

Case Study

Pure IP Telephony



case study Security

- : Deutsches Forschungsnetz, Berlin/Stuttgart
- : Public Sector
- : 370 Research projects agencies
- : IP 3000; Redundancy concept; Location concept

As technical innovations are increasingly fast-paced and work processes become ever more virtualized and dynamic, data communications is continuously facing new challenges, especially in the area of the sciences. Paving the way for digital communications technology, the Deutsches Forschungsnetz (DFN), Germany's National Research and Education Network, has fundamentally restructured work methods in science and research, thus adding significantly to the improvement of the work quality and -efficiency in the sciences. By implementing the DFN, the German scientific community has created a communications system tailored perfectly to the needs of science and research facilities and institutions. With its superb performance, large number of participants, and extensive range of services, the DFN sets international standards.

Among the DFN's particular strengths are its homogeneity, its direct access to other national science networks, especially in Europe and North America, and the coverage of virtually all scientific institutions in Germany. More than 500 scientific institutions, among them almost all universities, a large part of the non-university research facilities, and industrial research departments are directly connected to the science network. Integrated in a global system of over 50 national research networks, the DFN makes the scientific work of its participants highly visible. The DFN allows scientists to cooperate in virtual teams via the network and to share remote super computers or other technical resources, independent from any restrictions of time and space.

The DFN's national backbone – the heart, as it were, of this "Intranet for the German sciences" – is the Gigabit Wissenschaftsnetzwerk (gigabit science network) G-WiN. It covers Germany in a star shape to include 27 core nodes, which it integrates through 55 connections with bandwidths of 2,5 or 10 Gbits/s or through transparent wavelengths. Currently the most important service provided through G-WiN is the DFNInternet service, which connects the participants of the DFN and also provides direct, high-capacity transitions to the most important scientific partner networks and to the global Internet. With very short, constant transit times, the DFNInternet service provides the ideal basis for forward-looking applications such as grids, multi-media video conferences, CAVEs, and real-time control of large appliances.

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In order to prepare the ground for future upgrading and to advance further uses and services of the network, the DFN-Verein (DFN association) – the network's agency – supports the development of innovative services and applications designed to meet the particular requirements of scientific networks. It was therefore only logical for the association to employ state-of-the-art technology for their telephony as well – the telephony between the DFN locations Berlin and Stuttgart is therefore based on the Internet protocol.

The focus is on flexibility and cost-efficiency

Science networks are very powerful, offer supreme international connections, and have large, homogenous user groups. They are therefore ideally suited for the implementation of speech services such as telephony via IP. To motivate a large number of users to migrate from circuit-switched telephony to IP telephony, the latter's reliability and availability must be at least on a par, better yet superior to traditional telephony's. New equipment and

devices must be easy to integrate in the diverse infrastructures, and must be suited to the heterogeneous and complex structure of the scientific institution's digital environment. First and foremost, the IP telephony system should therefore be non-proprietary. Increasingly fast innovation cycles also make special demands on IP telephony. The development of new services such as video conferencing, advanced network uses and -organization – e.g. through the creation of grids –, and the continuous development of the science networks themselves, make it necessary that all components employed be able to react fast and flexibly to new demands. Finally, the costs of the infrastructure must always be kept under control.

Optimum use of the existing infrastructure

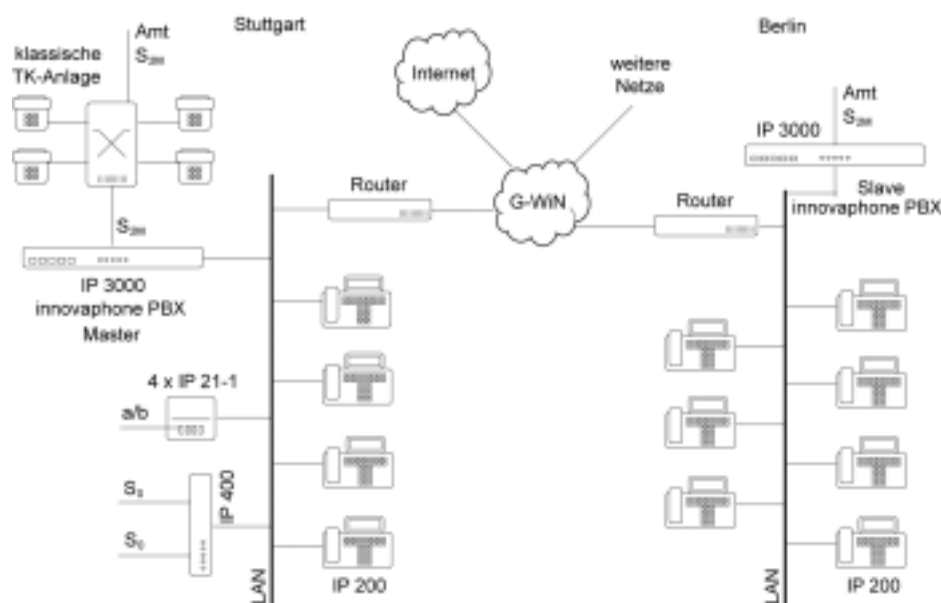
To make IP telephony available to the largest possible number of scientific institutions, the DFN association is looking for flexible, powerful, and cost-efficient solutions that offer the convergence

of speech and data transmissions. The association's branch offices in Berlin and Stuttgart have been using innovaphone IP telephones since June 2004 – for their internal telephony as well as their communications with those universities and research facilities connected to the science network that also employ IP telephony. Two innovaphone IP 3000 gateways were installed in Berlin and Stuttgart, one at each of the two locations. The problems that the migration from circuit-switched to IP telephony poses for scientific institutions are mostly organizational: Number charts, billing procedures, and representations of the complex communications environments at universities and research facilities have to be created. The experiences currently being made with innovaphone's products in the DFN association's branch offices are therefore also being discussed with other interested participants within the science network.

