



# CITY OF JENA TRAM SYSTEM

*Solution with PcVue helps relieve Jena's suburban traffic congestion.*

The attraction of urban public transport depends on faultless operation and punctuality. The traffic layout and topography of the city of Jena in the Saale valley are such that a large part of the intra-urban traffic is concentrated on a few commuter corridors. It is important to ensure regular operation and high availability on this main corridor. Outages at technical and railway facilities can cause failures in electrical supply, in control points and switchgear or to signals and security of passageways.

## HISTORY

In 1992, the Jena city public transport company installed the first supervisory control of the electrical supply. Until 1996, all voltage rectifier units, security units and signaling units were connected to a single Unix-based system. The maximum capacity of the system was soon reached. In 2008 the system was ten years old and order to continue to ensure reliable operation it became necessary to renovate the system.

## IMPLEMENTATION WITH PCVUE

The new supervisory control system was implemented by Cegelec using PcVue SCADA software running on a Microsoft Windows client server architecture. It consists of a communication server, a database server and four fixed workstations. There is an option of using any computer or laptop as a remote station. In addition, a development station is available for maintenance.

The servers act both as domain servers, provide user administration, wireless clock and data backup. The communication server is dedicated to the link to the PLCs via the ABB RP571 protocol. The handling of user actions, messages, alarms and variables take place on the database server running Microsoft SQL Server.

The graphical interface includes object-oriented diagrams that display the current state of the system, alarms, reports, real-time trends and historical trends, as well as running the customer's algorithms for tram operation.

PcVue's native capabilities, such as redundancy and automated project version management, made it was possible to have the project shared from the communication server. In this architecture, changes for any station in the network are only applied in one place.

PcVue allows a client to run as a Windows Terminal Server (now called Remote Desktop Session). In this way, authorized users can access the server of any workstation via remote terminal access, display existing information and – after their passwords have been verified – control the system.

Routers are used to provide a TCP/IP link from the telephone network to the local area network of the supervisory control system; no other software is needed.



## BUSINESS OBJECTIVE

- Migrate obsolete SCADA to new scalable architecture capable of further expansion
- Improve efficiency and reduce overtime
- Improve reliability to reduce traffic congestion, both in trams and vehicular traffic

To minimize the impacts of failures, it is important to reduce the length of breakdowns. The repair staff has significant travel due to the decentralized nature of the tram system. Travel to site plays a large part in the duration of the disruptions.

With PcVue, it is possible to visualize and control the electrical supply stations, points and switchgear; plus control and management of signaling alarms from a central location. Some predefined alarms are sent by SMS to the service technician's cellphone, via the alarm management function of PcVue. In the same way, it is possible to deliver voice alarms by telephone, so the technician on duty can get more information and more quickly resolve the problem.

PcVue offers many native interfaces as standard, such as Modbus/TCP, Profibus and S7 via TCP, and it can be used as an OPC DA server, OPC client or OPC DA XML client. That was vital for modernizing the system, making frequent adaptation of hardware components a thing of the past, even when suitable spare parts could not be obtained.

Future communication between the different devices will be of the Ethernet type, preferably IEC 870-5-104.

### EASIER HANDLING

The choice of PcVue was also in part, based on ease and speed of conversion from the Unix based SCADA. Design of the data model is accomplished by a set of menus, while changes during the project are integrated on the fly.

A major attraction of PcVue for Cegelec is the ability to view the whole data model or configuration definition as ordinary text files.

Using standard tools they can configure variables in bulk with the filtering, copying, insertion and search and replace functions.

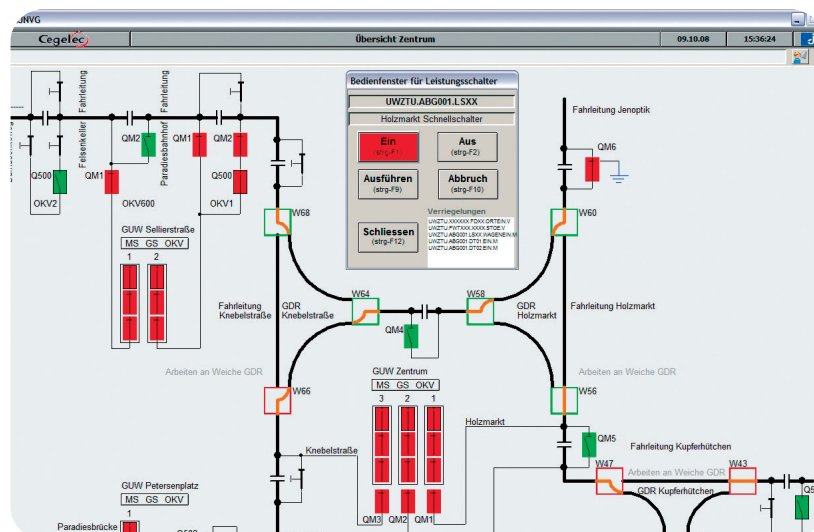
To make best use of this facility, and also for improving clarity and maintenance, the most meaningful naming structure possible was set up. The name of a variable indicates the collection, site and components as well as an individual explanation and the nature of the data.

The PcVue development tool represents the variable naming in a tree-structured manner which is also used to filter the data definition selection by site, collection and component type.

Images are easily converted into PcVue via an import tool. The installer can develop and maintain the application by dragging & dropping a preconfigured object as a referenced symbol. Production of the display pictures (mimics) uses a WYSIWYG technique (what you see is what you get).

### START-UP

During the start-up of the new system, it was imperative to ensure interruptions to the old system be minimized. This was possible by concurrently running both systems during the transition, such that there was only a short bump during switch-over. To achieve that required two measures, first by coupling the data via an OPC link to the old system, then after disconnection of the link, retrieving data directly from the PLCs.



## KEYS TO SUCCESS

- Ease and speed of conversion from the previous SCADA application
- Changes are applied in one place as the whole project resides on the communication server
- Concurrent running of the previous and new systems throughout the transition
- Remote access from any workstation for both monitoring and control
- Standard native interfaces such as Modbus/TCP, Profibus and S7 via TCP and IEC 870-5-104



## RESULTS

PcVue eliminates the need to travel to site to perform electrical disconnects

PcVue enables emergency shutdown of the entire system in case of danger

Solution with PcVue enables swift response to issues resulting in less traffic congestion

PcVue provides early warning of potential problems enabling breakdowns to be avoided


Solution with PcVue improves reliability via remote reconfiguring of substation feeds







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