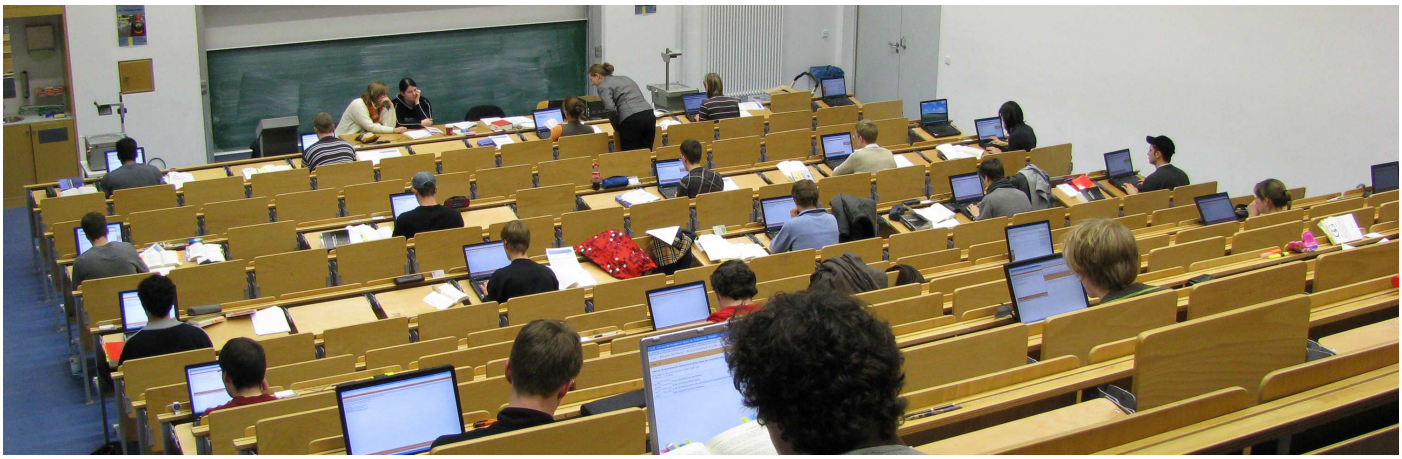

© TU Darmstadt

German University Takes Mobility to the Next Level

TU Darmstadt cements reputation as showcase for innovation with latest breakthroughs in wireless technology.

EXECUTIVE SUMMARY

Customer Name
Technische Universität Darmstadt

Industry: Education

Location: Germany

Number of users: 22,870

Challenge
- Improve the mobile user experience
- Make it easier to collaborate and share resources
- Protect existing wireless investments

Solution
- Cisco Unified Wireless solution based on new 802.11n Draft 2.0 standard
- Improved performance of legacy equipment and devices
- Simple and secure solution for teleworkers

Results
- Better roaming experience for students, faculty and staff
- Improved network management
- Extended life for 802.11 a/b/g equipment

Challenge

Located in the Frankfurt Rhine Main Region, Technische Universität Darmstadt's impressive record of academic achievement and early adopter approach to information and communication technology have helped to establish it within the top tier of Germany's technical institutions.

The university's Cisco® WLAN plays a critical role in this success. Many students bring their own devices and expect to easily log on, while teachers are constantly on the move, giving lectures or attending meetings and events. TU Darmstadt has augmented the indoor WLAN with an outdoor wireless mesh network, which allows wireless devices to smoothly transition between indoor and outdoor locations. The mesh topology reduces the need for cabling between nodes and covers areas where it would be cost prohibitive or impractical to wire.

The network links 68 buildings and some 270 teachers, 19,000 students, and 3600 support staff with access to voice, data, multimedia, and videoconferencing services as well as e-learning, research, and business applications. The WLAN also provides secure network access to scientists and researchers visiting from other universities. Via EduRoam, a visitor is authenticated using the same credentials (username and password) that they would use at their home institution.

