Spitzer Heritage Archive

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Spitzer Space Telescope

- One of the NASA's four great observatories
  - *Hubble, Compton, Chandra, Spitzer*
- Launched August 25, 2003
  - *Three instruments: IRAC, IRS, MIPS*
  - *Wavelength range from 3.6um and 160um*
- Cryogen depleted on May 15, 2009
- Warm mission started September 2009

- IRSA
  - *IRSA: InfraRed Science Archive*
    - IRAS, 2MASS, …
  - *Final home for Spitzer Heritage Archive*
- This talk
  - *Spitzer Data Products*
  - *Design principles*
  - *Major features*
  - *System architecture and reusability*

Spitzer Data Products

- Pipeline data
- Enhanced data
- Legacy data
- Warm mission data
- ~25 TB data products

Design Principles

- Easy to learn and use
- Feel fast
- Well integrated
- Consistent look
- Strong OO design
- Easy to maintain
- Extensibility and Reusability
- Reuse existing software

Major Features of

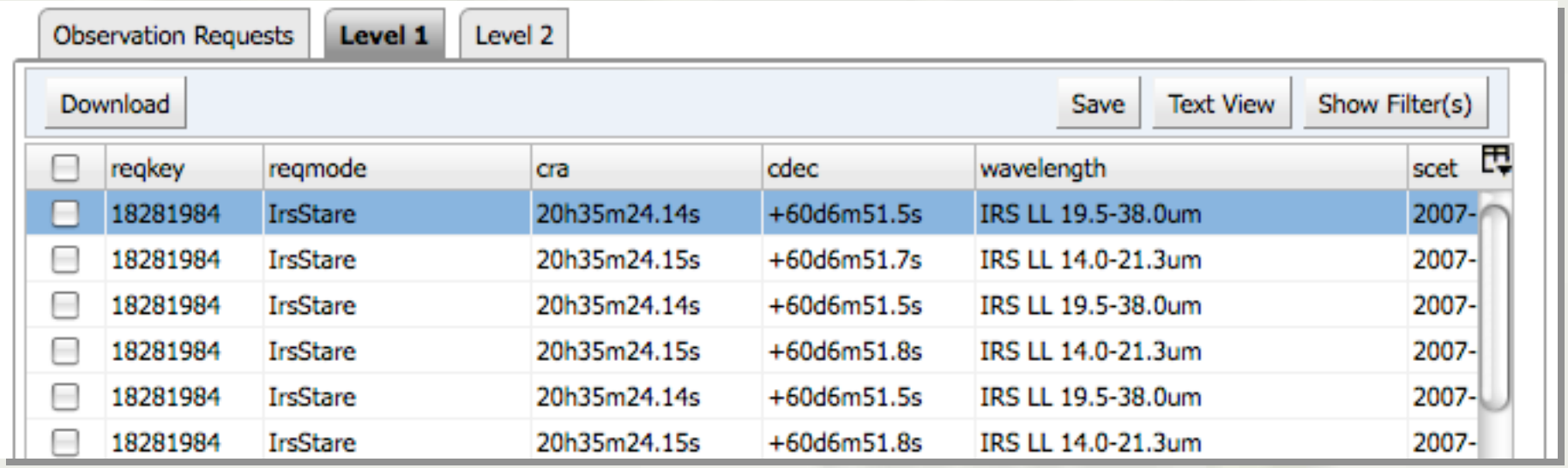
Spitzer Heritage Archive

Search Capabilities

- Radius search with instrument and wavelength constraints
  - *one position or a list of positions*
- Observer (PI)
- Program ID
- Observation Request (AOR) ID
- NAIF ID (for moving target)
- Campaign ID
- Observation date
- Free form text search(Google like)
  - *Any text in proposal abstract, proposal title, and category*

Data Presentation (1)

