

# National Institute for Subatomic Physics (NIKHEF)

## EXECUTIVE SUMMARY

### Challenge

Facilitate communication, cooperation, and the exchange of data-intensive applications among researchers within a High-Performance Computing (HPC) environment

### Solution

- Brocade MLX Series routers at the core
- Brocade FCX Series Layer 2/3 switches at the network edge

### Results

- Built a reliable HPC environment capable of supporting thousands of scientists and engineers
- Gained the ability to analyze and process more than 15 petabytes of data annually
- Completed a network upgrade to 10 Gigabit Ethernet (GbE) in less than six weeks
- Increased processing and storage capabilities by up to 30 percent

## Brocade Helps Nikhef Discover Secrets of the Universe

Despite advances made by modern technology, many scientific mysteries have yet to be fully explained, such as the nature of so-called “dark matter,” what happened shortly after the Big Bang, the origins of cosmic radiation, and what gravitational waves tell us.

These complex questions are exactly what Dutch research organization Nikhef works on every day. The National Institute for Subatomic Physics, known as Nikhef, carries out research in the area of astroparticle physics. Located at Science Park Amsterdam, Nikhef is a partnership between the Foundation for Fundamental Research on Matter (FOM) and four universities, including the University of Amsterdam.

Nikhef’s work has contributed to the study of the smallest particles of matter and the forces between them in the collision process within large particle accelerators. This includes helping to prepare experiments in the Large Hadron Collider (LHC) particle accelerator at the famed CERN (European Organization for Nuclear Research) facility in Geneva. In addition, Nikhef has played a significant role in the field of networking as a co-founder of the Amsterdam Internet Exchange (AMS-IX), the second-largest Internet exchange in the world (based on throughput traffic).

Following its ongoing involvement in AMS-IX, Nikhef invested heavily in a globally distributed computing and storage infrastructure. In 2007, Nikhef

helped launch BiG Grid. This project aims to create a grid infrastructure for scientific research in order to facilitate communication, cooperation, and the exchange of data-intensive applications.

While approximately 150 scientific staff and about 100 technicians and engineers work at Nikhef, its network supports the activities of many more people who rely on its computing infrastructure. “Together, Nikhef and [our local partner] SARA form one of the 11 Tier-1 centers for LHC data processing.

Each year, about 15 petabytes of data are analyzed and processed at our locations,” says Dr. David Groep, Senior Research Scientist, Grid Computing, at Nikhef

Faced with this massive, growing volume of data, Nikhef needed a network upgrade that would support thousands of researchers worldwide and provide enough storage capacity, computing power, and bandwidth for future needs. The organization was also looking for IPv6 support.

## The Big Bank Theory

Nikhef previously used core routers from Brocade and enterprise edge switches from 3Com, which suited the organization at the time. But the existing edge switches were creating a bottleneck during critical data analysis—a process that requires 1 to 10 Gbps speed, but was receiving the equivalent of ADSL performance. This became the tipping point for the upgrade.

For the evaluation process, Nikhef first checked the functionality of all potential suppliers, and then looked at prices from a short list of contenders. Key requirements for the organization included virtual routing, flow control for switches, open standards, and support for large numbers of Layer 2 Virtual LANs (VLANs). After these criteria, Nikhef examined the quality of support from various vendors.

To support its bandwidth, computing, and other requirements, Nikhef selected Brocade® MLX® Series routers, which provide extremely high levels of scalability, performance, reliability, and all-important cost-saving operational efficiency.

Nikhef also added four Brocade FCX Series 48-port edge switches, which feature advanced Layer 2 switching. The organization deployed the Brocade FCX switches with 10 Gigabit Ethernet (GbE) modules to deliver even more bandwidth and performance.

## Conducting a Network Experiment

After a six-week testing period, the new network was rolled out and running.

According to Groep, the impact of the Brocade FCX edge switches was felt immediately, as Nikhef gained enough computing capacity to support its ATLAS program at CERN. "The network is now scalable in computing and storage, and we can potentially triple the analysis throughput," says Groep.

Groep adds that with the Brocade equipment, Nikhef has had far fewer security and scaling issues, and was able to successfully roll out IPv6.

"Brocade offers reliable, industry-leading technology that allows us to support IPv6 and protect our vast amounts of data," says Groep. "We expect Brocade to be part of our environment for many years to come."

## WHY BROCADE

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## Making a Breakthrough Discovery

Groep expects the new routing core to be relevant for the next five to seven years. Its scalability gives Nikhef the breathing room it needs to support additional capacity.

Beyond that, he foresees a time when the group will need 100 GbE—and is confident that Brocade has the built-in flexibility to meet this demand. "The solution has been configured in a way that we can easily add a few 100 Gbps lines when we need the additional bandwidth," notes Groep.

For more information, visit [www.brocade.com](http://www.brocade.com).

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