FreVast - Combining Modelling with Diagnostics at University Level

Ingo Kirchner and Christopher Kadow

Institute of Meteorology
Freie Universität Berlin

29/Sep/2016

Freie Universität Berlin

The Red Thread

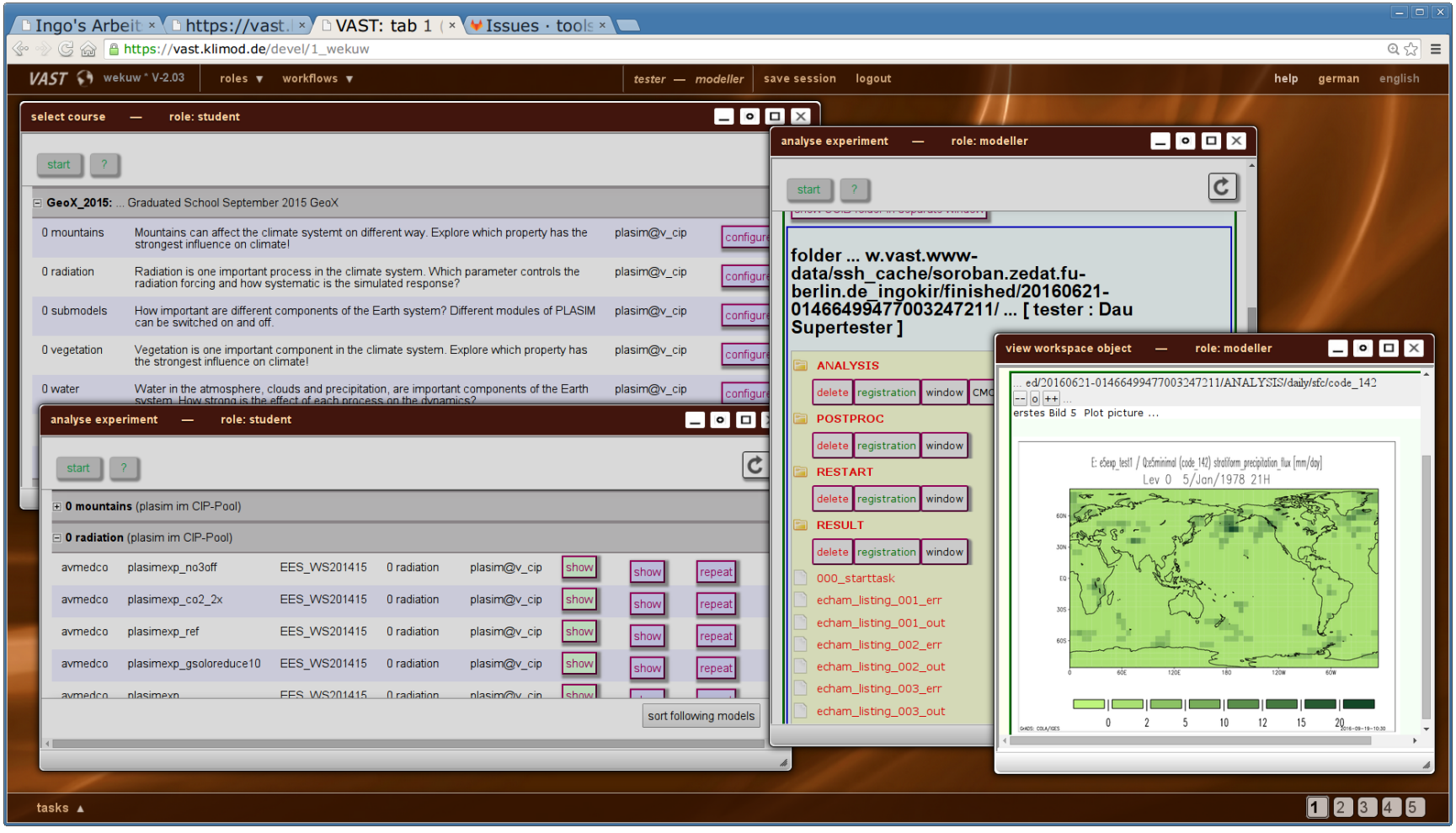
The Initial Situation

- 15-20 master students of meteorology each year
- courses in the curriculum
  - Climate Models and Variability (global scale)
  - Models for Weather and Environment (regional scale)
  - Weather and Climate Diagnostics
- two webbased software systems
  - model course configuration and run control environment **VAST**
  - flexible plugin based diagnostics system **FREVA**

