Toward the National Virtual Observatory

http://yourSky.jpl.nasa.gov

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Outline

- Motivation
- Virtual Observatories
- yourSky (http://yourSky.jpl.nasa.gov)
  - User Perspective
  - Behind the Scenes
  - Graphical Front-End
- Follow-on Activities
The Data Avalanche!

Growth in Aperture & Focal Plane
Of Institutionally Managed Observatories

$\text{m}^2$

Gigapixels
Virtual Observatories

- Community driven.
- Community built.
- Community access.
- Emphasis on many interoperable components developed and deployed by domain experts in different areas.
- Highly distributed, including centers for:
  - Archive
  - Processing
  - Visualization
- Exploit high performance computation and communications assets.
Transparent Use of High Performance Infrastructure
Example: Custom ‘On-the fly’ Mosaic Portal

- "Provide custom access to a compute-intensive, scalable interoperable service that delivers science-grade image mosaics to user’s desktops, through existing portals."
- Custom access = user specifies dataset, location, size, resolution, coordinate system, projection, data type, and image format.
  - Architecture invites growth to expand options for custom image processing – multiple background removal techniques, overlap blending recipes, multiple surveys, etc.
yourSky Custom Mosaic Portal

http://yourSky.jpl.nasa.gov

yourSky can access all of the publicly released DPOSS and 2MASS images for custom mosaic construction.

2MASS Atlas:
1.8 Million images
~4 TB

DPOSS:
2500 images
~3 TB
Custom Coordinate System and Projection

- WCS projections: LIN, TAN, SIN, STG, AZP, ARC, ZPN, ZEA, AIR, CYP, CAR, MER, CEA, COP, COD, COE, COO, BON, PCO, SFL, PAR, AIT, MOL, CSC, TSC, DSS, PLT.
# Custom Image Format and Data Type

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<tr>
<td></td>
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Graphical Front-End to yourSky
Web-Based Pan/Zoom Engine

- All-sky browsing at medium resolution.
- **Efficient Navigation:** Either click to re-center or zoom or enter Right Ascension (longitude), Declination (latitude) and a zoom level to jump to the desired view.
- **Multi-Spectral Viewing:** View gray scale image or map any member dataset to red, green, or blue for a color image.
- **Catalog Overlays:** Plot catalog objects overlaid on top of the image.
- **Integrated with yourSky mosaic engine:** Click a link to submit a yourSky mosaic request for the current view.
Graphical Front-End to yourSky

Status

- All sky 1/8 resolution 2MASS and DPOSS mosaics completed:
  - Multiple overlapping plates constructed to minimize distortion no matter where you look.
  - Plate locations determined by HTM vertices (HTM is Hierarchical Triangular Mesh, specified by A. Szalay, JHU under AISRP funding).
  - Nearly $10^{12}$ DPOSS and 2MASS pixels reprojected on 64 processor Origin 2000!

- To finish up we will build a "resolution pyramid" -- all sky coverage at successively coarser zoom levels to facilitate zoom functionality.

- Expect the graphical front-end to be accessible at http://yourSky.jpl.nasa.gov by November 15.
Graphical Front-End to yourSky

Architecture

Synoptic View

- Hierarchical Triangular Mesh
- Single tangent plane at each vertex.

~70° N
North Polar Region

Equatorial Region

~70° S
South Polar Region
Graphical Front-End to yourSky
Catalog Overlays
Graphical Front-End to yourSky
Sample Screen Capture
Follow-on Activities

Montage:

- yourSky is the baseline code for Montage, an ESTO-CT Round 3 Grand Challenge Project (P.I.: T. Prince).
- Collaboration between CACR, IPAC and JPL.
- Montage will improve upon yourSky:
  - **Science Quality** – Flux preservation / Background matching.
  - **Performance** – Throughput
  - **Interoperability** with NVO infrastructure.
  - **Interoperability** with TeraGrid and Information Power Grid infrastructure.
- Montage has staged code improvement deliverables through January, 2005.
Follow-on Activities (cont.)

**Information Power Grid**

- NASA’s computational grid infrastructure.
- Globus enabled version of yourSky.
- Launch yourSky mosaicking code on the Grid instead of on local machine.
- Dramatic improvements in the size and number of mosaic requests we can handle.
- Use power of the Grid to extend browse capability to full 1 arcsec resolution.
Summary

- yourSky supports large scale data access and image mosaicking on supercomputers.
- yourSky places minimal computing requirements on the users: Web browser.
- Requests to yourSky can be made using a simple form interface, or assisted by the graphical front-end (web-based pan/zoom).
- Questions?