

## BVG implements its Innovation Bus with state-of-the-art IP technology.

Equipping a bus with modern technology for enhanced passenger information and seat occupancy optimization.



**Organization:**

Berliner Verkehrsbetriebe (BVG)

**Location:**

Berlin, Germany

**Industry segment:**

Transportation

**Application:**

Passenger counting and seat occupancy optimization

**Axis partner:**

LAT Funkanlagen Service GmbH, Willy Rakow - Axis Solution Lab

### Mission

Berliner Verkehrsbetriebe (BVG) has developed the "Bus of the Future" to test innovative technologies under real-life conditions and investigate their technical and economic feasibility in relation to future production vehicles. To achieve this, they needed network cameras and other equipment. The cameras not only record video images, but also function as optical sensors.

### Solution

BVG had clearly formulated selection criteria: The network cameras had to not only provide excellent image quality, but also be particularly powerful, insensitive to vibrations and shocks, and have a discreet appearance. An additional optical sensor for counting passengers, and analysis software were also required.

Due to many years of good cooperation and positive experiences with past projects, BVG chose Axis Communications. BVG opted for ten AXIS P3905-R Network Cameras and two AXIS P8804 Stereo Sensor Kits with 3D sensors for counting passengers.

### Result

The Innovation Bus has been in operation on line 100 in Berlin since June 2018. In addition to the security aspect, the cameras in the bus optimize the distribution of passengers and show them what seats are available on the upper deck of the double decker bus by means of a TFT monitor right at the entry door. In addition to the technical evaluation, passengers are asked for their opinions on the individual services multiple times so that the company can make sure they are investing in the right technologies for the future.



Berliner Verkehrsbetriebe (BVG) is a public service company for public transport in Berlin, operating the subways, trams and buses as well as some ferries. BVG was founded in 1928 and has more than one billion passengers per year and, in terms of buses alone, operates just under 2,000 vehicles.

### The future of passenger transport – a pilot project

In 2016, one of BVG's MAN double decker buses was severely damaged in an accident. As part of the repair, the roof had to be completely removed and rebuilt. The experts of the BVG Center workshop decided to take this opportunity to equip the bus with some technical and structural extras. In addition to panoramic windows, expanded LED lighting and USB sockets, BVG also wanted network cameras that could record video images and be used as optical sensors for passenger counting.

BVG opted for ten AXIS P3905-R Network Cameras, which were specially developed for security surveillance in buses, trains, subways and emergency vehicles. The camera is protected against dust and moisture, insensitive to vibrations, shaking, shocks and temperature fluctuations, and adapts very quickly to changing light conditions without any impact to the high image quality. AXIS P39-R Series Network Camera provides maximum flexibility and is available with many lens options, making it easy to cover the different viewing angles on the bus.

BVG therefore sought a powerful, robust and discreet network camera solution to install on the Innovation Bus. The evaluation criteria were obvious:

- > Excellent image quality, even in poor lighting conditions
- > Insensitive to vibrations and shocks
- > Maximum flexibility in lens selection
- > Sensor for passenger counting
- > Compatible integrated analysis software
- > Discreet optics

The decision-makers also opted for two AXIS P8804 3D sensors for passenger counting on each staircase plus analysis software for evaluation. The stereo image is used to create 3D optical range mapping to measure passenger frequency and thus the occupancy of the seats. This transmits the information directly to the compatible analysis software in the vehicle. Thus, passengers are shown how many seats are available on the upper deck of the bus by means of a TFT monitor right at the entry door. The goal was to guide passengers to the upper deck of the bus and thereby optimize the load distribution. Both camera systems also have a very discreet appearance, and fit seamlessly into the environment.



### A glimpse into the future with investments in intelligent and innovative technologies

Due to many years of good collaboration and positive experiences with past projects, BVG chose Axis Communications. In addition to the security component, the cameras would also provide image material for vehicle utilization.

The company LAT Funkanlagen Service GmbH assumed responsibility for planning and installation of the cameras and special functions. LAT specially designed the compatible software for the particular requirements of the bus in collaboration with Axis Solution Lab under the leadership of Willy Rakow. In addition to the software, some other parts of the technology were adapted and modified.

Innovations were also added to the driver area: 270 degree rear camera view, providing an overview when taking the bus around curves.



**“We will be investing in new buses in the coming years. Naturally, we always think about how to make the ride in the double decker even more enjoyable for our passengers. In this bus, we deliberately played with the various technical possibilities and are looking forward to the results.”**

**BVG Bus Division Manager  
Torsten Mareck.**

### **Litmus test for future production vehicles**

Since June 2018, the Innovation Bus has predominantly been servicing line 100. Public bus line 100 is not just popular with Berliners – it is regarded as a cost-effective alternative to sightseeing buses and is therefore also frequented by tourists. It starts at the Zoologischer Garten railway station, passes all of the great sights, and then ends at Alexanderplatz. Thus, the bus of the future not only takes on an internal pioneering role, but can also be regarded as the technological flagship of BVG.

“We will be investing in new buses in the coming years,” says BVG Bus Division Manager Torsten Mareck. “Naturally, we always think about how to make the ride in the double decker even more enjoyable for our passengers. In this bus, we deliberately played with the various technical possibilities and are looking forward to the results.”

In the future, the economic feasibility of the components in relation to future production vehicles will be examined. In addition to the technical evaluation, the passengers of the Innovation Bus should also be asked for their opinions on the features.

“Extras that nobody uses are useless and uneconomical,” adds Mareck. “With this bus, we want to know – in short, what is possible? What is practical? What is affordable?”

BVG's entire bus fleet is due for a renewal, with the addition of up to 950 new single decker and articulated buses and 30 electric buses already approved.



**LAT**

# About Axis Communications

Axis enables a smarter and safer world by creating network solutions that provide insights for improving security and new ways of doing business. As the industry leader in network video, Axis offers products and services for video surveillance and analytics, access control, and audio systems. Axis has more than 3,000 dedicated employees in over 50 countries and collaborates with partners worldwide to deliver customer solutions. Axis was founded in 1984 and has its headquarters in Lund, Sweden.

For more information about Axis, please visit our website [www.axis.com](http://www.axis.com).

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