

ROLE OF “IT” FOR RAILWAYS

by

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ADDRESS IN RAILWAY STAFF COLLEGE VADODARA

To

MANAGERS OF BIMSTEC & MEKONG GANGA

CO-OPERATION Countries

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USE OF INFORMATION TECHNOLOGY BY RAILWAYS

- INFORMATION TECHNOLOGY (IT) HAS BEEN PART OF RAILWAY SYSTEM
- GOOD TELECOMMUNICATION SYSTEM IS THE BASIC REQUIREMENT FOR EFFICIENT IT.
- RAILWAYS ALWAYS KNOW THE POSITION OF EVERY TRAIN
- NO TRAIN CAN MOVE FROM ONE STATION TO NEXT WITHOUT COMMUNICATION

*EFFICIENT COMMUNICATION TO RAILWAYS IS LIKE BREATHING AIR
IN CASE IT IS WORKING WELL, IT IS NOT RECOGNISED BUT IN CASE OF INTERUPTION , TRAIN OPERATIONS COME TO HALT.*

THIS BASIC NEED HAS NECESSITATED ALMOST ALL RAILWAYS TO HAVE COMMUNICATION NETWROK OF THEIR OWN.

INDIAN RAILWAYS EARLIER DEPNEDED TOTALLY ON DEPARTMENET OF TELECOMMUNICATION (DOT). SINCE COMMUNICATION REQUIRMENT FOR RAILWAYS IS TOO SMALL FOR DOT, THE INTRODUCTION OF NEW TECHNOLOGIES FOR BETTER COMMUNICATION BY DOT WERE LITTLE.

ACCORDINGLY IR DECIDED TO HAVE THEIR OWN COMMUNICATION COMPANY TO MEET WITH THE RAILWAYS TOTAL REQUIREMENT AND ALSO TO USE COMMUNICATION REVOLUTION TO EARN MONEY.

RAILWAYS HAVE AN ADVANTAGE OF USING SEAMLESS RIGHT OF WAY BY THE SIDE OF RAILWAY LINE

THIS PAVED THE WAY FOR FORMATION OF **RailTel**, INDIAN RAILWAY'S OWN PUBLIC SECTOR UNDERTAKING ON 26TH SEPTEMBER 2000 .

RAILTEL'S OBJECTIVES

- ▶ **TO EXPEDITIOUSLY MODERNISE RLYS. CONTROL, OPERATIONAL AND SAFETY SYSTEMS AND NETWORKS**
- ▶ **CREATE A NATIONWIDE BROADBAND TELECOM INFRASTRUCTURE TO SPUR GROWTH OF TELECOM INTERNET AND IT ENABLED VALUE ADDED SERVICES IN ALL PARTS OF THE COUNTRY ESPECIALLY RURAL, REMOTE AND BACKWARD AREAS.**
- ▶ **SIGNIFICANTLY CONTRIBUTE TO REALISATION OF GOALS AND OBJECTIVES OF NATIONAL TELECOM POLICY 1999 &**
- ▶ **GENERATE MUCH NEEDED REVENUES FOR IMPLEMENTING RAILWAYS DEVELOPMENTAL PROJECTS, SAFETY ENHANCEMENT AND ASSET REPLACEMENT PROGRAMMES.**

Progress of OFC works on IR

YEAR	OFC Laid In Kms	Progress/ Year in Kms
1988-89	60	60
1999-2000	4487	4427 in 12 years
2000-01	6680	2193
2001-02	9950	3270
2002-03	19453	9503
2003-04	23606	4153
2004-05	26489	2883
2005-06	28871	2382
2006-07	30027	1156
2010-11	38077	8050 in 4 years



WITH THE CURRENT
TRENDS ALL OVER THE
WORLD TO USE
INFORMATION
TECHNOLOGY, IT IS
INCREASINGLY FOUND
USEFUL BY RAILWAYS TO
PROVIDE THEIR OWN OFC
NETWORK



HOW DOES IT HELP

- ▶ IT IS NOT NECESSARY THAT TO ENHANCE CARRY CAPACITY & TO IMPROVE EFFICENECY, ADDITIONAL LINES BE LAID.
- ▶ INFORMATION TECHNOLOGY CAN PLAY A MAJOR ROLE IN MAKING RAILWAYS CARRY MORE AND ALSO EARN MORE



USE of IT....

**RAILWAYMEN NEED TO FOCUS THAT
ANY ACTION BY THEM EITHER**

REDUCES OPERATIONAL COSTS

OR

***ENHANCES RAILWAYS EARNING
CAPABILITY***

IT CAN ENHANCE RAILWAYS CAPABILITY BY THREE MEANS:-

- ▶ **A- OPTIMISING ITS EXISTING INFRASTRUCTURE WITH MINIMUM INPUTS**
- ▶ **B- IMPROVEMENTS OF RAILWAYS OPERATIONS EFFECTING ITS CUSTOMERS**
- ▶ **C- IMPROVEMENTS OF INTERNAL WORKING SYSTEM TO MAKE IT MORE TRANSPARENT,COST EFFECTIVE AND**
- ▶ **EFFICIENT**

A-TRAIN OPERATIONS & SAFETY= MODERN SIGNALING-1

Provide :-

- **Automatic Signaling**
- **Computerized Centralised Traffic Control (CTC) along with Data Loggers to operate all station interlocking.**
- **Automatic Train Protection (ATP)/
ETCS Level 1 or 2**



A-TRAIN OPERATIONS & SAFETY= MODERN SIGNALING-2

Accrued Benefits:-

- ▶ **Enhances line capacity in a double line section to 10-20 trains / hr.** against normal capacity of 2-3 trains / hr.
 - ▶ **Reduces operational time** of signaling system at stations
 - ▶ **Improves average speed** of freight trains
 - ▶ **Reduce Train accidents due to Signal Passing At Danger**
 - ▶ **Train Management System (TMS)**, which can **generate all the reports** in the desired format for the management
-



