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DASH—Distributed Analysis System Hierarchy

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Abstract. We developed the Distributed Analysis Software Hierarchy (DASH), an object-oriented data reduction and data analysis system for efficient processing of data from the SUBARU telescope. DASH consists of many objects (data management objects, reduction engines, GUIs, etc.) distributed on CORBA. We have also developed SASH, a stand-alone system which has the same interface as DASH, but which does not use some of the distributed services such as DA/DB; visiting astronomers can detach PROCube out of DASH and continue the analysis with SASH at their home institute. SASH will be used as a quick reduction tool at the summit.

1. Introduction

DASH is an object-oriented data reduction and analysis system for the 8.2 m SUBARU telescope in Hawaii. It is the Observatory's system for managing, reducing, and analyzing the huge amount of astronomical data produced by various Subaru instruments. Design goals include reproducibility and portability of the reduction, seamless operability on heterogeneous computer systems, open architecture, trial-and-error processing, pipeline processing, and research-target-oriented analysis. For these purposes, CORBA is adopted as a distributed object environment (Takata et al. 1998). With CORBA, we can easily connect the system backbone coded in C++, and the GUIs coded in JAVA2 (Figure 1). The details of the DASH system were reported in Yagi et al. (2000) and Mizumoto et al. (2000).

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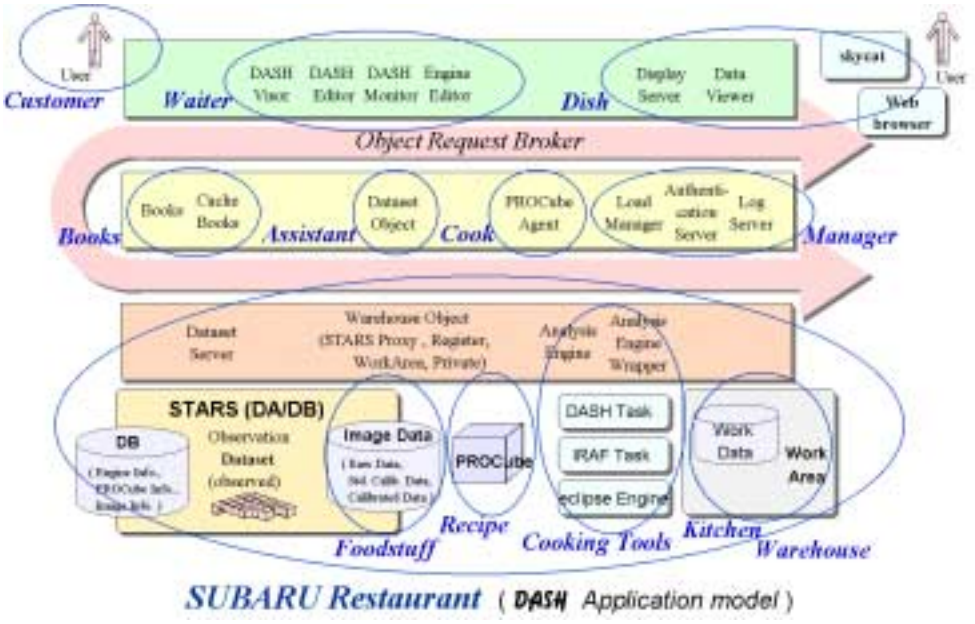

Figure 1. DASH application model (SUBARU restaurant)

2. Observation Dataset and Quality Control

There are three subsystems of the Subaru computer system: the Subaru Observation Software System (SOSS), the Subaru Telescope data ARchive System (STARS), and DASH. The key idea connecting them is the "Observation Dataset" (Kosugi et al. 1998).

The Observation Dataset consists of Dataset rules and an Observation log. Dataset rules define how the observation should be done. For example, it defines how often bias frames should be taken and which commands should be used. Every observer makes his/her observation plan in SOSS following Dataset rules, so that all calibration data to reduce a target should be obtained during the observation. The Observation log and the Dataset rules are sent to STARS with the data. After the observation, DASH reads the Observation Dataset from STARS. In the dataset, a template reduction procedure (skeleton PROCube) is also specified. DASH fills the template with the data, and the target is thus automatically reduced/analyzed to output some data quality parameter, such as seeing size. We can improve the Dataset rules by examining the data quality and feed it back to SOSS.

3. SASH

Just prior to this conference, we released SASH[2], a stand-alone system extracted from a core part of DASH. Because DASH is strongly connected with STARS

[2] `http://optik2.mtk.nao.ac.jp/SASH`

Figure 2. Phase 1: Current System

(Subaru data archiving system), and the SUBARU user/group authentication system, DASH is available only at SUBARU Hilo (Hawaii) and Mitaka (Japan). SASH is designed so that visiting astronomers can continue the data analysis at home institutions and feed the results back to the DASH systems.

