Chapter 7

SSTP Architecture & Network

Need of SSTP

The efficiency of SS7 had made a numbers of applications possible with e.g. fast connection setup in PSTN, “short message service” and “location update” messages in GSM world. As the size of the network grew, it became more and more difficult to manage the direct SS7 links between the switches and from switches to other network elements like HLR, SMSC, SCPs etc. The introduction of Standalone Signal Transfer Point (SSTP) was a historic step from that perspective. It immediately solved issues related to the complexity by converting the mesh networks into the star networks. It is now able to handle the signaling very efficiently. This capability also offloaded some of the processing power required in the L-1 TAX and all switches could breathe easier.

SSTP also handle the non call related messages efficiently. These messages exist in all the technology and may not be needed to be handled by a switch. Many times these will actually involve multiple technologies and in absence of the uniform signalling layer, the complexity increase many fold. For example a simple service like SMS, a CDMA subscriber may send the message to a GSM subscriber that could go through the long distance network. This involves three different networks and three technologies. However one thing is common, which is signalling as the transport to carry this.

The SSTP suddenly became the vantage point in the network because of the simple reason that the signalling protocol was common i.e. SS7, independent of the technology and the access. Be it GSM or CDMA, the connectivity was based on SS7 with different application parts (MAP, INAP etc.). Thus the SSTPs are actually a centralized routing database and not a transmission system for SS7 packet.

As the subscribers are growing, the number of nodes involved in the routing is also increasing exponentially. If the management of the routing is to be done on these individual nodes, the complexity increases accordingly, which also mean the increased chances of error and hence loosing the revenue. The SSTP, enabling the uniform signalling in SS7 domain, provided a single routing database, which is managed centrally. This routing database is able to make the routing decision based on the destination point codes (DPC), global title translation (GTT), routing keys etc.

When any mobile subscriber of a private operator roams into service area of other operator (say BSNL), the signaling traffic or SMS are being handled by signaling channel of BSNL taken by private operator against the POI. BSNL was not able to measure the traffic and it was also not known about the type of signaling traffic. To measure and know type of signaling traffic, SSTP was planned and installed so that billing to private operators can be done accordingly.

Due to reasons explained above, BSNL decided to have a separate signalling network by installing a number of SSTPs at various locations.

Objectives of SSTPs

Following were the main objectives:-

- Regulate, measure, and account for inter-network traffic including SMS messages from mobile networks including GSM and CDMA
- Achieve a flexibility and transparency in management of signalling for BSNL's wired and wireless networks.
- Optimal expansion of GSM & CDMA network of BSNL
- Introduction of new services.
- Offer CCS7 & IP Signalling Services to other Wire line & Wireless Network Operators.

With the above objectives in mind, BSNL awarded a contract to Ms. ITI for the supply and installation of 10 SSTP nodes in September, 2005. Later on, the scope of the project was further expanded to provide 24 nodes in total covering all the major location including all the level-1 TAX locations. This was a significant step in the direction of the giving the decades old BSNL network an uplift.

SSTPs in BSNL Network

- 21 TAX Locations with an STP at each location.
- Pair of STPs are designated as mated pair with identical routing data and complete failover capability.

- **Phase 1 -** 10 Locations
- **Phase 2** - 11 additional locations: This was later changed to 24 locations to take care of the connectivity issues.
- 4 Additional locations are Jammu, Shimla, Dimapur, Shillong and droping Raipur
- Phase 3 Expansion of all 24 nodes to about capacity of 1800 LSL per node
- 6 STPs are designated as ANSI-ITU MTP gateway (ILD Gateways).
- Connect multiple SS7 nodes (MSC, L1 TAX, L2 TAX, Local Exchanges, SMSC, HLR, SCP) to a mated pair using SS7 E1 links.
- SSTPs interconnected using BSNL's IP/MPLS network on M2PA
- Later on M3UA functionality is also included to connect the access nodes e.g. Soft switch, GMSC, IN, HLR etc.
- Centralized Network Management with an Active and DR Standby site.
- Central Billing Server for billing inter-carrier SS7 usage.
- The SSTPs shall form primary and secondly signaling path through the designated mated pairs only.
- The connectivity with private operators (including MTNL) for signaling traffic to be established either on link basis or with their SSTPs for bothway signaling traffic. The necessary instructions for tariff/ billing of signaling traffic may be issued separately.
- However, in case of emergencies the direct routes between two Level-1 TAXs will carry the signaling traffic. SSTP connectivity of TAXs will be governed by instructions issued by NM branch from time to time.

Selection of SSTP sites

- Preferably where MPLS VPN equipment is already working.
- Preferably in Telecom building where at least two independent OFC rings are working.
- If, the installation of SSTP equipment is not technically feasible in MPLS VPN building, then the location to be where spare STM-1 is available between the MPLS VPN building site and SSTP equipment building, on two OFC rings working on independent cable paths.

