Contiguous concatenation

The technique of contiguous concatenation makes it possible to transmit signals at a higher rate than would otherwise be the case. Victoria can carry out generation and analysis at these higher rates in both SDH and SONET hierarchies.

Application Note ANVASOCC21e

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Some of today's technologies such as ATM require payloads of up to 600 Mbit/s, while the system used to transport different signals of this type synchronously is usually either SDH or SONET. This creates a problem since neither of these systems defines containers that are optimized for the transport of tributary signals occupying bandwidths greater than the usual VC-4 or STS-3c SPE[1] capacity.

For this reason, in order to transmit signals requiring these bandwidths, the contiguous concatenation mechanism is used. With Victoria, it is possible to generate and analyze STM-4/OC-12 frames at bit rates of 622 Mbit/s.

CONTIGUOUS CONCATENATION

The basic principle of contiguous concatenation involves joining four consecutive VC-4 containers together to form a single STM-4/OC-12 structure that provides a bit rate of 622 Mbit/s. The resulting STM-4/OC-12 frame carries one virtual container instead of four VC-4s with their bytes interleaved, thus guaranteeing the integrity of the signal transported.

The virtual container formed by concatenation is called VC-4-4c/STS-12c SPE and is made up of one column for the path overhead (POH), three columns of fixed-stuff and 1040 columns for the C-4-4c container (actual payload capacity in SONET), which has a capacity of 600 Mbit/s.

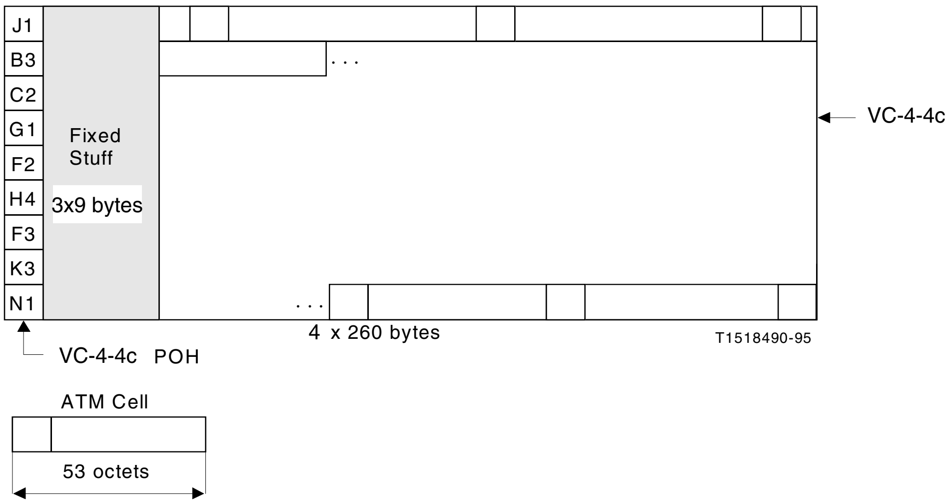

Figure 1 Mapping of ATM cells in VC-4-4c

1. SPE: Synchronous Payload Envelope

THE POINTER IN CONCATENATION

The pointers of the concatenated AU-4 take the fixed values “1001” in bits 1 to 4, bits 5 and 6 are unspecified and there are ten ones in bits 7 to 16. The concatenation indicator in these pointers is intended to show that they perform the same functions as the first AU-4 of the AU-4-4c (STS-3c SPE plus the corresponding pointers in SONET).

This first pointer contains three bytes: H1, H2 and H3. Bits 1 to 4 of these bytes contain the New Data Flag (NDF) and bits 7 to 16 represent a binary number between 0 and 782, which must be multiplied by 12 for STM-4 to locate the point in the frame where the VC-4-4c container begins. (The same mechanism is valid for SONET).The VC-4-4c is nested in the STM frame and the pointer value is updated. In order to keep the VC-4 containers contiguous, positive justification (the adding of stuffing bytes) is used when the VC-4 is too slow compared to the STM-1 signal, and negative justification (moving the payload forward in order to have an extra space given by H3 bytes) when the VC-4 is too fast.

