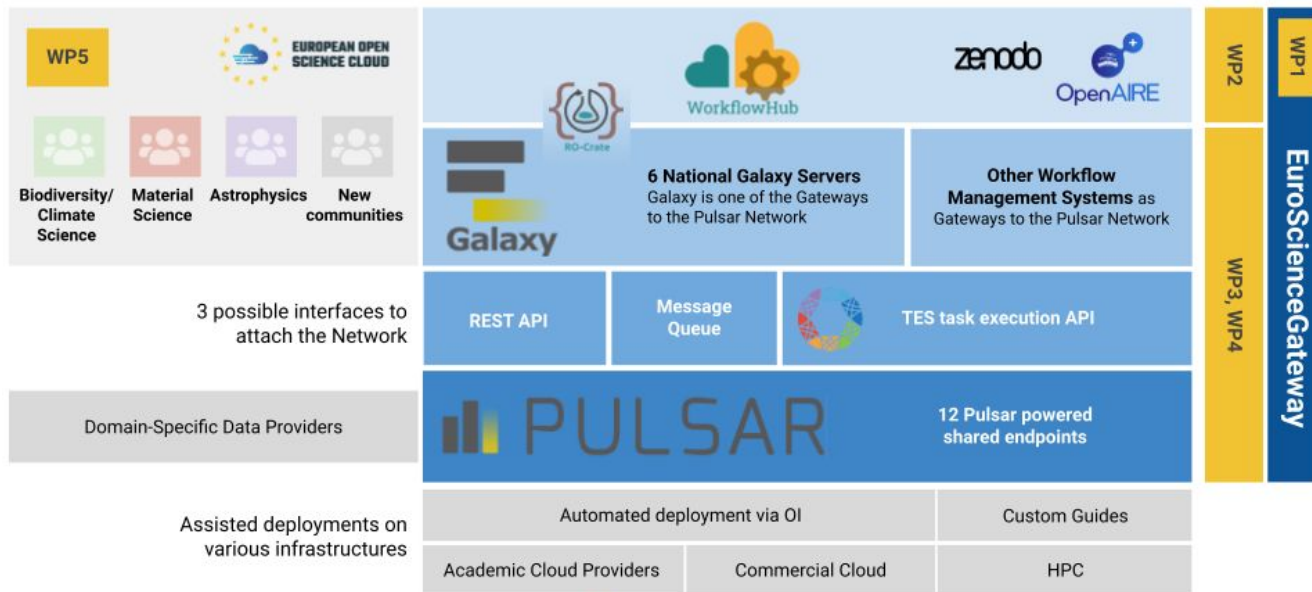


 eOSC | EuroScienceGateway

<https://eurosciencegateway.eu>

Obligatory organigram



Expected results

Pulsar Network:

A mature and tested (TRL-9) distributed compute network with demonstrated usage across **at least 12 European partners**.

ScienceGateways:

6 national Galaxy instances operational and proven by the scientific community with more than **100,000 users**.

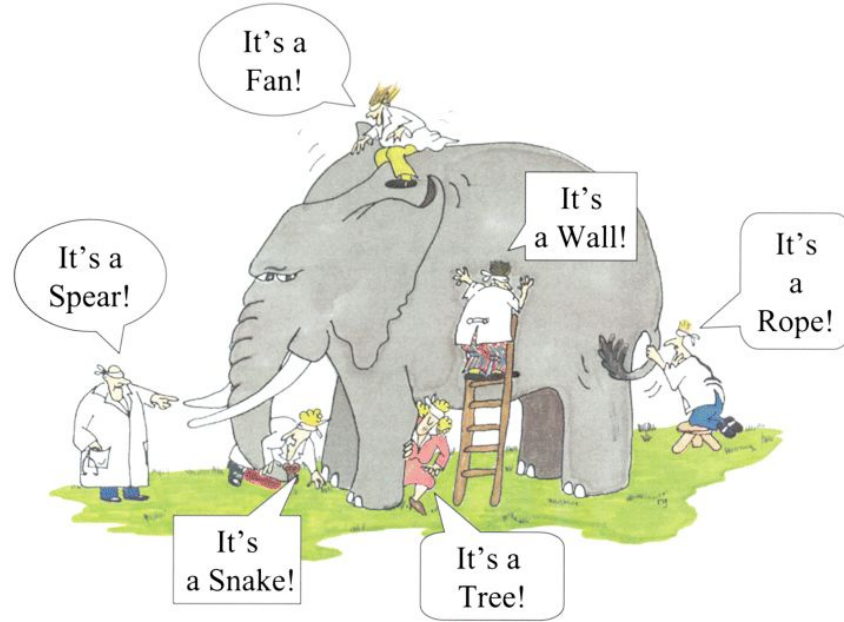
Communities:

Science Gateway with a custom set of tools and workflows for the **Biodiversity/Climate, Materials Science and Astrophysics** community.

FAIR data:

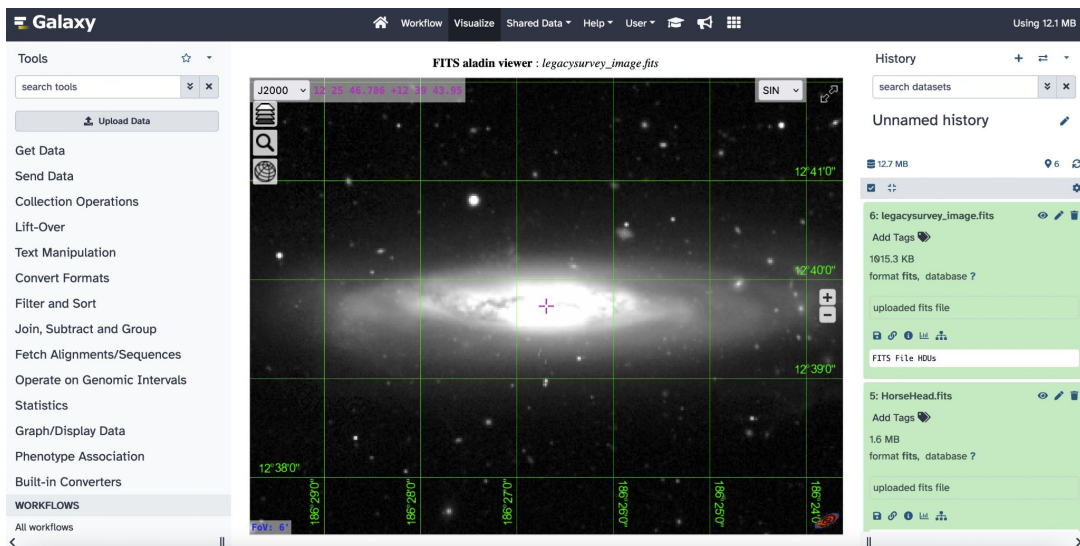
EOSC-catalogued **FAIR data and workflows** that can be found, consumed, created and published (**RO-Crate**) by users of the EuroScienceGateway, demonstrated for each of the 3 domain-specific use-cases.

What is Galaxy!




Communities

- Material Science
<https://materials.usegalaxy.eu>
- Astrophysics
- Biodiversity
<https://assembly.usegalaxy.eu>
<https://ecology.usegalaxy.eu>



Galaxy as large scale compute infrastructure

- Multi-user environment (77,000 - 2023/10) 
 - Caching of reference data
 - Caching of jobs
 - Multi-tiered scheduling (workflows, “users” (limits), jobs) → EuroScienceGateway
- 3,000 tools (Assembly, Jupyter, Alphafold, ...) - a system of systems - a VRE of VREs
- ~2,000,000 container runs a month
- 2.5 TB uploads per day

Open Infrastructure

<https://github.com/usegalaxy-eu>

On-boarding: APIs, standards, logins

- Users login via LDAP, AD, PAM, CAS, OpenID, ORCID, LS-LOGIN
- Findability / Interoperability

