

NEXTGEN IN A BOX (NGIAB)

Unlock the potential for
collaborative research



Developers CONFERENCE

Presenters:

Arpita Patel – The University of Alabama

Zach Wills – Lynker

Giovanni Romero - Aquaveo

AGENDA

- Introduction
- NextGen Basics
- NGIAB Applications
- NextGen In A Box
- Hands-on demo of NextGen In A Box (NGIAB) on local machine
- NextGen In A Box (NGIAB) Visualizer
- Future Work
- Q&A

NextGen Track Workshops at DevCon24

Day 1 - The NextGen **Hydrofabric**: What is it, how to get it, and how to make your own?

Day 1 - Get your model ready for NextGen with **BMI**

Day 2 - NextGen In A Box (**NGIAB**)

Day 2 - NextGen Simulation Development Tools

Day 3 - Building and Executing **Cloud Workflows** to Support NGEN Modeling Applications

Day 3 - Using **TEEHR** to explore, compare and evaluate streamflow simulations from different model formulations.

Day 4 - Using **Actors** for Parallelization in Hydrology

CIROH-UA Team



Steve Burian



Purushotham Bangalore



Jeffrey Carver



James Halgren



Arpita Patel



Benjamin Lee



Sepehr Karimi



Shahab Alam



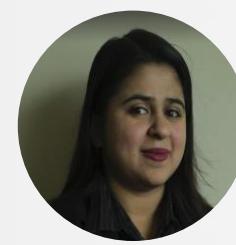
Hari Teja Jajula



Josh Cunningham



Trupesh Patel



Manjiri Gunaji



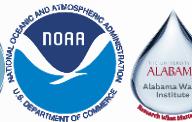
Chad Perry



Karnesh Jain



Manjila Singh



Lynker, BYU and Aquaveo Team



Nels Frazier



Zach Wills



Jordan Laser



Mike Johnson



Josh Sturtevant



Keith Jennings



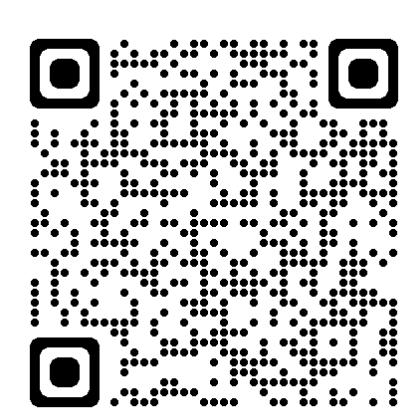
Gio



Dan Ames

NextGen Framework

- The NextGen Water Resources Modeling Framework (NextGen) is developed by **NOAA OWP at the National Water Center**
 - Enhance the forecasting of **flooding and drought**
 - Improve water resource management
 - Protect lives, property, and the environment
 - Multimodel computational framework for **NWM (National Water Model)**
- NextGen GitHub Repository: [GitHub: NOAA-OWP/ngen](https://github.com/NOAA-OWP/ngen)
- NextGen Wiki: [GitHub: NOAA-OWP/ngen/wiki](https://github.com/NOAA-OWP/ngen/wiki)



NEXTGEN IN A BOX

- USE CASE
- OVERVIEW OF NEXTGEN
- OBJECTIVES AND BENEFITS OF NEXTGEN
- KEY FEATURES

Community NextGen Development



Goal:

Advance research related to
NextGen and accelerate R2O
transition



Mission:

Community accessible Nextgen
Reproducible research



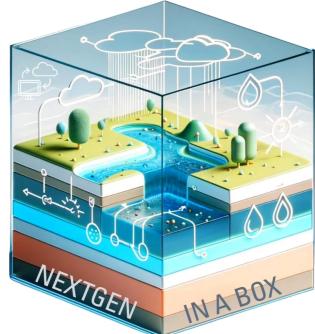
Vision:

Shared NextGen advancements
using shared computing

NextGen In A Box (NGIAB) Overview

Containerized Solution

- Run anywhere
- **Pre-compiled images** available in Docker Hub and Singularity Hub



Cloud Friendly Nature

- Reduce the **research time**
- Easily configure **multiple models**
- **Multi-cloud** compatible

NextGen In A Box Ready-to-run, containerized and cloud-friendly version of NextGen framework, packaged with scripts to help prepare data and get you modeling more quickly.

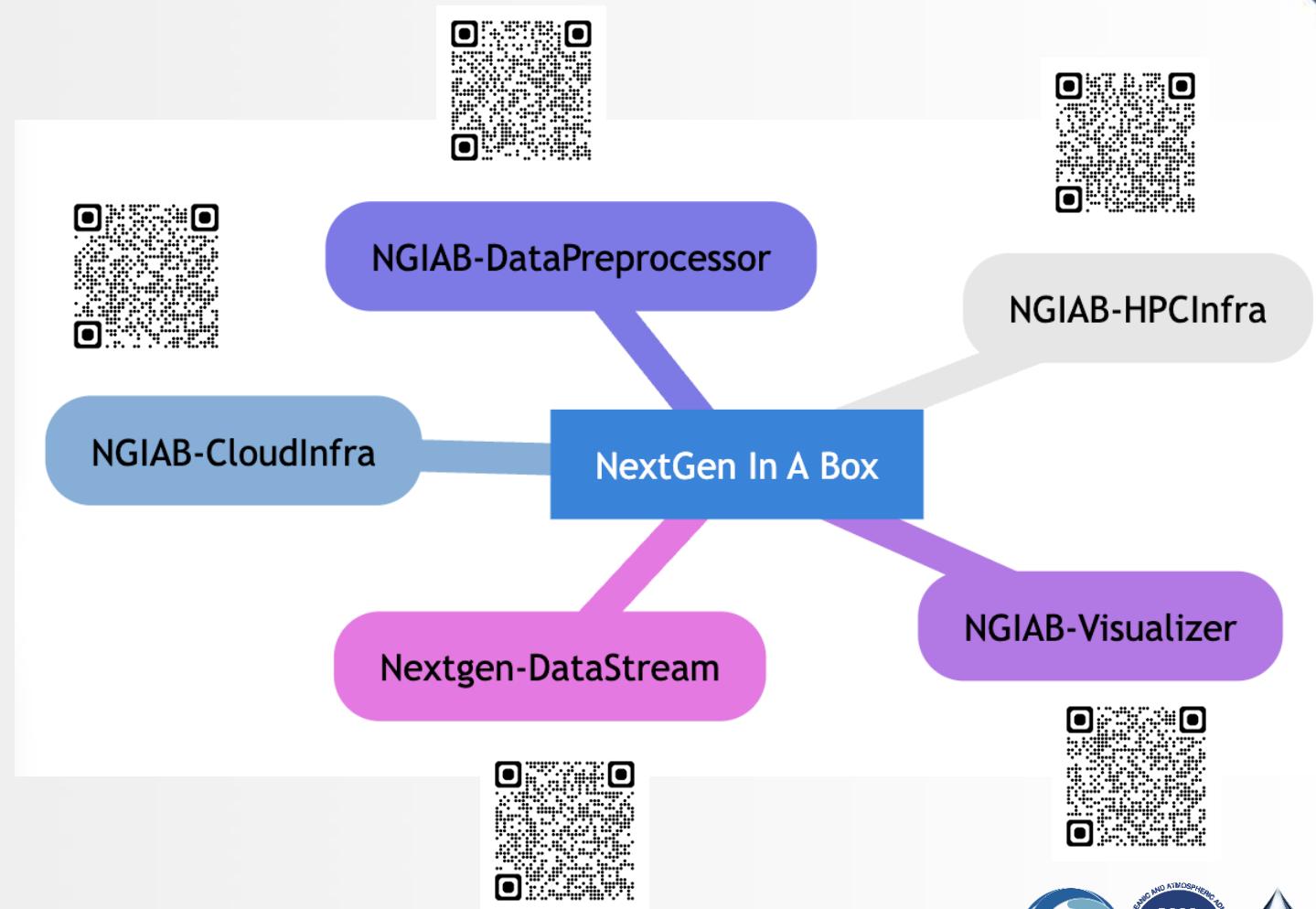
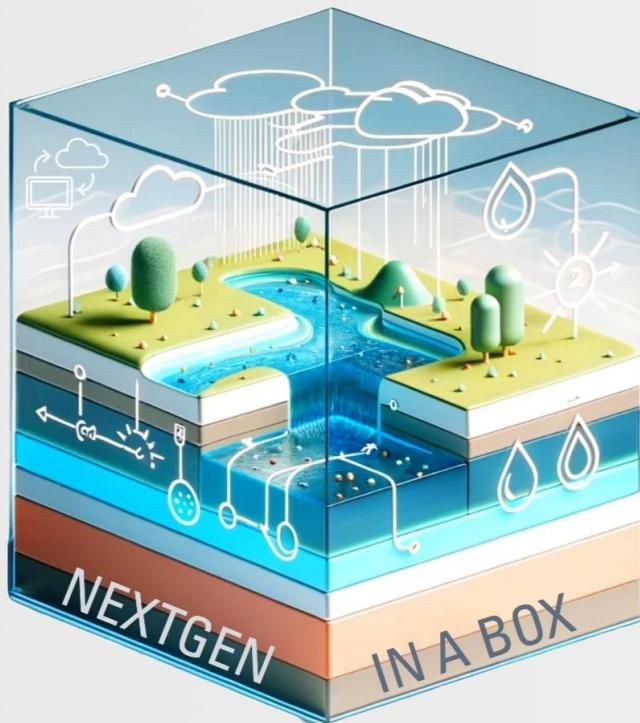
Simplifies NextGen Access

- Reduce **learning curve** for NextGen framework
- Compare **model performance**
- Facilitates accessibility and **accelerates modeling**

Collaborative Modeling Tool

- **Easy to use**
- **Reproducible** research outcomes
- Increase **collaboration** among researchers

NextGen In A Box Tools





Open-Source Research Practices

NGIAB-CloudInfra GitHub Repository: <https://github.com/CIROH-UA/NGIAB-CloudInfra>

NGIAB-HPCInfra GitHub Repository: <https://github.com/CIROH-UA/NGIAB-HPCInfra>

- Leveraging Open-Source Technologies
 - Git version control
 - **GitHub**
 - Continuous Integration & Continuous Deployment (CI/CD)
 - **GitHub Actions**
 - **Docker**
 - Singularity
- Fostering Transparency and Reproducibility in Research



NGIAB Images

- Docker Image : awiciroh/ciroh-ngen-image
- Image tags: latest_x86, latest
- Singularity Image: ciroh-it-support/ngiab/ciroh-ngen-singularity: latest_x86

The screenshot shows the Docker Hub interface with the search bar set to 'awiciroh'. The repository 'awiciroh / ciroh-ngen-image' is highlighted, showing it contains an image last pushed about 9 hours ago, with security unknown, 2 stars, 1069 downloads, and is public. Other repositories listed include 'awiciroh / ngen', 'awiciroh / tethys-ngiab', 'awiciroh / t-route', 'awiciroh / ngen-deps', and 'awiciroh / forcingprocessor'.

The screenshot shows the Sylabs library interface with the URL 'https://cloud.sylabs.io/library/ciroh-it-support/ngiab/ciroh-ngen-singularity'. The main title is 'ciroh-it-support/ngiab/ciroh-ngen-singularity'. A green box contains the command 'singularity pull library://ciroh-it-support/ngiab/ciroh-ngen-singularity:TAG'. Below this, there's a 'Filter By Architecture' section with 'amd64' selected, and a card for the 'ciroh-ngen-singularity : latest_x86' image, which has a SHA256 hash of sha256:902f558ac54197c7f0129a718953a3601cc3f282ffac06da6a19e75c26d1b54.

NEXTGEN IN A BOX : CI WORKFLOW

- Using Github Actions to run workflows.
- Automated flow to builds and push the docker image to Dockerhub once Pull Request is merged.
 - On Pull Request, triggers action workflow and validates changes.
 - On merge to main branch, triggers action, builds docker image and pushes to DockerHub.

The screenshot shows a GitHub Actions workflow page for the repository `github.com/CIROH-UA/NGIAB-CloudInfra/actions`. The left sidebar lists various actions: `New workflow`, `All workflows`, `Build and push deps image`, `Build and push final image`, `Build and push ngen image`, `Build and push ngen image`, `Build and push t-route image`, `Print Reference`, `Run Test`, `Validate TF script`, `X86 Build and push final image`, `Management`, `Caches`, `Attestations`, and `Runners`. The main area displays a list of completed and pending actions:

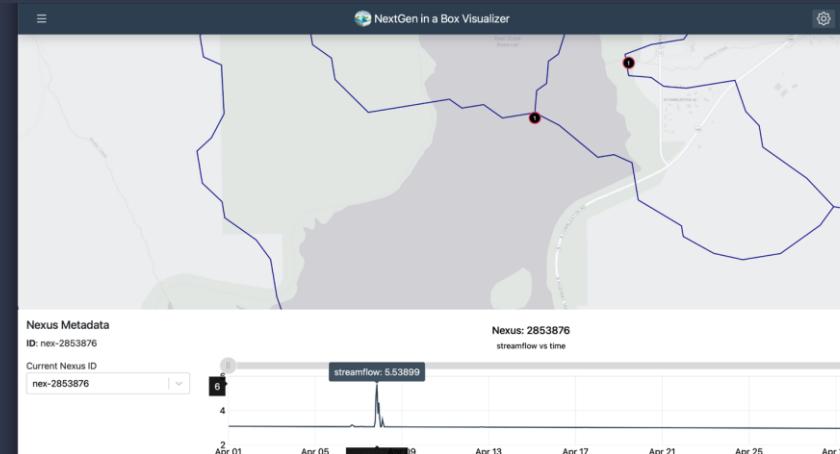
Action	Status	Commit	Last Run	...
<code>Build and push final image</code>	Success	#316: Manually run by benlee0423	1.1.1	last week 36m 25s
<code>lowercase platform (#157)</code>	Pending	Build and push final image #315: Commit 3b6b714 pushed by benlee0423	main	last week 8m 40s
<code>lowercase platform</code>	Success	Build and push final image #314: Pull request #157 opened by benlee0423	platform-tag-change	last week 1h 11m 36s
<code>X86 Build and push final image</code>	Success	X86 Build and push final image #12: Manually run by benlee0423	platform-tag-change	last week 38m 0s
<code>X86 Build and push final image</code>	Failure	X86 Build and push final image #11: Manually run by benlee0423	platform-tag-change	last week 33m 26s
<code>X86 Build and push final image</code>	Success	X86 Build and push final image #10: Manually run by benlee0423	main	last week 51m 50s
<code>add partition generation, modify find commands to outp...</code>	Pending	Build and push final image #313: Pull request #155 synchronize by ZacharyWills	JoshCu:devcon_prep	2 weeks ago 19h 50m 23s
<code>Fix ngen deps fails due to blosc2 and boost directory (#1...</code>	Success	Build and push final image #312: Commit a34820c pushed by arpita0911patel	main	2 weeks ago 39m 19s
<code>Fix ngen done fails due to blosc2 and boost directory</code>	Pending			...

