Virtual Observatory

Masatoshi Ohishi

Astronomy Data Center, National Astronomical Observatory of Japan, 2-21-1, Osawa, Mitaka,
Tokyo, 181-8588, Japan
email: masatoshi.ohishi@nao.ac.jp

Abstract. The International Virtual Observatory Alliance is briefly introduced as a concensus-based group to construct International Virtual Observatory – a new, planet-wide research infrastructure for the 21st century astronomy. Standardized protocols by the IVOA were used to interconnect more than 10 astronomical obsrvatories and data centers to provide astronomers with multiwavelength astronomical data. The the priority areas for technical development and planned developments are described.

Keywords. Standardized Protocol, Astronomical Database, International Collaboration

In recent years many large telescopes are operating, under construction, and planned to produce Peta-byte scale data. It is crucial to develop a mechanisim to utilize and integrate such data to accerelate astronomical researches. The International Virtual Observatory Alliance (IVOA: http://www.ivoa.net) represents 16 international projects, as of August 2006, working in coordination to realize the essential technologies and inter-operability standards necessary to create a new, planet-wide research infrastructure for 21st century astronomy. This international Virtual Observatory will allow astronomers to interrogate multiple data centres in a seamless and transparent way, will provide new powerful analysis and visualisation tools within that system, and will give data centres a standard framework for publishing and delivering services using their data.

The first step for the IVOA projects is to develop the standardised framework that will allow such creative diversity. Since its inception in June 2002, the IVOA has already fostered the creation of a new international and widely accepted, astronomical data format (VOTable) and has set up technical working groups devoted to defining essential standards for service registries, unified content descriptions (UCDs), data access (Images, Spectra, Catalogs, and so on), data models and query languages to access distributed databases following developments in the grid community. These standards are still evolving, and readers are suggested to visit at the IVOA web site, as well as links to each national project, to get the most recent information. Figure 1 shows a schematic diagram regarding relationship of each standards.

These new standards and technologies were used to build science prototypes, demonstrations, and applications. As of 2006, more than 10 observatories and data centers in Canada, Europe, Japan and the United States of America have been interconnetced to provide astronomers in the world with large scale, multi-wavelength data. More observatories and data centers are expected to join this international framework, and some VO projects have moved to their operations phase.

The ultimate goal of the International Virtual Observatory will be to provide not only a seamless and transparent way to access data in the world, but new powerful analysis and visualisation tools within that system. IVOA has been working to standardize workflow (pipeline) mechanism to perform data access, data analysis and visualization as a single job. It is required to define workflow description language, workflow execution mechanism,
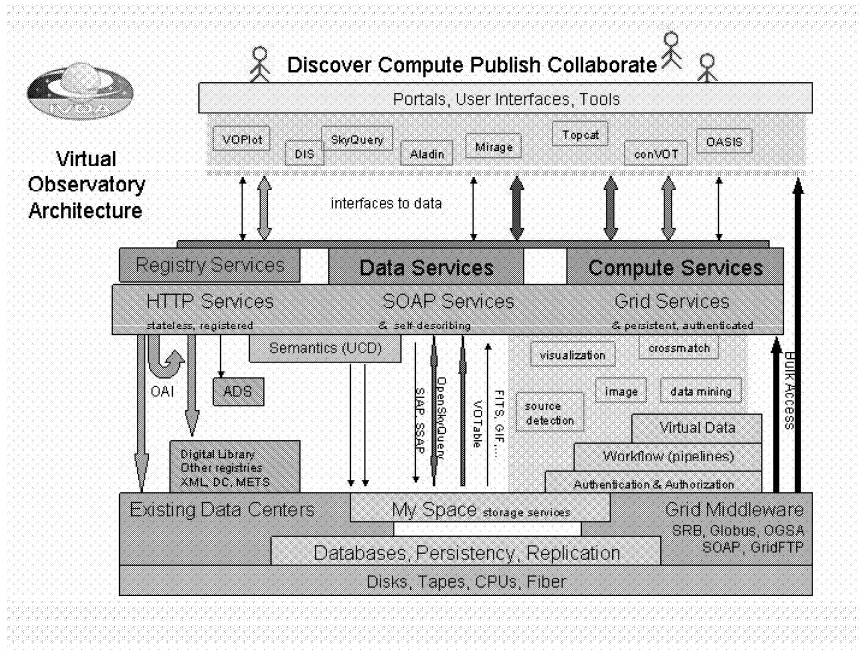
Figure 1. Schematic diagram showing relationship of IVOA standards and Computing Resources for Astronomy
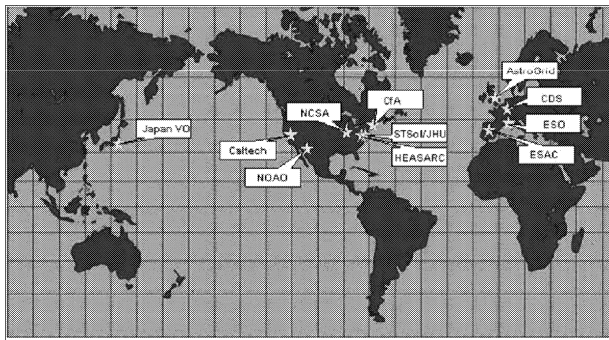

Figure 2. Observatories and Data Centers in the World, as of August 2006, that are being interoperated as International Virtual Observatory

metadata definition to describe applications, and single-sign-on mechanism to seamlessly access several sites that are operated under different access policies.

FInally it should be noted that the IAU has set up the VO Working Group under Commission 5 to authorize the IVOA standards.

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