GIS BASE MAP FOR INDIAN RAILWAYS

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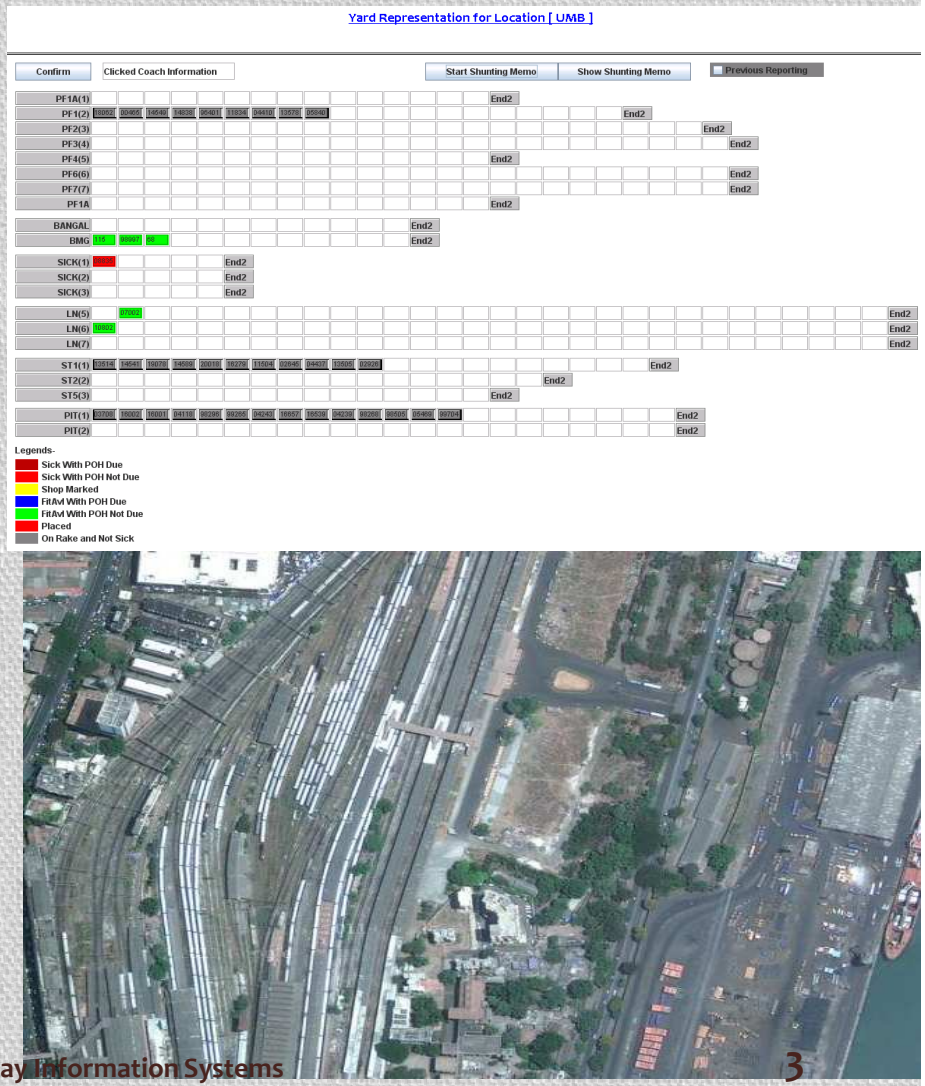
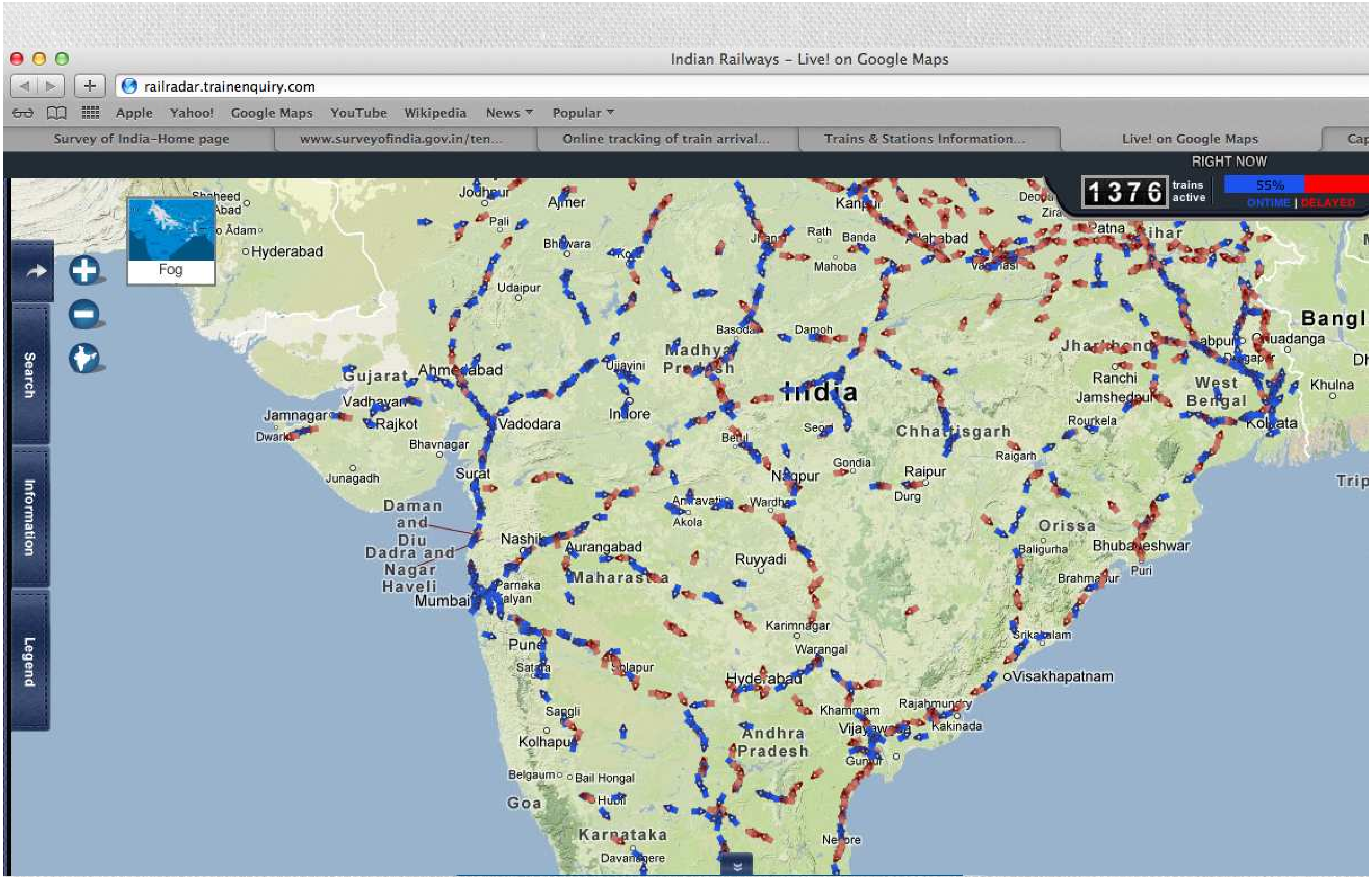
Need for a GIS system

