Globus Genomics – *Powered by Galaxy*

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Outline

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Computation Institute

• A joint institute of Argonne National Laboratory and the University of Chicago
• Goal: Accelerate discovery by individual researchers and reduce costs for both individuals and institutions by providing robust research data management as a service
• Leverage software-as-a-service to:
  – provide millions of researchers with unprecedented access to powerful tools
  – reduce research IT costs dramatically via economies of scale
• We are a non-profit service provider to the non-profit research community
Breadth of CI Galaxy-related projects

- Genomics
- Cosmology
- Materials Science
- X-Ray Beam Line Science
- Climate Science
How Globus Genomics Came about

- Started our efforts with CVRG – utilizing Galaxy to implement RNA-Seq analysis pipelines related to cardiovascular related research
- Applied the capabilities to help researchers at the University of Washington investigate neurodevelopmental disorders utilizing Globus to move files from commercial sequencing centers and executing Exome analysis workflows in Galaxy
- Broadened the suite of pipelines to include additional RNA-Seq and ChIP-Seq analysis at WUSTL in support of cancer research
- Enhanced research efforts associated with cancer relapse by extending Exome-Seq pipelines with additional downstream analysis with researchers at the University of Chicago
- Collaborated with leading diabetes researchers at the University of Chicago to apply consensus calling approaches to variant identification
- Engaging with a pediatric oncologist to develop proteomic pipelines in Galaxy
- Continuing to field growing interest in utilizing both Globus and Galaxy to address needs in biomedical research...
• Remember Dr. Karen Reddy’s Talk from GCC 2012?
  – Our goals of accessibility, democratization, sustainability are already motivated by the keynote and BioTeam’s presentations yesterday

• Cloudman and Biocloudcentral are great and serve a lot of users and increase adoption of Galaxy
  – Usage may still require considerable IT expertise

• With Globus Genomics we wish to serve
  – Individual PIs and small labs who don’t have the IT expertise to setup and run Galaxy
  – Core labs at Universities who wish to focus time working with researchers on downstream analysis

• We are Non-Profit
  – Subscription charged for amazon and operations, continued development
• Integrated Globus-Galaxy platform
• Provides access to scalable and elastic compute resources via AWS
• Provide technical support and bioinformatics consulting
• Provide access to pre-integrated end-points for reliable and high-performance data transfer (Broad, Perkin Elmer, UC FGF, etc.)
Globus Genomics - Description

Globus Online Provides a file transfer Service between all data-endpoints

- High-performance
- Fault-tolerant
- Secure

Galaxy Based Workflow Management System

- Globus Online Integrated within Galaxy
- Web-based UI
- Drag-Drop workflow creations
- Easily modify Workflows with new tools

- Analytical tools are automatically run on the scalable compute resources when possible

Data Management

Data Analysis

www.globus.org/genomics
Example Collaborations

Onel-Skol Lab

**Background:** Cancer researchers sequencing normal and relapse genomes from cancer patients to investigate genetic factors in cancer relapse

**Approach:** Replaced outsourced analysis with Globus Genomics

**Results:** Achieved greater than 10X speed-up in analysis of NGS data and 10X cost savings compared to alternative solutions

**Future Plans:** Leverage flexibility in Globus Genomics to extend analysis pipelines and compare results utilizing recently added algorithms
Example Collaborations

Dobyns Lab

**Background**: Investigate the nature and causes of a wide range of human developmental brain disorders

**Approach**: Replaced manual analysis with Globus Genomics

**Results**: Achieved greater than 10X speed-up in analysis of exome data

**Future Plans**: Leverage scale-out capability of Globus Genomics by running increasingly larger data sets
Georgetown Medical Center

**Background:** Innovation Center for Biomedical Informatics is an academic hub for innovative research in the field of biomedical informatics.

**Approach:** Augment current team and tools with a NGS analysis platform to support standard and best-practice pipelines while leveraging elastic cloud-based resources.

**Results:** Pilot effort is just getting underway

**Future Plans:** Provide Globus Genomics as a well-managed platform-as-a-service for ICBI collaborators and users
Benefits for the Galaxy Community

• **Increase adoption of Galaxy**  
  – Both Genomics and non-Genomics

• **Contributing tools, tool wrappers to the toolshed**  
  – This is already happening, you should see more of it in coming weeks

• **Add support for different computational modalities**

• **Further integration of Globus Online services for data management**

• **Help Accelerate research and lower time to science**
Questions?

• For more information on Globus Online and Globus Genomics
  – www.globusonline.org
  – www.globus.org/genomics

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