

IOOS Coastal Modeling Cloud Sandbox

IOOS DMAC Annual Meeting 2022
June 16, 2022

Patrick Tripp

Principal Software Engineer
RPS Ocean Science



Background

Development began in 2019 by IOOS and its partners to evaluate commercial cloud use for regional coastal modeling.

Models:

- Operational NOSOFS ROMS and FVCOM Models
- LiveOcean – University of Washington
- WRF/ROMS ESMF Coupled (Hurricane Irene test case)
- ADCIRC (Hurricane Florence test case)
- Cost estimate for Cook Inlet Ocean Forecast System (CIOFS)



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Sandbox Goals



Access



Connect



Collaborate



R2O2R



Reduce Costs



Reduce Effort

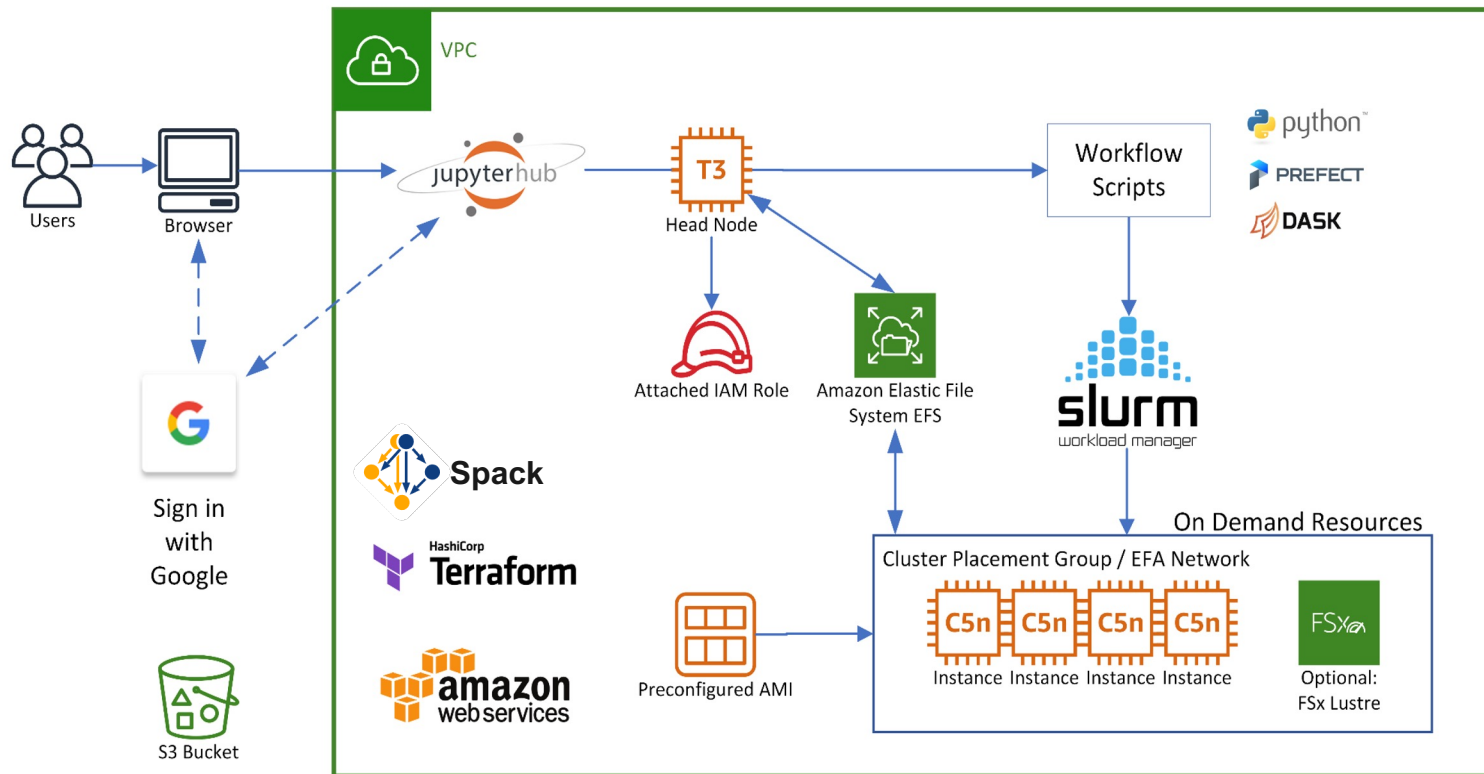


Governance

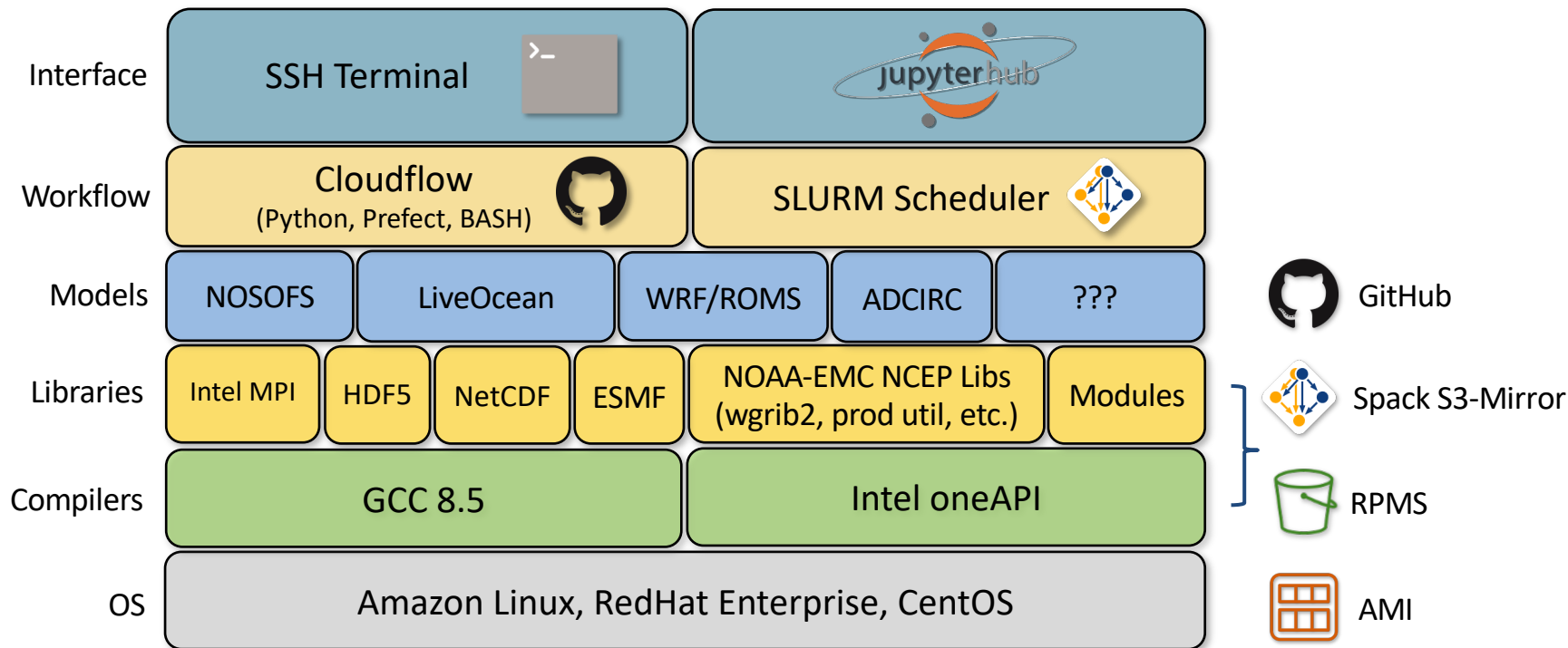
- Provide entry to HPC cloud computing
- Encourage community development of models
- Make it easier
- Ensure computational costs are allocated to various projects appropriately

Sandbox v2

- Infrastructure as Code – Terraform
- SLURM Workload Manager
- Spack Package Manager
- JupyterHub
- Authentication with Google



