

Chapter 6

6.1 Basic Concept of the Structure

A basic message of Instruction and Data has to be transferred from one place to another place. When this transfer takes place the message has to be evolved to suit for non-homogeneous and backward error control environment. Finally the aim of the transmission will be to receive another station the basic message. In order to achieve this many other information has to be considered and incorporated into this message. Hence the signaling can be divided into two major parts. They are as follows.

- ✓ Message transfer part.
- ✓ User part.

Where User part defines the actual information to be transferred and MTP incorporates the additional information that is required for non-homogeneous backward error correction transmission.

6.2 Layered Structure

The basic message (**Layer 4**) has been evolved to suit for non-homogeneous network by adding label and the Service Information Octet (**Layer 3**) and further evolved to suit for backward error correction by formulating sequence control field and with error control word (CRC) (**Layer 2**). This non-homogeneous network basic message has to be transmitted over a transmission link to the other station (**Layer 1**)
Hence in CCITT No.7 there are 4 layers. They are named as follows.

- Layer 4 User Part**
- Layer 3 Signaling Control Part**
- Layer 2 Link Control Part**
- Layer 1 Link**

When a message is transmitted from one station to another station it essentially means Layer 4 to Layer 4 virtual connection between these two stations. The other three layers are assisting to achieve the basic functionality of Layer 4 to Layer 4 connection.

6.3 Analogy of layers

This is analogues to a classroom. A teacher wants to transfer his knowledge to students. This is similar to the user part. What are the conditions that teacher should satisfy in order to transfer his knowledge to the student?

- (i) Speed - He should deliver his lectures in a proper speed. If it is slow, student will be bored; if it is high, student cannot understand. Hence proper speed is one of the major conditions that he should satisfy. Accordingly CCITT No.7 level 1 defines the speed of the link. i.e 64 kbits/sec for a digital link.
- (ii) Link Management - Teacher should establish a proper link with the

classroom. He should divide the subject according to the situation. There can be three types.

- (i) If he is discussing the subject, he should know how long he will discuss – Message signal unit (MSU).
- (ii) If he is warning or controlling the classroom only a few words are required to avoid any misbehavior in the classroom. Link status Signal Unit (LSSSU)
- (iii) If he has given an exercise, then he is observing the students. Fill-In Signaling Unit (FISU)

In the Link management message will be structured according to the situation. That is one of the functions. The other function will be the order of the messages that has to be transmitted or the order of the subjects the teacher should deliver in order for the student to understand. There are two methods, basic method where positive and negative acknowledgement is used. For example assume the teacher is lecturing on Kirchhoff law. In order to lecture Kirchhoff the student must know Ohms Law. After lecturing the teacher might ask “Do you understand Kirchhoff law?”. The student can answer “Yes I understand Kirchhoff’s Law” or “ No I understood Ohm’s Law”. This is the analogy of the basic method.

Similarly the same question can asked from the student and the answer can be one of the following

I understood Kirchhoff’s Law or I understood Ohm’s Law” This is analogous to preventive cycle re-transmission.

Hence in the link management two functions are achieved i.e. Message Structuring and Error Control.

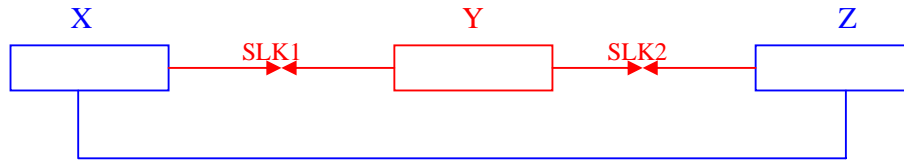
Signaling Link Management- When a teacher delivers a subject he should be aware about the students and their background so that the correct examples can be taken to transfer his knowledge. Also teacher should be aware what subject he is teaching not to get mixed up. A good teacher will follow this concept in order to disseminate his knowledge to the students. Similarly in CCITT No. 7 Layer 3 you get two major fields namely whether the message to be transmitted is international or local and other field is attributed to which user part. Hence in layer 3 the following functionalities will be achieved

- i. Virtual connection of messages depending upon the user part.
- ii. Message rerouting

When a teacher needs to transfer his knowledge to the students apart from the basic subject itself he should be aware about how to manage the flow of subject to the student. That is why there are **two major parts of signaling, user part and message transfer part.**

6.4 Message Routing with a signaling transfer point

Assume there are 3 signaling nodes X,Y and Z which is shown as follows.



Signaling Routing diagram

The above 3 nodes are interconnected with 2 signaling links SLK1 and SLK2. **The Node Y act as a signaling transfer point for nodes X and Z.** Hence X to Y the signaling will be *associated mode* and Y to Z also same. But X to Z the signaling will be *quasi associated mode* where signaling will always going via Y but **voice will be directly established from X to Z.**

The following diagram explains how the signaling is established between node X to node Z via node Y, where the latter acts as a signaling transfer point. The message K pertaining to the establishment of a call from exchange X to exchange Z will be sent via exchange Y. The voice path is directly established from exchange X to exchange Z and is not shown in the following diagram.

