Intro to CUmulus: a free Research Cloud platform for RMACC

Intro to CUmulus

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Outline

- CU Boulder Research Computing Overview
- **What is CUmulus?**
  - *What resources are available?*
  - *Who can use CUmulus?*
  - *Example use cases*
- How to access CUmulus

CU Research Computing Overview

- Provides Computing and Data Storage Beyond standard desktop resources:
  - *High Performance Computing (HCP), clusters include:*
    - Alpine
    - Blanca
  - *Storage of Research Data*
    - PetaLibrary
  - *High-Speed Data Transfer*
    - Globus Endpoint
  - ***Cloud Resources***
    - **CUmulus (On-premise Cloud)**
    - Cloud Foundations (Commercial Cloud)
  - *Secure Cloud Resources*
  - *Consulting in Computational Science and Data Management*

CU Research Computing Overview

What is CUmulus?

- **CUmulus** is CU Research Computing's free-to-use on-premise cloud service
- Supports cases not well-suited for HPC such as:
  - *Research-Oriented Web Servers*
  - *Databases*
  - *Long-Running Services*
  - *Research Hubs (Jupyterhub, RStudio Server, etc)*
- Provides users with persistent or ongoing availability by allocating logically isolated section of the cloud

What is CUmulus?

- You get your own virtual environment for experimentation - an environment that can be easily created/tested/removed
  - *Install Software*
  - *Administer your instance (you're in control!)*
  - *Run applications and jobs*
  - *Interface w/ other CURC services: Blanca, Alpine, PetaLibrary*
- You can request specific resources (CPU, storage, memory) and can set up persistent storage

What resources do we have available?

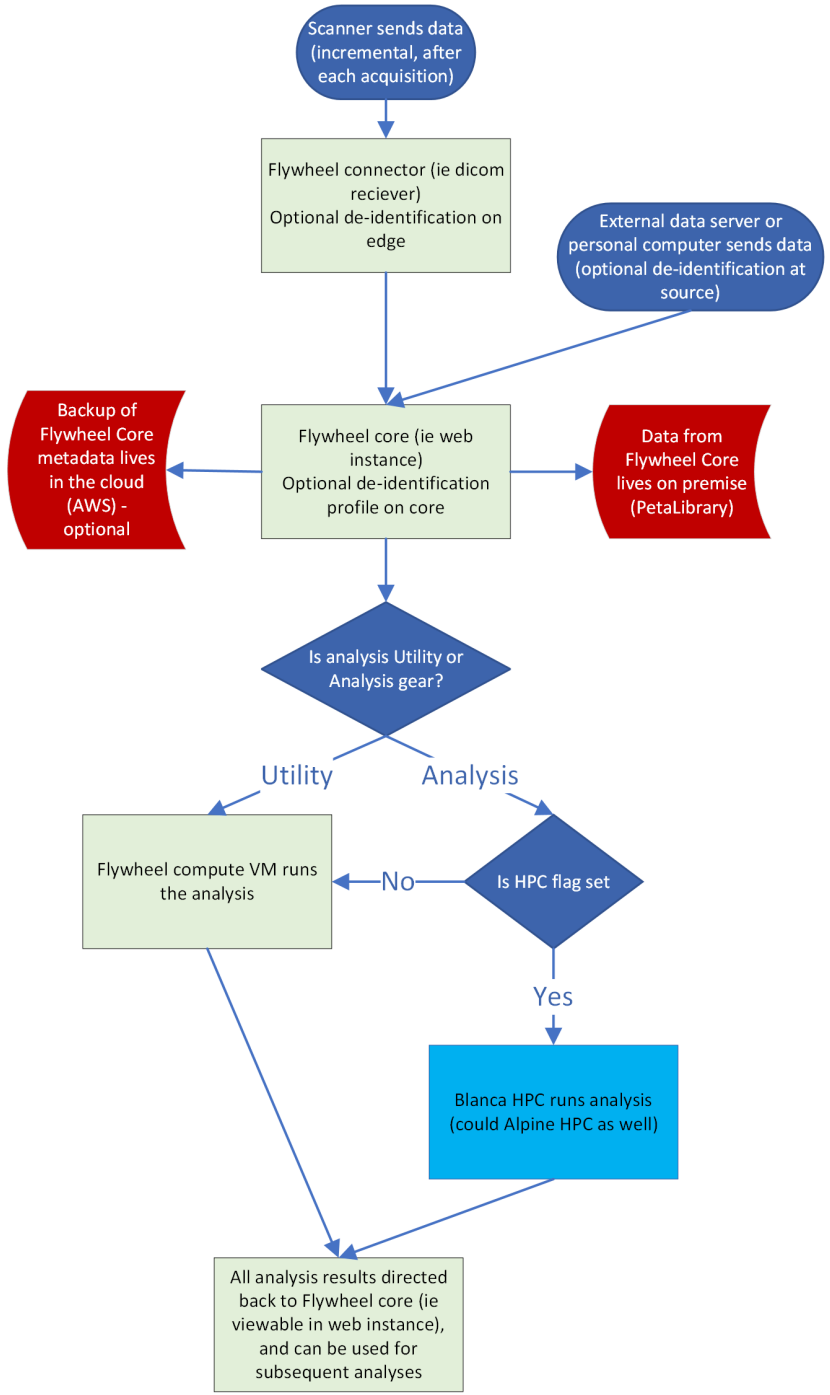
- Intel Hardware
- 264 Physical Cores, 528 with Hyper Threading
- 4GB RAM per core
- 101.3 TiB of Object-Oriented Storage (SSD)