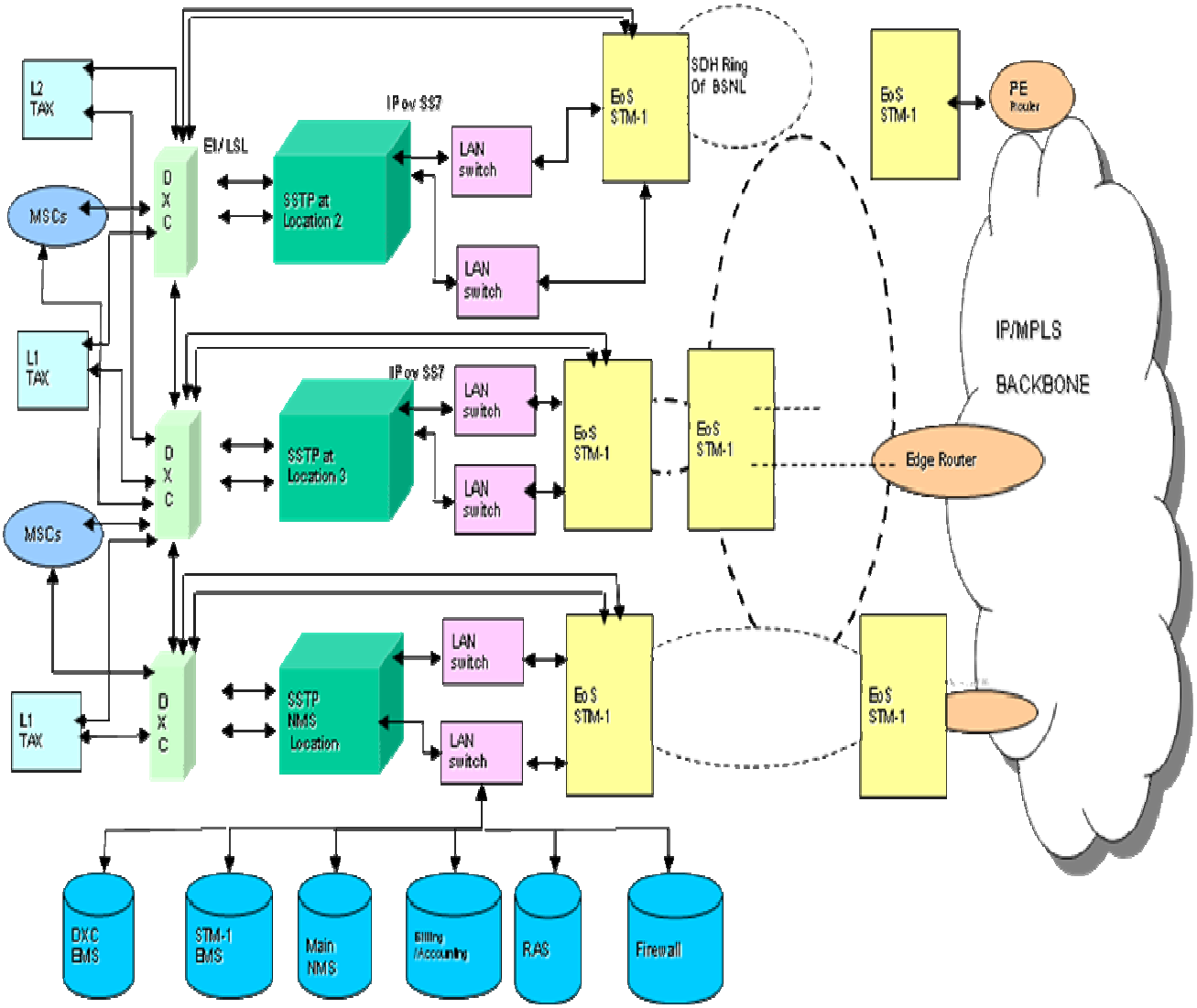

Fig. Building Blocks for SSTP

Planned Applications on SSTP Network

- Lawful Intercept of SMS
- Mobile Number Portability (MNP)

There are two ways for MNP

- Non-Integrated NP Solution
- SSTP's Integrated NP Solution

SSTP requirements for MNP

Connectivity

- All BSNL Network elements SMSC, IN, HLRs, MSCs to be connected to the SSTP.
- In case of circle STP/SGW already existing, these should be directly connected to the SSTPs so that directly or indirectly all the SS7 elements are connected via SSTP.
- All GSM & CDMA MAP traffic to be routed via the SSTP, including SGSN and GGSN.
- All PSTN traffic to be connected to SSTP via Level-1/Level-2 TAX.

Signaling Impact increase

- Number of links to SSTP need to be increased to cater to Direct Call routing method – Originating network has to query the NPDB.
- B links between SSTPs to be also increased.

Network Architecture

- Each SSTP will have NPDB for the routing purposes.
- SSTP architecture to be modified for efficient call routing.

Call Flows

- SSTP is capable of handling different variations of call flows and requirements from the protocol perspective.
- Query method and parameters to finalize with the vendors, based on their capabilities and network flexibility.

Terminologies in SSTP

SSTP: Standalone Signal Transfer Point

SS7: Signaling System 7

STP: Signaling Transfer Point

DPC: Destination Point Codes

MNP: Mobile Number Portability

MAP: Mobile Application Part

INAP: Intelligent Network Application Part

SMSC: Short Message Service Centre

SSP: Service Switching Point

SP/SEP: Signaling Point/ Signaling End Point

GTT: Global Title Translation

M2PA: MTP2 Peer-to-Peer Adaptation Layer

M3UA: MTP3 User Adaptation Layer

HLR: Home location register

GGSN: Gateway GPRS support Node

SGSN: Serving GPRS support Node

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