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The EUBrazilOpenBio-BioVeL Use Case in EGI

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EGI Technical Forum 2013 - Madrid

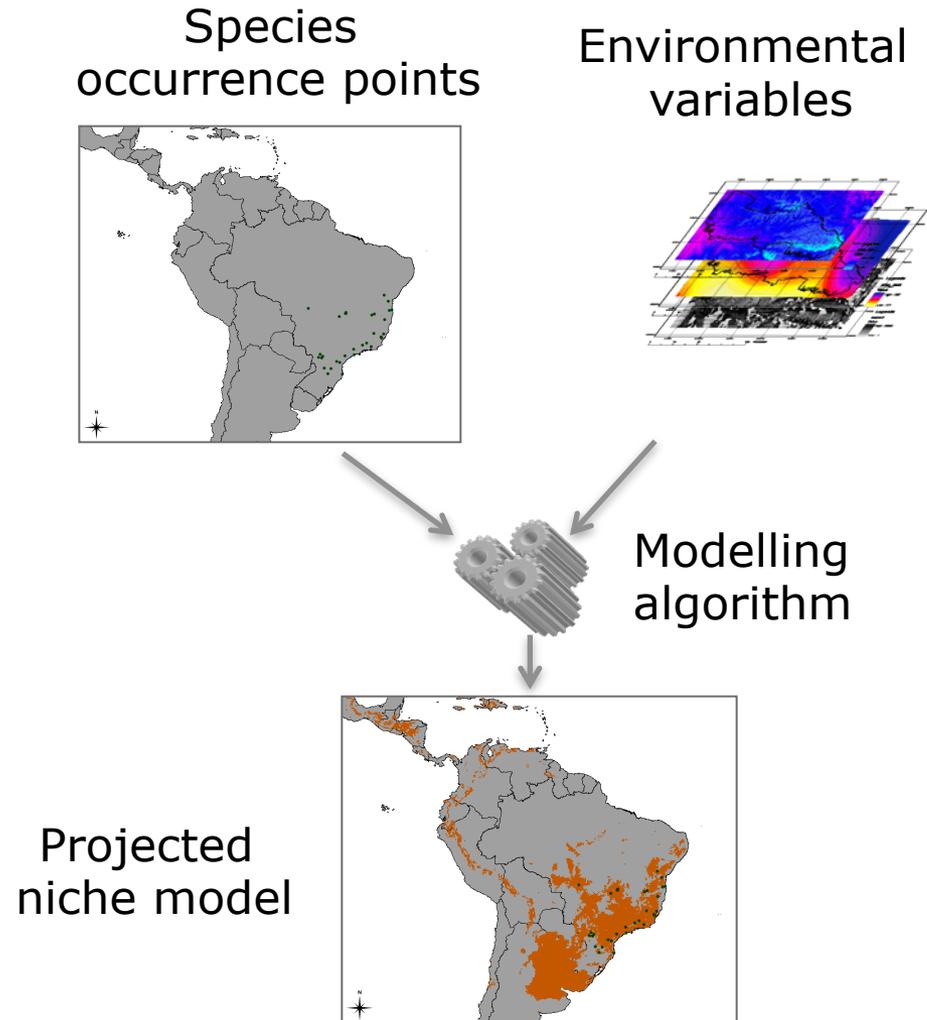


The Use Case: Ecological Niche Modelling

Ecological niche:

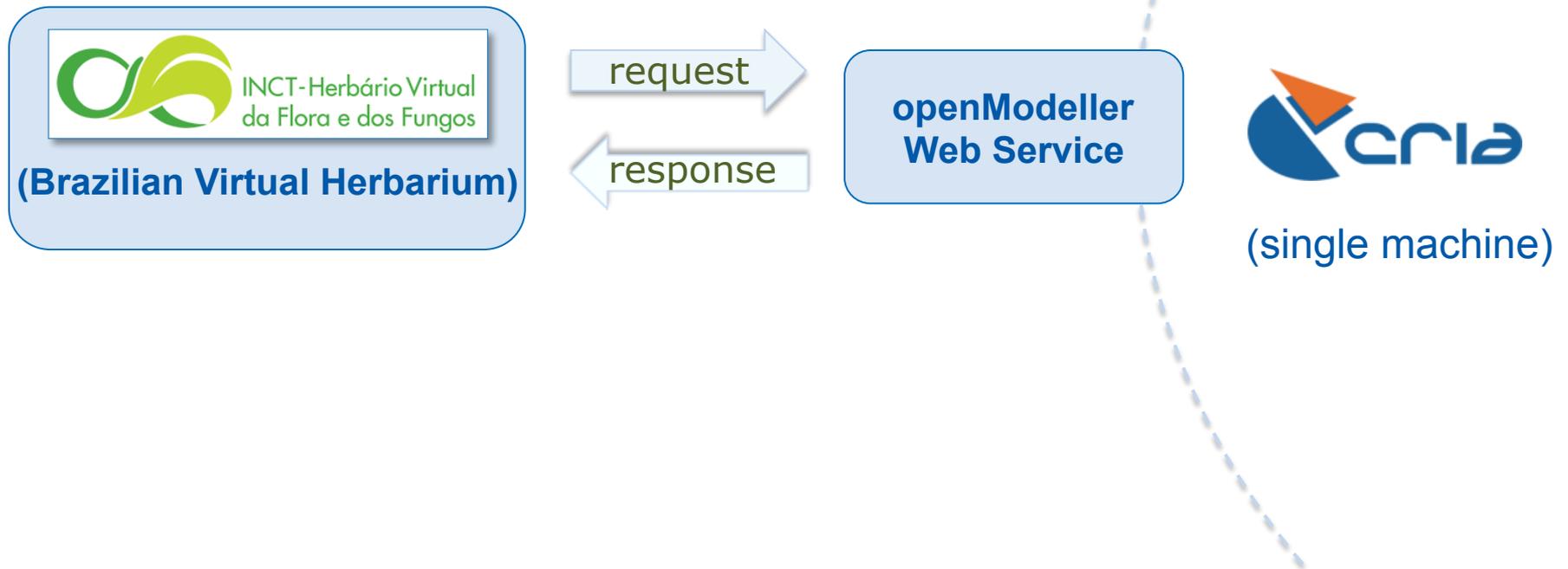
“Set of ecological requirements for a species to survive and maintain viable populations over the time.”

(Grinnel, 1917)

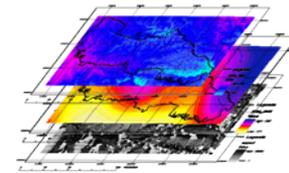


The Use Case: Ecological Niche Modelling

- One WS instance and one oM server
- ~50min for a single species (until the final model is generated)



The Use Case: Ecological Niche Modelling

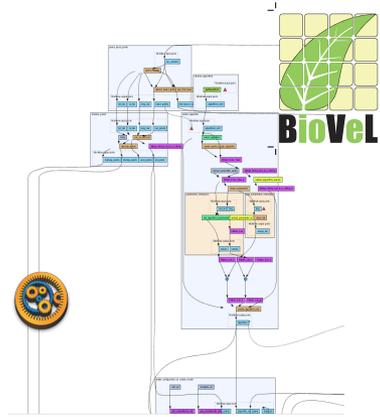


2012 lista de espécies flora do brasil

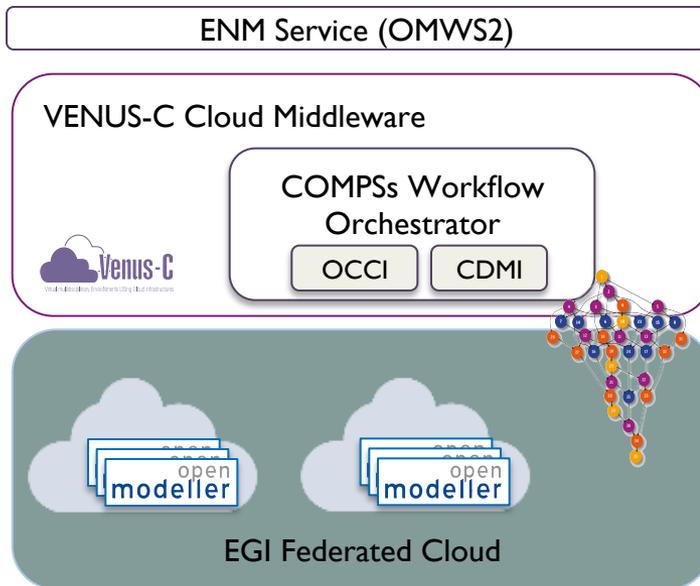
43203 species (18 Sept. 2012)