- Indian Railways is a geographically distributed system
- Assets are spread across the country
- Assets are of three types
  - Fixed assets, distributed: railway track, overhead electrified lines
  - Fixed assets, location-specific: stations, yards
  - Moving assets: locomotives, coaches, wagons, track machines
- Map interface is needed for
  - Locating assets
  - Tracking trains
  - Planning future investments

Need for GIS (cont'd)

- **Visualization:** GIS makes it easy to visualize different inputs and outputs from applications
- **Geospatial relationships:** It simplifies the management of geographically distributed assets





Indian Railways – Live! on Google Maps
railradar.trainenquiry.com
Apple
Yahoo!
Google Maps
YouTube
Wikipedia
News
Popular
Survey of India-Home page
www.surveyofindia.gov.in/ten...
Online tracking of train arrival...
Trains & Stations Information...
Live! on Google Maps
RIGHT NOW
1376
trains active
55%
ONTIME | DELAYED
Fog
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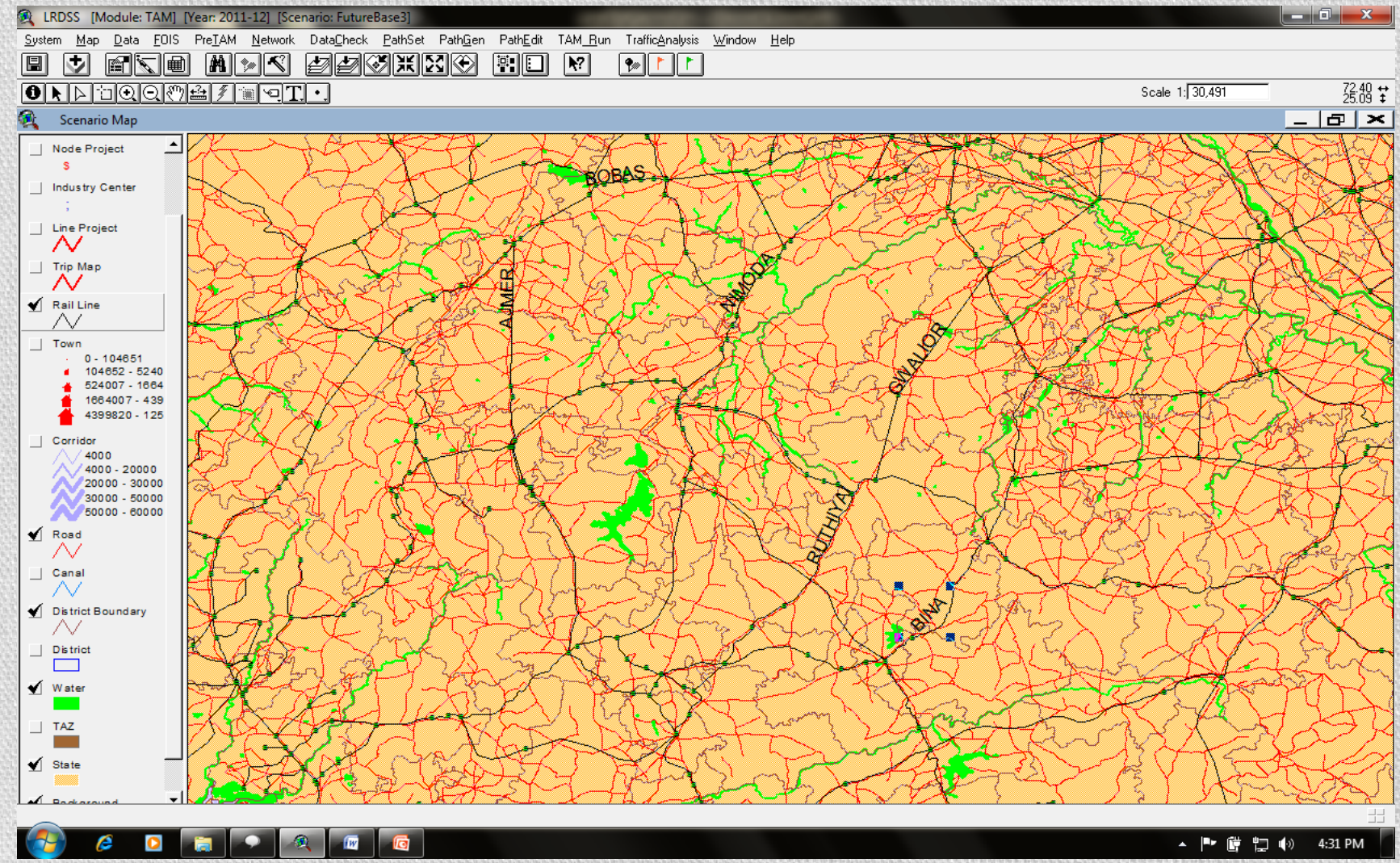
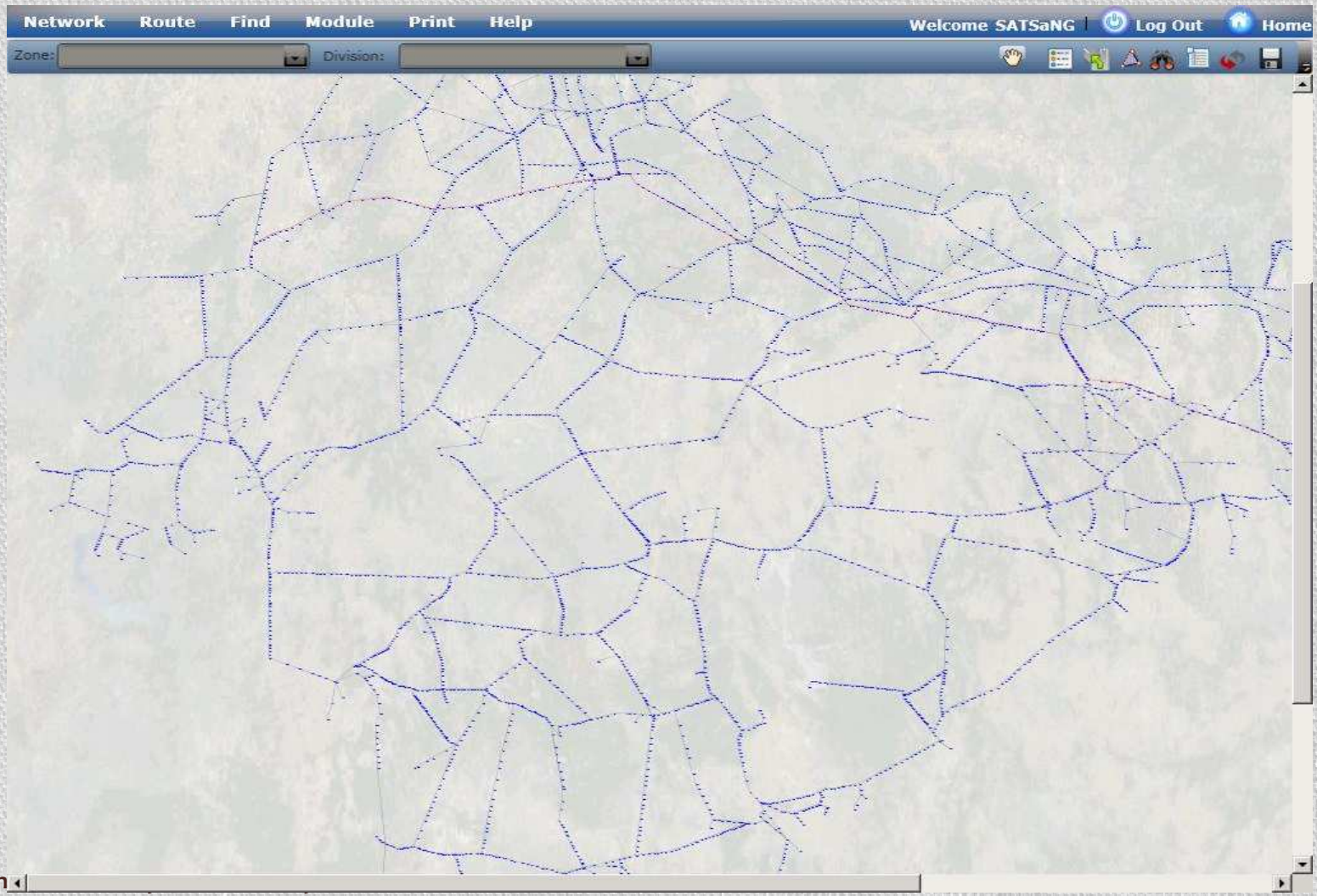
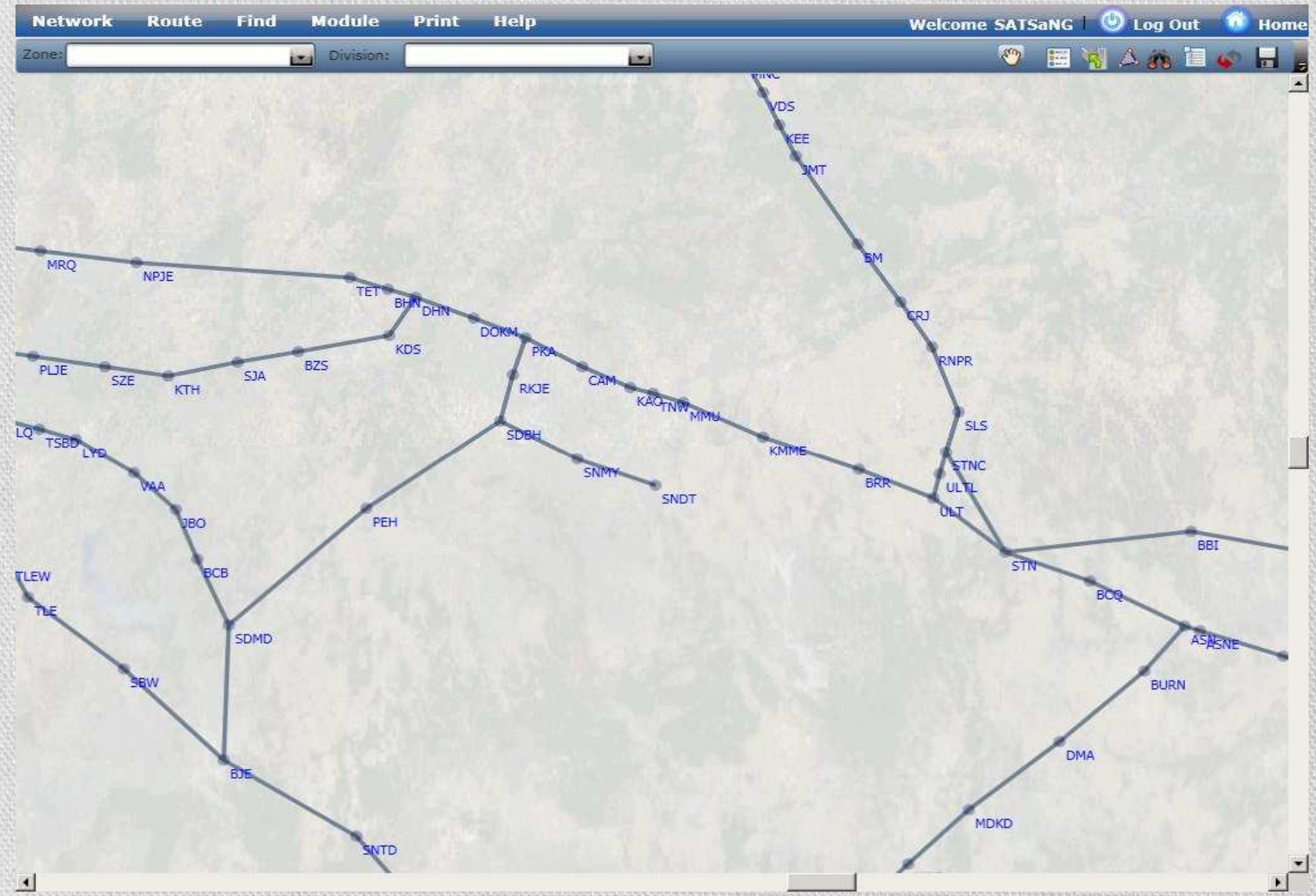
Information
Legend
Hyderabad
Jodhpur
Ajmer
Udaipur
Gujarat
Vadodara
Jamnagar
Rajkot
Bhavnagar
Junagadh
Surat
Nashik
Aurangabad
Maharashtra
Mumbai
Pune
Satara
Sangli
Kolhapur
Goa
Karnataka
Hubli
Indore
Madhya Pradesh
India
Nagpur
Gondia
Raipur
Durg
Chhattisgarh
Orissa
Bhubaneshwar
Puri
Jharkhand
Ranchi
West Bengal
Kolkata
Khulna
Hyderabad
Andhra Pradesh
Warangal
Karimnagar
oVisakhapatnam
Kakinada
Nellore