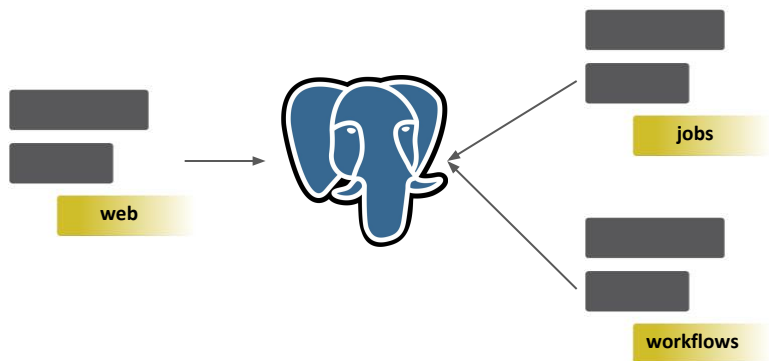


Global Alliance
for Genomics & Health



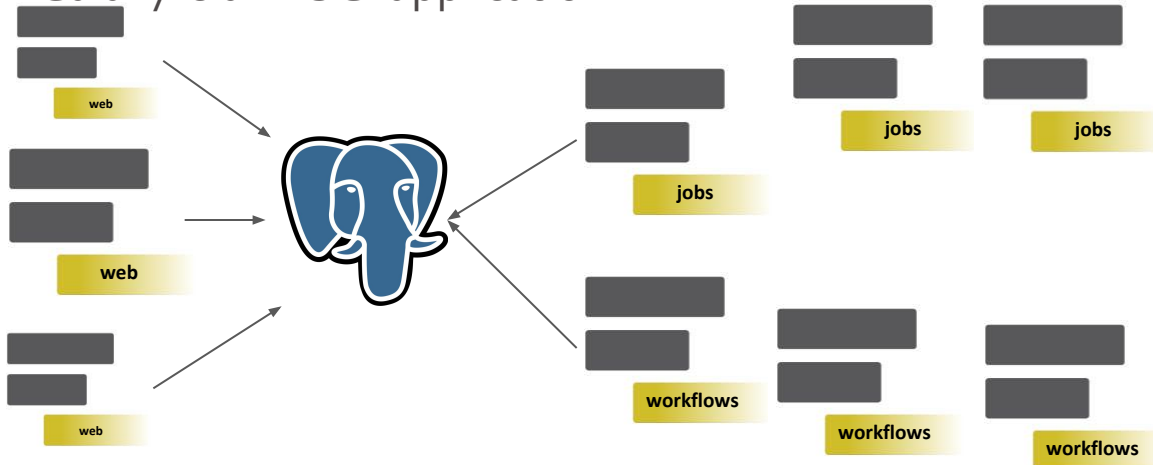
Mirco-services to handle requests

- Users interacting with the a) web frontend or b) a RESTful API
- Galaxy is a ASGI application



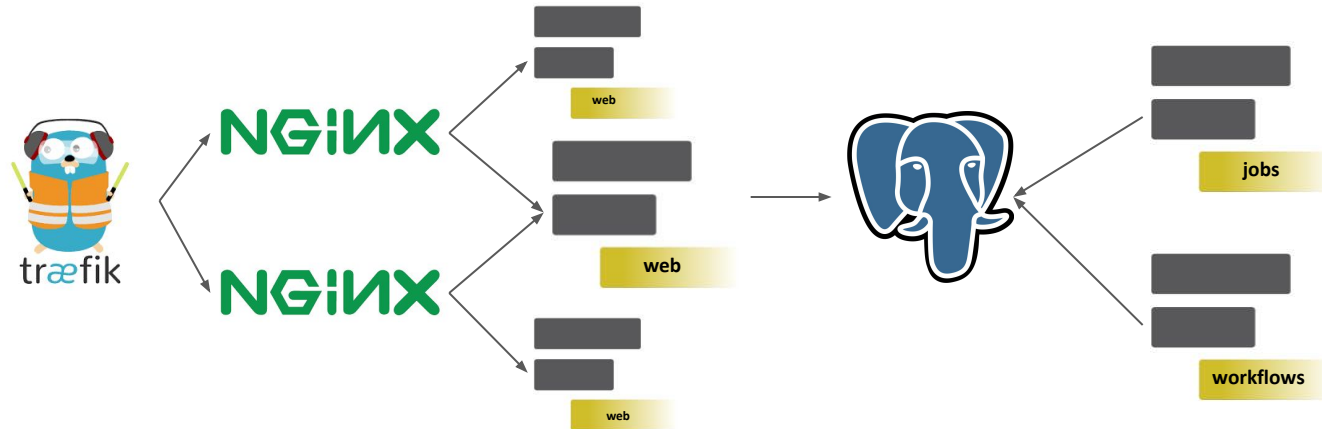
Micro-services to handle requests

- Users interacting with the a) web frontend or b) a RESTful API
- Galaxy is an ASGI application



Common theme: It's actually a bit more complicated ;)

- Resilient and scalable services



Galaxy as large scale compute infrastructure

- Jobs can be submitted to “destinations”
- All common and not so common DRMs
- dependency resolution



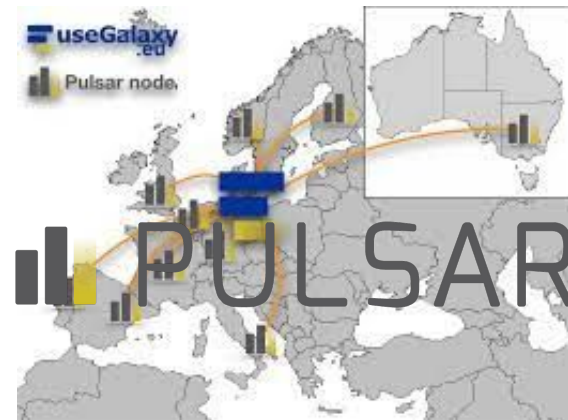
Galaxy as large scale compute infrastructure

- Running on all resources



Galaxy as large scale compute infrastructure

- Bridging to all resources at once with Pulsar
- ARC and DIRAC integration in the works
- Meta-Scheduler → EuroScienceGateway



HTCondor
Software Suite



NGINX



Global Alliance
for Genomics & Health



Things that I left out ... time and so ...

- Uploads and any kind of IO is hard



- Monitoring is essential - it helps with user support, it helps your DevOPS, it helps everyone even your funders ;) <https://stats.galaxyproject.eu>



Things that I left out ... time and so ...

- STORAGE and DATA
- Distributed storage
- Local storage
- User owned storage



iRODS®



A screenshot of the Galaxy web interface. A modal dialog box titled "History Preferred Object Store" is open in the center. The dialog lists four options: "User Preference Defined Default" (selected), "High Performance Storage", "Second Tier Storage", and "Experimental Scratch". Below these is a "SURFS" section. To the right of the dialog is explanatory text: "Selecting this will reset Galaxy to default behaviors configured by your Galaxy administrator. Select a preferred object store for new datasets. This is should be thought of as a preferred object store because depending the job and workflow configuration execution configuration of this Galaxy instance - a different object store may be selected. After a dataset is created, click on the info icon in the history panel to view information about where it is stored. If it is not stored in the correct place, contact your Galaxy administrator for more information." The background shows the Galaxy interface with a "Tools" panel on the left and a "History" panel on the right. The "History" panel shows an "Unnamed history" with three entries: "3 : 1.fasta", "2 : 1.bed", and "1 : Pasted Entry".

Open Infrastructure

<https://github.com/usegalaxy-eu>
<https://eurosciencegateway.eu>

 PULSAR



HTCondor
Software Suite



NGINX



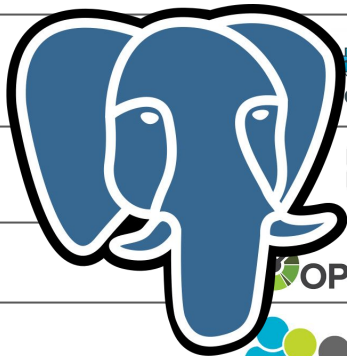
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Open Infrastructure

<https://github.com/usegalaxy-eu>
<https://eurosciencegateway.eu>

 PULSAR



HTCondor
Software Suite



web



jobs



workflows

NGINX



traefik

OPENAPI



Global Alliance
for Genomics & Health

schema.org

LS LOGIN



Infrastructure

- 6 national Galaxy instances
- 12 compute sites as part of the decentralised Pulsar network
- Smart meta-scheduler (optimize for performance, carbon footprint, cost ...)
 - Integrate with ARC and DIRAC
- BYOC - spin up your own Pulsar, ARC endpoint in your academic or commercial cloud - let Galaxy use it
- BYOD - user based object stores (you have an S3 bucket from your University, put it into Galaxy)

