

# Informatics in railway transport in the Czech Republic

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## Abstract

The article gives a review about present situation and realization of information and management systems in railway transport. It concerns above all systems used at the Czech railway company. Next I pay attention to integration bindings among systems and perspectives of development in this field.

*Keywords: railway transport, computer technology, hardware, software, real time, direct control, information system.*

## 1 Introduction

Even in the past it was typical for transport and especially railway industry of the Czech Republic to use actively means of computer technology to facilitate processing of huge and very complicated tasks. Progressive development of hardware a software tools and especially networking at the level of INTRANET of Czech Railways made expansion of PC applications possible from very easy tasks to real-time direct control of railway operation.

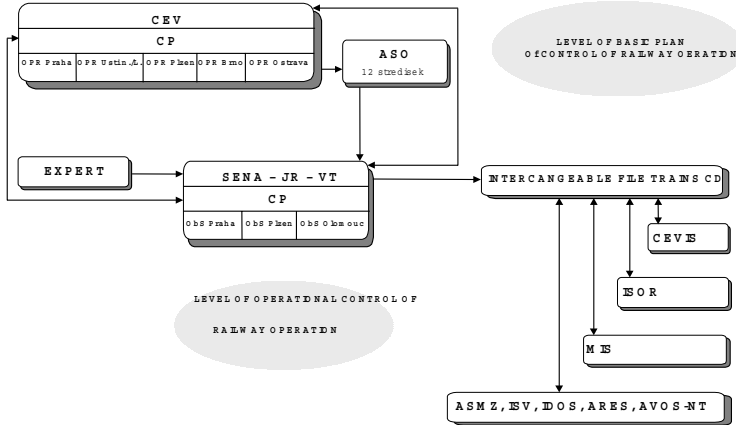
Very positive impact of the recent period is:

- Development of IS from 16-bit operation systems towards 32-bit and 64-bit operation systems;
- Creation of integrated operation systems;
- Gradual growth of number of applications and their scope;
- Integration of applications based on on-line data links between information systems.
- Example of implementation of integration links between information systems for control of railway operation (see Fig. 1).



Constraints are:

- Worsening of financial situation.
- Often changes of organizational chart of the company and of ways of railway operation management in the network.
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**Legend:**

- CEV – Central editor of trains
- CP – Central workplace of the system
- ASO – Automated formation of circulation plans (rolling stock – engines and coaches, train and engine crew)
- OPR – Regional operational headquarters
- EXPERT – Grafic editor of infrastructure data of the network
- SENA – JR – VT – Information system for timetabling
- Obs – Regional workplace for timetabling
- CEVIS – Central system for monitoring trains and wagons
- ISOR – Information system of operational control
- MIS – Local information system for yards
- ISV – Information system for planning maintenance and lockouts
- IDOS - Information system for searching optimum connection for public
- ARES – Automated booking system
- AVOS – Automated system for tickets’ sale

Figure 1: Links between systems of railway operation control.

**2 Nowadays informatics covers following areas of the railway industry:**

**Economy**

- Financial accounting
- Module FI SAP R/3
- Real estates
  - Modul AM SAP R/3



- Wages and staff
- Project TP 110
  - Central personnel database (CPD)
  - Module HP SAP R/3
- Material supply
  - Application of the company TESCO for end stores
  - Application MTZ VAX for supplying stores

## 2.1 Management of operation and freight service

- Applications on local level
  - IT CEVIS, MIS (Local information system for yards), INTESS(Integrated system of the railway station)
  - Operational journal of the train dispatcher, INTESS commands, Operational commands for train crew
- Applications for regional management of operational processes
  - ISOR (Information system of regional operational management) – module of operational dispatcher, module of train dispatcher, module of analysis of operational timetable, module of military trains management
  - IS for planning maintenance and lock-outs
- Central applications
  - CEVIS – Central wagons' information system
  - CDS – Central dispatcher system
  - MIMOZA – system for management of special consignments
  - IS UZV (central records of wagons) incl. Card register of freight wagons
  - Freight service and transportation revenues
- IS PT (transportation revenues)
  - APM(Automated workplace) freight cash desk
  - APM main cash desk
  - APM VA (Branch lines and sidings)
  - APM VNVK (Public loading and unloading siding)
  - CLA, JCD for customs declaration and contacts with customs administration
  - IS KMZP (Inspection of international railway transportation)
  - IS KPT (Inspection of transportation revenues)
- ISOPC – IS for support of business activities

## 2.2 Passenger transportation

- Sales system AVOS, ARES, POP (hand-held passenger cash desk), MOP (Small passenger cash desk), AVJ (Vending machine for tickets)
- Information system for transport connection IDOS (IDOS UNIVERZAL)



### 2.3 Rolling-stock

- Automated workplace of engine dispatcher APS
- IS supporting repairs of rolling-stock – application ID2
- IS STP (Stations of technical inspections)
- Card register of coaches, Card register of locomotives, Card register of freight wagons

### 2.4 Basic management of operation

- Timetabling, rules and basic technological and regulation tools
  - SENA incl. modules CEV (Central editor of trains) and EXPERT (Editor of standard database of the Czech Railways network – infrastructure, rolling stock)
  - ASO (Automated creation of circulation plan) of rolling stock, engine crew, train vehicles
  - ETT (Editor of route technology) for routing plan and local train formation
  - POPOV (IT-supported plan of train formation)
  - TR6 (Support of creation of the railway stations' list TR6 describing shipping possibilities)
  - Overview of distances in kilometers
  - Digitizing of shipping, operational and signalling rules

