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Adapting ISO and XMM-Newton Archives to Inter-Operability VO Standards

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Abstract. The ISO Data Archive (IDA) and XMM-Newton Science Archive (XSA) were already providing some support for inter-operability from external archives and applications to the IDA and XSA. These services allow to directly access IDA and XSA metadata and data products without going through the archives usual user interfaces. These services have been adapted to existing VO standard, in particular the SIAP (Simple Image Access Protocol). This paper describes the way ESA, as a data (ISO and XMM-Newton) provider has adapted his system to the VO without modifying the internal metadata and data repository structure.

1. Introduction

Within the ESA's Science Operations and Data Systems Division, the Archive Development Group in Villafranca, Spain is responsible of developing and maintaining ESA Scientific Archives. In particular, the ISO Data Archive (IDA) and the XMM-Newton Science Archive (XSA) have been developed using the same flexible and modular 3-tier architecture which have allowed them to be inter-operable with other astronomical archives and applications.

The standard way of accessing these ESA archives is normally through a powerful and similar Java interfaces (IDA[2] XSA[3]) where users can interactively query, visualize and retrieve the observations and sources' catalogues of these missions.

In the recent months, IDA and XSA existing inter-operability services have been adapted to comply to the new VO standards, in particular the SIAP (Simple Image Access Protocol). The archive modular architecture has made this adaptation relatively easy, without requiring to modify the way the archives are internally organized.

2. Inter-Operability System Before the VO

For several years already, the IDA and XSA have offered some inter-operability services which allowed external archives or applications to bypass their standard

[2]`http://www.iso.vilspa.esa.es/ida`

[3]`http://xmm.vilspa.esa.es/xsa`

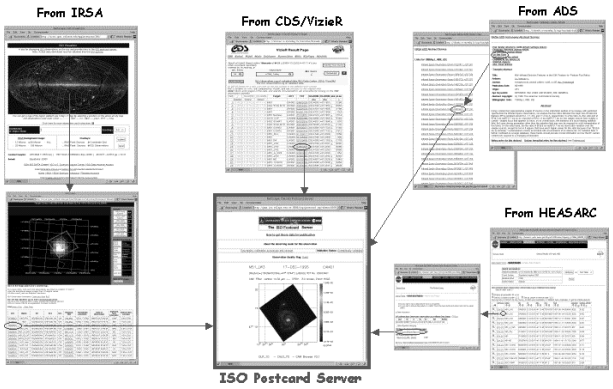

Figure 1. ISO Postcard Server

user interfaces and access the archives catalogue and products without requiring human intervention. Furthermore, the IDA and XSA user interfaces are also accessing remote archives (ADS, SIMBAD, NED, IRAS, ...) to provide links to relevant information for the end user. An example of such service is described in Figure 1 describing how the ISO Postcard Server is accessed from various archives.

Nonetheless, this access mechanism has some drawbacks:

- there is no real access to the metadata, but only to the data products (quick look data or scientific data products)
- the interface has to be defined on a case by case basis, by giving the required metadata to the external archive

Therefore, it has been decided to develop a system that could give access to both archives metadata and data products. This was initially provided by the new system Archive Inter-Operability which was developed for ISO and XMM-Newton.

Later on, VO inter-operability working groups defined the SIAP (Simple Image Access Protocol) which provides the following major functions:

- Image Query (access to metadata)
- Image Retrieval (access to data products)

3. New AIO Architecture for the VO

With the existence of our AIO system to provide inter-operability to our archives and the advent of the SIAP, it appeared natural to us that the AIO system should be adapted to be able to support SIAP standard. We did not want to build a completely new SIAP system beside our existing AIO, but rather building an extra layer on top or our AIO to support SIAP requests. The resulting architecture is described in Figure 2.

Normal project clients (such as the IDA and XSA Java user interfaces) are interfacing with the Project Business Logic. This Business Logic, also called middle tier allow transparent access to the metadata and the data products. If the organization of the data is modified, the clients do not have to be modified as this is dealt with by the Business Logic.