Modeling Software Stack



ROMS: CBOFS, CIOFS, DBOFS, GoMOFS, TBOFS, LiveOcean

FVCOM: LEOFS, LMHOFS, NGOFS, NEGOFs, NWGOFs

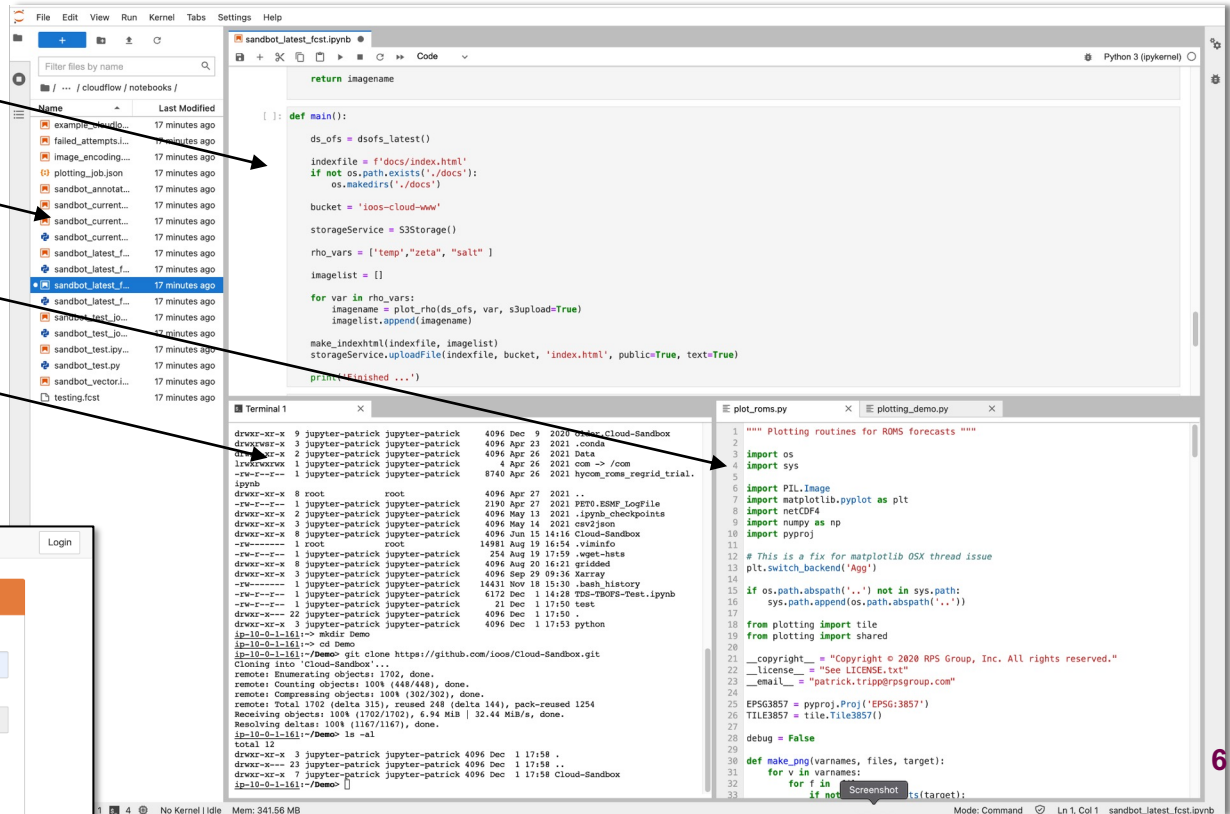
Other: ESMF WRF/ROMS Irene, ADCIRC Florence, SWAN/ROMS New York Harbor

- Interactive Notebooks

- Text editor

- Shell Terminal

- Multi-language support (Python, R, Matlab, et.al.)



