



Spitzer Heritage Archive

Xiuqin Wu, Trey Roby, Loi Ly



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)*

Observation Requests						
Level 1						
Level 2						
Download						
Save						
Text View						
Show Filter(s)						
<input type="checkbox"/>	reqkey	reqmode	cra	cdec	wavelength	scet
<input type="checkbox"/>	18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
<input type="checkbox"/>	18281984	IrsStare	20h35m24.15s	+60d6m51.7s	IRS LL 14.0-21.3um	2007-
<input type="checkbox"/>	18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
<input type="checkbox"/>	18281984	IrsStare	20h35m24.15s	+60d6m51.8s	IRS LL 14.0-21.3um	2007-
<input type="checkbox"/>	18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
<input type="checkbox"/>	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*

The screenshot displays two panels from the IRSA data presentation interface. The left panel is a metadata table with columns for reqkey, reqmode, cra, cdec, wavelength, and scet. The right panel is a 2MASS coverage map showing a field of stars with a red box highlighting a specific region.

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-
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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	20h35m24.15s	+60d6m51.7s	IRS LL 14.0-21.3um	2007-
18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
18281984	IrsStare	20h35m24.12s	+60d7m19.7s	IRS SL 5.2-8.7um	2007-
18281984	IrsStare	20h35m24.12s	+60d7m19.7s	IRS SL 5.2-8.7um	2007-
18281984	IrsStare	20h35m24.06s	+60d7m19.8s	IRS SL 7.4-14.5um	2007-
18281984	IrsStare	20h35m24.12s	+60d7m19.7s	IRS SL 5.2-8.7um	2007-
18281984	IrsStare	20h35m24.13s	+60d7m19.7s	IRS SL 5.2-8.7um	2007-
18281984	IrsStare	20h35m26.54s	+60d7m15.7s	IRS SL 5.2-8.7um	2007-
18281984	IrsStare	20h35m26.61s	+60d7m15.6s	IRS SL 7.4-14.5um	2007-
18281984	IrsStare	20h35m26.61s	+60d7m15.6s	IRS SL 7.4-14.5um	2007-



Data Exploration - table manipulation



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

Observation Requests **Level 1** Level 2

Download Save Text View Show Filter(s)

<input type="checkbox"/>	reqkey	reqmode	cra	cdec	wavelength	scet
<input type="checkbox"/>	18281984	IrsStare	20h35m24.14s	+60d6m51.5s	IRS LL 19.5-38.0um	2007-
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<input type="checkbox"/>	18281984	IrsStare	20h35m26.54s	+60d7m15.7s	IRS SL 5.2-8.7um	2007-

1 of 9 Page Size: 50 Displaying 1 - 50 of 450



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

The screenshot displays the IRSA data exploration interface. On the left, a table lists data points with columns for wavelength, scet, and time. The selected row is highlighted in blue. On the right, a panel shows the image of the selected data point, along with its position and flux values. The image is a spiral galaxy with a bright central region and blue-tinted outer regions.

	wavelength	scet
i04	MIPS 24um	2007-01-20 12:48:33.334
'02	MIPS 24um	2007-01-20 12:53:08.060
i01	MIPS 24um	2007-01-20 12:49:37.299
i04	MIPS 24um	2007-01-20 12:51:13.244
i99	MIPS 24um	2007-01-20 12:51:45.225
i95	MIPS 24um	2007-01-20 12:48:01.354
i	MIPS 24um	2007-01-20 12:49:05.319
'06	MIPS 24um	2007-01-20 12:50:09.279
'92	MIPS 24um	2007-01-20 12:52:36.080
'96	MIPS 24um	2007-01-20 12:50:41.260
i02	MIPS 24um	2007-01-20 12:54:44.006
i97	MIPS 24um	2007-01-20 12:54:12.025
i	MIPS 24um	2007-01-20 12:53:40.045
i96	MIPS 24um	2007-01-20 12:56:19.951
i95	MIPS 24um	2007-01-20 12:55:47.970
i04	MIPS 24um	2007-01-20 12:55:15.986

Details View
MIPS_24um_small_FOV1
Eq-J2000: 13h29m54.21s, +47d12m01.5s
Eq-J2000: 202.476, 47.2
Image Pixel: 53, 75.5
Gal: 104.847, 68.554
Eq-B1950: 13h27m47.85s, +47d27m29.1s
Flux: 48.73 MJy/sr
1 Pixel: 2.491"
Zoom Level: 2
File Size: 91 K

