Summer Internship Training Report

on

Signal and Telecommunication

[EAST COAST RAILWAY]

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Thank You

ABSTRACT

This report takes a pedagogical stance in demonstrating how results from theoretical computer science may be applied to yield significant insight into the behaviour of the devices computer systems engineering practice seeks to put in place, and that this is immediately attainable with the present state of the art. The focus for this detailed study is provided by the type of solid-state signalling and various communication systems currently being deployed throughout mainline railways. Safety and system reliability concerns dominate in this domain. With such motivation, two issues are tackled: the special problem of software quality assurance in these data-driven control systems, and the broader problem of design dependability. In the former case, the analysis is directed towards proving safety properties of the geographic data which encode the control logic for the railway interlocking; the latter examines the fidelity of the communication protocols upon which the distributed control system depends.

INTRODUCTION

Signal and Telecommunication Department is responsible for installation and maintenance of Signalling system essential for the safe & speedy movement of trains and Telecommunication systems required for the effective utilization of the large fleet of locomotives and other rolling stock and track as well as for the administration of the vast Railway Network. Telecommunication is a vital infrastructure for managing any transportation network. Indian Railway has an in-house Railway Telecommunication Network for managing Train operations and staff management and to offer Passenger Amenities. In terms of the sophistication in Signalling and Telecommunication installations, Eastern Railway occupies the pride of place among the various Indian Railway systems.

RAILWAY SIGNALLING :

Railway signalling engineers face a difficult distributed control problem. Train drivers can know little of the overall topology of the network through which they pass, or of the whereabouts of other trains in the network and their requirements. Safety is therefore invested in the control system, or interlocking, and drivers are required only to obey signals and speed limits. The task of the train dispatcher (signalman, or signal operator) is to adjust the setting of switches and signals to permit or inhibit traffic flow, but the interlocking has to be designed to protect the operator from inadvertently sending trains along conflicting routes. The network can be operated with more security and efficiency if the operators have a broad overview of the railway and the distribution of trains. Since the introduction of mechanical interlocking in the late 1800's, and as the technology has gradually improved, the tendency has therefore been for control to become progressively centralized with fewer signal control canters individually responsible for larger portions of the network. In the last decade Solid State Interlocking has introduced computercontrolled signalling, but the task of designing a safe interlocking remains essentially unchanged. At the signal control centre, a control panel displays the current distribution of trains in the network, the current status of {signals}, and sometimes that of point switches (points) and other signalling equipment. The railway layout is depicted schematically on the panel.

SALIENT FEATURES

Advanced Signalling System :

To increase Efficiency as well as Safety in train operations, Advanced Signaling System with **Route Relay / Panel / Electronic Interlocking (PI/RRI/EI)** along with Multi Aspect Colour Light Signals have been progressively provided, covering more than 85% of Broad Gauge stations of Indian Railways, replacing Outdated Multi Cabin Mechanical Signaling system involving a large number of human interfaces.

Route Relay Interlocking (RRI) and Central Control Panels in signal Control system :

By mere operations of knobs and route buttons, routes are set automatically and signals are cleared with absolute safety. The entire station is track circuited. Points and signals are operated by individual knobs/slides in small yards.

Panel Interlocking system(PI) :

Unlike Route relay interlocking, in panel interlocking points and signals are operated individually. This is being adopted in smaller wayside stations.