GIS view


LRDSS [Module: TAM] [Year: 2011-12] [Scenario: FutureBase3]
System Map Data FOIS PreTAM Network DataCheck PathSet PathGen PathEdit TAM_Run TrafficAnalysis Window Help
Scale 1: 30,491
Scenario Map
Node Project
Industry Center
Line Project
Trip Map
Rail Line
Town
0 - 104651
104652 - 5240
524007 - 1664
1664007 - 439
4399820 - 125
Corridor
4000
4000 - 20000
20000 - 30000
30000 - 50000
50000 - 60000
Road
Canal
District Boundary
District
Water
TAZ
State
BORAS
AJMER
NIMODA
GWALIOR
RUTHIYAI
BINA
4:31 PM

Schematic view of IR




Network
Route
Find
Module
Print
Help
Welcome SATSaNG
Log Out
Home
Zone:
Division:
VDS
KEE
JMT
BM
CRJ
RNPR
SLS
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MDKD
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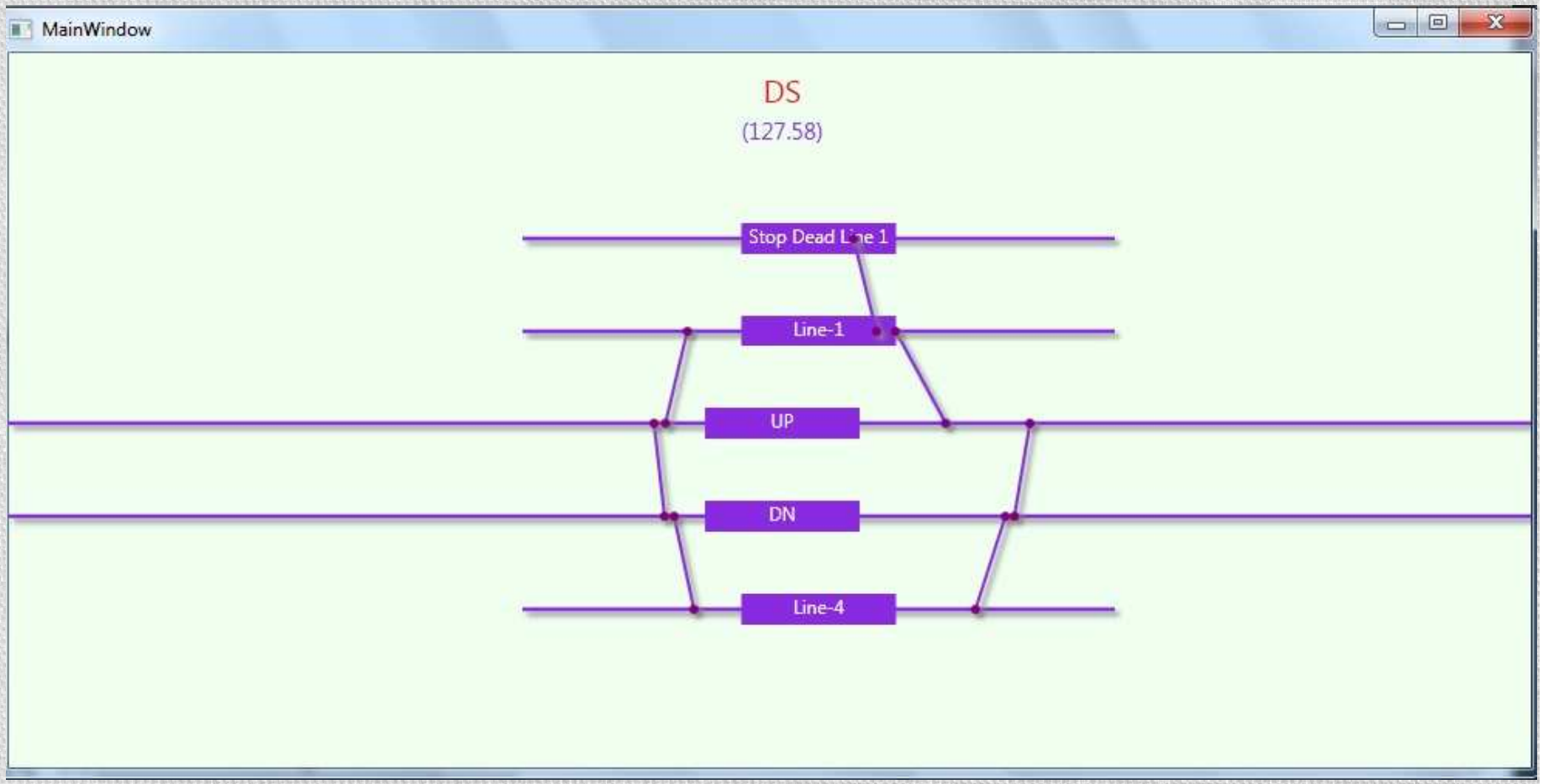
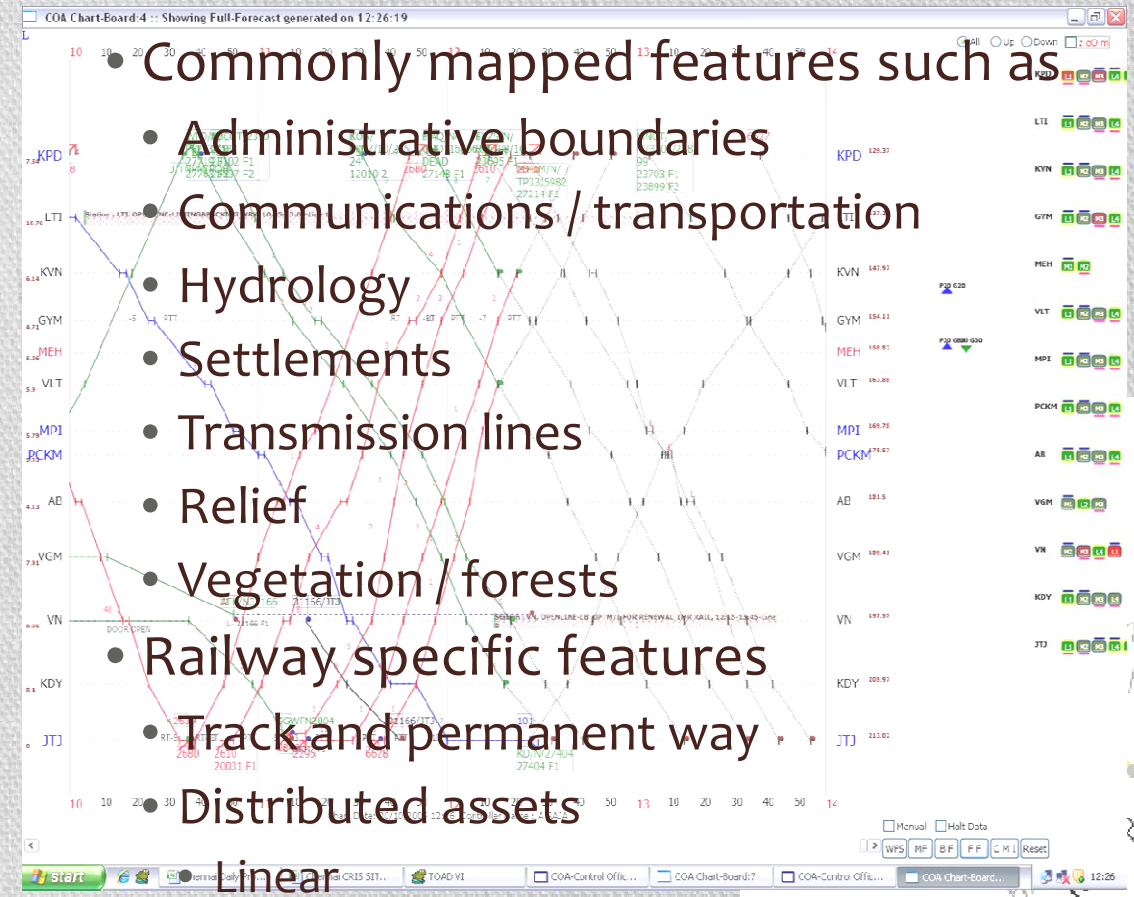
SZE
PLJE
RKJE
SDBH
SNMY
SNDT
PEH
LQ
TSBD
LYD
VAA
JBO
BCB
SDMD
TLEW
TLE
SBW
BJE
SNTD

