

T-Systems ensures components work together/German Minister of Transport Manfred Stolpe satisfied with fault-free operation

## Toll System without Bugs

***Since its start-up on 1 January 2005 the new toll system in Germany is running without a fault. It ensures that all trucks over 12 tons now pay a toll based on use: those who drive a lot, pay a lot. The system contractor is satisfied: "The toll system is running without a hitch," says German Minister of Transport Manfred Stolpe.***

Credit for the successful start of the new toll system is due to all partners in the implementation process, not least among them T-Systems. The business customer unit of Deutsche Telekom assumed responsibility for additional tasks in the project on behalf of Deutsche Telekom AG during March of 2004. For this purpose, some employees switched over to Toll Collect GmbH, the operating company – e.g., as Chief Executive Officer and Chief Information Officer. T-Systems is considered the key supplier in the toll project. The information and communications technology (ICT) service provider was charged with the following tasks: developing large parts of the toll system, integrating all individual components required for collecting the toll into a functional whole, and operating the entire ICT infrastructure for Toll Collect GmbH.

This was a challenge for T-Systems, for the contractor of the toll project, the Federal Ministry of Transport, had made high demands on Toll Collect GmbH: The system must recognize a predetermined fixed toll road network and only charge fees for these routes. It must consider the emission class and the number of truck axles. The toll calculation must be possible without stoppage and jams. Users should be able to dial into the system manually and automatically. Finally, the toll system should also take into account that future systems in Europe must be compatible.

# ■ ■ ■ ■ T ■ ■ Systems ■

Five demanding requirements but no existing system in use could meet all of them. Example Austria: There the toll fee is recorded at toll bridges. Given a network of only 2,500 kilometers and a small number of superhighway access and exit ramps this is no problem.

However, in Germany the toll road network already comprises of 12,000 kilometers and has proportionally more access and exit ramps. The Austrian model is not transferable. Or France: All vehicles required to pay tolls must stop at tollbooths – a bottleneck solution that was ruled out in the German tendering.

The result: the developers of the German toll system had to develop an entirely different solution. It consists of a multitude of individual components. These include – as the system's heart – small computers in the trucks, the on-board units, which automatically calculate the tolls according to the route driven, toll terminals and the Internet as the alternative, manual check-in methods as well as control bridges for monitoring trucks due to pay toll – just to name the most familiar components.

Different companies developed these components and supplied a variety of software required by the system. In order for these components to communicate with each other, they had to be integrated into a comprehensive system. This was T-Systems' task.

For this purpose, the ICT service provider developed the centralized system, made up of the software and the system architecture, which stores all data of the toll system and makes it available for processing. This system is not only the basis for error free invoicing of the toll fees, but are also used by Toll Collect for customer management.

To provide an example: if a shipping company wishes to equip its trucks with on-board units, Toll Collect must record the data of the shipping company and store it in the customer database. Toll Col-

# ■ ■ ■ ■ T ■ ■ Systems ■

lect's call center must be able to access this system so that in case a customer makes an inquiry, the data can be called up on the screen by pushing a button and answering the customer.

Also, Toll Collect GmbH as the operating company must be able to communicate with the decentralized components, such as the on-board units, to be able to transfer future updates of the on-board unit software and changes of the route and rates model to the vehicle-based equipment.

Finally, the on-board unit in a truck must be configured so that it knows to which vehicle and which shipping company it belongs. This information is passed on by the on-board units to Toll Collect GmbH so that the invoice is delivered to the proper customer.

Or, to give another example, take the invoicing system: T-Systems has developed a custom-made invoicing system for toll collection based on SAP standard software.

All this is run – somewhat loosely formulated – on a central computer. In reality these are two independent computer centers. They have their own power and emergency power supplies, network substitute and climate control systems. Each of these computers is mirrored, i.e., they each have a backup. They are interconnected and monitor each other. In case one computer malfunctions, the other is ready without a gap. Technically, this is referred to as high availability architecture. It ensures problem-free operation of the toll system if one computer malfunctions.

The connection between the central computer and the on-board units, the terminals, the control bridges and the vehicles of the Federal Agency for Goods Traffic (BAG) – amongst other tasks responsible for monitoring and enforcing the toll payments – runs through technical interfaces. These communications interfaces either consist of wired links – e.g., between control bridges and the computer cen-

# ■ ■ ■ ■ T ■ ■ Systems ■

ter – or they function through the mobile phone network as in the connection between the on-board units and the computer center.

For security reasons the data is transferred encrypted – T-Systems developed software for this purpose and operates a security center that supplies the keys and chip cards for the on-board units. By the way: The Federal Agency for Security in Information Technology (BSI) issued both – the operator Toll Collect and T-Systems' computer center – a comprehensive basic security certificate for data security.

"The satellite-based toll system is an effective instrument for mastering the traffic policy and environmental challenges of a future-oriented transportation system," says Manfred Stolpe. Now a modern and tried technology is available that can also be used in other countries in the future.

The interest abroad in the technology "Made in Germany" is high. Many international delegations have already inspected the new toll system – especially because many countries are considering introducing tolls or are preparing to do so.