NEXTGEN IN A BOX

NextGen Model Framework Tutorial

AutoMode

NGEN Ecosystem



```
},
    model_type_name : CFE,
    name : bmi_c,
    registration_function : register_bmi_cfe,
    uses_forcing_file : false,
    variables_names_map :
        {
            atmosphere_water__liquid_equivalent_precipitation_rate : precip_rate,
            ice_fraction_schaake : sloth_ice_fraction_schaake,
            ice_fraction_xinanjiang : sloth_ice_fraction_xinanjiang,
            soil_moisture_profile : sloth_smp,
            water_potential_evaporation_flux : EVAPOTRANS,
        },
    },
}
Building Feature Index
Catchment topology is dendritic.
Running Models
Running timestep 0
Definition of "au" in "/usr/share/udunits/udunits2-accepted.xml", line 123, overrides prefixed-unit "1.6605402e-45 kilogram"
Definition of "kt" in "/usr/share/udunits/udunits2-common.xml", line 105, overrides prefixed-unit "100000 kilogram"
Definition of "microns" in "/usr/share/udunits/udunits2-common.xml", line 411, overrides prefixed-unit "1e-15 second"
Definition of "ft" in "/usr/share/udunits/udunits2-common.xml", line 522, overrides prefixed-unit "1e-12 kilogram"
Definition of "yd" in "/usr/share/udunits/udunits2-common.xml", line 531, overrides prefixed-unit "8.64e-20 second"
Definition of "pt" in "/usr/share/udunits/udunits2-common.xml", line 785, overrides prefixed-unit "1e-09 kilogram"
Definition of "at" in "/usr/share/udunits/udunits2-common.xml", line 1258, overrides prefixed-unit "1e-15 kilogram"
Definition of "ph" in "/usr/share/udunits/udunits2-common.xml", line 1888, overrides prefixed-unit "3.6e-09 second"
Definition of "nt" in "/usr/share/udunits/udunits2-common.xml", line 1889, overrides prefixed-unit "1e-06 kilogram"
ut_get_converter(): Units not convertible
Catchment topology is dendritic.
Running Models
Running timestep 0
Definition of "au" in "/usr/share/udunits/udunits2-accepted.xml", line 123, overrides prefixed-unit "1.6605402e-45 kilogram"
Definition of "kt" in "/usr/share/udunits/udunits2-common.xml", line 105, overrides prefixed-unit "100000 kilogram"
Definition of "microns" in "/usr/share/udunits/udunits2-common.xml", line 411, overrides prefixed-unit "1e-15 second"
Definition of "ft" in "/usr/share/udunits/udunits2-common.xml", line 522, overrides prefixed-unit "1e-12 kilogram"
Definition of "yd" in "/usr/share/udunits/udunits2-common.xml", line 531, overrides prefixed-unit "8.64e-20 second"
Definition of "pt" in "/usr/share/udunits/udunits2-common.xml", line 785, overrides prefixed-unit "1e-09 kilogram"
Definition of "at" in "/usr/share/udunits/udunits2-common.xml", line 1258, overrides prefixed-unit "1e-15 kilogram"
Definition of "ph" in "/usr/share/udunits/udunits2-common.xml", line 1888, overrides prefixed-unit "3.6e-09 second"
Definition of "nt" in "/usr/share/udunits/udunits2-common.xml", line 1889, overrides prefixed-unit "1e-06 kilogram"
ut_get_converter(): Units not convertible
Finished 24 timesteps.
NGen top-level timings:
  NGen::init: 204.734
  NGen::simulation: 20.0003
  NGen::routing: 6.583e-06
real   3m48.776s
user   3m.844s
sys  0m12.442s
Finished executing command successfully.
Would you like to continue?
Select an option (type a number):
1) Interactive-Shell
2) Exit
#?
```

```
[bash-5.1# ../../mod/bin/ngen-parallel --info
NGen version: 0.1.0
Build configuration summary:
  Generator: Unix Makefiles
  Build type:
  System: Linux
  C Compiler: /usr/bin/cc
  C Flags:
  CXX Compiler: /usr/bin/c++
  CXX Flags:
  Flags:
    NGEN_WITH_MPI: ON
    NGEN_WITH_NETCDF: ON
    NGEN_WITH_SQLITE: ON
    NGEN_WITH_UDUNITS: ON
    NGEN_WITH_BMI_FORTRAN: ON
    NGEN_WITH_BMI_C: ON
    NGEN_WITH_PYTHON: ON
    NGEN_WITH_ROUTING: ON
    NGEN_WITH_TESTS: ON
    NGEN_WITH_COVERAGE: OFF
    NGEN QUIET: OFF
  Extern Models:
    NGEN_WITH_EXTERN_ALL: ON
    NGEN_WITH_EXTERN_SLOTH: ON
    NGEN_WITH_EXTERN_TOPMODEL: ON
    NGEN WITH_EXTERN_CFE: ON
    NGEN_WITH_EXTERN_PET: ON
    NGEN_WITH_EXTERN_NOAH_OWP_MODULAR: ON
  Environment summary:
  Boost:
    Version: 1.79.0
    Include: /ngen/boost
  MPI (C):
    Version: 3.1
    Library: /usr/local/lib/libmpi.so
    Include: /usr/local/include
  MPI (CXX):
    Version: 3.1
    Library: /usr/local/lib/libmpicxx.so,/usr/local/lib/libmpi.so
    Include: /usr/local/include
  NetCDF:
    Version: 4.8.1
    Library: /usr/lib/libnetcdf.so
    Library (CXX): /usr/local/lib64/libnetcdf-cxx4.so
    Include: /usr/include
    Include (CXX): /usr/local/include
    Parallel: TRUE
  SQLite:
    Version: 3.34.1
    Library: /usr/lib64/libsqllite3.so
    Include: /usr/include
  UDUNITS2:
    Library: /usr/lib64/libudunits2.so
    Include: /usr/include/udunits2
  Fortran:
    BMI_FORTRAN_ISO_C_LIB_PATH:
    BMI_FORTRAN_ISO_C_LIB_NAME: OFF
    BMI_FORTRAN_ISO_C_LIB_DIR: OFF
  Python:
    Version: 3.9.18
    Virtual Env: <none>
```

NEXTGEN IN A BOX

Conceptual Relationships:

Standard Data Structure

#	name	type	size
0	config	dir	288 B
1	forcings	dir	343.8 KiB
2	lakeout	dir	64 B
3	outputs	dir	592.3 KiB
4	restart	dir	64 B

Mount

Pre-compiled Models,
Tutorial, Runtime

0	ngen-serial
1	ngen-parallel
2	partitionGenerator
3	HelloNGEN.sh

NEXTGEN IN A BOX

AWI Data Package

Standard Data Structure

#	name	type	size
0	config	dir	288 B
1	forcings	dir	343.8 KiB
2	lakeout	dir	64 B
3	outputs	dir	592.3 KiB
4	restart	dir	64 B

```
=====
Welcome to CIROH-UA:NextGen National Water Model App!
=====

Looking for input data (a directory containing the following directories: forcings, config and outputs):
forcings is the hydrofabric input data for your model(s).
config folder has all the configuration related files for the model.
outputs is where the output files are copied to when the model finish the run

Last used data directory path: /Users/zachary.wills/Desktop/projects/AWI/AWI_16_2853886_006
Do you want to use the same path? (Y/n): y
The Directory you've given is:
/Users/zachary.wills/Desktop/projects/AWI/AWI_16_2853886_006

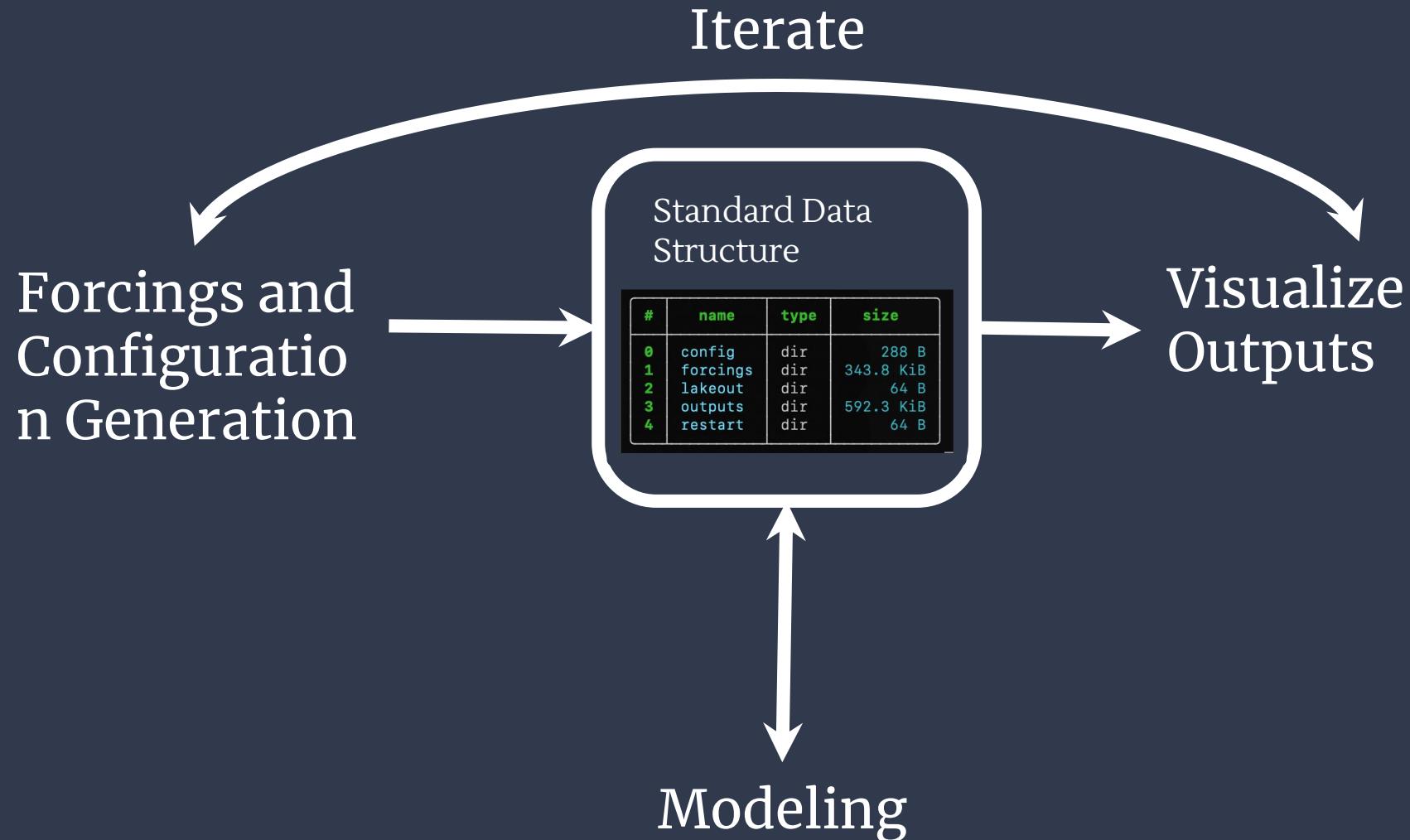
forcings exists.      2 forcings found.
config exists.      12 config found.
outputs exists.      3 outputs found.
Files found:          0
Outputs is ready for run. No matching files found.
Files found:          0
ngen/data is ready for run. No matching files found.

Looking in the provided directory gives us:
Found these datastream files:
/Users/zachary.wills/Desktop/projects/AWI/AWI_16_2853886_006/config/datastream_wb-2853886_subset.gpkg
Found these datastream files:
/Users/zachary.wills/Desktop/projects/AWI/AWI_16_2853886_006/config/datastream_wb-2853886_subset.gpkg
Found these realization files:
/Users/zachary.wills/Desktop/projects/AWI/AWI_16_2853886_006/config/realization.json

Detected ISA = Darwin Z.local 23.4.0 Darwin Kernel Version 23.4.0: Fri Mar 15 00:10:42 PDT 2024; root:xnu-10063.101.17~1/RELEASE_ARM64_T6000 arm64
Docker version 26.1.1, build 4cf5afa
Docker found
Darwin Z.local 23.4.0 Darwin Kernel Version 23.4.0: Fri Mar 15 00:10:42 PDT 2024; root:xnu-10063.101.17~1/RELEASE_ARM64_T6000 arm64
Select an option (type a number):
1) Run NextGen using existing local docker image
2) Run NextGen after updating to latest docker image
3) Exit
#?
```