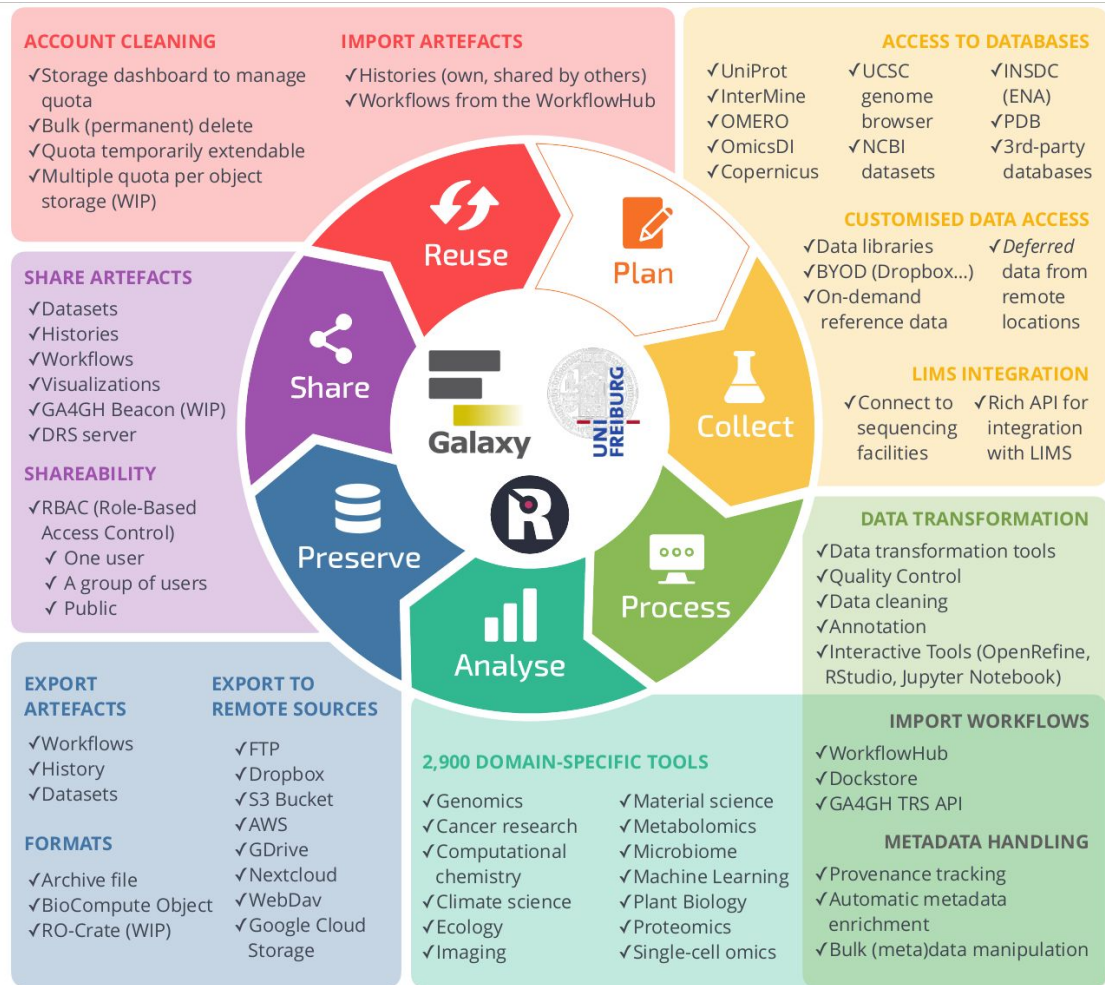
usegalaxy.* community expanding

The image displays five overlapping screenshots of the usegalaxy.* web interface for different countries:

- Galaxy / ELIXIR-ES:** Shows a message: "This instance is in a preproduction phase. Please, report any issue to info@elixir-es. Thank you!"
- Galaxy / NeLS:** Shows a message: "This is the development version of the new usegalaxy.no website. Not for production use!"
- Galaxy France:** Shows a "Welcome to usegalaxy.fr" message with a link to the Terms of Use.
- Galaxy Project:** Shows a "Welcome to usegalaxy.fr" message with a link to the Terms of Use.
- Galaxy Galaxy @ Belgium:** Shows a "Welcome to usegalaxy.be" message and a list of tools and events. The "Tools" list includes: FASTQ Quality Control, SAM/BAM, BED, VCF/BCF, Nanopore, COMMON GENOMICS TOOLS, Operate on Genomic Intervals, Fetch Alignments/Sequences, GENOMICS ANALYSIS, Annotation, Assembly, Mapping, Variant Calling, Multiple Alignments, RNA Analysis, Peak Calling, Phylogenetics, and Rhinovirus Association. The "Events" list includes: "Galactic September News" (Aug 30, 2019), "Galaxy Community Conference - a brief summary!" (Aug 5, 2019), "Galaxy HTS data analysis workshop in Freiburg" (Sep 23, 2019 - Oct 27, 2019), "ELIXIR Belgium All hands 2019" (Sep 16, 2019), and "ELIXIR 2019 All Hands" (Jun 17, 2019 - Jun 20, 2018).

usegalaxy.es
usegalaxy.no
usegalaxy.fr
usegalaxy.be
usegalaxy.ee
usegalaxy.it
usegalaxy.eu
usegalaxy.cz
usegalaxy.org
usegalaxy.co.au

Data



Data

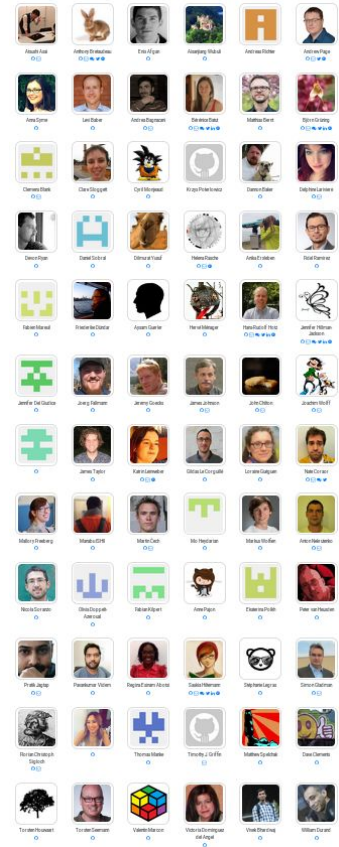
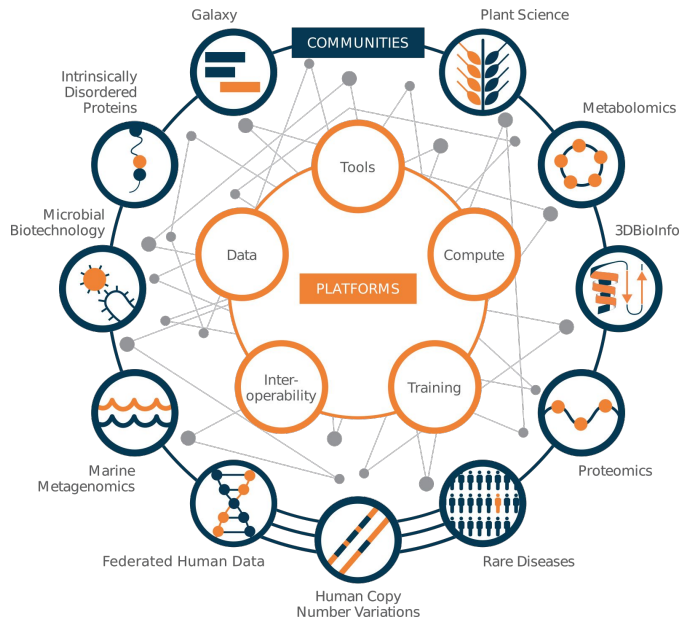
- RO- Crate into Galaxy and out
- Workflows from WorkflowHub into Galaxy
- Workflows from Galaxy to WorkflowHub
- Galaxy artefacts into the OpenAIRE KnowledgeGraph

Workflow Invocations

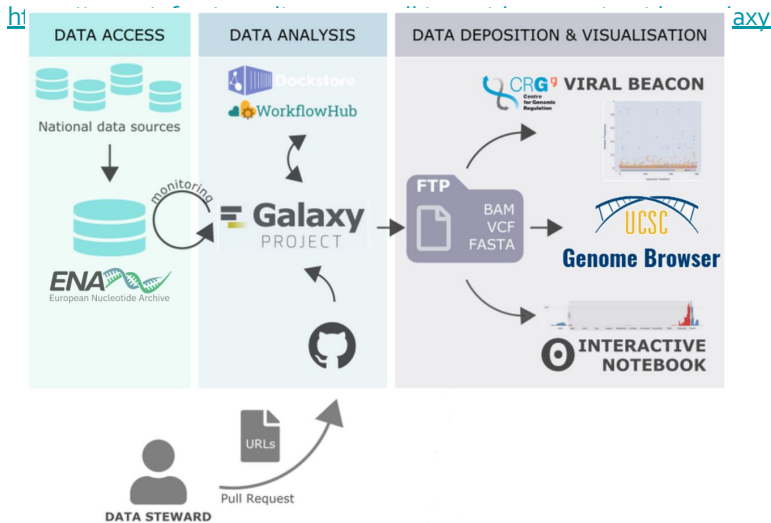
Workflow	History	Invoked	Updated	State	
Test workflow	Large history	5 days ago	5 days ago	scheduled	▶
Test workflow	History with workflow	about 2 months ago	about 2 months ago	scheduled	▶

Communities sharing one coherent framework

- rna.usegalaxy.eu
- clipseq.usegalaxy.eu
- metagenomics.usegalaxy.eu
- hicexplorer.usegalaxy.eu
- cheminformatics.usegalaxy.eu
- proteomics.usegalaxy.eu
- imaging.usegalaxy.eu
- metabolomics.usegalaxy.eu
- ecology.usegalaxy.eu
- nanopore.usegalaxy.eu
- singlecellomics.usegalaxy.eu
- humancellatlas.usegalaxy.eu
- virology.usegalaxy.eu
- climate.usegalaxy.eu
- streetscience.usegalaxy.eu
- ml.usegalaxy.eu



BY-COVID



Infectious Diseases Toolkit

Main

About

Contribute

Main

- Pathogen characterisation
- Socioeconomic data
- Human biomolecular data
- Human clinical and health data

Showcase

- An automated SARS-CoV-2 genome surveillance system built around Galaxy
- National resources
- Tools and resources list
- Training resources list

Showcase

Showcase

Search Type here...

