

# Knowledge to shape the future

SWITCH at the service of education and research



**SWITCH**  
Serving Swiss Universities

## **SWITCH.**

### **The future of academic work.**



Thomas Brunner, Managing Director

#### **New perspectives for education and research**

*Academic work is undergoing a process of change. Global, network-based cooperation and direct access to worldwide knowledge are becoming increasingly important for education and research. With its open and secure infrastructure and its innovative services, SWITCH ensures that the Swiss universities are networked across institute, national and continental boundaries.*

*SWITCH currently holds the global lead in fields such as identity management, network security and optical fibre networks. We are already working on application and user-oriented, next-generation systems – on solutions that will work in networks that span the entire globe.*

*SWITCH is playing an active role in the developments within e-science, by participating in numerous European Union projects and representing the Swiss universities on key international bodies.*

## SWITCH. Making Switzerland a top centre for education and research.



Studying sources?

### The future shape of the university landscape in Switzerland

*As a knowledge, work and financial centre, Switzerland is among the leading countries of the world. It is also in one of the top positions in the latest 'innovation barometer' compiled by the European Union. Education and research are two of the driving forces behind an excellent economic performance.*



Studying sources!

Switzerland is in the process of carrying out significant reforms in its university sector. It is setting out to modernise teaching, strengthen research and encourage innovation as well as to strive for more intensive national and international cooperation and networking between universities. Numerous projects and programmes are intended to make the most out of the possibilities offered by the new information and communication technologies.

### The Swiss academic network

Within the international community, Switzerland enjoys a very good reputation as a place of education and research. SWITCH also features in the university landscape and has a key contribution to make in this respect. We see ourselves as a platform for academia, in that we provide efficient support to the universities in their need for communication and cooperation with one another. Through the Swiss academic network, we ensure that anyone involved in Swiss universities has round-the-clock access to the information society. We similarly guarantee the operation of the national network as well as providing connections with European and worldwide knowledge networks and education programmes.

### SWITCH – competence and technological leadership

SWITCH is one of the world's leaders in numerous fields such as identity management, network security and top-performance, high-speed networks. We underscore our competence and our claim to technological leadership through our active involvement in the work of key international bodies and by representing Switzerland on them and also through our participation in many projects set up by the European Union. We also take good care of Switzerland's interests in international organisations like TERENA or DANTE.

## SWITCH. Our vision of e-academia.



E-Learning?

### Full-speed ahead for the transfer of knowledge and exchange of ideas

*Students, researchers and lecturers are becoming more and more mobile all the time. They are working in international project groups, attending courses away from their home campus and are spending a very considerable time travelling. No matter where they are accredited and where they are working at any given point in time, they would like to have protected access to their own and others' data – be it on their home campus, on a visited campus, at a station or airport, in a hotel or restaurant, or simply at home.*

SWITCH is working at various levels on the implementation of a virtual community:

#### Deckchairs replacing lecture halls

On a simple platform, which is intuitive to operate, SWITCH has grouped together various services, all using the same uniform, protected access with an AAI login. SWITCH's streaming platform is an all-round genius. It has no difficulty in archiving, reformatting and distributing recordings of university lectures. Students can use them anywhere and at any time on their iPod or laptop, as a film or stream.

IP video conferencing makes a reality out of real-time multipoint conferences, with audio and video communication in high-definition quality. A helpdesk assures professional support and advice.



E-Learning!

### The omnipresent campus

With SWITCHconnect, we offer the possibility of uniform, secure, remote access from any campus visited to both the internet and personal e-mails as well as to electronic diaries, file servers and databases held on the home campus.

Internationally, we are active participants in eduroam and are also building up the corresponding national infrastructure. European academic roaming enjoys the support of the European Union and is intended to give those belonging to the participating European universities the possibility of roaming beyond their national borders.

