



Biodiversity Virtual e-Laboratory

Ecosystem modelling with the help of workflows and desktop grid technology

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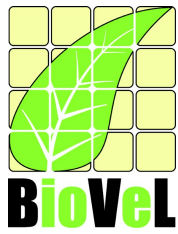
1. MTA Centre for Ecological Research

2. MTA Institute for Computer Science and Control

20th IDGF tutorial and workshop, Helsinki

19 May 2014



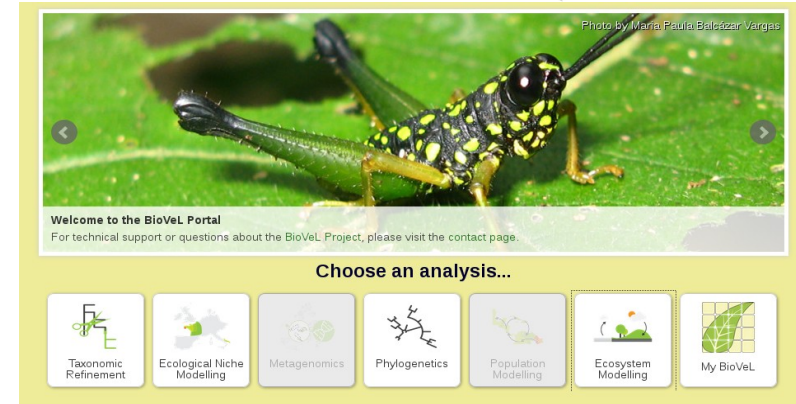


Summary

1. Biovel Project
2. Ecosystem modelling + Biome-BGC
3. [EDGeS@Home](#) integration

BioVeL:

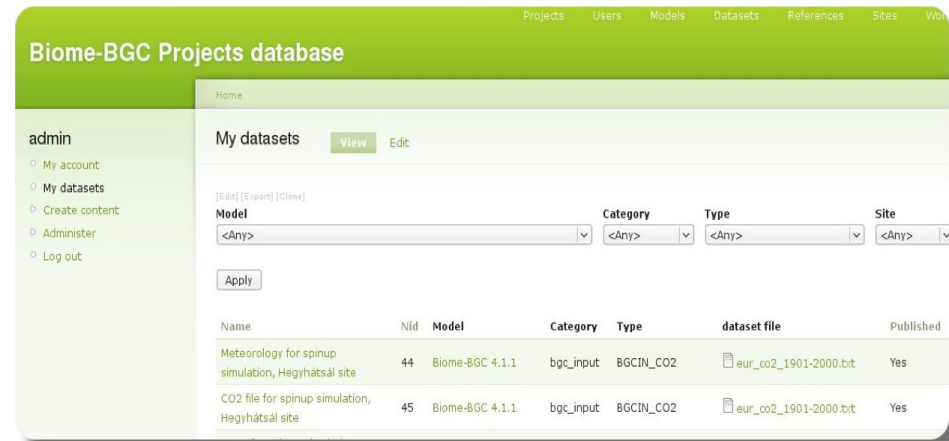
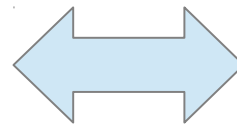
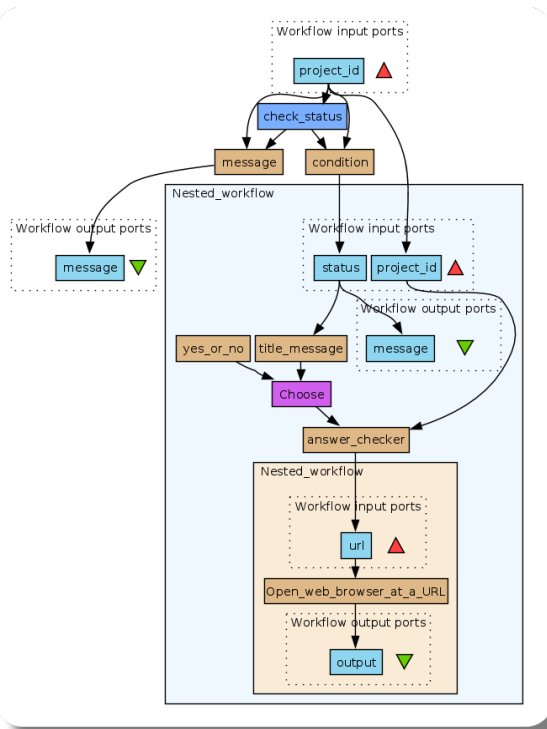
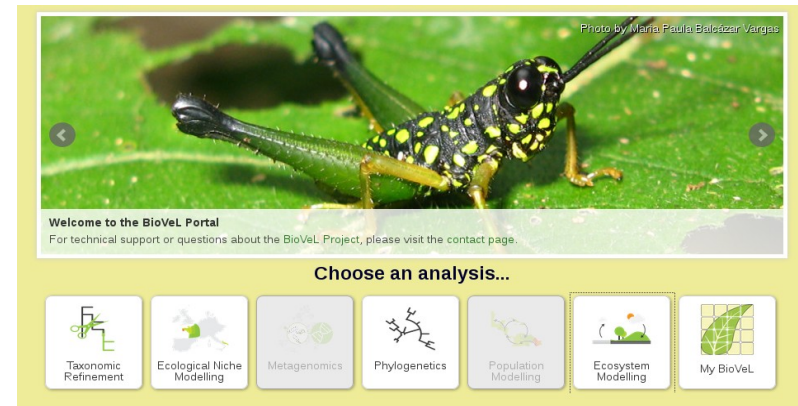
- Creates data processing tools
 - Carbon Sequestration
 - Ecosystem Functioning and Valuation
 - Invasive Species Management
- Aims to foster cooperation in the community by:
 - Discussing scientific use cases
 - Identifying and deploying important Web Services
 - Designing and offering workflows <http://portal.biovel.eu>
 - Training scientists



