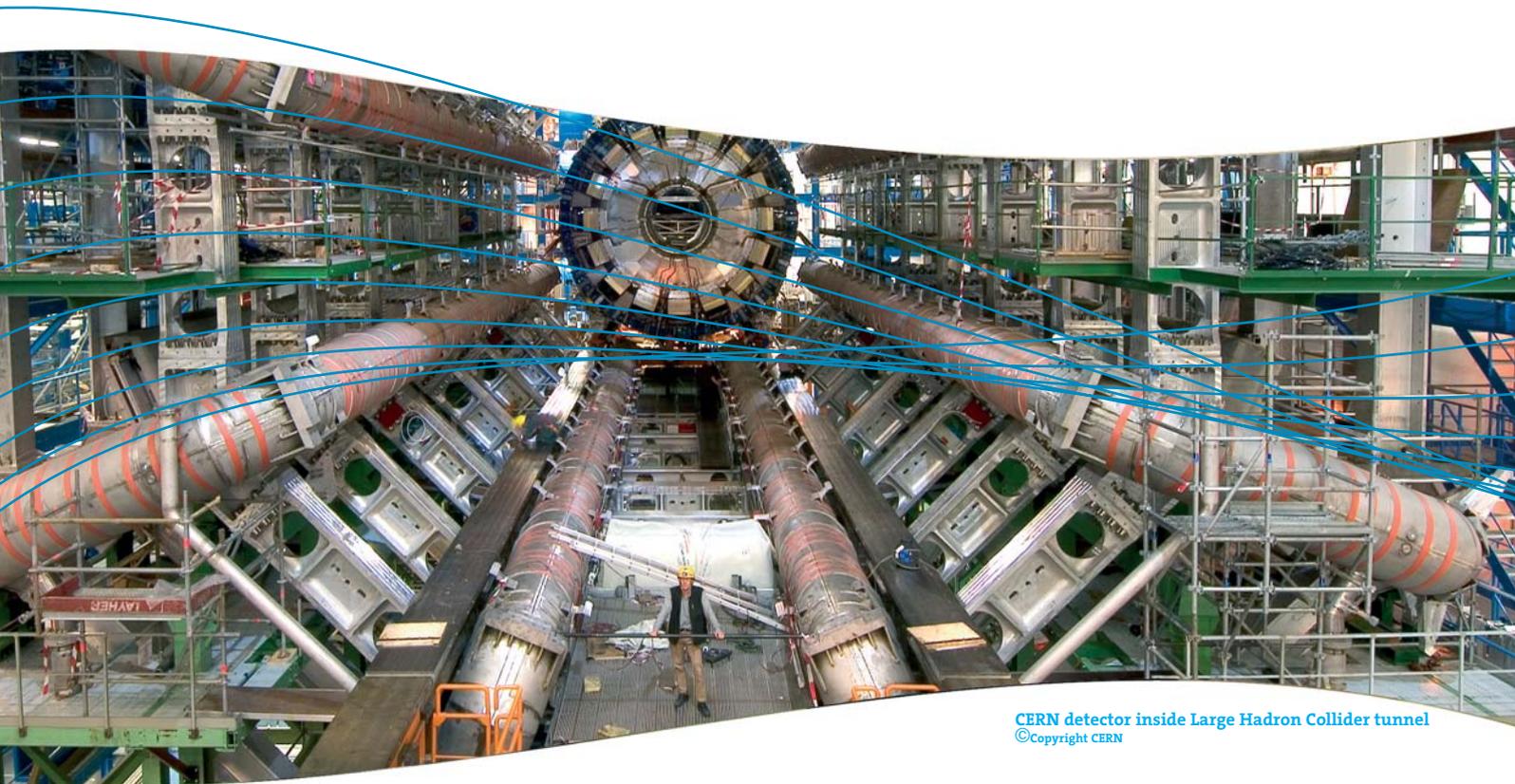


ProCurve Networking by HP

# ProCurve Networking partners with CERN to unlock the secrets of the universe



CERN detector inside Large Hadron Collider tunnel  
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**David Foster**  
Communication Systems Group Leader  
CERN  
Switzerland

CERN, (the European Organisation for Nuclear Research), is the world's largest particle physics research laboratory. Founded in 1954, CERN is situated at the foot of the Jura Mountains on the borders between France and Switzerland, northwest of Geneva. Here scientists and researchers operate six particle accelerators that are among the largest scientific instruments ever built. In these devices, elementary particles are accelerated to tremendously high energies and then smashed together. These collisions, recorded by particle detectors, give a glimpse of matter, as it was, moments after the Big Bang.