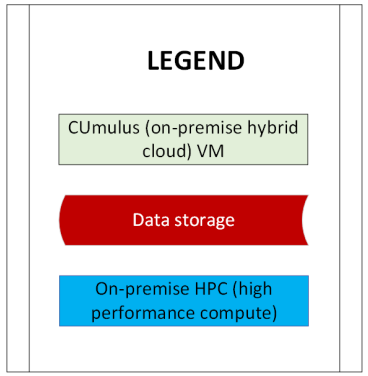
Example Use Case: Open Access Research Tool

- Researcher wanted to publish and host trainings for a custom language processing tool that helps to build language databases and tools (think auto-correct) for endangered languages
- Needs:
  - *A web-based dashboard where any user can load and use the tools the research team developed*
  - *Persistent storage of data*
  - *Compute ability to continuously mine the data and advance algorithm*
- They were able to:
  - *Setup a Jupyterhub instance where they control access of users*
  - *Have an environment where researchers around the world can easily use their research tools*
  - *Collect the incoming test data and use that for future training*
  - *Have the resources for persistent storage of large datasets and compute resources*

Example Use Case: Galaxy Server

- Researcher wanted to create a custom Galaxy Server (web-based GUI for popular bioinformatics software)
- Needs:
  - *A way to host a website that the researchers can use to load and analyze data, create reports and schedule compute jobs*
  - *Persistent storage of data*
  - *The ability to create compute jobs on the virtual machine or send jobs to the Alpine Supercomputer*
  - *Run persistent jobs (multiple days long)*
- They were able to:
  - *Host the website, and control access of users who can access it*
  - *Have the resources for persistent storage of large datasets and compute resources*
  - *Create an interface to send jobs to the Alpine Supercomputer, all controlled via GUI*
  - *Test custom tools and data pipelines that they created*





Example Use Case: Flywheel Project

- Researcher wanted to create a tool that interfaces with MRI machines in the area and pulls data to a persistent web application where they can create processing pipelines and send these to the Alpine Supercomputer
- Needs:
  - *A web-based dashboard where users can develop processing pipelines, move data, and create compute jobs*
  - *Persistent storage of data (very large datasets)*
  - *Compute ability to continuously process the data*
- They were able to:
  - *Setup a Flywheel Dashboard, a web-based application that researchers can access from anywhere.*
  - *Store data on the VM or in PetaLibrary or AWS*
  - *Send jobs to the Alpine Supercomputer for faster processing*

CUmulus Access

CUmulus Access and Allocation

Submit a proposal for your use case (email rc-help@colorado.edu)

- Describe your CUmulus workflow
- Describe why your workflow is appropriate for CUmulus
- Estimate the resources you require:
  - *Operating System, CPU cores, Disk Space, Memory*

This is an *iterative process* where we work with you to make sure the request for resources fits your (and our) needs

- Learn more about the allocation request process at https://www.colorado.edu/rc/userservices/allocations

Access to CUmulus Resources

There are 3 current authentication/login methods at cumulus.rc.colorado.edu/:

1. CU Boulder
2. CSU Fort Collins
3. XSEDE* (all other RMACC institutions)
    a. *Create account: https://portal.xsede.org/#/guest*
    b. *Configure 2FA (Duo): https://portal.xsede.org/mfa*

How to get access

1. Request a CUmulus application by contacting the CU RC help-desk: rc-help@colorado.edu
2. Once your application has been accepted, manage your project at the CUmulus Web Portal.
3. Check out our documentation on example use cases and how to setup your instance
4. Visit all our CUmulus specific tutorials on the Research Computing GitHub for step-by-step examples.

A few questions for you:

1. What types of applications could you see your users building on CUmulus?

2. What demand do you have for these types of persistent services?

Thank you!

- Contact: anwi7603@colorado.edu
- Help Desk: rc-help@colorado.edu
- **Hands-on with CUmulus: a free Research Cloud platform for RMACC**
  - *90-minute session where we can all create an account and get hands-on with CUmulus*
  - ***Wednesday, May 17, 1pm-2:30pm***