An automated SARS-CoV-2 genome surveillance system built around Galaxy

An automated, modular system for large-scale FAIR analysis of SARS-CoV-2 sequencing data analysis powered by the Galaxy platform.

Affiliations:  

eosc Biodiversity and the BGE project

BGE, VGP, ERGA 🍷

Class	Order	Species	Size (Mb)	Contig N50	Scaffold N50	Gaps	Het (%)	Repeat (%)	Merqury	Busco (%)					
Mammalia	Sirenia	<i>Dugong dugon</i>	3,159	58	139	0	0.17	14.8	99.70	17.80					
		<i>Halpinoides dugon</i>	3,259	58	139	0	0.17	14.8	99.70	17.80					
		<i>Loxodonta africana</i>	3,396	0	0	0	0.32	16.8	99.34	16.50					
		<i>Loxodonta africana</i>	3,396	0	0	0	0.32	16.8	99.34	17.80					
	Artiodactyla	Ptilodactyla	<i>Moschus moschiferus</i>	2,729	21	129	10	0.23	17.2	99.44	16.60				
			<i>Moschus moschiferus</i>	2,729	29	132	31	0.21	17.2	99.44	16.60				
		Eulipotyphla	<i>Sorex araneus</i>	2,216	4	348	0	0.17	27.0	99.76	18.00				
			<i>Meles meles</i>	3,113	16	488	10	0.33	25.0	99.00	18.00				
		Cingulata	Didelphimorphia	<i>Marmosa murina</i>	2,117	5	111	31	0.20	20.8	99.88	16.50			
				<i>Citellus richardsoni</i>	2,115	66	125	0	0.16	26.4	99.54	16.20			
			Carnivora	Dermoptera	<i>Desmodus rotundus</i>	3,236	16	115	30	0.60	32.5	99.36	16.60		
					<i>Desmodus rotundus</i>	3,236	15	96	74	0.50	32.5	99.36	17.00		
				Primates	Carnivora	<i>Meffitis nebulosa</i>	2,390	34	149	1	0.36	19.0	99.65	17.50	
						<i>Macropus eugenii</i>	3,232	45	75	1	0.20	18.8	99.24	17.00	
					Artiodactyla	Hippopotamidae	<i>Hippopotamus amphibius</i>	2,553	72	168	0	0.00	23.0	99.60	18.20
							<i>Hippopotamus amphibius</i>	2,553	73	184	0	0.00	23.0	99.60	18.20
Artiodactyla	Bovidae					<i>Eubalaena glacialis</i>	2,662	39	87	0	0.00	30.6	99.60	18.00	
						<i>Eubalaena glacialis</i>	2,662	33	84	29	0.27	30.6	99.60	17.60	
Aves	Sphenisciformes	<i>Archimedes holboellii</i>	2,729	48	109	0	0.32	17.4	99.69	17.80					
		<i>Balaeniceps aberti</i>	2,701	36	109	13	0.39	30.3	99.69	17.80					
	Rheiformes	<i>Spheniscus humboldti</i>	2,247	16	88	1	0.48	12.8	99.62	16.00					
		<i>Rhea pennata</i>	1,255	19	80	1	0.45	11.5	99.35	16.90					
	Psittaciformes	<i>Ara ararauna</i>	1,217	0	0	0	0.22	16.1	99.71	17.30					
		<i>Ara ararauna</i>	1,217	0	0	0	0.22	16.1	99.71	16.80					
	Passeriformes	Columbidae	<i>Cathartidae guttata</i>	1,010	10	71	5	1.47	10.8	99.00	0.00				
			<i>Foecile zincophila</i>	1,049	8	117	14	3.90	10.5	99.61	0.00				
		Passeriformes	Columbidae	<i>Foecile zincophila</i>	1,049	10	76	1	0.99	10.5	99.48	0.00			
				<i>Myiagraha pacifica</i>	1,291	8	22	14	1.17	30.6	99.60	0.00			
			Passeriformes	Columbidae	<i>Diapha piper</i>	990	11	74	0	1.16	4.8	99.55	13.10		
					<i>Diapha piper</i>	990	14	76	0	1.14	4.8	99.55	13.20		
Columbidae				<i>Cornus nasuta</i>	1,062	22	69	13	0.24	11.2	99.90	16.00			
				<i>Ammodramus melanurus</i>	1,191	12	40	3	1.17	21.3	99.28	16.80			
Caprimulgiformes				<i>Ammotriptus caudicinctus</i>	1,205	0	40	4	0.24	2.6	99.60	16.10			
				<i>Acridotheres tristis</i>	1,354	7	30	3	1.50	30.0	99.62	15.60			
Opisthocomiformes				<i>Opisthocomus hoahu</i>	1,217	14	88	0	0.50	19.9	99.54	15.60			
				<i>Opisthocomus hoahu</i>	1,313	11	35	1	0.60	22.6	99.60	16.20			
Columbiformes	<i>Colinus eschscholtzii</i>	1,130	2	5	1	0.60	12.6	99.60	16.20						
	<i>Colinus eschscholtzii</i>	1,130	0	2	48	0.50	12.6	99.66	16.70						
Caprimulgiformes	<i>Podiceps gringoides</i>	1,093	15	85	2	1.23	12.0	99.78	16.10						
	<i>Vipera asotus</i>	1,444	48	203	40	1.13	39.0	99.00	0.00						
Lepidosauria	Squamata	<i>Liasis fuscus</i>	2,444	20	204	0	0.13	12.7	99.28	17.80					
		<i>Eutretes nungarensis</i>	1,590	34	105	6	0.57	27.1	99.43	16.30					
Reptilia	Testudines	<i>Erythrochelys macleayi</i>	1,908	3	256	0	0.68	18.4	99.61	15.10					
		<i>Caretta caretta</i>	1,472	38	209	0	0.49	11.2	99.57	15.90					
Crocodylia	Testudines	<i>Caretta caretta</i>	1,472	52	210	0	0.48	13.2	99.57	17.50					
		<i>Stenomachus odonatus</i>	2,287	39	282	0	0.21	22.3	99.65	17.90					
Amphibia	Anura	<i>Stenomachus odonatus</i>	2,287	44	256	4	0.21	22.3	99.65	17.90					
		<i>Erythronchelys macleayi</i>	2,272	93	138	17	0.28	27.6	99.28	18.10					
Reptilia	Crocodylia	<i>Gavialis gangeticus</i>	2,260	1	1	1	0.12	22.8	99.70	17.70					
		<i>Gavialis gangeticus</i>	2,301	17	256	1	0.17	22.8	99.70	17.90					
Amphibia	Anura	<i>Sora borboniensis</i>	959	21	109	4	0.87	28.6	99.20	15.20					
		<i>Pseudophryne carolinensis</i>	1,453	7	723	23	0.47	7.8	99.87	14.50					
Sauriformes	Scorobromiformes	<i>Hyala sarda</i>	1,750	5	302	0	0.12	61.2	99.20	13.80					
		<i>Hyala sarda</i>	1,750	4	507	0	1.08	61.2	98.29	13.80					
Sauriformes	Scorobromiformes	<i>Gastrophryne carolinensis</i>	1,090	5	510	0	1.45	62.0	98.35	13.80					
		<i>Gastrophryne carolinensis</i>	1,190	5	510	0	1.45	62.0	98.35	14.00					
Sauriformes	Scorobromiformes	<i>Trichomycterus masabianka</i>	999	0	0	0	0.13	34.1	99.60	15.20					
		<i>Trichomycterus masabianka</i>	999	0	0	0	0.13	34.1	99.60	15.60					
Actinopteri	Perciformes	<i>Reinhardtius graeffii</i>	2,420	15	80	23	0.87	66.6	99.80	17.10					
		<i>Scorobromus japonicus</i>	149	7	1	1	1.22	19.9	99.29	17.00					
Actinopteri	Lampriiformes	<i>Lycodapus pacificus</i>	590	5	29	0	0.50	25.8	99.33	16.00					
		<i>Lampris macrochirus</i>	1,327	1	61	1	1.00	50.8	98.79	16.00					
Actinopteri	Characiformes	<i>Lampris macrochirus</i>	1,327	1	61	1	1.00	50.8	98.79	16.10					
		<i>Salminus hilarii</i>	0	6	41	20	0.30	0.0	8.00	17.50					
Chondrichthyes	Hybridiformes	<i>Salminus hilarii</i>	0	6	39	0	0.12	34.1	99.60	16.00					
		<i>Hyporhamphus intermedius</i>	1,007	5	57	63	0.67	33.1	99.20	17.20					
Chondrichthyes	Hybridiformes	<i>Hyporhamphus intermedius</i>	1,007	57	63	63	0.67	33.1	99.20	16.60					
		<i>Chondrochasma japonicus</i>	924	10	31	0	0.43	39.7	99.20	16.70					
Chondrichthyes	Hybridiformes	<i>Chondrochasma japonicus</i>	1,415	10	74	13	0.36	43.7	99.33	16.00					
		<i>Hydrolagus leucon</i>	1,415	31	74	3	0.36	43.7	99.33	16.00					
Chondrichthyes	Hybridiformes	<i>Hydrolagus leucon</i>	1,472	5	159	0	0.44	43.5	99.23	16.80					
		<i>Hyporhamphus intermedius</i>	1,416	5	151	0	0.44	43.5	99.23	17.00					

