VLB ARRAY MEMO No. 230

CALIFORNIA INSTITUTE OF TECHNOLOGY

TO VLBA Design Group/Operations DATE May 13, 1983

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SUBJECT Correlator Operations -- Tape Changing

I want to pick up on a point that was buried in Craig Walker's Memo 214. Handling of tape in a 14-station processor is a major task!

For the moment, assume that we will use Mk III-style 1-inch recording with a 15x density upgrade. In full, "normal" 128 Mb/s/antenna playback, a tape will last for about 200 minutes. That is fine, you will say, the operator only needs to wake up every three hours.

It is not that simple, because if the operation is scheduled in the "obvious" way, with all telescopes switching tapes at the same time, the hapless operator will have to change 14 tapes at once! Allowing 3 minutes per tape, this is nearly an hour of dead processor time.

You might say that the loss of 1/3 of correlator time is the price we pay for being in business, and it's really OK if the processor can run at least 1/3 faster than normal record speed. Alternatively, you could add operators; 14 tape hangers, after all, could do the changeover in 3 minutes!

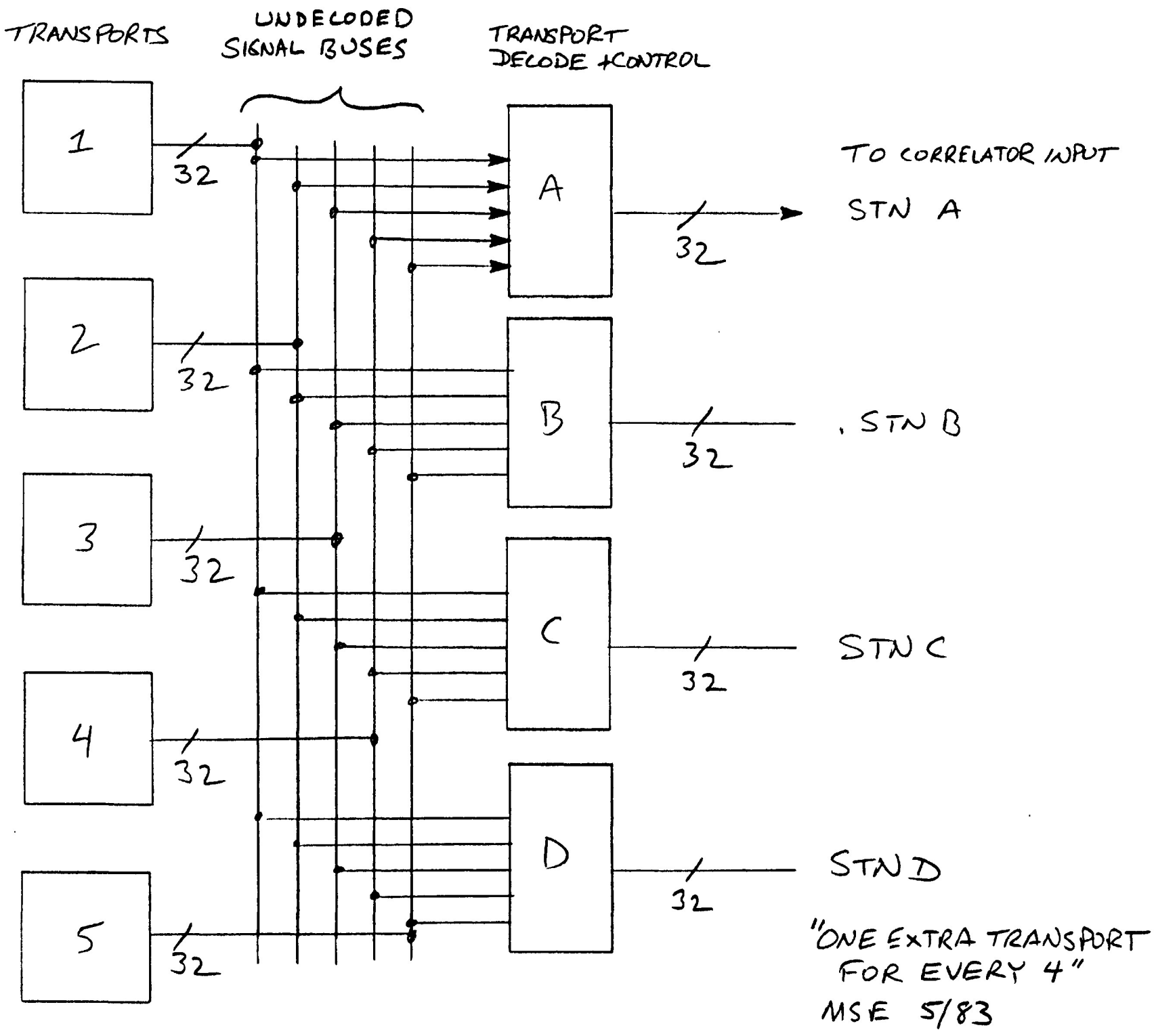
My view is that 1/3 dead time is intolerable because that means you have built 1/3 more correlator than necessary. (There is the virtue, though, that our chronically undersized computers will have that extra time to catch up.) I think we should stagger the tape changing load so as to use tape hanging labor more-or-less continuously. The tapes have to be changed without stopping the correlator.

One solution would be to allow two tape transports per antenna at the processor. The operator would then be able to change tapes at his/her leisure during the three-hour period that the current tapes are running. The disadvantage is transport cost and the large floor space requirement.

Another solution is to stagger the telescope tape changeovers so that one tape finishes every 200/14 = 14.3 minutes. Processing can keep on continuously if at least 15 transports are available, and if any transport can be switched to any correlator input. If 16 transports are available, the operator has 28.6 minutes, perhaps a more comfortable number.

When it comes to engineering, we see that switching would be simpler if one had one extra transport per N transports. I would suggest N=4 is a reasonable value from a cost and efficiency point of view. You would have 200/4 = 50 minutes to change tapes for each group of four; this would cost you 25% extra for tape transports, perhaps 4 extra transports @ $20K each. These extra transports may be required as spares, in any case. (The complete playback electronics could be replicated, too, at a correspondingly higher cost.)

The Figure illustrates how an N = 4 system would appear.


TRANSPORTS
UNDECODED SIGNAL BUSES
TRANSPORT DECODE + CONTROL
1
2
3
4
5
32
A
B
C
D
TO CORRELATOR INPUT
STN A
STN B
STN C
STN D
"ONE EXTRA TRANSPORT FOR EVERY 4"
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