Running and monitoring climate experiments easily with Autosubmit

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The scientists of the Barcelona Supercomputing Center (BSC) run the EC-Earth model daily for production simulations, using different model versions and configurations. These experiments run **complex workflows** involving **several platforms**, each one specialized in one or some particular tasks: transfer, computation, data processing... The **Autosubmit** workflow manager has traditionally allowed to control and automatize all the tasks needed to fulfill these simulations. Lately, several improvements have been performed to enhance both robustness and performance, and a Web Graphical User Interface has been created to dramatically enhance the user experience.

Autosubmit features

Autosubmit is able to manage **complex workflows** with **tolerance to failure**, facilitating **robust development cycles** and **reproducible experiments**. Besides that, it provides many more features:

- Easily copy experiments and configurations.
- Visualize & share the current workflow status at any time.
- Wrap concurrent tasks or job series in vertical and horizontal packages executing them on within single jobs maximizing the resources usage.
- Migrate experiments from one user to another.
- Generate and visualize experiment statistics
- Have all the log files (local & remote) together in an accessible location.
- Modify the number of start dates / ensemble members or the length of an experiment by changing a parameter.
- Repeat any part of the workflow

How to run EC-Earth using Autosubmit

With **Autosubmit** any user can run EC-Earth experiments, from the most simpler cases to the more complex ones. Inside the **runtime/autosubmit** folder there are available all the files needed to do that:

copy-runtime.sh : upload sources to the cluster, call ecconf

compilation.sh : compile all the model components

ece-esm.sh or ece-nemo.sh : run the simulation

https://dev.ec-earth.org/projects/ecearth3/wiki/Autosubmit

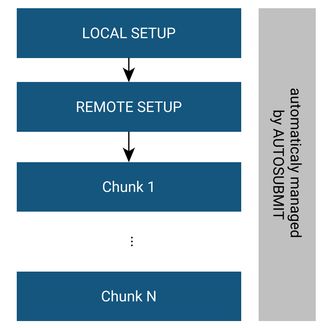


Fig. 1: Simple Auto-EC-Earth workflow

Autosubmit GUI

The new **Autosubmit GUI** is a web based tool that makes any Autosubmit workflow, and the associated metadata, **easily accessible** by showing it in a simple and comprehensible way. For this purpose, Autosubmit GUI is divided in two tools that complement each other: The Autosubmit API generates and collects data in an optimized serving through a web service. The front-end tool is a **web application** that consumes this data and shows it in a friendly way using state-of-the-art visual libraries, characterized by its customization and user interaction.

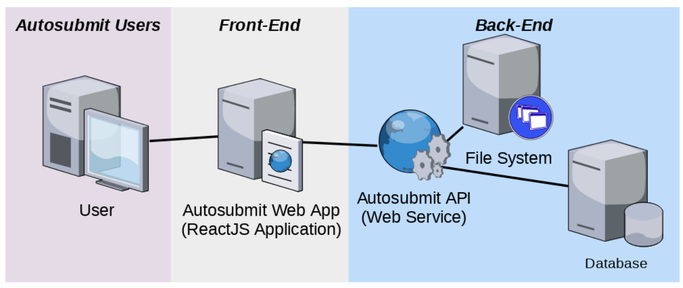


Fig. 2: Autosubmit GUI architecture and data flow

Autosubmit GUI: Experiments panel

The experiments panel is the entry point to the graphical interface. It provides fast **discovery and search capabilities**, allowing to find experiments by their unique identifier, owner's username, current status of the experiment, or any sub-string in the description. As a result, the user gets a friendly look of all the experiments in the user environment matching the query, plus an indicator of the overall progress of the experiment's execution. From this view, the user can launch the *Experiment View* for any of the listed results.