A- EVOLUNTION OF DATA LOGGER-3

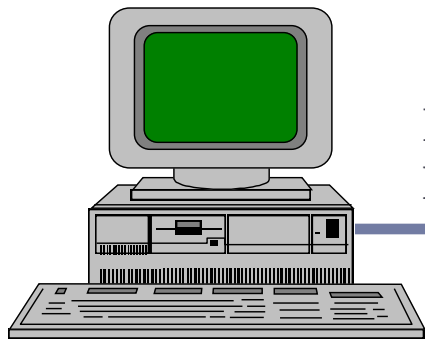
THEY WERE DEVELOPED IN 1998 TO MONITOR STATION SIGNALING EQUIPMENT TO ENSURE

- ▶ SAFE, EFFICIENT & PUNCTUAL RUNNING OF TRAINS
- ▶ BETTER AVAILABILITY OF SIGNALLING SYSTEMS
- ▶ AID TO MAINTAINERS FOR REDUCING DOWN TIME
- ▶ REDUCTION OF MANPOWER
- ▶ MOVE FROM FAILURE MAINTENANCE TO PREVENTIVE MAINTENANCE



CENTRAL CONTROL OFFICE

CENTRALISED MONITORING SYSTEM



RS 232
LINK

FEP

MODEM

RE TELECOM
CABLE/ OFC

GURLA C STATION
RELAY LOGIC AND
ANALOG SIGNALS

OPTOISOLATOR

DATALOGGER

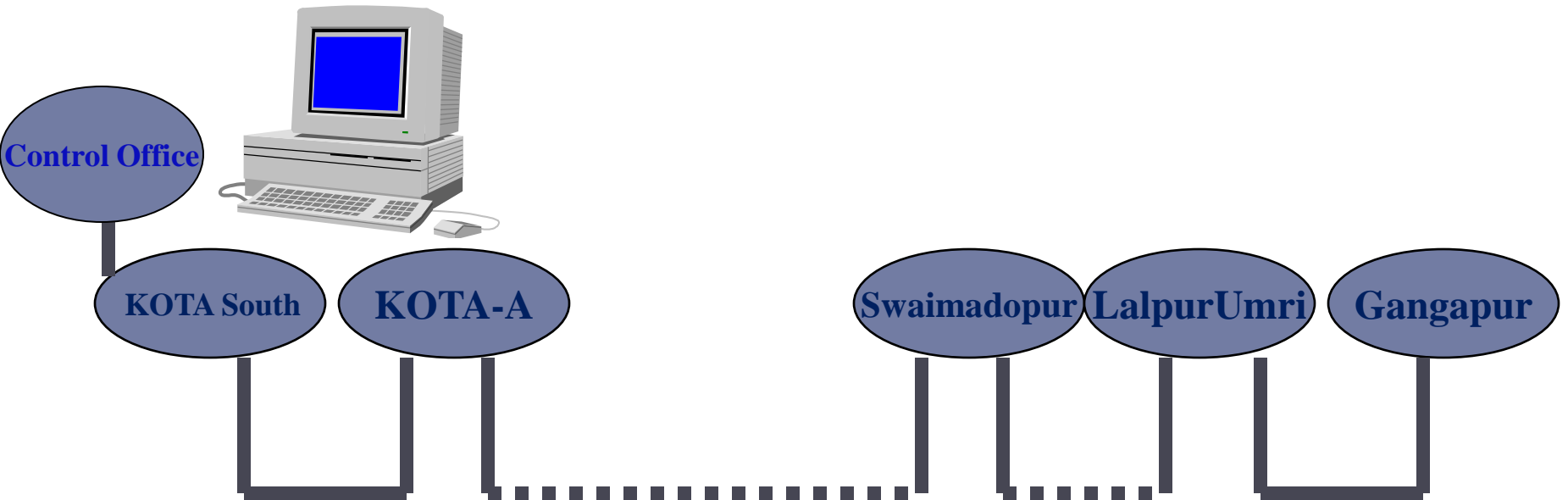
MODEM

MODEM

TO NEXT
STATION



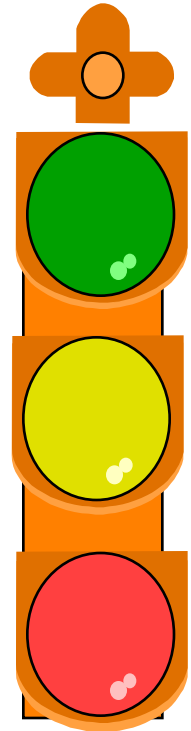
NETWORKED DATALOGGER SYSTEM



FEATURES

SUITABLE FOR RELAY BASED OR ELECTRONIC INTERLOCKINGS

- ▶ LOGGING OF ALL EVENTS AT THE STATIONS EVERY 20 Milliseconds
- ▶ FAILURE DIAGNOSIS
- ▶ FAILURE PRE-WARNING
- ▶ FAILURE ANALYSIS
- ▶ ON-LINE STATUS DISPLAY
- ▶ VITAL & NON-VITAL ALARMS



SYSTEM REQUIREMENTS

- ▶ TRANSMISSION OF DATA TO CENTRAL LOCATION THROUGH OFC or QUAD CABLE
- ▶ STORAGE AT CENTRAL LOCATION UP TO 3 MONTHS
- ▶ ANALYSIS & GENERATION OF ALARMS
- ▶ GENERATION OF HISTORICAL DATA