Project Highlight:

The Vertebrate Genomes Project in Galaxy



VERTEBRATE
GENOMES
PROJECT

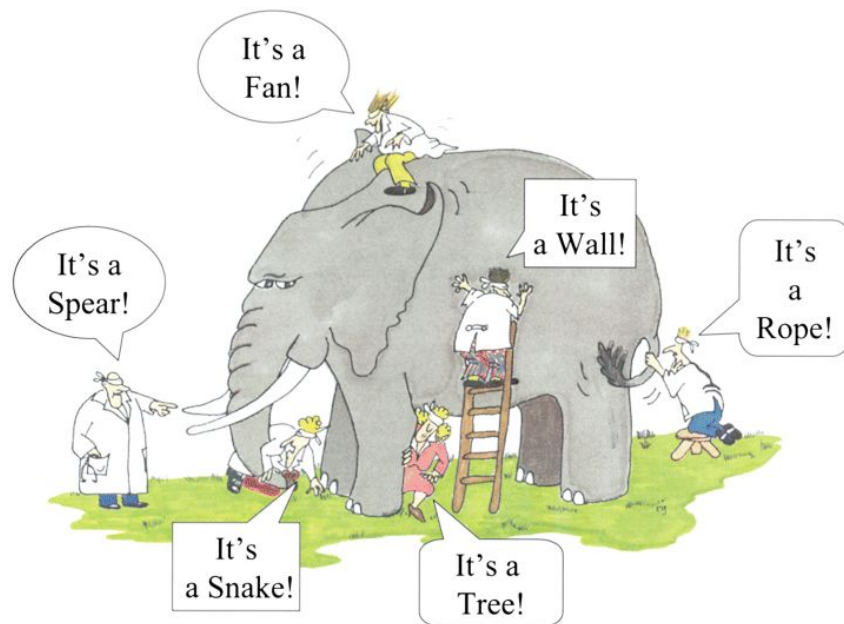
A PROJECT OF THE G10K CONSORTIUM

Generating near error-free genome assemblies for more than 70,000 vertebrate species!

eosc Even more diversity

even more sharing, more empowering

- Build a coherent analysis platform for all researchers
- More citizen science projects
- Outreach is hard - and we are not outreach experts
- How do we scale user-support to 100k users?



Stronger together: FAIR-EASE and EuroScienceGateway join forces

06 February 2023



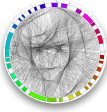
Two Horizon Europe projects directed toward the development and deployment of the European Open Science Cloud (EOSC)—[FAIR-EASE](#) and [EuroScienceGateway](#) (ESG)—have agreed to closely cooperate over the next three years in order to extend the open source [Galaxy platform](#) for FAIR data analysis to a broader group of scientific user communities.

The cooperation will include shared compute resources, joint workshops, and a merging of tools and workflows from FAIR-EASE to be run via the distributed computing network being developed by the ESG project. The aim is to evaluate if FAIR-EASE's Earth Analytical Lab (EAL) can be based on the ESG.

“Synchronising the work of ESG and FAIR-EASE is good news for the users of EOSC,” said Björn Grüning, project coordinator of ESG. “We believe that if ESG and FAIR-EASE combine our efforts we can achieve more for our users and utilise European resources more effectively. This is a way of working that the European Commission and the [EOSC Association](#) have been encouraging among the EOSC-related projects.”

Let's discuss VREs

- Galaxy as a VRE
 - Galaxy can and is deployed as VRE for single user
- Galaxy is a system of systems
 - We offer 3000 “VRE” (we call it tools) on the European Galaxy instance
 - Data importer, Data exporter
 - Traditional HPC tools
 - Text Processing tools
 - Jupyter Notebooks, RStudio
- Galaxy can schedule all kinds of “VRE” (like Jupyter)



Galaxy Interactive Tools (GxITs): A Wormhole Between the Worlds

Table Data:

color	clarity	depth	table	price	x	y	z
E	VSI	61.2	56.0	5.75	3.51	6.42	1.42
Good	I	S11	58.4	60.0	6.78	3.03	1.42
E	S11	61.6	57.0				
H	S12	62.1	55.0				
G	S12	63.7	60.0				
Good	G	VVS2	62.5	56.0			
Good	J	S11	60.3	57.0			
Good	D	VS1	59.3	55.0	4		
Good	E	S11	62.7	57.0	4		
G	S11	62.9	57.0	4			
Good	F	S12	63.1	58.0	4		
E	S12	60.5	61.0	4			

Code Snippets:

```
In [41]: delay_counts_df = delay_counts_df.rename_axis({'ARR_DEL15': 'COUNTS'}, axis=1)
trip_counts_df = trip_counts_df.rename_axis({'FL_DATE': 'COUNTS'}, axis=1)

In [42]: mat = (delay_counts_df / trip_counts_df).unstack().T.reset_index(level=0, drop=True).T
```

Heatmap Data (Approximate):

State	AR	CA	TX	Other States
AR	0.8	0.2	0.1	0.1
CA	0.1	0.8	0.1	0.1
TX	0.1	0.1	0.8	0.1
Other States	0.1	0.1	0.1	0.8

“HPC” / CLI tools
pre-built tools, rigid interface, Galactic scale

Interactive tools
Complete freedom! Dynamic outputs,
no rules, less scale

GxITs: Use RStudio & Jupyter directly within Galaxy

Tools

search tools

- Get Data
- Send Data
- Collection Operations
- GENERAL TEXT TOOLS
- Text Manipulation
- Filter and Sort
- Join, Subtract and Group
- GENOMIC FILE MANIPULATION

- Convert Formats
- FASTA/FASTQ
- FASTQ Quality Control
- Quality Control
- SAM/BAM
- BED

o.R x calendar.js x bullets.js x job.R x ggplot2:diamonds x

Filter

color	clarity	depth	table	price	x	y	z
E	VS1	61.2	56.0			5.75	3.51
Good I	SI1	58.4	60.0			6.78	3.93
G	SI1	61.6	57.0			6.24	3.82
H	SI2	62.1	55.0			6.20	3.84
G	SI2	63.7	60.0			6.28	4.02
Good G	VVS2	62.5	56.0			5.98	3.73
Good J	SI1	60.3	57.0			6.49	3.90
Good D	VS1	59.3	55.0	4003	5.86	5.83	3.47
Good E	SI1	62.7	57.0	4003	6.08	6.13	3.83
G	SI1	62.9	57.0	4004	6.37	6.30	3.98
Good F	SI2	60.7	57.0	4004	6.42	6.46	3.91
F	SI2	63.1	58.0	4004	6.34	6.38	4.01
E	SI2	60.5	61.0	4004	6.31	6.38	3.84

Showing 1 to 14 of 13,082 entries, 10 total columns (filtered from 53,940 total entries)

