Galaxy Update
GMOD Workshop PAG 2013

Jennifer Hillman-Jackson
Penn State University

Wednesday, January 16
Workshop 3:45-4:30 pm

galaxyproject.org
gmod.org

Agenda

Galaxy project mission

Who's on the team

Overview start of 2013

How to get involved

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Galaxy Project Mission

Galaxy is an open, web-based platform for accessible, reproducible, and transparent computational biomedical research.

Accessible: Users without programming experience can easily specify parameters and run tools and workflows.

Reproducible: Galaxy captures information so that any user can repeat and understand a complete computational analysis.

Transparent: Users share and publish analyses via the web and create Pages, interactive, web-based documents that describe a complete analysis.

Galaxy Project Mission

"Next-generation sequencing data interpretation: enhancing reproducibility and accessibility", by Nekrutenko & Taylor, *Nature Reviews Genetics*, 13, 667-672 (September 2012)

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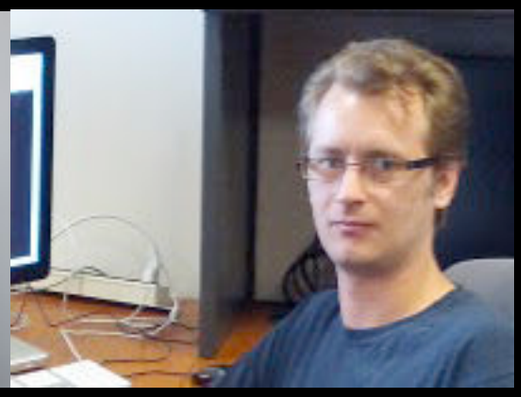
Enis Afgan

Guru Ananda

Dannon Baker

Dan Blankenberg



Dave Bouvier

Dave Clements

Nate Coraor

Greg von Kuster

Carl Eberhard

Jeremy Goecks

Jen Jackson

The Core Galaxy Team

Ross Lazarus

Anton Nekrutenko

James Taylor

http://galaxyproject.org/wiki/GalaxyTeam

Nuwan Goonasekera

Yousef Kowsar

Finn Bacall
Brad Chapman
John Chilton
Peter Cock
Kyle Ellrott

*** Plus many others via suggestions/help/code through Trello, Tool Shed, and galaxy-dev@bx.psu.edu mailing list. Galaxy is truly a community effort!**

Extended Team and Other Current Contributors

http://galaxyproject.org/wiki/GalaxyTeam

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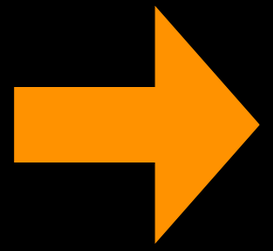


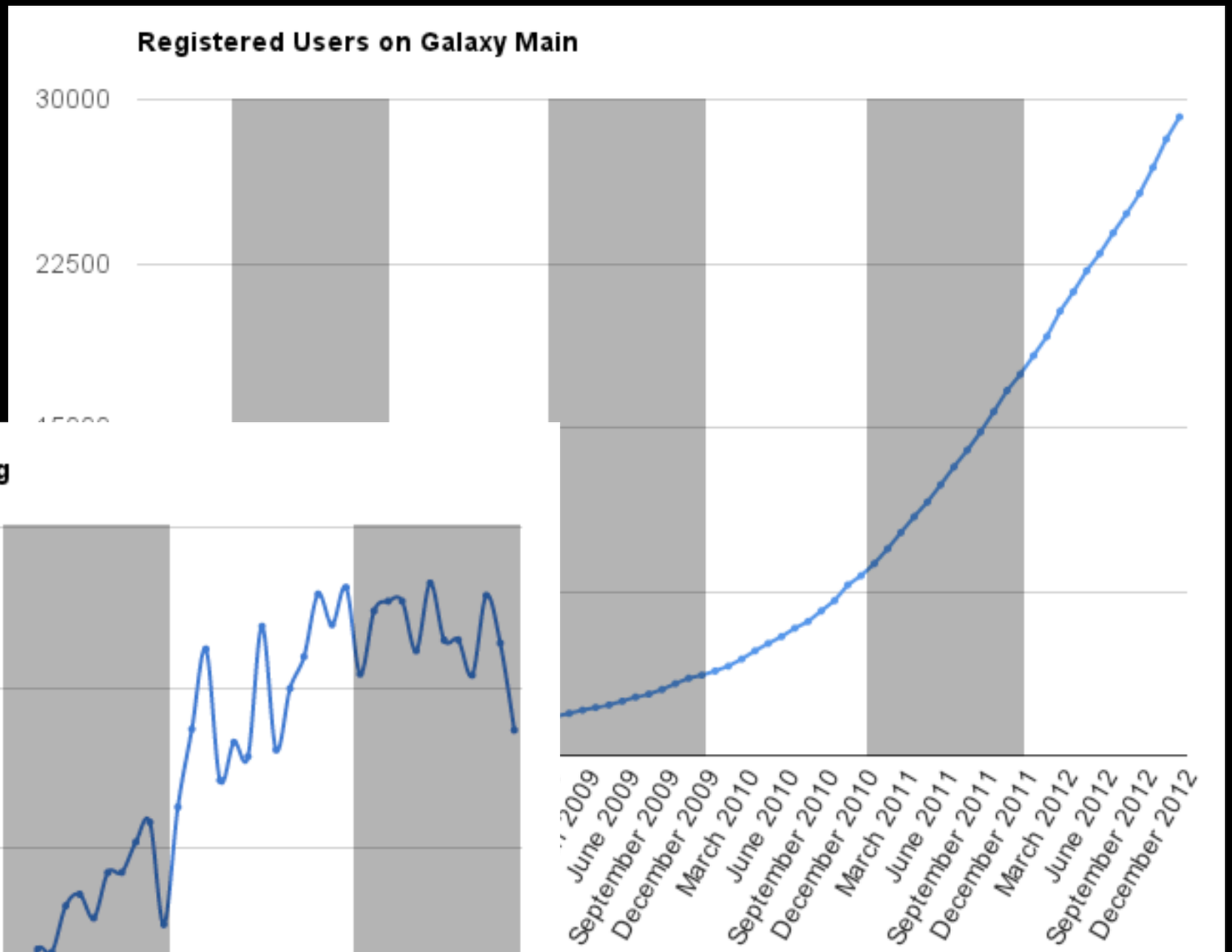
Using Galaxy
Web Objects/UI
Data & Tools
Visualizations
Publications
Tool Shed
Support