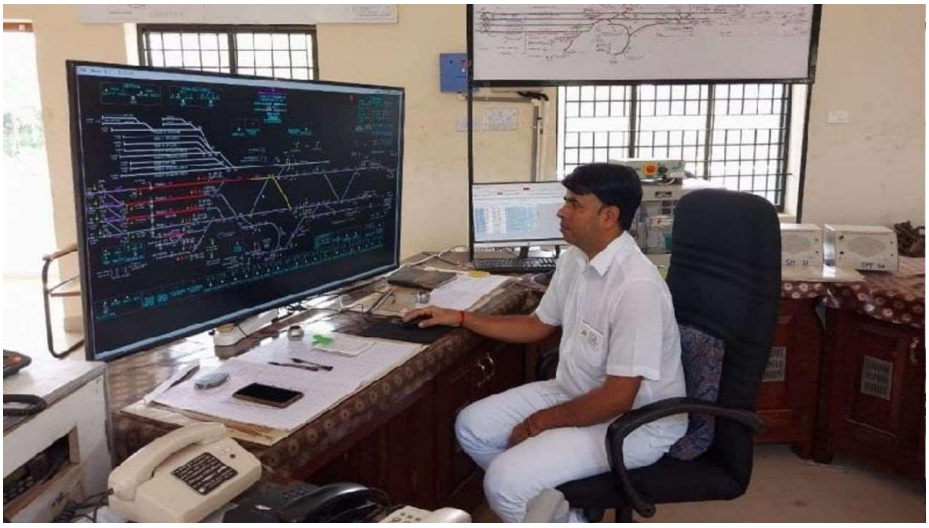
Networking of Data Loggers *:*

This is a modern equipment used for monitoring the operation of important functions like Track circuits, Points, Signals, Battery chargers, Batteries etc. installed in Panel interlocked/RRI installations. These are microprocessor-based equipment logging the events of the change of status of the various functions in field and relay rooms and recording the precise time also. The data loggers are useful devices for detecting the cases of passing the signal at danger by the driver and give important clues in case of accidents. The data loggers are also used as predictive maintenance tools regarding deterioration of the performance of signalling gadgets.

Solid State Interlocking(SSI) :

As a technological development, the solid state with electronics system having software programming, solid-state interlocking signalling control system is being now inducted to achieve economy and flexibility. This sophisticated microprocessor based interlocking system works through Microprocessor devices and software programming. In this system there is less number of relays, and alterations/additions in the yard is possible without much extra wiring. This system adopts the usage of latest CENLEC standard of software validation.

ELECTRONIC INTERLOCKING



• EI is an advanced signalling, computer-based system that uses electronic components to manage the movement of trains and the configuration of tracks. The EI, which is based on software, is designed to prevent two trains from running on the same track at the same time. It ensures that a train gets a go-ahead only when the route ahead is clear.

• The system is an alternative to the conventional Relay Interlocking system. And a development to the solid-state interlocking system which is first generation microprocessor based interlocking system.

• The interlocking system is usually operated and monitored by trained personnel from the signalling and telecommunications department in Railways, often known as 'signallers' or signal operators.

• They are responsible for setting the signals, monitoring track circuits, and ensuring the safe movement of trains.

• Three crucial elements of EI o Signal :

▪ Based on the status of the track ahead, signals are used to tell a train to stop (red light), proceed (green), or exercise caution (yellow).

Track circuit :

▪ These are electrical circuits on tracks to detect the presence of a vehicle or a train on a section of track.

▪ Track circuits help to verify whether a particular route is clear or occupied and if it is safe for a train to proceed.

Point switch :

▪ A train can change its track using a point. These are movable sections of a track which guide the wheels towards either the straight or diverging track.

▪ Switch points are operated using switches to lead trains in the desired direction.

▪ For instance, if a train has to change lines, the switch point is activated ahead of time and the point is locked.

▪ A point machine is a device used for locking point switches and plays an important role in the safe running of trains.

• Functioning :

o The EI signal system uses two factors to determine when a train can proceed: the direction of the track and whether the alternate track is clear. o First, the system checks if the train needs to continue on the current track or switch to a different one. o Then, it guides the train to an available track at a junction.

▪ Special circuits ensure that another train cannot enter that section of track at the same time. o All activities in the signalling system are recorded in a microprocessor-based system called a data logger

. ▪ It acts like the black box of an aircraft and can store and process signal data to generate reports.

• How does the system sense whether a track is occupied?

o There are various kinds of track-occupancy sensing devices. Generally, sensors are installed on the tracks that detect the passage of wheels on the rails. o These are also called **axle counters**. ▪ They count how many sets of wheels or axles have passed over them in order to determine whether the entire train has passed through.

• How safe is this system?

If any of the three components (signals, points, and track occupancy sensors) does not correspond to the overall ‘safe’ logic fed into the computer, the system will work to stop the oncoming train. o It is called a fail-safe system, so it means that even if it fails, all the signals will turn red and all train operations will stop.

• Status of implementation o as of 2022, 2,888 stations in India were equipped with an electronic interlocking system — comprising 45.5% of the Indian Railways network.

RELAY:

A relay is an electromagnetic device, which is used to open or close electricalcircuits. It is so called because it relays information from one circuit toanother circuit.