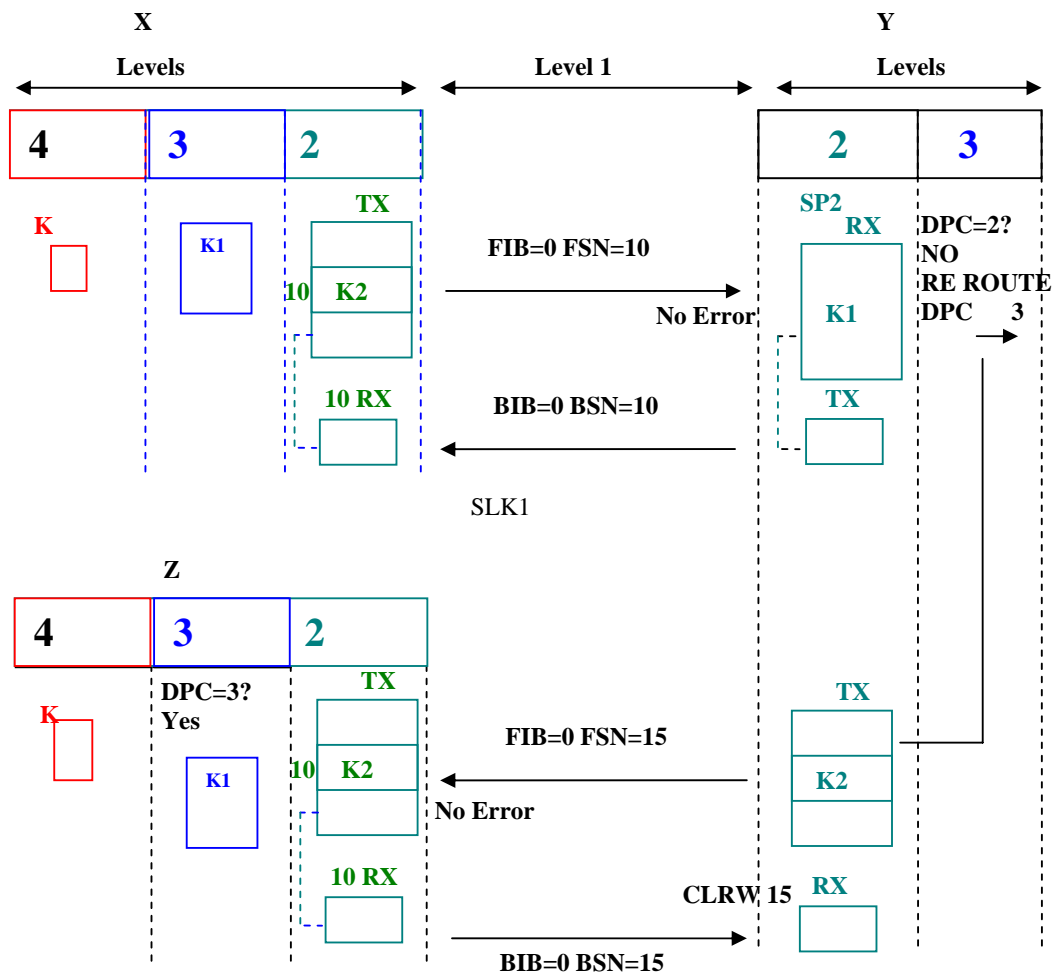
Assume the numbering of signaling point is as follows

For node X Signaling point 1, for node Y signaling point 2 for node Z signaling point 3. The telephone user part message K assume IAM (Initial Address Message) has to sent from exchange X to exchange Z. When K become K1 a label to be appended where the OPC, DPC CIC to be filled. In this message OPC will be 1, DPC will be 3 and CIC will be 125 (assuming 125 channel from exchange X to Z to be used for the voice in this call).

The following processes are established to send the message k from exchange X to exchange Z.

K2 message will be sent from exchange X to Y.

Assuming at Y a message is correctly received the Layer 2 at exchange Y will send this information to Layer 3 where in Layer 3 the label of the k2 will be verified to see whether DPC is 2. But here DPC is 3 which indicates the station Y Layer 3 should not send this message to Layer 4 but send to the transmitter buffer of the same station Layer 2 where the messages are been transmitted from exchange Y to exchange Z. The same phenomena applies at exchange Z and at exchange Z Later 3 this message is checked for DPC equal to 3. Since it is equal the message k1 will be sent to Layer 4 of exchange Z. This is the method how a message k is received from exchange X to exchange Z via exchange Y.



6.5 Summary of Structure of CCITT No. 7 Signaling

CCITT No. 7 signaling can be structured into two major parts i.e. User part and message transfer part. The message transfer part makes a conducive environment to transfer from one place to the required destination. The message transfer part is divided into 3 layers i.e. speed (physical layer), Link Control and Signaling Link Control. There are 3 types of messages depending upon the circumstances to send information the structure will be MSU and for Link Control will be LSSU and for idle period will be FISU. In addition to this signaling can be sent either associated or non (quasi) associated mode.

Formats of message types are given below.

Flag	BSN	BIB	FSN	FIB	LI	Spare	CRC
8	7	1	7	1	6	2	16

Fill In Signal Unit (FISU)

Flag	BSN	BIB	FSN	FIB	LI	Spare	Status	CRC
8	7	1	7	1	6	2	8 or 16	16

Link Status Signal Unit (LSSU)

Flag	BSN	BIB	FSN	FIB	LI	Spare	SIO	SIF	CRC
8	7	1	7	1	6	2	8	8n or 272	16

Message Signal Unit (MSU)