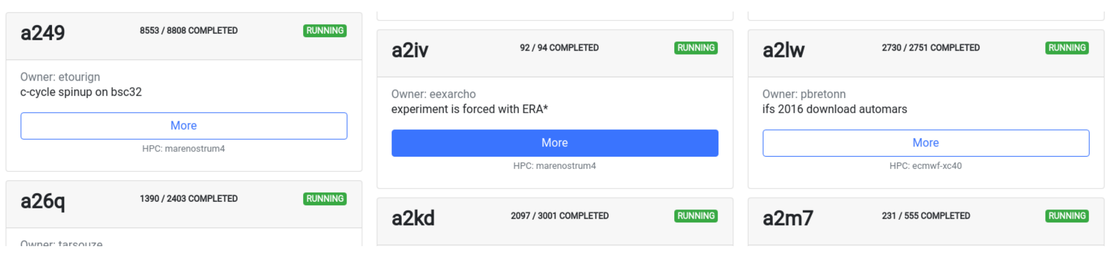
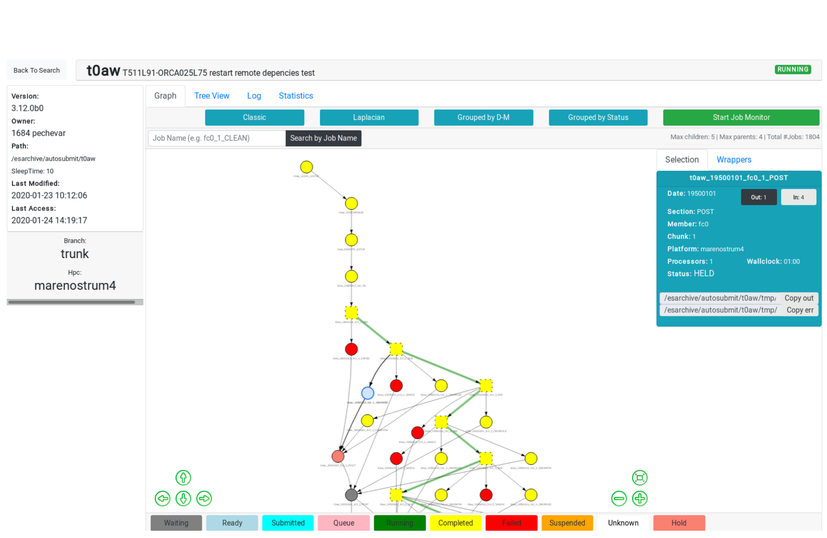


Fig. 3: Autosubmit GUI experiments panel: each box correspond to one experiment showing its details and status.

Autosubmit GUI: Experiment view

This view shows all that is needed to monitor any Autosubmit experiment. It provides different types of **visualization** on the current workflow, **statistics**, **logs**, in a live mode which is constantly updated by a background process.

- A **Graph representation** of the experiment, which allows clustering, search, exploration, with continuous updates of the experiment's progress without need to refresh the page.
- It uses an appropriate graph drawing algorithm depending on experiment complexity.
- A **Tree View representation** of the experiment that allows grouping, collapse/expand, search, filtering, also updated in the background.
- Shows **queuing, running, completed times** per job.
- Shows **current progress (number of completed jobs)** for all experiments running under Autosubmit in a single page that loads almost instantly.
- Makes the Autosubmit main **log** easily accessible through the web interface, and also updates it continuously if the experiment is currently running.
- Provides access to **detailed information and logs** from the jobs in both representations thanks to the interaction capabilities of the web interface.
- Computes and shows **statistics** about the experiment's progress..



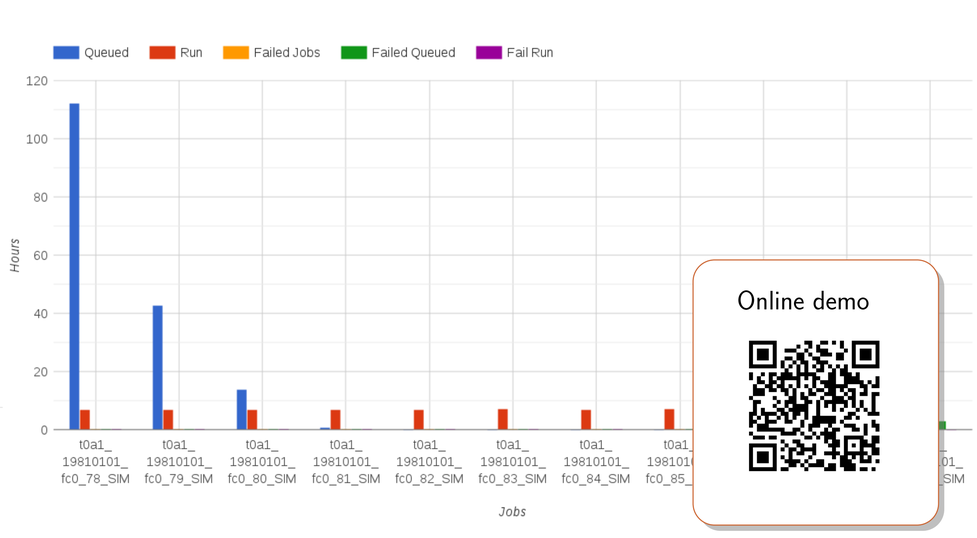


Fig. 4: Autosubmit GUI experiment view features. Left: main window with all the controls and a graph view of the workflow. Center: workflow tree view with job status, queuing and running times. Right: experiment statistics for the last 10 simulations of an experiment.

AUTOSUBMIT

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