



Good news for drivers: Saxony's highways will not only be safer, but also fewer traffic jams are to be expected.

## High-Speed Next to the Road

Saxony's Highway Authority Is Improving Traffic Safety Using Cisco Borderless Networks

In Germany, the Saxony Highway Authority is building a broadband borderless network based on Cisco® technology throughout the region. This will enable IT staff to remove the artificial boundaries that have separated control, monitoring systems, and communications applications from one another. The results will be highway systems that are more efficient and environmentally friendly and safer roads with less traffic for drivers.

Millions of vehicles are driven on Saxony's highways every year. Built in next to the highway is an underground highway that transmits digital data traveling at gigabit speeds over fiber optics. Countless sensors and monitoring tools generate this network traffic in addition to the switch commands to remotely controlled safety systems and operating or traffic control systems. Along Saxony's 562 highway kilometers, there are more than 68,000 data points that generate 30 billion data records annually.

### Overcoming System and Technology Limits

"For years, we have been pursuing the strategy of consolidating our entire measurement and control technology together with voice and data communications on a joint Ethernet platform," explains Frank Weirauch, head of the Dresden-based Saxony Highway Authority telecommunications office.

The term "telecommunications office" itself sounds outdated, like an office space out of an old movie with teletypewriters or wood-paneled telephone systems with the cranks and plug connections. In fact, just after the fall of the Berlin Wall, that's exactly what Dresden's telecommunications office



Frank Weirauch, Lead Telecommunications Engineer with the Saxony Highway Authority

looked like. At that time, the recently founded office had just opened for the State of Saxony. Only two men worked there, and one of them was Frank Weirauch.

Today, there is no sign of the old office. In its place is a new building whose interior looks like a high-tech lab. Frank Weirauch's team, now staffed with 18 highly qualified employees, is one of eight field offices for the Saxony Highway Authority and is responsible for the development, installation, and operation of the communications infrastructure, among other tasks.



Highway Authority employees benefit from greatly simplified maintenance and improved control options.

Frank Weirauch sees the migration to an IP-based fiber optic network from Cisco as a technological milestone in the now 20-year history of the agency. Weirauch explains: “Our top priority is to operate all applications, equipment, and systems as efficiently and as inexpensively as possible using a standardized platform. At the same time, we want to liberate ourselves from technical barriers that have separated IT and communications applications—as well as signal and control systems—from one another in the past.”

### Everything on the Same Network

Running on this same fiber optic network will be information on how many vehicles are currently on the road and whether traffic warnings are necessary. Temperature and other road condition parameters provide the decision-making variables for issuing ice warnings and deploying sand trucks and snow plows. All signals from Saxony’s highway tunnels (totaling 16.8 kilometers) are also included. These signals are generated by 143 emergency telephones, 120 fans, 194 video cameras, 300 loudspeakers, and 4300 tunnel lights installed in these tunnels.

All these systems supply measurement and monitoring data to the universal IP network and are remotely monitored by the telecommunications office. The fire detectors, for example, which are attached every 8 meters along the tunnel roof, trigger the alarm in just 10 seconds if there is a temperature difference of 3°C. In order to get a better picture of the situation, the network in the tunnel control center rotates the video cameras to focus on the fire detectors. This advanced networking improves operating

efficiency, as well as traffic and tunnel safety. Additionally, more power supplies from diverse auxiliary power stations are integrated so that the IP platform reduces overall power consumption, thus making highway operations more ecologically friendly.

### Single-Source Solution

“In the future, more and more institutions, cities, and communities will upgrade their infrastructure with innovative communications technology in order to monitor and control systems and applications from one location, which will be more efficient and help preserve the environment. The Saxony Highway Authority is an absolute pioneer in this regard,” commented Markus Buschmann, managing director of NK Networks & Services GmbH. The Cologne-based systems company is the German distributor for the Vinci energy brand AXIANS, which provides network integration and innovative communications solutions. AXIANS is heavily involved in the planning, design, and implementation of the fiber optic infrastructure for the Saxony Highway Authority.

