INTEGRATING HUBZERO AND IRODS

GEOSPATIAL DATA MANAGEMENT FOR COLLABORATIVE SCIENTIFIC RESEARCH

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geospatial data analysis building blocks

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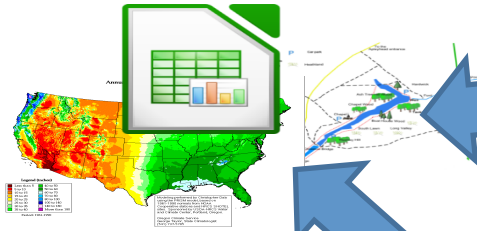
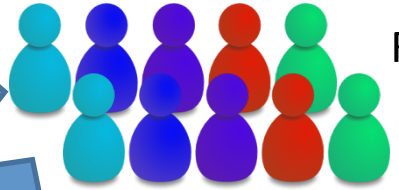
HISTORY – GEOSHARE, DRINET, U2U



Time-series, geospatial data and regular files

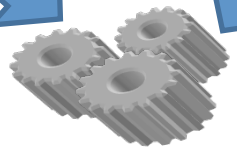


Researchers

Share

Process

Contribute



Processing Tools

- Manage, query, access, share scientific data
- Research collaboration
- Quick preview
- Run shared post-processing tools
- Compare data from different sources

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HUBZERO

- Cyberinfrastructure platform
- User collaboration
  - Groups, projects, blogs, message boards
- Instruction
  - Courses, tutorials, lectures, seminar series
- Data sharing, simple preview, curation
  - Publications with file bundles, supporting documents, DOI generation

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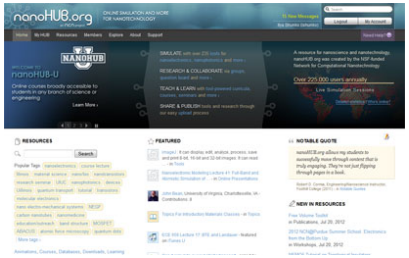
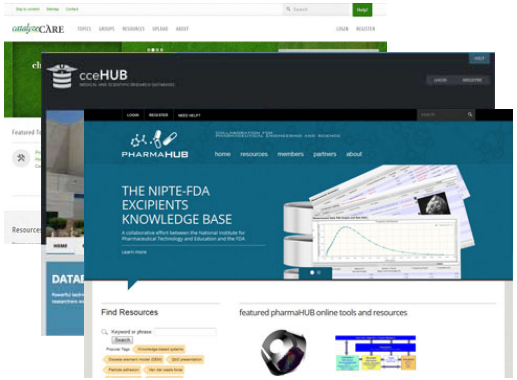
HUBZERO – OVER THE YEARS

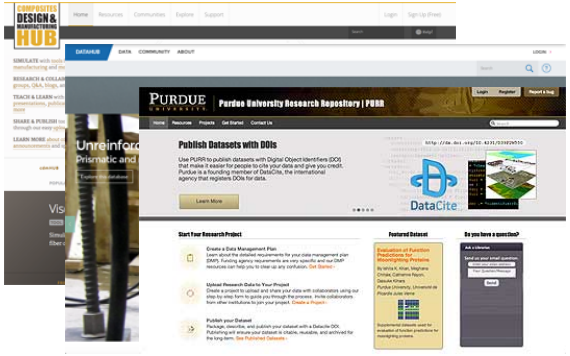
Nanotechnology





Medical Research

Education, Outreach



Materials and Manufacturing

HPC

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HUB TOOLS

- Web-enable scientific tools
- Rappture Tool Kit
  - Common GUI elements
  - Support for various programming languages
  - Output visualization
- Containerized
  - OpenVZ containers with VNC support
- Data transfer to/from local desktop

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GABBS

- Reusable building blocks for geospatial data
  - Processing
  - Metadata extraction
  - Map visualization
  - Search
- Part of the NSF DIBBS initiative
  - Data sharing for collaborative research
  - Diverse domains

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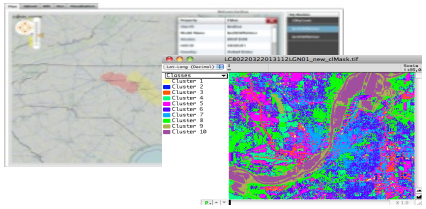
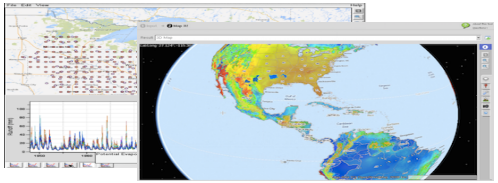
GABBS ARCHITECTURE