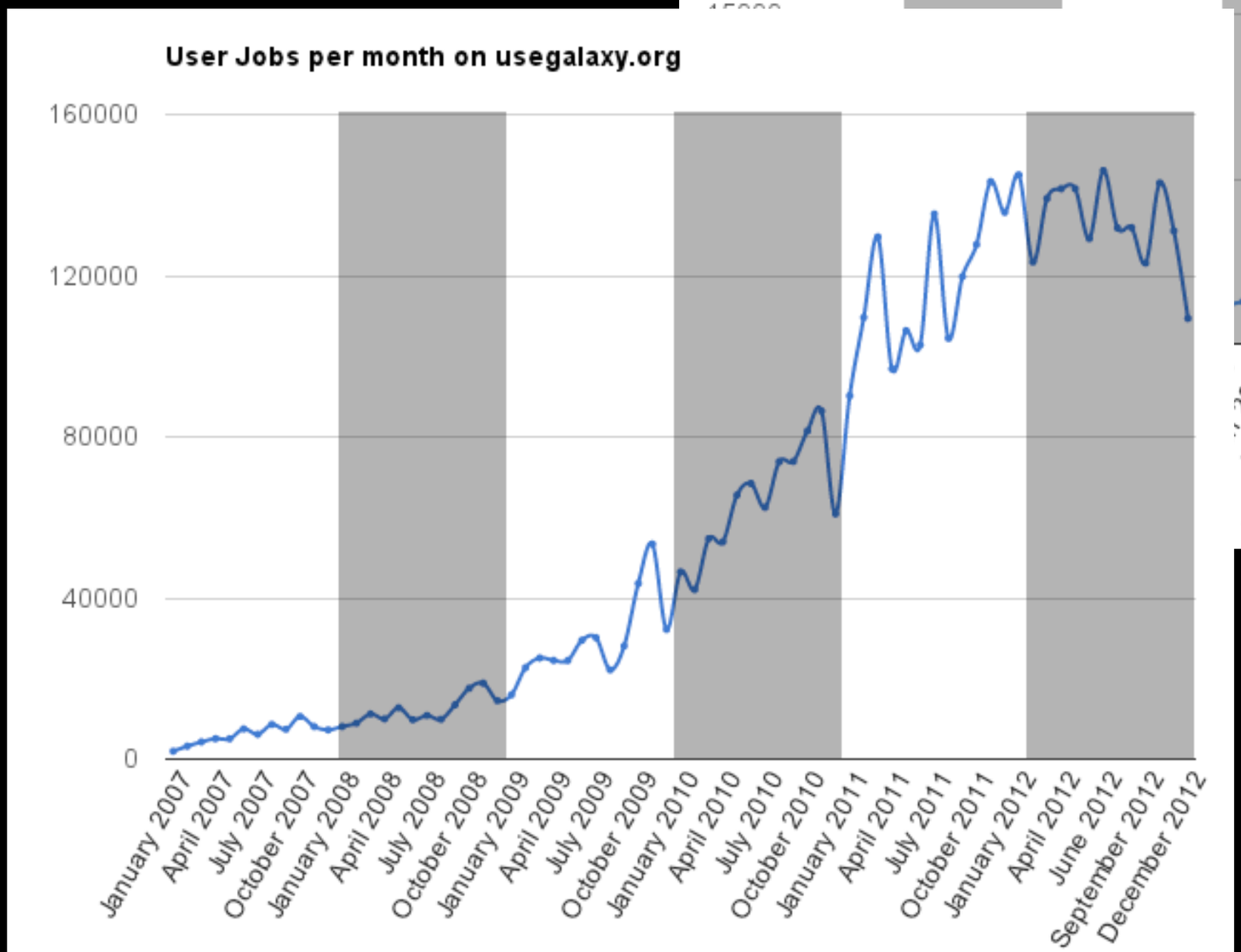
Using Galaxy - 4 ways

- **Public Main** Galaxy web instance: ***usegalaxy.org***
- **Local** instance: ***getgalaxy.org***
- **Cloud** instance: ***usegalaxy.org/cloud***
- **Other Public** Galaxy web instances hosted by various groups: ***wiki.galaxyproject.org/PublicGalaxyServers***

http://wiki.galaxyproject.org/Big%20Picture/Choices

usegalaxy.org
“Main”





What’s new?
More hardware
- soon.

getgalaxy.org

"Local"

wiki.galaxyproject.org/DevNewsBriefs

galaxy-dist.readthedocs.org

bitbucket.org/galaxy/galaxy-dist

Code Downloads -- how often??

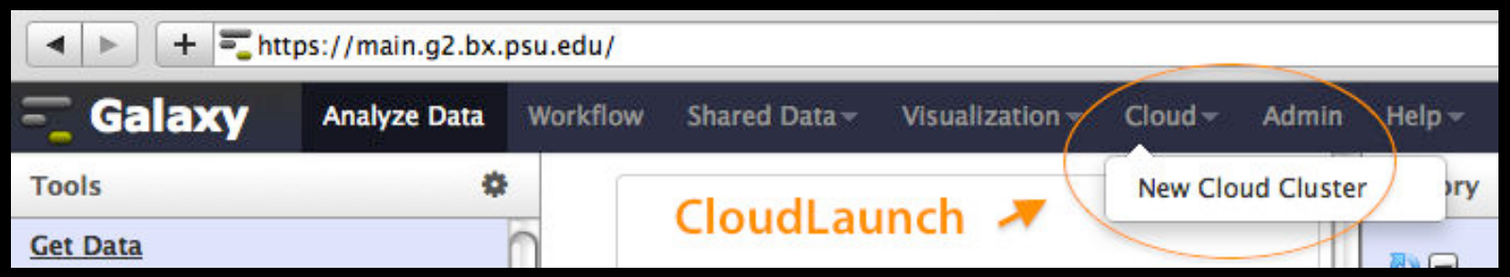
Alas, this information does not appear to be available from Bitbucket. Therefore, *we don't know.*