#### 'New learning' is a new culture.

The term 'new learning' is applied to learning and solving problems under one's own responsibility in a cooperative environment, which integrates innovative, technology-based forms of teaching and learning. SWITCH is actively working on building up a national, federally-run repository of learning objects with the objective of achieving the local, inter-institutional, national and international exchange of learning contents. The aim is to link this in with existing SWITCH services, such as the authentication and authorisation infrastructure, security middleware and e-conferencing.

### Bundled resources – with a grid infrastructure

Grid technology makes a consistent, end-to-end software infrastructure available, which facilitates the efficient use of computing power across the boundaries between universities and national borders. It is of very great importance for both teaching and research. In joining the international cooperative project EGEE2 (Enabling Grids for e-Science, Phase 2), SWITCH is now involved in the world's largest grid project, with more than four hundred partners from more than ninety countries. Within the ambit of this project, SWITCH is focusing above all on the aspects of grid security, the operation of central services and coordinating functions. These represent the springboard for dealing successfully with the massive challenges of the future, which it is only going to be possible to master by working together all around the world.

## SWITCH. Security is our main concern.



Authorisation?

### Secure access – secure use

*The correct identification of users and services across the limits of organisations is indispensable for the secure operation of SWITCH's academic network and the efficient, reciprocal use of resources. Our Security Division provides support through offering appropriate services for secure access to the network.*



Authorisation!

### Authentication and authorisation

SWITCH<sup>aa</sup>i, the authentication and authorisation infrastructure developed by SWITCH, constitutes a milestone in communication with the universities and has widespread roots throughout the whole of Switzerland. All the conventional universities and more and more universities of applied sciences are today operating their own AAI home organisation. More than three quarters of those involved in tertiary education in one way or another already possess a user account, which makes it possible for them to have access to the AAI-protected services.

The process of protecting further web resources and applications with AAI is a continuing one – on the one hand in the field of e-learning and, on the other hand, in the field of important cooperative platforms and institutions. The massive success that AAI has already had throughout Switzerland is now spreading internationally too. For the first time, for instance, AAI is being used in the largest project funded by the European Union, the grid-computing activity called EGEE2.

From AAI to AAA: it is planned to expand the authentication and authorisation infrastructure still further by adding an accounting function to generate use statistics. This will make it possible for infrastructures to be provided in an optimised, targeted manner.

### Efficient emergency response

Our customers, Switzerland's universities, attach the greatest importance to the protection and secure operation of the academic network. In order to satisfy this customer need, SWITCH operates a computer emergency response team (CERT). One of its most important tasks is incident handling. This team is ready at very short notice at any time (working with the universities' own security services) to react to any possible incident (such as hacking attempts) that might disrupt the operation of the network.

## SWITCH. The name for domain names in Switzerland.



Identity?

### Continuity and stability

*Since the very beginnings of the Internet, SWITCH has operated the registries for domain names ending in .ch (Switzerland) and .li (Liechtenstein).*

Related to that, we provide various services as an independent competence centre for internet questions. On the one hand, we handle the administrative aspects of registering new domain names, the annual renewal of existing subscriptions and the maintenance of the domain-name database. On the other hand, we are also responsible for the smooth, uninterrupted operation of domain names in Switzerland and the Principality of Liechtenstein.

In addition, we represent the interests of the internet community in numerous international bodies, such as ICANN (Internet Corporation for Assigned Names and Numbers), CENTR (Council of European National Top-Level Domain Registries) and IETF (Internet Engineering Task Force).

### Programmed for growth

The .ch top-level domain has existed since 1987. The first domain names to be registered under it were cern.ch, ethz.ch and switch.ch, followed by other names for the universities. During the pioneering phase of the internet, interest remained low. As the world wide web, however, was gradually built up and expanded, demand quickly accelerated too, and SWITCH registered the one-millionth .ch domain name in August 2007. With that, Switzerland has one of the highest domain-name densities of any country in the world, measured in terms of its number of inhabitants.



Identity!