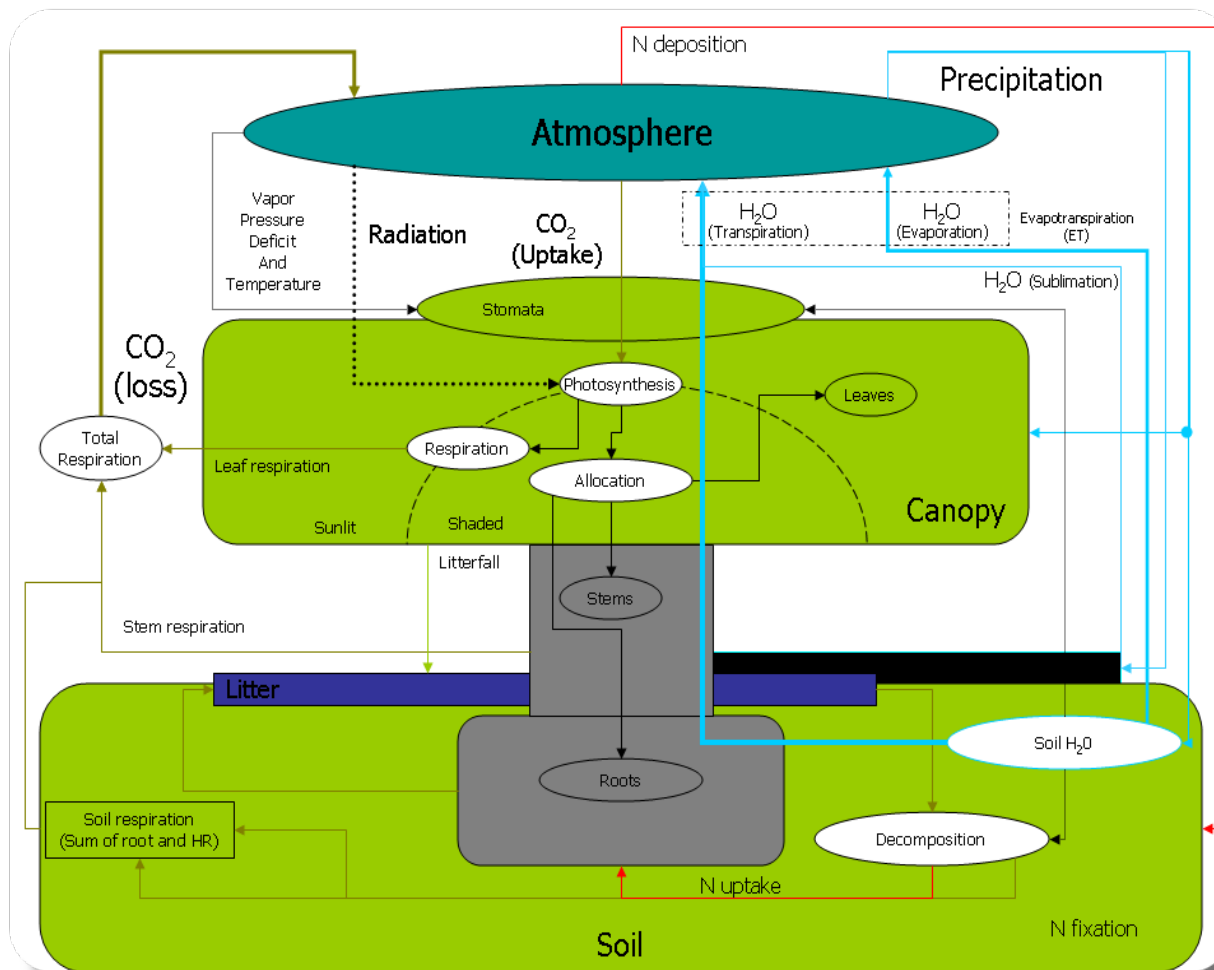
Ecological Niche Modelling
 Biogeochemical modelling
 Metagenomics
 Phylogenetics
 Population Modelling
 Taxonomy
 Geospatial Visualization

