



# The network to power intergalactic discovery

The European Gravitational Observatory in Italy gets an infrastructure to match its growth, and a threefold increase in computer power helps it explore 1,000 times more of the universe



## Customer profile



<b>Company</b>	European Gravitational Observatory (EGO)
<b>Industry</b>	Biotechnology & Science
<b>Country</b>	Italy
<b>Website</b>	<a href="http://www.ego-gw.it">www.ego-gw.it</a>

## Business need

EGO needed a modern network to cope with the expansion of its laser interferometer.

## Solution

The observatory completed a comprehensive upgrade of its data centre that included Dell Networking switches, a Dell PowerEdge converged platform with Intel® Xeon® processors, and Dell Storage.

## Benefits

- Faster network with higher throughput allows worldwide scientific community to react to events more quickly
- Downtime and related costs virtually eliminated with resilient network
- EGO has an infrastructure designed to match its growth as it explores 1,000 times more of the universe
- Virtualized server environment results in threefold increase in processing power

## Solutions featured

- Networking
- Data Center Virtualization
- Enterprise Support
- Storage Virtualization

“We’ve saved more than 60 per cent on hardware alone while performance has increased and the number of available CPUs has tripled, giving us a threefold improvement in processing power.”

*Antonella Bozzi, Head of IT Department, European Gravitational Observatory*

Tucked away in the Italian countryside outside Pisa lies the laser interferometer VIRGO. It comprises of two orthogonal arms, each 3 kilometres long and 1.2 metres in diameter – the largest ultra-high vacuum vessels in Europe.

VIRGO detects gravitational radiation from outer space. This data is then processed through an online computing system, sent to major computing centres and analysed. This data is made available to the scientific community by VIRGO's parent organisation, the European Gravitational Observatory (EGO).

EGO was set up as a joint Franco-Italian initiative to construct and operate VIRGO and its data centre, promote research and development into the detection of gravitational waves, and foster cooperation in the field of gravitational wave research in Europe. Today, this collaboration involves 19 laboratories with more than 250 scientists across France, Hungary, Italy, the Netherlands and Poland. Staff are currently upgrading VIRGO to increase the volume of the universe it can explore by 1,000 times.

All the signals coming from the interferometer must be transmitted through the EGO network. As a result, high speed and reliability are key requirements, with an average data throughput of 24 megabytes per second (MB/s), which results in an average daily data stream from the experiment of 3 terabytes. As a gravitational event may occur at any moment, the network has to be available 24x7.

However, EGO's existing infrastructure was struggling to cope. The fibre channel and switch environment was 10 years old and could not support present workloads – let alone the future expansion of the experiment.

EGO's six-person IT staff also lacked a powerful management tool for the network, meaning they had to perform many tasks manually. In addition, the system was not fully resilient against hardware failure, with switch replacements taking up to 90 minutes, increasing the risk of missing a scientific event.

"With the redundant network based on Dell, the risk of unexpected downtime has been virtually eliminated. We sleep soundly."

*Antonella Bozzi, Head of IT Department, European Gravitational Observatory*

## Products & Services

### Services

Dell Support Services  
– Dell ProSupport Plus

### Hardware

Dell Networking S5000/  
S6000/S4820T switches

Dell Networking MXL blade  
switches

Dell PowerEdge M1000e blade  
chassis

Dell PowerEdge M620/M820  
blade servers with Intel® Xeon®  
processors

Dell Storage PS Series

Dell Storage SC Series

### Software

Dell Active Fabric Manager

Dell OpenManage Network  
Manager

Dell OpenManage Essentials

### Partner

Citrix® XenCenter®

Linux® virtual servers

VMware® hypervisors

In a worst-case scenario of a system restore, the interferometer would have to be realigned, requiring the work of 15 people for at least four hours. EGO issued an initial tender, known internally as a testbed, involving the purchase of storage hardware, one switch, one chassis and blade servers. The tender was won by Dell over IBM and HP. The migration took just two weeks over the Christmas holiday, and staff returned to work to a new infrastructure, having faced no disruption.