For portability, the SASH platform is coded in JAVA2, with some C++ backbones of DASH rewritten in JAVA2. Users may add to the SASH platform using reduction engines such as eclipse or IRAF. There are few UNIX OSs on which JAVA2 1.2.2 is available. We therefore selected Solaris Sparc and Linux for the SASH environment at present. Some engine wrapper scripts written in Bourne shells must be rewritten because of the difference of behavior of some binaries (eg. awk).

4. Connection between DASH and SASH

There are two DASH systems now, in Hawaii and Japan. Each is connected to a local database and archive system, and the DB/DA systems are not synchronized. On the other hand, SASH has its 'database' as files. So, DASHs and SASHs share 'reduction' by exporting/importing warehouses, which contains engines, PROCubes, and data (Figure 2). Users should explicitly detach and attach warehouses. DASH and SASH use their own naming service for local objects.

In the next development phase, we plan is to connect the two DASHs at Hilo and Mitaka via IIOP (Figure 3). The naming service of each system will collaborate with the other to resolve objects so that users can continue the reduction at Hilo on the Mitaka system, and vice versa. If a requested object is not in its local system, the object is transferred from another system through ORB. This function depends on faster Internet speeds between Hilo and Mikata than are currently available.

Our ultimate plan is to connect DASH and SASH via IIOP and to use an interoperable naming service on all systems (Figure 4). Importing/exporting would then no longer be needed. If some data were needed, SASH would automatically connect to the nearest DASH and to retrieve them.

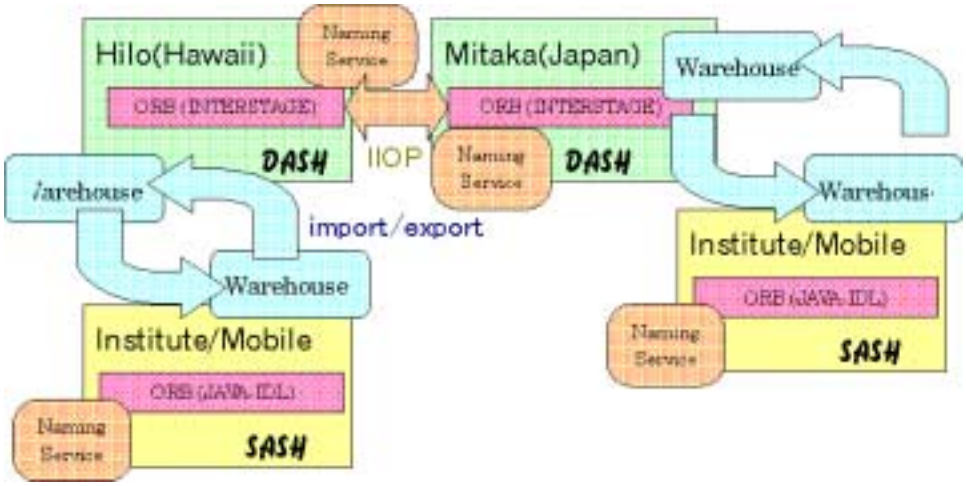

Figure 3. Phase 2: Near Future

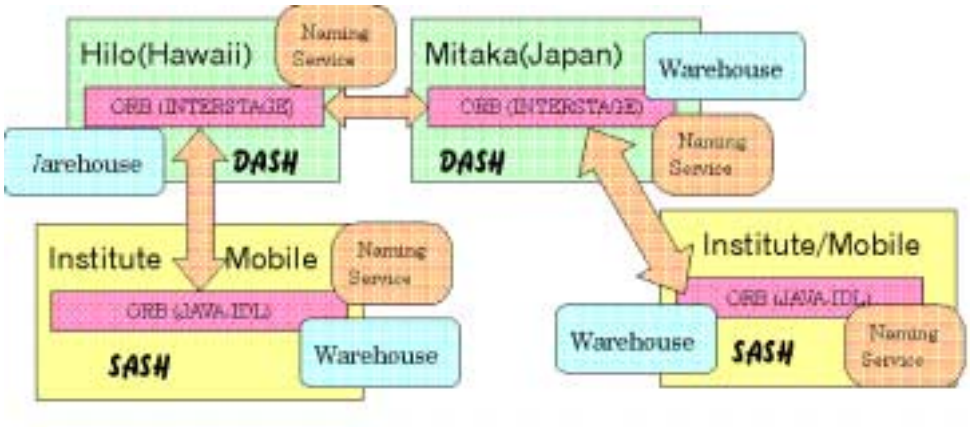

Figure 4. Phase 3: Final System

References

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