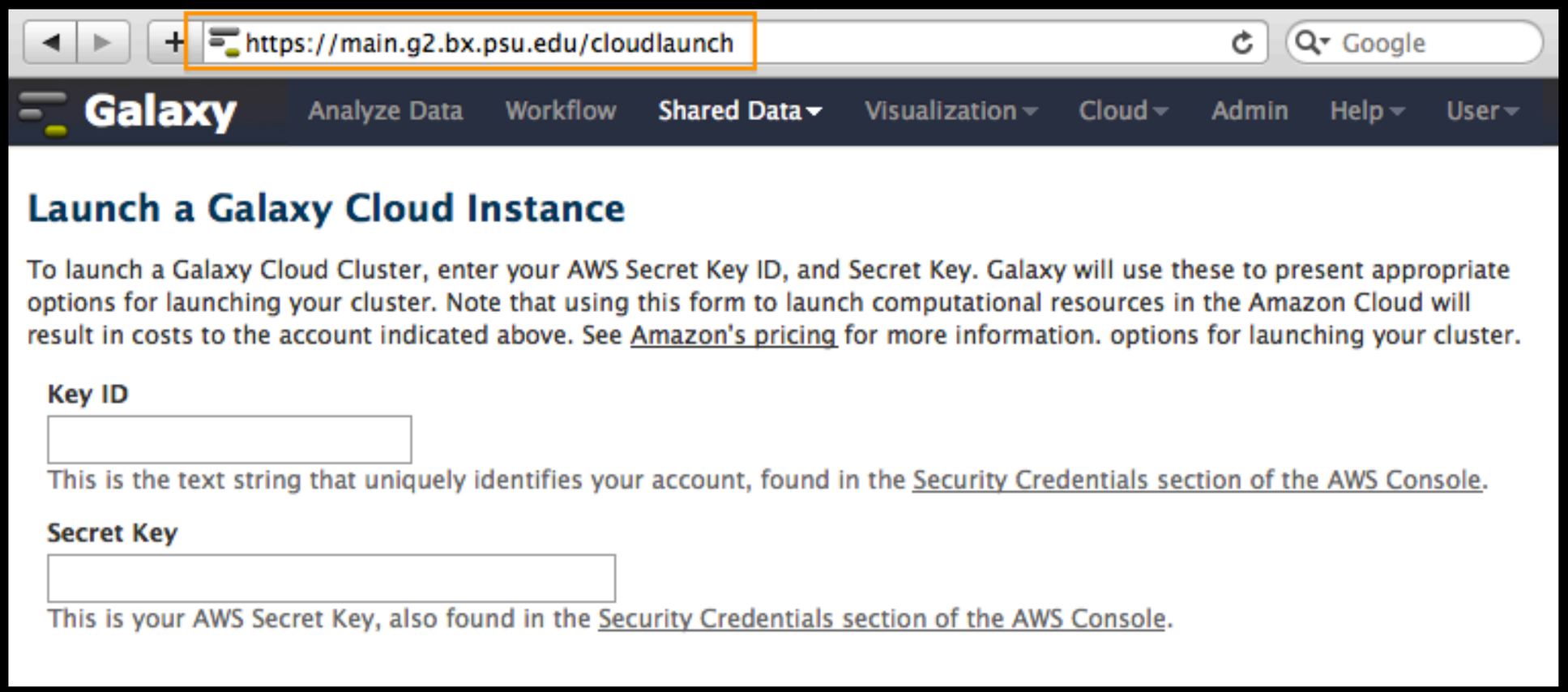
What's new?

- **~ 2 week release cycle**
- **"readthedocs" documentation**

usegalaxy.org/cloud

“CloudMan”





What’s new?

- **Educational grants for cloud time from Amazon**
- **CloudLanuch directly from within “Main”**
- **Publications integrating Galaxy cloud workflows**

Galaxy CloudMan
http://usegalaxy.org/cloud

- Start with a **fully configured and populated** (tools and data) Galaxy instance.
- Allows you to scale up and down your compute assets as needed.
- Someone else manages the data center.

http://aws.amazon.com/education

wiki.galaxyproject.org/PublicGalaxyServers

"Known Publicly Accessible Servers"

This is not an absolute count, but it is a rough measure of the trend.

Date	# Servers
2011/07	15
2012/01	21
2012/07	20
2013/01	25

What's new?

- **"GalaxyAdmins" community group founded**

Public Galaxy Servers

Interested in:

ChIP-chip and ChIP-seq?

✓ Cistrome

Statistical Analysis?

✓ Genomic Hyperbrowser

Sequence and tiling arrays?

✓ Oqtans

Text Mining?

✓ DBCLS Galaxy

Reasoning with ontologies?