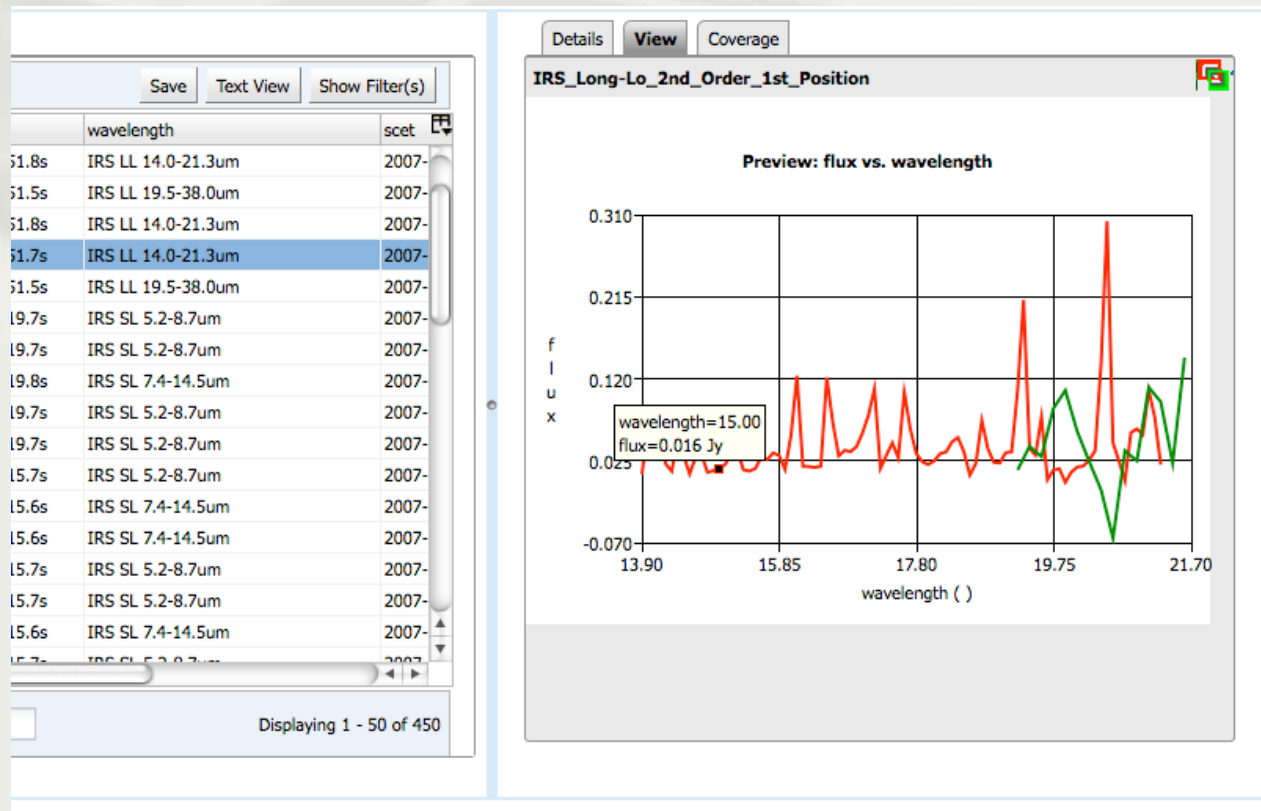
Page Size: 50 Displaying 1 - 16 of 16



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

Observation Requests **Level 1** Level 2

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<input type="checkbox"/>	18281984	IrsStare	20h35m24.15s	+60d6m51.8s	IRS LL 14.0-21.3um	2007-



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)