Console Terminal Jobs

Start Local Job

job.R Step 2 0:07

job.R Succeeded 10:57 AM 0:44

job.R Failed 10:56 AM 0:07

Environment History Connections Build Git

Install and Restart Check More

Testing R file using 'testthat'

Loading example

OK | F W S | Context

1 | test-hello

Results

OK: 1

Failed: 0

Warnings: 0

Skipped: 0

Files Plots Packages Help Viewer

Zoom Export Publish

Revenue
US\$, in thousands

Profit
%

Order Size
US\$, average

New Customers
count

Satisfaction
out of 5

History

search datasets

RStudio Demo

9 shown, 4 deleted

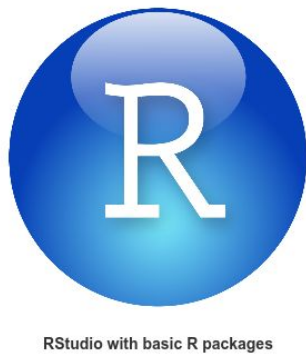
220.36 KB

- 20: Species occurrences
- 17: Pasted Entry
- 16: workspace.RHistory
- 15: workspace.RData
- 11: workspace.RHistory
- 10: workspace.RData
- 9: jupyter-vs-rstudio.png
- 8: all.png
- 4: its.tsv



jupyter

Jupyter lab for Python, R and Julia

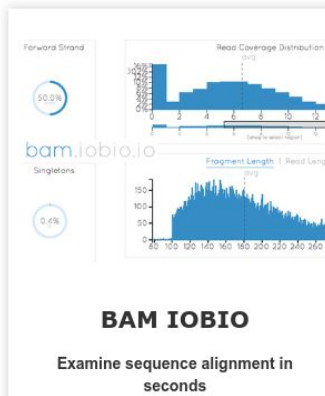


RStudio with basic R packages



ASK
OMICS

SPARQL query interface



Forward Strand

0.0%

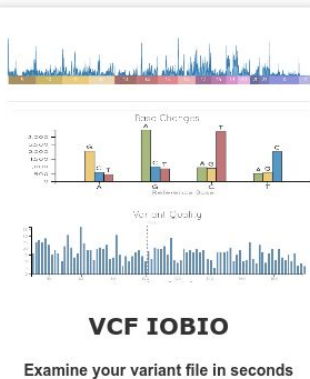
bam.iobio.io

Singletons

0.6%

BAM IOBIO

Examine sequence alignment in seconds



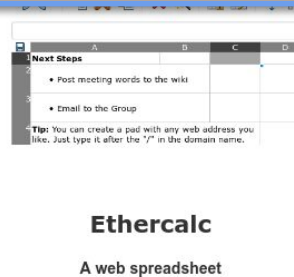
VCF IOBIO

Examine your variant file in seconds



cellxgene

Explore single-cell transcriptomics data



Ethercalc

A web spreadsheet



PHINCH

Visualise large biological datasets
(microbiomes, metagenomes, etc.)

live.usegalaxy.eu

History



search datasets



RStudio Demo

8 shown, 5 deleted

220.36 KB



17: Pasted Entry



16: workspace.RHistory



15: workspace.RData



11: workspace.RHistory



10: workspace.RData



9: jupyter-vs-rstudio.png



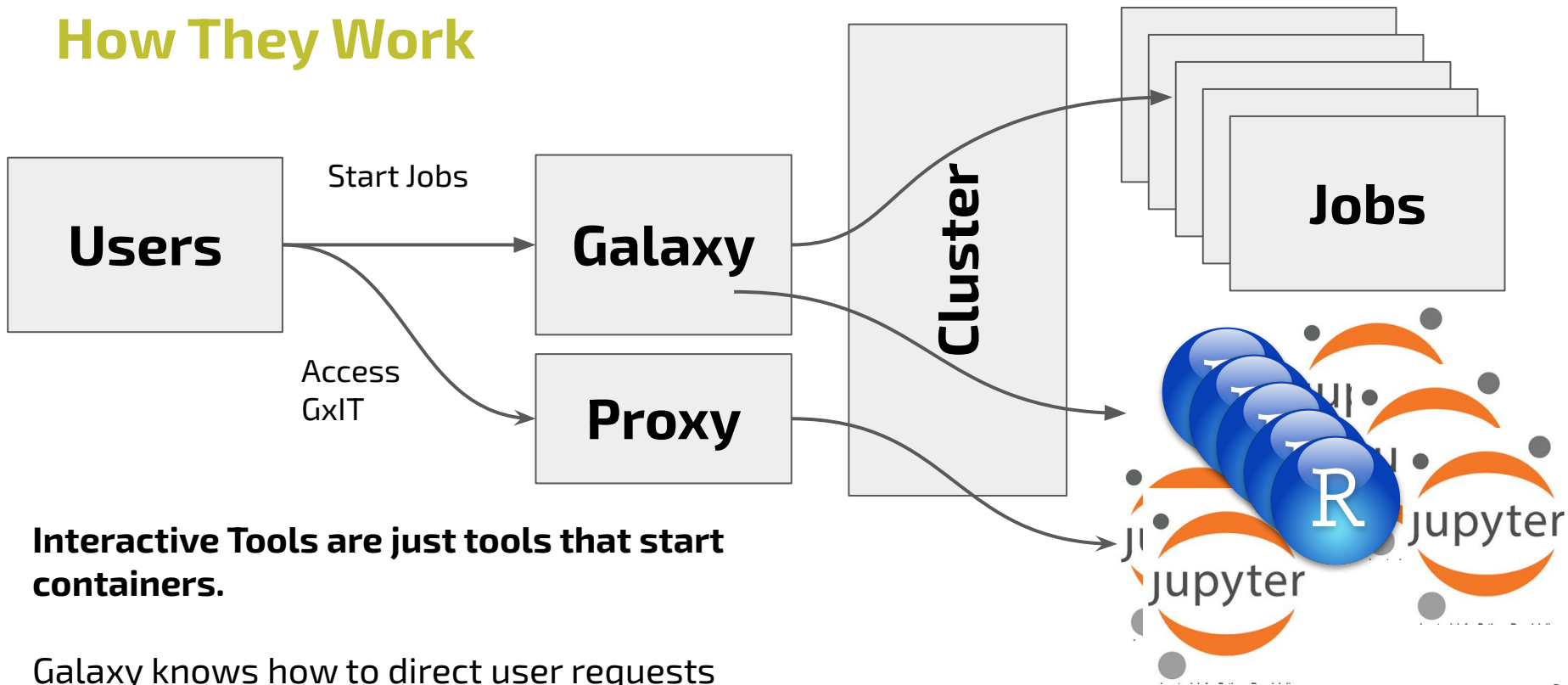
8: all.png



4: its.tsv



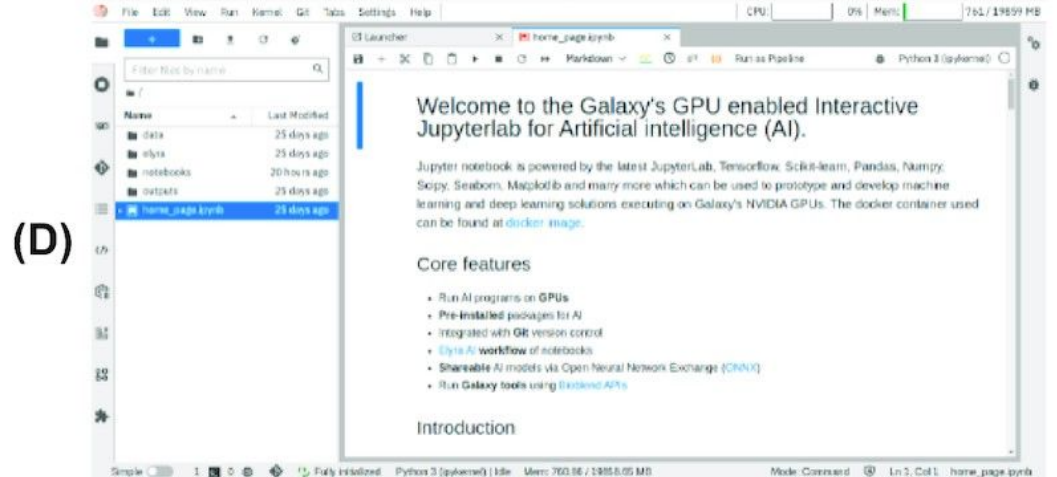
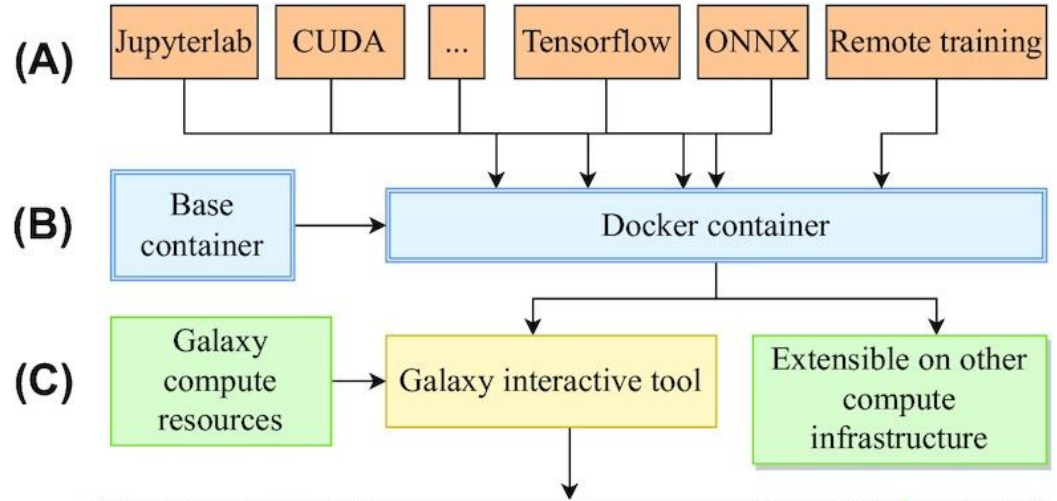
How They Work