CLASSIFICATION OF RELAY:

Relays may be classified into various ways depending upon the followingfactors.

1. Type of mounting – Shelf type and plug in type.

2. Supply used – DC relay and AC relay

3. Contact arrangement - Proved and non-proved.4. Application – Track relay, Line relay and special relays.

USAGE:

The relays are used to control signaling circuit and signallingapparatuses.

The relay also protects the signaling equipment.

Axle Counter

An axle counter is a device on a railway that detects the passing of a train between two points on a track. A counting head (or detection point) is installed at each end of the section, and as each train axle passes the counting head at the start of the section, a counter increments. A detection point comprises two independent sensors, therefore the device can detect the direction and speed of a train by the order and time in which the sensors are passed. As the train passes a similar counting head at the end of the section, the counter compares count at the end of the section with that recorded at the beginning. If the two counts are the same, the section is presumed to be clear for a second train.

Applications :

Axle counters have been finding more and more uses on modern safety signaling systems in railways. These are being used presently for the following.

a. Monitoring of berthing tracks in station areas and yards.
b. Monitoring of point zones in station areas and yard.
c. Automatic Signaling systems.
d. Block working through axle counters using multiplexers (USBI) with cable, OFC or radio communication (Last Vehicle Checking Device /Axle Counter Block Working/Block Proving by Axle Counter).
e. Level-crossing warning system using axle counter. (f) Intermediate Block Signaling in Double line sections.

Telecommunication

Telecommunication plays an important role in train control, operation and safety on IR. Indian Railways has set up a state of the art, nationwide telecom network for meeting its communication needs. RailTel, a Railways Central Public Sector Enterprise formed in September, 2000 is successfully exploiting surplus capacity of IR Telecom network commercially. As on March 2013, Indian Railways has about 42,099 Route Kilometers of Optical Fibre Cable (OFC) that is carrying Gigabits of traffic. Railways Control Communication which is quintessential for train operation and control is also being transferred to OFC system. Till date control communication on 37,463 RKms has been shifted on OFC system. This OFC network is also contributing significantly in building National Knowledge Network through RailTel. It is also planning to provide Broadband connectivity to Panchayats through this OFC network. Indian Railways have decided to adopt Global System of Mobile Communication – Railways (GSM-R) based Mobile Train Radio Communication. The same has already been provided on 2,074 Route Kms and is being extended on the balance 'A','B' & 'C' routes. Indian Railways has its own satellite hub that is being utilized for connecting remote locations for Freight Operation Information System (FOIS), Unreserved Ticketing System (UTS), Disaster Management System as well as for other critical communication systems. Besides, IR works uses 13,116 data circuits that power its various data and voice networks across the country. Railways have also established its Multi-Protocol Level Switching (MPLS) based Next Generation Network (NGN) for voice traffic. This Next Generation Network (NGN) has been used to interconnect more than 100 exchanges of Railways carrying the administrative voice traffic. Common User Group (CUG) mobile phones have also been hired to enable communication while on move to enhance safety, reliability and productivity. IR is also using 1.29 lakh VHF walkie-talkie sets to ensure safety and enhance reliability. Internet has changed the way organizations work today. It is impacting almost all the activities of daily life today. Broadband

TRAIN TRAFFIC CONTROL

GENRAL

RAILWAY CONTROL CIRCUITS: Railway Control Circuits are omnibus telephone circuits which provide communication with each train working point, thus facilitating efficient train operation. They should provide satisfactory and reliable communication between the controller and the various way-side stations, important signal cabins, loco sheds, yard offices etc.

TYPE OF CONTROL SYSTEM:

According to traffic requirements and to cater to the needs of Electric Traction area, a section may be provided with one or more Railway Control Circuits as detailed below:

a) SECTION CONTROL / TRAIN CONTROL

b) DEPUTY CONTROL

c) S&T CONTROL d) EMERGENCY WIRELESS CONTROL COMMUNICATION

NETWORK MANAGEMENT SYSTEM AND TRAFFIC MONITORING(NMS):

Network Management System (NMS) is an essential part of any data network to monitor the health of the network. It is vital tool for creating and operating a reliable, redundant and efficient data networks using SNMP protocol based on open standards. The Network Management System can do various tasks like configuration, diagnostic, provisioning, security and originating various MIS reports to be utilized by the Network Manager. Traffic monitoring software is required to monitor the traffic in the communication links and the link capacity should be increased wherever necessary. Packet Sniffer is a tool for monitoring the traffic in the network and generating various MIS reports which helps in planning and augmenting the network resources. Packet Sniffer can also be a part of NMS.

