ADAPTATION OF XMM-NEWTON SAS TO GRID AND VO ARCHITECTURES VIA WEB SERVICES TECHNOLOGY

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ABSTRACT

The XMM-Newton Scientific Analysis Software (SAS) is a robust software that has allowed users to produce good scientific results since the beginning of the mission. This has been possible given the SAS capability to evolve with the advent of new technologies and adapt to the needs of the scientific community. The prototype of the Remote Interface for Science Analysis (RISA) presented here, is one such example, which provides remote analysis of XMM-Newton data with access to all the existing SAS functionality, while making use of GRID computing technology. This new technology has recently emerged within the astrophysical community to tackle the ever lasting problem of computer power for the reduction of large amounts of data.

Key words: Virtual Observatory.

1. THE RISA SERVICE

The RISA Service consists of a Client, a Web Service Interface to SAS (Gabriel, 2003), and a Server application (GRID Interface), that uses VOTable standard as input/output (figure 1). This service provides remote access to all the existing SAS functionality as well as some predefined SAS and scientific workflows that include the extraction of some basic scientific products, such as event files, source images, light curves or spectra. This kind of service represents an advantage for the user. For one, the user does not have to take care of software installation or updates, third party libraries, data downloading or calibration files upgrades. For another, and in a transparent way for the user, the Service takes advantage of GRID architecture to run SAS, achieving high performance in resource management, allowing the analysis of large amounts of data.

1.1. SAS Web Service Interface

With a Client application, an end-point access and an input VOTable file, a user can execute remotely a SAS task or workflow, defined here as a chain of SAS tasks (Ibarra, 2005), in a GRID environment. A given workflow starts with the selection of the desired SIAP(Tody, 2004) (Simple Image Access Protocol) search, like, source coordinates or name, and finishes with the delivery of the workflow products to the user. The search is done on the XSA archive with access to all the XMM-Newton public observations and those private to the user. The user can choose between a predefined scientific workflow (provided by the Science Operations Centre) or define their own workflow with access to all the SAS tasks and parameters. The Client serializes the workflow, together with the correspondent SAS parameters, and using SOAP (Service Oriented Architecture Protocol) messages sends the request to the RISA Service for handling. The RISA Client gets notified when the processing on the GRID has finished and the products are delivered to the user. The application is designed to send the products to a persistent layer architecture compliant with the emerging VOSpace protocol (to be implemented). VO applications, like VOSpec, will be able to read the RISA products.

1.2. Server and GRID Interface

Once the Web Server has processed the user request and the workflow VOTables have been handed to the Server, the Server application creates a template file for each workflow and sends it to the GRID[1] for its processing. Each node in the GRID can run SAS (Ibarra, 2005) and access the XMM-Newton Science Archive (XSA) to retrieve the correspondent Observation Data Files (ODF) thought the AIOClient application. Once the workflow has been executed on the GRID, the products are stored in a Data Product Storage unit and the Client notified via

[1]GridWay tool (http://www.gridway.org)

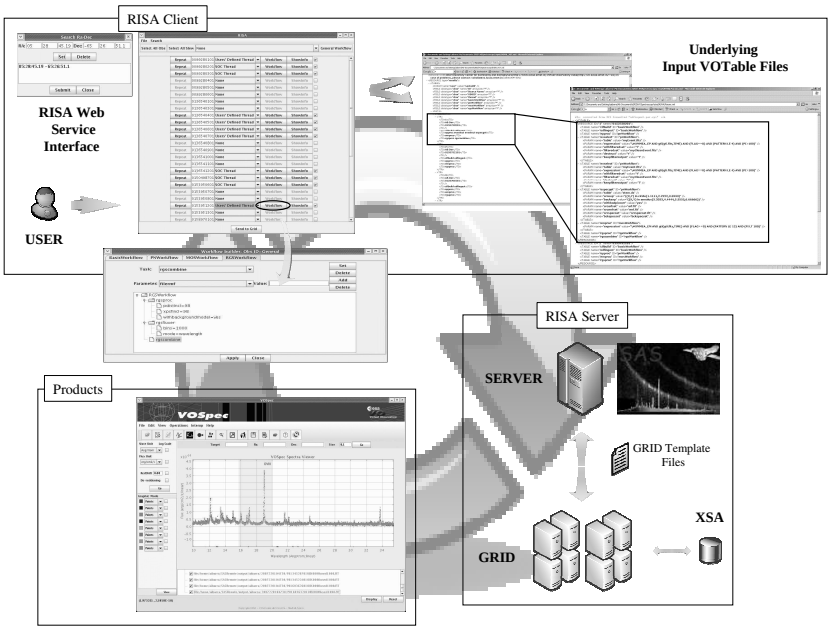

Figure 1. The RISA service consists of a Client application (Web Service Interface) that provides full access to all the SAS task, and a Server application to process the user request and manage the data processing in a GRID environment. The Client/Server application uses VOTable standard as input and output.

an output VOTable file that will provide the user with information about the execution and links to the products.

2. CONCLUSIONS

The RISA Service provides remote access to all the SAS functionality with no need for SAS or third party software installation, with the implicit advantage of having the latest version of SAS and XMM-Newton calibration files. The Service is a stable, reliable and platform independent system with no need of local maintenance, and provides easy and fast access to large amounts of data, with no download required, along with access to large computer resources (GRID).

3. FUTURE WORK

The standardization of the SAS and scientific workflows, access to all the SAS functionality, in the form of a SAS parameter interface, and SAS error handling, still need to be addressed. Workflow generators, such as Taverna[2], will be implemented providing interactive data processing. Tools such as MySpace or VOSpace will be used for data storage. Finally, the RISA Service will generate VO compliant products.

[2]Taverna project (http://taverna.sourceforge.net)

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