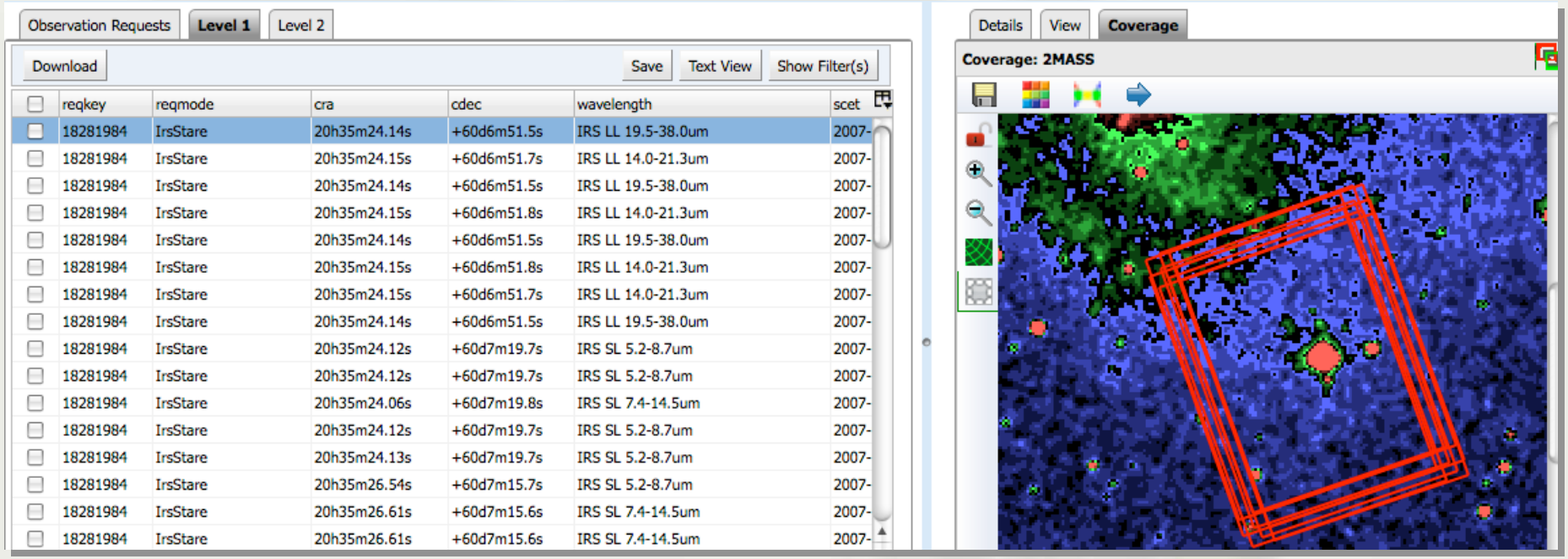
- Different levels of data
  - *Observation Request*
  - *Level1(BCD)*
  - *Level2(PBCD)*
  - *Level3(Enhanced products or source list)*



reqkey	reqmode	cra	cdec	wavelength	scet
18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
18281984	IrsStare	20h35m24.15s	+60d6m51.7s	IRS LL 14.0-21.3um	2007-
18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
18281984	IrsStare	20h35m24.15s	+60d6m51.8s	IRS LL 14.0-21.3um	2007-
18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
18281984	IrsStare	20h35m24.15s	+60d6m51.8s	IRS LL 14.0-21.3um	2007-