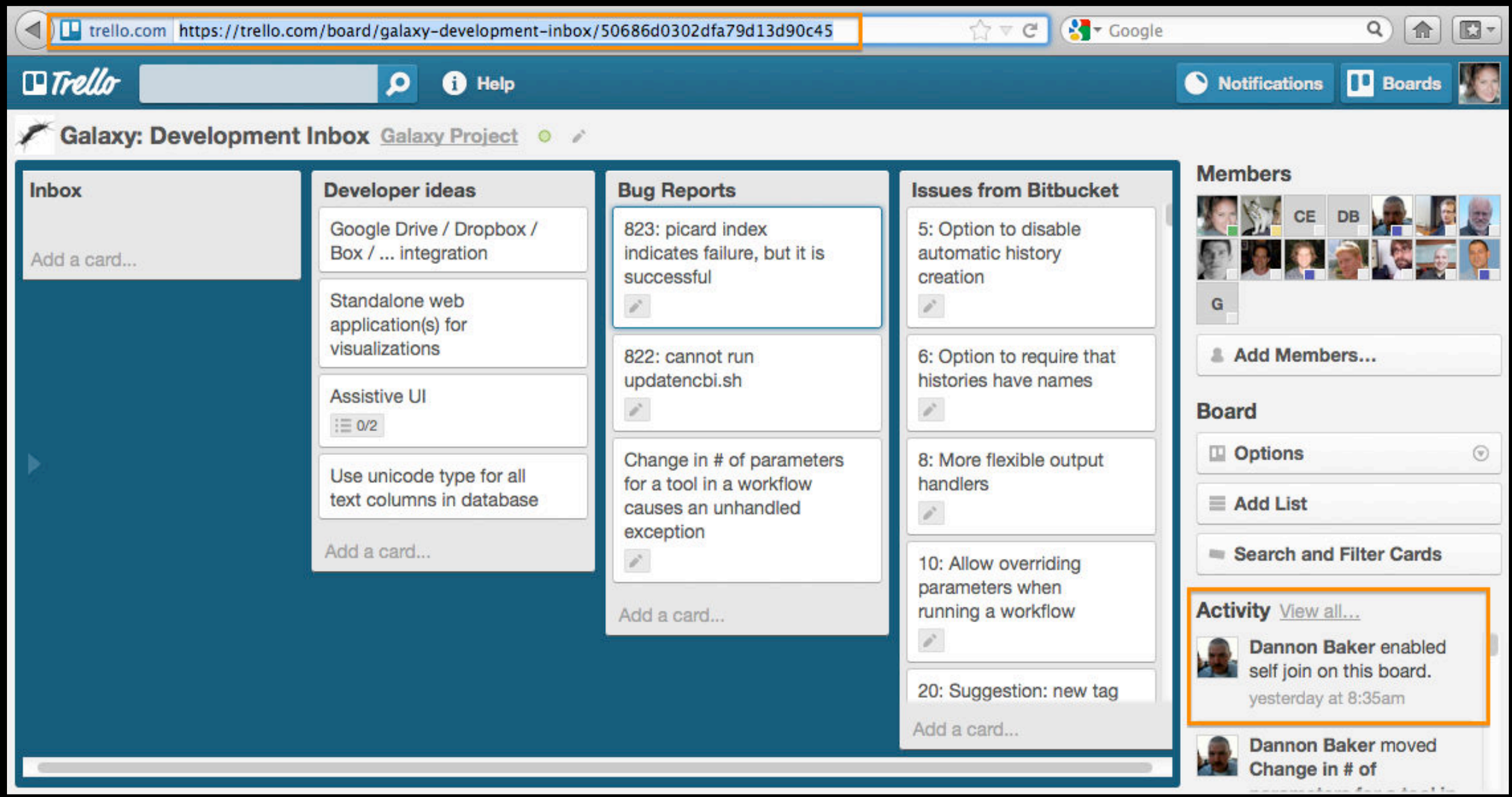
✓ GO Galaxy

Internally symmetric protein structures?

✓ SymD

http://galaxyproject.org/wiki/PublicGalaxyServers

Common to all Development contributors and general users, the new Trello Issue Board replaced bitbucket in 2012: *http://wiki.galaxyproject.org/Issues"*



Galaxy UI Terminology

Dataset:

Any input, output or intermediate set of data + metadata. A record of a specific data or analysis step.

History:

A series of inputs, analysis steps, intermediate datasets, and outputs. A record of a group of data and analysis steps.

Tool:

An operation within Galaxy that acts upon dataset(s) as an analysis step. May be developed by Galaxy team or a 3rd party program that has been "wrapped" for Galaxy.

Workflow:

A series of analysis steps executed in a sequential stream

What's new in the UI?

Dataset:

More "i" info page details. Metadata includes underlying tool version for most tools in the "info" attribute. Adding to all is a goal.

History:

Re-run warns if original input datasets or tool versions are not available. Finds inputs even if "hidden".

Tool:

Wrapper versions displayed in UI for all.

Workflow:

Enhancements to control via API. Warning similar to history re-run actions to support reproducibility.

General:

Multiple display improvements and tunings.

Data and Tools

Reference Genomes:

Dozens of full genomes added and over a hundred genomes had some content (index, liftOver) added in 2012. New data early 2013 to include **Bowtie2** indexes both on **Main** and **rsync** download area.

- The rsync area was new in 2012, too:

http://wiki.galaxyproject.org/Admin/Data%20Integration

Key Tools Included:

GATK (beta); Updates to the RNA-seq tool set **Bowtie2/ Tophat2**, **Cufflinks/merge/diff**; **FreeBayes**; **Trinity** (Tool Shed); **Wormbase** 2; **IGB**; **GenomeSpace**; **Megablast** to use BLAST+; **MPileup**, and the **Tool Factory** (Tool Shed)**:**

"Creating re-usable tools from scripts: The Galaxy Tool Factory," Ross Lazarus, Antony Kaspi, Mark Ziemann, The Galaxy Team, Bioinformatics (28 September 2012)