- ⌘ 31 718 angiosperms (flowering plants)
- ⌘ Assuming that 30% will have enough points to generate models (~9 000 species):
 - 495k models, 540k tests, 90k projections
- ⌘ 10 months to generate all models!
- ⌘ But what if we want to generate models for
 - All ~43 thousand plant species from Brazil?
 - Using more than one spatial resolution?
 - Projecting into different environmental climatic scenarios?
 - With global coverage?
- ⌘ Note: models may be regenerated every time new data is available for each species...

OpenBio in EGI: An interoperable and scalable solution

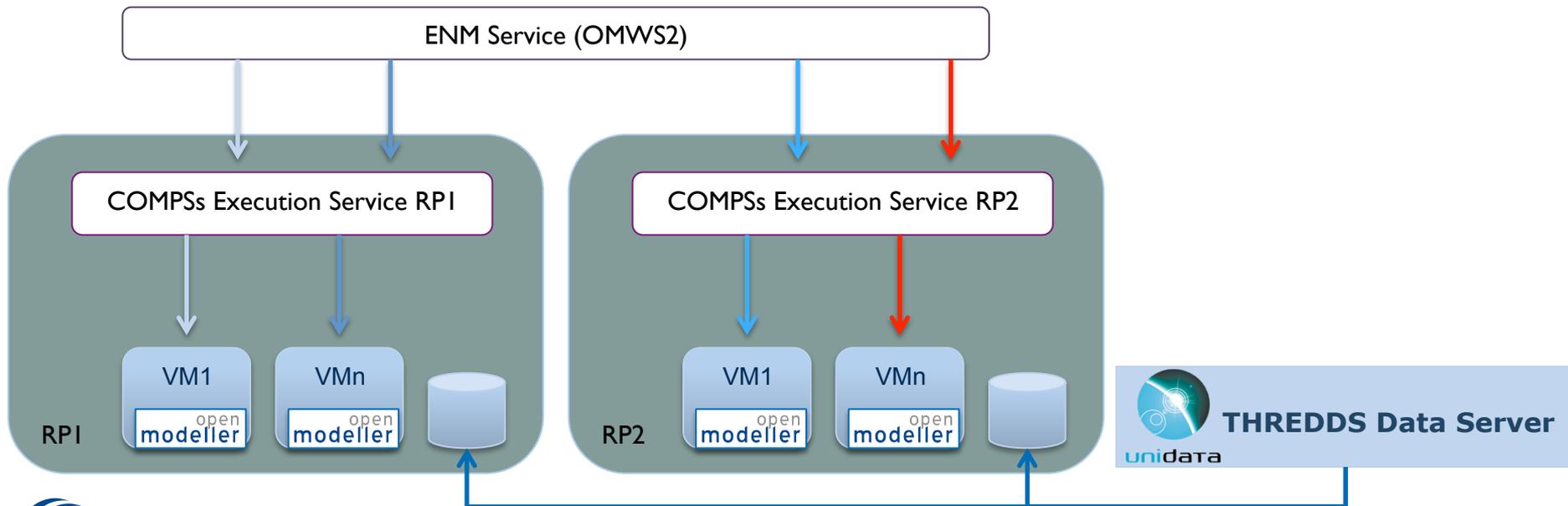
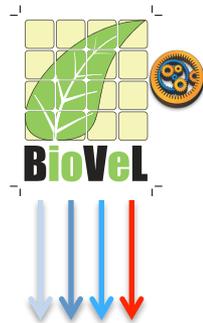


- **Shared requirements** between EUBrazilOpenBio and BioVeL
- The **EUBrazilOpenBio ENM service** is exposed through an extended openModeller Web Service interface (**OMWS2** in the picture).
- Such interface in EUBrazilOpenBio supports multi-staging and multiparametric experiments implemented through **COMPSS** and the openModeller software and managed through a Virtual Research Environment (VRE) portal.
- The OMWS extensions are backwards compatible with the original specification, allowing existing clients, as the Taverna Workflow Management System in BioVeL, to be fully supported in the new implementation.
- In the case of the EGI Federated Cloud, the **VENUS-C** middleware is used to instantiate openModeller workflows on **cloud resources** from different providers **dynamically deployed by COMPSS**.
- An **OCCI connector** is used for the VMs management while data management supports **CDMI** endpoints.