Biovel portal, Taverna workflows and Project Portal

Starting point: <http://portal.biovel.eu>



Biogeochemical models are widely used to simulate the functioning of terrestrial ecosystems, including evergreen and deciduous forests, grasslands, shrubs and crops. These process-based models are driven by daily meteorological data, and handle the key ecophysiological, biogeochemical processes.

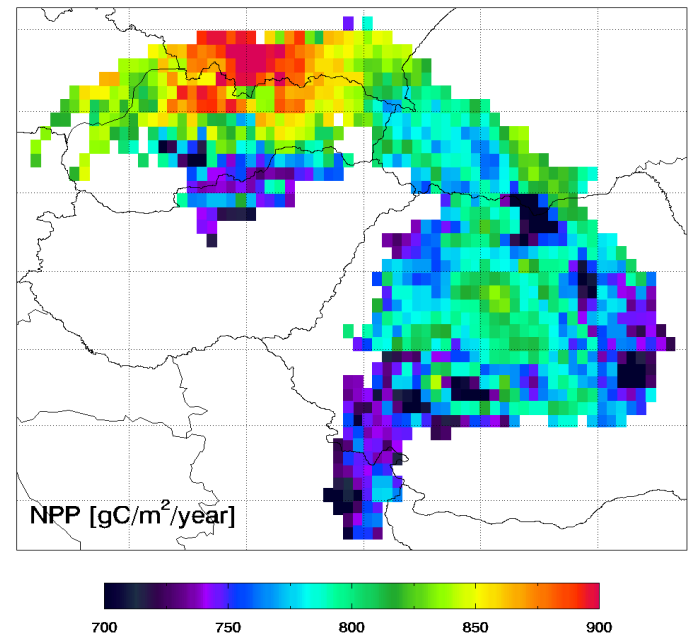


Spatially Explicit Modelling and Monte Carlo Experiments

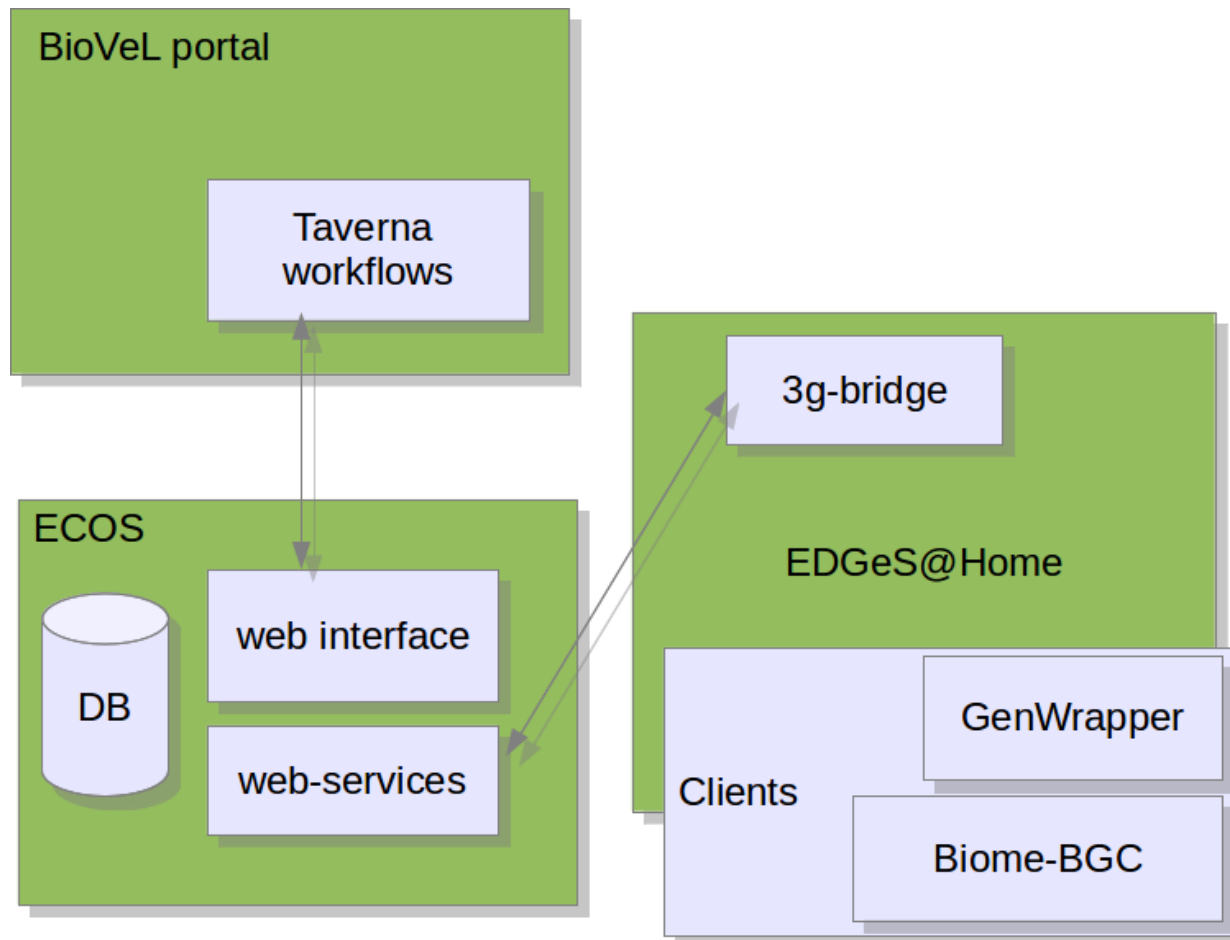
Monte Carlo experiments

- Sensitivity analysis
- Model Calibration

Spatially explicit modelling



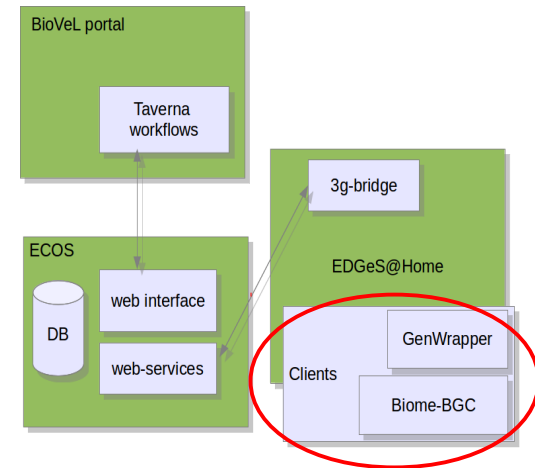
Biome-BGC, EDGeS@Home Desktop Grid and Workflows



Desktop Grid Integration I.

