Case Study

Hewlett Packard Enterprise

Deep research, simplified network

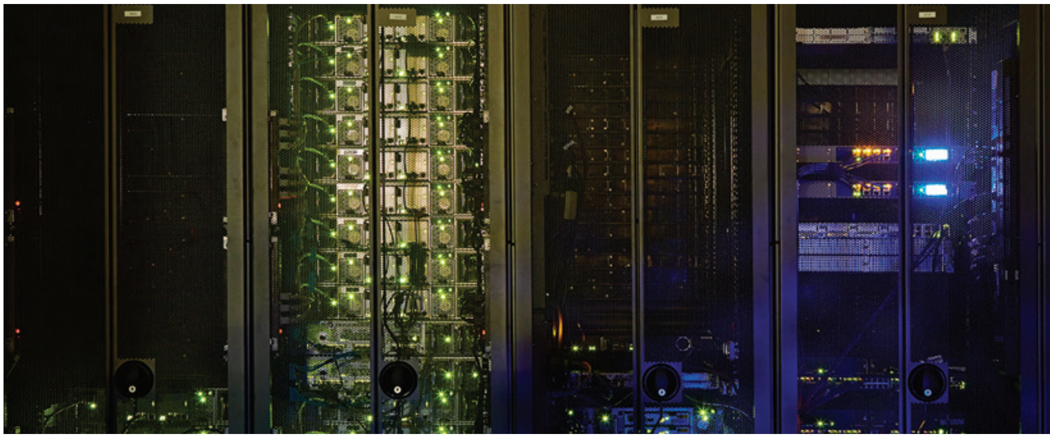
Max Planck Institute turns to HPE Networking solutions to simplify gravitational wave study

Objective
Simplify network topology for improved reliability, performance, and manageability, resulting in optimum total cost of ownership

Approach
Engage with HPE Partner microstaxx to replace proprietary network fabric technology with HPE Networking solutions based on open standards

IT Matters
- Maximizes IT staff resources by simplifying network topology and maintenance
- Enables seamless migration to new network fabric with zero unplanned downtime
- Enhances supercomputing environment with ease of adding new nodes, storage

Business Matters
- Allows the institute to focus its innovation on research instead of IT
- Delivers an integrated, supported system, removing guesswork from implementation
- Meets tight timelines, delivering technology ahead of schedule and meeting academic budgets



The Max Planck Institute for Gravitational Physics (Albert Einstein Institute) was founded in 1995 by the Max Planck Society for the purpose of pursuing research into the fundamental laws of gravitation. To support its research into gravitational waves, the institute built a massive compute cluster to gather and analyze data from the most sensitive gravitational wave detectors in the United States and Europe. Seeking a network architecture that would allow for high performance, simplicity, reliability, and lower TCO, the institute worked with HPE Partner microstaxx to design and build a 10Gbase-T network based on HPE FlexFabric 12916 Switch AC Chassis for modular scalability and unprecedented levels of performance. The solution fits in with the institute's vision for a data center based on open standards, extreme simplicity, and expandability.

A century of relativity

When Albert Einstein upended the scientific world with his general theory of relativity in 1915, he forever changed the way the world thought about mass, energy, and gravity. Not only did he show that Newton's Law of Universal Gravitation was wrong, but he also predicted something that researchers had not yet directly detected: gravitational waves.

One hundred years later, we are just detecting them for the very first time. "Normally, we expect to observe the universe with the same kinds of visual tools we use to measure every other kind of phenomenon," says Bruce Allen, director of the Max Planck Institute for Gravitational Physics in Hannover, Germany. "But there are very interesting objects, such as black holes, that do not emit any light or radio waves, and our dream is to observe these using gravitational waves."

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>
> – Bruce Allen, Director, Max Planck Institute for Gravitational Physics

Measuring the unseen

In the case of the Max Planck Institute, those observations include collecting data from gravitational wave detectors—including the LIGO detectors in the United States, and the VIRGO detectors in Italy—and analyzing the results in a massive computer cluster. Named ATLAS, the cluster is the world's largest and most powerful data analysis system for finding gravitational waves.

"Our cluster is all about simplicity and high performance," Allen explains. "It has to be reliable, available, and easily managed by our small IT staff." In total, the cluster is made up of 3,350 computes nodes (most with 4 CPU cores), 37 file servers, and 12 storage servers, for an a overall storage capacity of 4.4 petabytes.

In order to keep data moving as quickly as possible between servers and storage, the team at the institute needs to ensure its network is not a weak link in the chain. That hasn't always been the case. "Our previous network was great at the time we purchased it eight years ago," Allen relates, "but it was based on proprietary technology that introduced a lot of unnecessary complexity."