ALARMS PROVIDED

- BLANKING OF SIGNALS
 - SIGNAL PASSING AT DANGER
 - TRAIN ENTERING SECTION W/O LINE CLEAR
 - FAILURE OF POWER SUPPLY
 - FUSING OF SIGNAL LAMPS
 - LOOSE PACKING OF POINTS
 - POOR MAINTENANCE OF TRACK CIRCUITS
 - CIRCUIT DEFICIENCY OR TROUBLE
 - SHOOTING
-

IMPROVED SAFETY WITH DATA LOGGERS

IT HAS HELPED IMPROVING SAFETY IN FOLLOWING WAYS

- ▶ **Detection of system deficiencies in Electrical circuits**
- ▶ Reduction in incidences due to wrong operations
- ▶ Improvement of maintenance of track circuits, points & crossings
- ▶ Making running staff alert as cases of Signal Passing At Danger are known immediately even if there is no accident
- ▶ In Accident Inquiries the precise cause is known

Automatic Train Charting

- **Online Plotting of train movement in graphical form as conventional control chart on screen.**
Maintenance blocks are also visible on screen. Control chart can be printed off line.

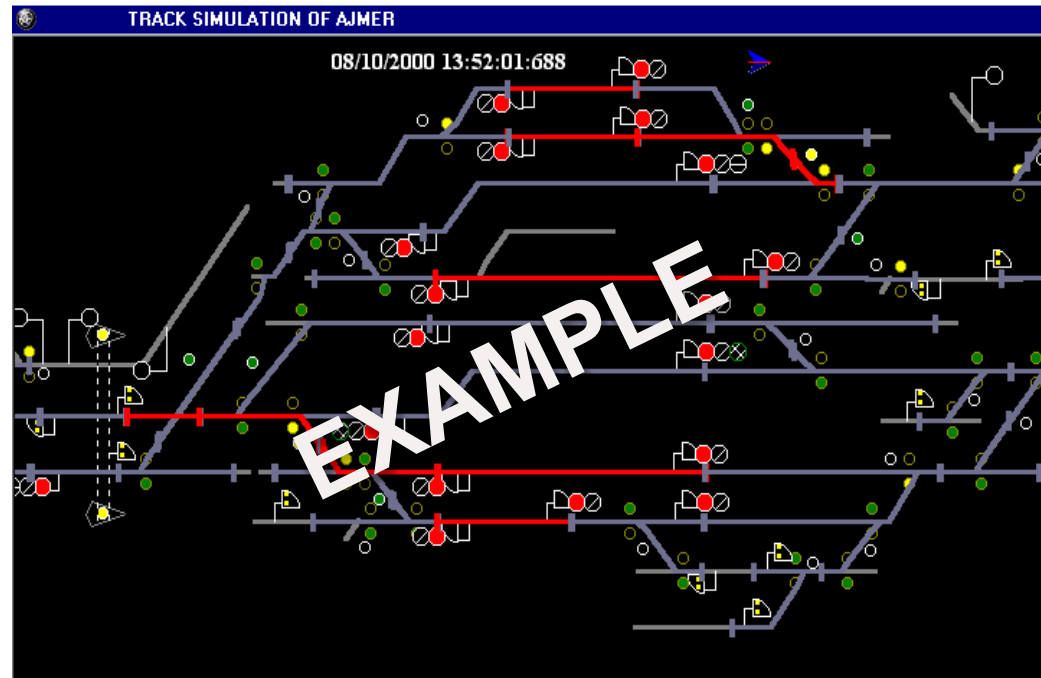
Entry of unusual, blocks and train information is provided.

Train number etc. is required to be entered only at time when the train enters the jurisdiction of the section control first station by ATNL .