Deployment options and Possible use cases

Deployment options

- Self deployed/hosted: Deploy using your own cloud account and funding
- IOOS hosted: NOAA AWS Government Cloud
- RPS hosted: Isolated/secure VPC

Some possibilities

- Shared usage, split funding
- University graduate courses
- Hindcasts/Reanalysis
- R2O
- Quasi-operational fail-over

Since 2021 DMAC

- CIOFS hindcast cost analyses
- Cost and performance evaluation of AWS's new AMD hpc EC2 instances
- Comparison of Intel and GCC compilers on Intel and AMD cores
- Software and library installation using Spack Package Manager
- Improved node setup scripts, software and driver installation
- Improved plotting routines for FVCOM and ROMS grids
- Updates and bug fixes

Progress

JupyterHub integration on the head node

- sign in with Google account
- or sign in with GitHub account
- or sign in with other OAuth providers

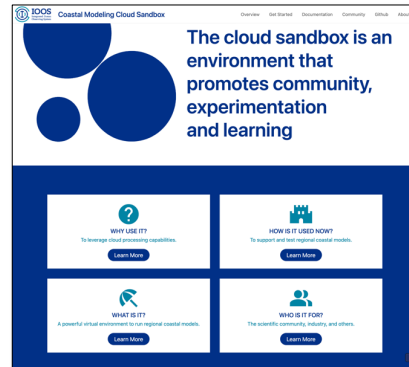


SLURM Workload Manager

- Manage the compute resources
- Fine grained accounting of usage

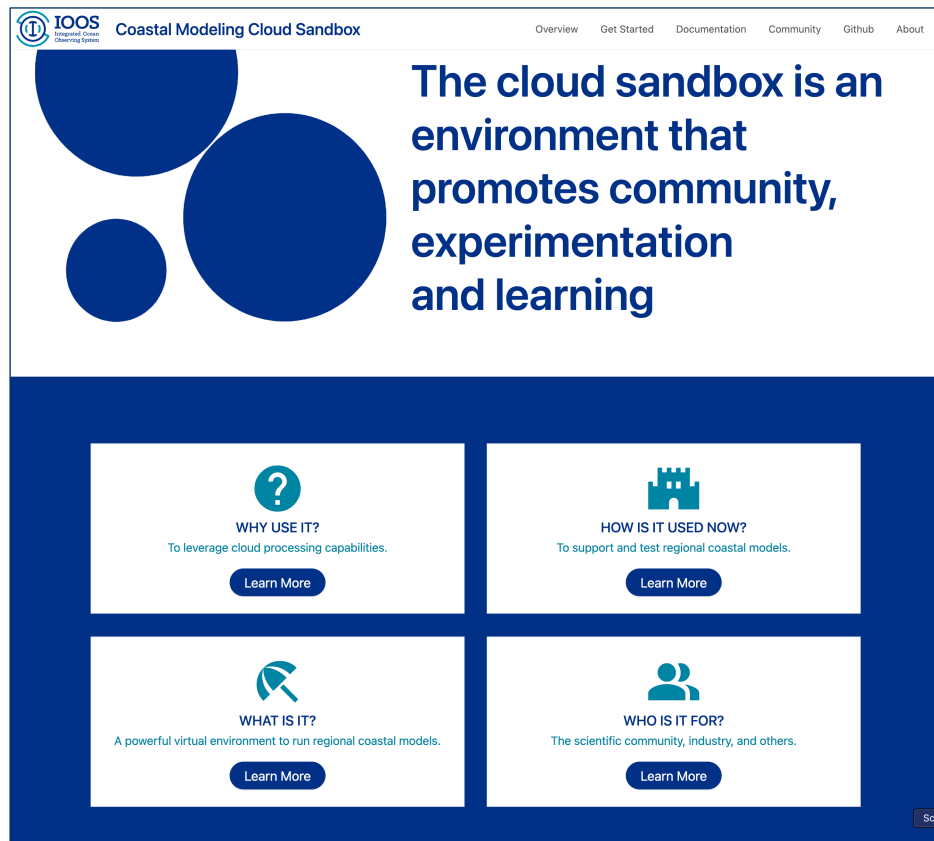
Dedicated IOOS website

- Documentation, on-line community



Future

- Website launch
- UFS Weather Applications
- UFS Coastal Applications
- Sandbox Workshop/Code-Sprint
- Refactoring
- Improve Terraform scripts
- Option to use pre-built AMI
- Singularity containers?
- ARM Graviton testing and support



Links, Q & A

Links:

<https://github.com/ioos/Cloud-Sandbox>

<https://github.com/ioos/nosofs-NCO> (v3.2.1)

<https://ioos.github.io/Cloud-Sandbox/> - Workflow API reference

<http://prototype.ioos.us:5000/> - IOOS Cloud Sandbox in development