### Top security for domain names

Businesses and organisations that use their websites for conducting business are interested in the best-possible protection of their domain names – especially against malicious or unintentional changes. With SWITCHguard, we are the first registry in the German-speaking world to offer a new domain-name type, which guarantees this enhanced security. It is based on the involvement of up to five trusted third parties with an additional countercheck, by one or more persons, being performed on any requested change.

### The SWITCH Junior Web Award – a SWITCH initiative

As a Swiss internet pioneer, SWITCH pursues a policy of encouraging schoolchildren to learn about the internet and to familiarise themselves with this medium. The SWITCH Junior Web Award provides an excellent opportunity for Swiss school classes to create their own webpages and to put these on the internet. SWITCH makes various utilities available to all participants, and participation in the competition is free-of-charge.

Joining the award scheme is open to any primary, lower-secondary or upper-secondary school class from anywhere in Switzerland or the Principality of Liechtenstein. It is possible for teachers to pick any topic of their choice and to integrate it in their normal tuition or to run a special project. Once all the school classes have created and submitted their webpages, these are switched live, and the initial preliminary vote on them is open to the general public. After that, the members of the Best-of-Swiss-Web jury determine the winners for each age group. The five best applicants in each age class receive their prizes at a special award ceremony.

## SWITCH. Building our future on our history.



Knowledge transfer?

### Brief chronology of SWITCH's twenty years of history

**1987:** SWITCH was set up and given the aim of promoting the use of modern tele-informatic methods in teaching and research in Switzerland.

**1988:** SWITCH introduced its first services for Swiss universities, including SWITCHlan and SWITCHmail.

**1989:** All Swiss universities were interconnected through SWITCHlan, but were using various different systems and protocols.

**1990:** SWITCH became the official registry for .ch domain names (and held a portfolio of fifteen of them by 31 December).

**1991:** In the year in which the world wide web was born, SWITCH's DNS servers were entered in the root DNS at IANA.

**1992:** SWITCH began to operate an e-mail gateway for the SWISS PTT, thanks to which that organisation's customers were able to exchange e-mails with internet users all around the world.

**1993:** SWITCH took over the administration of the .li top-level domain too. A total of 148 domain names were registered under .ch and .li together.

**1994:** SWITCH used the 'Superhighway' to advertise internet access for private customers.

**1995:** The aggregated data traffic of all the universities on SWITCH's network broke through the 1-Gbit/s barrier.

**1996:** A total of 115 universities and commercial undertakings were connected to SWITCHlan.

**1997:** The 'SWITCH Next Generation' expert report pointed to possible ways into the future for the academic network.

**1998:** SWITCH expanded the news servers in Geneva and Zurich in order to be able to handle the growing volume of Usenet traffic.

**1999:** The newest generation of the national backbone network, SWITCHlan, entered service.



Knowledge transfer!

**2000:** SWITCH tested a new high-speed connection in the gigabyte range between Zurich and Geneva, in the form of an optical-fibre cable.

**2001:** SWITCH made progress on expanding the SWITCHlambda project – a Swiss optical-fibre network to interlink all the conventional universities and the universities of applied sciences.

**2002:** The SWITCH CERT security team was strengthened and set about maintaining and improving an international network of contacts.