ADDED BENEFITS POSSIBLE

- ▶ REAL TIME DISPLAY OF YARDS TO CONTROLLERS

**Offline
Simulation
of the Yard**



Future usage of the Data Logger-4

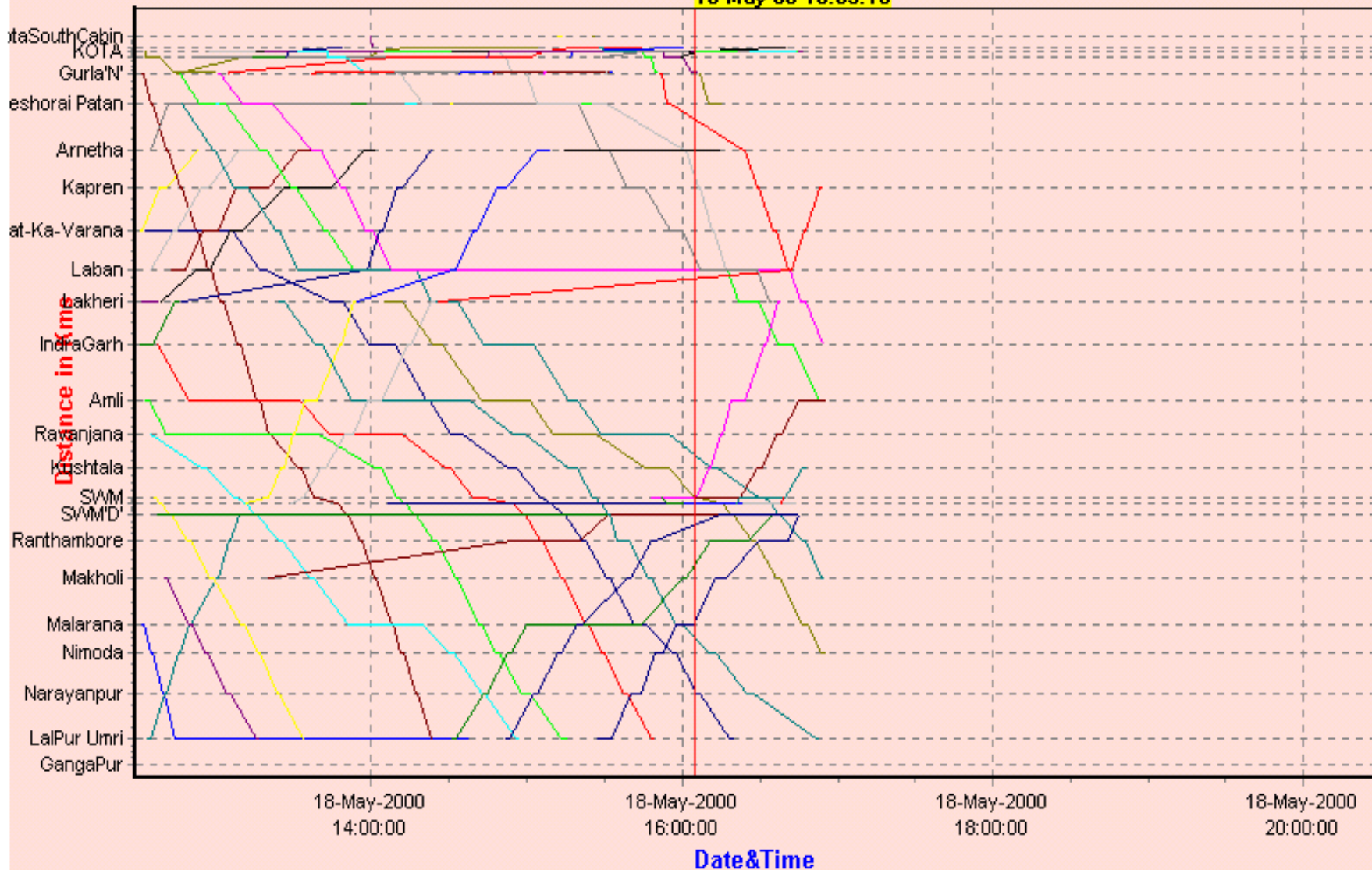
PREPARATION OF AUTOMATIC TRAIN CHARTING

- The information of occupation of lines and arrival and departure of the train in the station is used for preparing these control charts. Implemented successfully in 7 control sections.
- **Train Detentions:** By comparing scheduled time with the actual arrival as derived by the train chart, the information can be fed automatically to for Train Enquiry and Passenger Information etc.
- **Loco & Wagon Utilization:** By using the control chart data of item 1 above.



Print the Chart

TRAIN CHARTING 18-May-00 16:05:18



Future usage of the Data Logger

1. Flat wheel Detection:

Providing strain gauge on the web of the rail to monitor the “impact” on the rail through data loggers. With impact voltage more than the prescribed limit, the Tyre of the wheel can be detected as Flat. Such strain gauges can be put at the entry point of the station yard and generate alarm to draw the attention of SM and Control Office.

- ## 2. Efforts are under way to check rail fractures by
- Monitoring the rail profile through Laser beams and the Data is collected at every Kilometer to be fed to the nearest Data Logger

A- OPTIMISING ITS EXISTING
INFRASTRUCTURE WITH MINIMUM INPUTS

**B- IMPROVEMENTS OF RAILWAYS
SERVICES EFFECTING ITS
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SYSTEM TO MAKE IT MORE
TRANSPARENT,COST EFFECTIVE AND
EFFICIENT



B- IT for CUSTOMERS

IT CAN PROVIDE EXCELLENT SUPPORT for:-

A. PASSENGER TRAFFIC

- ▶ Passenger reservations
- ▶ Passenger Information

B. FREIGHT TRAFFIC

- ▶ Monitoring freight train movements
- ▶ E - payments



B- COMPUTERISED TRAIN RESERVATIONS

IT HAS BROUGHT IN REVOLUTION IN PASSENGER RESERVATIONS WHICH AT ONE TIME WAS NIGHT MARE IN INDIAN RAILWAYS

TODAY ONE CAN BUY TICKET TO ANY DESTINATION ON INTERNET OR BOOKING WINDOWS.

STILL NOT POSSIBLE IS

- ▶ Providing last minute reservation after charts are prepared
- ▶ Seat allocation in the running train

It can be through 'On Line' hand held computers connected to the main frame computer



STILL MISSING & YET TO COME - “TICKETING”

A. Purchase of unreserved tickets

Passengers have to spend lot of time to purchase and many jump in train *without ticket*.

Possible Solution :-

- ▶ More computer counters at stations
- ▶ Link agents computers to issue tickets
- ▶ Encourage use of Credit /Debit card in kiosks

B. It is a challenge to control Entry/ Exit at stations in IR to eliminate revenue leakage.

Possible Solution :-

DELHI METRO has set excellent example by use of **PREPAID CARD** and computerized reusable token.



STILL MISSING & YET TO COME “PASSENGER INFORMATION”

- ▶ **ACCURATE STATUS** OF TRAINS ON RUN
- ▶ **COACH GUIDANCE** AT PLATFORMS (TRAINS ARE 18-24 COACH LONG)
- ▶ **PLATFORM INFORMATION** FOR ARRIVAL/ DEPARTURE
- ▶ STATUS OF NEXT STOPPING STATION & RUNNING STATUS OF DELAY/ RIGHT TIME **INSIDE THE TRAIN DURING THE RUN**



FREIGHT OPERATIONS

- ▶ Freight loading has improved from 73.2 Million Tonnes in 1950-51 to 557.39 Million Tonnes in 2003-04 to **892 Million Tonnes in 2009-10**
- ▶ Average speed of Goods trains has remained almost stagnant 17.4 Kmph in 1950-51 to 23.3 Kmph in 2003-04 to **25.8 Kmph in 2009-10**
- ▶ **STRATEGIES NEED TO BE PREPARED TO IMPROVE THIS BY USE OF IT**