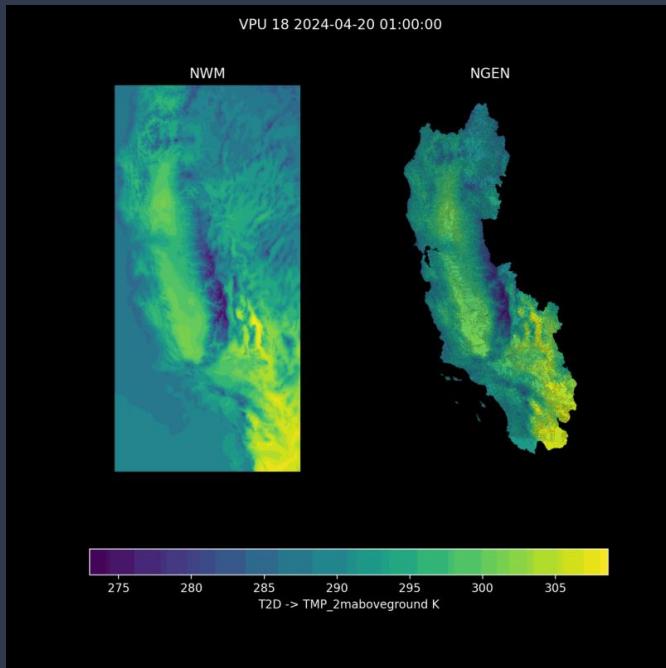
NEXTGEN IN A BOX

Workflow

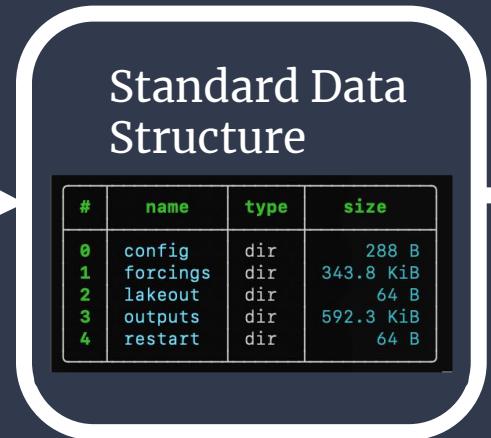


NEXTGEN IN A BOX

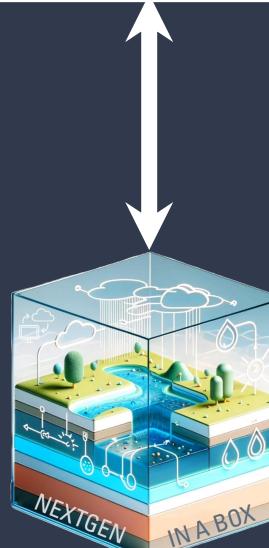
EcoSystem



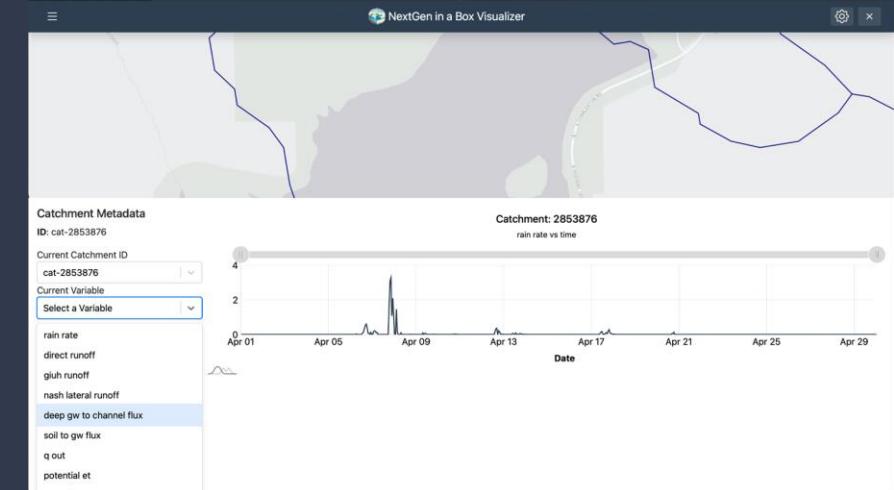
Forcings and Configuration Generation



Visualize in Tethys



NextGen Model Run



NEXTGEN IN A BOX

EcoSystem

All on your
laptop.



NEXTGEN IN A BOX

EcoSystem

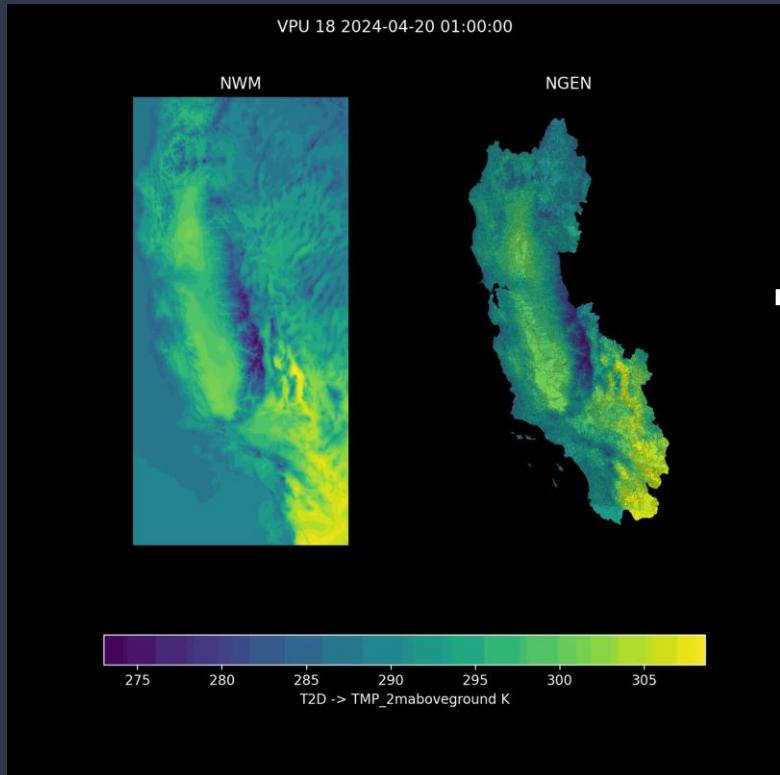
All on your
laptop.

Then your HPC.

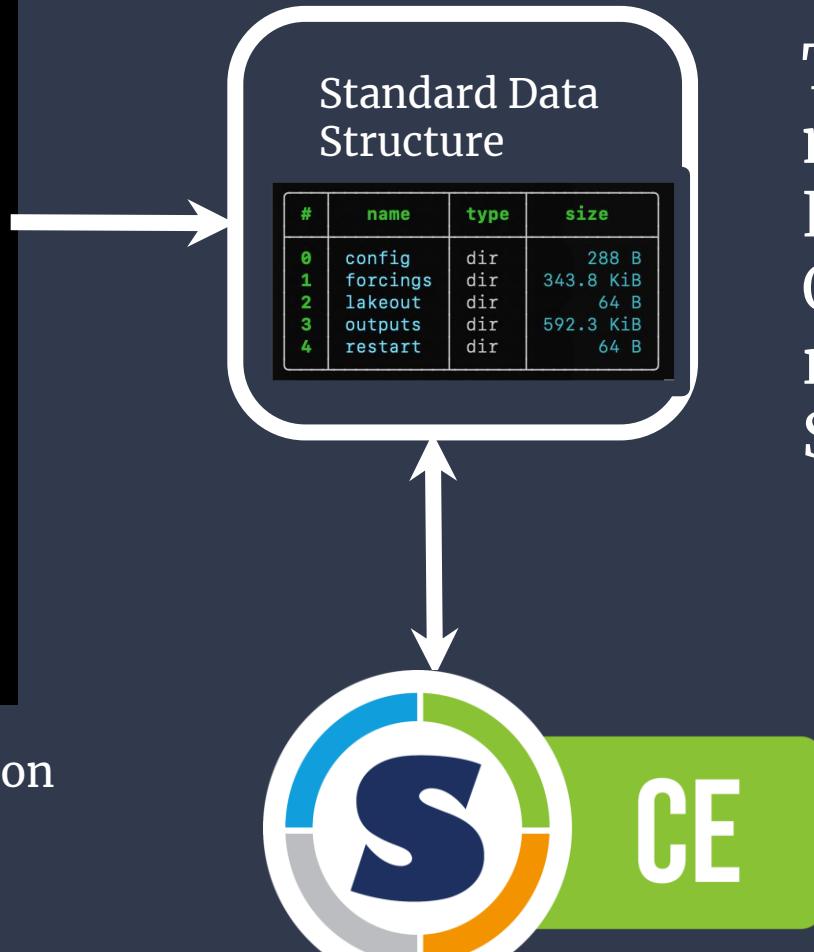


NEXTGEN IN A BOX

EcoSystem



Forcings and Configuration Generation



Singularity NextGen Model Run

The common data structure means that NGEN Framework Inputs and Outputs are portable and reproducible based on the Standard Data structure.

HANDS-ON DEMO

README.md

Open README file:

<https://tinyurl.com/ngiab-cloudinfra>

3 Steps:

1. Install docker
2. Download sample data
3. Run NextGen In A Box – guide.sh

github.com/CIROH-UA/NGIAB-CloudInfra/blob/main/README.md

Code Issues 22 Pull requests 3 Discussions Actions Projects Wiki Security Insights

main NGIAB-CloudInfra / README.md

arpita0911patel Updated README.md

Preview Code Blame 287 lines (158 loc) · 9.92 KB

NextGen In A Box (NGIAB)

Run the NextGen National Water Resources Modeling Framework locally with ease.

NGIAB provides a containerized and user-friendly solution for running the NextGen framework, allowing you to control inputs, configurations, and execution on your local machine.

STEP 0 : ONLY FOR VIRTUAL INSTANCES

If you are working from a virtual instance: you might need to do the following:

Steps :

1. Download the key from:

1. <https://alabama.app.box.com/s/fig2o4uko0j29bigholkolgsze96qtvh>

2. Connect to the instance:

1. \$ ssh -i <your_key_pem_file> <user>@<remote IP host>

You do not need to install docker in this instance. It came with docker pre-install.

STEP 1 : INSTALL DOCKER

On Windows:
Install Docker Desktop on Windows :
<https://docs.docker.com/desktop/install/windows-install/#install-docker-desktop-on-windows>

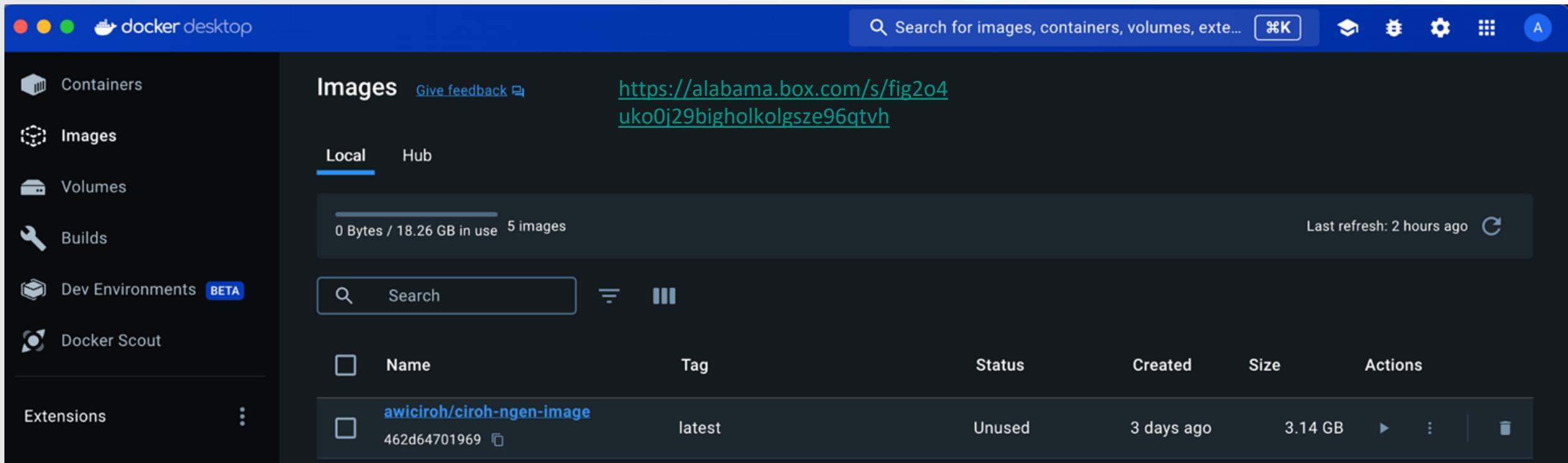
Install WSL:
<https://learn.microsoft.com/en-us/windows/wsl/install>

On Mac:
Install docker on Mac :
<https://docs.docker.com/desktop/install/mac-install>

- Once docker is installed, start Docker Desktop.
- Open terminal app
- Type 'docker ps -a' to make sure docker is working.