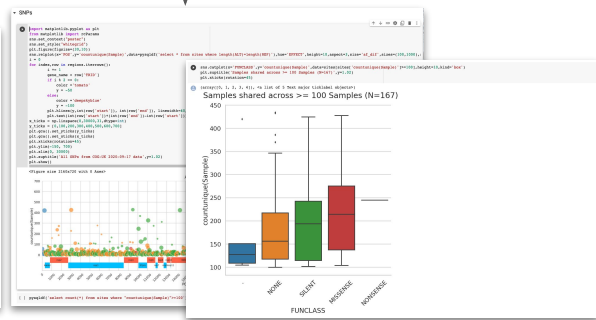
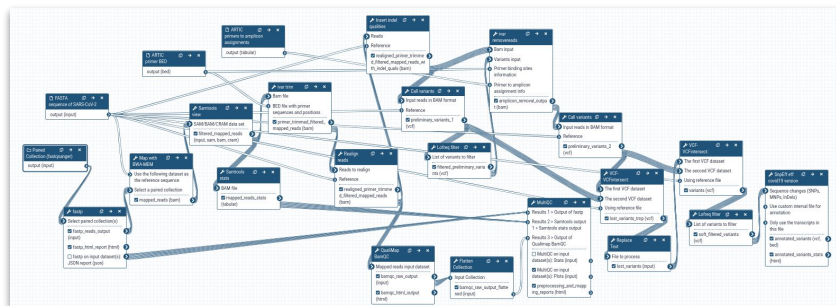
Interactive Tools are just tools that start containers.

Galaxy knows how to direct user requests to cluster where the tools are running

More technical



Interactive tools in COVID-19 variant calling analysis



1 year ago

Published Workflows

Search name, annotation, owner, and tag:

Advanced Search

Name	Annotation	Owner	Community Rating	Community Tags
COVID-19: variation analysis on WGS SE data	Call variants from WGS (non-ampliconic) single-end reads.	wolfgang-maier	★★★★★	covid-19 covid19.galaxyproject.org
COVID-19: variation analysis on ARTIC PE data	Call variants from ampliconic paired-end reads.	wolfgang-maier	★★★★★	covid-19 artic covid19.galaxyproject.org
COVID-19: variation analysis on WGS PE data	Call variants from WGS (non-ampliconic) paired-end reads.	wolfgang-maier	★★★★★	covid-19 covid19.galaxyproject.org
COVID-19: consensus construction	Build a consensus sequence from a list of variants. Hard-mask regions with low coverage and sites with called, but filtered variants. Note: Sites with...	wolfgang-maier	★★★★★	covid-19 covid19.galaxyproject.org
COVID-19: variation analysis of ARTIC ONT data	A Galaxy workflow that replaces the ARTIC minion shell command	wolfgang-maier	★★★★★	ont covid-19 artic covid19.galaxyproject.org
COVID-19: variation analysis reporting	Generate variant reports for the output of SARS-CoV-2 variation analysis workflows	wolfgang-maier	★★★★★	covid-19 covid19.galaxyproject.org

Workflow: COVID-19: variation analysis reporting

Number of Clusters:

The number of clusters that your samples should get grouped into in the Variant Frequency Plot.

gene products translated:

Variation data to report:

A collection of VCF data specific filter options. Filter by:

AF Filter:

minimal allele-frequency:

DP Filter:

minimal depth of coverage:

DP_ALIT Filter:

Now

Climate analysis on usegalaxy.eu



COVID-19 Research!
Want to learn the best practices for the analysis of SARS-CoV-2 data using Galaxy? Visit the Galaxy SARS-CoV-2 portal. We mirror all public SARS-CoV-2 data from ENA in a Galaxy data library for your convenience. The Galaxy community has created COVID-19 dedicated training materials. Please check our recent [advice](#) for more details.
If you need help submitting your data to public archives, like ENA, please [get in touch](#). We will support you in sharing your data.

Welcome to the climate science community

The Climate Science workbench is a comprehensive set of analysis tools and consolidated workflows. The workbench is based on the [Galaxy framework](#), which guarantees simple access, easy extension, flexible adaption to personal and security needs, and sophisticated analyses independent of command-line knowledge.
The current implementation comprises a few tools dedicated to different research areas of climate science. More tools are coming soon!
The list of tools is maintained by [Anna!!!](#)

Content

- Welcome to the climate science community
- Get started
- Training
- Available tools
 - Interactive tools
 - Climate Analysis
 - GIS data handling
- Machine Learning Workbench
- Acknowledgments
- Citation

Get started

Are you new to Galaxy, or returning after a long time, and looking for help to get started? Take a [guided tour](#) through Galaxy's user interface.

Training

- Galaxy 101 for everyone
- Climate Galaxy Training

Want to learn more about Galaxy? Check out the following hands-on tutorials from the [Galaxy Training Network](#).

We are passionate about training. So we are working in close collaboration with the [Galaxy Training Network \(GTN\)](#) to develop training materials of data analyses based on Galaxy (Batu et al., 2017). These materials hosted on the GTN GitHub repository are available online at <https://training.galaxyproject.org>.

Available tools

Interactive tools

- Panoply netCDF viewer
- JupyterLab for Ocean / Atmosphere / Land / Climate Pangeo Python ecosystem with:
 - PANGEO python ecosystem: PANGEO is a community platform for Big Data geoscience;
 - Community Earth System Models (CESM) development & Training platform: The Community Earth System Model (CESM) is a fully-coupled, global climate model that provides state-of-the-art computer simulations of the Earth's past, present, and future climate states.
 - ESMValTool: a community diagnostic and performance metrics tool for routine evaluation of Earth system models in the Coupled Model Intercomparison Project (CMIP).

The JupyterLab ESMValTool environment can be used for developing new diagnostic recipes and as a teaching platform.

Climate Analysis

Tool	Description	Reference
cdfs_essential_variability	Copernicus Essential climate variables for assessment of climate variability from 1979 to present	-
shftl_longitude_ranges	Shift longitude range in netCDF data file from 0->360 to -180->180 degrees	-
pny_maps	Visualization on a geographical map with pnyplot	-
mean_per_zone	Plot zonal statistics from a raster and shapefile on a geographical map	-

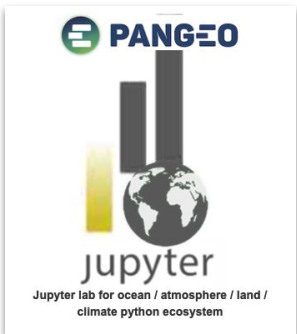
Interactive tools for climate

jupyter
Jupyter lab for ocean / atmosphere / land / climate python ecosystem

Panoply netCDF Data Viewer



JupyterLab for Ocean / Atmosphere / Land / Climate

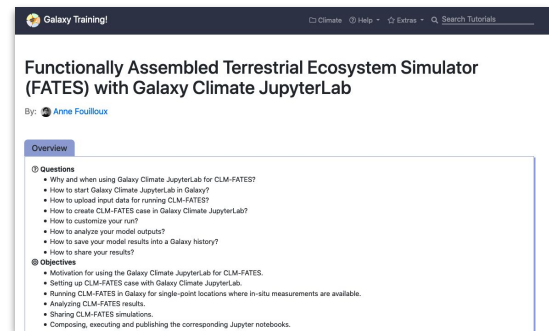


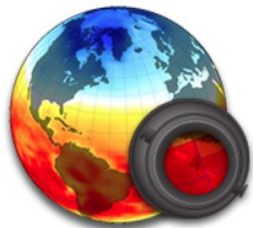
COMMUNITY EARTH SYSTEM MODEL
CESM®



Use cases

- Development of climate models
- Co-design for new Galaxy tool development
- Data analysis and visualization