POWER SUPPLIES

For selective calling system employing DTMF signalling, the following should be provided:

(a) At control office 12V DC supply shall be provided from secondary batteries of 12V/80AH with associated charger.

(b) At Wayside Station 12V DC supply which can vary between +20% to -10% of the nominal value for way station equipment shall be provided from secondary batteries of 12V/40AH with associated charger.

❖ All secondary batteries should be housed exclusively in a separate room with provision of exhaust fans.

❖ Standby diesel generators, wherever, provided, should be sufficiently rated to enable them to take the load of lights and fans during failures of AC mains supply. and all batteries should be adequately insulated from earth.

DUAL TONE MULTI FREQUENCY CALLING SYSTEM

This system for train traffic control equipment with voice frequency signalling using Dual Tone Multi Frequency (DTMF) signals for 4 Wire and 2 Wire operation is known as DTMF Calling System. CONTROLLERS EQUIPMENT:

The control office equipment consists of operating console with DTMF code generator and voice communication equipment.

The operating console with code generator has following facilities:

a) Standard DTMF Key Pad for calling 99 stations with two push button operation.

b) Station group code button A, B, C, D.

C) Push button for general call for calling stations simultaneously.

D) Push button LR for extending long ring at way stations.

E) Special push button 'RT' - for repeating last transmitted station code. 'RS' - to reset the system 'RC' - for row/column frequency check. 'DL' - for cancellation of code.

F) Visual indications for “System O.K”., “Display of station code” and “power ON” indication.

Telephone Exchange

ISDN- (Integrated Services Digital Network):

ISDN is a circuit-switched telephone network system, but it also provides access to packet-switched networks that allows digital transmission of voice and data. This results in potentially better voice or data quality than an analog phone can provide. It provides a packet-switched connection for data in increments of 64 kilobit/s. It provided a maximum of 128 kbit/s bandwidth in both upstream and downstream directions.

ISDN INTERFACES:

Basic Rate Interface (BRI) –

There are two data-bearing channels (‘B’ channels) and one signalling channel (‘D’ channel) in BRI to initiate connections. The B channels operate at a maximum of 64 Kbps while the D

channel operates at a maximum of 16 Kbps. The two channels are independent of each other.

Primary Rate Interface (PRI) –

Primary Rate Interface service consists of a D channel and either 23 or 30 B channels depending on the country you are in. PRI is not supported on the iSeries. A digital pipe with 23 B channels and one 64 Kbps D channel is present in the usual Primary Rate Interface (PRI). Twenty-three B channels of 64 Kbps each and one D channel of 64 Kbps equals 1.536 Mbps. The PRI service uses 8 Kbps of overhead also. Therefore, PRI requires a digital pipe of 1.544 Mbps. ISDN PROVIDES ALL BEARER SERVICES (VOICE, DATA, VEDIO), TELESERVICES, SUPPLEMENTARY SERVICES (REVERSE CHARGING, CALL WAITING AND MESSAGE HANDLING)

IDF AND MDF

IDF -Intermediate Distribution Frame

It is a type of patch panel that is used to manage the cabling connections between the main distribution frame (MDF) and the end user. IDFs are typically located near the end user's location, allowing for easy access and maintenance. They are used to route signals between the MDF and the end user, providing a secure and organized connection. IDFs can be used to connect voice, data, and video networks, allowing for efficient communication between users.

MDF-Main Distribution Frame

It serves as the central point of connection between a network's communication devices and the outside world. The MDF manages all the incoming and outgoing signals from the network, allowing for smoother and faster communication among users. It also helps to ensure data security and integrity by providing a secure connection point for the devices.