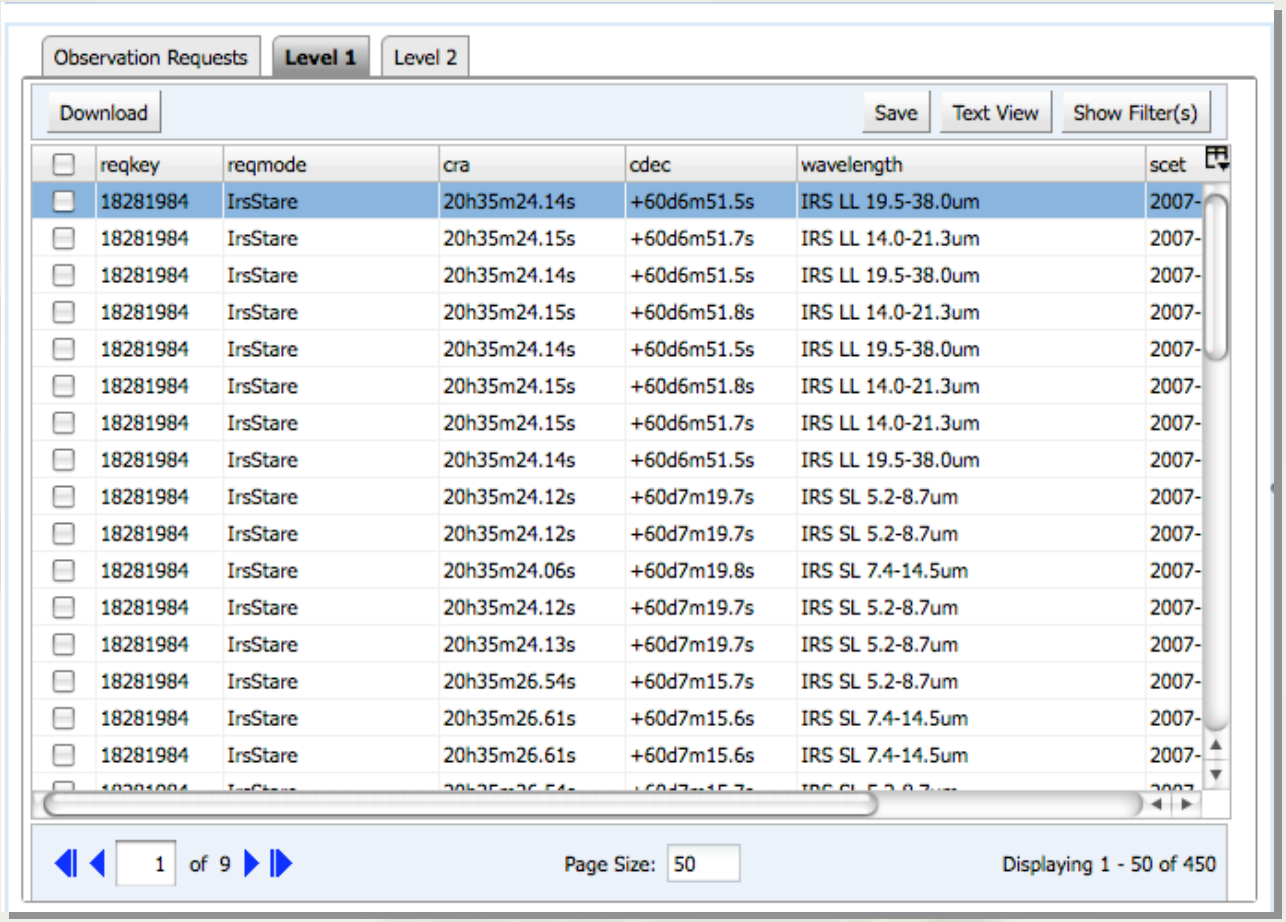
Data Presentation (2)

- Dual panels display
  - *Meta data table panel*
  - *More information panel*
  - *Interaction between the two panels*



