IP Introduction to Railways

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Based on the Portuguese railway experience, UIC, jointly with some other networks, coordinate the development of a manual of best practices on migration to IP technology.

- A second edition to be published until the end of 2013.
Towards Unified IP Network

**Communication Networks**

- GSM/UMTS
- SDH/SONET
- FRAMES RELAY
- ATM
- ETHERNET
- GSM-R

**Distributed Systems**

- SCADA for Energy Systems
- Level Crossings
- Signaling Interlocking
- Train Control System

**Operational Command Center**

- Passenger Information
- Passenger Audio Announcements
- Ticketing
- Operational Mobile Telephony
- Operational Communications
- Operational Fixed Telephony
- Video surveillance
- Security & Safety
- Corporate TV & Web Kiosk
- IT application to support business
- Time Information
- SCADA Infrastructure Monitoring

**Towards Unified IP Network**
General telecommunications traffic trends:

- Network traffic has been and will continue to evolve from TDM to packet IP.
- However, the need to support legacy TDM services still be required.
The approach was:

- Converge interfaces and protocols towards IP
- Redesign the network as a unified IP network

**Convergence:**

- Operational Optimization
- Project Simplification
- Higher Flexibility
- Higher Resource Allocation
- Optimized Costs Cx/Ox

Separate Networks

Communication topologies specific to each railway system

Unified Network

All railway systems supported in a multiservice network
Railway Operational Model

Control (sub) systems:
- Signal boxes
- Control systems
- Traffic monitoring
- SCADA/telecontrol

Communications (sub) systems:
- Telephony
- Data
- Mobile/private mobile radio

Safety (sub) systems:
- Video surveillance
- Emergency call
- Contact detector
- Alarm detector

Information (sub) systems:
- Passenger info display
- Information announcements

Integrated data network
MPLS as a Step Forward on IP

MPLS implements virtual circuits on top of packet networks

Operational Command Center

Reliability / Traffic Engineering / Traffic Isolation / Multiprotocol / Synchronization
Challenges of Introducing IP/MPLS

Railway services over TDM technology

Railway services over IP/MPLS technology
Challenges of Introducing IP/MPLS

Railway services over IP/MPLS technology

<table>
<thead>
<tr>
<th>Requirement</th>
<th>ESTW</th>
<th>PIPC</th>
<th>Axel Counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Recovery in case of link failure</td>
<td>&lt; 500 ms</td>
<td>&lt; 5s</td>
<td>&lt; 500 ms</td>
</tr>
<tr>
<td>Interface</td>
<td>V.24 / RS232</td>
<td>V.24 / RS232</td>
<td>V.24 / RS232</td>
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</tbody>
</table>
Guidelines for Introducing IP

Network Planning

New needs from rail projects
- New lines
- New applications introduction
- Modernization of lines
- Deployment of new systems
- Moving of installations, of Control Center
- Equipments End of Life
- Maintenance costs increasing
- Ageing of systems

Technology Evolution
- New generation of equipments
- New software releases
- Evolution of supported hardware baselines
- New railways rules
- Standard Evolutions (Mandatory)
- New laws

Regulatory

Inputs for Network Planning
Guidelines for Introducing IP

Security

QoS

Traffic Engineering

Risk Analysis

Testing
Guidelines for Introducing IP

Economical Indicators

Human Resources
Modern railway demands a set of new challenges on telecoms:
- International border-crossing interoperability, higher rail track capacity, higher capacity of command and control systems, higher safety and security and novel passenger services, among others

- Wired and wireless communication technology shall be able to provide seamless communications to all railway applications;
- New railway applications based on virtualized IT platform and cloud computing will arise as a standard solution;
- Network security and flow control will play an important role in the network operation;
- Novel in-train and in-station passenger oriented applications will benefit from a broadband and harmonized network;
- The network design to support safety and mission critical communications based on IP requires a deep and mature experience.
Thank You