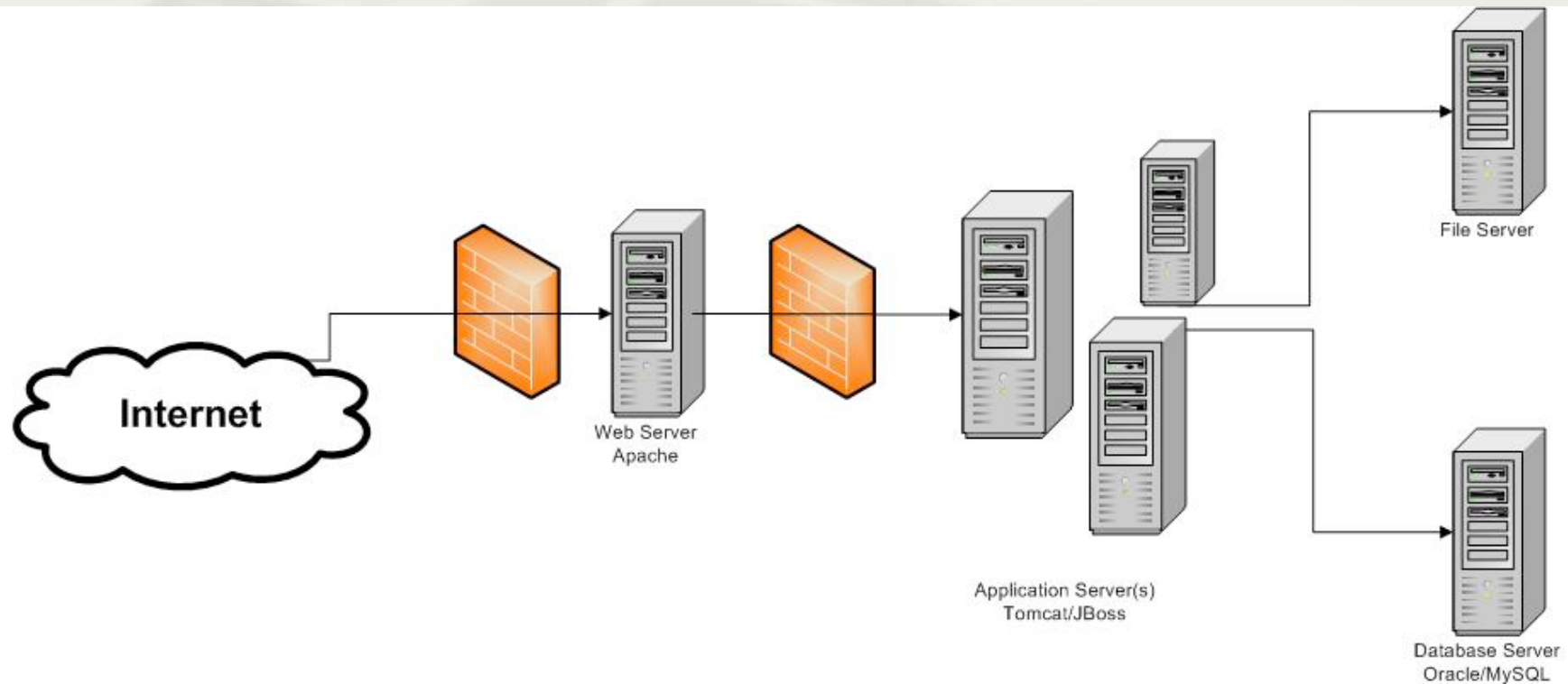
Multi-tiered Deployment Architecture

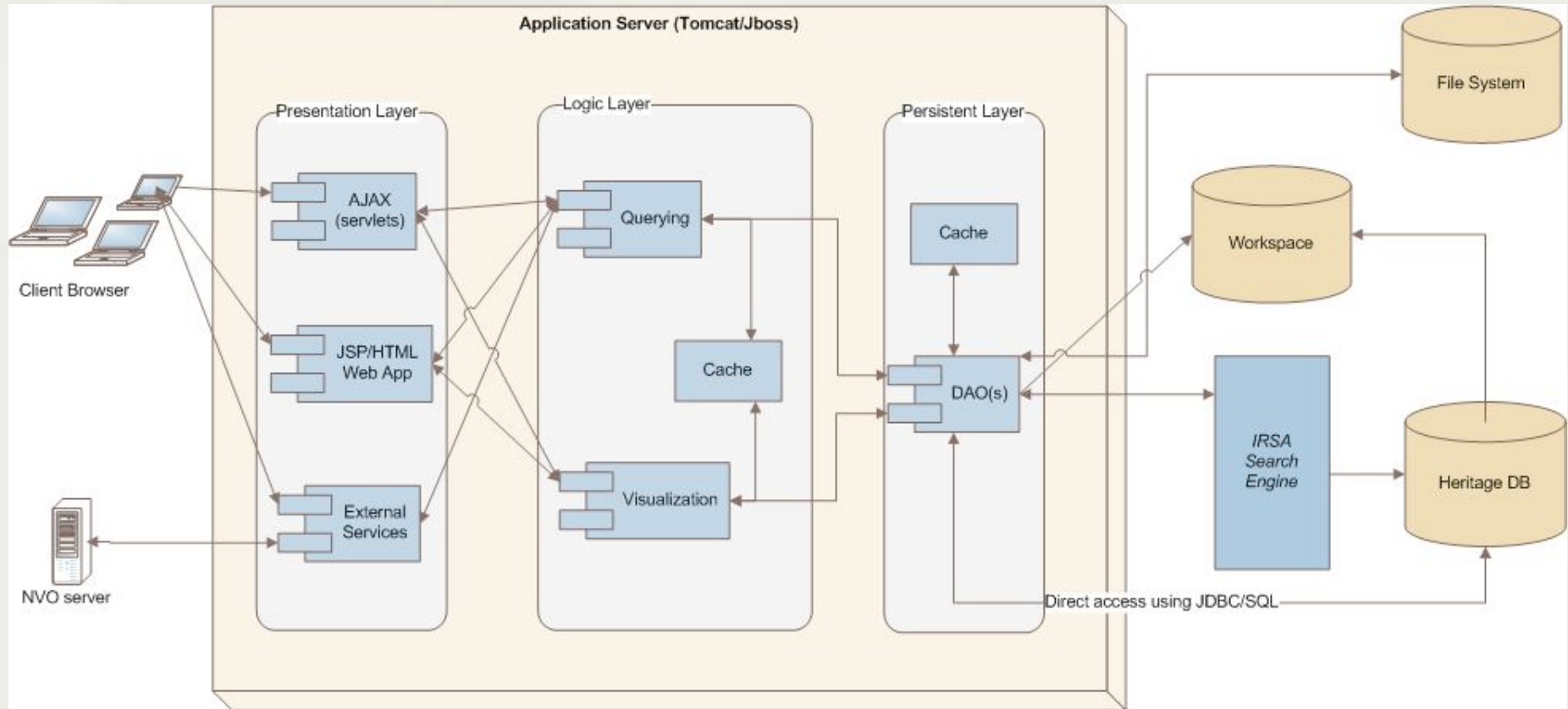


Security

Scalability

Stability





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