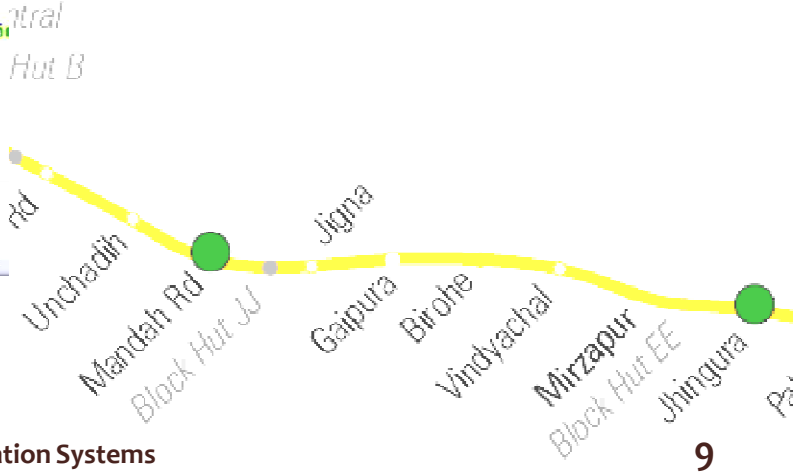
Schematic from TMS data



IR's Base map - contents



- Commonly mapped features such as
  - Administrative boundaries
  - Communications / transportation
  - Hydrology
  - Settlements
  - Transmission lines
  - Relief
  - Vegetation / forests
- Railway specific features
  - Track and permanent way
  - Distributed assets
    - Linear
    - Non-linear



Railway specific features in Base Map

Layer	Land
Features	Land owned by Railways, mostly on both sides of the track
Data Available	• Station diagrams, paper records, land patta / khasra records, engineering drawings, etc. • Partly in digital form
Approach	• 1 m resolution data to be used for major railway areas (such as stations, yards, etc.) • 2.5 m resolution data to be used for land along the railway lines • AutoCAD drawings, drawings available in paper format can be digitized and superimposed into the GIS data.