FREIGHT OPERATIONS (CTD)

- ▶ BASIC CHANGE IN GOODS STOCK PROCUREMENT TO MAKE THEM FIT FOR **100 Kmph** AND ABOVE
- ▶ **IT** RELATED TECHNOLOGIES CAN BRING ABOUT SEA CHANGE IN FREIGHT OPERATIONS.THEY ARE:-
 - ▶ PROVIDING **RFID** ON ALL ROLLING STOCK
 - ▶ **RECAPTURE PARCEL** TRAFFIC BY:-
 - COMPUTERIZING ALL PARCEL TRAFFIC FOR 'ON LINE TRACKING' BY THE CUSTOMERS
 - ▶ USE COURIER COMPANIES FOR DOOR TO DOOR DELIVERY BY GIVING ASSURED SPACE IN PARCEL TRAINS
 - ▶ MECHANISE PARCEL HANDLING AT STATIONS



FREIGHT OPERATIONS(CTD)

RFID - RADIO FREQUENCY IDENTIFICATION TAGS
HAVE THE FOLLOWING FEATURES:-

- ▶ **PASSIVE OR LONG LASTING ACTIVE READ/WRITE TAGS ARE PROVIDED ON BOTH SIDES OF ALL THE ROLLING STOCK**
- ▶ **TAG READERS ARE PROVIDED AT THE ENTRY AND EXIT OF JUNCTION STATIONS. THESE READERS CAN READ THE TAG DATA AS THE TRAIN RUNS PAST THESE READERS**
- ▶ **THE READERS ARE CONNECTED TO MAIN FRAME COMPUTER THROUGH OFC NETWORK AND KEEP THE INFORMATION UPDATED ON LINE**

FREIGHT OPERATIONS(CTD)

RFID SHOULD BE PROVIDED ON ALL THE ROLLING STOCK.

THE CURRENT STOCK (2009-10)

- ▶ LOCOMOTIVES- 8889
- ▶ COACHING STOCK- 51030
- ▶ OTHER STOCK- 6505
- ▶ GOODS STOCK- 219931

TOTAL 286355



FREIGHT OPERATIONS(CTD)

THE ADVANTAGES OF THIS TECHNOLOGY IS:-

- ▶ **ON LINE MONITORING** OF ALL ROLLING STOCK AND THEIR UTILISATION
- ▶ CUSTOMERS CAN DRECTLY **TRACK THEIR RAKES**
- ▶ **ELECTRONIC RAILWAY RECEIPT** FOR FREIGHT LOADING
- ▶ EFFICIENT MOVEMENT OF ALL EMPTY STOCK
- ▶ **QUICK IDENTIFICATION** OF SECTIONS GIVING LOW AVERAGE SPEEDS AND TAKE REMEDIAL MEASURES.
- ▶ **IMPROVED AVERAGE SPEEDS** AND WAGON TURN ROUND
- ▶ **AVOIDING** ANNUAL WAGON CENSUS



Improvements in Goods Freight Services

It can effectively improve the railways freight operations by:-

- ▶ Improvement in average freight train speed.
- ▶ Optimize the use of rolling stock
- ▶ It would ensure increase loading & earning from the same rolling stock



ENHANCING SAFETY AT LEVEL CROSSING GATES (1)

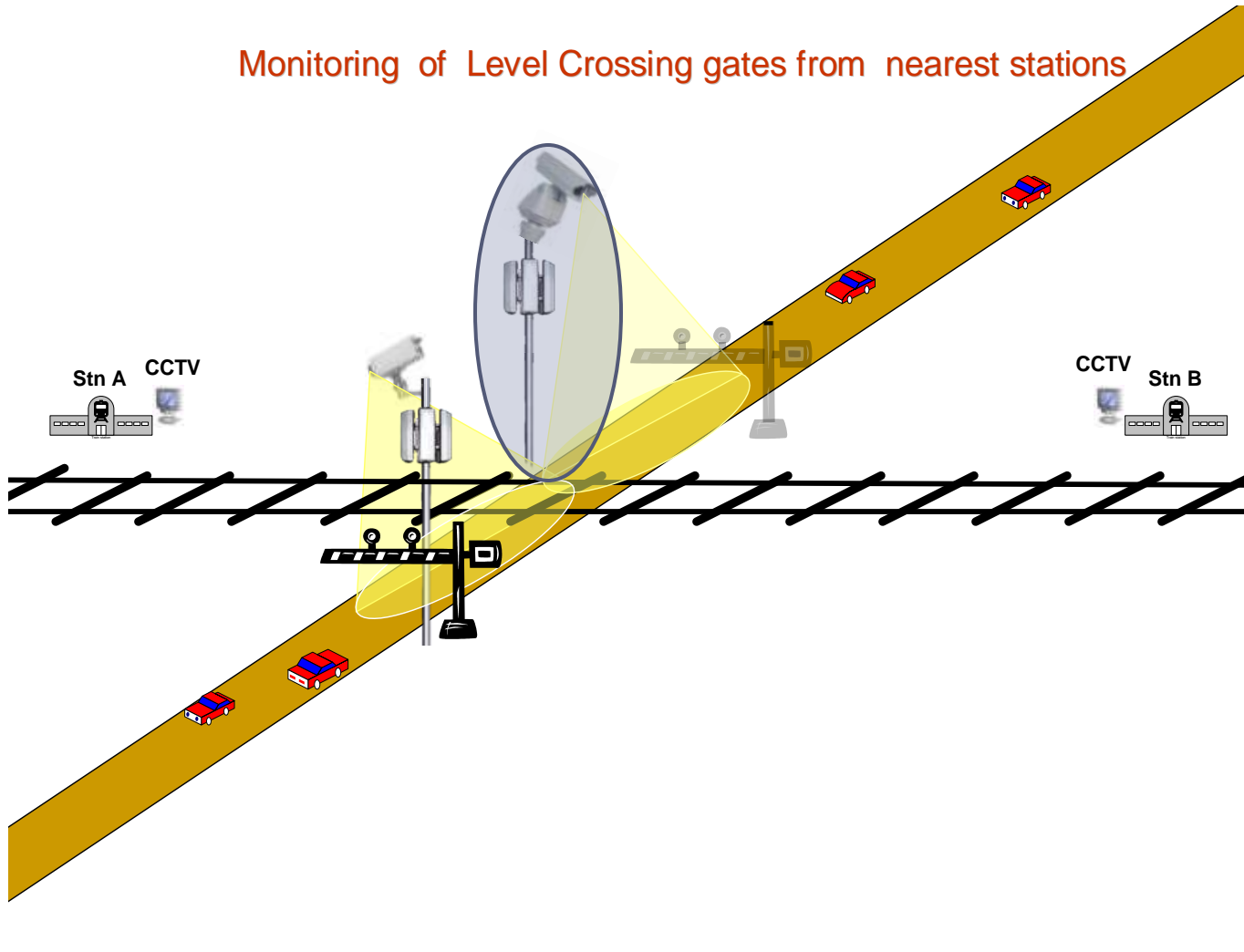
The Infrastructure so created that it can provide following facilities at all Level Crossing Gates:

I. Remote monitoring of LC gate for violation of Road rules through Video Cameras along with Public address system at the LC Gates operated by power supply from solar cells and/or through OHE supply. The gate portion should also be lit during night for proper visibility.



An Example

Monitoring of Level Crossing gates from nearest stations

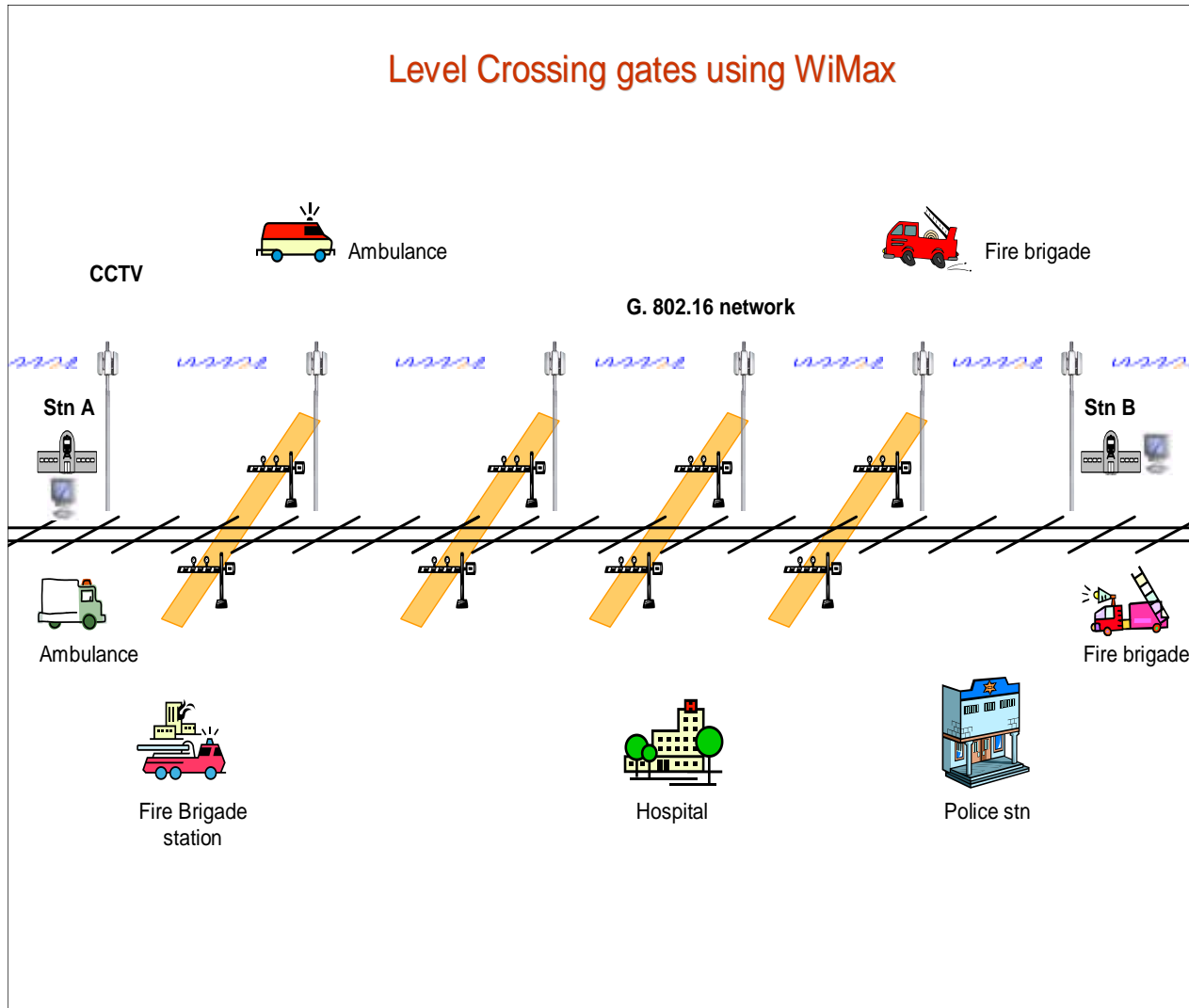


ENHANCING SAFETY AT LEVEL CROSSING GATES (2)