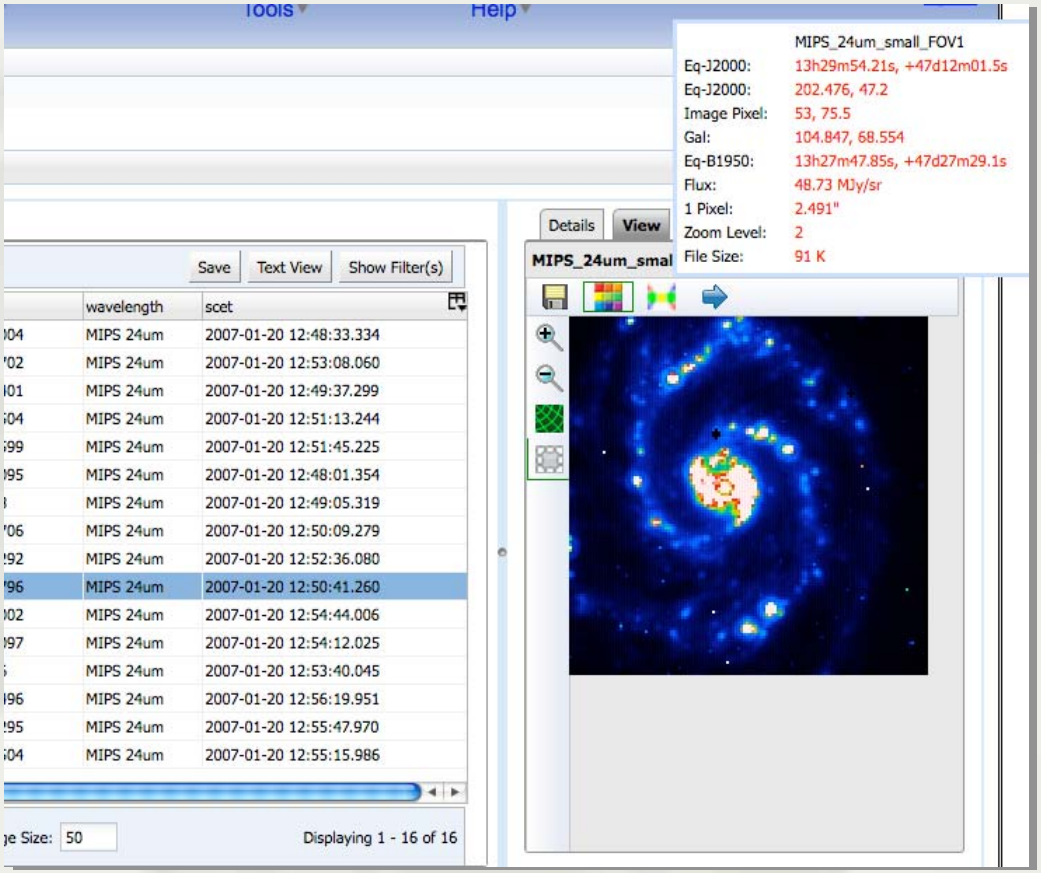
Data Exploration - table manipulation

- Paging
- Sorting on columns
- Filtering on columns
- Customizing displayed columns
- Saving meta data