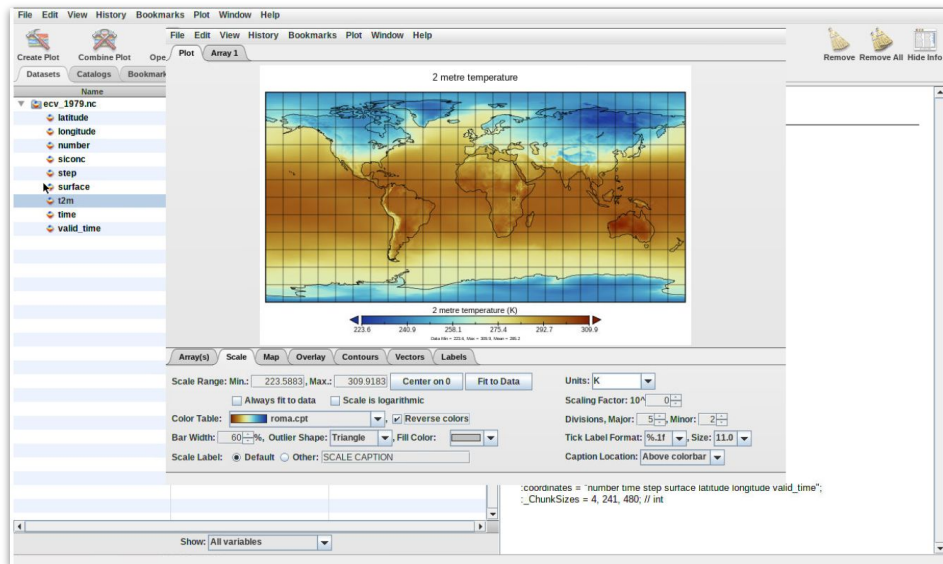
Panoply netCDF Data Viewer

Panoply netCDF viewer



Use cases

- Data visualization
- Image saving
- Time series video creation



Galaxy Training!

Climate Help Extras Search Tutorials

Visualize Climate data with Panoply netCDF viewer

By: Anne Foulloux

Overview

Questions

- How to start Panoply interactive environment in Galaxy?
- How to inspect netCDF data?
- How to make a plot with Panoply?
- Where to save your plots in Panoply?
- How to customize plots in Panoply?
- How to generate animation in Panoply?

Objectives

- Learn to use Panoply in Galaxy to visualize netCDF geo-referenced data
- Learn how Panoply plots are exported to Galaxy

Ecology with Interactive Tools: 3 use cases

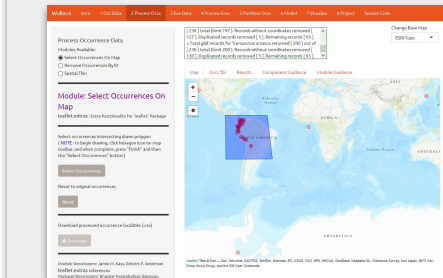


Inside a complete analysis

Biodiversity and environmental
data collection

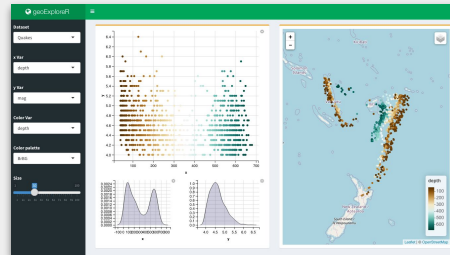
Selection / Filtering

Analysis via modelling
R Shiny Wallace



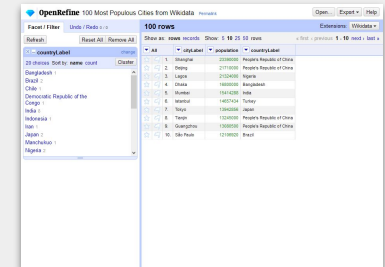
Data visualisation

Cartography + visualisation
R Shiny GeoExplorer



Data cleaning

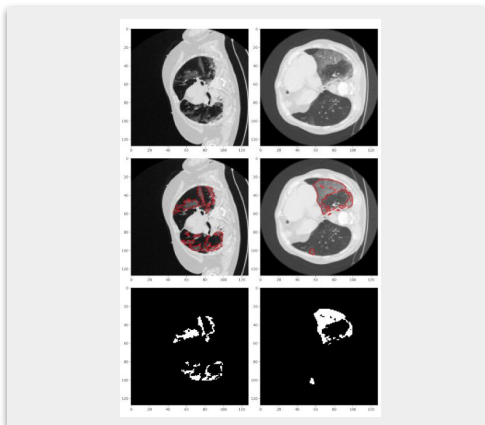
Data cleaning
OpenRefine



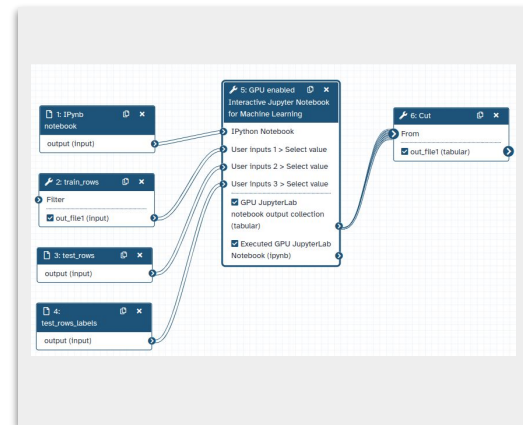
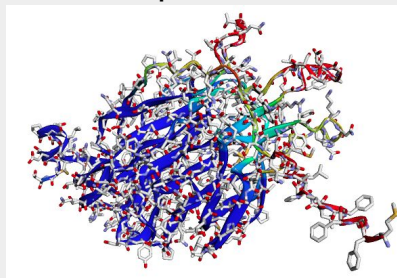
GPU-enabled VREs for everyone

An accessible infrastructure for artificial intelligence using a Docker-based JupyterLab in Galaxy

Image segmentation of COVID-19
CT scans



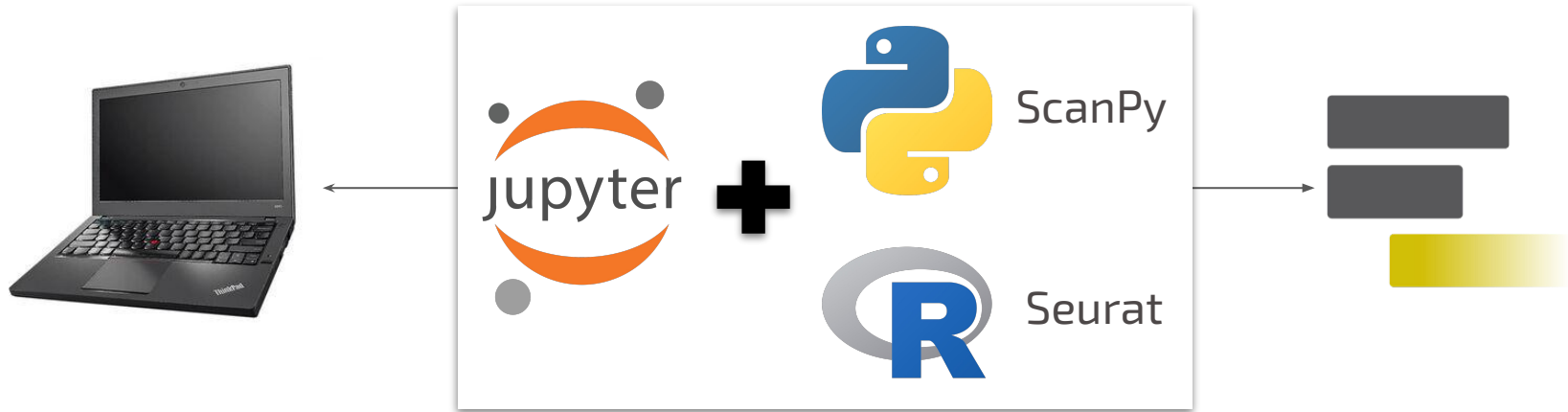
Prediction of 3D structures
of proteins



Single-cell data analysis



When offline limitation (RAM, dataset size, etc)



Project Partners

