 message information to an Application Server for a particular application and range of traffic.

In an **IPSP-IPSP scenario**, M3UA can be used for *point to point signalling* between two IP based endpoints (IP server processes –IPSPs-). In this case, M3UA provides the same set of primitives and services as MTP3. However, in this case the expected MTP3 services has to be provided by the own M3UA layer.
In this case the procedures to support these services will be a subset of the MTP3 procedures due to the simplified point to point IPSP-IPSP relationship.



Model 2. Point to Point Signalling

2.4 Mobile Application Part (MAP) & other TCAP Users

As an example, the protocol stack for MAP, when the M3UA adaptation layer is used according to the SIGTRAN architecture is showed below.

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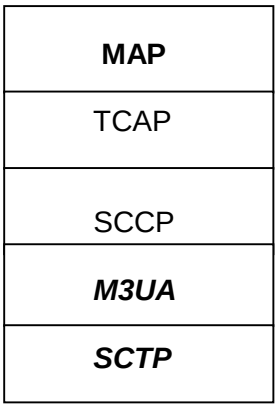

Protocol Stack for MAP

3. References

1) Internet Draft : SS7 MTP3-User Adaptation Layer (M3UA), http://www.ietf.org/internet-drafts/ draft-ietf-sigtran-m3ua-03.txt

2) Internet draft: Stream Control Transmission Protocol, http://www.ietf.org/internet-drafts/ draft-ietf-sigtran-sctp-13.txt

3) Internet draft: SS7 SCCP-User Adaptation Layer (SUA), http://www.ietf.org/internet-drafts/ draft-ietf-sigtran-sua-01.txt