Step-by-step extension of IP-based communications

The two locations – Berlin and Stuttgart – were connected via IP trunks. Thus, telephone calls between Berlin and Stuttgart incur no charges, as the entire communication is carried out through the DFN association's corporate network. The migration from circuit-switched to IP telephony at both locations shows in detail the variety of options offered. In Berlin, the entire traditional telephony system was replaced by an innovaphone PBX (Private Branch Exchange) telephony system, based fully on

Deutschen Forschungsnetz - innovaphone PBX scenario :





In action at Deutsches Forschungsnetz:
IP Phone IP 200

the Internet protocol. In Stuttgart, on the other hand, the existing Alcatel telephony system was kept on in a switched circuit with an innovaphone IP 3000 gateway. This latter migration scenario, also known as "soft migration," is a low-cost, future-oriented version, as existing maintenance contracts may be fulfilled while simultaneously, the advantages of state-of-the-art technology can be profited from.

The innovaphone IP 3000 VoIP gateway installed in Stuttgart offers 30 speech channels. A second, smaller innovaphone IP 400 gateway serves as ISDN terminal adapter. Fax transmissions, too, were switched to the Internet protocol. For this, four innovaphone

IP 21-1 terminal adapters were integrated into the system to connect analogue end devices. As all innovaphone equipment components supplied were already configured, the entire implementation was carried out smoothly and without problems.

New performance features gained by migration to Voice-over IP

The consistent application of the Internet protocol opens a whole new range of performance features unavailable to traditional telephony systems. Thus, innovaphone gateways offer "master-slave" configurations in which the innovaphone PBX's data are mirrored by a second gateway. Should the first gateway fail, the second gateway can take over all its functions – without delay or data loss. Another advantage of an IP-based communications solution is its flexibility. All gateways are freely scalable, so that scenarios of any size and scale may be realized. Users do not have to make any final

decision on the scale of their telephony system beforehand – the infrastructure can be easily expanded at any time, without modification of the existing hardware. Unlike other, less flexible transitions, which may make it necessary to shut down the entire communications system for days or even weeks, this allows for a step-by-step migration to IP telephony that will leave the communications system of a facility intact at all times.

Easy handling – impeccable speech quality

The quality of IP telephone calls is comparable to the ISDN standard users are familiar with. Features such as conference circuits and redirection are additional assets of VoIP. The innovaphone IP 200 end devices are at first sight indistinguishable from traditional telephone sets. Yet unlike those, IP phones may be configured easily and fast through a web browser application. Any employee can thus be available through his personal extension number, even if he works at different desks or locations – his personal extension number "follows" him as soon as he signs on to the system. Tedious searches and forwarding have thus become a thing of the past. This is a significant advantage for employees of universities and other research facilities, who often work in their offices as well as in the labs or in the plant. In the long run, this solution also offers the integration of home offices into the telephony infrastructure.

Advantages of the IP-based solution for the DFN:

- ✓ **Consistently standard-based solution** without proprietary components; therefore uninhibited interoperability with third-party products
- ✓ **High degree of failure-safety** through redundant systems and automatic fail-over
- ✓ **High scalability**, including the option to easily modify the IP network at any point in order to meet future requirements
- ✓ **Option to interconnect telephony systems** at different locations, also retroactively
- ✓ **Soft Migration:** Step-by-Step migration from classical PBX to IP telephony





In action at
Deutsches Forschungsnetz: IP 3000

In addition to a number of functions also available with ISDN telephony, voice-over IP offers a range of organizational features that traditional telephony can't. These include switching across locations and caller groups with participants at different locations. Another advantage of IP telephony is its easy integration into video conferencing setups. As video conferencing is crucial in today's scientific communications, and as the DFN association's service caters to the needs of the scientific community, integrating IP telephony structures and components into the existing video-conferencing environment is a high priority.

Open to face future challenges

For the future, the DFN association is planning to expand the DFN telephone service. The existing VoIP environment will be extended with additional applications, as Holger Wirtz, project manager for the test installation at the DFN, explains. Wirtz pointed out: "We are mainly interested in the performance features that allow us to expand the range of services offered by the DFN telephone service and to further the convergence of the data and speech networks. As the hardware installation may be expanded at any point by including further gateways, we can easily integrate new offices or parts of a building complex. This is another advantage of the IP based speech communication: As the two networks converge, we only need one set of cables – the second set of cables always required by traditional telephony has become obsolete.

Guido Lankes, account manager and project manager at innovaphone, sums up the advantages of voice-over IP for the DFN: "By using the existing IP infrastructure for speech communications, the scientific locations open up a whole new range of possibilities, particularly regarding added-value applications such as UMS, CTI, and billing systems. What's more, the acquisition costs are turned into maintenance costs, as the participating research facilities can easily swap out all value-added services connected with voice-over IP scenarios. This procedure may well generate the highest added value for the DFN association."

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