Objectivity Case History

Customer Information

Customer: Fermi National Accelerator Lab - Sloan Digital Sky Survey (SDSS)
Status: (X) SOLD ( ) Prospect ( )Integrator
Industry: Astrophysics
Application Domain: Mapping (The Universe)
Status: Customer
Platform: SGI (will also be on Digital UNIX - Alpha IBM AIX - RS6000 & Sun - Solaris)
Compiler: SGI
Other Tools: Paradigm Plus (Object Modeling tool from Platinum)

Buying Criteria

Performance on benchmarks, interoperability and scalability

Why Objectivity

The Sloan Digital Sky Survey represents an ambitious project to photograph and catalogue one quarter of the celestial sky. Images for approximately 100 million stars, 100 million galaxies, and 100,000 quasars, visible across the northern galactic cap, will be digitally collected and stored. An important result of the study will be a three-dimensional map of the universe. Additionally, the significant volume of data collected from some of the deepest portions of the universe should provide greater insight to the large-scale composition and evolution of the universe.

The SDSS is a collaborative effort between several institutions in both the United States and Japan. Major funding for the project is provided from the Alfred P. Sloan Foundation.

Images of the stars will be scanned through the 2.5 meter optical telescope located at the Apache Point Observatory in New Mexico. However, instead of a conventional camera with photographic film, electronic devices known as CCD's will be mounted at the base of the telescope to digitally capture and record the passing sky. The high volume of data involved in the Survey necessitates the use of digital methods for both image acquisition and analysis.

Over the five year observing period, both photometric image data (in several wavelengths from infrared to ultraviolet) and spectroscopic data will be collected. The analysis of this data (some 12 terabytes worth) is left to the Survey's subsystems or pipelines. These pipelines comprise a coordinated study to measure the brightness, geometric positions, and distance of stars, galaxies, and quasars.

The following institutions are full scientific partners in the SDSS project. All participate in science software development and decisions about the project's science.

University of Chicago
Fermi National Accelerator Laboratory
Institute for Advanced Study
Japanese Participation Group
Johns Hopkins University
Princeton University
US Naval Observatory
University of Washington

The following groups are responsible in various ways for overseeing the SDSS:

ARC (Astrophysical Research Consortium) Board
SAC Science Advisory Committee
WGs Scientific Working Groups
TOG Technical Oversight Group
SSAC Science Software Advisory Committee
CIAC Computing Implementation Advisory Committee

Astrophysical Research Consortium

Originally formed in 1984 to build telescopes at Apache Point, New Mexico, ARC now is comprised of:

The University of Chicago
Institute for Advanced Study
The Johns Hopkins University
New Mexico State University
Princeton University
University of Washington
Washington State University

ARC has a board, which oversees the 3.5m telescope and other ARC facilities at APO.

As part of its expanding Astrophysics program, Fermilab is participating in the Digital Sky Survey (DSS). Fermilab is part of a collaboration involving University of Chicago, Princeton University, and the Institute of Advanced Studies (at Princeton). DSS main results will be a photometric imaging survey and a redshift survey of galaxies and color-selected quasars over the Northern Galactic Cap.

The main reasons for the selection of Objectivity were performance and heterogeneity.

Heterogeneity was necessary as they are running multiple platforms at FermiLab in Batavia IL (Operational version of the database) and at John Hopkins ("Science version).

Each day brings a large quantity of data which must be "Stuffed" into Objectivity. The chart below summarizes all the processing against the database:

	Function	Machine Used	Users/Processes	Comment
1.)	Stuff Image data in DB from FITS files	SGI/IRIX 6 Processor	6 Simultaneous Processes	Preceeded by FITS creation from D (Non-DB operation run on Digital U hours (for full 8 hour night of data fr Run every day data is received.
2.)	Resolve Overlap	SGI/IRIX 6 Processor	1-2 Simultaneous Processes	Need a few #1's first Then run for e (roughly same as each day data re
3.)	Export Resolved Image data to FITS Format (as input to Operational DB and to Determine Spectra Targets)	SGI/IRIX 6 Processor	Up to 6 Simultaneous Processes	Run after each resolve step
4.)	Add Spectra (red-shift) links to DB	SGI/IRIX 6 Processor	4 Simultaneous Processes	Every day spectra data received - after startup
5.)	Export to FITS with Spectra Data	SGI/IRIX 6 Processor	4 Simultaneous Processes	After each 4.) - FITS is input to 7.)

6.)	Load Science DB from FITS files created in 3.) (Johns Hopkins code)	SGI/IRIX 6 Processor	TBD	Johns Hopkins code - Run at Ferm
7.)	Update DB from FITS files created in 5.) (Johns Hopkins code)	SGI/IRIX 6 Processor	TBD	Johns Hopkins code - Run at Ferm
8.)	Queries to Operational DB	SGI/IRIX 6 Processor	Roughly 5 users	Written at Fermi
9.)	Queries to Science DB Johns Hopkins Code	SGI/IRIX 6 Processor	70 Simultaneous astrophysicists VIA NET and/or Direct Log-in	Johns Hopkins code - Run at Ferm
10.)	Other Johns Hopkins	SGI/IRIX 6 Processor	TBD	
Notes:	A.) If 6 Processor SGI Machine Overloads, A Digital UNIX machine (currently used to create FITS from DLT Tapes) may also be used for DB			

Contact Information

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