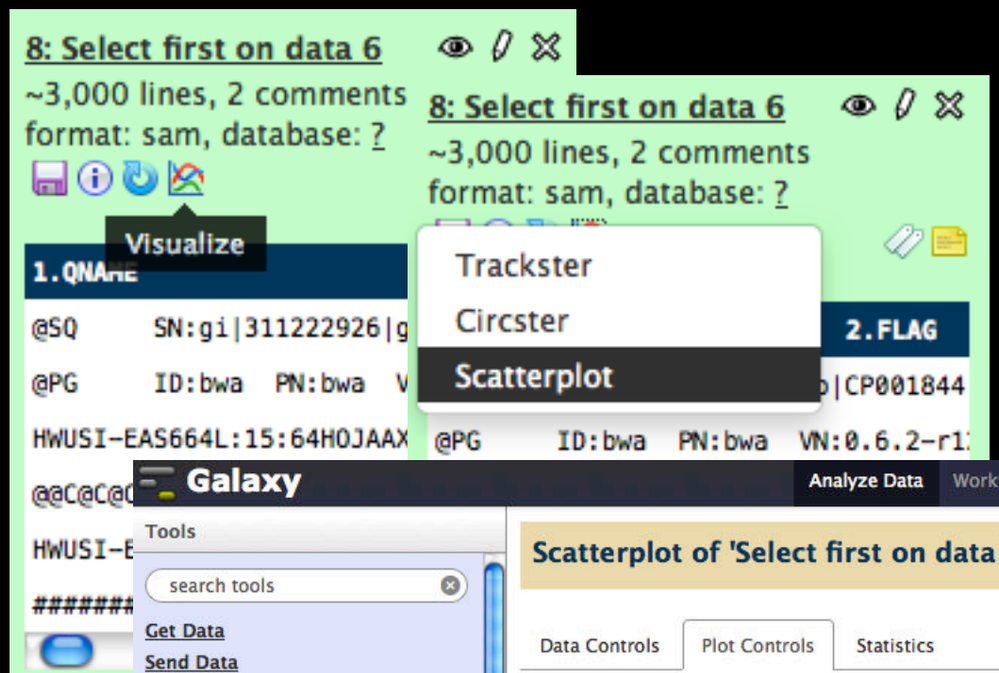
Visualizations

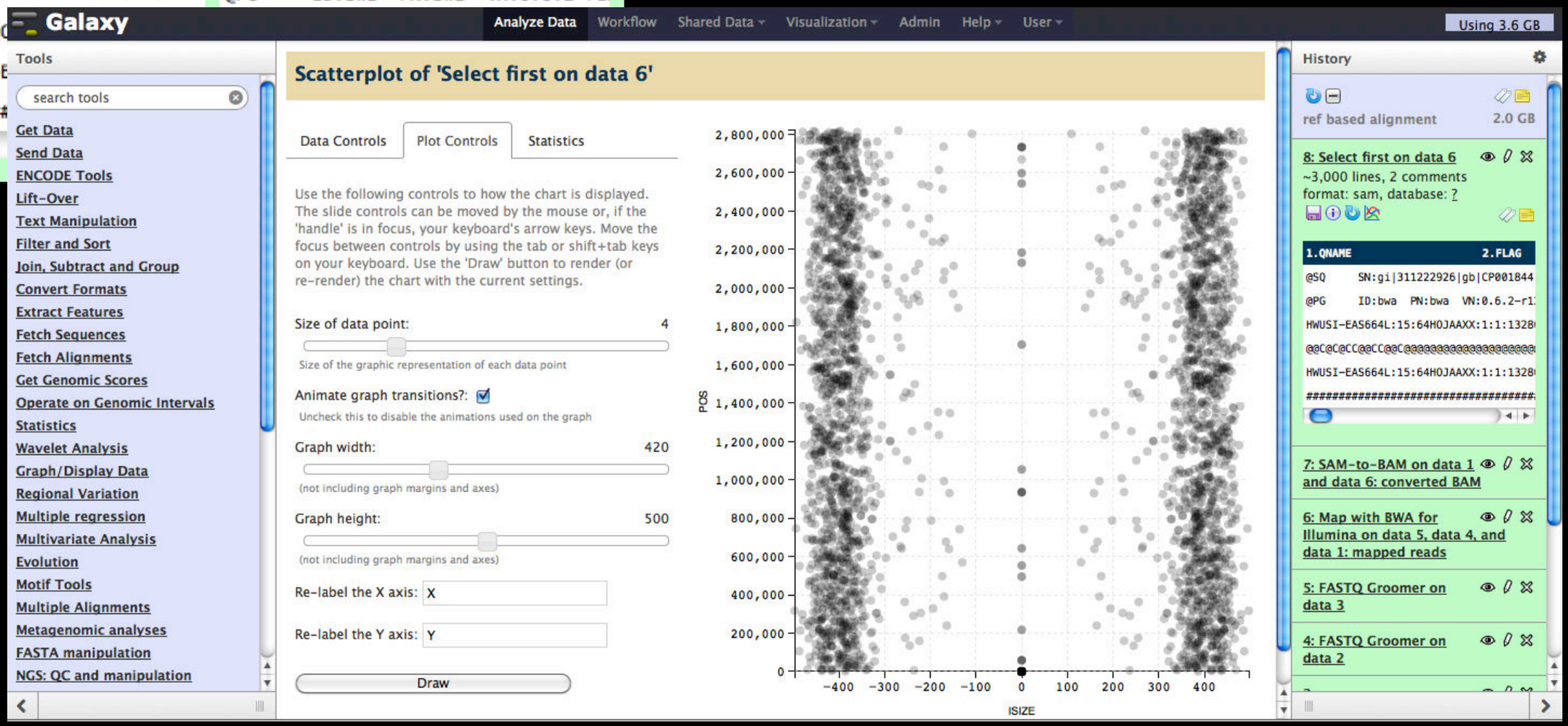
Trackster had significant number of new refinements in 2012 leading to a publication.

Jeremy Goecks, Nate Coraor, The Galaxy Team, Anton Nekrutenko & James Taylor, "NGS analyses by visualization with Trackster." *Nature Biotechnology* 30, 1036–1039 (2012)

Visualizations

And Circster (not shown) and Scatterplot were introduced:





Publications - CiteULike

A Galaxy CiteULike group was started in late 2011. It lists all the pubs that are about, reference, or mention Galaxy that we know about. We started keeping track of this partway through 2011, so it is an undercount for that year (and previous years are almost entirely absent). For years after 2011, it is likely to be more accurate, but still approximate, and to still be an undercount.

Publication Year	# Papers in CiteULike Group
2005	2
2006	3
2007	8
2008	22
2009	42
2010	76
2011	183
2012	398
2013	15
Total	759

As of January 2013, there are this many papers in the Galaxy CiteULike Group:

Date	Papers in CiteULike Group
2012/01	174
2012/07	361
2013/01	759

Publications - Example 1

CSH PRESS GENOME RESEARCH

Windshield splatter analysis with the Galaxy metagenomic pipeline

Sergei Kosakovsky Pond[1,2,6,9], Samir Wadhawan[3,6,7],
Fran
Jame

OPEN ACCESS ARTICLE

This Article

Published in Advance October 9, 2009, doi: 10.1101/gr.094508.109

Current Issue

October 2010, 20 (10)

Footnotes

[Supplemental material is available online at http://www.genome.org. All data and tools described in this manuscript can be downloaded or used directly at http://galaxyproject.org. Exact analyses and workflows used in this paper are available at http://usegalaxy.org/u/aun1/p/windshield-splatter.]

