CASE STUDY

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European Space Agency

XML-based Procedures Take Flight On Board the International Space Station

CHALLENGE

To develop a more efficient system of authoring flight procedures for use on the International Space Station.

SOLUTION

An XML content authoring system utilizing XMetaL Author and XMetaL Developer.

RESULT

- Authors generate procedures 70 to 80% faster
- All new procedures comply with rigorous ODF standard
- Eliminated need for manual reformatting of procedures
- Created XML schemas with 10 to 15 year longevity
- New procedures accessible through multiple formats, including laptops, handheld devices, and print, making them easier for astronauts to execute.

Profile

Using the power of XML, the European Space Agency (ESA) along with the National Aeronautics and Space Administration (NASA) initiated a project to improve the system of authoring and executing flight procedures for the International Space Station.

Going to Extremes Demands Precision

If it was your job to wake up in the morning and begin a complex scientific experiment, or prepare a satellite for deployment, you would want explicit instructions. Otherwise things could go seriously wrong.

In industries where safety, extreme environmental hazard and high machine and human resource costs are paramount, the need for procedural accuracy cannot be over emphasized. Literally no where on earth could you find a more stringent requirement for procedural accuracy, than on the International Space Station (ISS).

Control staff on the ground and astronauts in space both use a set of procedures for every operation they perform. The official name for these procedures is Operations Data File procedures (ODF). Essentially instruction sets, ODFs allow astronauts to perform tasks related to the smooth operation of the space station, or to the execution of scientific experiments on board the space station. Even highly trained individuals like astronauts require exact instructions when dealing with extremely complex systems, or while running experiments designed on the ground by experts in many diverse fields.

Static Procedures Take Flight with XML

Currently ISS procedures are static, read-only PDF documents. Their structure and appearance are based on an ODF standard created jointly by international partners in the space station. The ODF ensures legibility, consistency and ease of use. Flight procedures based on the ODF are generated as Microsoft® Word documents. Then they were exported as read-only PDF files.

Using this approach, procedure content and format are inextricable. As a result, authors who may be highly valued for their work as a systems or payload expert, waste a considerable amount of time making sure that what they write is presented in the proper format, rather than concentrating on the actual content. XML allows independent syntax and structure definition while providing powerful input validation features that ensure flight procedures comply with ODF standards. XML also makes it easy to publish procedures to a number of different media, such as laptops, handheld devices and paper.

Recognizing the benefits for astronauts to receive procedures through an XML-based digital on board system, the European Space Agency spearheaded a new project. Maurizio Martignano, Senior System Engineer for SERCO FM at the European Space Agency, knew that XML-based procedures would allow

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"XMetaL was instrumental in the creation of new XML-based systems for the authoring and execution of in-flight procedures for use on board the International Space Station."

Maurizio Martignano, Serco Facilities Management M.B.V. European Space Agency

procedure writers to concentrate on content, making optimal use of their knowledge and expertise. In addition, he knew that XML would reduce the number of errors.

The ESA worked with EADS Space Transportation GmbH; an Irish company, Skytek; and Denmark-based Rovsing to develop the systems necessary to support the creation, management and on board delivery of XML-based procedures. Now, ESA and NASA are working jointly to implement the extensively tested systems across global operations. Martignano worked as a member of this distributed team to develop a system for authoring, validating, maintaining and executing in-flight procedures.

Powering the Transformation

To form the heart of the combined systems, the team chose two XMetaL products, XMetaL Developer and XMetaL Author. Using XMetaL Developer, the team created new XML schema to define the ODF. Now if the ODF changes, the team can change the schema and it will be immediately evident which procedures need to be modified at what points. "By separating the content from the strict formatting requirements using XMetaL Author templates, the team removed a heavy burden from those not trained and not interested in XML formatting, leaving them to deal with their core competencies," explains Martignano. "The application makes it easy for experts to enter content. It formats information and data automatically to meet schema requirements."

Why XMetaL?

XMetaL provides end-users a framework to create reusable business content that increases content quality, cuts production costs and expedites content delivery. XMetaL Author's user interface, which looks and acts very much like the familiar Microsoft Word, allows people to use customized document templates readily with minimal training. "NASA project programmers customized XMetaL Author to provide supportive editing, which means that authors do not need to know low-level XML details in order to create flight procedures that conform to the ODF standard, they simply enter the data and the application formats it for them, producing valid XML," said Martignano.

Another reason the team chose XMetaL over other products was due to XMetaL Developer.

"XMetaL Developer offered our programmers superior power and flexibility," Martignano explains. "The flexibility for integration using COM and Java allowed developers to take advantage of existing application interfaces (APIs) to work with the JAVA-based ODF Workbench which manages and archives the procedures." Experienced Visual Studio .Net customization specialists felt instantly at home within XMetaL Developer. "We didn't have to train programmers at all, they just started using XMetaL Developer right out of the gate," said Martignano. Templates, thorough debugging, and support for drag-and-drop forms design aided development.

Protecting Space Station Safety and Effectiveness

NASA and ESA are so encouraged by the results of the initial systems, that they are now working to convert over 3000 procedures to XML. Today, 20 people at NASA and another 20 people at ESA use the new system to create XML-based ISS procedures. Starting in June 2004 the XML-based system will be used in on-the-ground training and for eventual use on board. "Generating procedures in XML means that by definition they conform to the ODF standard." Martignano concludes, "This not only saves time and money on the authoring side, but in the end, and most importantly, helps us improve usability and safety for astronauts working in space."

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About JustSystems

JustSystems is a leading global software provider with three decades of successful innovation in office productivity, information management, and consumer and enterprise software. With over 2,500 customers worldwide, the company is continuing a global expansion strategy based on its xfy enterprise software, XMetaL content lifecycle solutions, and its pioneering work in enabling XBRL financial reporting technologies. JustSystems is one of the 2008 KMWorld 100 Companies that Matter in Knowledge Management, a 2008 EContent 100 member, and was recognized on the 2008 KMWorld Trend-Setting Product list for XMetaL. Major strategic partnerships include IBM, Oracle and EMC.

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