- ▶ **Convey the information** to nearest Police station as well to the violator through public address system at Gate.
- ▶ Incase of any **LC gate accident**, the information can be sent on the network through wireless to nearest hospital as well as police stations for immediate help



An Example



ENHANCING SAFETY AT LEVEL CROSSING GATES (3)

**LC GATES CAN BE MADE AS COMMUNICATION
HUBS** for

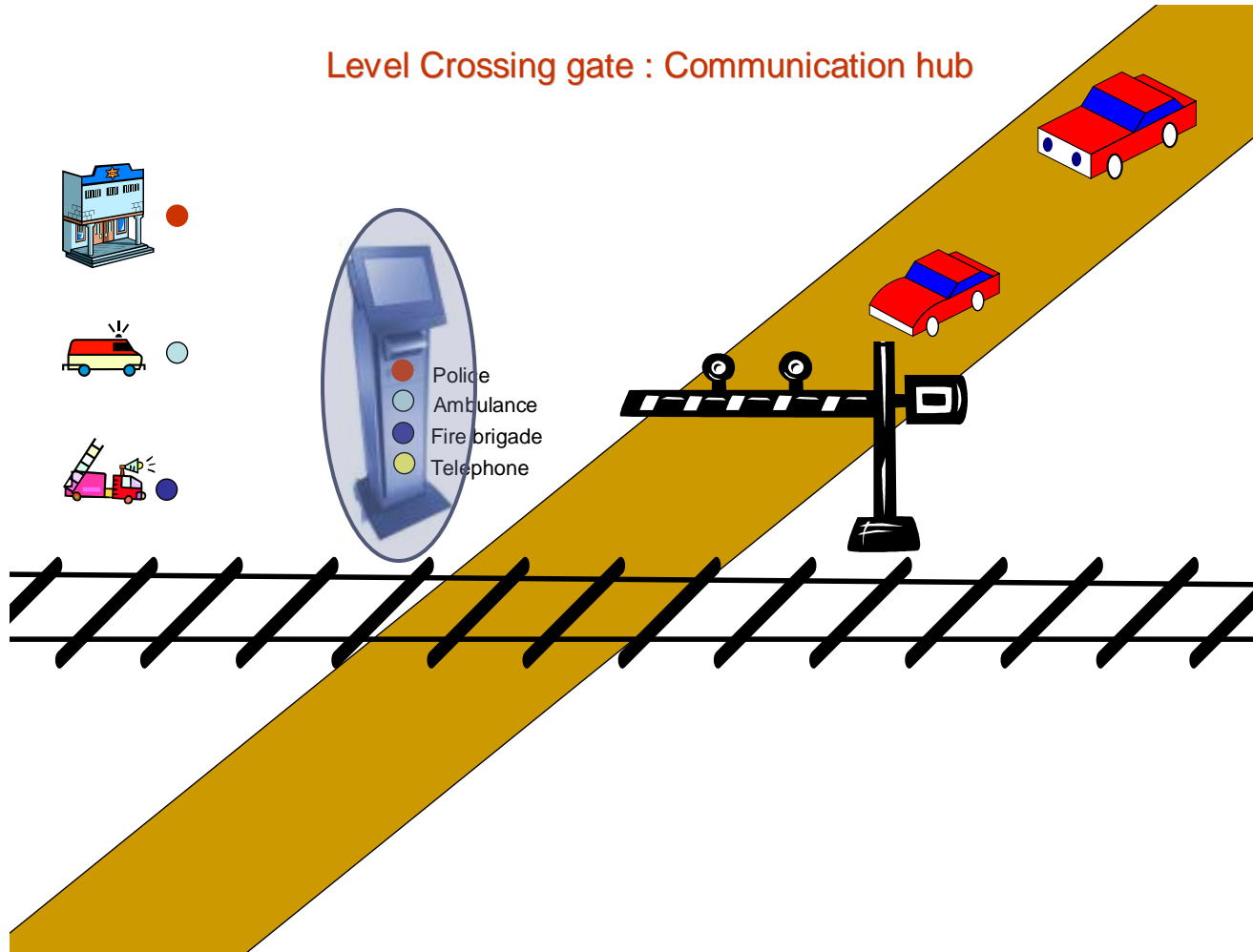
Providing emergency and normal
phone services at the LC gates
for Public use through prepaid
cards or through ATM cards

There 33,553 LC gates .

In addition ATM's can be
provided by Banks to make it a
financially viable proposition