On Linux:
Install docker on Linux :
<https://docs.docker.com/desktop/install/linux-install>

- Follow similar steps as Mac for starting Docker and verifying the installation



The screenshot shows the Docker Desktop application window. The left sidebar has icons for Containers, Images, Volumes, Builds, Dev Environments (BETA), and Docker Scout. The main area is titled 'Images' with a 'Local' tab selected. It shows 5 images used 0 Bytes / 18.26 GB in use. A search bar at the top right contains the URL <https://alabama.box.com/s/fig2o4uko0j29bigholkolgsze96qtvh>. Below the search bar are filters and a refresh button. A table lists the image details:

Name	Tag	Status	Created	Size	Actions
awiciroh/ciroh-ngen-image 462d64701969	latest	Unused	3 days ago	3.14 GB	

STEP 2 : DOWNLOAD SAMPLE DATA

Use Case: AWI_006 - Provo River Basin, UT - 16 VPU

Steps :

```
$ mkdir -p NextGen/ngen-data
```

```
$ cd NextGen/ngen-data
```



```
$ wget --no-parent https://ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com/AWI-006/AWI\_16\_2853886\_006.tar.gz
```

```
$ tar -xf AWI_16_2853886_006.tar.gz
```

```
$ mv AWI_16_2853886_006 my_data
```

```
$ pwd
```

```
[apatel54@UA-W2RP43G:~/NextGen/ngen-data] $ wget --no-parent https://ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com/AWI-006/AWI_16_2853886_006.tar.gz
--2024-05-13 21:54:25--  https://ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com/AWI-006/AWI_16_2853886_006.tar.gz
Resolving ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com (ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com)... 52.219.108.186, 3.5.132.135, 52.219.177.90, ...
Connecting to ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com (ciroh-ua-ngen-data.s3.us-east-2.amazonaws.com)|52.219.108.186|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 40323415 (38M) [application/x-tar]
Saving to: 'AWI_16_2853886_006.tar.gz'

AWI_16_2853886_006.t 100%[=====] 38.46M 36.9MB/s in 1.0s
2024-05-13 21:54:27 (36.9 MB/s) - 'AWI_16_2853886_006.tar.gz' saved [40323415/40323415]
```

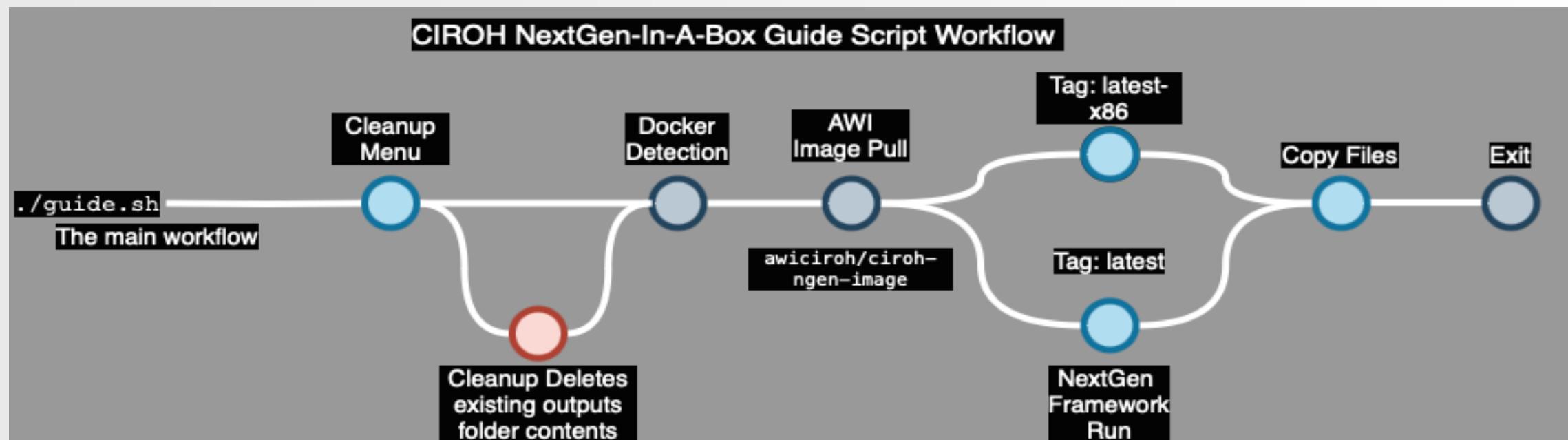
Please attend following workshop for more info on how to prepare the dataset:
NextGen Simulations Development Tools (Day 1 afternoon)

STEP 3: NEXTGEN IN A BOX: GUIDE.SH WORKFLOW

Clone repo:

```
$ cd NextGen  
$ git clone https://github.com/CIROH-UA/NGIAB-CloudInfra.git  
$ cd NGIAB-CloudInfra
```

Latest guide.sh location: <https://github.com/CIROH-UA/NGIAB-CloudInfra/blob/main/guide.sh>



STEP 3: RUN GUIDE.SH

```
[apatel54@UA-W2RP43G:~/NextGen/NGIAB-CloudInfra]⇒ ./guide.sh  
=====  
Welcome to CIROH-UA:NextGen National Water Model App!  
=====  
Looking for input data (a directory containing the following directories: forcings, config and outputs):  
  
forcings is the hydrofabric input data for your model(s).  
config folder has all the configuration related files for the model.  
outputs is where the output files are copied to when the model finish the run  
  
Last used data directory path: /Users/apatel54/NextGen/ngen-data/my_data  
Do you want to use the same path? (Y/n): █
```

~/NextGen/NGIAB-CloudInfra => ./guide.sh

....
....
....

Script will execute and prompt the user for entering the absolute path of input data.

Enter absolute input data path.

e.g:

/Users/apatel54/DevCon24/NextGen/ngen-data/my_data/

NOTE: If you are rerunning the script, it will reuse the path from previous run.

Looking for input data (a directory containing the following directories: forcings, config and outputs):

forcings is the hydrofabric input data for your model(s).

config folder has all the configuration related files for the model.

outputs is where the output files are copied to when the model finish the run

Last used data directory path: **/Users/apatel54/NextGen/ngen-data/my_data**

Do you want to use the same path? (Y/n): Y

The Directory you've given is:

/Users/apatel54/NextGen/ngen-data/my_data

forcings exists. 230 forcings found.

config exists. 471 config found.

outputs exists. 1043 outputs found.

Files found: 1043

Cleanup Process: matching files (-name '*') in Outputs: /Users/apatel54/NextGen/ngen-data/my_data/outputs/

Select an option (type a number):

1) Delete files and run fresh 3) Exit

2) Continue without cleaning

#?

~/NextGen/CloudInfra => ./guide.sh

....

....

Script will prompt user if the cleanup steps are needed.

Enter “1” if output files needs to be deleted before running the model.

```
1) Delete files and run fresh 3) Exit
2) Continue without cleaning
#? 1
Cleaning folder for fresh run
Files found:      0
Restarts is ready for run. No matching files found.

Looking in the provided directory gives us:
Found these hydrofabric files:
/Users/apatel54/NextGen/ngen-data/my_data/config/wb-2853886_subset.gpkg
Found these realization files:
/Users/apatel54/NextGen/ngen-data/my_data/config/realization.json

Detected ISA = Darwin UA-W2RP43G 23.2.0 Darwin Kernel Version 23.2.0: Wed Nov 15
21:53:18 PST 2023; root:xnu-10002.61.3~2/RELEASE_ARM64_T6000 arm64
Docker version 26.0.0, build 2ae903e
Docker found
Darwin UA-W2RP43G 23.2.0 Darwin Kernel Version 23.2.0: Wed Nov 15 21:53:18 PST 20
23; root:xnu-10002.61.3~2/RELEASE_ARM64_T6000 arm64
Select an option (type a number):
1) Run NextGen using existing local docker image
2) Run NextGen after updating to latest docker image
3) Exit
#?
```

~/NextGen/CloudInfra =>
./guide.sh

....

- Script will display hydrofabric and realization files under input data.
- Script will detect the OS architecture (arm vs x86) and make sure Docker is running.
- Script will prompt user to enter "1" if ready to run the Model using local docker images.
- enter "2" to pull latest docker image.



```
ngen/data within the container.
```

```
Working directory is:
```

```
/ngen/ngen/data
```

```
Found these Catchment files:
```

```
./config/wb-2853886_subset.gpkg
```

```
Found these Nexus files:
```

```
./config/wb-2853886_subset.gpkg
```

```
Found these Realization files:
```

```
./config/realization.json
```

```
Entering Interactive Mode
```

```
Select an option (type a number):
```

- 1) Run NextGen model framework in serial mode
- 2) Run NextGen model framework in parallel mode
- 3) Run Bash shell
- 4) Exit

```
#?
```

```
~/NextGen/CloudInfra =>
```

```
./guide.sh
```

```
....
```

- Script will display catchment, nexus and realization files.
- The user is then prompted to select whether they want to run the model in serial mode (1), parallel mode (2) or Run bash shell (3).

```
Found these Realization files:  
./config/realization.json
```

Entering Interactive Mode

Select an option (type a number):

- 1) Run NextGen model framework in serial mode
 - 2) Run NextGen model framework in parallel mode
 - 3) Run Bash shell
 - 4) Exit
- #? 1

Selected files:

Catchment: ./config/wb-2853886_subset.gpkg
Nexus: ./config/wb-2853886_subset.gpkg
Realization: ./config/realization.json

Your NGEN run command is /dmod/bin/ngen-serial ./config/wb-2853886_subset.gpkg all ./config/wb-2853886_subset.gpkg all ./config/realization.json

If your model didn't run, or encountered an error, try checking the Forcings paths in the Realizations file you selected.

Do you want to redirect command output to /dev/null? (y/N, default: n):

~/NextGen/CloudInfra => ./guide.sh

....

....

- Enter "1" for serial mode run.
- Model will run in serial mode using /dmod/bin/ngen-serial command.
- Enter “n” if you want to check the console output.

```
Config Value - Param: 'soil_params.expon' | Value: '1' | Units: ''
Config Value - Param: 'soil_params.expon_secondary' | Value: '0.005' | Units: ''
Config Value - Param: 'max_gw_storage' | Value: '249.814804077' | Units: 'm'
Config Value - Param: 'Cgw' | Value: '0.0018' | Units: 'm h-1'
Config Value - Param: 'expon' | Value: '6.0' | Units: ''
Config Value - Param: 'gw_storage' | Value: '0.05' | Units: 'm/m'
Config Value - Param: 'alpha_fc' | Value: '0.33' | Units: '(null)'
Config Value - Param: 'soil_storage' | Value: '0.05' | Units: 'm/m'
Config Value - Param: 'K_nash' | Value: '0.03' | Units: ''
Config Value - Param: 'K_lf' | Value: '0.01' | Units: ''
Config Value - Param: 'nash_storage' | Value: '0.0,0.0' | Units: '(null)'
Config Value - Param: 'giuh_ordinates' | Value: '1.00,0.00' | Units: '(null)'
Found configured GIUH ordinate values ('1.00,0.00')
Config Value - Param: 'num_timesteps' | Value: '1' | Units: '(null)'
Config Value - Param: 'verbosity' | Value: '1' | Units: '(null)'
Config Value - Param: 'DEBUG' | Value: '0' | Units: '(null)'
Config Value - Param: 'refkdt' | Value: '3.878265282527349' | Units: '(null)'
Schaake Magic Constant calculated
All CFE config params present
GIUH ordinates string value found in config ('1.00,0.00')
Counted number of GIUH ordinates (2)
Finished function parsing CFE config
At declaration of smc_profile size, soil_reservoir.n_soil_layers = 0
```

~/NextGen/CloudInfra =>
./guide.sh

....

....

- This output on console indicates script is running.
- This step will take few mins depending on machine/specs.

```
Definition of "pt" in "/usr/share/udunits/udunits2-common.xml", line 785, overrid  
es prefixed-unit "1e-09 kilogram"  
Definition of "at" in "/usr/share/udunits/udunits2-common.xml", line 1250, overri  
des prefixed-unit "1e-15 kilogram"  
Definition of "ph" in "/usr/share/udunits/udunits2-common.xml", line 1880, overri  
des prefixed-unit "3.6e-09 second"  
Definition of "nt" in "/usr/share/udunits/udunits2-common.xml", line 1889, overri  
des prefixed-unit "1e-06 kilogram"  
Running timestep 100  
Running timestep 200  
Running timestep 300  
Running timestep 400  
Running timestep 500  
Running timestep 600  
Finished 697 timesteps.  
creating supernet connections set  
supernet connections set complete  
... in 0.12949371337890625 seconds.  
2024-05-14 01:47:51,505 INFO [AbstractNetwork.py:494 - create_independent_netw  
orks()]: organizing connections into reaches ...  
2024-05-14 01:47:51,506 INFO [AbstractNetwork.py:651 - initial_warmstate_prepr  
ocess()]: setting channel initial states ...  
Reformatting qlat nexus files as hourly binary files...
```

~/NextGen/CloudInfra =>
.guide.sh

....

....

....

....

....

....