Application Porting with GenWrapper

- BOINC integration for legacy applications
- <http://genwrapper.sourceforge.net/>
- POSIX like shell scripting
- Biome-BGC called from the GW script
- Different compiled versions for each platform



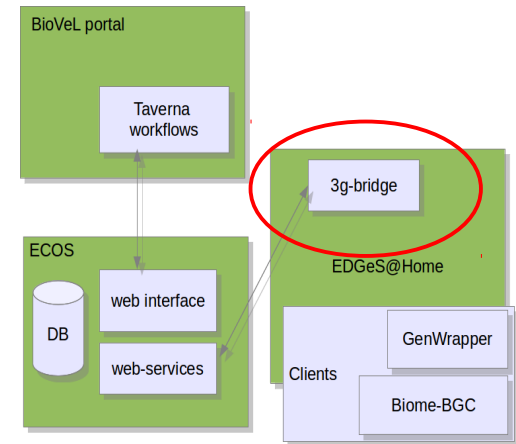
```

14  unzip -o -X ${INPUT_ZIP_FILE_NAME}
15
16  BBGC_FILE_NAME='boinc_resolve_filename bgc.exe'
17
18  CKPT_LAST=""
19  if [ -f ${CKPT_FILE} ]; then
20    CKPT_LAST='cat ${CKPT_FILE}'
21  else
22    CKPT_LAST="0"
23  fi;
24
25  N='ls -l normal*ini|wc -l'
26  N='expr $N - 1'
27  for i in `seq ${CKPT_LAST} $N`
28  do
29    rm -rf ./${i} *annavgout *annout *dayout *monavgout
30    if ./${BBGC_FILE_NAME} spinup ${i}.ini 1>/dev/null && ./${
31

```


Desktop Grid Integration II.

Job submission and download: 3g-bridge

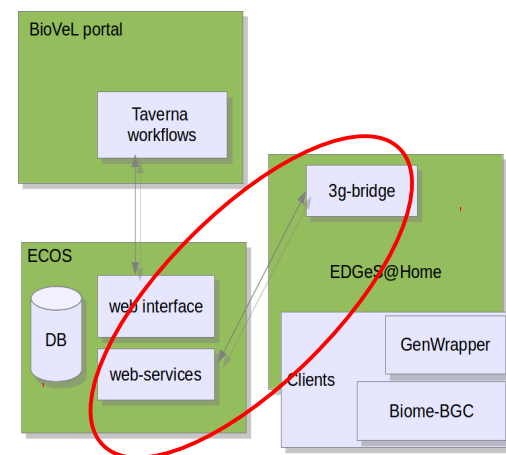


<http://doc.desktopgrid.hu/doku.php?id=component:3gbridge>

1. web-service interface to receive the incoming jobs
2. database and queue manager to store and schedule the jobs
3. plugins -> grid specific job handling

Desktop Grid Integration III.

Work-unit submission



- Creating and compressing input files - work-units
- Web accessible
- SOAP: submitRequest (input name, input URL, output name)

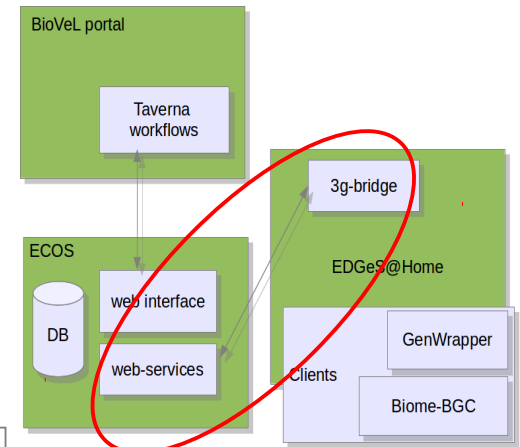
Returns a job id (0354f5c6-af97-4916-9d00-315d1c8a6229)

Desktop Grid Integration VI.

