Detection and Correction of E1 Lines

Aditya Sharma[1] and Atul Kumar Srivastava[2]

[1]*Department of Electronics and Telecommunications, Amity University, Noida*
[2]*Amity University, Noida*
E-mail: [1]aksrivastava1@amity.edu, [2]adityasharma1093@yahoo.com

Abstract—*In Digital Telecommunications, a single physical wire pair is used to carry many simultaneous voice conversations with the help of time-division multiplexing, worldwide standards have been created and deployed in past few years. The European Conference of Postal and Telecommunication Administrations (CEPT) originally standardized the E-Carrier system, which revised and improved earlier American T-Carrier technology; this has now been adopted by the International Telecommunication Union Telecommunication Standardization Sector(ITU-T).*

E1 (or E-1) is a European digital transmission format devised by the ITU-TS and given the name by the Conference of European Postal and Telecommunication Administration (CEPT). It's equivalent of the North American T-carrier system format. E2 through E5 are carriers in increasing multiples of the E1 format.

The AT-AR390 router supports unstructured E1 and structured E1 in point-to-point mode.

Unstructured and structured E1 are described in the section below.

The AT-AR395 router supports unstructured E1 and structured E1 in both point-to-point and

point-to-multi-point mode. The router also supports Primary Rate Access ISDN.

The AR020 E1/T1/PRA PIC supports unstructured E1 and structured E1 in both point-to-point

and point-to-multi-point mode. The card also supports Primary Rate Access ISDN and T1.

1. INTRODUCTION

An E1 link operates over two separate sets of wires usually unshielded twisted pair or coaxial cable. The link data rate is 2.048 Mbits/s both upstream and downstream. It is split into 32 time slots each being allocated 8 bits in turn. Thus, each time slot sends and receives an 8-bit sample, 8000 times per second (8*8000*32=2048000).

The time slots are numbered from 0 to 31.The time slot 0 is for Alarming and Synchronization while time slot 16 is for signalling purpose. The rest time slots are assigned for voice and data transport.

It provides an interface to the GSM mobile communications network.

E1 lines are used to connect two different or same operators, so that a call between two same or different operators used by subscribers can be established successfully.
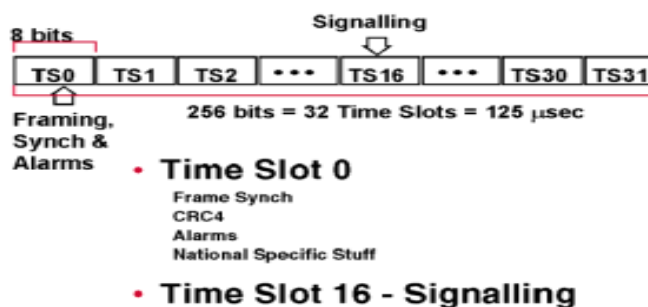

Fig. 1: Frame Structure of E1 Lines

There are two types of E1 lines :

(i)Structured E1

(ii)Unstructured E1

Further differences between unstructured and structured E1 are described below.

1. Line Clocking

In unstructured E1 circuits, one of the devices must generate the clock for synchronisation, the other must receive the clock from the line. If this is not set correctly, data communications may still occur but be unstable due to frame slippage.

In structured E1, the clocking is always received from the telecommunications network so the equipment at each end of the circuit must be set to receive the clock from the line.

2. Cyclic Redundancy Check(CRC)

In unstructured E1, no provision is made for CRC multi-framing, so this should be turned off in the software.

In structured E1, CRC provides a means of determining and reporting line failures to both the network and terminal equipment. It is necessary to check with your telecommunications provider the correct setting for CRC-4. If CRC is not set correctly, the equipment may assume that CRC synchronisation has been lost and attempt to resynchronise, disturbing data flow and possibly giving symptoms of temporary line failure.

2.   FAULT MANAGEMENT

There can be different types of faults which can occur during functioning of E1 lines:

(i)Software Problem: Problem during or after the installation of E1 lines which can occur due to some software issues.

(ii)Hardware Problem: Hardware problems can occur due to any kind of hardware issues that can be due to Balloon breakage, Connector issues.

(iii)Physical Damage: Damage in the Wire or cables, breakage in E1 lines can cause a fault.

There are different types of tools in the market through which fault can be detected and corrected or we can say managed properly.

It is an electrical cable to send data and has a combination of 4 copper wires. Suppose there are number of E1's between two operators and we need to rectify or troubleshoot the faulty E1's.

There are certain steps which need to be considered for detecting and correcting the E1 lines.

i.   Open WinFIOL, login with user id and password.
ii. WinFIOL is a software informer used by operators to monitor the network and it works on C programming language.
iii. Enter commands to check which E1 has a fault.
iv. A list of all faulty E1's appears.
v.   Choose an E1 to be rectified by entering specific commands.
vi. You will get the location of faulty E1. Go to the switch room then.
vii. Process of breaking and looping is followed here. There is a balloon between two operators. It is a type of connector we have to break that and then loop it.
viii. Suppose there is an error from B-side party then we go to the Digital Distribution Frame of that operator in our switching room. Digital Distribution Frame is a passive device which terminates cables. It is a device through which operators are connected through E1 lines.
ix. Connector connecting the B-side party operator cable is removed such that a loop is formed between the same operator.
x.   Again commands are entered in WinFIOL to check whether the fault exists on its own side (A-party).
xi. Suppose there is no fault detected on its own side (A-party), then the other side (B-party) operator is contacted to rectify the error.

2.1 CASE: E1 Down
Commands are used for detecting and correcting a particular E1 and commands are entered in software called WinFIOL.