- This output on console indicates script is still running.

```

2024-05-20 15:26:14,392 INFO [AbstractNetwork.py:125 -  assemble_forcings(): Creating a DataFrame of lateral inflow forcings ...
2024-05-20 15:26:17,362 INFO [__main__.py:1074 -      nwm_route(): executing routing computation ...
2024-05-20 15:26:17,363 INFO [compute.py:418 - compute_nhd_routing_v02()): JIT Preprocessing time 0.0009942054748535156 seconds.
2024-05-20 15:26:17,363 INFO [compute.py:419 - compute_nhd_routing_v02()): starting Parallel JIT calculation
2024-05-20 15:26:18,144 INFO [compute.py:648 - compute_nhd_routing_v02()): PARALLEL TIME 0.7807533740997314 seconds.
2024-05-20 15:26:18,149 INFO [output.py:109 - nwm_output_generator()): Handling output ...
/usr/local/lib64/python3.9/site-packages/troute/nhd_io.py:2162: FutureWarning: Downcasting object dtype arrays on .fillna, .ffill, .bfill is deprecated and will change in a future version. Call result.infer_objects(copy=False) instead. To opt-in to the future behavior, set `pd.set_option('future.no_silent_downcasting', True)`
empty_df = pd.DataFrame(index=empty_ids, columns=nudge_df.columns).fillna(-9999.0)
/usr/local/lib64/python3.9/site-packages/troute/nhd_io.py:2163: FutureWarning: The behavior of array concatenation with empty entries is deprecated. In a future version, this will no longer exclude empty items when determining the result dtype. To retain the old behavior, exclude the empty entries before the concat operation.
nudge_df = pd.concat([nudge_df, empty_df]).loc[flowveldepth.index]
***** TIMING SUMMARY *****
-----
Network graph construction: 0.32 secs, 0.41 %
Forcing array construction: 77.06 secs, 97.31 %
Routing computations: 0.78 secs, 0.99 %
Output writing: 1.02 secs, 1.29 %
-----
Total execution time: 79.17999999999999 secs
Finished routing
NGen top-level timings:
    NGen::init: 13.0649
    NGen::simulation: 34.9045
    NGen::routing: 79.2219

real    2m7.786s
user    0m36.592s
sys     0m8.822s
Finished executing command successfully.
Would you like to continue?
Select an option (type a number):
1) Interactive-Shell
2) Exit
#?

```

~/NextGen/CloudInfra =>
./guide.sh

....

....

- Timing summary is displayed.
- User is prompted if they want to select Interactive-Shell(1) or exit (2)
- Select "2" to Exit and copy the output files.

```

/usr/local/lib64/python3.9/site-packages/troute/nhd_io.py:2162: FutureWarning: Downcasting object dtype arrays on .fillna, .ffill, .bfill is deprecated and will change in a future version. Call result.infer_objects(copy=False) instead. To opt-in to the future behavior, set `pd.set_option('future.no_silent_downcasting', True)`
    empty_df = pd.DataFrame(index=empty_ids, columns=nudge_df.columns).fillna(-9999.0)
/usr/local/lib64/python3.9/site-packages/troute/nhd_io.py:2163: FutureWarning: The behavior of array concatenation with empty entries is deprecated. In a future version, this will no longer exclude empty items when determining the result dtype. To retain the old behavior, exclude the empty entries before the concat operation.
    nudge_df = pd.concat([nudge_df, empty_df]).loc[flowveldepth.index]
***** TIMING SUMMARY *****
-----
Network graph construction: 0.32 secs, 0.41 %
Forcing array construction: 77.06 secs, 97.31 %
Routing computations: 0.78 secs, 0.99 %
Output writing: 1.02 secs, 1.29 %
-----
Total execution time: 79.17999999999999 secs
Finished routing
NGen top-level timings:
    NGen::init: 13.0649
    NGen::simulation: 34.9045
    NGen::routing: 79.2219

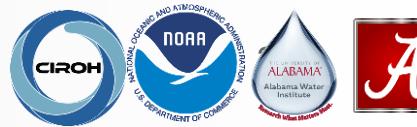
real    2m7.786s
user    0m36.592s
sys     0m8.822s
Finished executing command successfully.
Would you like to continue?
Select an option (type a number):
1) Interactive-Shell
2) Exit
#? 2
Have a nice day.
    1043 new outputs created.
Any copied files can be found here: /Users/apatel54/NextGen/ngen-data/my_data/outputs
Darwin UA-W2RP43G 23.2.0 Darwin Kernel Version 23.2.0: Wed Nov 15 21:53:18 PST 2023; root:xnu-1000.2.61.3~2/RELEASE_ARM64_T6000 arm64
\c[33mVisualize outputs using the Tethys Platform (https://www.tethysplatform.org/)? (y/N, default: y):\c[0m

```

~/NextGen/CloudInfra => ./guide.sh

....

- Output files are copied to path displayed.
- If no errors, new output folders and files are created.
- Once the guide.sh has finished running the script, the user can be prompted to use NGIAB-Visualizer app for visualization ([Tethys Platform](#))
- For demo say “Y”, if you also want you can run the visualization separately (./viewOnTethys.sh)



NGIAB-Visualizer

```
Would you like to continue?
Select an option (type a number):
1) Interactive-Shell
2) Exit
#? 2
Have a nice day.
1043 new outputs created.
Any copied files can be found here: /home/gio/tethysdev/docker/NextGen/ngen
-data/AWI_16_2853886_006/outputs
Visualize outputs using the Tethys Platform (https://www.tethysplatform.org/)? (y/N, default: y):
y
Setup Tethys Portal image...
Select an option (type a number):
1) Run Tethys using existing local docker image
2) Run Tethys after updating to latest docker image
3) Exit
#? 2
Pulling container...
dev-r1: Pulling from awiciroh/tethys-ngiab
Digest: sha256:498e5c819e72c50e1db28ee6565479d612435d8a5da34f356840ce3a87a9
822b
```

- `~/NextGen/CloudInfra => ./guide.sh`

- Enter "2" to pull the NGIAB-Visualizer app image.

NGIAB-Visualizer

```
DALWIN-01 WERK 100-237170 DALWIN Kernel Version 2.6.27.7-2.217.0.1-WED-Nov-10-21:08:10-107-2020, Rootfs SHA-1:0002E70178-E, RELEASE_2.6.27-1-00000-0-0m
\[33mVisualize outputs using the Tethys Platform (https://www.tethysplatform.org/)? (y/N, default: y):\e[0m
y
\[32mSetup Tethys Portal image...\e[0m
Select an option (type a number):
1) Run Tethys using existing local docker image
2) Run Tethys after updating to latest docker image
3) Exit
#? 2
Pulling container...
main: Pulling from awiciroh/tethys-ngiab
Digest: sha256:124b13df3d9437ce8e20d115d648229ce8e806f77ef2a8350b740837a828a99c
Status: Image is up to date for awiciroh/tethys-ngiab:main
docker.io/awiciroh/tethys-ngiab:main

What's Next?
  View a summary of image vulnerabilities and recommendations → docker scout quickview awiciroh/tethys-ngiab:main
7341de5c3ad42be2da85e44abf336764fb53fd24811a6e1cd97d36a233fc166
\[32mSetup GeoServer image...\e[0m
Select an option (type a number):
1) Run GeoServer using existing local docker image
2) Run GeoServer after updating to latest docker image
3) Exit
#? 
```

~/NextGen/CloudInfra =>
./guide.sh

- Enter "2" to pull the GeoServer image.

NGIAB-Visualizer

~/NextGen/CloudInfra => ./guide.sh

```
What's Next?  
View a summary of image vulnerabilities and recommendations → docker scout quickview awiciroh/tethys-ngiab:main  
7341de5c3ad42be2da85e44abf336764fb53fd24811a6e1cd97d36a233fc166  
\e[32mSetup GeoServer image...\e[0m  
Select an option (type a number):  
1) Run GeoServer using existing local docker image  
2) Run GeoServer after updating to latest docker image  
3) Exit  
#? 2  
Pulling container...  
2.25.x: Pulling from geoserver  
Digest: sha256:a21b6a4c7255bc3f0fcc295ebc9e5a6d0ef8e1cf5462378ed54c6ea07213b678  
Status: Image is up to date for docker.osgeo.org/geoserver:2.25.x  
docker.osgeo.org/geoserver:2.25.x  
  
What's Next?  
View a summary of image vulnerabilities and recommendations → docker scout quickview docker.osgeo.org/geoserver:2.25.x  
Successfully updated GeoServer image.  
WARNING: The requested image's platform (linux/amd64) does not match the detected host platform (linux/arm64/v8) and no specific platform was requested  
e10ede5ee810fb683186acc6148dba684afc89e5bfc3dbf71805a6eafa6fa743  
Waiting for container: tethys-ngen-portal to start, this can take a couple of minutes...
```

- If the images are pulled successfully then please wait for containers to start. This might take couple of mins.
- Open a tab with the NGIAB-Visualizer app in your current browser.

NGIAB-Visualizer

```
NGIAB-CloudInfra — ./guide.sh — bash + guide.sh — 136x37
./guide.sh
Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug tethys-ngen-portal
Learn more at https://docs.docker.com/go/debug-cli/
File generated at "/usr/lib/tethys/portal_config.yml".

What's next?
Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug tethys-ngen-portal
Learn more at https://docs.docker.com/go/debug-cli/

What's next?
Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug tethys-ngen-portal
Learn more at https://docs.docker.com/go/debug-cli/
Waiting for container: tethys-geoserver to start, this can take a couple of minutes...
Container tethys-geoserver is now healthy.
\e[36mLink data to the Tethys app workspace.\e[0m

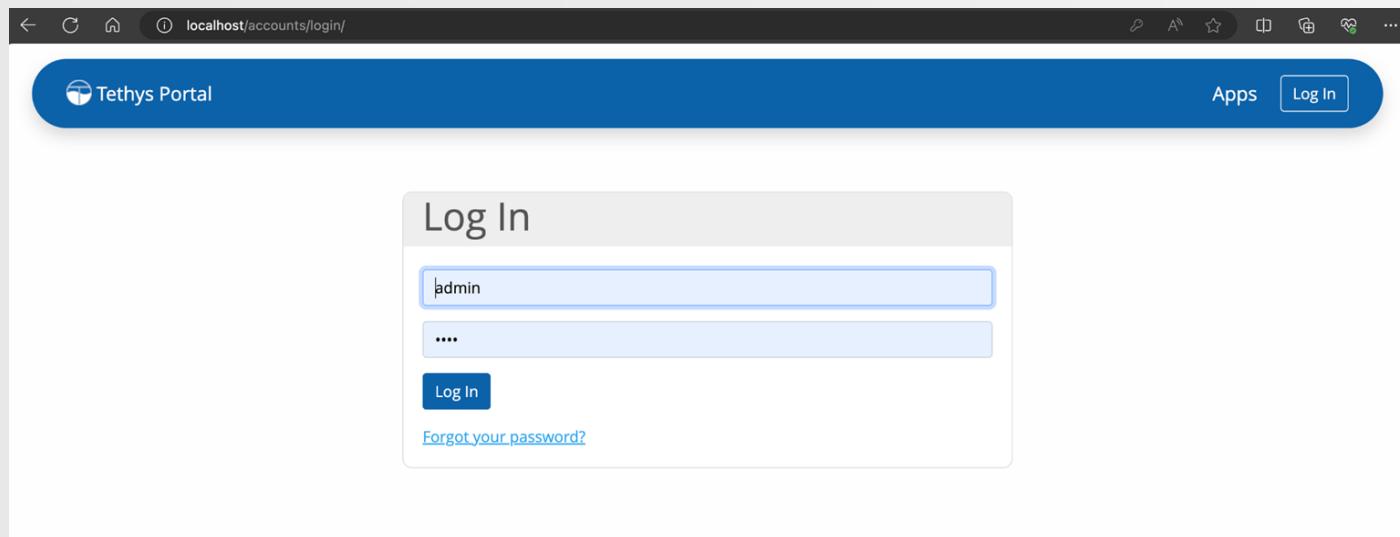
What's next?
Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug tethys-ngen-portal
Learn more at https://docs.docker.com/go/debug-cli/
\e[32mPreparing the hydrofabrics for the portal...\e[0m
\e[36mPreparing the catchments...\e[0m
/usr/lib/tethys/apps/ngiab/cli/convert_geom.py:23: UserWarning: Column names longer than 10 characters will be truncated when saved to ESRI Shapefile.
gdf.to_file(f"{shp_path}.shp", driver="ESRI Shapefile")

What's next?
Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug tethys-ngen-portal
Learn more at https://docs.docker.com/go/debug-cli/
\e[36mPreparing the nexus...\e[0m
Successfully copied 29.2kB to tethys-ngen-portal:/var/lib/tethys_persist/ngen-data/config/nexus.geojson
\el[32mYour outputs are ready to be visualized at http://localhost/apps/ngiab \e[0m
\el[35mYou can use the following to login: \e[0m
\el[36muser: admin\el[0m
\el[36mpassword: pass\el[0m
\el[35mCheck the App source code: https://github.com/Aquaveo/ngiab-client \e[0m
Press q to exit the visualization (default: q/Q):
```

~ /NextGen/CloudInfra =>
./guide.sh

- Your outputs are ready to be visualized at
<http://localhost/apps/ngiab>
- This might take few mins depending on your hardware.