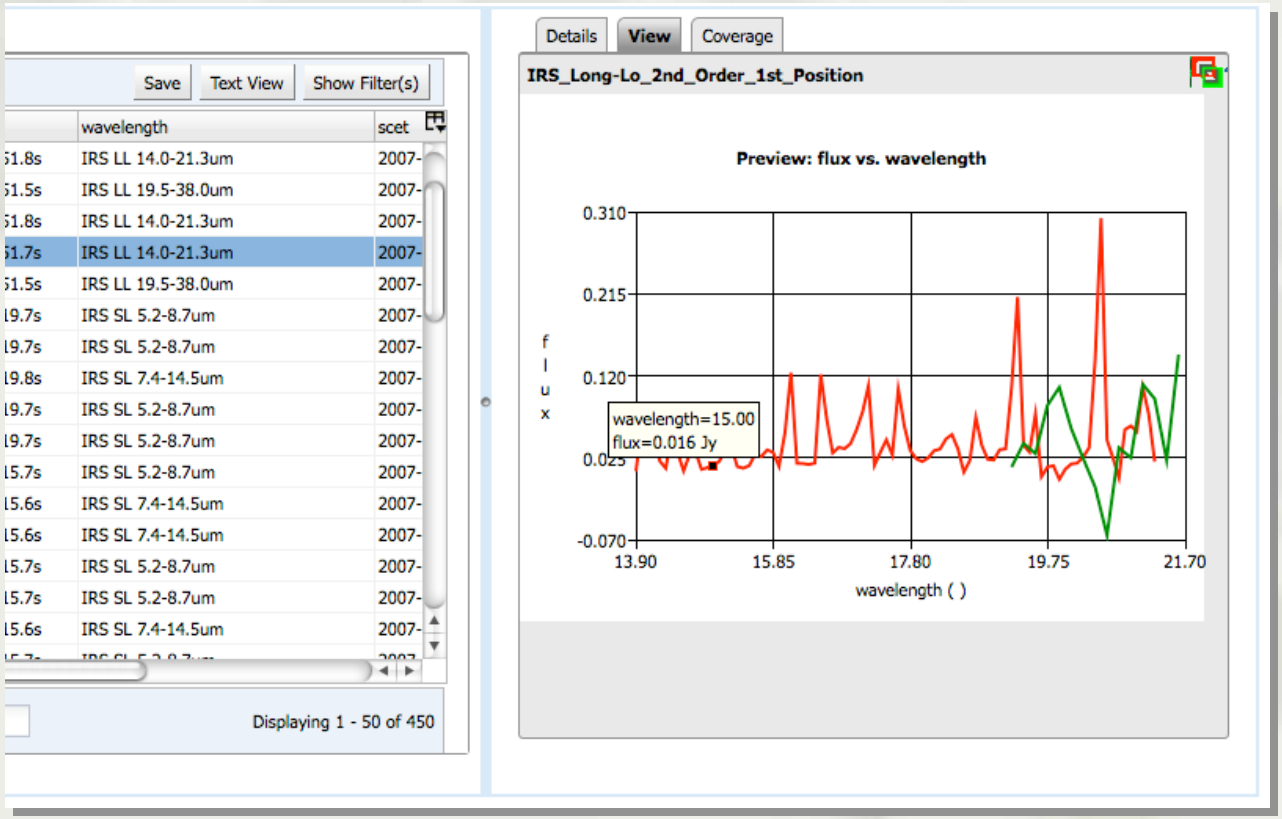
Data Exploration - image

- Position and flux value read-out
- Pre-defined color table and stretch
- Grid overlay
- Zoom in/out
- Image cut-out
- North up arrow
- Image rotation
- Magnifier and thumb-nail



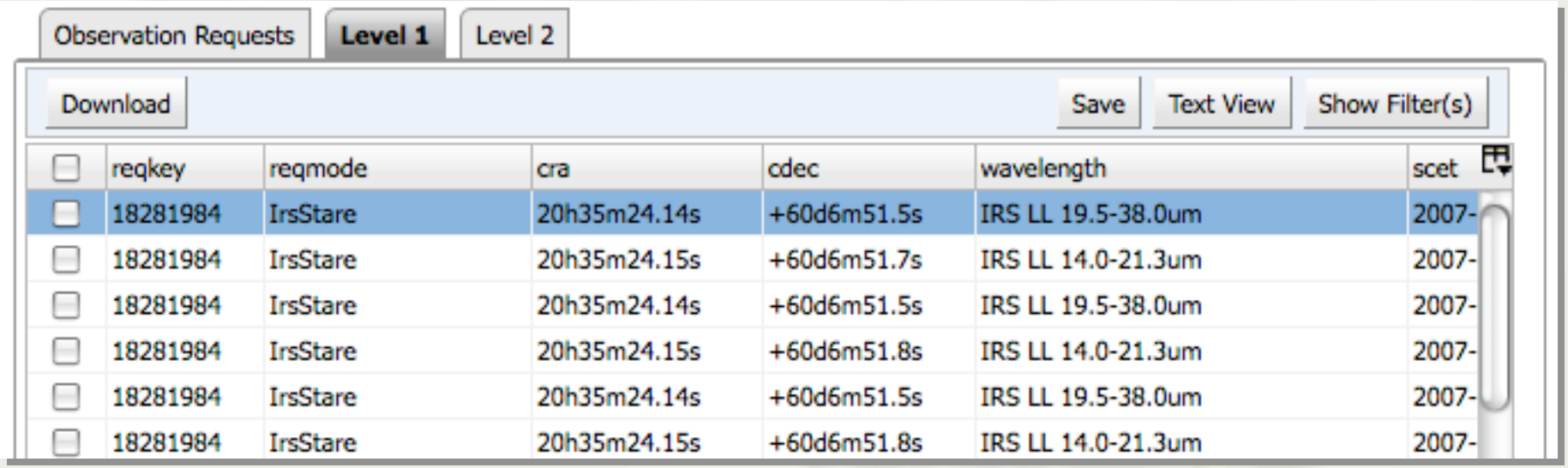
Data Exploration - spectrum

- Flux and wavelength value read-out
- Zoom in



Data Download

- Download anytime
- Select individual or all the data to download
- Package in background
- Monitor packaging status



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User Registration

- Optional
- Benefits
  - *Remember email for download notification*
  - *Remember the search history*
  - *Remember user preference*

Two Ways to Access

- Web interface
  - *Search*
  - *Explore interactively*
  - *Download*
- Program interface
  - *Search*
  - *Download*