CERN is funded by 20 member states which are: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom. India, Israel, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and UNESCO have Observer status.

CERN's broad research programme is carried out by some 6,500 visiting researchers from more than 80 nations, (which equates to around half of the world's particle physicists), who are supported by 2,500 resident staff. Achievements resulting from CERN's research include the discovery of the W and Z bosons, (two fundamental particles of our universe). CERN scientists have also developed a host of detector and accelerator technologies, with spin-offs in areas including medical radiology. In addition to being the recipient of Nobel Prizes in physics, CERN researchers also pioneered the development of the modern Internet: Tim Berners-Lee invented the World Wide Web at CERN in the early 1990s to meet the demand for automatic information sharing between scientists working in different

universities and institutes around the world.

Currently in the final stages of construction at CERN is the Large Hadron Collider (LHC). This giant particle accelerator, which will begin operation in late 2007, is the world's largest scientific instrument. It will be housed in a circular underground tunnel which has a circumference range of 27 km (16.7 mi), 100 m (320 ft) below CERN's site, where particles will be accelerated at practically the speed of light. Such is the scale of this instrument that the LHC in fact spans the borders of both France and Switzerland. This accelerator will generate vast quantities of computer data, which CERN will stream to laboratories around the world for distributed processing. In February 2006 a trial successfully streamed 1GB per second to seven different sites across the world.

In addition to housing the world's largest and most powerful particle accelerator, CERN also manages the LHC Computing Grid (LCG) project – the world's largest international scientific grid service, which will provide access to shared computer power and data storage capacity over the Internet and dedicated 10Gbit/s links, enabling scientists across the globe to produce, store and analyse an expected 15 Petabytes (15 million Gigabytes) of data each year.

Back in 2004, while preparations for the LHC were well underway, CERN's IT department recognised the need to revitalise its IT infrastructure, which had to be capable of managing the data processing power of this ambitious Computing Grid project. The Grid project is essentially a global network of distributed data-processing resources. For this purpose, CERN is in the process of setting up a data centre comprising 6000 PCs, each of which needs to be connected by reliable, high-

**Objective:**  
CERN needed to connect the world's largest and most powerful particle accelerator, and to network 600 PCs in the world's largest scientific computing grid.

**Approach:**  
CERN engaged ProCurve to provide the ProCurve Adaptive EDGE Architecture™ strategy, including 600 units of the ProCurve 3400cl switch and 400 units of ProCurve's award-winning 3500yl switch.

- IT improvements:**
- Process high levels of information
  - Increased network security
  - Intelligence required to manage complex applications

- Business benefits:**
- Low overall cost of ownership
  - Greater flexibility in developing new applications
  - Lifetime warranty supplied

performance Gigabit Local Area Network switches. Although CERN's IT infrastructure had previously coped with the networking demands made of it on a day-to-day basis, it was well aware that it needed to reassess its needs as a result of the heavy demands that the Grid would eventually place on its network environment. Therefore in 2005, CERN invited leading networking vendors to tender for their business. ProCurve won the deal for a number of reasons.

"The decision to buy ProCurve was based on the high performance, reliability, and low overall cost of ownership that ProCurve's products would bring to our organisation," explained David Foster, Communication Systems Group Leader at CERN. "Ambitious initiatives such as the Large Hadron Computing Grid project, demand technical specifications that are ahead of the industry standard – therefore we like working with vendors such as ProCurve Networking who are flexible enough to invest in developing appropriate solutions. Our campus strategy is to deploy intelligence and increase security at the edge of our network, making ProCurve's Adaptive Edge Architecture™ the ideal strategy for us to adopt."

The ProCurve Adaptive EDGE Architecture™ strategy is the industry's only comprehensive and inclusive network design strategy that is adaptable, scalable and completely interoperable for achieving command from the centre with control to the network edge, which recognizes the necessary migration of intelligence and functionality to the network edge.

To date, approximately 600 units of the ProCurve 3400cl switch have been deployed on the CERN site. These switches will bolster the campus network, support individual experiments and enable the 6000 PCs within CERN's data centre to process and analyse the data produced by the protons and nuclei that will be collided at the speed of light in the LHC. 1400 units of ProCurve's award-winning 3500yl switch will also be installed on the site over the next two years, again with the task of processing and analysing this critical data, which holds the clues as to the origins of the universe. The high-performance 3500 series switches were considered especially well-suited for the LHC's network environment due to their ability to complement the core network.

