

Model as a Service and Distributed Model on Demand: Tools to Automate and Abstract Model Development Overhead Tasks

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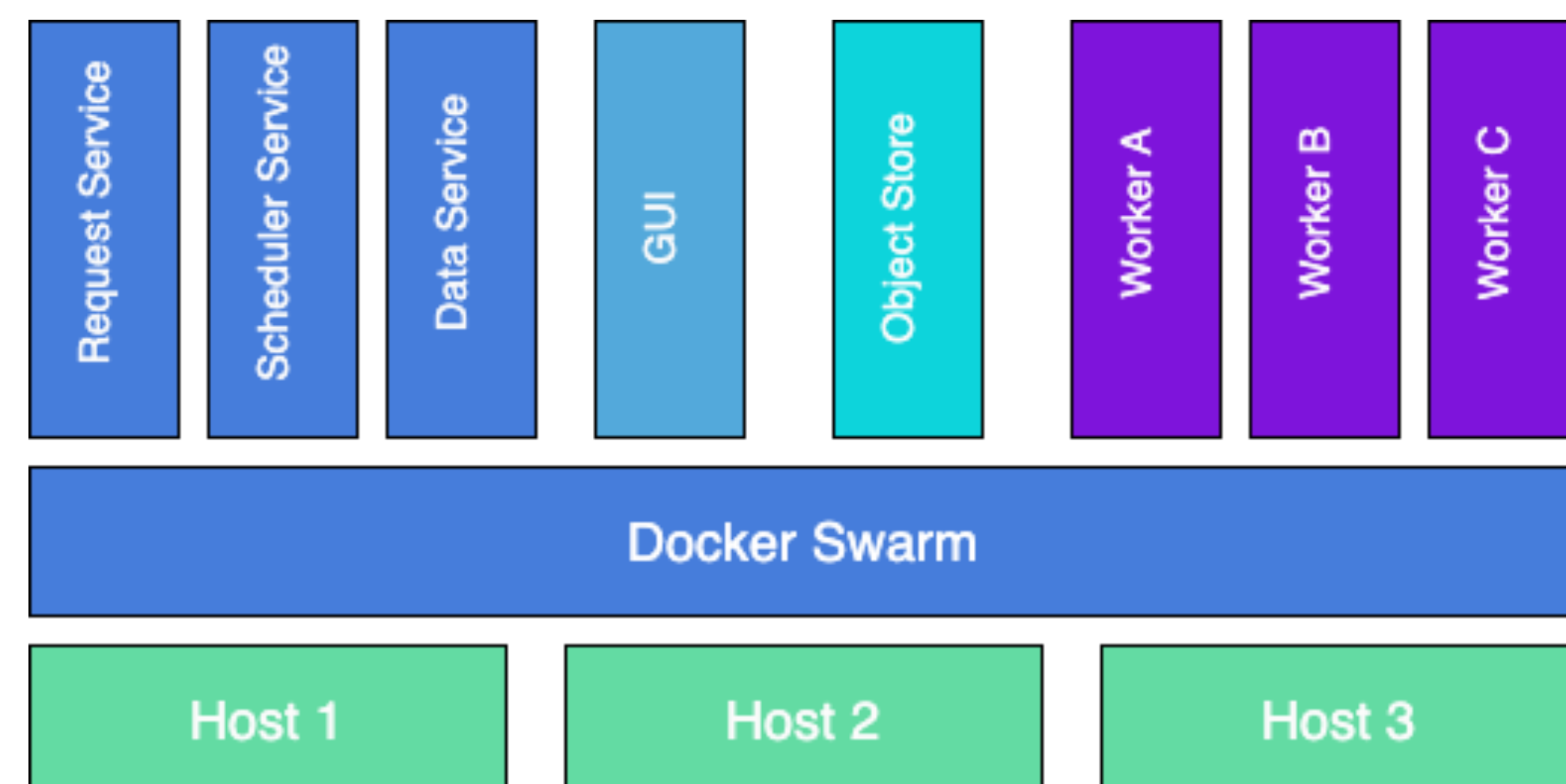
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SESSION NUMBER:
H451