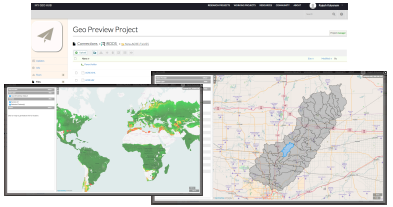
End User



Computation



Visualization



Data Sharing

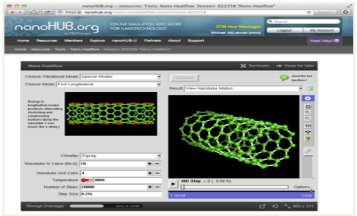
New Capabilities

Maps
Control widgets
Data presentation
Remote servers
Overlays
Data processing
Tool builder
Geo-processing
Data formats
Standard protocols
Data management
Data sharing
Data-Tool connectors

hubzero

HUBzero Platform for Scientific Collaboration

Computation tools and online databases, Content publishing, Collaboration (group, project), Learning (courses, self-help), Support (tickets, Q&A), Community (forum, review, calendar)



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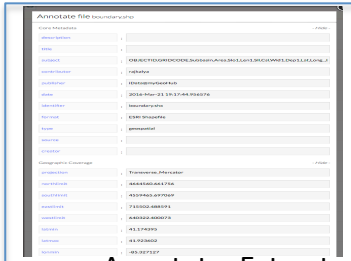
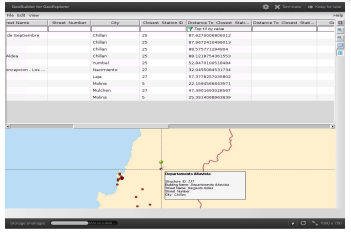
GABBS DATA LIFECYCLE



Annotate, Extract Metadata

Not automatic !

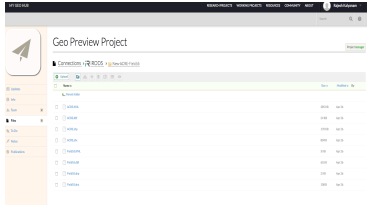


Process, Transform

Data

No Common Access

Visualize



Share

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HUBZERO AND IRODS INTEGRATION

- Require central storage mechanism uniformly accessible throughout data lifecycle
- Needs to support easy extensibility to handle large file quantities
- Support for processing co-located with data
- iRODS storage underlies Hub Projects Filespace
  - iRODS FUSE mount onto hub webserver
  - PHP Flysystem adapter for CMS access, future expansion

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HUBZERO AND IRODS INTEGRATION

- Hub tools have local access to Hub Project files
  - Bind mount users' accessible collections on webserver into tool OpenVZ container
  - Can serve as tool input source and output destination, simplifying development
- Supports pre, post-processing of files
  - Automatic metadata extraction, ingestion into Apache Solr on file creation
  - On-demand bulk metadata update
  - On-demand visualization of geospatial files

