ICOM: A Communication Framework for Interoperable European Railways

Jérôme Billion, Didier Van den Abeele – ALSTOM – France

ITST – Sophia Antipolis – 6 June 2007
The InteGRail Project

- **GOAL**: Improve the attractiveness of Railway transport
  - optimization at continent level not per country nor single operator

- **APPROACH**: Integration of Railway Information Systems
  - operation, traffic management, rolling stock & infrastructure domains

- InteGRail defines an Intelligent Transport System architecture to
  - improve/optimise railway network capacity and performance
  - reduce ownership cost with cooperative and predictive maintenance
  - distribute and share information between railway actors
  - assist operator decisions and improve automation of railway process
  - to develop intelligent mobility added value services for railway operators and their passengers and freight customers

- **The RIGHT INFO at the RIGHT MOMENT at the RIGHT LEVEL**
Railway Business Context for Communications

CORE NETWORKS
- Administrative Distribution

IM Operator
- Core Network

Public Telco
- WiFi/WiMAX

IM Operator
- Private GSM-R

Public Telco
- GPRS/UMTS

RU Operator Y
- Core Network

RU Operator X
- Core Network

RU Operator X
- Depot Wifi

Internet

Operational Train

ACCESS NETWORKS
- Geographic & Administrative Distribution

PDG

GGSN

SGSN

Administrative Distribution

ALSTOM

ICOM: a Communication Framework for Interoperable European Railways
Intelligent Communications in InteGRail

System Wide Information Exchanges

Co-ordinated Ground Systems

Multi Operators

Multi Countries

Integration of Heterogeneous Railway Networks

Trains on the move

SP 3A Intelligent System Monitoring and Control

SP 3D Advanced System Communication

SP 3B Intelligent System Maintenance

SP 3C Intelligent System Management

INTElligent integRation of RAILway systems
ICOM Communication Framework

- Distribution of applications with communication needs
- Separation of Concern ICOM - Applications
  - Functional IF
  - Negotiation IF
- ICOM Framework
  - Common Services & Properties
  - Standard Patterns
- Mapping to Concrete Technologies
  - Railway Networks
  - Internet Technos
- ICOM networks with communication capabilities

New Added Value Services
ICOM Functional Layers

- **ICOM Nodes**
- **ICOM Networks**

**APPLICATION INTERFACE**

- **Application Interactions Support**
- **Transparency - Managers**
- **Enhanced ICOM Sessions**
- **End to End Information Transport**
- **Routing - Scheduling - Mobility**
- **Heterogeneous Networks**

**APPLICATION ENVIRONMENT layer**

- **SOA**
- **Domain Specific**
- **Business Orientation**

**INFORMATION TRANSFER layer**

- **QoS**
- **Security**
- **Streams, UDP, TCP, Process Data**
- **Mobile IP, MIH**

**EXECUTION SUPPORT - SECURITY**
ICOM Application in Train Networks

- **Evolution toward Ethernet and IP technologies**

- **Flexible use of multiple middleware technologies**

- **Addressing: consists (static) vs train (dynamic)**
Addressing Moving Trains

Consists permanent ground addresses

RU Operator X

Consist Mobility CSS

Train Mobility CSS

Communication Sub System

Train GW

Operational Train Dynamic Network

RU X Consist A12 CSS

Train GW

RU Y Consist 3X2 CSS

Train GW

RU Operator Y

ICom Mobility Gateway

Mobile Communication Gateway

Access Networks

Internet

Static Binding

Consist

IMG

MC

G

RU X

MC

G

RU Y

IMG

MC

G
Opportunistic Use of Radio Resources

- Transparent over the air transmission of all applications data from/to train
- ICOM makes best use of available radio resources

- trains time schedule
- passengers related data
- cellular network
- wireless hotspot
- fault report
- diagnosis
- full data
Thank you for your kind attention

More information on: www.integrail.info
ERRAC Vision at 2020

To cope with the increased transport demand, railways must:

- Triple rail market volumes*
- Double rail market share*: 15% for freight and 12% for passengers

*compared to the year 2000

InteGRail will contribute to the achievements of these objectives providing Information Technologies as enablers
InteGRail: Facts and Figures

- **Duration:** 48 Months
- **Commencement Date:** January 1st, 2005
- **Partners:** 39 from 10 EU Countries + Chile
- **Budget:** about €20 million
- **EC Contribution:** about €11 million
- **Labour Effort:** more than 1500 Person Months