NGIAB-Visualizer

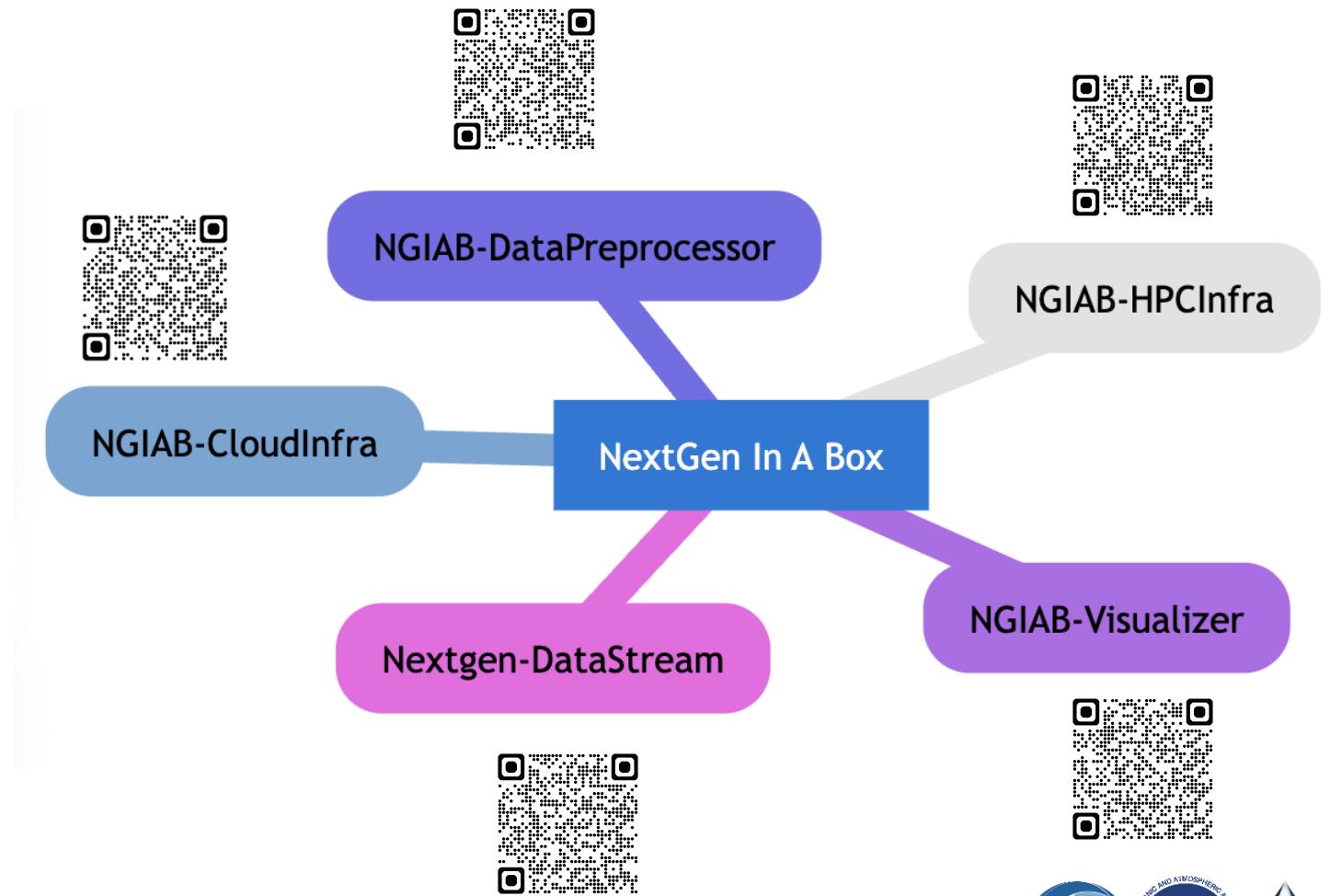
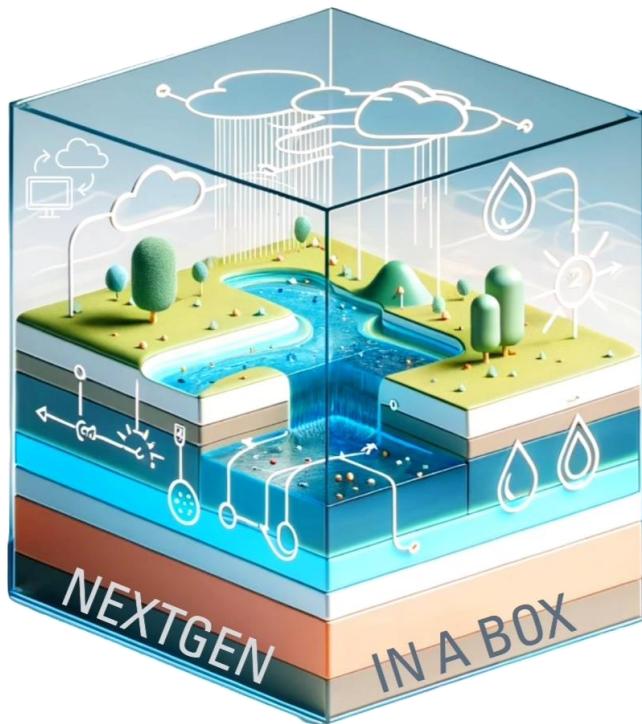


The browser will open automatically for you at: <http://localhost/apps/ngiab> or

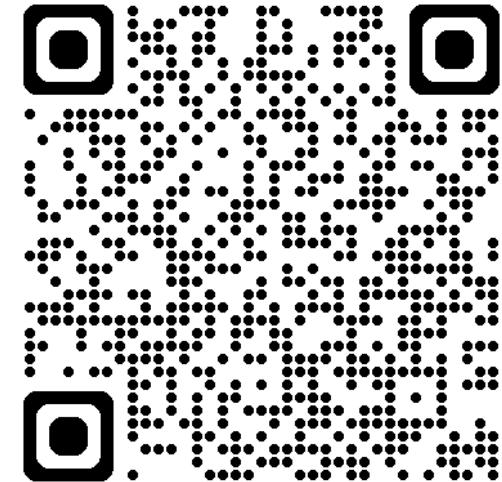
- If you are in a cloud instance run the following command:
 - sudo ssh -i <your_key_pem> -N -L 80:localhost:80 -L 8181:localhost:8181 <user>@<host>
- If the browser does not launch, just open the browser.
- Use the following credentials to access the portal:
 - user: **admin**
 - password : **pass**

NGIAB - Applications

NGIAB Products



NGIAB-HPCInfra



- Repo : <https://github.com/CIROH-UA/NGIAB-HPCInfra>
- Provides Singularity Image for running NextGen In A Box
- Run NGIAB on any HPC using Singularity

NGIAB-Data PreProcessor

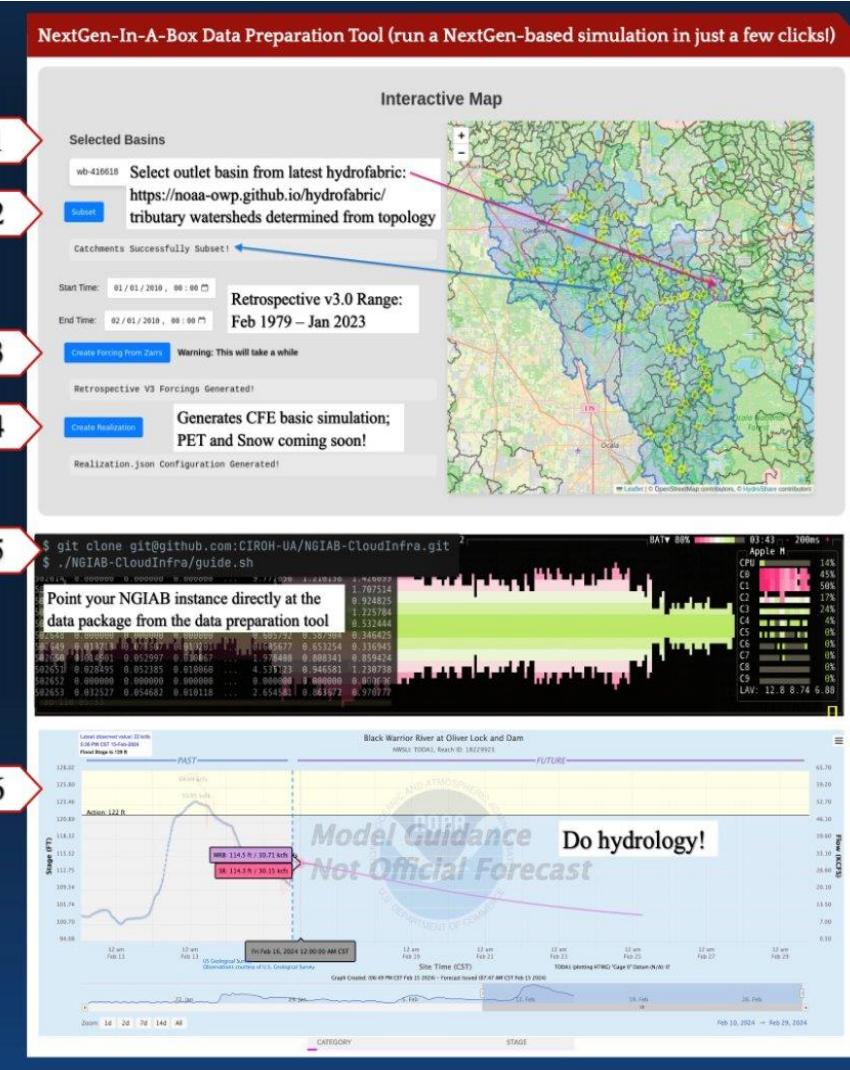
CIROH wants YOU to Improve the National Water Model

In version 4.0, slated for release in 2026, the U.S. National Water Model (NWM) will be transitioning to the NextGen Water Resources Modeling Framework. Engage with CIROH – the Cooperative Institute for Research to Operations in Hydrology – to make a difference in water forecasting for your basin.

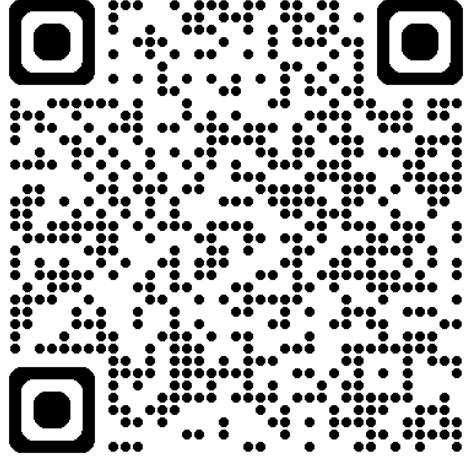
NextGen needs you!

Come use our CIROH community versions of the NextGen tools to get started:

- NextGen in a Box (NGIAB): NextGen prepackaged execution environment.
- NGIAB Data Preparation Tool: Easy map-based tool to create CFE-based NextGen realizations with all necessary inputs.
- NextGen Datasream: Benchmark dataset for demonstrating model improvements. (Coming Soon!)

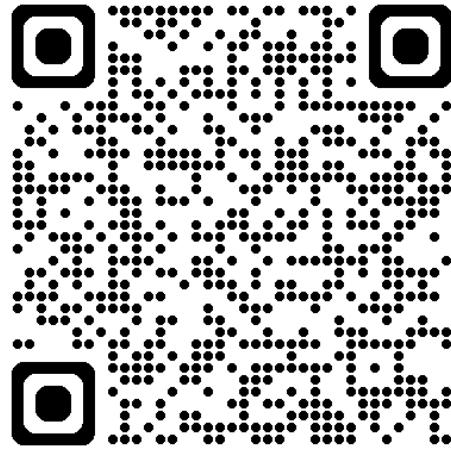
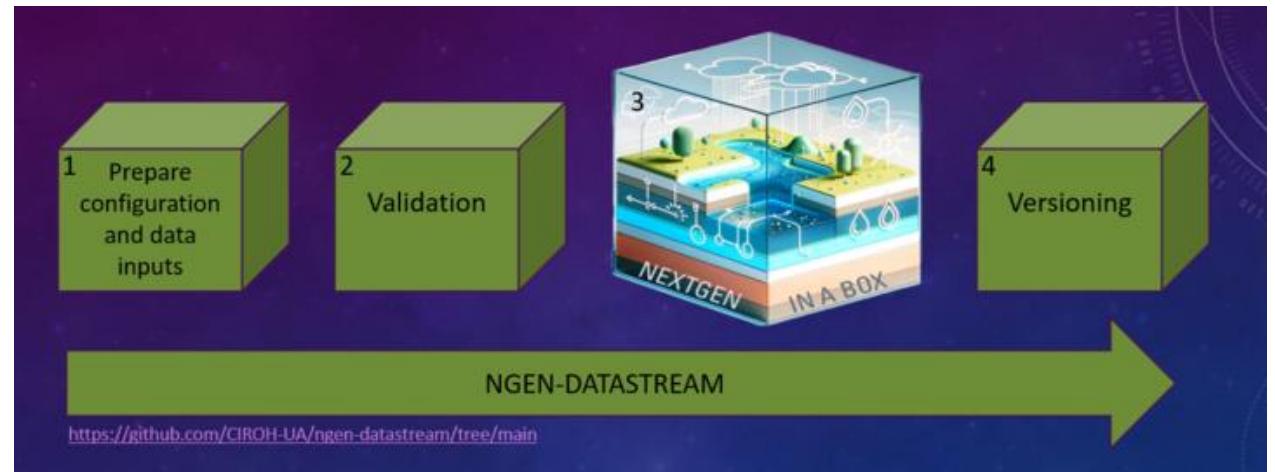


- Repo :
https://github.com/AlabamaWaterInstitute/NGIAB_data_preprocess
- Provides one way to create input data for NGIAB
- Check it out later this afternoon in the NextGen Simulation Development Tools Workshop!



