The ESO Product Data Management System — A New Home for ESO's Technical Documents

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Originally the technical archives at ESO grew organically and lacked a single coherent storage and access system. A search for a powerful product data management (PDM) system to unify the document archives of observatory, telescope and instrument technical material was initiated. After a careful assessment of the possible systems, it was decided to implement the *Kronodoc* system and its recent introduction as the ESO PDM system is described.

Technical archives at ESO

Over the years several tools have been introduced and used for the archiving and sharing of the ESO documents that staff, contractors and consortium partners produce and store for technical products and projects related to telescopes and instrumentation. This hybrid approach has worked well for most of the project teams, but the overall availability and control of the documents was not optimal. There has also been a central archive, called the Technical Archive, which developed from the documentation system set up for the Very Large Telescope (VLT) project and was located at ESO Headquarters in Garching. The VLT archive was originally planned for printed documents and drawings on paper, and was controlled using document lists. On Paranal a separate archive with a copy of the documents from Garching was set up.

In 2003 this paper-based Technical Archive (see Figure 1) was migrated to an electronic archive. New documents were only accepted as electronic files, and were accessible to ESO internal users on the intranet. The printed documents produced earlier and stored were scanned on demand and also made available on the intranet. In 2009, because of the urgent need for office space, the Technical Archive rooms were needed and all the paper documents were scanned by a specialised contractor and thereafter only stored electronically.

Staff at the La Silla Paranal Observatory had, in principle, access to this archive through the intranet. However, on account of a shortage of network bandwidth and speed, the search and download performance was not considered good enough. At the observatories technicians did not always have the documents available when they were needed, and problems remained in maintaining the documentation set in the event of changes or upgrades.

Over the years, and especially with the advent of the European Extremely Large Telescope (E-ELT) project, the need for a centralised archive for technical documentation became more and more evident. In addition, modern features like remote access, configuration control of documents and release workflows were necessary to support such a large and complex project efficiently. It was therefore decided to search for a replacement for the archiving systems.

Search for a new archiving system

Initially the search for an archiving system concentrated on a drawing management system, because it was perceived that drawing sets, with their parts lists and structures, are very complex to handle, and "normal" documents (for example, specifications) should be more straightforward to store and access. Several commercial systems were examined, but, after a detailed investigation, in each case a number of missing features or functions were identified and the candidate systems were considered unsuitable for the ESO research environment.

Contact with colleagues at the European Organization for Nuclear Research (CERN) was established and visits were arranged to learn first-hand from their experience. Many years ago CERN introduced their Equipment Data Management Service (EDMS[1]) system. After years of development and adaptation, EDMS has become a powerful tool and is in use for many projects at CERN, such as the Large Hadron Collider (LHC), and it is accessible worldwide to CERN partners. The CERN documentation experts shared their experience in the design of the EDMS configuration and also generously offered ESO access to their system. The ESO administrators were trained and worked for several weeks with CERN colleagues and in that way gained valuable information.

One major lesson learned from this exchange was that commercial systems designed for industry fit poorly into an open and creative research environment. This is also why CERN had heavily modified a commercial system and programmed a completely new user interface. CERN operates two completely different archives: one for the creation of drawings and another for the project teams, as they had learned that there are different working cultures and processes in the two areas, and integrating them would be difficult and cause many problems.

As a result of these exchanges, ESO investigated the suitability of the CERN EDMS system as a tool to operate the ESO Technical Archive. While these investigations were proceeding, we learnt about another commercial documentation management system from a small Finnish company, called *Kronodoc*. This company was created by engineers who used to work at CERN and helped to implement the CERN EDMS system within the framework of a Finnish in-kind contribution to CERN. Further information on this spin-off company has been published[2]. The *Kronodoc* system was investigated, and we immediately understood the similarities between it and the CERN EDMS.

During the investigation of the CERN system as a possible solution for ESO, we learnt about its many interesting features, but also recognised that EDMS is fully configured for use at CERN. It could only be adapted to ESO's needs in a very limited way, and there would still need to be some compensation for CERN's substantial efforts. The *Kronodoc* system took care of this limitation: it offered many of the interesting features of the CERN system, but with the flexibility to configure it for ESO's needs. So it was

Figure 1. Two views of the paper-based ESO Technical Archive: storage of folders in sliding cabinets (left); registered documents in suspension files (right).

decided to enter into a definition and testing phase, and a contract was concluded with the Dutch company BlueCielo, who had recently acquired the Finnish company *Kronodoc*[3].

Evaluation process

All the evaluations of possible ESO archiving systems were coordinated by the ESO Mechanical Department in the Technology Division, but other areas within ESO, such as the Instrumentation Division or the E-ELT Department, which also deal with projects, were involved so that they could also bring in their respective requirements.

During the system definition and evaluation phase, CERN's approach of separating the technical drawing and CAD (Computer Aided Design) data management system from the general technical documentation system was confirmed. It was decided to go for the drawing and CAD data management system from our CAD system provider, *AUTODESK*, on account of the complex interface between the CAD system and the drawing management system.

For the handling of the technical and project documentation, the *Kronodoc* system was found to be compliant. It had all the needed functionality: its flexible nature allowed it to be adapted to the needs of ESO, it was accessible from everywhere via a secure internet connection and its user interface was compatible with all computer platforms.

As a consequence two projects were started, first setting up the CAD and drawing management system for the Mechanical Department in May 2011, and then defining and configuring the PDM system in December 2011.

PDM

Why do we call our technical documentation system PDM? PDM is an acronym for Product Data Management. In the production industry, PDM systems are complex databases that can track and control the development of complex machines, plants or systems, in very great detail. An industrial PDM system handles thousands of parts, how they are assembled to form complex machines and can provide users with the relevant documenta-

tion at any time. Changes to processes are managed and any change initiated by a designer is scrutinised, and once accepted, the purchase department or workshop will be using the updated documents. Only then can the finished product be traced and the up-to-date documentation be available when the product is used.