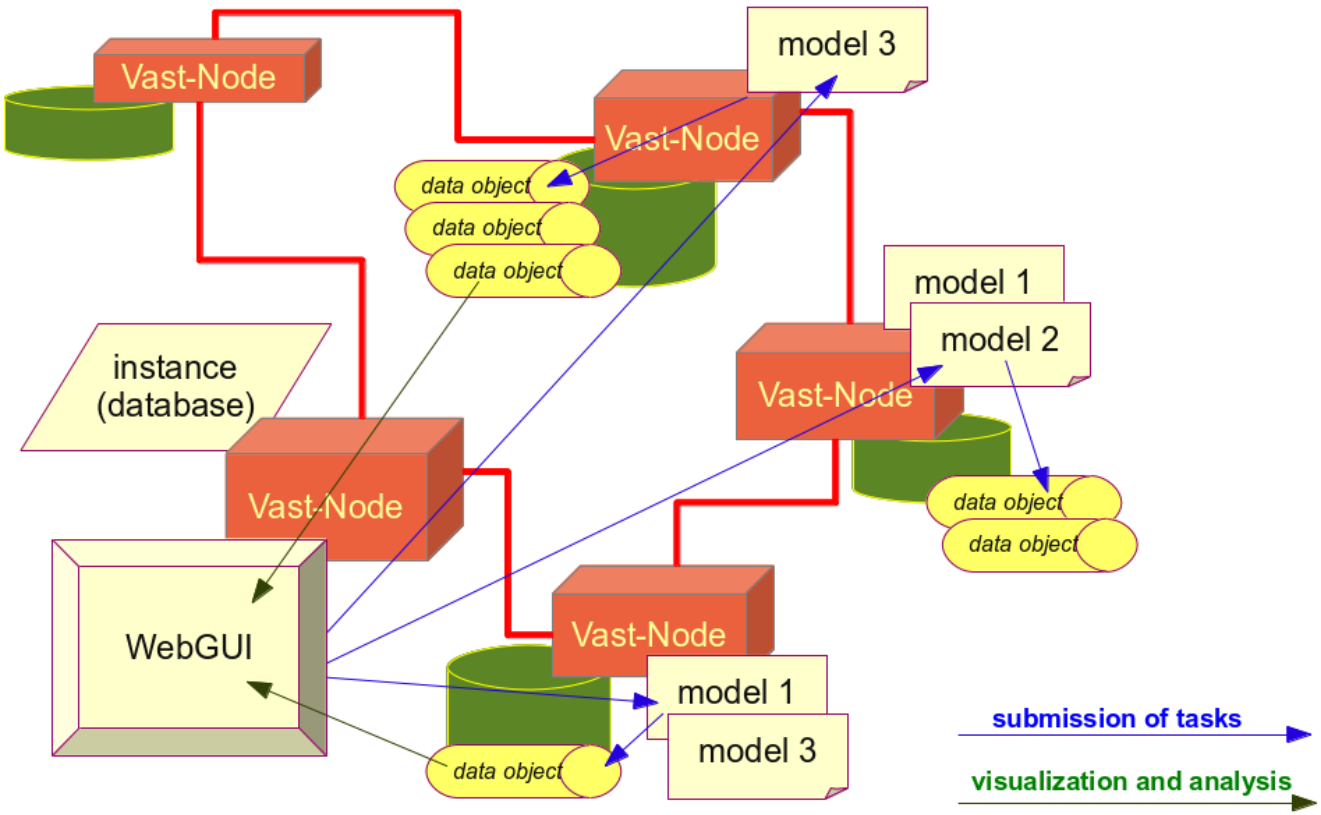
The Vision

- the students can work with up-to-date models
- the model experiments can be analysed easily with complex diagnostics (reproducable, comparable, traceable)
- the model output can be compared consistent with observations
- state-of-the-art technology is an integral component of the exercises