TU Darmstadt had been closely monitoring 802.11n, the new standard for next-generation wireless technology. Although the benefits of increased coverage and faster data transfer speeds had obvious appeal, the university needed to find a way to protect its existing wireless investment. This investment included 430 Cisco access points and associated WLAN controllers. The mixed campus environment also presented an additional challenge in helping ensure that slower 802.11a/b/g equipment did not limit the performance of any new 802.11n devices being installed.

> **"ClientLink technology extends the life of our existing 802.11a/g clients. This means that we can migrate to 802.11n at a pace that suits the university."**
>
> **–Thomas Vogel, Head of Network Group, TU Darmstadt**

Solution

As a showcase for leading technology, the university decided to pilot the new Cisco 5508 Wireless Controller. Optimised for next-generation 802.11n wireless networking, the 5500 Series provides improved mobility and higher client density, and delivers more efficient roaming.

Best of all, a backwards compatible design means that existing wireless clients also benefit from improved traffic handling, throughput, and predictability. This capability is made possible by Cisco ClientLink, a pioneering 'beamforming' technology in the Access Point that enables faster speeds for older devices and eliminates 'dead spots' in coverage. ClientLink technology improves performance on both the uplink and downlink. This feature is significant because the majority of client traffic, such as web browsing and file downloads, is in the downlink direction.

> **"The Cisco 5508 Wireless Controller effectively increases the system capacity of the entire network. It also helps to better manage traffic peaks, which for us can mean as many as 13,000 wireless users at any one time."**
>
> **–Andreas Liebe, Network Services Manager, TU Darmstadt**

Thomas Vogel, head of the Network Group at TU Darmstadt, says, "ClientLink technology extends the life of our existing 802.11a/g clients. This means that we can migrate to 802.11n at a pace that suits the university."

Following extensive testing in the live campus environment, TU Darmstadt is implementing the Cisco 5508 Wireless Controller in conjunction with 802.11n Access Points. The solution will initially be deployed across two large lecture halls. These areas of densely populated mobile users (the halls can house up to 800 students) will be the first to benefit from faster and more reliable wireless performance.

"The Cisco 5508 Wireless Controller effectively increases the system capacity of the entire network," says Andreas Liebe, network services manager for TU Darmstadt. "It also helps to better manage traffic peaks, which for us can mean as many as 13,000 wireless users at any one time."

The Cisco 5508 Wireless Controller also offers a simple and effective teleworker solution. Using the Cisco OfficeExtend feature, Cisco 1130 and 1140 Access Points can be easily preconfigured to set up a secure virtual private network (VPN) tunnel back across the Internet to the campus network. Any laptop, PDA, or other mobile device that works on-campus will then also work remotely without the need for additional hardware or any separate reconfiguration.

To protect the wireless network and help ensure high availability, TU Darmstadt has also deployed the Cisco Adaptive Wireless Intrusion Prevention System (wIPS). wIPS software employs network analysis and signature-based techniques, as well as automated wireless vulnerability and performance monitoring that constantly scans the campus network to ward off attacks. Cisco 5508 Wireless Controllers also help TU Darmstadt to mitigate the increased risk of viruses, worms, and attacks by working with Cisco firewall and security products.

"The Cisco 5508 Wireless Controller means we do not have to swap out old access points. In fact, because we can connect over two times more devices than before, we can actually consolidate hardware. Fewer controllers also mean less electricity and greener IT operations. These savings can be re-invested back into frontline education or other innovation-led projects."

–Thomas Vogel, Head of Network Group, TU Darmstadt

TU Darmstadt also plans to go beyond basic data connectivity and leverage the Cisco wireless infrastructure as the platform for delivering enhanced mobility services. For example, real-time location services can be used to help identify the exact location of network faults. The university is also currently testing radio frequency identification (RFID) tagging as a means to track equipment and improve utilisation of university assets. By leveraging the Cisco Mobility Services Engine, TU Darmstadt has a highly scalable and open solution for deploying a variety of mobility services.