IPDSLAM

An **Internet protocol digital subscriber line access multiplexer,** more commonly known as IP DSLAM, is a piece of technological equipment that channels and directs Internet-based traffic over a telephone exchange. These sorts of devices are usually situated at the headquarters of the access provider, usually a phone or cable company. Users who subscribe to cable or digital subscriber line (DSL) services for their Internet use these pretty much every time they get online, but they don't usually realize it; they aren't like modems or other devices that have a more visible role on the user's end. The way the device works from a technical perspective can be very complex. In the simplest sense, it acts as a sort of mediator of the digital traffic coursing through a network. It allows individual machines and devices to send and receive data packets, and works as part of the team of tools and coding devices

SALIENT FEATURES

Train Control Communication:

Movement of each and every train is monitored by a controller at the nearest divisional Hqrs. Facility is also provided to the driver or guard to communicate with divisional Hqrs through portable telephone which can be easily connected to the overhead line wires which are running parallel to the track or connected to the Emergency Telephone sockets provided at every KM in the section where controls are working through under ground cables. An emergency portable telephone is kept in the Guard's compartment of each and every train.

Block Circuits

Running of trains in each section (between any two stations) is controlled by block circuits through which running of only one train in a section at one time is Electrically ensured in addition to oral confirmation. Overhead lines of Railway or BSNL and underground cables are used for this purpose.

Optical Fibre Cable network

Optical Fibre Cable is laid along the track to provide a reliable and noise free communication. OFC network is widely used for Railway Control Communication taking advantage of its all long haul high bandwidth circuit interconnecting Railway Telephone Exchange. Passenger Reservation System, Unreserved Ticketing System, Network Freight Operating Management system have been transferred through railway OFC. In Southern Railway distribution of various media for Telecommunication is as follows 1. OFC and RE quad cable in Electrified sections 2. OFC and 4/6 quad cable 3. Only OFC. 4. Railway owned overhead line. 5. Rented overhead line/ channels/ bandwidth from BSNL .

Splicing of optical fibers

Splicing fusion process –

The fibers must first be stripped, cleaned and cleaved. To allow spare fiber for easy access and to allow for several attempts, a length of at least five meters of jacket should be removed. The primary buffer is only stripped to about 25 mm. The exact length is determined by the fusion splicer in use. After the fiber is cleaned and cleaved then the vee-groove is cleaned by a lint free cloth, tissue or a 'cotton bud' moistened with isopropyl

alcohol. The fiber is gently pressed into the vee-groove by a magnetic or gravity clamp. Once the fibers are safely clamped into their vee-grooves, they are moved, vee-grooves and all, until the fibers are aligned with each other and positioned directly under the electrodes from which the electric arc will be produced. We are aiming to achieve positioning with an accuracy of better than 1 µm. All fusion splicers are fitted with some means to observe the fiber positioning and the condition of the electrodes. This is achieved by either a microscope or by a CCD camera (CCD = charge coupled device - a semiconductor light sensor) and a liquid crystal display (LCD). The trend is towards CCD cameras since they are more pleasant to use and have the safety advantage of keeping our eyes separated from the infrared light which can, of course, cause irreparable damage to the eyes if we accidentally observe an active fiber through the microscope. The main fusing arc is more powerful and lasts for a longer period of time, between 10 and 20 seconds. Once fusing is completed, have a good look at the splice. If it is difficult to see where the splice is, then it's probably a good one (Figure below). We are looking for the outer edges of the cladding to be parallel, just like a new continuous length of fiber. Sometimes a small white line appears across the core but this is not important and can be ignored.

Railway Telephone Network

There is an in-house Railway Telephone Network connecting all-important offices, officials, Way stations, Divisional Headquarters & Zonal Head Quarters. Railway telephones exchanges are inter-connected through Railway OFC network, Railway Microwave network and are supported by rented BSNL channels as stand by.

. Wireless communication System

Driver, Guard, Supervisors & officers of permanent way, Mechanical, Electrical and Signal & Telecom departments are provided with 5 watts hand held walkie-talkies, which can be used to establish communication between moving train & adjacent stations. Every railway station is provided with 25 watts VHF set for this purpose.

Data network

There is an exclusive PRS network connecting Chennai and all the PRS centers of Southern Railway and other Metros. The centers are connected either through Railway OFC network or hired channels from BSNL. Similarly there is a Freight Operating Management System network for monitoring the movement of freight transport. Coach Operation Information System is a network for coach management and this is under implementation.

Passenger Amenities

Safety, security and comfortable journey of the passengers are the aims of Railways in train operation. To meet this objective, the following facilities have been provided in almost all-important stations. • Continuous announcement through public address system • Electronic display board • IVRS system for giving on line information about availability of Accommodation, arrival & departure of trains. • Call centers and integrated IVRS for giving all types of passenger Information.