1. etbijsi@airmas2o-> eaw GMSC2(login in GMSC2)

2. <dtstp:dip=all,state=abl;(command used to check all blocked DIP)

DIP TYPE STATE FAULT

DIP	TYPE	STATE	FAULT
1M4DLFN	IEX	ABL	RDI
2M4DLFN	IEX	ABL	LOF&LOS
3M4DLFN	IEX	ABL	RDI
60M4RAJ	IEX	ABL	LOF&LOS
61M4RAJ	**IEX**	**ABL**	**LOF&LOS**
13M4RIL	IEX	ABL	AIS

3. **<dtstp:dip=61m4raj;(DIP name which will be analyzed further)** DIGITAL PATH STATE
DIP TYPE STATE FAULT
61M4RAJ IEX   ABL LOF&LOS
END
<dtdip:dip=61m4 raj;
DIGITAL PATH
DIP   SNT   DEV DIPP
61M4RAJ UPET-362 552 UPDIP
END
4. <expop:snt=upet-362;(this command will help in locating the physical position of DIP)
DEVICE POSITION
SNT   POS
UPET-362   CAB-6-58-3-28
END
Firstly check the loop from form own side (A) by loop back. The state is working means no fault from A side.

5. <dtstp:dip=61m4raj;
DIGITAL PATH STATE
DIP   TYPE   STATE   FAULT
61M4RAJ   IEX   **WO**   END
Then make the connection as is it, as in starting by loop through.

6. <dtstp:dip=61m4raj;
DIGITAL PATH STATE
DIP   TYPE   STATE   FAULT
61M4RAJ   IEX   ABL   LOF&LOS
END
Then call to B side party to give the loop and we check the status by command. If fault is clear than the status is working, otherwise check the status again and again by command.

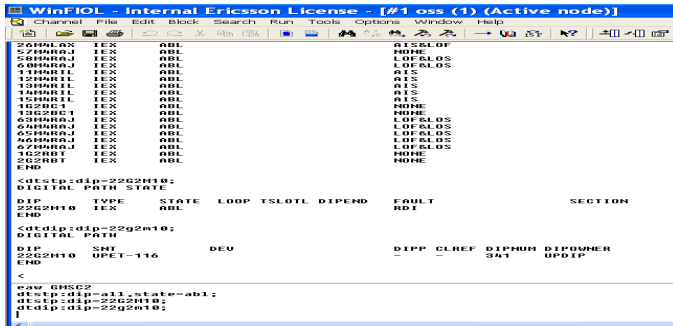<dtstp:dip=61m4raj;
DIGITAL PATH STATE

DIP	TYPE	STATE	FAULT
61	M4RAJ	IEX	**WO**

Fig. 2: WinFIOL Software

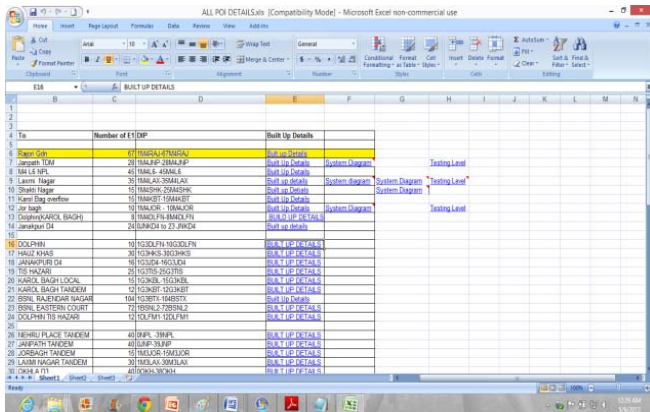
Fig. 3: Balloon or Connector
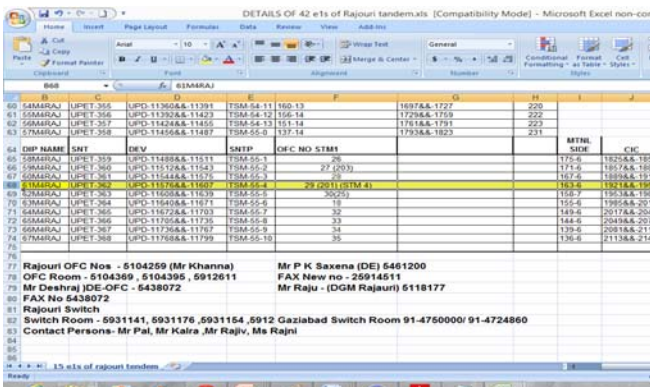

Fig. 4: Point of Interconnectivity

Fig. 5: E1's of Particular Tandem(Exchange)

3. CONCLUSION

E1 and also T1 are well established for telecommunications use. However with new technologies such as ADSL, DSL, and the other IP based systems that are now being widely deployed, these will spell the end of E1 and T1. Nevertheless they have given good service over many years, and they will remain in use as a result of this wide deployment for some years to come.

There are different technologies like E1, E2, E3 and different procedures are followed for their detection and correction, using these troubleshooting techniques they are able to provide good service and has a vast scope in upcoming years.

This Paper is a small contribution towards the detection and correction of E1 lines.

4. ACKNOWLEDGEMENTS

REFERENCES

[1] Installation and Maintenance of E1 circuits by Albedo. Retrieved 19 October 2012.

[2] E1 Environment, RAD data communications University Tutorials

[3] Signaling System No. 7 (SS7/C7): Protocol, Architecture, and Services, Lee Dryburgh, Jeff Hewett, 2004

[4] Signaling System No. 7 (SS7/C7): Protocol, Architecture, and Services eBook