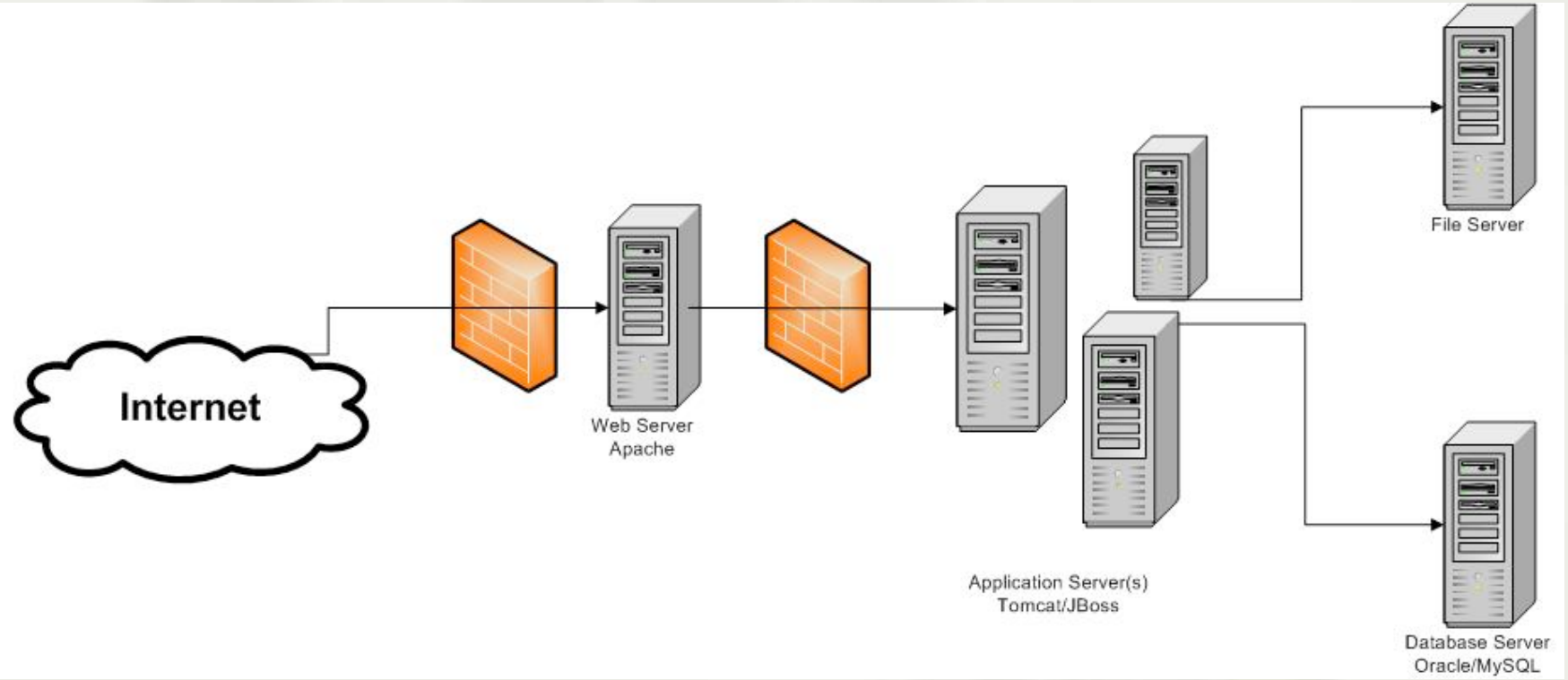
System Architecture and Reusability

Major Technologies

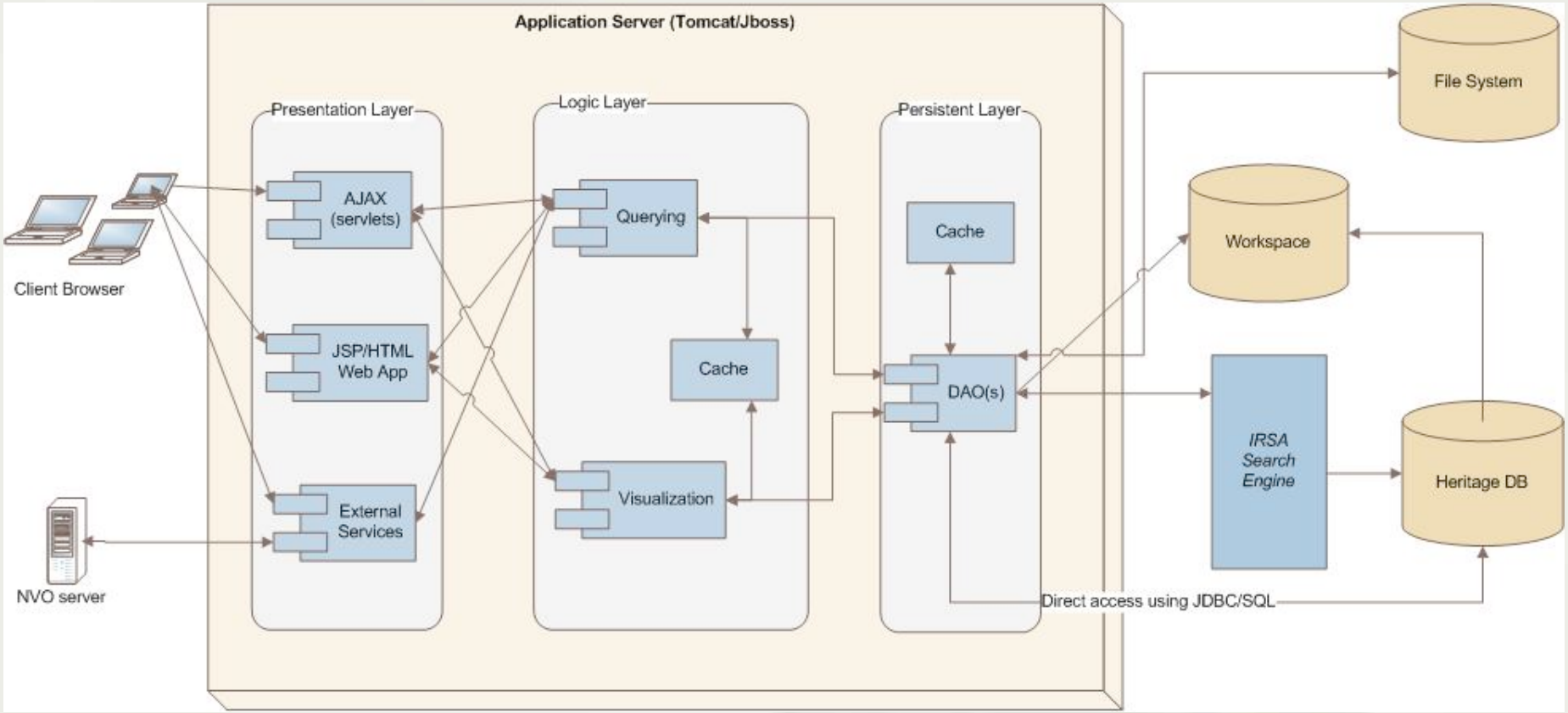
- Multi-tiered architecture
- AJAX
  - *GWT - Google Web Toolkit*
- Java application server
  - *Tomcat*
  - *Three layered design*
    - Uniform access to external data in files, DBMS, *etc.* (Persistence)
    - Generic data manipulation (Logic)
    - Receive user requests and generate results (Presentation)

Multi-tiered Deployment Architecture

Security Scalability Stability



Server Design Diagram



DAO: Data Access Object

Performance Enhancements

- Maximum use of client computation power
  - *Input validation*
  - *Name resolution through NED or Simbad*
  - *Coordinate conversion*
  - *FITS image position read-out*
- Image search using R-tree index
- Cache
- Partial return of large data result

Existing Software Reuse

- Catalog search using spatial index
- Image search using R-tree index
- Name resolution through NED or Simbad
- Coordinate conversion
- FITS image display
- Getting images and catalogs from other archive

Future Software Reuse

- Firefly - common web frame work
  - *Infrastructure*
  - *Data display and table manipulation*
  - *FITS image display*
  - *Spectrum plot*
  - *Data download management*
  - *Input fields*
  - *Data validation*
  - *Coordinate conversion*

Schedule

- Beta public release, February 2010
  - *As much data as possible*
- First Public release, July 2010
  - *All final reprocessed cryogen data*
- Second public release, January 2011

ipac

SSC
Spitzer Science Center

IRSA