Histories, workflows, visualizations and ***pages*** can be shared with others or published to the world.

http://usegalaxy.org/u/aun1/p/windshield-splatter

Publications - Example 2

Galaxy | Analyze Data | Workflow | Shared Data | Visualization | Cloud | Admin | Help | U

Published Pages | galaxyproject | Using Galaxy 2012

June 2012

Using Galaxy to Perform Large-Scale Interactive Data Analysis: A live supplement

Jennifer Hillman-Jackson,[1] Dave Clements,[2] Daniel Blankenberg,[1] James Taylor,[2] Anton Nekrutenko,[1] and the Galaxy Team[1,2]

[1]Penn State University, University Park, Pennsylvania

[2]Emory University, Atlanta, Georgia

Correspondence should be addressed to Jennifer Hillmar

How to use this document

This document is an interactive supplement to "Using Ga
Protocols in Bioinformatics. Every protocol, dataset, and
supplementary items at Galaxy can be examined, copied
migrated to a local or cloud Galaxy instance (getgalaxy.c
Browser, IGV, Ensembl Browser or other tool of interest.
wish. All external datasets are public; please review each

Citations should reference this publication, the core Gala
tools used as appropriate.

For each Protocol, the following is provided:

- **Input datasets**
- **Complete history**

History

A complete history for **Basic Protocol 1**, showing all input, intermediate, and output datasets, and a description of each step in the analysis.

Galaxy History | CPB2012 - BasicProtocol1 - Finding Human Coding Exons with the Highest SNP Density

Screencast Video Tutorial

"Using Galaxy: Finding Human Coding Exons with Highest SNP Density"

Protocol 1 step-by-step video tutorial that *includes a supplemental* **Trackster** walk-through for visualizing input and result datasets.

Shared Data:
Published Pages

Get all of the data and follow a tutorial start to finish using the supplimental methods, workflows, and screencasts.

http://main.g2.bx.psu.edu/u/galaxyproject/p/using-galaxy-2012

Galaxy Tool Shed

Date	# Repositories	# Tools
2011/10	100	
2012/04	~160	1244
2012/07	~230	1967
2013/01	464	2414

- Allow users to share "containers" of tools, datatypes, workflows, sample data, READMEs, and automated installation scripts for tool dependencies.
- Integration with Galaxy instances to automate tool installation and updates.
- Is currently undergoing an audit to identify "valid tools" with community collaborators.
- In process of supporting **improved dependency documentation** and upgrading installation processes.

toolshed.g2.bx.psu.edu

Galaxy Tool Shed

- There is a "**Main**" tool shed hosted by the core Galaxy team, but satellite tools sheds are encouraged. We'd like to learn about them and list on our wiki, as public Galaxies are.

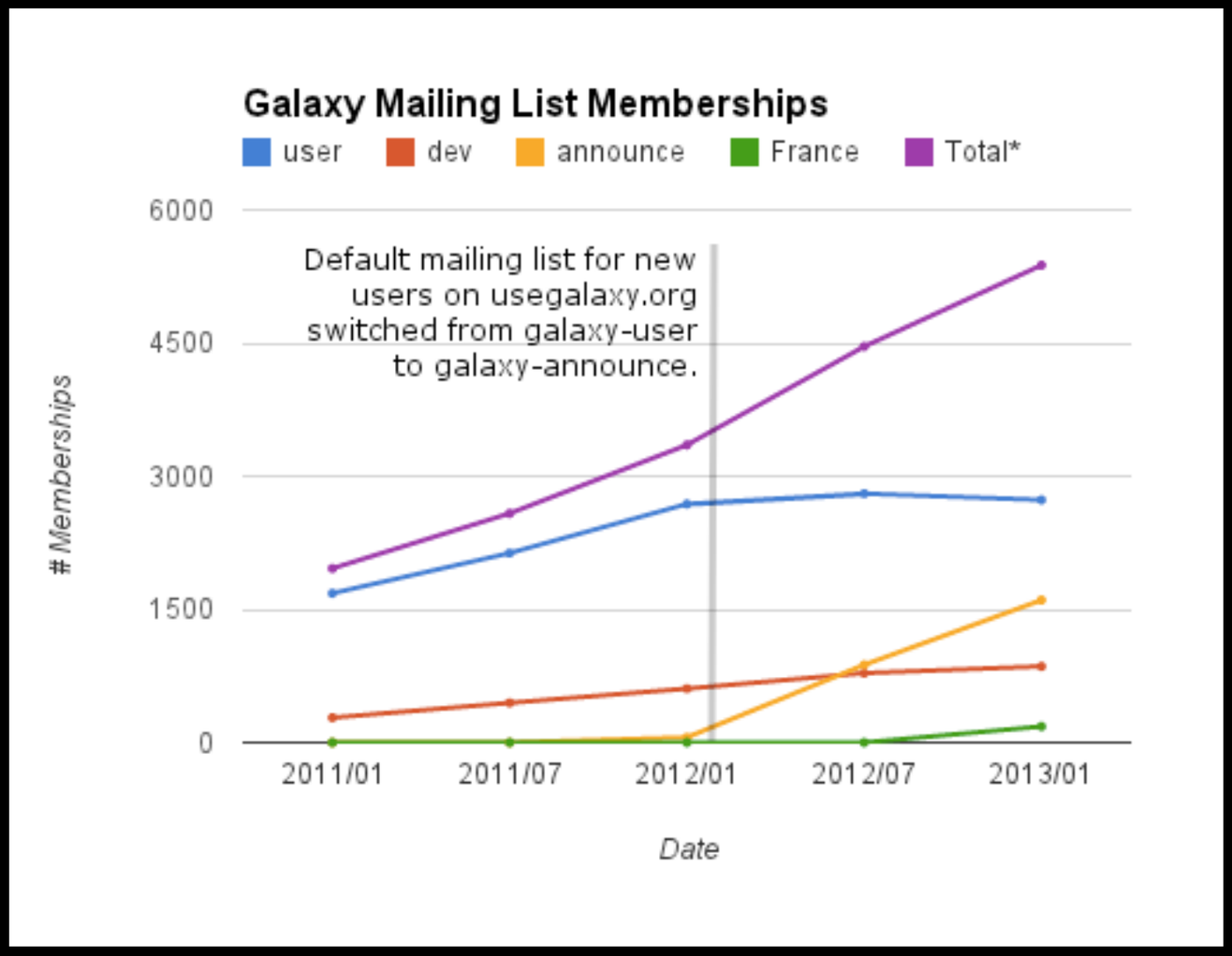
- This "**Main**" tool shed currently tracks the Galaxy distribution as many enhancements are linked/dependent.