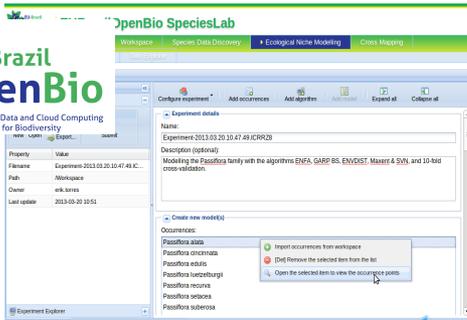


OpenBio in EGI: Execution Scenario 1

- **ENM Service:** the OpenBio ENM service receives from the BioVeL portal simple requests for the generation of models, balancing them between different RPs.
- **COMPSs Execution Service:** deployed at each site, executes the requests to pre-deployed VMs. Additional VMs are dynamically created to serve additional requests.
- **openModeller application:** the application first checks if the layer is available, otherwise downloads it from a layers repository to the storage local to the provider.



OpenBio in EGI: Execution Scenario 2



- **ENM Service:** the OpenBio ENM service receives from the OpenBio VRE portal complex requests for the generation of models, balancing them between different RPs.
- **COMPSs Execution Service:** deployed at each site, delegates the execution to the COMPSs runtime.
- **COMPSs Orchestrator:** executes (in parallel) the different parts of the complex wf to dynamically created VMs.

ENM Service (OMWS2)