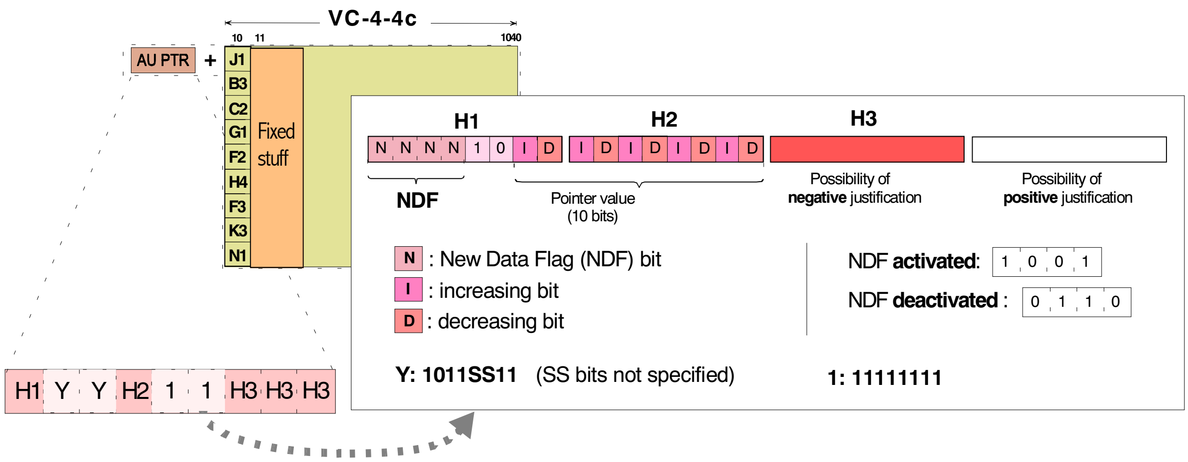

Figure 2 Inside the pointer bytes

The pointer of the STM-4 frames follows a logical multiplexing process whereby parts of the pointers are multiplexed byte by byte. Victoria lets you work at 622Mbit/s in SDH and SONET with VC-4-4c or STS-12c SPE or by mapping up to the STM-4/OC-12 frame. This makes it possible to perform a range of tests over 622 Mbit/s, such as transparency tests over bulk-loaded C-4-4c/STS-12c SPE payload capacity and overhead channels. Likewise, mux/demux tests, pointer actions/sequences, detection/insertion of errors and alarms or the programming/visualization of overheads can all be carried out at 622 Mbit/s.

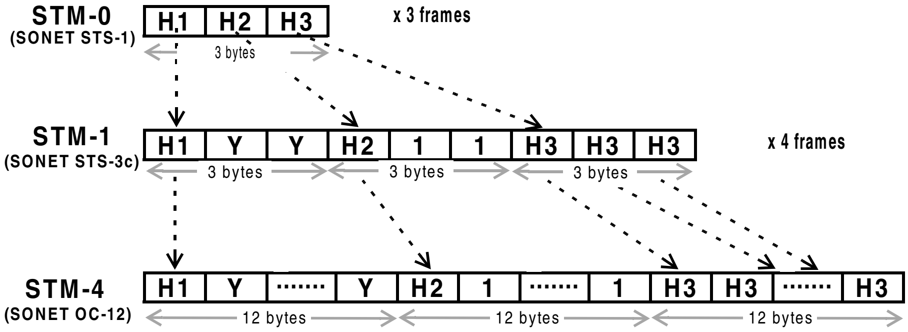

Figure 3 *Pointers in STM/STS frames*

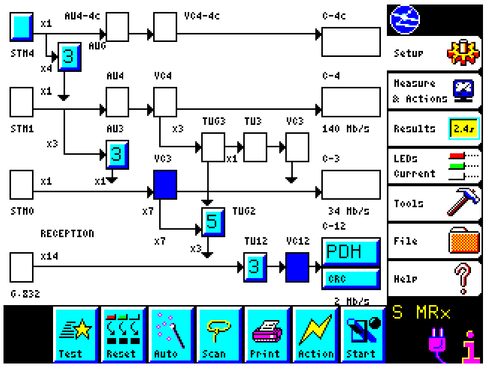

Figure 4 *Multiplexing up to STM-4 with Victoria*

TrendCommunications

Trend Communications SL
Pujades, 60
08005 Barcelona (Spain)
www.trendcomms.com
infoline@trendcomms.com

Trend Communications Ltd
Knaves Beech Estate
Loudwater, High Wycombe
Buckinghamshire HP10 9QZ UK

International: .... +44 1628 524977
España:............ 93 300 3313
UK:.................... 01628 524977
Deutschland: 089 32 30 09 11

Italia: 02 73 91 414
France: 01 69 35 54 70
India:................. 22 8597 463/4
US: 256 461 0790