Marketing Info Sheet 27 – Distributed, SS7 Signalling

The Problem

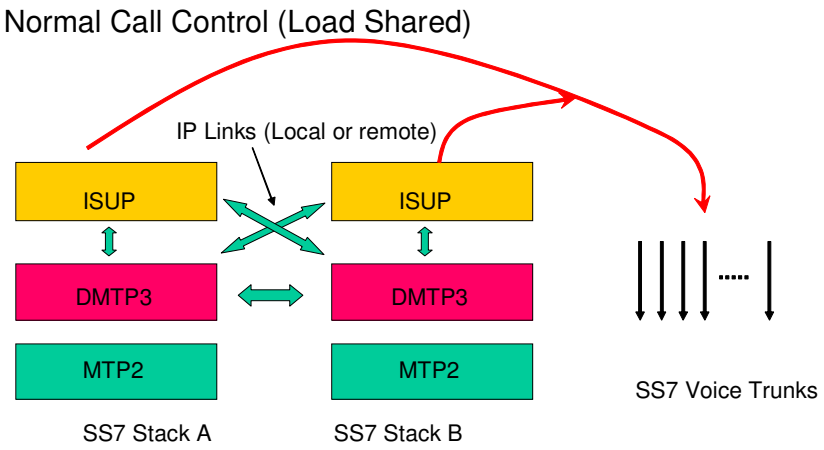
SS7 works by concentrating the signalling information for many trunks into a single signalling channel. This signalling channel may carry control information for up to 128 E1s of traffic (voice trunks). This architecture is highly efficient for the carrier because signalling intelligence can be concentrated in a single point. Scalability is also made easier because extra voice trunks can be added without having to interfere with the signalling link. However, with so many trunks depending on a single signalling link resilience becomes an issue as failure of this link would have widespread effects. For this reason almost all SS7 signalling links are delivered by carriers in pairs. These are normally operated as a pair of load sharing links (A & B links).

The Solution

It has always been possible to achieve some resilience in the WTL switch by having the A & B signalling links on different E1 cards within the switch. The WTL SS7 architecture also allows signalling links on one WTL switch to control voice trunks on remote WTL switches.
Another method of providing resilience would be to simply duplicate the whole SS7 interconnect. In practice this would be expensive and inconvenient as it would require the user to apply for 2 Point Codes. However, the DMTP3 (Distributed MTP3) feature offers a more robust and practical solution.
DMTP3 overcomes the resilience problem by allowing the A & B SS7 signalling links to be on separate WTL switches. The only restriction is that the switches must be linked to one another by a reliable IP network.
Switch A will handle one of the signalling links from a carrier and Switch B will handle the other. These 2 nodes may be geographically separate. The DMTP3 software is located on each of two switches sharing one point code and the signalling links from one or more carriers. Each DMTP3 instance is a backup for the other one. They are both active and behave like a single MTP3 end point from the point of view of the carrier.