Additionally, on the campus, CERN has deployed 20 ProCurve 5400 series switches, each equipped with 10Gbit/s uplinks (the 10Gbit/s uplink was a crucial requirement for CERN in terms of its capacity to provide sufficient throughput to the distribution layer). It is expected that this number will grow to more than 100 switches in the near future.

One of the goals of CERN's LHC is to answer questions about the nature of the 96% percent of the universe, which astronomical observation tells us is



Aerial view of CERN



CERN data centre



ProCurve 5400zl series switch



Path of real network data flowing out of CERN



220-ton Solenoid magnet  
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unaccounted for by ordinary matter. In addition, researchers using the LHC are attempting to determine whether extra dimensions exist, as predicted by various models inspired by the string theory, as well as to identify subtle differences between matter and anti-matter that could account for the dominance of matter in our current universe. It is testimony to ProCurve that it has been identified as CERN's long-term networking partner of choice. As Foster concludes:

“Thanks to ProCurve our network now has the high level of performance, reliability and

intelligence required to manage complex applications that are integral to CERN and in particular to the Large Hadron Collider project. We also appreciate ProCurve's comprehensive lifetime warranty and the low total cost of ownership that we are now experiencing. We look forward to a continuing and growing relationship with the ProCurve Networking team.”

#### Customer at a Glance

Industry sector: Scientific Research  
 Name: CERN  
 Headquarters: Geneva, Switzerland  
 Founded: 1954  
 Number of employees: 2,500  
 URL: [www.cern.ch](http://www.cern.ch)

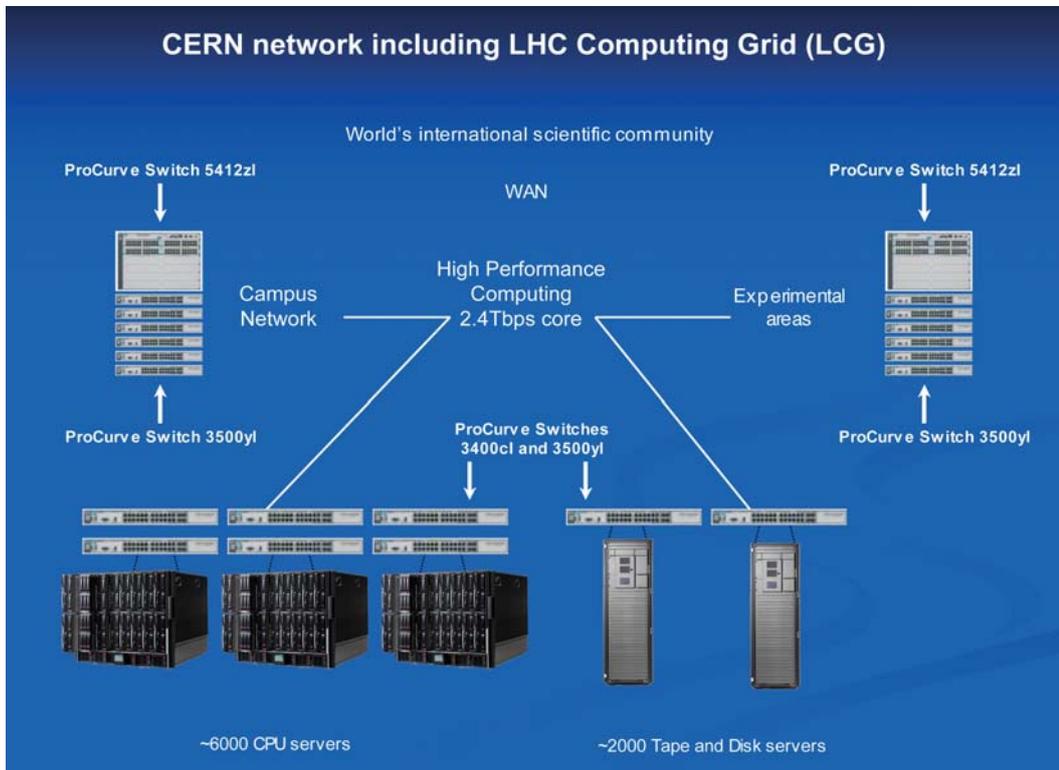
#### What Makes it Work

##### Hardware

- 650 ProCurve 3400cl switches
- 400 ProCurve 3500yl switches
- 10 ProCurve 5406zl switches
- 10 ProCurve 5412zl switches

For more information on ProCurve Networking, visit: [www.hp.com/eur/procurve](http://www.hp.com/eur/procurve)

For information about the ProCurve Network Design Centre, visit: [www.hp.com/go/requestyournetworkdesign](http://www.hp.com/go/requestyournetworkdesign)



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