### Upgrading to 40GbE

The data centre comprises an expanded version of the testbed with a Dell Networking core of S5000, S6000, S4820T and MXL switches, plus Dell PowerEdge M620 and M820 blade servers powered by Intel® Xeon® processors, and Dell Storage SC and PS Series. EGO chose the S6000 switches for their high performance, providing a mix of 32x 40 Gigabit Ethernet (GbE) ports or 96x 10GbE ports. Their sub-600 nanosecond latency was a key feature in ensuring fast throughput. Dell also recommended S5000 switches with both Ethernet and fibre channel connectivity. This allowed EGO to converge storage area network and local area network traffic into one switch, saving 50 per cent in hardware costs. The MXL 10/40GbE blade switch is designed to simplify management and is optimised for virtual workloads. The S4820T switches are used in the data centre to guarantee 40 Gigabits per second (Gbps) uplink performance.

Antonella Bozzi, Head of IT Department at EGO, says: "The main reason we preferred Dell's offer was its completeness and high degree of integration, as well as the efficient, centralised hardware management."

### Faster network drives discovery

EGO now has a network to match its requirements as it expands its scope of exploration. The throughput of the present interferometer has increased from 14MB/s to 20MB/s. Antonella

Bozzi says: "We experienced a dramatic improvement in system-level data throughput, moving from just 1Gbps to 10–20Gbps. While in the past the network was almost always saturated, now it runs at just 50 per cent of its capacity, leaving plenty of space for managing spikes in demand or supporting future expansion." Dell's converged infrastructure allows EGO to effectively manage unpredictable events and sudden data peaks, so it can acquire and process experimental data in real time and transmit it worldwide. This way the scientific community can respond to an event as soon as it occurs.

### Simpler infrastructure management

With Dell's Active Fabric Manager software, EGO also has a tool to build, manage and automate its fabrics to save time and money. Stefano Cortese, a Senior System Engineer at EGO, says: "With Dell Active Fabric Manager my team and I no longer have to use the switches' command line. This totally automates switch management and gets rid of time-consuming, error-prone work. We save at least one week each month because we no longer have to intervene in the network manually." EGO also uses Dell OpenManage Network Manager to look after its inventory and upgrade functions throughout the whole network. Cortese says: "The software platforms provided by Dell make management much easier. We get the best of both worlds: the capability to manage large databases through Active Fabric Manager and the flexibility to configure even a single switch with Dell OpenManage Network Manager."

"The exceptional reliability of Dell's solution eliminates a number of worries for us," adds Antonella Bozzi. "Combined with Dell OpenManage Essentials, IT management is easier and the interaction with Dell support is faster. As a result, we expect that management time for routine activities will be cut by half. This frees considerable time that our IT staff can



now dedicate to value-added projects like implementing a new WiFi network, improving EGO's backup infrastructure, or building a disaster recovery site."

#### Greater resilience for peace of mind

The potential costs of network downtime to EGO are huge, but with the new network, overall system availability has improved and the whole infrastructure is redundant. Antonella Bozzi says: "The thought of losing an hour and a half of data acquisition time if a switch fails is intolerable. In some cases, a fault at a switch can result in a problem with the interferometer or at a mirror, which cost €1.5 million each. With the redundant network based on Dell with Intel technology, the risk of unexpected downtime has been virtually eliminated. We sleep soundly."

#### Virtualizing for success

Previously EGO had 70 physical servers and about 40 virtual machines dedicated to monitoring and managing the interferometer and IT infrastructure, and 100 servers dedicated to online computing. It has now extended the virtualization on Citrix® XenCenter® to 100 virtual machines running on 30

hosts. Critical services for the scientific tool are provided by Linux® virtual servers on two VMware® hypervisors in a fault-tolerant configuration. These host servers are located in four Dell PowerEdge M1000e blade chassis, all connected through Internet SCSI (iSCSI). Antonella Bozzi says: "This has boosted overall system reliability. We've saved more than 60 per cent on hardware alone while performance has increased and the number of available CPUs has tripled, giving us a threefold improvement in processing power."

#### Future-proof solution

Antonella Bozzi expects that the present solution will support EGO's needs for the next eight years. She's optimistic about the relationship: "Dell's staff directly assist and can advise us on every aspect of the IT infrastructure. We appreciate this direct relationship model, which has led to great trust between Dell and EGO. Having a single point of contact with Dell ProSupport Plus means that in the event of a problem, we can rely on a partner that knows our specific needs and always provides us with the right solution."

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