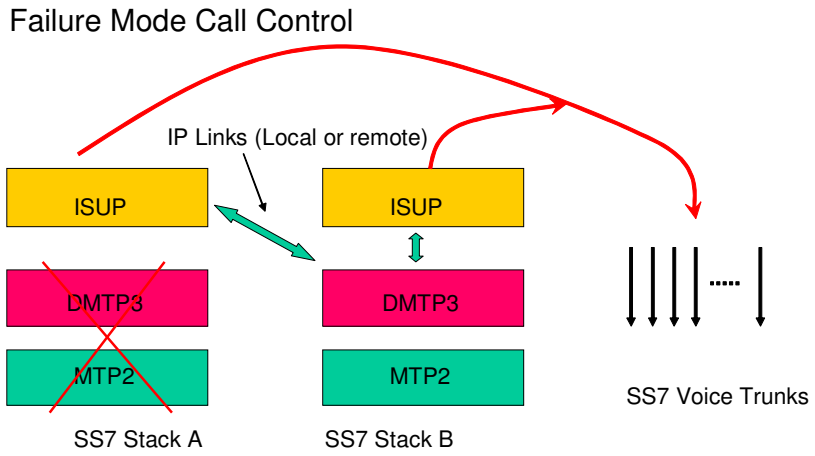
Operation in Normal Mode

The call signalling layer of an SS7 system is the ISUP software. This sits above the MTP2 & MTP3 layers which have the responsibility for managing the communication links between the two SS7 end points and ensuring safe delivery of the messages from the layer above. Any WTL switch may be licensed and configured to run WTL's own ISUP software.
In the simplest case, a single ISUP software entity will communicate with a single MTP3 entity. The DMTP3 feature allows a single ISUP software entity to communicate with two DMTP3 entities and to use one or both, whichever is functioning.
However, WTL SS7 architecture also allows more complex designs. For example, multiple ISUP stacks may be located in multiple switches, (including the ones with DMTP3). Each ISUP stack is responsible for the local E1s. There is no redundancy at ISUP level but the effect of ISUP failure is limited to the switch in which it is running (in which case the switch is probably down anyway). Each ISUP stack is in constant communication with both DMTP3 stacks and will detect the failure of DMTP3 automatically. Communication between the DMTP3 stacks, and between DMTP3 and ISUP, is TCP/IP based and uses a WTL proprietary message format. No redundancy at IP level is currently implemented but this can be achieved by careful design of the IP network.



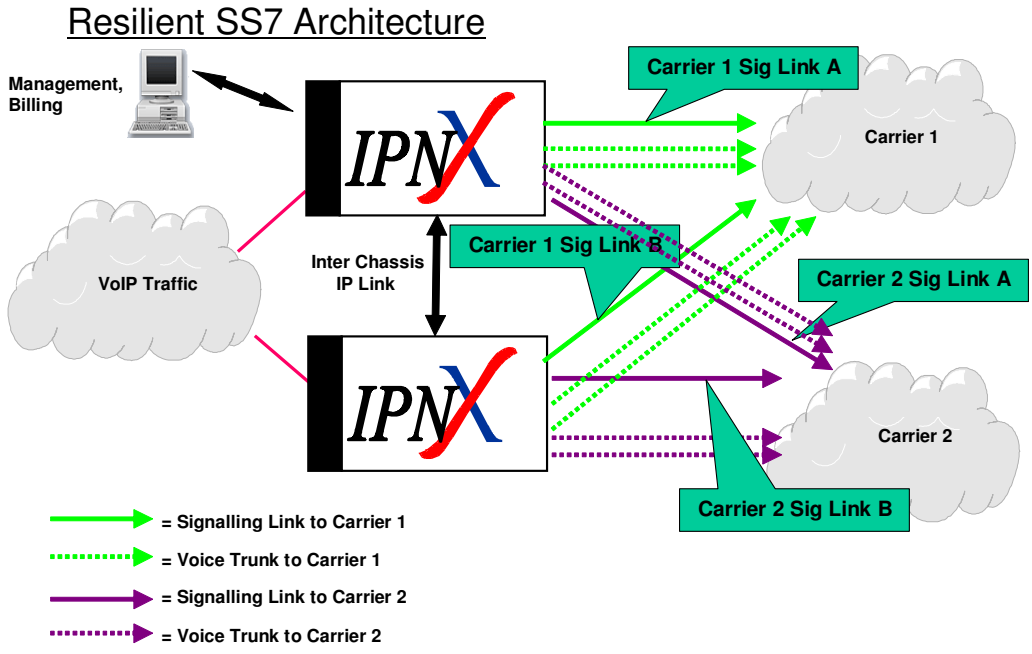
Operation in Failure Mode

There are a number of scenarios where the Active SS7 signalling link may fail. The physical link to the SS7 carrier may fail, the carrier SS7 equipment may have a problem or the WTL switch itself may suffer a problem. Any calls that were transiting the failed trunk or switch at the time of the failure will of course be lost. However, the DMTP3 software will detect the loss of the active SS7 link and will take over the processing of SS7 call control messages from that point on.



Network Design

DMTP3 allows resilient SS7 networks to be designed. The dual IPNx approach provides the architecture for
splitting a point code over two active SS7 signalling engines. Using this technique, the links in an SS7 link set
can be spread between two separate chassis with DMTP3 running in each. In normal operation, signalling can be shared between two units. In the event of a failure, signalling is maintained by the remaining unit.



A further benefit of a resilient design distributed over 2 switches is that planned maintenance by the carrier or the WTL switch operator does not have to result in a complete loss of service. Whilst one of the signalling links is out of service the other can continue processing SS7 signalling messages and traffic can continue to be carried on the remaining trunks.

Restoring The Connection

When the failed element recovers, the ISUP layer will automatically detect this and message processing will once again be shared between the 2 active SS7 signalling engines.

Availability

DMTP3 is a standard part of the WTL SS7 operating software. All WTL switches which are purchased with SS7 signalling licenses are shipped with this feature.