Results

TU Darmstadt has significantly improved collaboration and access to digital content and web-based tools that enrich learning, teaching, and administration. By improving coverage and throughput, 802.11n in conjunction with the Cisco 5508 Wireless Controller will transform the roaming experience for students, faculty, and staff, who will be able to enjoy consistent streaming of video and reliable, toll-quality voice.

"The Cisco 5508 Wireless Controller means we do not have to swap out old access points," says Vogel. "In fact, because we can connect over two times more devices than before, we can actually consolidate hardware. Fewer controllers also mean less electricity and greener IT operations. These savings can be re-invested back into frontline education or other innovation-led projects."

Students will have greater flexibility and control over their own studies. It is easier for them to get online in order to upload and download information and materials or share problems and learning outcomes. They can also use their mobile devices to record and store lectures or to work outside of the classroom, for example, to conduct experiments, while still retaining the ability to research or access course notes.

Cisco OfficeExtend will enable the university to simplify arrangements for teleworkers, such as lecturers, administration staff, and IT teams. The solution could also be made available to students unable to attend lessons. VoIP-enabled wireless phones or softphone clients can also be deployed in conjunction with OfficeExtend, providing smooth connectivity to voice, voicemail, and directory services and allowing calls to be routed more cost-effectively over the campus infrastructure.

"Before, we used to spend a lot of time provisioning and managing remote access" says Liebe. "Now, using Cisco OfficeExtend, faculty and staff do not even need to change the personal settings on their devices. They can simply take a wireless access point, plug it into a home broadband connection, and within seconds they have access to all the tools and resources they need."

Technical Implementation

Cisco 5508 Wireless Controllers form part of Cisco's vision for Next-Generation Wireless, which uses several techniques to improve the throughput, reliability, and predictability of wireless LANs. These innovations include:

- Cisco ClientLink – after learning the best way to combine the signal received from a client on the access point's multiple antennas, ClientLink uses that information to send packets in an optimum way back to the client in a technique referred to as multiple-input, multiple-output (MIMO) beamforming. When independently tested, ClientLink was shown to increase the average throughput for 802.11a/g clients by 65 per cent and overall channel capacity by 27 per cent[1].

1. Miercom, Lab Testing Report, Jan 2009.

- Automated RF management – established the channel plan and output power of each access point to optimise coverage of the office space. This optimisation greatly speeds up deployment and reduces management overhead.
- Consistent connections – device, connection management, and Quality of Service (QoS) tools to help ensure consistent performance.

The Cisco Aironet® 1140 Series Access Point is an 802.11n indoor access point designed for simple deployment and energy efficiency. It comes in both single and dual 802.11n radio configurations, which deliver full 802.11n performance using standard 802.3af power. With integrated antennas and a sleek industrial design, the 1140 Series blends smoothly into any enterprise environment.

Cisco Wireless Control System (WCS) allows TU Darmstadt to simplify management of its wireless network and reduce total cost of ownership. WCS provides network administrators with a single, centralised solution for managing the WLAN, including RF prediction, policy provisioning, network optimisation, troubleshooting, user tracking, security monitoring, and reporting.

PRODUCT LIST

Wireless

- Cisco Aironet 1140 and 1250 Series Access Points with ClientLink technology
- Cisco Aironet 1500 Series Outdoor Mesh Access Points
- Cisco 5508 Wireless Controllers
- Cisco OfficeExtend
- Cisco Wireless Control System
- Cisco 3300 Series Mobility Services Engine
- Cisco Adaptive Wireless Intrusion Prevention System software
- Cisco Context-Aware software

Security

- Cisco ASA 5500 Series Adaptive Security Appliances
- Cisco IPS 4200 Series Sensors

Voice

- Cisco Unified Wireless IP Phone 7921G and 7925G (in trial)

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at **www.cisco.com/go/offices.**

