bradmark technologies

ESO: European Organization for Astronomical Research

Discovering Real-Time, Performance Monitoring and Event Management

INDUSTRY

• Aerospace

KEY BENEFITS

• "Out-of-the-box" database and system knowledge provides immediate monitoring capabilities

• Maintains a end-to-end monitoring solution under one roof

• Drill down to the root cause rather than manually extracting information

• Proactive monitoring with multi-level alerts

BRADMARK TECHNOLOGY

• Surveillance DB for Sybase ASE

• Surveillance RS for Replication Server

• Surveillance IQ for Sybase IQ

The European Organization for Astronomical Research (ESO) is one of the world's leading research organizations. It is dedicated to astronomy and astrophysics, and operates the La Silla Paranal Observatory in the Atacama Desert in Chile, on behalf of its thirteen member states. Here, ESO operates several optical telescopes with mirror diameters of up to 8.2 meters. The VLT, a complex of 8.2 meters telescopes able to operate either jointly or separately, is the most advanced ground-based optical astronomy facility in the world. ESO is the pre-eminent intergovernmental science and technology organization in astronomy. It carries out an ambitious program focused on the design, construction, and operation of powerful ground-based observing facilities for astronomy, to enable important scientific discoveries.

Created in 1962, ESO provides state-of-the-art research facilities to European astronomers and astrophysicists and is supported by Belgium, the Czech Republic, Denmark, Finland, France, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom. The annual member state contributions to ESO are approximately 120 million Euros and ESO employs around 600 staff members.

ESO's Operations Demand Critical Observation

Originally a DBA, but now ESO's Critical Applications Support group leader, John Lockhart has been responsible the past 12 years for maintaining the databases that directly support ESO operations and its observation facilities in Chile. As one of Sybase's early customers in continental Europe, it's no surprise that ESO's primary data archive relies heavily on Sybase's Adaptive Server Enterprise (ASE). In addition, they utilize both Replication Server and Sybase IQ that currently run on multiple Solaris and Linux platform environments.

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— *John Lockhart,*
Critical Applications Support
Group Leader, ESO

ESO's Paranal observing platform on the Paranal mountain in Chile.

The need for enhanced database monitoring happens twice a year when astronomers around the world get the opportunity to submit proposals to the ESO for telescope research time. During this month-long proposal submission period, it is estimated that approximately 90% of all requests come in to the ESO during the last 36 hours. As a result, high-volume, database interactions put heavy demands on system performance and availability.

After the submission period ends, a peer review process takes place where panels of astronomers review the submitted proposals for grading. Based on the grading and the scientific merit of the proposal; time is allocated to the astronomers and they in turn submit what part of the sky they want to observe and in what order. Once the astronomers have put their observation data into the database in the form of observation blocks (OBs), these OBs are then replicated to ESO's South American facilities. This entire data transaction process resides on a Sybase ASE environment.

Sybase Replication Server is used to replicate the database transactions to the Observatory databases, and to replicate back to ESO's headquarters in Europe the vital meta-data once the observation has taken place. The text meta-data, which is in reality the header of a .fits file, is then compressed and written into the Observatory database server as an image file.

That image meta-data is then written off into Sybase IQ because every image contains between 300-800 descriptors. "We have got quite a few million images and when you multiply those by 100 or 1000," said Lockhart, "you get a lot. And at the moment, in IQ, our largest table is about four billion rows."

On top of Sybase IQ, key information about the telescopes is also stored for the purpose of maintaining quality control and troubleshooting. This critical data includes the wind speed at the top of the shutters, the temperature of the instruments, the periods of time, and which shutters open when. Operations can then look back and see if there is a problem, if it is related to conditions in the dome, or whether it was the instruments.

At the end of the proposal submission cycle, towards the end of March and again in September, ESO's most critical moments occur when system data reliability becomes "double redundant," said Lockhart. "We have to make sure that the proposals are not lost, because you never know which proposal could be a Nobel Prize."

Lockhart explains the importance of monitoring these environments. It is during those critical stages, Lockhart points out, that everything related to database availability is taken with utmost caution. That is when we really need the granularity required to quickly isolate and resolve database issues… and that is where Bradmark's proactive monitoring solution pays for itself. "When you have many databases being replicated there (are) many, many different function strings that change the data. Moreover, when there are many small things going on, you are not able to keep the level of granularity that you would like to. Before, we were running cron-jobs that checked the database every couple of hours and checked replication every couple of hours, and sometimes when you are in a critical period, a couple of hours is a bit too late. You really want to know before hand."
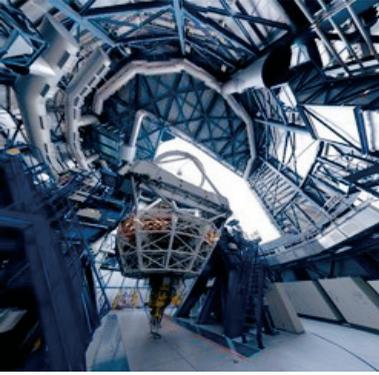
A view inside the dome of one of the four VLT Unit Telescopes.

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— John Lockhart, Critical Applications Support Group Leader, ESO

Surveillance Provides End-To-End Granularity

Because ESO's operations are so interlinked with Sybase ASE, Replication Server and IQ, the primary objective was to not only keep everything all under one roof, but to also implement monitoring solutions that supported their complete Sybase infrastructure.

Their objective was to get real-time monitoring in place. Initially, ESO began its search for monitoring tools in 2002. Unfortunately, no tools were available at that time that supported both ASE and RepServer. In the interim, the ESO team utilized a series of routines that would execute and check the status of various queues and processes. These scripts were very costly to write, and they took valuable time to write. Then the DBA's needed to regularly update and check the routines. ESO also implemented some very basic monitoring, but that only occurred every two hours.

It was not until the Sybase IQ system was enhanced in 2005 that the Sybase IQ team first recommended Bradmark's Surveillance to ESO. Surveillance properly monitored both IQ and Replication Server systems, and "the fact that ASE was there as well – it just fitted in nicely," Lockhart added.

Out-of-the-box, Surveillance provided all the necessary functionality to start monitoring quickly. Lockhart explains that scripts could have been written manually, but it would have taken years to get to the sort of granularity needed, compared with performing just a few mouse clicks to reveal the actual query plan from a runaway query. "Surveillance allows us to be proactive and it allows us to see things before they happen. For example, if we have run away query… we can now see it. Or, if we see that processes are taking more resources, we can actually drill down and see what exactly it is doing. It enables us to get to the query plans from within the actual tool rather than having to manually, extract the information, and manually having to see 'what this process is doing'. We can now actually just drill down… and that's the bit that really does help."

"It's (Surveillance) a great product that covers all the required functionality Sybase has to offer," claims Lockhart. "So for us, it provides everything we need, and more, for all the products that we use. And without these critical applications, we would have difficulty with the automatic movement of the telescopes."

ESO Plots a Course to Standardize Database Environment

ESO operational database challenges are moving forward on a continuous, phased process now that the monitoring functionality is in place. Their next goal is to place all servers and services on a single Linux platform. And finally, they plan to upgrade everything to the same version of Sybase, so that they can eventually expand Bradmark's Surveillance's capabilities. This will allow them to achieve standardize reporting on all platforms. "It's not something that's going to happen overnight. Many applications will need to be adjusted to work for (Sybase ASE) 15 first. The onus is on us to migrate whenever the time is ready."