Railway specific features in Base Map

Layer	Civil Engineering Assets
Features	• Track, formation (Permanent Way) • Buildings • Cuttings, embankments • Level crossings • Bridges, culverts.
Data Available	Engineering drawings
Approach	• 2.5 m resolution data can be used for non focus areas. • 1 m resolution data can be used for focus areas. • Available track data as attributes (like broad gauge/ meter gauge/ narrow gauge; electrified / non-electrified; up/down line, etc.) • Nomenclature for segmentation of track • Location of level crossings, culverts, bridges, embankments, cuttings etc

GIS Data Layers

Layer	Signaling and Telecom Assets
Features	Signaling and interlocking system at stations / sections, and OFC (optical fiber cable) network. S&T equipment at a station are signals, lever frames, location boxes, relays, power supply equipment, cables, control phones etc.
Data Available	Schematic diagram
Approach	Once Land and civil engineering assets are mapped, signaling and Tele-communication assets can be mapped with the help of station layout diagrams etc.

GIS Data Layers

Layer	Electrical OHE (overhead electrification assets)
Features	Location of OHE masts, catenaries, cables, and other equipment, substations, neutral sections, etc
Data Available	Schematic diagram
Approach	Once land and civil engineering assets are mapped, OHE assets can be mapped

Layer	Maintenance Facilities
Features	• Location of production units, maintenance sheds, sick lines – coaching and freight • Maintenance workshops
Data Available	Drawings of the facilities
Approach	To be delineated on map from building and track data

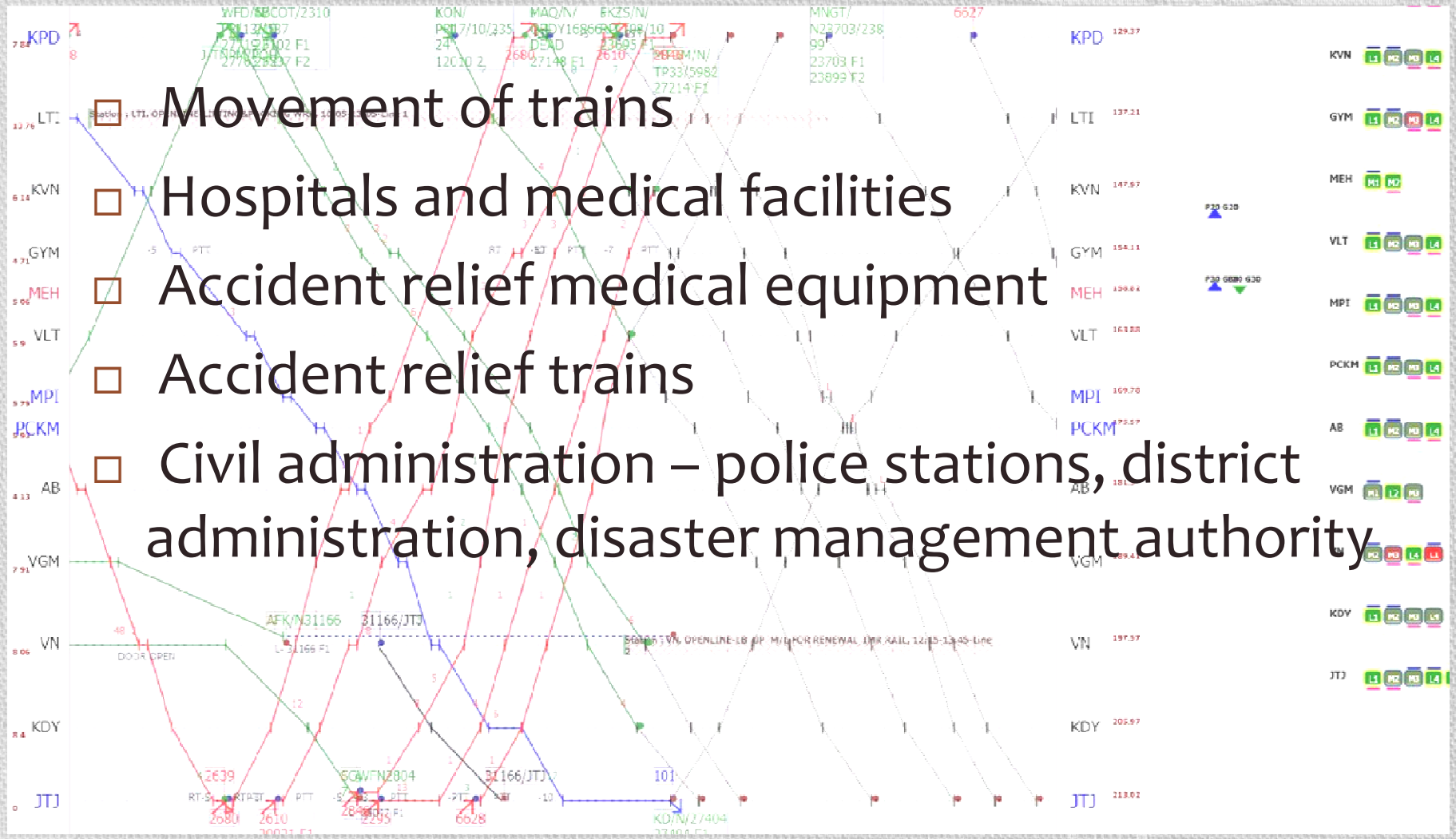
Preparation of Base Map

- Identification of focus areas and non-focus areas
  - The focus areas will include Railway assets in cities, stations, yards, workshops, major bridges, and other areas where high resolution mapping is important.
  - Non-focus areas will include permanent way and its surrounding land in the hinterland where high-resolution mapping is not important.