- The complete list of updates, usage examples, features, etc. (and there have been many this year!), are in the News Brief Archives at: *wiki.galaxyproject.org/DevNewsBriefs*

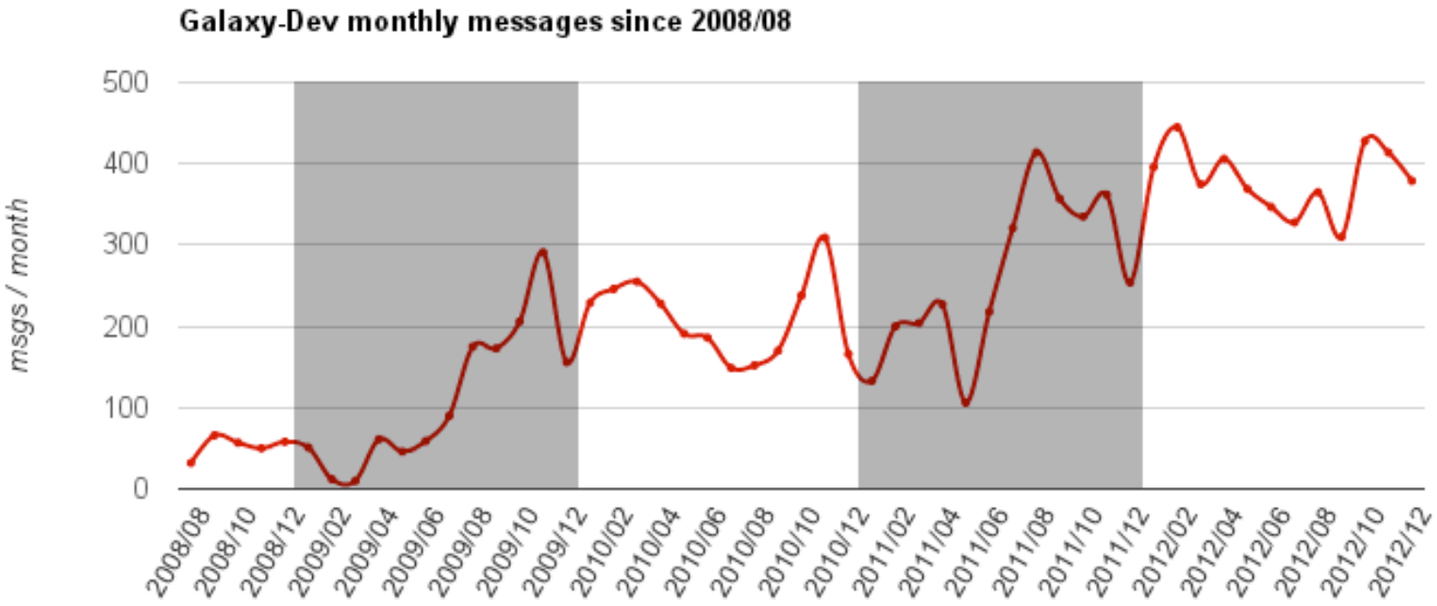
- The tool shed documentation covers a LOT of material relevant to the Galaxy framwork as a whole: *wiki.galaxyproject.org/Tool%20Shed*