As for Cisco, there are several reasons why the Highway Authority standardized Cisco’s Borderless Networks technology. According to Frank Weirauch, “In 2003, when we made the decision to opt for IP instead of Ethernet via fiber optics. Only one manufacturer submitted a proposal that fully met our requirement, and that was Cisco. This led us to use Cisco technology almost exclusively in Saxony, so there was never a question of compatibility. In developing our expertise, we additionally concentrated on high-quality, standards and forward-looking technology. In this regard, we have naturally benefitted greatly from the proven high level of Cisco competence through our partner, AXIANS.”

### The Integration Concept

Currently, 18 switches from the Cisco Catalyst® 6500 Series Switch product family form the core of the ring-shaped fiber optic network. The bandwidth in the ring amounts to 10 Gbps. The Highway Authority chose Multiprotocol Label Switching (MPLS) to handle the transmission process. “It gives us the flexibility to prioritize data flows that belong to different applications—which guarantees, for example, that voice-over-IP traffic or real-time signals from safety-related sensors have priority to a certain degree over less time-critical data traffic,” explained Weirauch.

The Cisco Unified Communications Manager is used as the standard voice-over IP platform for all Saxony highway authorities. In fact, plans are underway to connect their digital private mobile radio to Cisco’s central communications software by means of an IP interface. “Telephony, emergency

call system, and wireless communications will meld into one common or shared integration solution that will make new value-added applications possible by means of standard interfaces. For example, highway authority employees can look at their logbook on the display of the IP telephone,” explained Cisco Account Manager Dr. Manfred Zschiesche.

Just like digitalized voice signals, the 10 Gigabit Ethernet network also transmits video images as IP data packages. Images of particularly critical stretches of road are transmitted over the network using tunnel cameras. “In the future, we will be able to see video images directly on our telephones,” added Weirauch. At temperatures around freezing, on-call employees can identify the actual road conditions on a telephone display, without having to start up a program on a computer beforehand.

Moreover, the broadband MPLS network has made a quantum leap because applications that have thus far been kept separate can now be consolidated under one uniform interface. This mainly affects the comprehensive information management system (IMS) in the Saxony Highway Authority. From tunnel monitoring to emergency call and remote control systems, traffic counting systems, and cable management, everything will be displayed uniformly. This will also reduce training time and expense considerably as well as open up new opportunities in the way work is organized.

Head telecommunications engineer Frank Weirauch is pleased with the numerous opportunities offered by the Cisco platform, and gives particular praise to the outstanding performance of his staff: “Without the dedication of my highly motivated team, there is no way we would be where we are today.”

## For More Information

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## Background

The telecommunications offices run by Saxony's Highway Authority manage and operate the entire communications infrastructure along all federal highways in the state on behalf of the Federal Ministry for Traffic, Building, and Urban Affairs. Connected to this infrastructure are, among others, emergency and ice warning systems, private mobile radio, and traffic control systems, as well as tunnel-operating technology and video cameras.

## Challenges

In order to continuously improve safety on Saxony's highways and to optimally regulate traffic flow, all technical systems will be operated by means of a shared IP-based fiber optic network. In addition to high availability, flexible traffic control and efficient management rank among the core requirements of this ambitious project.

## Solution

The center of this 10 Gigabit Ethernet fiber optic network consists of 18 high-performance Cisco Catalyst 6500 Series Switches. The MPLS transmission process helps to ensure that different data flows can be prioritized with a high level of flexibility. This means old borders between highway applications, systems, and equipment can finally be broken down.

## Benefits

- Unified platform for sensors, controllers, video, telephony, and private mobile radio
- Greatly simplified maintenance and improved control options
- Greater safety and Gradient bar + wave texture + type traffic congestion on Saxony's highways
- Open platform for future innovations
- Long-term investment protection



A view of traffic: Information on how many vehicles are currently on the road and whether traffic warnings are necessary is transmitted via the fiber optic network.