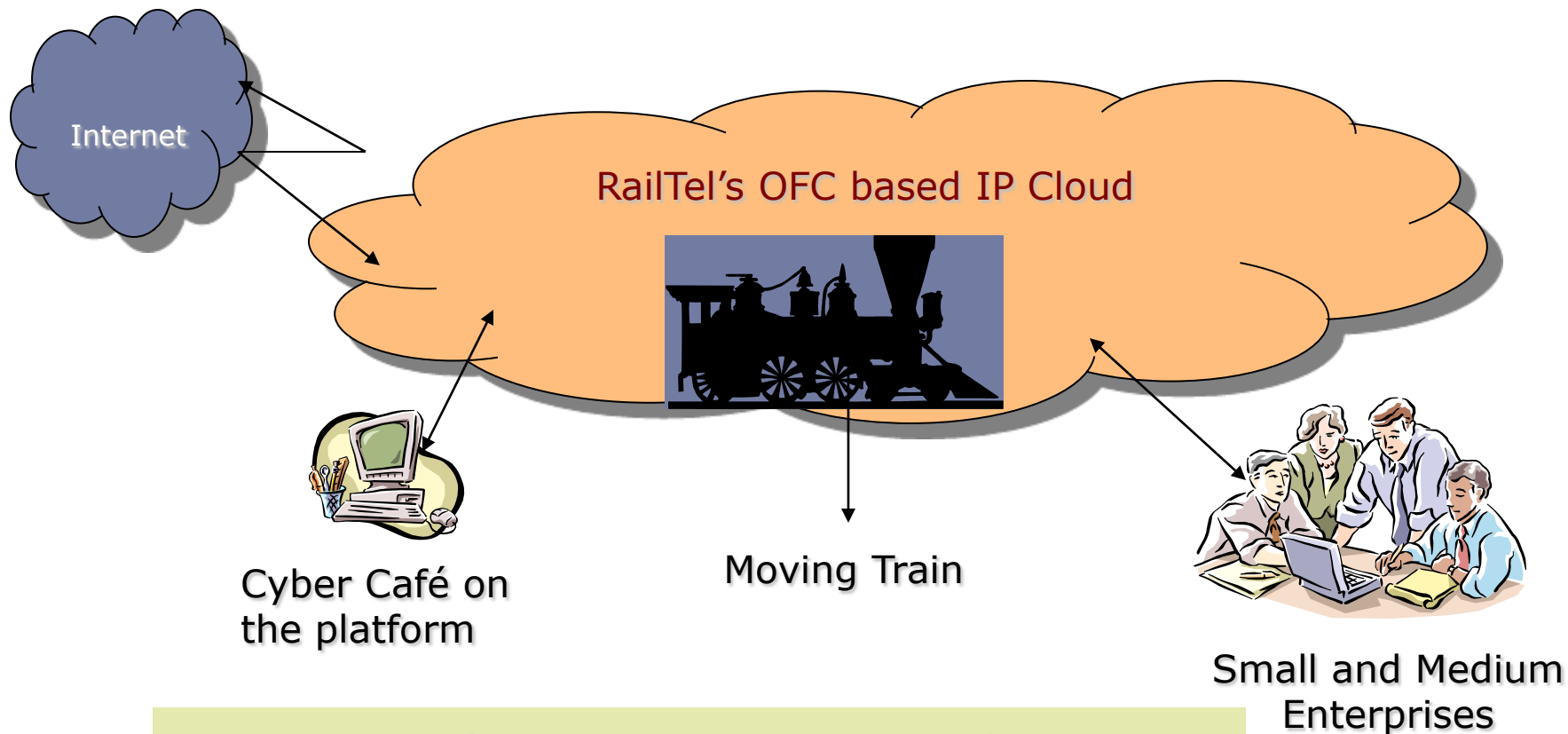
An Example

Level Crossing gate : Communication hub




What More ?

Services on moving trains, stations and surrounding areas



**IR IS ALREADY ON
CLOUD**

- A- OPTIMISING ITS EXISTING
INFRASTRUCTURE WITH MINIMUM INPUTS
- B- IMPROVEMENTS OF RAILWAYS SERVICES
EFFECTING ITS CUSTOMERS
- C- IMPROVEMENTS OF INTERNAL
WORKING SYSTEM TO MAKE IT
MORE TRANSPARENT, COST
EFFECTIVE AND EFFICIENT
-
- 

C- USE OF **IT** FOR INTERNAL IMPROVEMENTS (1)

A. OFFICE ADMINISTRATION

- ▶ Eliminate/ reduce file work and ensure all decisions are taken on railways own intra network
- ▶ Provide **SMART CARD** to all employees for;-
 - ▶ Complete Automation of Processing Salaries
 - ▶ Stop cash payments & make all salary Payment through banks
 - ▶ Provident Fund account of individual employees on intranet
 - ▶ Apply and sanction leave & tour programmes on net
 - ▶ Make the leave account details accessible to individual employees



USE OF IT FOR INTERNAL IMPROVEMENTS

(2)

Use Smart Card for :

- ▶ Free Passes details to all railway employees, public servants & freedom fighters etc.
- ▶ Issue of tickets by reservation office / internet for privilege as well as on duty movements through these cards

This will reduce :-

- ▶ Clerical efforts for writing passes
- ▶ Maintenance records
- ▶ Plug misuse



USE OF **IT** FOR INTERNAL IMPROVEMENTS (3)

USE IT FOR **KEEPING STORES INVENTORY LOW** BY:-

- ▶ **Long term running contracts** for stores procurement
- ▶ Simplify procurement by “**On Line Tendering**”
- ▶ **All stores transactions should be ‘On Line’**
- ▶ It should be possible to see a specified material with its code number on Line for the entire Indian Railways. This will help in emergencies
- ▶ **Outsource to logistic companies** for storing and material movement



OPEN CALL CENTERS

OPEN CALL CENTERS OPERATED BY PRIVATE COMPANIES WITH THE DATA CONNECTED WITH THE RAILWAY NETWORK FOR PROVIDING:-

- ▶ ALL THE INFORMATION OF TRAIN OPERATION AND ACCIDENTS.
- ▶ PROVIDE TECHNICAL SUPPORT TO THE RAILWAY STAFF IN FIELD LIKE RULES REGULATIONS, TROUBLE SHOOTING ETC.



To Conclude....

THESE ARE FEW AREAS FOR USE OF IT WHICH HAVE BEEN DISCUSSED.

THESE IDEAS ARE TIP OF THE ICEBERG.

THERE ARE IMMENSE POSSIBILITIES WHICH EVERY RAILWAY MAN CAN THINK IN HIS / HER FIELD KEEPING THE MAIN VISION, FOR RAILWAYS AS WELL OF THE RAILWMEN....



THANKS

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