Breaking down barriers to breakthroughs

The network's multi-layer, proprietary fabric presented numerous issues when it malfunctioned. "We used to spend a lot of time worrying about the details of the network," Allen recalls. "If something went wrong, discovering the source of the problem would mean hours of investigation, during which time, our network performance would be compromised or down."

Resolving this issue was important for the institute, which is part of a worldwide collaboration of 100 institutions spread out over 20 countries. When the institute began looking for a new network solution, its leaders published an RFP with very strict technical and commercial requirements, as well as a ranking algorithm for vendors.

Right-sized partnerships

"In the past, we've chosen to do business with smaller technology companies because they've traditionally given us more attention," Allen says. "But that hasn't always worked out as well as we would have liked. It's meant we've been locked into proprietary systems that have gone out of support before the gear reached end of life."

So when HPE Networking emerged as the clear winner of the RFP, Allen and team then turned to HPE Partner microstaxx—a preferred technology vendor for all Max Planck Institutes—to help them make the change. "We were already under a deadline to spend our budget in 2014, so we had every hope HPE would deliver in time," Allen recalls.

After a conference call with leaders from microstaxx and HPE, it was clear the institute was on the right path. "In a few minutes on the phone, it became very clear that HPE wanted to make this work for us," Allen recalls.

Grace under pressure

Even though the core switch that the institute wanted—the HPE FlexFabric 12916 Switch AC Chassis—wasn't yet available on the market in the configuration Allen and team needed, HPE Technology Services was able to make sure the institute received its order on budget and on time. "There was a big push on the part of HPE and microstaxx to get our order fulfilled on time," Allen recalls. "Because we're a public sector customer, it had to be delivered within the calendar year, or we would lose the funds."

Before the end of the year, the equipment arrived at HPE in Germany, and was integrated and tested by microstaxx before arriving on site at the Max Planck Institute. "We were really surprised by the level of service we got from microstaxx and HPE," Allen relates. "We've kind of gotten used to a bunch of cardboard boxes on pallets being delivered to our front door, so this was a new level of integration and service for us."

Swift migration

Because of the advance planning and integration of the system, Allen and team were able to move to their new HPE network core with no disruption to its research environment. "Connecting nodes and storage to the switches went so smoothly, we had our students help us with it," Allen recalls.

In use at the institute today, Allen and team are experiencing a new level of reliability with their ATLAS cluster. "The reason we wanted the HPE 12916 at our network core was the sheer power and simplicity of it," Allen explains.

Low latency, high performance

With the highly scalable non-blocking HPE 12916 switch in the core addressing 672 installed 10GbaseT Ports (which still leaves headroom for future growth with 40GE and 100GE interfaces), and the 2920 switch supplying the server-aggregation layer with aggregated 10GbaseT uplinks to the core, ATLAS now has a state of the art network supplying a flat non-blocking and deep-buffered fabric of symmetric low-latency server-to-server connectivity.

Customer at a glance

Hardware
- HPE FlexFabric 12916 Switch AC Chassis
- Aruba 2920 Series Switches

HPE Services
- HPE Technology Services
  - Network Support Services

"Before, we needed a multi-layer switching environment to get the features and performance we wanted, but with HPE at the core, we have direct, 10Gbase-T connections to our switches, and in turn, servers and storage, giving us the raw performance we wanted and the simplicity we needed," Allen says. "Einstein said things should be as simple as possible, but not simpler, and that's exactly what we've achieved with our new network."

Future-proof flexibility

It's a philosophy that allows the institute to focus its resources on the thing it most prizes: gravitational wave research. "We have the largest capacity flagship core switch HPE sells, and with that comes all the flexibility we'll ever need," Allen says. "With a 16-slot chassis, and 720 10Gb Ethernet ports, it's really a remarkable network core that will support whatever we want to do for the next 10 years."

Whether the institute wants to add more storage or additional compute nodes, the new network will accommodate its research needs. "Our HPE network is built on open standards for high reliability—this is telecommunications-grade stuff—and our experience shows that it's actually more reliable than our compute and storage environments," Allen explains. "So when we want to address more storage or servers, there won't be any proprietary issues to prevent us from doing what we want to do."

"And what they want to do is discover 100 year-old secrets at the heart of Einstein's famous theory. Our focus is on detecting these gravitational waves that Einstein predicted a century ago and using them to study things like black holes, not IT" Allen concludes. "And now with HPE, we have tools at the core of our network to enable that research for years to come—technology that's a significant step ahead of what we had before."

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