Rail net

Railway has its own data network for management purpose called “RAILNET”. This is widely used for file transfer, e-mail and public information. Public can visit site www.gov.railnet.in. This network spreads through entire Railway system connecting divisional headquarters, Zonal headquarters, workshops and hospitals.

RAILNET – PRESENT STATUS

• All the Zonal Headquarters, PUs, Divisions & Workshops have been linked to Railnet.

• Railnet sites of all Zonal Railways and most Divisions have been developed.

• Most units have their own Email servers for internal communication.

• Codes/Manuals are available on Railnet. ❑ Computer Network as a Management Tool:

• Provide fast & reliable communication.

• Seamless exchange of information.

• Easily accessible & manageable data.

• Reduction in paperwork.

• Reduction in manpower.

• Increased economy in operation.

• Provide decision support system to management.

Its uses are

• Internet surfing

• Railnet surfing (sites of various zones, CTI, PU etc.)

Disaster Management

Telecom plays a vital role in Disaster Management. To meet the requirement of Disaster Management a universal number is provided at all control offices which can be accessed from any part of India duly pre fixing the city code. There are Accident Relief Trains and Medical Relief Vans placed at strategic locations. All such ARTs and MRVs are equipped with mobile INMARSAT telephones, walkie-talkie sets and public address system. Video conferencing equipments and wireless satellite based modems are also being added.

Video conferencing

Video conferencing facilities are available in divisional headquarters, zonal headquarters and Railway board, for administrative purpose.

Switches

•Usually configured with 8, 12, or 24 RJ-45 ports

•Often used in a star or tree topology

•Sold with specialized software for port management.

•Also called intelligent hubs

Types Of Switches

- Unmanageable switch
- Manageable switch
- Layer-3 switch

Routers

• Routers are used to connect remote LANs technologies.

• A router uses a combination of hardware and software to actually "route" data from its source to its destination.

• It works at the network layer (layer 3).

FOIS - Freight Operations Information System

FOIS is the Management Information System (MIS) used in Indian Railways for its freight business. MISs are used for improving efficiency in management and control of operations in Railways resulting in higher productivity of resources and improving quality of service to customers. FOIS helps to improve the process of planning, monitoring and decision making and reduce operating expenses through a more efficient utilization of rolling stock. FOIS software comprises Rake Management System (RMS) for handling operating portion and Terminal Management System (TMS) pertaining to commercial transactions. The system has been introduced to keep records of loads/trains, wagons, loco movements and consignment details etc. by reporting rake formation, load formation, train arrangements, crew assignment.