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WATER
PREDICTION

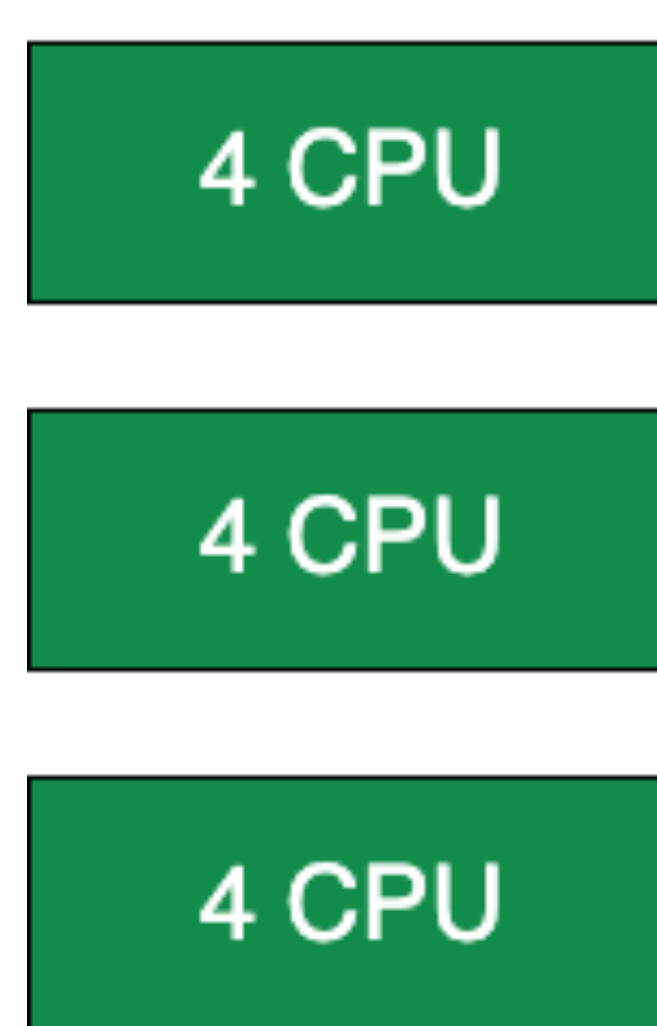
Abstract Compute Resources

DMOD is designed as a series of “stacks” providing its essential capabilities:

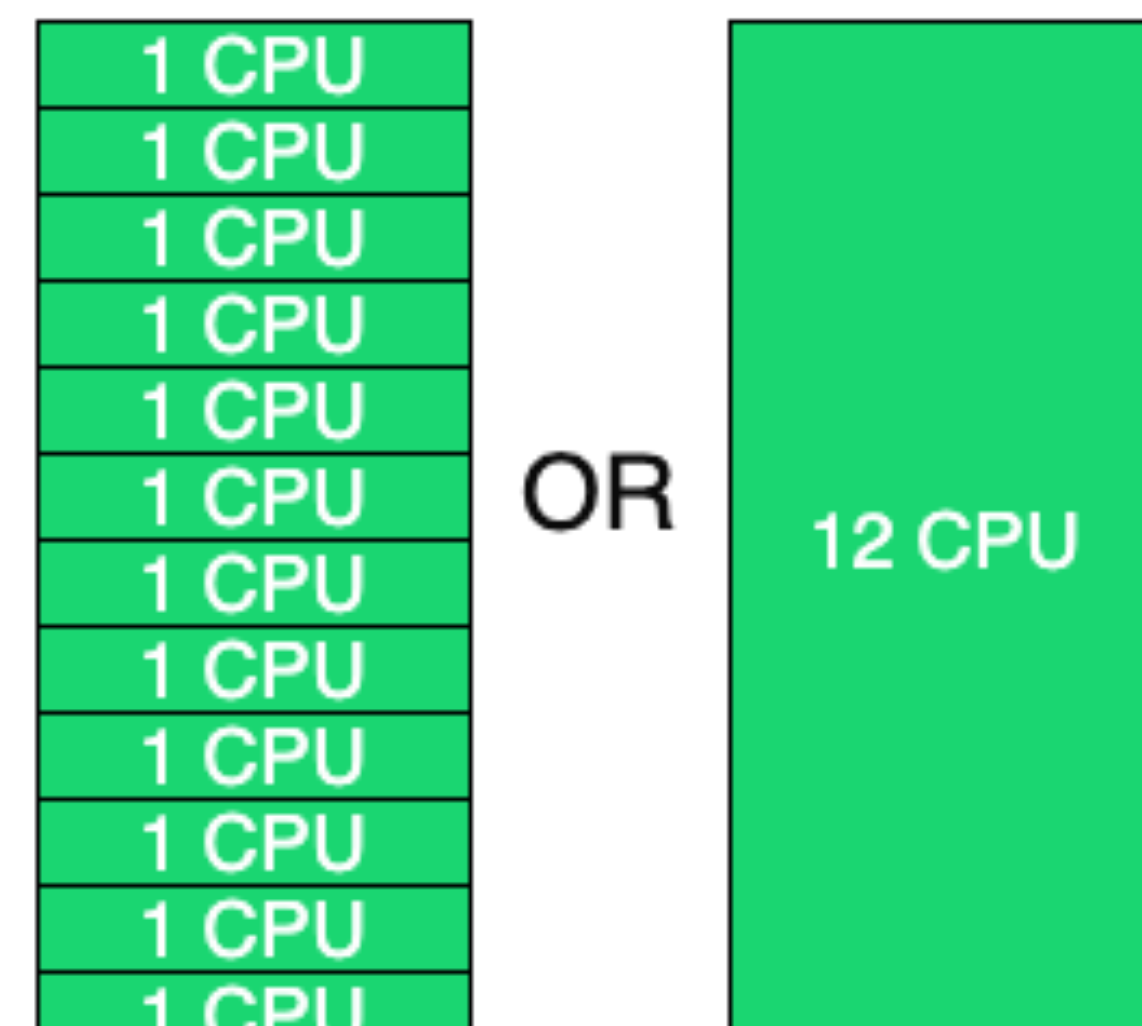


The Power of Abstracting Resources

Make These:



Function Like:



Bundle Execution Environments

- All execution takes place within Docker containers
- Containers are started from Docker images
- Images are like snapshots of the state of a container

What Comes with DMOD?

- DMOD provides configurations for all necessary images
- This yields portable, reusable, generic environments

Key Benefits

- Users avoid figuring out how to get software to compile
- User don't have to fight with dependencies
- Users get consistent, re-creatable environments in which to run models

What Distributed Model on Demand Can Do For Domain Scientists

What is DMOD?

- A tool for managing the compute infrastructure needed for running domain science models
- Software to integrate and automate tedious steps of model development and testing
- A tool to reduce cognitive and manual burdens for domain science developers

It does this by:

- Abstracting compute environment and resources
- Building services to manage automated model job workflows
- Intelligently managing data and data requirements

Go From This:

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1 {
2   "global": {
3     "formulations": [
4       {
5         "name": "bmi_multi",
6         "params": {
7           "name": "bmi_multi",
8           "model_type_name": "NoahOWP-CFE",
9           "main_output_variable": "Q_OUT",
10          "init_config": "",
11          "allow_exceed_end_time": false,
12          "fixed_time_step": false,
13          "uses_forcing_file": false,
14          "modules": [
15            {
16              "name": "bmi_c",
17              "params": {
18                "name": "bmi_c",
19                "model_type_name": "PET",
20                "main_output_variable": "water_potential_evaporation_flux",
21                "init_config": "/workdir/input/PET/((id))_pet_config.txt",
22                "allow_exceed_end_time": true,
23                "fixed_time_step": false,
24                "uses_forcing_file": false,
25                "variables_name_map": {
26                  "water_potential_evaporation_flux": "water_potential_evapora-
27                    tion_flux"
28                },
29                "library_file": "/ngen/ngen/extern/evapotranspiration/evapotrans-
30                    piration/cmake_build/libpetbmi.so",
31                "registration_function": "register_bmi_pet"
32              }
33            }
34          ]
35        }
36      }
37    ]
38  }
39 }
```

```
1 cfe_params: 81d001
2 - init: '0.17999999999999997'
3 max: 1
4 min: 0
5 name: x_kinanjang_shape_parameter
6 - init: '1.2421666666666666e-06'
7 max: 0.000726
8 min: 0.0
9 name: satdk
10 - init: '77.0'
11 max: 21.9
12 min: 0.0
13 name: b
14 - init: '0.354999989'
15 max: 0.955
16 min: 0
17 name: steps1
18 - init: '0.4287968161666666'
19 max: 1.0
20 min: 0.2
21 name: maxsmc
22 - init: 0.81
23 max: 1.0
24 min: 0.0
25 name: Klf
26 - init: 0.83
27 max: 1.0
28 min: 0.0
29 name: Kn
30 - init: '1.8e-05'
31 max: 0.1
32 min: 1.8e-06
33 name: Cgw
34 - init: '77.0'
35 max: 3
36 min: 0
37 name: expon
```

To This:

Automate Minutia

DMOD workflows simplify and guide the user interaction.

Orchestrate Data for Users

DMOD provides data access and intelligent management :

- placement of data for hosts, stacks, and workers
- deciding whether data for a requested task is available
- combining and/or reformatting datasets when necessary

Dataset Management

Manage	Create		
Dataset Name	Category	Actions	
bmi-config-1	CONFIG	Details Files Download Upload Files Delete	
huc01-forcing-demo-subset-1	FORCING		
huc01-hydrofabric-cspit-8	HYDROFAB		
huc01-simple-realization-config-2	CONFIG		
huc01-simple-realization-config-3	CONFIG		
partition-huc01-copy-8	CONFIG		

Name: huc01-forcing-demo-subset-1

Category: FORCING

Type: OBJECT_STORE

Format: AORC_CSV

Read Only: false

Created: 2022-06-16 08:10:12

Last Updated: 2022-06-16 08:10:12

Data Domain

TIME: 2012-05-01 00:00:00 to 2012-05-31 23:00:00

CATCHMENT_ID: 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