COMPSs Execution Service RPI

COMPSs Workflow Orchestrator

VM1

VMn

open modeller

open modeller

RPI

COMPSs Execution Service RP2

COMPSs Workflow Orchestrator

VM1

VMn

open modeller

open modeller

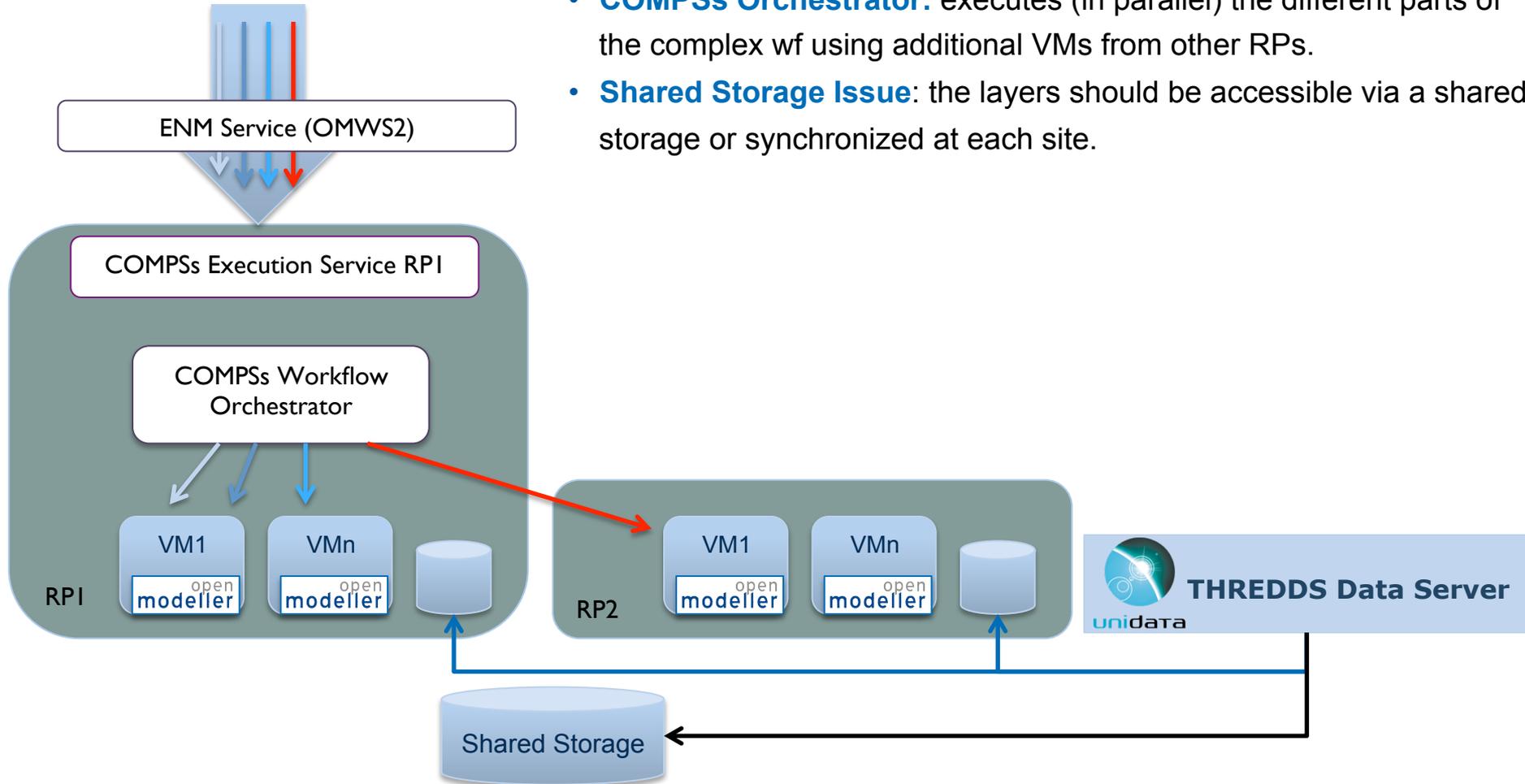
RP2



THREDDS Data Server

unidata

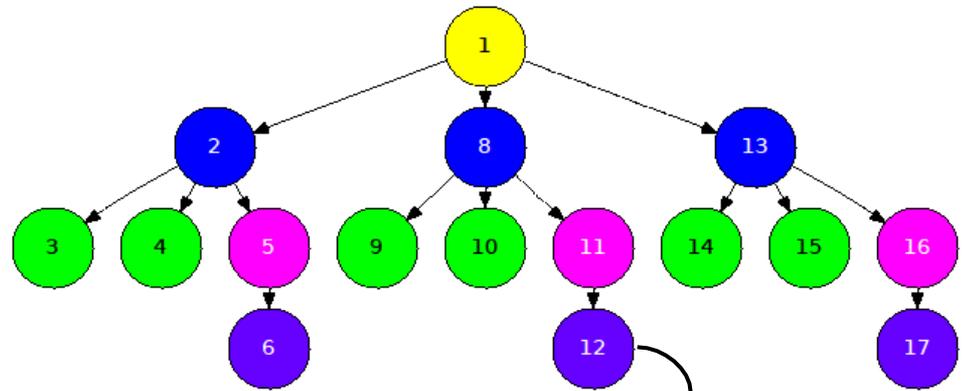
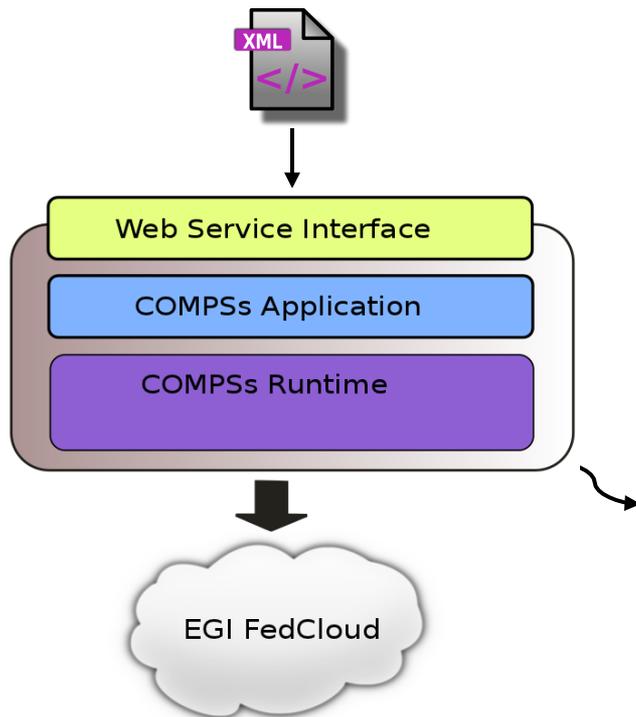
OpenBio in EGI: Hybrid Scenario



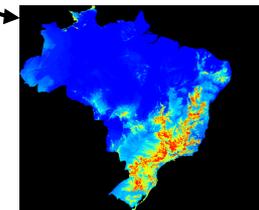
- **COMPSs Execution Service:** deployed at each site, starts the execution of the COMPSs workflow using resources of a RP.
- **COMPSs Orchestrator:** executes (in parallel) the different parts of the complex wf using additional VMs from other RPs.
- **Shared Storage Issue:** the layers should be accessible via a shared storage or synchronized at each site.