**2003:** SWITCHmobile and AAI made students and lectures independent of place and time.

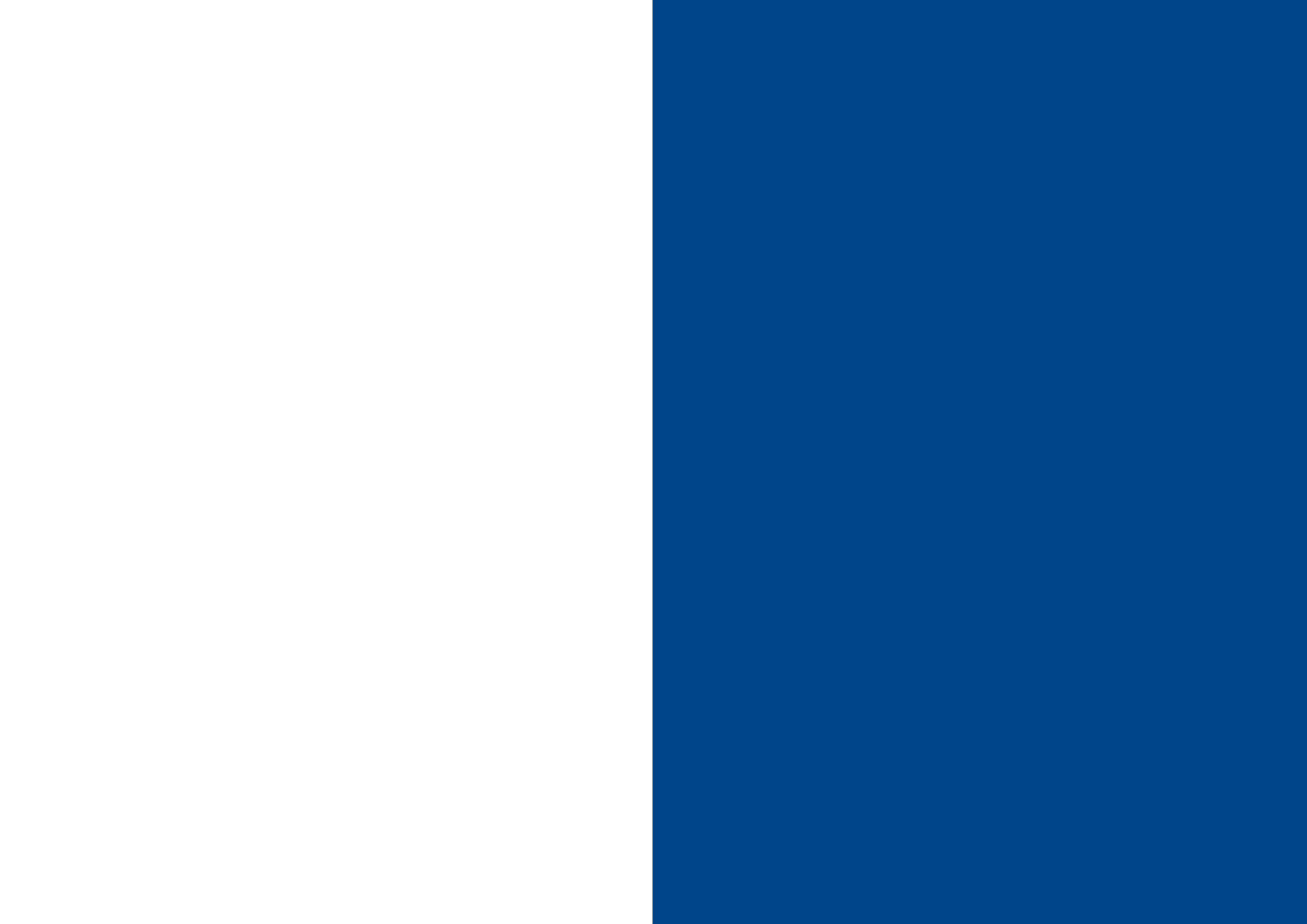
**2004:** SWITCH introduced internationalised domain names (IDN), which triggered a new boom in domain-name registrations.

**2005:** SWITCH launched ENUM domain names to bridge the gap between the telephone network and VoIP.

**2006:** Streaming products offered by SWITCH set new standards for e-learning with podcasts.

**2007:** SWITCH introduced the Junior Web Award to encourage broader use of the internet in schools. The one-millionth .ch domain name was registered.

**2008 and thereafter:** SWITCH is continuing to post news on the latest developments and innovative services on its website at [www.switch.ch](http://www.switch.ch).





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