Downloading results

SOAP requests uses the job Id

- Polling the 3g-bridge: getStatusRequest
- GetOutputRequest: downloading the finished jobs
- DeleteRequest: deleting the downloaded jobs



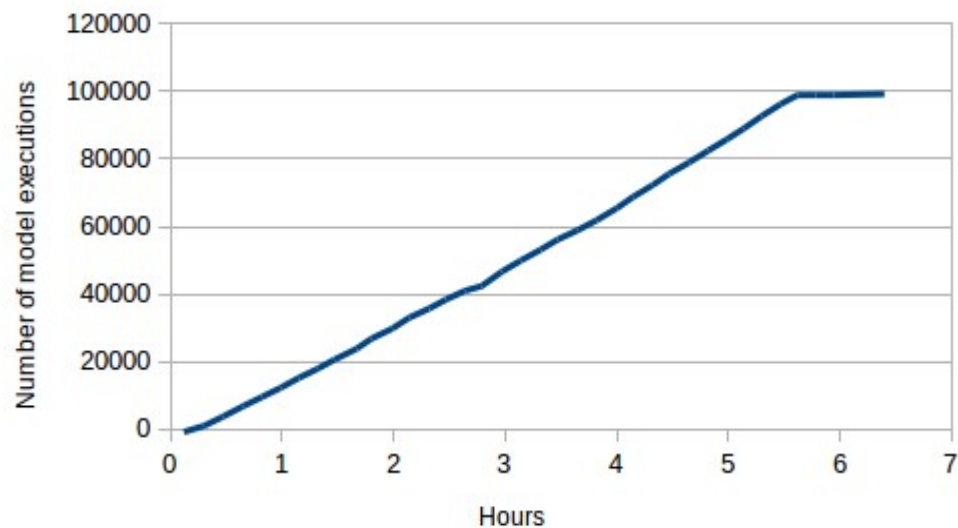
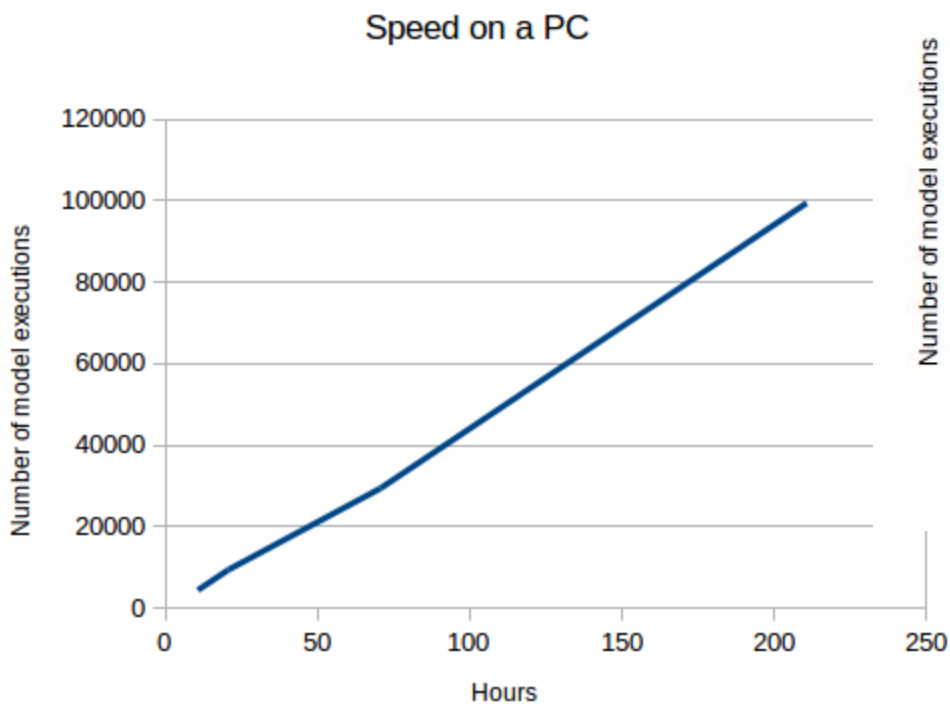
```

0354f5c6-af97-4916-9d00-315d1c8a6229 RUNNING
f99a10e8-5afe-4e0d-99b4-c707690fe9c3 INIT
283f7841-9934-4636-ac32-e20b7b635113 ERROR
69009fc2-8ee0-4362-a27d-7ae7e66f824a FINISHED
    
```

Computation time

Speed of the EDGeS@Home Grid

Biome-BGC



~30x



Questions ?

BioVeL is funded by the European Commission 7th Framework Programme (FP7).
It is part of its e-Infrastructures activity.

BioVeL contributes to LifeWatch and GEO BON.

BioVeL products are free to access.

Desktop Grid extension is supported by SZTAKI and IDGF



e-infrastructure