At ESO the product creation process is usually not as complex as in the manufacturing industries; however there is the same need for complete and updated documentation when our products enter into their productive life. So we tried to achieve a similar goal: a database which can identify all our products from when they start their life as Phase A projects, through the start of operations at the observatory, tracking any modifications until they are retired from use. The system must provide all users with all documents relevant to our products at any moment of their life.

The majority of ESO's products are designed and produced by industry or consortia, and after testing, delivered to ESO. So there is no need for the ESO PDM system to cover the complex design and manufacturing environments. However, it is essential that we absorb all information created in industrial PDM systems and can access the documents delivered when products pass through their acceptance phase, making this data available to ESO project teams and observatory staff for operation and maintenance. The ESO PDM system is configured primarily for that purpose. In addition the PDM provides collaboration areas for project teams, where they can create and share working documents, and exchange documents with contractors and other partners in a controlled way.

After the contract with BlueCielo for the implementation of an ESO PDM system began, an intensive discussion and fact-finding process started. Over the years, in different areas of ESO, slightly different working cultures had developed, with different processes, or even different names for similar processes. It was necessary to bring all areas back to common standards so that they could be implemented in the automatic processes of a

computerised tool. Representatives of all divisions were involved in discussions and brought up many topics where processes needed documentation and clarification. This coordination work will also continue after the implementation of the system.

In parallel with this preparatory work, a technical question needed clarification: how could colleagues in Chile get access to and find and retrieve documents. With the help of the ESO IT department, intensive tests were undertaken: the latency to a connection to Chile was simulated and the *Kronodoc* system was compared with other existing similar systems including the CERN EDMS. The performance of *Kronodoc*, based on a central server hosted in Finland, was found to be sufficient. Later this was also confirmed by direct tests from Paranal.

After the ESO's internal discussions about documentation processes, experts from the contractor were called in for workshops. The findings of the earlier discussions were explained to the external experts so that they could be implemented into the configuration of the documentation system. This exercise was completed as planned, owing also to the experience of the external experts in similar projects. Testing started, and the ESO PDM administrators were trained. Even during testing, the configuration needed to be adapted by the ESO administrators, because, as is usual in such projects, attempts to implement complex processes, which seemed to be logical in the planning phase, turned out to be too involved.

PDM into operation

As soon as a working system was available the data upload process began. Thanks to the good organisation of the existing archives, the VLT Technical Archive and the ELT Archive, the upload of the documents was achieved within a few months and was completed by the end of 2012.
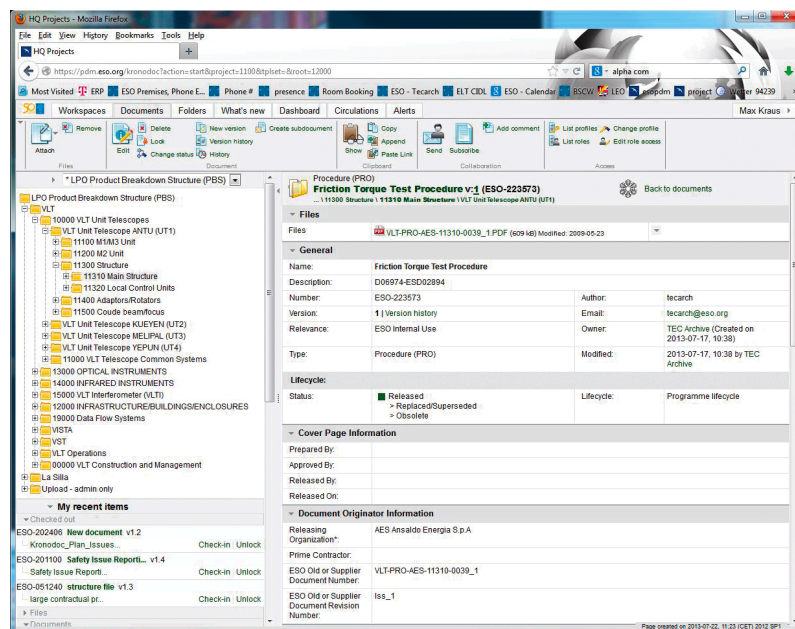
Figure 2. A screenshot of the user interface of the ESO PDM system.

By the beginning of 2013 the documents from the VLT archive, and also all documents from the E-ELT project produced in the study phases, were available in the system and users could access those documents (see Figure 2). After a general presentation, given first in Garching, and later at Paranal, the PDM system became available for the retrieval of all documents previously archived in the Technical Archive. The large volume of scanned documents from the paper archive can now be searched better due to the full-text search capabilities of the PDM system. All these documents are now available for registered users from any internet connection, and using any of the common computer platforms. User training sessions have been offered in Garching and are planned soon in Chile.

At the beginning of 2013 the team of PDM administrators was enlarged and is now preparing additional functionality, such as workspaces for project teams where team members can load documents on their own and share drafts with their colleagues. These workspaces will be created for subsequent project teams and more training on the additional PDM functions is being prepared and will be offered.

All the system selection and configuration work described has given an interesting insight into the growth of internal processes around our products and projects and thereby also into the, sometimes hidden, ESO cultures.

Links

[1] CERN EDMS:
https://epsace.cern.ch/edms-services/
[2] Story of *Kronodoc*:
http://webhotel2.tut.fi/citer/Kronodoc-story.pdf.
[3] Acquisition of *Kronodoc* by BlueCielo: http://www.bluecieloecm.com/bluecielo-acquires-majority-stake-finnish-software-company-kronodoc-oy.