DB Netz Fault Clearing Project - RB (Regional Division) East
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As a subsidiary of DB Group, DB Netz AG is responsible for the entire infrastructure of the railway system. That includes:

- The track system
- Combined freight transport facilities and terminals
- Control and safety systems
- Signal boxes
- Overhead contact lines

DB Netz AG provides the railway company with timetables and routes and operates rail transport.

Responsibilities:

- Preparation and coordination of timetables as well as network operation
- Maintenance and repairs
- Network development, planning and engineering of new and expansion construction projects (in role of main contractor)
Around the world by rail

The length of all tracks owned by Deutsche Bahn is equal to about 64,000 km. If you were to lay all of these tracks next to each other, they would trace the equator more than one and a half times.

Brick by brick

The world’s largest brick bridge is the Göltzschtal Bridge passing over the Weisse Elster river in the Vogtland (Saxony). About 1,700 people worked on its construction from 1846 to 1851 using 26 million bricks.

Three times to the sun and back

Each year on DB’s tracks trains cover over a billion kilometres. That distance would take you from the Earth to the Sun and back more than three times.
Network Division
Facts & Figures 2008

About 41,000 employees work to ensure high quality and smooth operations in the rail network.

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<tr>
<td>Total operating performance (in million Trkm)</td>
<td>1,042</td>
</tr>
<tr>
<td>Employees</td>
<td>40,974</td>
</tr>
<tr>
<td>Length of routes operated (in km)</td>
<td>33,780</td>
</tr>
<tr>
<td>Length of tracks (in km)</td>
<td>64,022</td>
</tr>
<tr>
<td>Track switches and junctions</td>
<td>69,232</td>
</tr>
<tr>
<td>Level crossings</td>
<td>17,981</td>
</tr>
<tr>
<td>Tunnels (Number/Length in km)</td>
<td>770 / 492</td>
</tr>
<tr>
<td>Railway bridges</td>
<td>27,094</td>
</tr>
<tr>
<td>Signal boxes (thereof IECC*)</td>
<td>4,474 (893)</td>
</tr>
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*IECC = Integrated Electronic Control Center
DB Netz AG within DB Group
DB Netz AG is organised into five Board of Management divisions that are supported by service and Group functions.
What led to this project?

- Call for topics for IMS work plans within RB (Regional Division)
- Two topics named from EVZS*
- Implementation of IMS manual and process management
- Optimisation of fault clearing
- Process management implementation and development in Group
- Test possibility of implementation of additional ARIS modules with VQ
- Support in implementation of Pro Netz requirements

*EVZS = Fault Clearing and Reporting Centre
ARIS simulations will optimise the fault clearing process at Regional Division RB East and increase train punctuality

The initial situation
- Availability of EVZS occasionally unsatisfactory
- Application of existing processes and those to be newly defined impractical
- Definition and publication of measuring points relevant to performance indicators of fault interference periods inconsistent

The project order
- Monitor current process
- Analyse points of weakness
- Clear faults from process goals
- Define and implement target process
- Develop and implement monitoring concept
- Test practicality of the ARIS module for simulation

The goal
- Increase punctuality by minimising fault interference periods
- Increase customer satisfaction for DB Netz AG customers and external customers
- Increase employee satisfaction with clearly structured processes
- Shorten wait periods when faults occur

What does the project aim to achieve?
- Stabilise process by defining and co-ordinating interfaces and identifying process deviations early on
- Recognise peak loads through ongoing process monitoring
- Use resources ideally
- Implement ProNetz requirements in process
What benefits does the project offer?

- **The goal**
  - Decrease incidence of faults
  - Increase punctuality

- **The benefit**
  - Greater track availability
  - Increased customer and employee satisfaction from clearly structured processes
  - Increased efficiency of operations by using all resources available
  - Shorter processing times in planning when faults occur
Analysis/simulation of current processes forms the basis for development of target process alternatives that are later simulated and evaluated in turn.

**Simulation steps**

1. **I**
   - define current processes
   - monitor data
   - describe process
   - improve the process

2. **II**
   - analyse weak spots
   - simulate current process (database for comparison with target process alternatives)

3. **III**
   - define target processes
   - Target process alternatives
     - developed together with the specialist unit
     - simulate
     - contrast with one another and evaluate

**Types of results relevant to simulation**

1. **I**
   - processing times (current) and frequency/probability

2. **II**
   - level of capacity (current)
     - personnel
     - technical resources
   - process bottlenecks (required wait times)

3. **III**
   - level of capacity per target process variant
   - compare current vs. target
The current process was defined in fault clearing management and stored in the detail process with values measured.
The framework for process description was set up

The processes represented within the frame form the basis for the pilot implementation of the ARIS simulation and ARIS PPM in the EVZS (Fault Clearing and Reporting Centre). The processes lying at the edges of the frame have only been described for this implementation to the extent that they represent the effects of the EVZS on fault interference periods.
The current process is simulated and analysed

- define current process
- analyse weak spots
- define target process

The ARIS-Simulation offers convenient representation of the analysis factors as:
- process graphics
- separate tables
- charts
The simulation of the current process indicates highly dynamic required wait periods due to resource bottlenecks.

