FUJITSU

Case study
European Southern Observatory (ESO)

»A space telescope places extremely high demands on a storage system. After the comparison of different systems, the unrivalled performance and cost-benefit ratio of the ETERNUS DX models made the scales tip in favor of Fujitsu.«

Alessio Checcucci, ALMA Archive, European Southern Observatory

The customer

The European Southern Observatory (ESO) is the pre-eminent European science and technology organization in astronomy and operates the scientifically most productive observatory in the world. **www.eso.org**

The challenge

To create a safe harbor for valuable research data captured, for instance, by the ALMA network of radio telescopes in the Chilean Atacama desert. The site produces one Terabyte per day requiring fast replication.

The solution

Disk storage systems from the Fujitsu ETERNUS DX400 S2 series.

The Cosmos in focus

With its world-class observing facilities the European Southern Observatory plays a leading role in cutting-edge astronomical research. ESO is an intergovernmental organization with 15 member states: Austria, Belgium, Brazil, Czech Republic, Denmark, Finland, France, Germany, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland and Great Britain. ESO is headquartered in Garching near Munich where it harbors the most important scientific and technical departments including the organization's administration. The annual contributions of the ESO member states amount to approximately 140 million euros. Presently the organization has about 700 employees. The design, construction and operation of pioneering astronomical facilities and instruments places high demands on the organization's scientists, technicians and engineers and, at the same time, opens up unique opportunities to cooperate with the industry and promote technology transfer.

Powerful storage systems for space information

In Garching the space data captured by ESO's telescope networks runs together. On the Paranal site in Chile, for, instance, ESO operates the sophisticated Very Large Telescope (VLT), based on latest technologies. It is an array of four unit telescopes, each with a main mirror of 8.2 meters in diameter and four additional 1.8-meter movable auxiliary telescopes with the option to use it as a giant optical interferometer. In this mode the telescope can snap images with an angle resolution within the range of thousandths of an arc second. To put it another way, images of such powerful resolution theoretically make it possible to capture a car on the moon and distinguish its two headlights from our planet. It is obvious that the telescopes generate immense and very valuable data volumes night after night. To make the space images and technical data accessible to its members the ESO operates various Sybase databases. "Astronomers from the member states and all over the world regularly retrieve observation data from our scientific archive," explains Dieter Suchar, Head of the Operations Technical Support Department at ESO. "In order to deliver data reliably we use fast-access storage solutions."

Reliable storage systems for data from distant galaxies

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Outstanding performance and easy administration

"To meet the different requirements we distribute our data on high, middle and low performance storage," explains Dieter Suchar. "In the middle performance segment we had already gained positive experience with the Fujitsu ETERNUS DX90 series. However, when it came to high performance storage, we decided to have a completely new look at the cutting-edge technologies on the storage market – and opted for Fujitsu once again." After a trial installation of several months the scales clearly tipped in favor of the ETERNUS DX440 S2 series, Fujitsu's second generation of ETERNUS DX disk storage systems. Its redundant components and RAID protection make this storage system a true data safe. Owing to its superior scalability the ETERNUS DX440 S2 scales flexibly to 960 2.5-inch disk drives enabling the organization to keep pace with intensive data growth. ESO deploys the system with a storage capacity of 50 TB. "We are highly satisfied with the outstanding performance of our ETERNUS DX440 S2," Dieter Suchar is pleased to note. "And also the ETERNUS SF Storage Management Suite goes down extremely well with our system administrators. It ensures maximum configuration flexibility and flawless administration."

Shared storage for ESO science users

In addition to the images the telescopes capture it is also necessary to store the Meta data. "When it comes to the analysis of our data it is important to determine under which circumstances the images were

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grabbed," Dieter Suchar explains. "This includes factors such as wind speed and temperature at the telescope sites. Since the data is collected and stored throughout the night, it is clear that every single one of our observatories has to be able to keep pace with the massive data growth." The Fujitsu storage system mastered the field trials at the Garching-based ESO headquarters brilliantly:

"The data flow is run through the ETERNUS DX440 storage system which is connected to our Sybase database server at a speed of 2,500 Mbit per second. The performance of the ETERNUS DX440 as shared storage is extremely high. When other applications access the system at the same time we are still able to offer our science users 1,400 Mbit per second."