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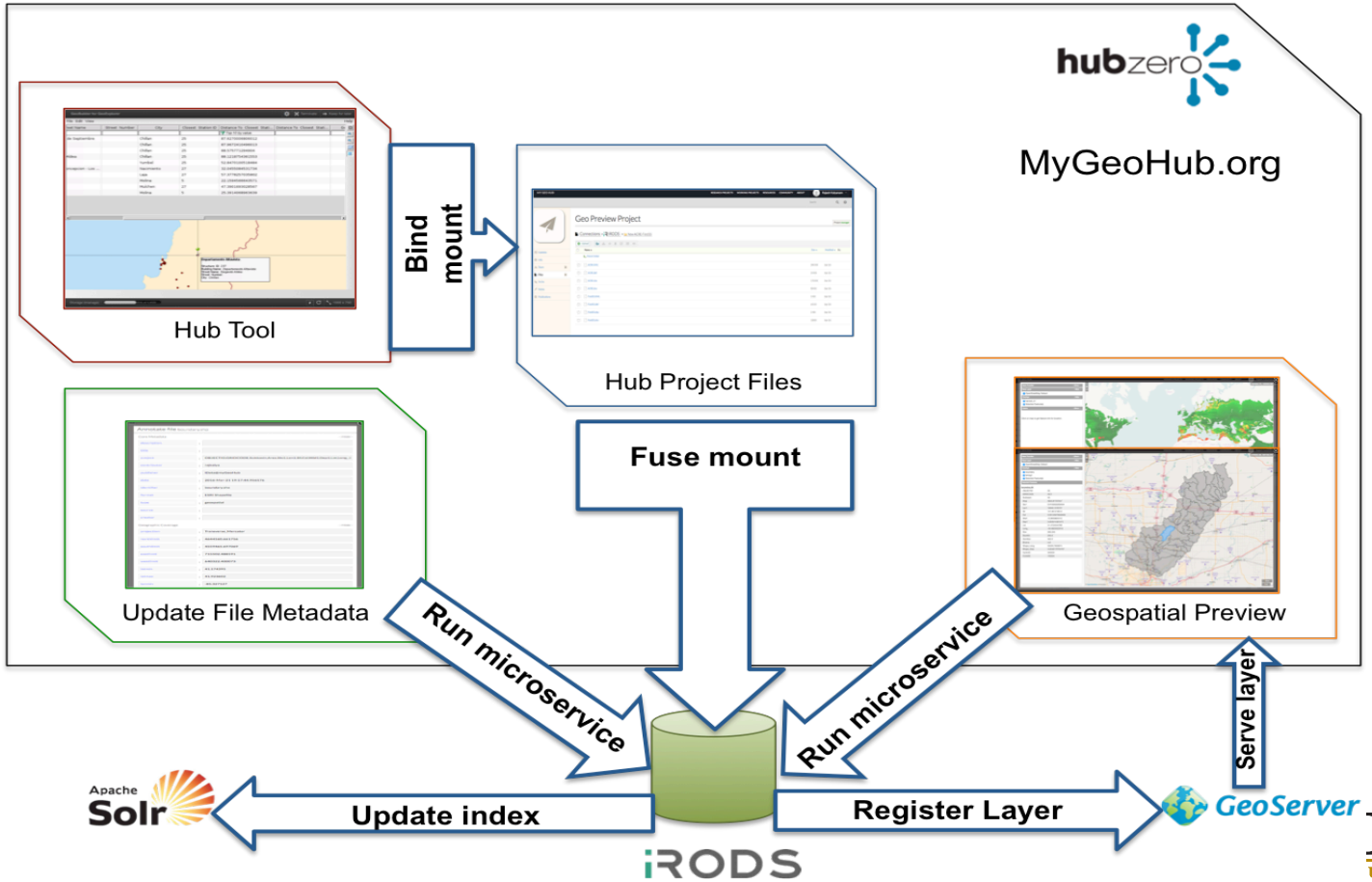
HUBZERO AND IRODS INTEGRATION



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GEOSPATIAL METADATA EXTRACTION

- Implemented as iRODS microservice
  - Runs on file creation, attached to ***acPostProcForPut***
  - Uses GDAL C++ APIs to process vector, raster geospatial files
  - Abstracts extracted information into 15 common Dublin Core Metadata Initiative (DCMI) fields
  - Also extracts geospatial bounds for subsequent geo-search
- Metadata storage
  - Extracted metadata stored as iRODS AVU triples
  - Ingested into Apache Solr for subsequent search

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METADATA UPDATE

- Implemented as iRODS microservice
  - Runs on-demand from Hub Project Files UI
  - iRODS PHP APIs used to execute iRODS rule
  - Metadata to be updated provided as key-value pair array input
  - Supports arbitrary additional non-DCMI key-value pairs
- Index update
  - Solr index updated with changes to DCMI fields only

GEOSPATIAL PREVIEW

- Implemented as iRODS microservice
  - Runs on-demand from Hub Project Files UI
  - Enabled for supported file extensions
- Preview Implementation
  - Files registered as GeoServer layers after appropriate processing
  - GDAL APIs used for reprojection, format conversion and subdataset extraction
  - Layer name, projection information returned as rule output
  - OpenLayers Javascript library used for map display

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GOING FORWARD

- iRODS Federation to link distinct hubs for data and tool sharing
  - Potentially enable tool workflows across hubs
- Integrate other storage mechanisms into hub projects
  - Support offline data replication between iRODS storage and these other storage providers (Globus, Dropbox, Google Drive)
- Integrate data access protocols (OpenDAP)
  - Allow data subsetting for chunked access to larger files

ACKNOWLEDGEMENTS

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