IOOS Coastal Modeling Cloud Sandbox

IOOS DMAC Annual Meeting 2022
June 16, 2022

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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)
Sandbox Goals

- 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
JupyterHub Features

- Interactive Notebooks
- File explorer
- 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