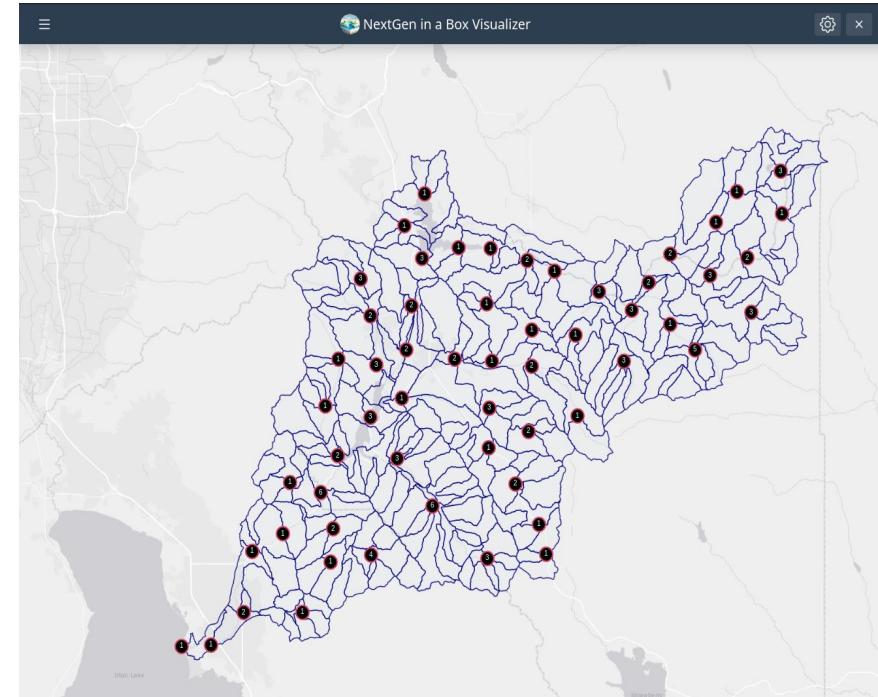
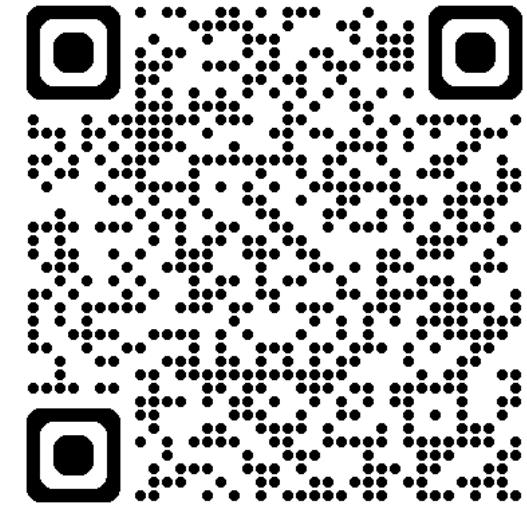
Ngen-DataStream

- Repo : <https://github.com/CIROH-UA/ngen-datastream>
- Provides continuous datastream that creates input data and runs NGIAB in one flow.
- Check it out later this afternoon in the NextGen Simulation Development Tools Workshop!

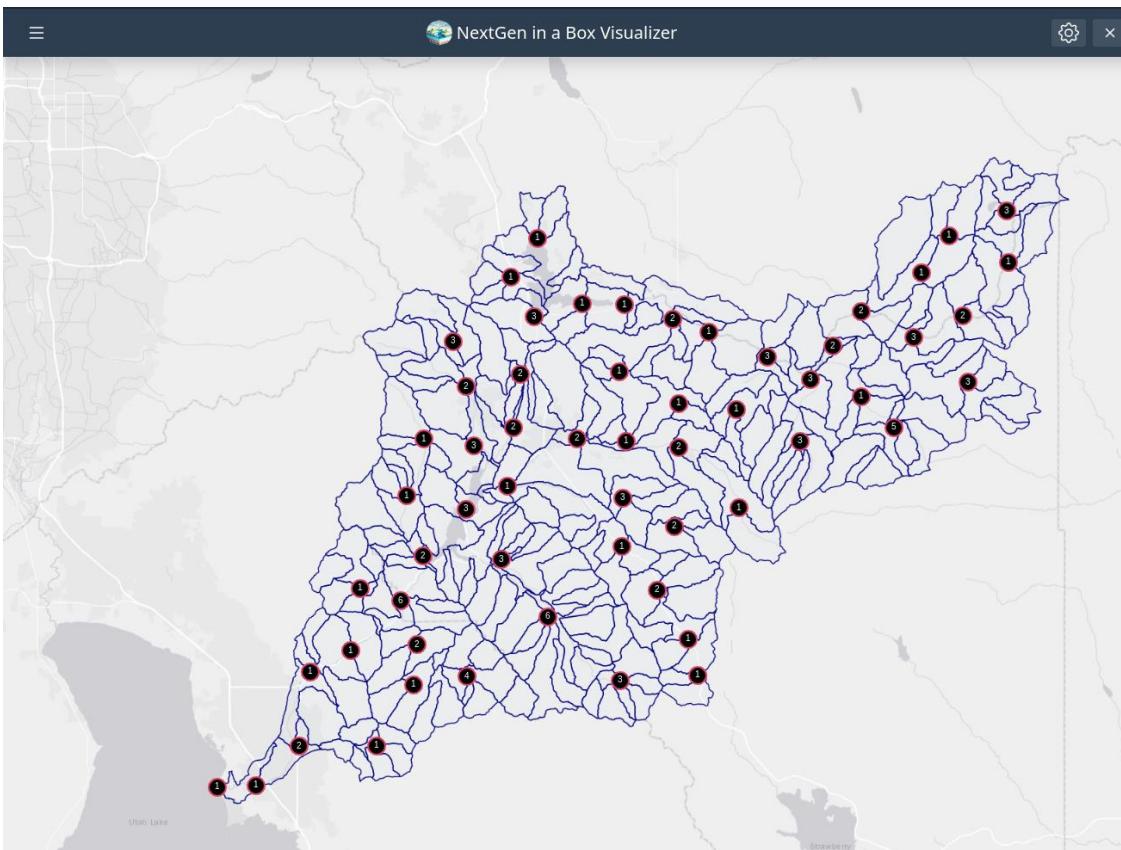


NGIAB-Visualizer

- Repo :
<https://github.com/CIROH-UA/ngiab-client>
- Provides visualization capability for NGIAB output data.

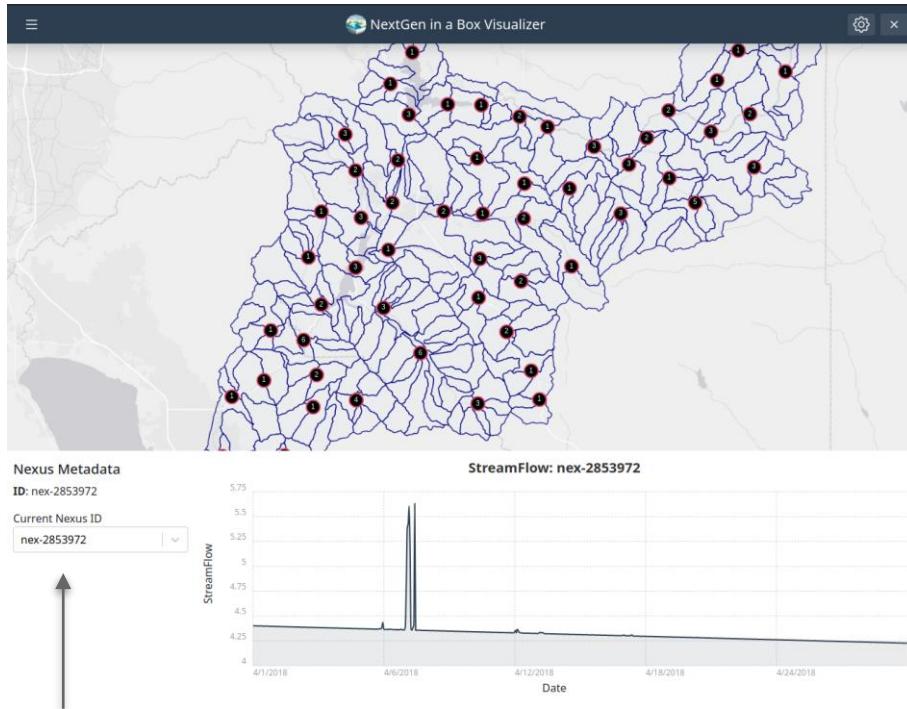


NGIAB-Visualizer



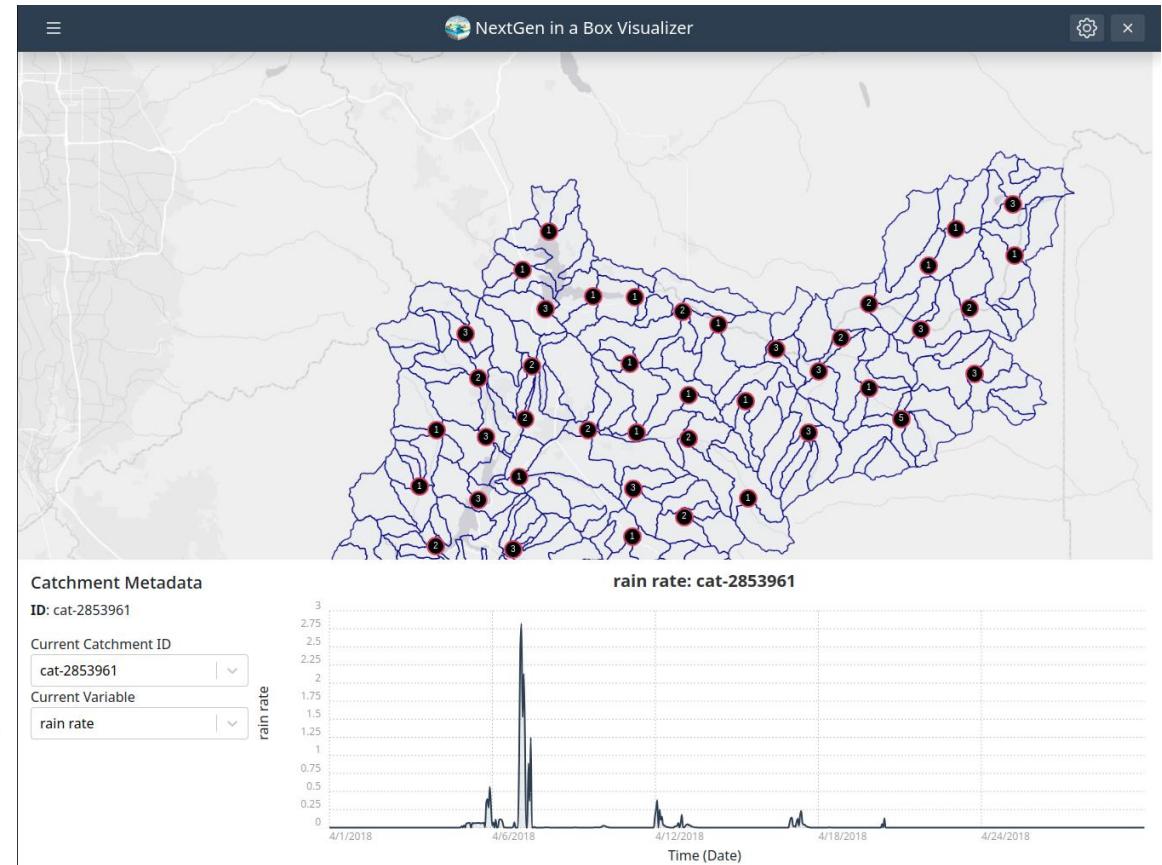
- Build using the [Tethys Platform](#).
- Geospatial and time series visualization of the Catchments and Nexus Point.
- Outputs of different model runs can be visualized by the user mounting the outputs of the NGIAB
- It can be used with the **guide.sh**
- it can be used standalone using **viewOnTethys.sh**

NGIAB-Visualizer

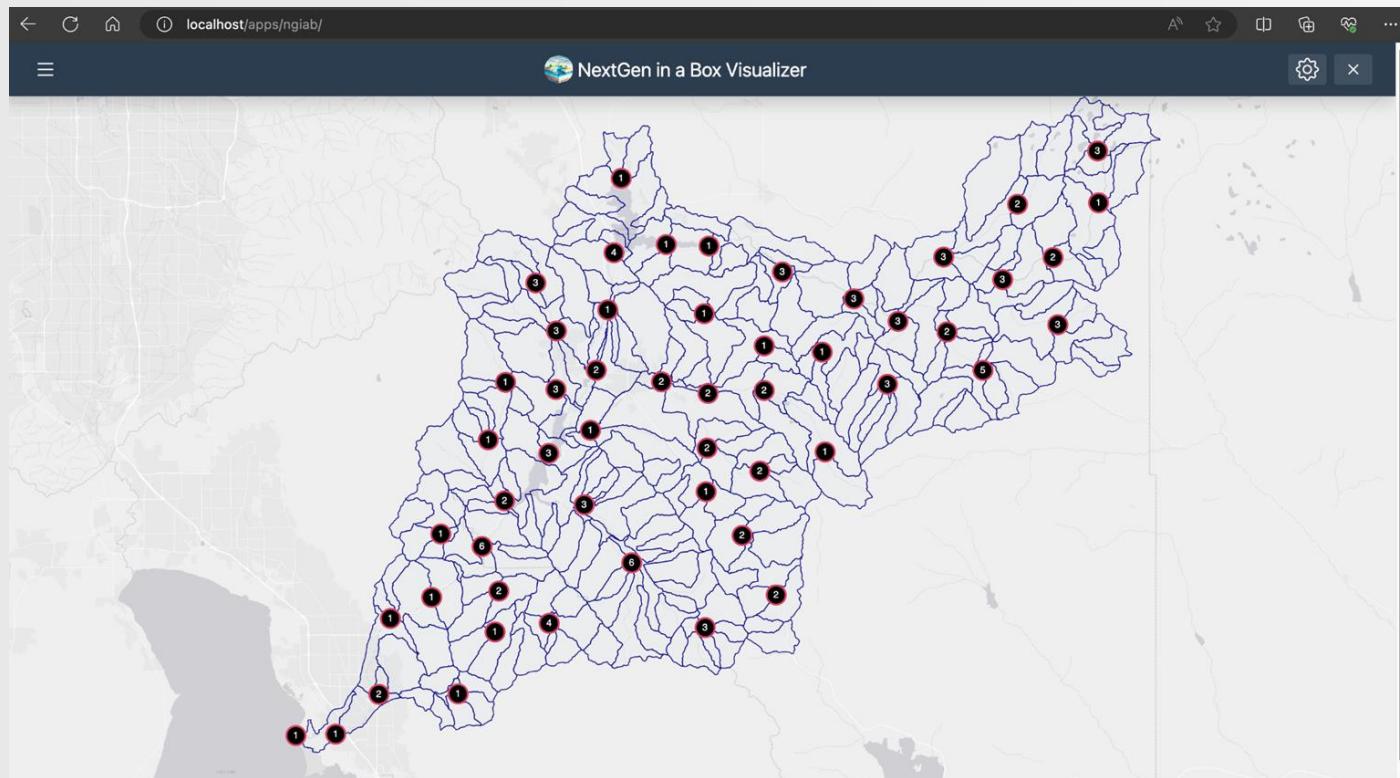


Search and lookup the
Nexus/Catchment ID using a
custom dropdown.