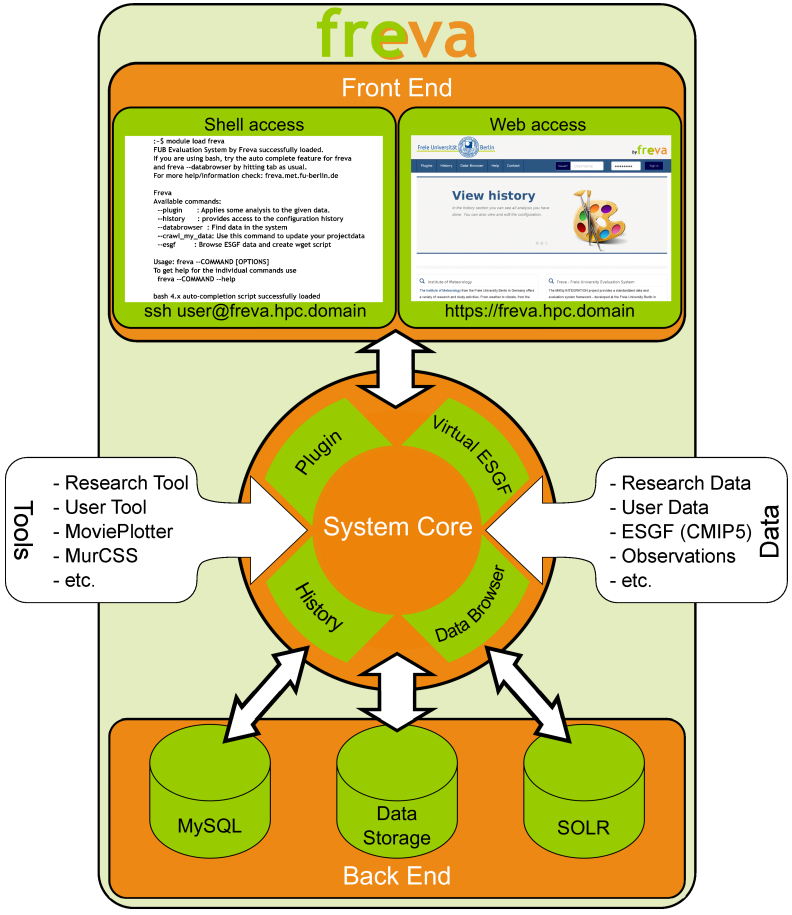
VAST


Ingo's Arbeit
https://vast.
VAST: tab 1
Issues · tools
https://vast.klimod.de/devel/1_wekuw
VAST wekuw ^ V-2.03
roles
workflows
tester — modeller
save session
logout
help
german
english
select course — role: student
start
?
GeoX_2015: ... Graduated School September 2015 GeoX
0 mountains
Mountains can affect the climate systemt on different way. Explore which property has the strongest influence on climate!
plasim@v_cip
0 radiation
Radiation is one important process in the climate system. Which parameter controls the radiation forcing and how systematic is the simulated response?
0 submodels
How important are different components of the Earth system? Different modules of PLASIM can be switched on and off.
0 vegetation
Vegetation is one important component in the climate system. Explore which property has the strongest influence on climate!
0 water
Water in the atmosphere, clouds and precipitation, are important components of the Earth system. How strong is the effect of each process on the dynamics?
analyse experiment — role: student
0 mountains (plasim im CIP-Pool)
0 radiation (plasim im CIP-Pool)
avmedco
plasimexp_no3off
plasimexp_co2_2x
plasimexp_ref
plasimexp_gsoloreduce10
EES_WS201415
show
repeat
sort following models
analyse experiment — role: modeller
folder ... w.vast.www-data/ssh_cache/soroban.zedat.fu-berlin.de_ingokir/finished/20160621-01466499477003247211/ ... [tester : Dau Supertester]
ANALYSIS
POSTPROC
RESTART
RESULT
delete
registration
window
000_starttask
echam_listing_001_err
echam_listing_001_out
echam_listing_002_err
echam_listing_002_out
echam_listing_003_err
echam_listing_003_out
view workspace object — role: modeller
erstes Bild 5 Plot picture ...
Lev 0 5/Jan/1978 21H
tasks
1 2 3 4 5

