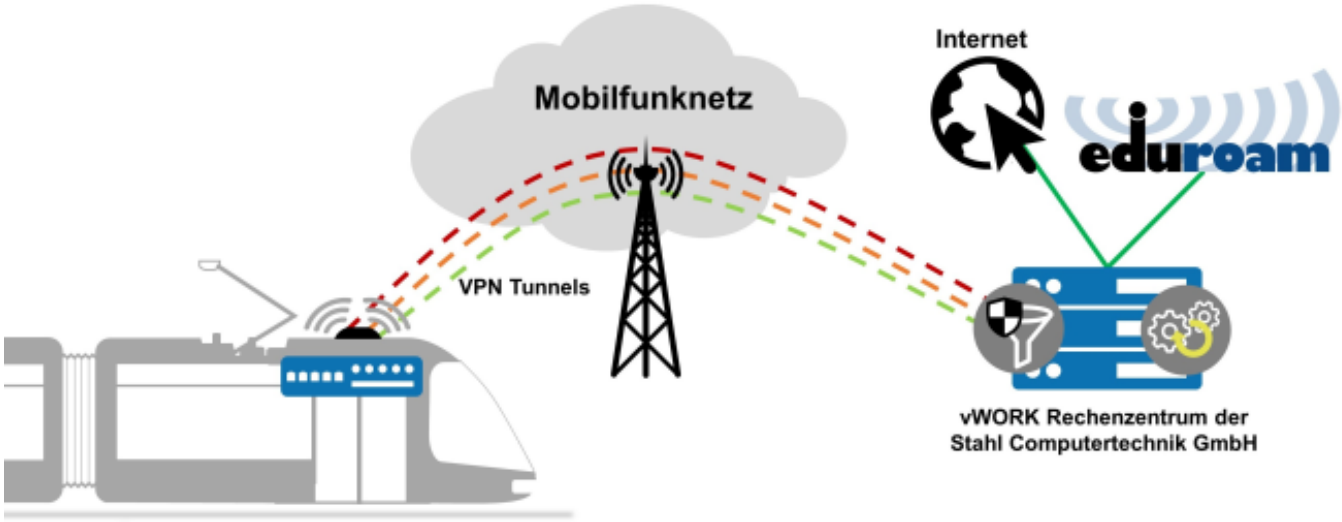
Success Story Stahl Computertechnik GmbH ? WiFi in Public Transport

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The Project

The smartphone has become a constant companion and more and more people use the internet while travelling. The municipal services of Augsburg have recognized this and thus expanded the free internet access of the city by free WiFi in buses and trams.
By now, 73 buses and 20 trams have been equipped with WiFi routers. Further vehicles are to follow in the course of 2016 and the mobile internet access will be finally available over the entire fleet of more than 180 buses and trams. With over 1,000 registrations per day - and rising - is the service very popular and indispensable for the passengers.
To use the service, the passengers once have to accept the Terms of Use. Every passenger has a data volume of 500 MB per day freely available, but the network speed is limited, so that not a single passenger can claim the whole bandwidth for himself. As a special service, students can log into the education and research network ?eduroam? via the WiFi hotspots in the vehicles.

The necessary knowledge and experience for the realization of this project come from Stahl Computertechnik GmbH from Pfaffenhofen, a. d.Ilm, Germany. The company?s offering comprises IT system consulting as well as planning and realization of IT infrastructure projects.
Under the brand name "vWORK" Stahl Computertechnik GmbH offers exclusive cloud solutions. The solution "vWORK WLAN for public transport and long-distance transport" was developed especially for buses and trams. The flexible out-of-the-box industry solution combines hardware, data center services, such as centralized management and monitoring, as well as assumption of the ?Stoererhaftung? (interferer?s liability). In order to bring the Internet into the vehicles of municipal

services of Augsburg, Stahl Computertechnik GmbH uses the routers of NetModule.