Nexus/Catchment
time series visualization.

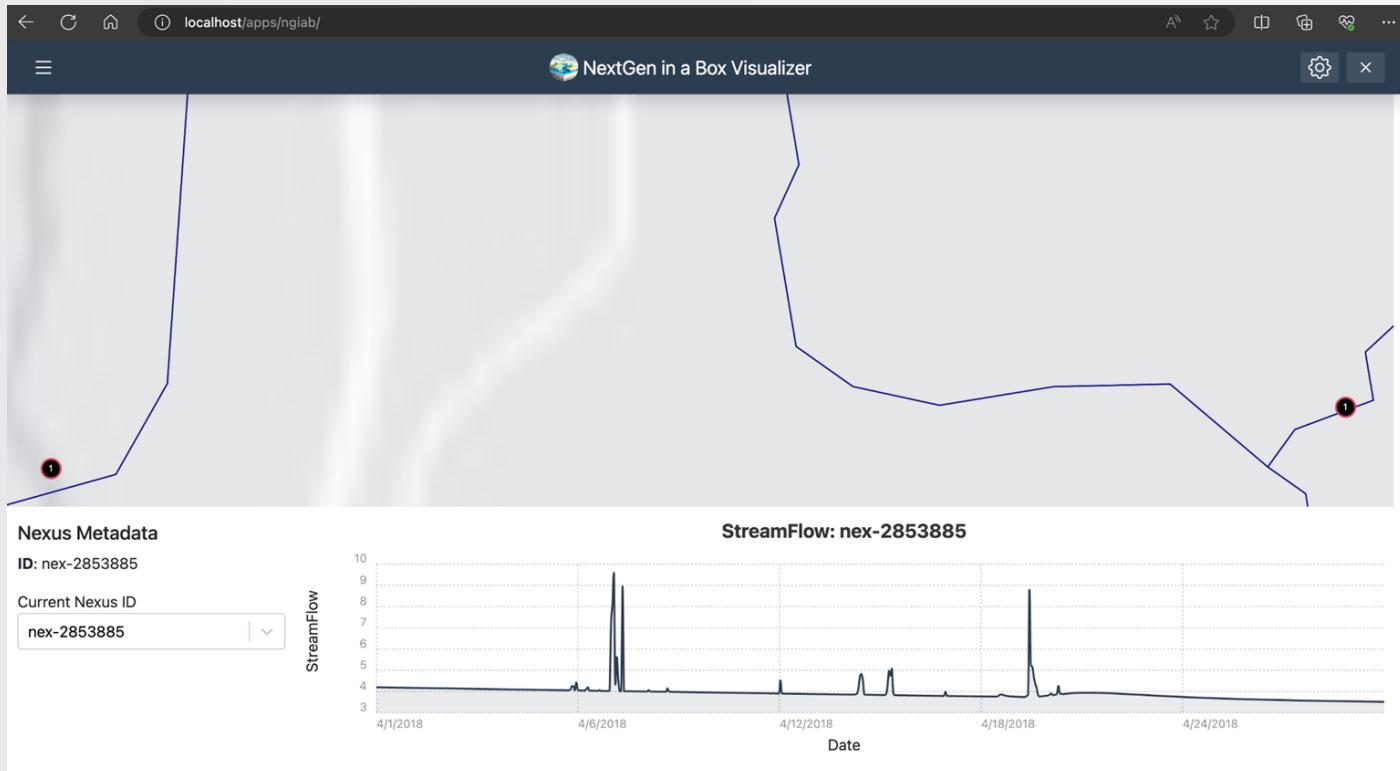


NGIAB-Visualizer



- If you do not see the layers, please refresh the page.
- Feel free to click on the nexus points and catchments.

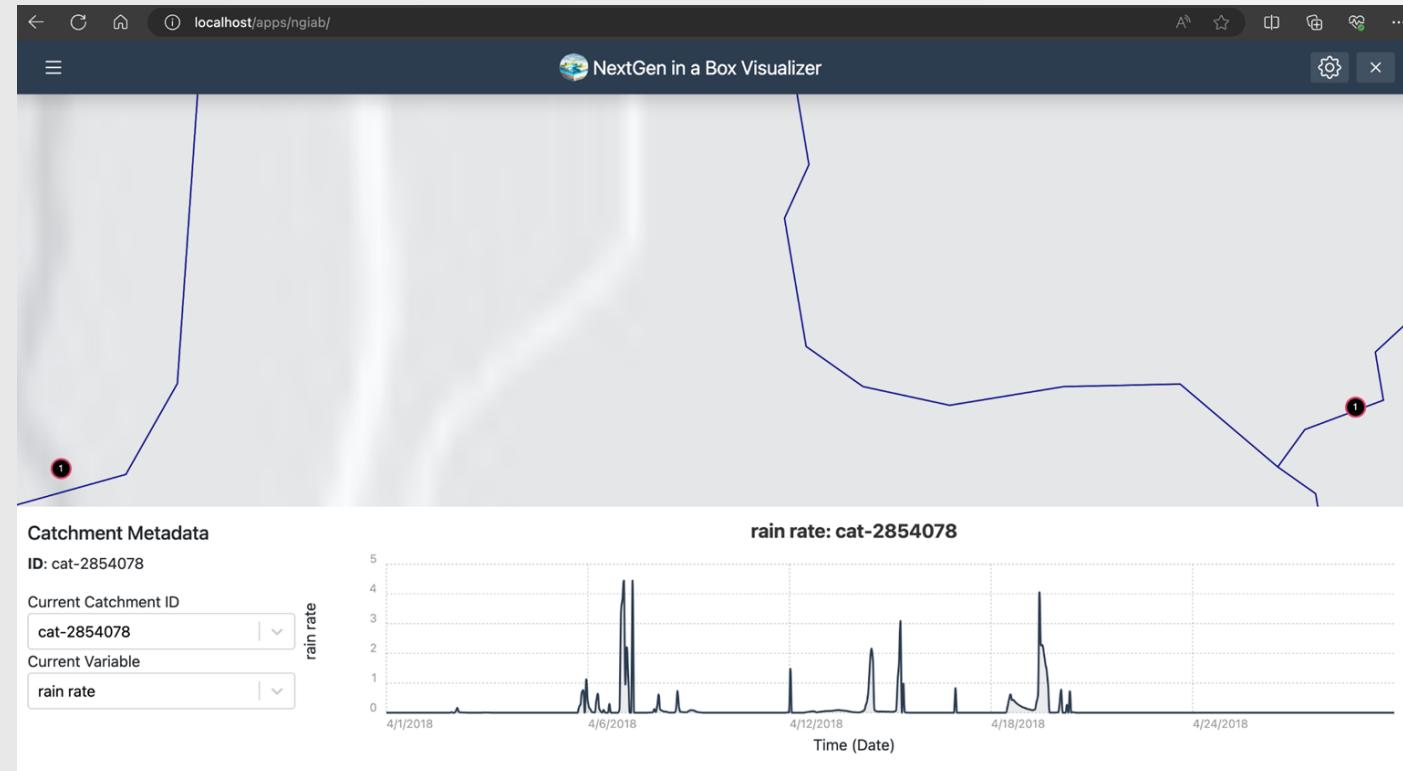
NGIAB-Visualizer



Once you click on a nexus cluster

- The cluster will zoom in revealing more nexus points
- Select a single nexus point, if this one has the “1” text.
- After clicking time series should appear in the lower portion of the application
- You can change the nexus point with the nexus ID using the custom search dropdown

NGIAB-Visualizer



Once you click on a catchment polygon

- After clicking timeseries should appear in the lower portion of the application
- You can change the catchment polygon with the catchment ID using the custom search dropdown.
- Similarly, you can change the time series variable for the catchment using the custom search dropdown for the catchment variable.

NGIAB-Visualizer



Future Work

1. More visualization

- Outputs
 - Parquet files
 - Troubles
- Forcings
- Config files:
 - Flowpaths.geojson
- Realizations

2. Hydrofabrics input creation

3. Allow the user to run NGIAB through the application

- Local environment, using the web interface (similar to the guide.sh).
- Production environment, where ngiab can be run on demand creating the necessary infrastructure using terraform through the web application

RUN PARALLEL MODE

```
Entering Interactive Mode
Select an option (type a number):
1) Run NextGen model framework in serial mode  3) Run Bash shell
2) Run NextGen model framework in parallel mode 4) Exit
#? 2

Selected files:
Catchment: ./config/wb-2853886_subset.gpkg
Nexus: ./config/wb-2853886_subset.gpkg
Realization: ./config/realization.json

Reading 230 features from layer divides using ID column `divide_id`
Partitioning 230 catchments into 10 partitions.
Reading 115 features from layer nexus using ID column `id`
Validating catchments...

Number of catchments is: 230
Catchment validation completed
Found 4 remotes in partition 0
Found 9 remotes in partition 1
Found 2 remotes in partition 2
Found 10 remotes in partition 3
Found 10 remotes in partition 4
Found 15 remotes in partition 5
Found 5 remotes in partition 6
Found 4 remotes in partition 7
Found 5 remotes in partition 8
Found 1 remotes in partition 9
Found 65 total remotes (average of approximately 6 remotes per partition)
Your NGEN run command is mpirun -n 10 /dmod/bin/ngen-parallel ./config/wb-2853886_subset.gpkg all ./config/wb-2853886_subset.gpkg all ./config/realization.json /ngen/ngen/data/partitions_10.json
If your model didn't run, or encountered an error, try checking the Forcings paths in the Realizations file you selected.
Do you want to redirect command output to /dev/null? (y/N, default: n):
```

- There is an option to run NGIAB in parallel mode. (not part of demo)
- Repeat same steps as serial mode and enter “2” to run in parallel mode.

NEXTGEN IN A BOX

– OUTPUT FILES

```
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs]⇒ ls  
ngen    parquet  trout  
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs]⇒ ]
```

```
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs/ngen]⇒ ls  
cat-2853852.csv      cat-2853968.csv      nex-2853852_output.csv  
cat-2853853.csv      cat-2853969.csv      nex-2853853_output.csv  
cat-2853854.csv      cat-2853970.csv      nex-2853854_output.csv  
cat-2853855.csv      cat-2853971.csv      nex-2853855_output.csv
```

```
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs/parquet]⇒ ls  
201804010000NEXOUT.parquet 201804101700NEXOUT.parquet 201804201000NEXOUT.parquet  
201804010100NEXOUT.parquet 201804101800NEXOUT.parquet 201804201100NEXOUT.parquet  
201804010200NEXOUT.parquet 201804101900NEXOUT.parquet 201804201200NEXOUT.parquet  
201804010300NEXOUT.parquet 201804102000NEXOUT.parquet 201804201300NEXOUT.parquet
```

```
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs]⇒ cd trout  
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs/troute]⇒ ls  
troute_output_201804010000.csv  
[apatel54@UA-W2RP43G:~/NextGen/ngen-data/my_data/outputs/troute]⇒ ]
```

- Nexus output file – volumetric flow (m^3/s) from the catchment to the nexus
- e.g: nex-2854051_output.csv
0, 2018-04-01 00:00:00, 3.33025

1, 2018-04-01 01:00:00, 3.32986

2, 2018-04-01 02:00:00, 3.32946

3, 2018-04-01 03:00:00, 3.32907

- Catchment output file:
- e.g : cat-2853961.csv
Time
Step,Time,RAIN_RATE,DIRECT_RUNOFF,GIUH_RUNOFF,NAS
H_LATERAL_RUNOFF,DEEP_GW_TO_CHANNEL_FLUX,SOIL
_TO_GW_FLUX,Q_OUT,POTENTIAL_ET,ACTUAL_ET,GW_S
TORAGE,SOIL_STORAGE,SOIL_STORAGE_CHANGE,SURF_RU
NOFF_SCHEME

0,2018-04-01

00:00:00,0.000000000,0.000000000,0.000000000,0.0000000
00,0.000629746,0.000000000,0.000629746,0.000613381,0.00
0000000,12.496590866,0.047898793,0.000000000,1.0000000
001,2018-04-01

01:00:00,0.000000000,0.000000000,0.000000000,0.0000000
00,0.000629709,0.000000000,0.000629709,0.000053649,0.00
0000000,12.495961157,0.047898793,0.000000000,1.0000000
00

SUPPORT

- For any questions, comments or issues:

Email us at : ciroh-it-support@ua.edu

Contact us on CIROH

Slack: #nextgen_help_2023-24



nextgen_help_2023-24

+ Add a bookmark

But now it's only writing one .nc file, but only 91 day Friday, May 10th trying to trouble shoot this, so I'll post my yaml file (which is originally from the NGIAB preprocessing tool, but then modified to run on our HPC). (edited)

ngen.yaml ▾

```
1 compute_parameters:  
2 assume_short_ts: true  
3 compute_kernel: V02-structured  
4 cpu_pool: 1  
5 data_assimilation_parameters:
```

And running the route above is taking about 3.5 hours, which seems really long. The original PET+CFE was quick. (edited)



Q&A?



Thank you for your time and attention