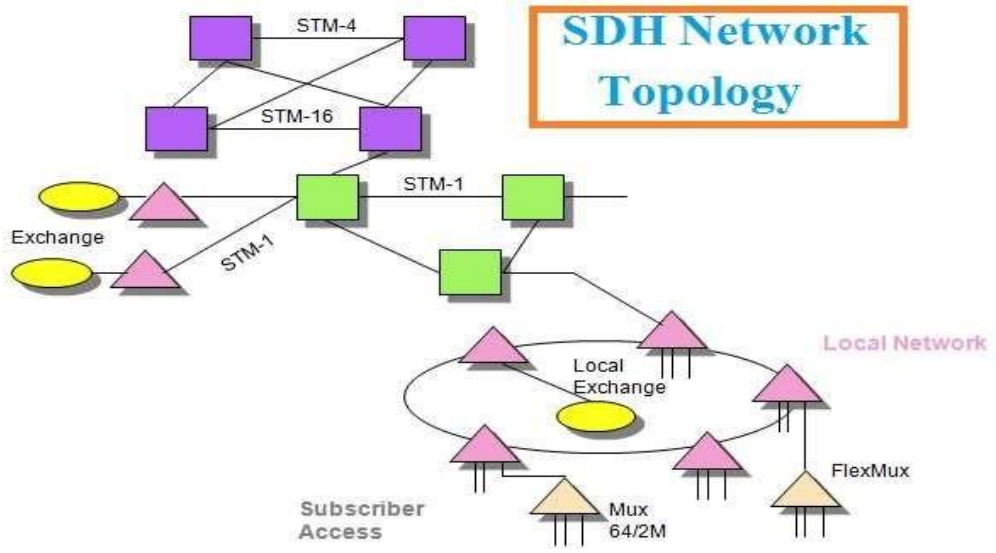
PASSENGER RESERVATION SYSTEM (PRS) →

PRS started in 1985 as a pilot project in New Delhi. The objective was to provide ticketing system for reserved accommodation on any train from any counter, preparation of train charting and keeping a proper record of the money received. This was implemented all over Indian Railway later on. With this implementation any passenger can get a reserved ticket from one destination to another station of India Railway from any Passenger Reservation Systems counter of Indian Railways. →PRS networking of entire Indian Railways completed in April, 1999. This project involves the integration of five major regional reservation centres. It therefore enables better coordination to improve the reservation process. The major regional centres with all the information for their regions coordinate for better planning and control. This is a complex but comprehensive system which provides for better functioning of the reservation process. IT enables this scale of coordination and such systems rely heavily on a strong IT backbone.

Unreserved Ticketing System (UTS)

More than 1.2 crore Rail passengers travel in unreserved coaches and trains every day and thus form the bulk of rail users. For this category of passengers Railways have introduced the facility of Computerised Unreserved Ticketing System. It was initially provided at 10 stations of Delhi area in the first stage as a pilot project on 15 August 2002. Another 13 stations of Delhi area were provided with UTS counters in the second stage on 2nd Oct, 2002. →UTS will provide the facility to purchase Unreserved Ticket 3 days in advance of the date of journey. A passenger can buy a ticket for any destination from the UTS counter for all such destinations which are served by that station. The cancellation of tickets has also been simplified. Passengers can cancel their tickets one day in advance of the journey lxviii from any station provided with a UTS counter.

SDH & PDH



SDH- Synchronous Digital Hierarchy

Synchronous Digital Hierarchy (SDH) is a group of Fiber optic transmission rates that transport digital signals with different capacities. SDH technology enables low-bit rate data streams to combine with high-rate data streams. Furthermore, as the whole network is synchronous, it enables users to embed and extract individual bit streams from high-rate data streams relatively easily.

SDH uses the following Synchronous Transport Modules (STMs) and rates:

STM-1 (155 megabits per second)

STM-4 (622 Mbps)

STM-16 (2.5 gigabits per second

STM-64 (10 Gbps)

SDH combines n signals with a bit rate of b to form data streams with bit rates of n x b on a synchronously clocked network. Unlike PDH, the individual transmission paths have minimal clock discrepancies. The synchronous mode of operation allows low-order multiplex systems, such as communication links for telephone systems, to be inserted in higher hierarchy levels and then removed again via add and drop.

PDH:

Plesiochronous Digital Hierarchy Multiplex levels:

- 2.048 Mbit/s
- 8.448 Mbit/s
- 34.368 Mbit/s
- 139.264 Mbit/s

PUBLIC ADDRESS SYSTEM AND ACOUSTICS (PA System)

P.A System is a setup, which is used to disseminate information to a limited public over a limited area. The basic function of an audio system is to deliver audible and recognizable

sounds to the listeners.PA system comprises all the devices and networks that exist between a source of sound (or its electrical equivalent) and its point of final reproduction.

1.1 Application of P.A. system in Railways:

a.Passenger amenity: For giving detailed information about the train arrival, departure, late running if any, and the location of trains and any other important information related to Railway users.

b.Marshalling Yards: Communication is being established between Yard Master and shunting staff for the formation, reception and dispatch of trains, through paging and talkback systems.

c.Breakdown train Emergency Equipment: The P.A. System provided in ARTs (Accident Relief Trains) like megaphone and other devices must be tested as per schedule and kept in working condition so that if any accident occurs; it can be used to guide the passengers and staff during rescue operations at the site of accident.

d.Special functions: A high quality P.A. System needs to be provided in important functions of Ministers, G.M., officials, VIPs and other Railway Week celebrations, felicitations, Scouts and Guides rally, some social meetings, cultural programmes, etc.

e.Railway Workshops: To give the announcements pertaining to staff in Workshops when required. And also for entertainment music during lunch hours.

f.Conferences: For conducting seminars, special lectures, administrative meetings for a limited group of officials in conference halls. For this suitable conference system is installed in GM conference hall in Zonal HQ and DRM conference hall at Divisional HQ.

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