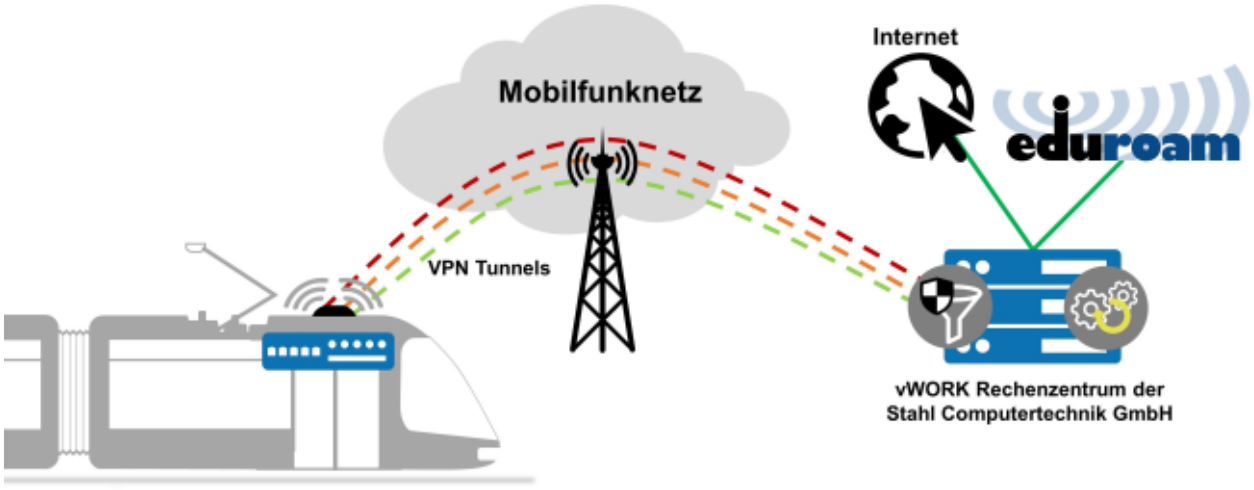
RequirementsTo be able to provide a reliable WiFi service, the following requirements have been defined during the preliminary stage of the project and have to be fulfilled by the routers:

- Certification for use in buses and trams
- Interruption-free usage of the cellular radio system (4G/LTE)
- Establishment of VPN tunnels to the data center
- Support of IEEE 802.1x (Authentication for eduroam)
- Network separation with VLAN and multi SSID
- Central management, remote management via data center and monitoring

Solution

To provide internet access en route, Stahl Computertechnik GmbH equipped the vehicles with routers of type NB2700-LW-G and NB3700-LW-G of NetModule. With its E-mark certification, the NB2700 is suitable for use in busses and with fulfillment of the railway standard EN50155, the NB3700 can be installed in trams. Both router types are designed for a temperature range from -25 °C to +70 °C or rather -40 °C to +70 °C and thus can be installed directly into the roof of the vehicle.

With the integrated LTE (4G) module and WiFi module according to standard IEEE 802.11n the robust routers bring the internet into the vehicle. If required, the routers can be equipped with multiple SIM cards to make use of the services of several providers. The WiFi module, operating in access point mode, can manage up to 4 SSIDs, each with its own configuration. This makes it possible to access the public WiFi of Augsburg as well as the eduroam network over the same hotspot. To log into eduroam, a username and a password have to be given. This is realized with the standard IEEE 802.1x, a standard for secure authentication in a network.The users of the WiFi are isolated and thus invisible for others, what increases the security within the network.



Stahl Computertechnik GmbH operates its own redundant data center. There every vehicle is registered and its online status is monitored over the network. The monitoring allows to check the availability, the bandwidth and the utilization of the WiFi. If a fault occurs within the network, an alarm is automatically sent via SMS or email.A central management of the routers was considered particularly important by Stahl Computertechnik GmbH. New configuration and firmware can easily and quickly be distributed remotely via LTE, without the vehicles have to be driven to the depot.
The data center is equipped with a content filter, which blocks illegal pages or morally damaging content to juveniles. With this measure, Stahl Computertechnik GmbH takes responsibility for the so called ?Stoererhaftung? for the municipal services of Augsburg. Also implemented is a captive portal that forwards the user after selecting the wireless network in the bus or tram directly onto the accepting Terms of Use.Also the passenger information systems of the vehicles are connected to the routers. Over the LTE connection, the monitors can be provided anytime with latest news, current disruptions in traffic, stops and also advertisements.
For each of the three applications Passenger WLAN, remote maintenance and data provision, a separate VPN tunnel is established. The three tunnels are terminated in the data center. Additionally, the data of the three applications are separated through VLANs.

With the free WiFi access for passengers in their vehicles, municipal services of Augsburg in collaboration with Stahl Computertechnik GmbH, have created a real value for their passengers and thus increased customer loyalty and satisfaction.