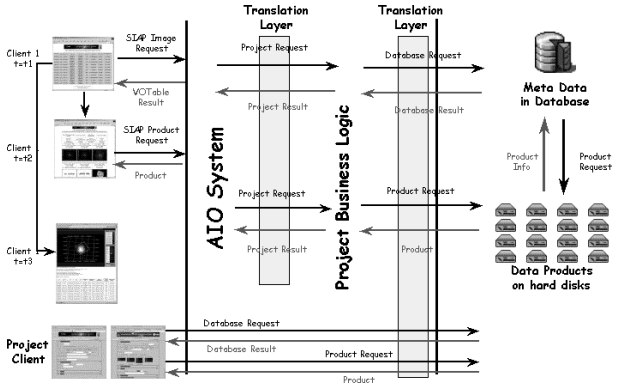

Figure 2. VO AIO Architecture

The AIO provided an extra layer of abstraction for other clients to access metadata and data products, bypassing the standard user interfaces. As a new client, the AIO interfaces with the Project Business Logic.

Furthermore, an extra layer has been added to allow clients to make SIAP requests through the AIO system.

Finally, all clients (normal user interfaces, AIO system, other VO clients) can access the metadata and data products through the same final interface which is the Project Business Logic.

To provide ISO and XMM-Newton metadata and data products to the VO, the internal existing systems (user interfaces, Project Business Logic, database, data products repository) did not have to change at all.

4. Translation Layers

To allow the existing systems to be re-used to support VO standards (SIAP, VOTable), translation layers have been built to translate VO SIAP specific request into known requests to our existing systems.

A SIAP Image Request is translated into an AIO metadata request, which then is transformed into a Database Request (standard SQL query). The Database Request is then returned as the result of the SQL query, but is then translated into a VOTable as per the SIAP standard. For the results to be also viewable, we have added two more formats of the results (ASCII and HTML).

Similarly, a SIAP Product Request is translated into an AIO product request, which then is transformed into a product request to the existing data repository. The products are then returned in a URL stream for the SIAP client to make use of it. If wanted, the products can also be returned on a FTP server.

The translations are made through the translation layers using XML files. Metadata query can be made based on UCDs as per SIAP format, but it will finally be translated into an SQL query based on our existing database structure (table and column fields) which are of course not in UCDs.

All is illustrated in Figure 3.

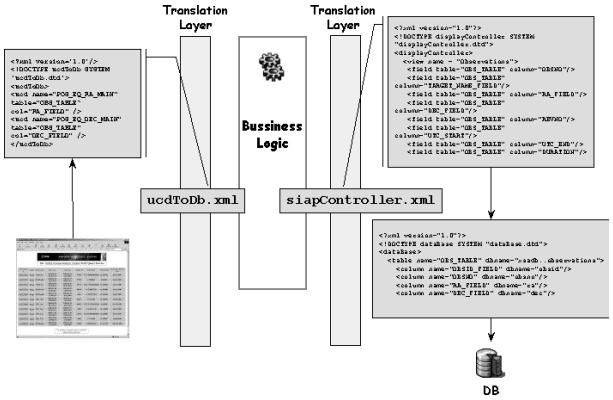

Figure 3. Translation Layers

5. Conclusion

Thanks to an already modular and flexible 3-tier architecture design of the ISO Data Archive and XMM-Newton Science Archive, it has been quite easy to adapt our existing inter-operability system for them to support VO standards (SIAP, VOTable).

The use of translation layers between the various parts of the systems has proven to be very appropriate as it allows to support VO standards without necessity of modifying your existing database and data products repository. You can then allow searches on UCDs without having to modify anything in your existing database.

All this development has been performed with JAVA JSP and Servlets coupled with XML which have proven to be a good suite for developing this type of application.

This system is very flexible and although originally designed to provide Simple Image Access, has also been improved to provide access to ISO and XMM-Newton spectra using exactly the same mechanisms.

Full documentation about how to use these services can be found at:

- ISO : http://pma.iso.vilspa.esa.es:8080/aio/doc
- XMM-Newton : http://xsa.vilspa.esa.es:8080/aio/doc

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