World's biggest network of radio telescopes opens its eye on the Universe

ALMA is one of the most recent and largest astronomy projects the European organization ESO has embarked on with North America, Eastern Asia and Chile. ALMA, the Atacama Large Millimeter Array, is the most complex ground-based astronomy observatory on Earth. By 2013, i.e. after the completion of the largest expansion phase, ALMA will be comprised of a giant array of linked 12-meter and 7-meter antennas. The new network of telescopes will capture light in the Cold Universe at submillimeter wavelengths and hunt its hidden secrets between the threshold levels for infrared and radio radiation. However, when passing through the earth atmosphere the waves are markedly weakened through the water vapor in the atmosphere. Since a high and dry site is crucial to millimeter wavelength operations the array is being constructed on the Chajnantor plateau in the Chilean Atacama desert at 5,000 meters altitude. The world's highest observation position is thus located 750 meters above the Mauna Kea observatories (Hawai) and 2,400 meters above ESO's Very Large Telescope (VLT) on the Paranal (Chile). ALMA's 66 individual precision antennas will form a single revolutionary network of telescopes – with a resolution that tops the capacity of the Hubble Space Telescope tenfold. With ALMA astronomers will be able to explore the composition of stars, planetary systems, galaxies and even the basic building blocks of life more closely.

Data storage at 2,900 meters altitude

ALMA's first scientific observations were initiated already in 2011. "Our operations generate a continuous data stream," explains Alessio Checcucci, who is in charge of the ALMA Archive at ESO. "The observatory produces approximately one Terabyte research data per day." Alessio Checcucci, who also works at the ESO headquarters in Garching, was involved in situ at the ALMA site in Chile for about 6 months. "The data we accumulate at an altitude of 5,000 meters is transferred 40 kilometers downhill via four fiberglass lines." Day after day the raw data that is captured by the telescopes runs together at the control center that is situated at an altitude of approximately 2,900 meters. "For this purpose we need a storage system that meets the highest demands," says Alessio Checcucci. "And that is why, after the comparison of various systems, we opted for Fujitsu."

While EOS in Garching deploys an ETERNUS DX440, the slightly smaller version ETERNUS DX410 that scales flexibly to 480 2.5-inch disk drives and provides a rich set of connectivity and interoperability choices from FC and FCoE to iSCSI host interfaces best suits the needs of ALMA. "The unrivalled performance and cost-benefit ratio of the ETERNUS DX models made the scales tip in favor of Fujitsu," Alessio Checcucci is pleased to report.

The benefit

- Reliable and safe storage of valuable research data
- Non-stop data availability
- Non-disruptive capacity upgrades
- Superior scalability
- Fast access times

Products and services

Storage systems:

- 1 x ETERNUS DX410 S2 with a storage capacity of 10 TB
- 1 x ETERNUS DX440 S2 with a storage capacity of 50 TB

Optimal support in Chile

"To start with, we put the system to the proof in Garching. After successful testing Fujitsu got the go-ahead for Chile," Alessio Checcucci continues. "The Fujitsu experts gave us excellent support and assisted us greatly with the installation on site." The ETERNUS DX410 S2 deployed at the ALMA site in Chile is provided with a total capacity of ten TB. The system is connected to a cluster with four Fujitsu PRIMERGY servers. From here the data is transferred to the main data center in Santiago de Chile and replicated in the regional centers of the ALMA partners in Germany, the United States and Japan. Remote replication to offsite locations is a key component of the ETERNUS DX systems – and truly indispensable for maximum data protection.

Non-disruptive upgrades

Whether in Garching or in the Chilean Atacama desert, the ESO IT managers have the possibility to upgrade their respective ETERNUS DX systems with different 2.5-inch, 3.5-inch, SAS, Nearline SAS and SSD hard drive types, even in mixed configurations. Non-disruptive capacity upgrades are supported just by adding the hard drives with zero downtime. After all, the telescopes never take a break either – they observe the Cosmos all year round and require storage systems that do not take the back seat when it comes to staying power and reliability.

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