ARIS simulations allow for:

- Mathematical verification of resource bottlenecks "sensed"
- Detailed representation of individual time blocks ⇒ concrete effects of varying working loads are understood immediately

Results:

- Starting point for allocation of tasks in division, other service scheduling
- High working load means longer required wait periods
- Working load over 80% in the long-term not recommended from an ergonomic perspective

Values as of 03.12.2008

- Simulation period of 8 weeks -
Furthermore the simulation of the current process showed high required wait periods where there are tasks that directly affect fault interference periods.

**Tasks with long required wait periods**

<table>
<thead>
<tr>
<th>Task</th>
<th>Required wait periods in minutes per task</th>
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<tbody>
<tr>
<td>nächstzügelselbstfahrt</td>
<td>0:14:24</td>
</tr>
<tr>
<td>Priorität selbestfahrt</td>
<td>0:14:07</td>
</tr>
<tr>
<td>Priorität abstimmen und geben</td>
<td>0:13:49</td>
</tr>
<tr>
<td>Störungsmeldung in SAP 1/3 eingeben</td>
<td>0:13:32</td>
</tr>
</tbody>
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**Aim:**

- Minimise required wait periods at prioritised tasks
- This leads to minimised fault interference periods
In a close collaboration, IMS Region East, Specialist Division and VQ have developed proposed solutions together and simulated them in ARIS.

**Simulating target process variants**

Based on the current general requirements (number of reports per day, distribution, time blocks, etc.), each target process variant is simulated:

- Scheduler works through faults prio. 5-6 individually – information transferred via SAP
- Scheduler works through prio. 5-6 individually and additionally prio. 3+4 during normal working hours – information transferred via SAP
- NI02 actions processed separately - Mo-Fr by early shift workers
- Feedback personnel is prepared (only to accept and process feedback; using shift worker resources for each shift)
- Feedback personnel only during normal working hours (using shift worker resources)
- Introduce NI02 and feedback personnel → **Combined variant***

* = Most promising variant for success from perspective of specialist division
The simulation of the target process combined variant shows a significant decrease in required wait periods at prioritised tasks.

Reduction in required wait periods with implementation of combined variant:

- Predicted decrease in required wait periods at prioritised tasks with the implementation of combined variant.
- Decrease in fault interference periods (which is only affected up to 10 percent by EVZS!) resulted in reduced wait times.

Tasks:
- nach Störungsart selektieren
- Prioritäten selektieren
- Priorisierung abstimmen und eingeben
- Störungsmeldung in SAP R/3 eingeben

Reduction in required wait periods as a percentage:
- von 13 min. zu 8 min.
- von 13 min. zu 2 min.
- von 13 min. zu 11 min.
- von 14 min. zu 13 min.
The implementation of the combined variant significantly accelerates workflow in the first three steps of the process chain.

**Predicted decrease in required wait periods with the implementation of combined variant**

- approx. 28% in the "Report fault" and "Enter fault report" steps
- approx. 37% in the "Initiate fault clearance" step
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Benefits and conclusion
The simulation tool ARIS proved itself in the pilot and has contributed substantially to identifying the solution.

### Advantages of ARIS tool
- No test phase required for target processes in ongoing operations
- Thereby saving time and costs
- The tool's precision analysis methods deliver crucial information and results fast
- ARIS tool is user-friendly and convenient

### Benefits to DB Netz AG
- Process management put into action in the organisation
- Systematic process development creates acceptance of process management implementation
- Coordination of interfaces initiated – process-oriented thinking above and beyond the division
- Target process scenarios discussed and effects reported in simulation

### Lessons learned
- Resilient values required for simulation of current processes
- Develop and expand on methodological expertise in application and interpretation of simulation results in business areas
- 1 database (local) per process variant – reorganise databases
- Save functions, results (except start and end results) as defined objects (not occurrence copy)
Feedback: The use of the ARIS tool in the “Optimisation of Fault Clearing” project made the EVZS’s work processes more efficient and transparent

- A reorganisation of resources – particularly reallocating work tasks to day shifts and changing reporting channels – allowed us to optimise our operating capacity
- This improved the availability of the EVZS and reduced fault interference periods
- The additional time required for surveying and transmitting the values was worth it!
- The simulation results were widely accepted by employees involved
- The project increased transparency of work processes in the EVZS and helped prevent us from being stuck in a rut
- We would like to continuously monitor process performance using ARIS-PPM

Manfred Brauer, I.NP-O-D BLN(E), contractor:
Thank you for your attention!