The Modeller Service (operations)

- **Convert:** Converts multi-job request in a single requests.
- **Model:** models a specie distribution for a given request.
- **Test:** Checks the accuracy of the distribution.
- **Project:** Project each distribution over geographical layers in raster format.
- **Translate:** Translates the raster projection into an image.



Type	Tasks
Convert	1
Model	2 8 13
Test	3 4 9 10 14 15
Project	5 11 16
Translate	6 12 17



COMPSs integration with EGI FedCloud

- A COMPSs VM is available with the required software in the VM repository.
- The EGI Marketplace contains the list of providers offering this VM.

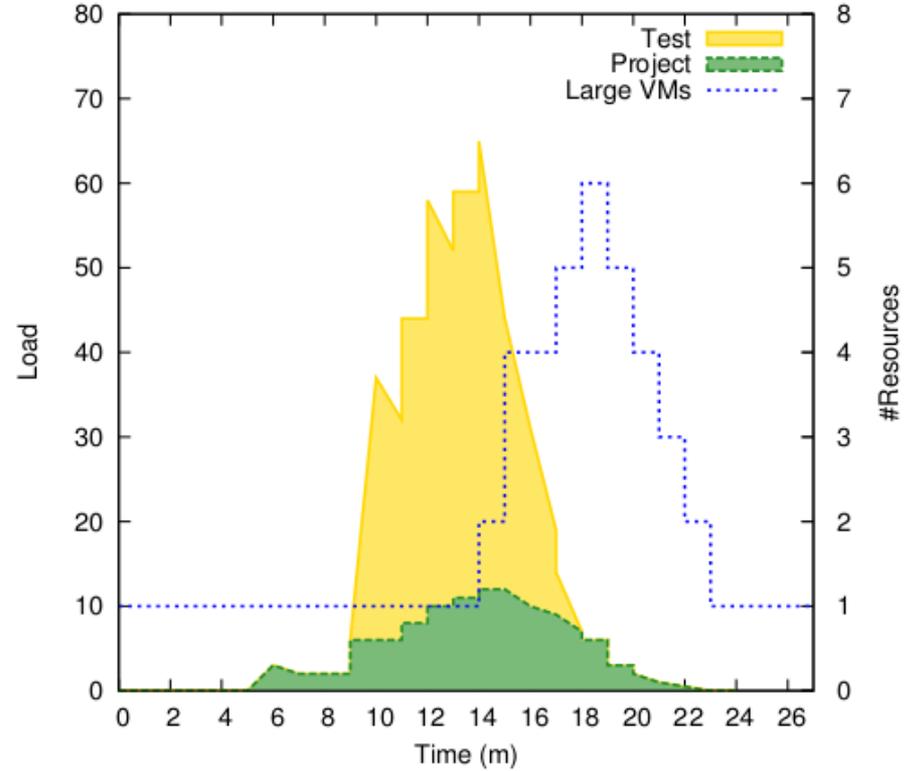
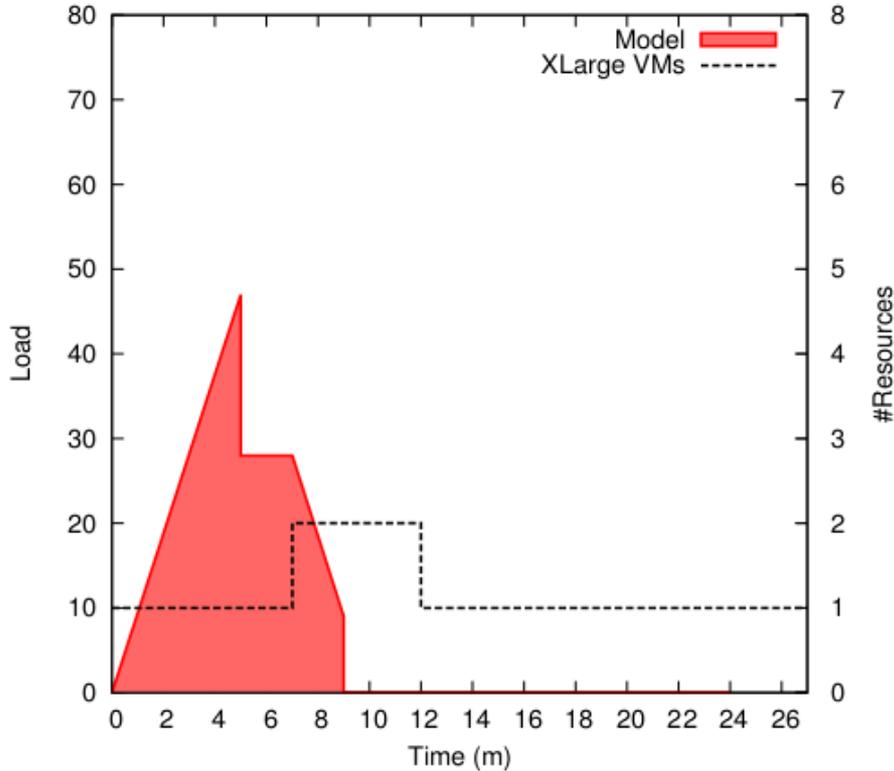
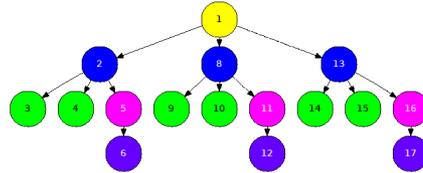
The screenshot shows the EGI Marketplace interface. At the top, there are navigation links: Home | Endorsers | Query | Upload | About. The main heading is 'Metadata'. Below this, there is a search bar with 'biovel' entered and a 'Show 10 entries' dropdown. The list of VMs includes:

- EGI-BioVel-GWDG**
Endorser: piotr.kasprzak@gwdg.de
Identifier: B8e40tT1ne9cc0PAHZjuVeGCguO
Created: 2013-04-08T09:00:49Z
Kind: machine
BioVel appliance for FCTF available at GWDG
[More...](#)
- EGI-BioVel-CESGA**
Endorser: asimon@cesga.es
Identifier: Eapzoza9uStHYBFdO0ky10FQfwf
Created: 2013-04-07T23:20:14Z
Kind: machine
BioVel appliance for the FedCloud demo available at CESGA
[More...](#)
- LAL-BioVel-Demo**
Endorser: airaj@lal.in2p3.fr
Identifier: MO0qUGEqM6FzagQoO_gkWDN4EAb
Created: 2013-04-07T12:46:08Z
Kind: machine
BioVel appliance for the EGI-CF2013 demo
[More...](#)
- EGI-biovel-CESNET** (circled in red)
Endorser: daniele.lezzi@bsc.es
Identifier: EltZ9x7N_pFo96zkV6v0gt20IB_
Created: 2013-04-03T21:47:46Z
Kind: machine
COMPSs appliance for the OpenBio-BioVel demo at EGI-CF2013
[More...](#)

At the bottom, it says 'Showing 1 to 4 of 4 entries (filtered from 33 total entries)' and 'Page 1 of 1'. On the right side, there are filters for Status (valid), Location (all), and a Filter section with search options for os, version, arch, endorser, and kind. There is also a 'Sort by' dropdown.

Results: Single request scenario

System load vs. available virtual resources



« Integration of the EUBrazilOpenBio solution in the EGI Federated Cloud:

- Provision of the Ecological Niche Modelling Service Endpoint
- EUBrazilOpenBio extensions to openModeller
- Seamless execution from the OpenBio VRE and the BioVeL Portal

« Use of COMPSs for the interoperability with the EGI FedCloud:

- Dynamic VM multi-provider management through the rOCCI connector
- Parallelization of the execution of complex openModeller workflows
- Optimized execution of BioVeL single requests
- Support to CDMI endpoints



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Thank you!

For further information

<http://www.eubrazilopenbio.eu>

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