SD-WAN FOR INDUSTRIAL 3D PRINTING AND ROBOT AUTOMATION

Deutsche Telekom

INDUSTRY
INTEGRATED TELECOMMUNICATIONS

HEADQUARTERS
BONN, GERMANY

ANNUAL REVENUE
62.7 BILLION EUROS

CHALLENGES

- Simplify orchestration to deploy advanced architectures supporting next generation industrial networking for robotic applications as quickly as possible
- Connect locations in Berlin, Germany and Mountain View, California with an agile, responsive network
- Minimize cost, management requirements, and impact to the existing MPLS network

RESULTS

- Deployed and activated SD-WAN infrastructure in less than one week
- Established SLAs over secure VPN connections between Berlin and Mountain View with the ability to insert network services anywhere
- Achieved SDN programmability to ensure high application performance

Deutsche Telekom's Silicon Valley Innovation Center used VMware SD-WAN™ by VeloCloud® to deploy and activate its SD-WAN infrastructure in less than a week. Establishing SLAs over secure VPN connections between Europe and America, Deutsche Telekom gained the ability to insert network services anywhere and achieved SDN programmability to ensure high application performance.

Building a Software-Defined Future

Silicon Valley has long been one of the world's leading innovation centers, and many well-known organizations establish a presence there to collaborate with the brightest minds in technology. Deutsche Telekom created its Silicon Valley Innovation Center (SVIC) in 2008 to focus on research and development in emerging network and mobile technologies. Located in Mountain View, California, the center primarily focuses on Software Defined Networking (SDN), Network Function Virtualization (NFV), Mobile OS and infrastructure, and cloud networking technologies. Deutsche Telekom also has an innovation center in Israel, which specializes in artificial intelligence and persistent security protection. T-Labs, which is headquartered in Berlin, focuses on networking including 5G and FMC as well as SDN, Big Data, M2M, robotics, and mobile and network security.

Since its founding, the Silicon Valley Innovation Center has built relationships with local universities, such as Stanford University, UC Berkeley, as well as with Columbia University, University of Massachussets and commercial companies to foster work in a wide range of network, mobile, and device innovation. As a participant in Stanford's Clean Slate Program, Deutsche Telekom SVIC research engineers developed FlowVisor—a special purpose OpenFlow controller that functions as a proxy between OpenFlow switches and multiple OpenFlow controllers in SDN infrastructures.

The SVIC also collaborated with Mozilla in developing Near Field Communication (NFC) infrastructure for mobile applications; worked with top-tier device manufacturers, chipset vendors, and other telecommunication operators; and works closely with the University of California, Berkeley Seismology Laboratory on the development of a smartphone-based Earthquake Early Warning network.

"Within the first week we had the VeloCloud SD-WAN set up. Previously, we engaged in an evaluation of the VeloCloud product, and were very satisfied with how the product worked, the ease at which it could be integrated into an existing network and the visibility and manageability it provided.

"Although we were knowledgeable about their product, that knowledge and our previous work wasn't a prerequisite to being able to quickly, simply, and successfully connect everything and have the network up and running. Because of our experience, we also shipped equipment to our sister lab in Berlin and made similar connections in a very short time."

LOUIS SCHREIER
VICE PRESIDENT AT DEUTSCHE TELEKOM

Applying Next Generation Industrial Automation Principles to Network Innovation

Because Deutsche Telekom SVIC is working at the leading edge of so many new technologies, it found itself smack in the middle of multiple disruptive digital technology trends, which may collectively be known as Industry 4.0. These technology areas include the Internet of Things, cybersecurity, the cloud, horizontal and vertical system integration, big data analytics, simulation, 3D printing, robotics, augmented reality, and at its core, networking. These technologies offer significant promise in working together to enable more efficient, secure, and economical processes. For example, cyber-physical systems can monitor physical processes, create a virtual copy of the physical world, and make decentralized decisions.

Deutsche Telekom has already developed an SDN-based data center networking framework that allows operators to bring remote sites online in just hours, instead of traditional deployments that take days or weeks. Engineers now began to explore ways in which next generation industrial automation and network architectures could take advantage of this framework. Can they more easily manage network bandwidth and security policy to deliver better services for customers without having to re-design either their network or the customer's network?

They were about to find out.