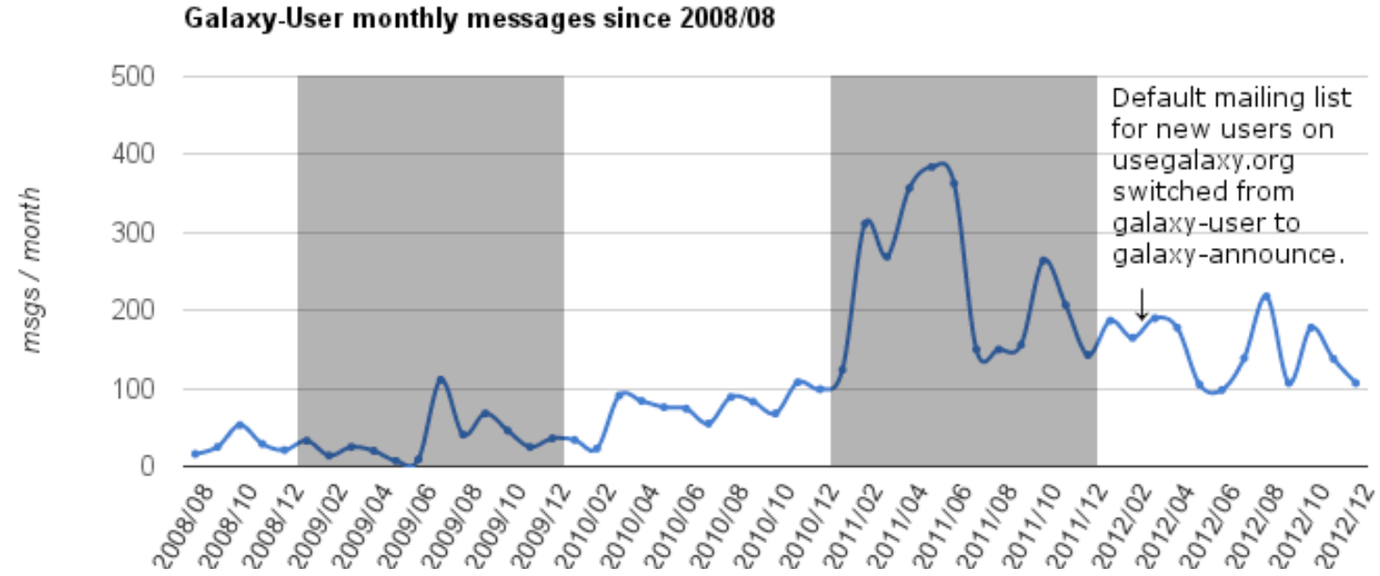
Support

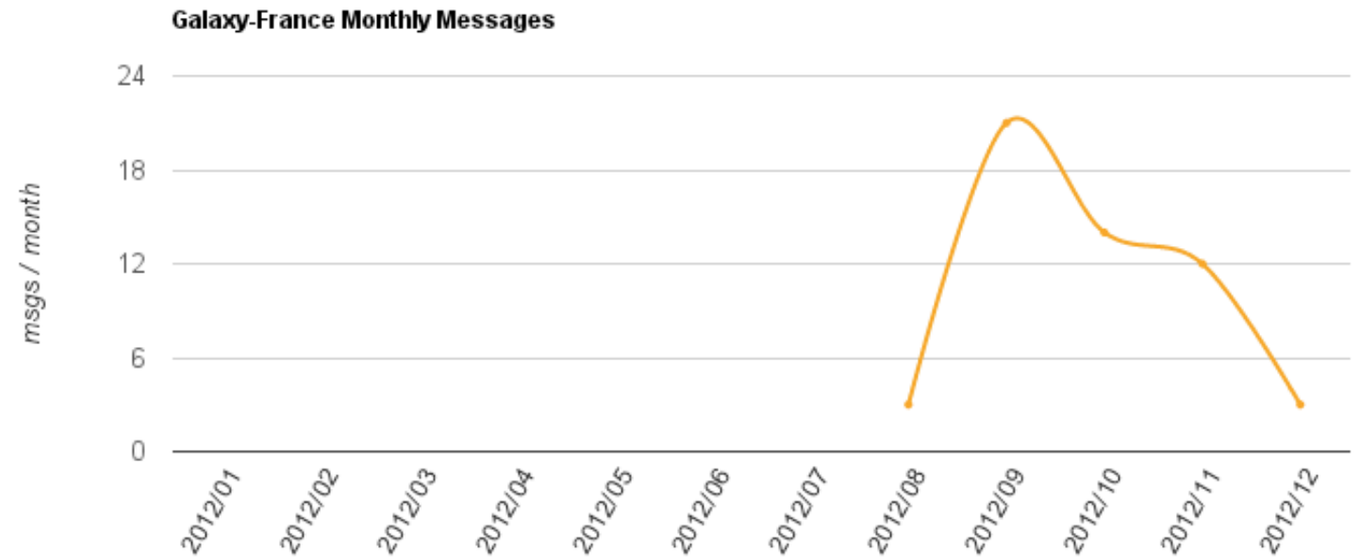
Mailing lists now include: galaxy-user, galaxy-dev, galaxy-announce (new), galaxy-france (new).

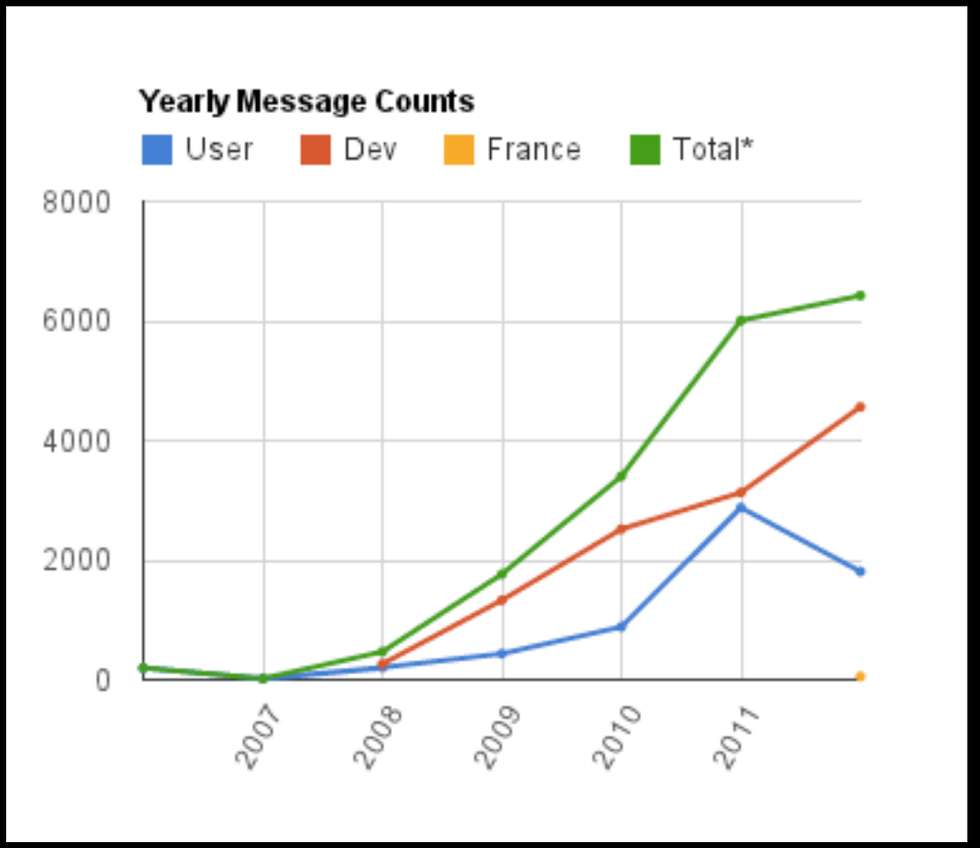


Support









"Public" mailing list traffic (does not include direct help through "bug reports", which are most often usage help questions.)

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Join the Galaxy Community

Tool Shed
Mailing Lists (Sci User, Development, Private Data help)
Screencasts (Community and Galaxy Team)
Events Calendar, News Feed, Twitter, Monthly Updates
Distributions & Release Notes/Feature Descriptions
Community Wiki
Local/Public Installs, GalaxyAdmins Monthly Mtg
CiteULike group, Mendeley mirror
Annual **Galaxy Community** Meeting - GCC2013 is next!

http://galaxyproject.org/wiki

Event/Year	Location	# Registered
GDC2010	Cold Spring Harbor, New York, United States	69
GCC2011	Lunteren, The Netherlands	148
GCC2012	Chicago, Illinois, United States	203
GCC2013	Oslo, Norway	

Galaxy Community Conference

http://galaxyproject.org/GCC2013

If you walk
away with one thing,
the rest can be found later,
including these slides ...

http://galaxyproject.org

Thanks for using Galaxy !!
(done)

Acknowledgments

Scott Cain & GMOD Community

PAG 2013 Organizers

Dave Clements, Anton Nekrutenko,
James Taylor, & Galaxy Team

Galaxy Community & You!!

Hope to see you in Oslo!

Galaxy Community Conference

30 June - 2 July 2013

OSLO

UiO : University of Oslo

http://galaxyproject.org/GCC2013