VAST Network Layer



FREVA



→ details ... see talk by Christopher Kadow

FreVast

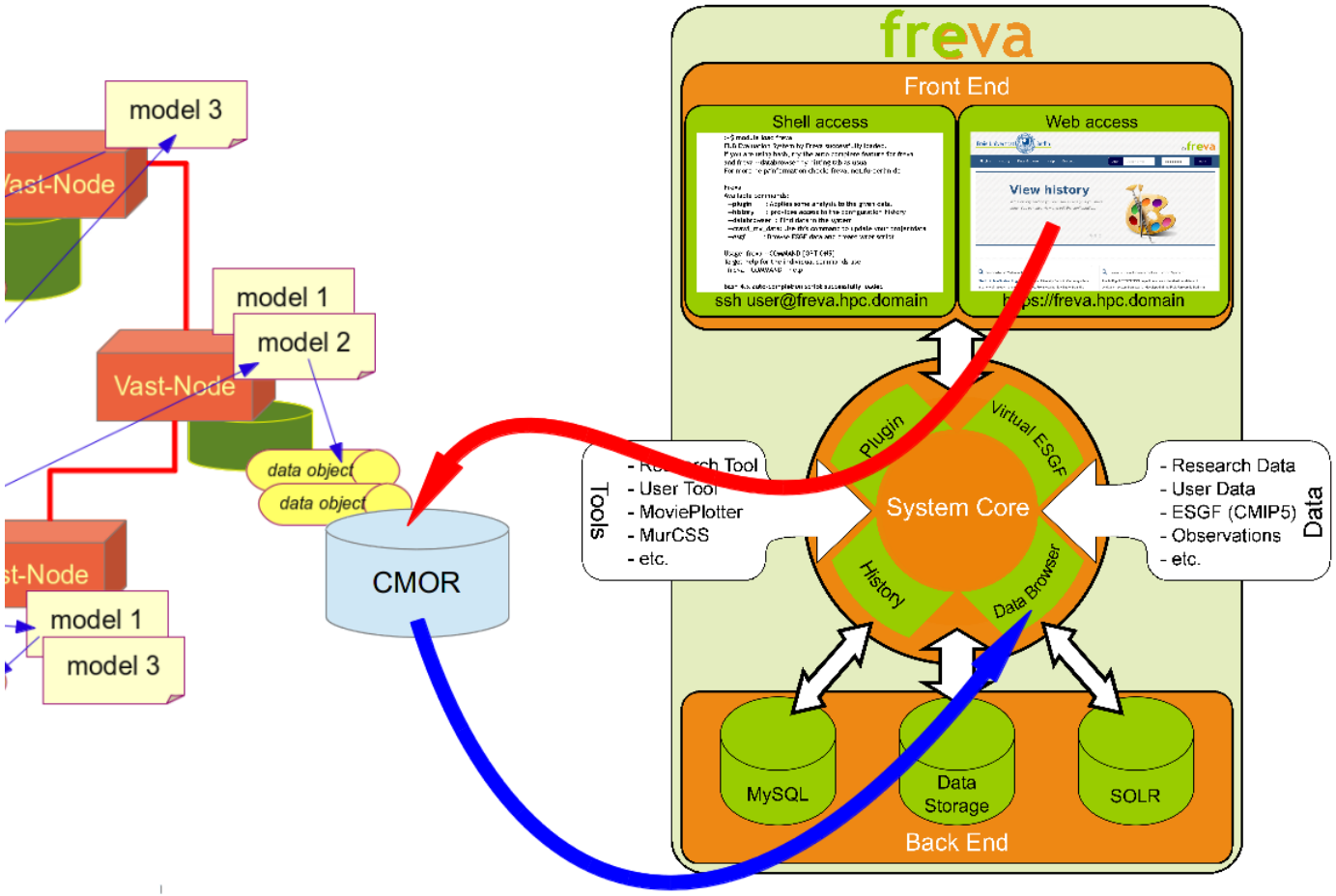
Interface between VAST and FREVA

1. reorganisation of model output using CMOR standard

project	VAST
product	course name
institute	VAST instance name
experiment	scientific question

2. cross-linking of VAST data container into FREVA

FreVast


model 3
Vast-Node
model 1
model 2
Vast-Node
data object
data object
CMOR
model 1
model 3
freva
Front End
Shell access
ssh user@freva.hpc.domain
Web access
View history
Plugin
Virtual ESGF
System Core
History
Data Browser
Tools
- User Tool
- MoviePlotter
- MurCSS
- etc.
Data
- Research Data
- User Data
- ESGF (CMIP5)
- Observations
- etc.
MySQL
Data Storage
SOLR
Back End

Scientific Question

What are the Systematic Changes of Circulation over the Northern Hemisphere Following an Abrupt Change of Solar Insolation?

model scenario ECHAM5 10 year AMIP type simulations

tasks 15 students running ensembles with initial condition perturbations

cases increase and decrease of solar constant by 5 percent

Modelling Part

- the students perform 3 ensembles
- low, normal and high solar constant case
- each ensemble contains 5-10 members
- model data will be cmorized

→ **students learn more about models and model experiments**

Diagnostics Part

- apply FREVA plug-ins
- perform ensemble statistics of model variables (temperature, ...)
- calculation of complex measures (DSI, EADY, stormtracks, WTrack, ...)
- compare extrem cases of solar constant change
- presentation and discussion of results

→ **students learn more about data analysis**

Project Schedule

April/2016 start-up as e-learning project

currently improving implementation and testing

Nov/Dec/2016 first realization of course concept in practice

See more details .....

https://vast.klimod.de
https://freva.klimod.de

Conclusions

It is far better to adapt the technology to the user than to force the user to adapt to the technology.

Larry Marine, Designer

If you do the things that are easier first,
then you can actually make a lot of progress.

Mark Zuckerberg, Facebook