CCITT STUDY GROUP XV
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INTRODUCTION

The current constraints for the North American Digital Facilities are that the number of consecutive zeroes in a DS1 bistream should be less than or equal to 15 and the minimum pulse density should be 12.5%. The DS1 bistream is formed by multiplexing 24 DS0 channels with blocks of 8-bits long. In order to meet the above mentioned constraints, the least significant bit of a block of 8 zeroes is always replaced by a 1 in a voice channel.

The transmission of video signal on DS1 presents a special challenge. It is important to design a VLC which meets the DS1 constraints. Although no restriction has been placed on the channel assignment of N x 384 Kb/s signal, it is highly desirable to assign consecutive channels to ease the design of VLC.

Documents #122 and #147 propose a VLC for N x 384 Kb/s transmission which does not fully meet the DS1 requirements. This is because some combinations of the proposed VLC words may contain fourteen (14) zeroes in a row (disregarding GBSC and PSC) and when placed next to the audio channel can violate the fifteen (15) zero requirement. As an example, consider a sequence of fourteen (14) consecutive zeroes of video that was preceeded by a sequence of "10000000" of audio channel which brings the total consecutive zeroes to twenty-one (21) in the DS1 bistream.

In order to maintain the fifteen (15) zero requirement it is necessary to design a code by ensuring that no word should contain all zeroes and no combination of words will have more than eight consecutive zeroes.* One example of such a code is given in Table I. Compared with the CCITT proposed VLC of documents #122 and #147 this code has the following characteristics:

i) No word has more than seven consecutive zeroes. As a result, 16-bit words start from code number 13 instead of 15 in Table I of Document #122.

ii) At least one of the two least significant bits should be one. This is to ensure that no combination of two words can have more than eight zeroes in a row.

* This condition is based on the assumption that all six videoconference time slots (starting with audio) be adjacent to each other throughout the transmission on the T-Carrier Facility.

DISCUSSION

To measure the efficiency loss, the above VLC set is compared with the proposed CCITT code of Document #122. The results are displayed in Table II. As can be seen from this table the efficiency loss is marginal. Instead, the proposed code has the following advantages:

1. Does not violate DS1 constraints.
2. There would be an extra 64 words which still meets the condition of at least one of the two least significant bits being one. The extra words can be kept for other purposes such as GBSC and PSC as well as aiding the resynchronization.

It should also be pointed out that, for the same reason, the proposed CCITT code for GBSC and PSC Document #147 does not fully meet DS1 constraints of North America. It is therefore suggested that some of the extra words of the new code should be assigned to GBSC and PSC.

CONCLUSION

In this document the issue of DS1 constraints regarding N x 384 Kb/s videoconference is addressed. Conditions for the design of VLC's are discussed. As an example a VLC set is designed which meets the DS1 constraints without significantly affecting the bit rate. This code has also the advantage of having some extra words which can be used to help a faster resynchronization after loss tracking due to errors.

TABLE I

NUMBER	CODE	LENGTGH
1	1	1
2	001	3
3	010	3
4	011	3
5	00010	5
6	00011	5
7	000010	6
8	000011	6
9	0000010	7
10	0000011	7
11	00000010	8
12	00000011	8
13	0000000100000001	16
14	0000000100000010	16
15	0000000100000011	16
16	0000000100000101	16
17	0000000100000110	16
18	0000000100000111	16
19	0000000100001001	16
.		.
.		.
.		.
202	0000000111111101	16
203	0000000111111110	16
204	0000000111111111	16

TABLE II

ITEM	MISS AMERICA	SPLIT-SCREEN
CCITT-VLC DOCUMENT #122	278847	389361
PROPOSED VLC	280072	396617
EFFICIENCY LOSS	0.439%	0.85%