### 2.5 Infrastructure

- Basic data for
  - Railway tracks, power engineering, telecommunication engineering, signalling, structures and real estates
- IS supporting maintenance SORUT, ECOTRACK
- IS creation of JZDM (Digital railway maps) GIS of railway tracks
- IS for charging of energy consumption – module ISU CCS SAP R/3
- Geographical information systems
- Management applications covering record keeping MAPINFO
- Support for project documentation

### 2.6 Management a statistics

- Performance data of Czech Railways
- Statistics of freight transporation, data marketplace of freight transporation
- Statistics of passenger transportation
- Central record keeping, basic data of the network



## 2.7 Other applications

- Mostly licenced applications
  - Fire protection
  - Enviromental management
  - Elektronik mail
  - Office applications
  - Intranet
  - Public web pages of Czech railways on Internet

## 3 Plans for further development of IS in the railway industry

### 3.1 Future development of informatics in the railway industry tends to

- Deeper integration of applications by means of implementation of complex modules and applications,
- Finishing all the data links between all important sites based on IP network,
- Expanding of functions of existing and future applications from support of internal activities towards direct support of customers and suppliers of the Czech Railways,
- Conversion of IS and applications for future organization chart of the Czech Railways after transformation of the Czech Railways and after entering European structures
- IS applications of Europe wide character, e.g. PathFinder

### 3.2 In the area of present applications there are under development these applications

- Further modules of SAP R/3
- Freight operation and management of operation
  - Finishing and implementation of integrated information system for railway station management as uniform platform on the level of railway stations
  - Gradually formed new links within IS of operational dispatcher management and signalling and interlocking systems
- Freight transportation and revenues
  - Creation of IS of business controlling for evaluation of effectiveness of business in freight transportation and support of these activities
  - Set-up of these systems for on-line communication with customers
  - Creation of IS for freight wagons' management on central and regional level linked to changes in transportation and operational technologies
  - Creation of global system for freight wagons' management



- Creation of links between IS CD and customers by means of elements according to EDIFACT
- Joining the project ORFEUS (based on EDIFACT) to transfer bills of freight between EU Member states
- Passenger transportation – creation of integrated modular IS for passenger transportation ISOP to unify all the activities in the framework of existing applications and to extend portfolio of services in passenger transportation and to reduce costs
- Rolling stock
  - Finishing and implementation of a new generation of application APS – Automated workplace of engine dispatcher
  - Implementation of PM module as a basic SW for management of repairs and maintenance of rolling stock and other equipment
- Railway infrastructure
  - Implementation of the module real estates management REM SAP R/3 and module PM for maintenance and repairs of infrastructure to create integrated and auditable system of infrastructure administration integrated with existing basic databases
  - Finishing JZDM (Digital Railway maps), which is necessary for exact description of all parts of railway infrastructure
  - Further development of applications GIS in the area of infrastructure
- Management applications
  - Innovation of existing statistic applications using technology of data marketplaces of freight and passenger transportation, business controlling etc. The goal is to provide correct and timely data for the company management to document evincible losses in passenger transportation in the contact with the government administration etc.

### 3.3 Strategic level of management of IS/IT

1. Strategic management IS/IT involves information strategy and global philosophy of informatics and its updating during a year.

### 3.4 Tactical level of management of IS/IT

2. Planning and coordination of projects IS/IT, i.e. planning, commission, approving, deciding ways of resolving, choice of supplier and ensuring of time and content consistency between projects.
3. Development of the company linked to informatics – changes of organizational chart, links to other projects, development of methodologies.
4. Management of availability of IS/IT, especially security, reliability, system reaction time.
5. Management of economy IS/IT – planning of financial resources, monitoring and evaluating of costs, direct and indirect effects.
6. Management of human resources IS/IT – planning and management of work teams, knowledge management, programs of requalification.



7. Management of data resources – planning, evaluation and organization of internal and external data resources.
8. Management of technological resources – planning of technological architecture of IS/IT.

### **3.5 Operational level of management of IS/IT**

9. Management of projects – provided by external suppliers and by own resources according to the type of projects (transaction, infrastructure, business intelligence, ...).
10. Management of running IS/IT and network administration – planning, monitoring and evaluating of running IS/IT, administration of main components.

### **3.6 Further factors of the development process**

- Nowadays IS/ID are able, when necessary, to work on-line or almost on-line. Their importance of managing characteristics increases as well as abilities to provide timely information for management process. ISD become more and more an integral part of management of technological processes and of these processes themselves, too. It is a qualitative change-over from systems of informative and complementary nature.
- Very important factor, which can influence on principle quality of transport services, is gradual change-over towards electronic inputs and outputs of ISD. It means not only easier contacts between customer and transport company by means of terminal of the computer network, but also fundamental simplification of current paper form of transport and accounting documents, including non-cash payment system. These benefits are intensified by international nature of transport and joining EU community. Prerequisites of integration are linked with implementation of international norms and standards of technical, commercial and information nature (DOCIMEL, HIPPS).

## **4 Conclusion**

- From this presentation can be seen that the Czech railways have reached quite a high level of integration of information and managing systems. These systems have already proved their viability in real technological processes of railway operation. It is very important that most of these systems are able to work in real time (on-line) conditions.

Like most European railway companies the Czech railways are under the process of restructuring now. This fact will have a very strong impact on future development of most of the information systems presented in this paper.



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