Eclipse Software Project Runs on Schedule at Swiss Railway

SBB CFF FFS

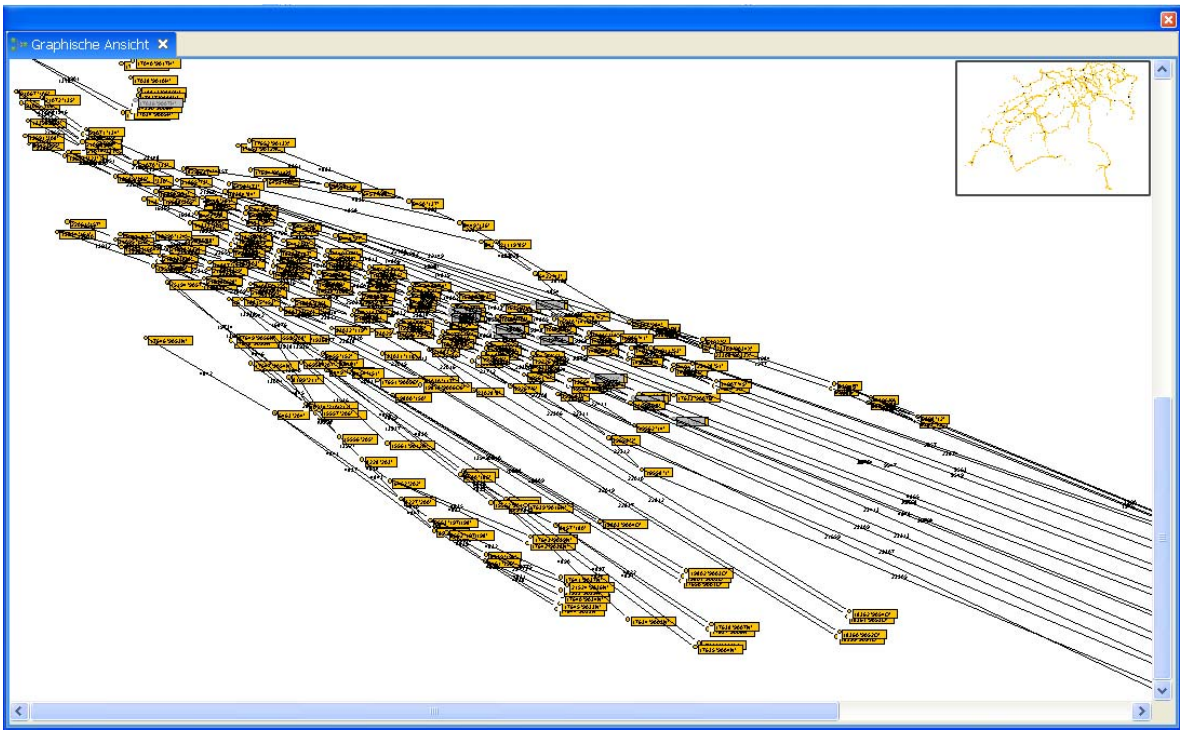
"By using RCP, a lot of useful code is already written. This cuts down development costs/time substantially."

eclipse

Swiss Federal Railways (SBB) has long been central to the image of Switzerland as a country where things run smoothly. With 300 million passengers a year traveling on over 3,000 kilometers of mainline track, they take pride in being the company behind the old saying about keeping the trains running on time.

Not wanting to become victims of their own success, they set upon a major overhaul of their operational and dispatch systems in 2004.

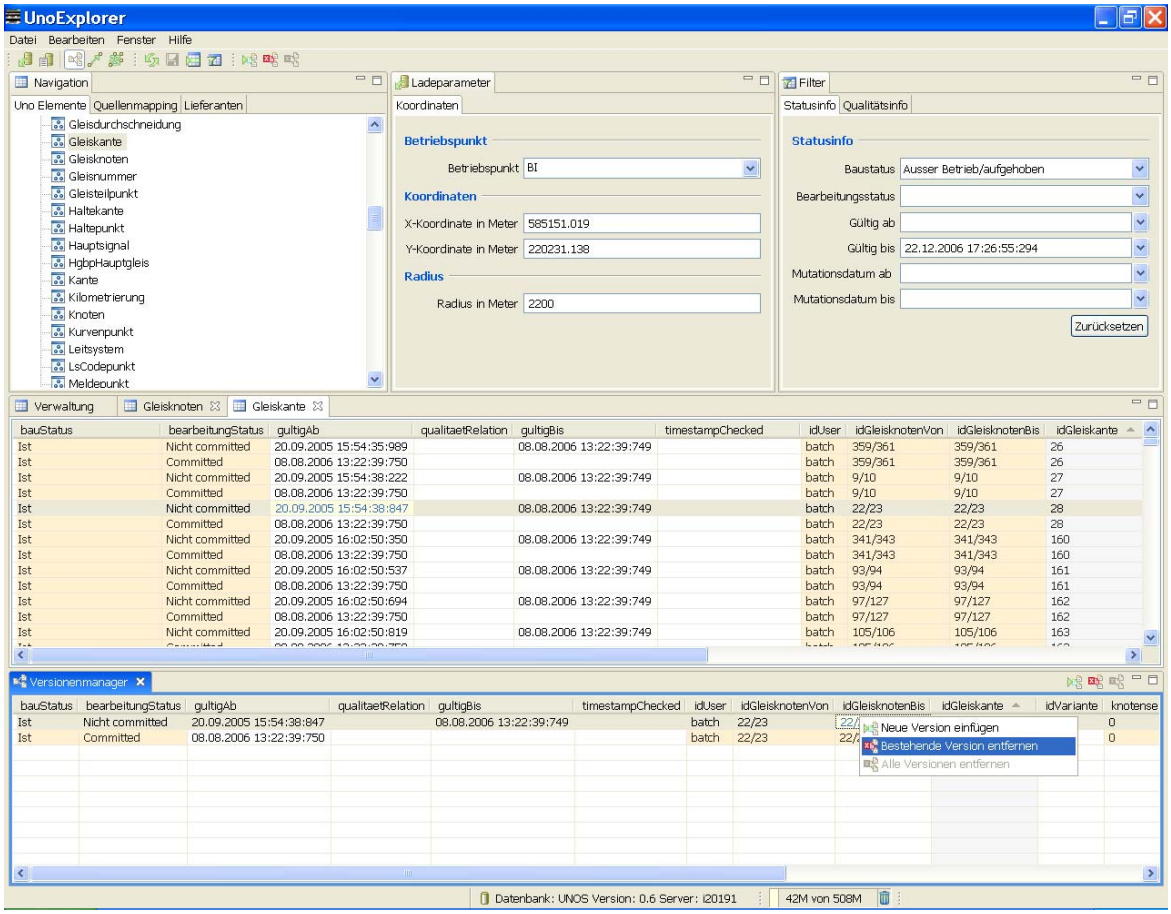
The Rail Control System (RCS) project was launched to consolidate these operations in the face of increasingly dense and complex traffic patterns that require highly coordinated, real time responses. Central to the RCS strategy is the Unified Network Objects (UNO) technology initiative. UNO itself is a monumental task:



Providing railway personnel with an intuitive view of the complex relationships in the UNO database was a critical usability feature for the project. The Eclipse Graphical Editing Framework was an elegant solution.

to merge and maintain all the railway's topological data into a single repository as the basis for web-based monitoring and management tools and give workers throughout the country a shared view of the entire system. As Marcus Völcker, head of the RCS initiative explains, "Historically, these functions within railways have been separate and duplicated across regions.

delete information as the physical equipment being monitored changes over time. André Dietisheim, Senior Developer at Puzzle ITC GmbH of Berne, the main development partner for UNO, immediately saw the engineering challenge presented by UNO Explorer. "There are over 200 very complex datatypes in the UNO database schema." explains Dietisheim. "It would have been



UNO Explorer includes sophisticated version control features that allow user-requested state changes to be validated by the server. Object validity is guaranteed.

When something went wrong - like a failed switch or a mechanical breakdown - the impact quickly rippled across the whole system, but communicating solutions by phone lagged behind."

Key to success with UNO is the Eclipse RCP-based UNO Explorer, a rich desktop application that will be used by up to 20 project managers to view, add, change and

silly to write customized editing code for each on any delivery schedule, and simply impossible on ours." The SBB Team and the developer from Puzzle knew that they had to abstract UNO Explorer from the data so it could gracefully handle any current and future datatyping.

This approach was particularly important since UNO Explorer was being developed at

the same time as the rest of UNO. Design changes along the way were to be expected. “We’ve had over 30 schema changes so far” said Dietisheim. “We knew we had to be able to roll with a punch.” Rail workers expect intuitive, topological ways of looking at data, and it was important to provide a graphic view of the data in addition to forms and text-oriented fields.

Before settling on Eclipse, UNO hand-created a prototype Explorer. That exercise drove home the importance of working within a solid framework to control both development time and costs. They briefly considered .Net, but Swiss Rail policy required a Java-based solution. RIA/Ajax was also ruled out because they needed a highly responsive and dynamic desktop solution. Eclipse not only met these core criteria, it had also been used successfully elsewhere at Swiss Railway, and had proven itself in other RCS sub-projects.

Anthony Smith, the lead architect for UNO and long term Puzzle employee tackled the issue of data abstraction using XML-based descriptions of the data entities. Specialized tools reverse engineer the database metadata and then use templates to generate the persistence, business and service layers. An XML-based meta model is created that describes the different data types to be shared by the server and clients. The meta-model holds information that is not reflected in the domain-beans, such as foreign key relations, constant-labels, complex attributes, and more. In the client, Puzzle created factories that generate tables and forms on behalf of the meta information.

With this design, UNO Explorer is completely generic. It can be reconfigured to access any domain object that has an accurate meta-description, and the client’s behavior can be modified simply by editing XML definitions. The Jface data-binding framework made it simple and straightforward to create bindings between form elements and domain entities.

Almost everything in the UNO database is version controlled, with versions representing different states of an object over time. Dietisheim explains that Puzzle built a specialized version editor into UNO Explorer, which allows users to modify versions and request provisional state changes. The server validates and commits state changes on their behalf to ensure consistent validity and gapless history. “With this design,” he points out “we can guarantee that every object always has a currently valid version.”

The functionality of the UNO Framework is cleanly managed using the Eclipse plug-in model. Views, logging, graphical topology and other aspects of UNO Explorer are all implemented as plug-ins, and while the importance of this approach was not high in the first version, SBB knows that it will become more critical as the software grows.

Eclipse RCP gave SBB a robust and feature-rich workbench that serves most functions commonly needed in fat clients. “By using RCP, a lot of useful code is already written.” states Johnny Metzler from SBB, head of the UNO project. “This cuts down development costs and time substantially.”

Dietisheim also points out that Eclipse is a powerful ecosystem of frameworks and brings a huge palette of solutions to various software development tasks. He was impressed with the large community base, which helped assure him of stable code, rapid evolution and technological longevity.

On the Right Track

When the UNO database is filled, it will hold over a million records representing over 7,300 kilometers of track, signals, switches, rolling stock and other equipment. Swiss Railway plans to add reporting to UNO to help manage this mountain of information.

Ron Stone is a technology writer and content management consultant based in Ottawa, Canada.

February, 2007