Preparation of Base Map (cont'd)

- Procurement of SOI Toposheets
  - 1:25,000 scale for focus areas or where available
  - 1:50,000 scale for non-focus areas
- Procurement of Satellite imagery from NRSC
  - 1 meter resolution PAN data for focus areas
  - 2.5 meter resolution PAN data for non-focus areas (where required)
- Collection of existing data such as State-level Spatial Data Infrastructure (SSDI) and other sources
- Geo-referencing of satellite data, collection of Ground Control Points (GCP)

Subsequent phases

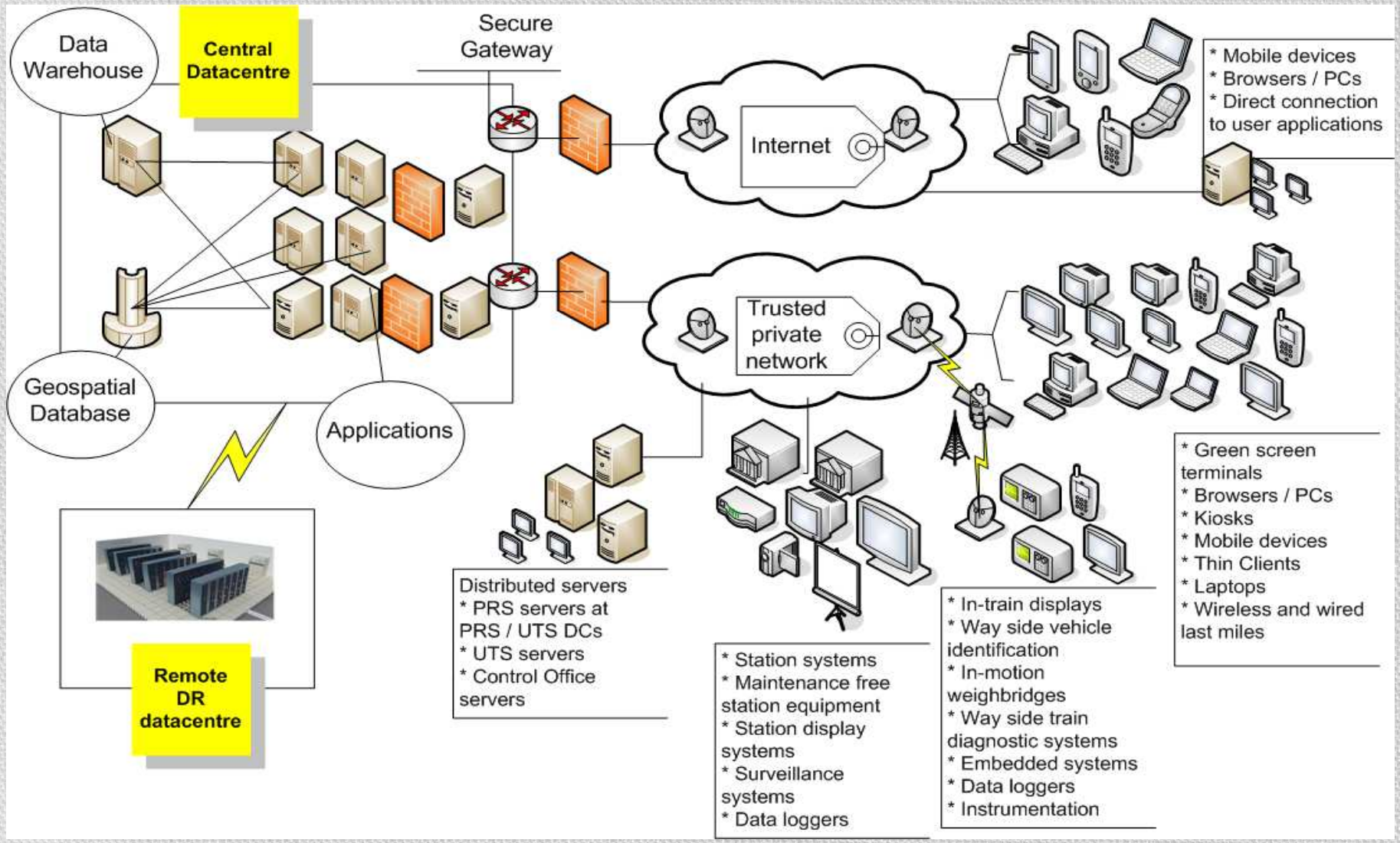


- Movement of trains
- Hospitals and medical facilities
- Accident relief medical equipment
- Accident relief trains
- Civil administration – police stations, district administration, disaster management authority

Interfacing the GIS with applications

- Asset management systems for asset location
- Train operations management systems for train running position
- Planning systems to visualize system bottlenecks
- Project management systems to visualize project progress

Indian Railways Information Architecture



Architecture

- Central database
- Exposing map on the Internet / intranet
- Using web services to provide interfaces with the different applications
- System for updation of data and configuration control of the database
- Access control

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THANK YOU