SDN Benefits, Scaled Over Miles

Deutsche Telekom SVIC had the perfect opportunity to test whether its SDN and data center framework would scale internationally and deliver the same agility, visibility, and management benefits that it delivers on smaller-scale networks. Working to demonstrate the strength and benefits of SDN WAN to its partner, Siemens, Deutsche Telekom SVIC decided to develop a prototype network that would connect the robotics and 3D printing command center in Berlin with or other non-printing robots in other parts of Germany. The goal was to enable 3D printers or robotic arms in Mountain View, or elsewhere, to instantly execute commands issued in Berlin. Deutsche Telekom already has highly reliable Multiprotocol Label Switching (MPLS) networks with easily manageable Quality of Service (QoS) and Service Level Agreements (SLAs). But the lab needed a way to deploy and get a series of 3D printers running—in a week.

"We were considering alternative network architectures, including setting up of Software Defined Networks between Mountain View and Berlin," said Louis Schreier, Vice President of the T-Labs Silicon Valley Innovation Center. "However, we recognized that building a separate WAN and VPN network on top of our existing infrastructure would be cumbersome, time-consuming, and very expensive."

Re-designing the network to introduce 3D printing or other robotics into the industrial automation infrastructure was not an option. Agility and low costs were important for the project, as well as simplicity. A network operator needed to be able to program and manage 3D printers and robots in Mountain View or elsewhere from Berlin without much training on an ongoing basis. Finally, orchestrating all of the various components needed for the 3D printing project had to be automated.

The VMware SD-WAN Solution

"We decided to augment our existing network using Software-Defined Wide Area Network (SD-WAN) as the overlay to connect and provide for these end devices.", said Sumanth Sathyanarayana, Research Engineer at Deutsche Telekom.

An overlay would provide a separate control network with its own performance SLA, policy management, and business policy framework. It also had to be easy to implement while enabling deep visibility into the WAN to get the industrial automation network prototype up and running in the fastest possible time."

The Silicon Valley lab turned to VeloCloud, now part of VMware. VMware SD-WAN simplifies branch office networking while assuring optimal application performance.

VMware SD-WAN separates control plane and data plane layers, moving intelligence from the data plane into the programmable control plane for greater agility. The VMware SD-WAN architecture also operates across any combination of public or private circuits.

Fast, Easy Deployment

The VMware SD-WAN provides the Berlin-to-Mountain View connectivity, ensuring reliable response. Using existing network links between four locations, the lab installed and connected the VMware SD-WAN Edge devices and VMware SD-WAN Gateways.

"Within the first week we had the VMware SD-WAN set up," said Sathyanarayana. "The setup and connectivity was very easy as it is a plug and play solution. We also shipped equipment to the other locations and made similar connections in a very short time."

Orchestration is a Breeze

Deutsche Telekom SVIC used VMware SD-WAN Orchestrator policy management features to establish SLAs over secure VPN connections between Berlin and Mountain View. The VMware SD-WAN Orchestrator enables the team to insert network services at the edge, in the cloud, or in a data centers through business policies, which handle optimal gateway selection, distributed QoS configurations, automatic VPN connections, and network services insertion. The team can discover and fingerprint thousands of enterprise and cloud applications quickly and easily to automatically prioritize, insert services, and deploy security policies.

Programmability is a Non-Issue

"VeloCloud gives agility to the WAN through programmability", said Sathyanarayana. "Capabilities like automatic WAN link discovery and monitoring eliminate having to configure links and branch locations individually."

Ensuring high performance for robotic commands is achieved using VMware SD-WAN Dynamic Multipath Optimization™ technology. It aggregates broadband Internet, 4G-LTE, and MPLS circuits with application-aware, per-packet link steering and on-demand remediation to maximize performance over any transport. VMware SD-WAN also provides consolidated monitoring and visibility across multiple WAN links and service providers, which greatly simplifies

management.

Looking Ahead

With the prototype network for this next generation project in place, Deutsche Telekom SVIC is continuing to validate SD-WAN architecture and capabilities supporting industrial 3D and robotic automation. As it scales SDN capabilities across thousands of miles, the company is adding value to customers and their future network deployments as it delivers resilient, real-time-capable, highly secure network communications that can be ordered and deployed with high predictability at short notice.

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