



Pop-up Cloud-Based Jupyter Platforms for Coding Camps Using HelioCloud

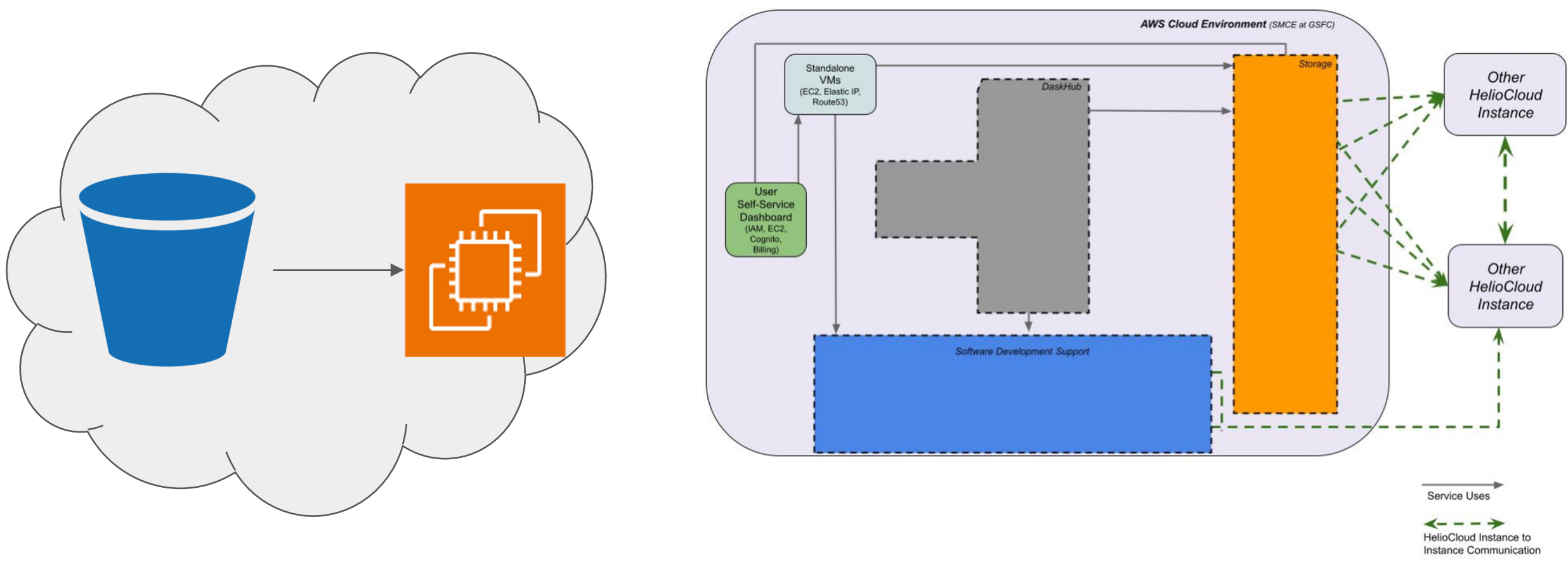


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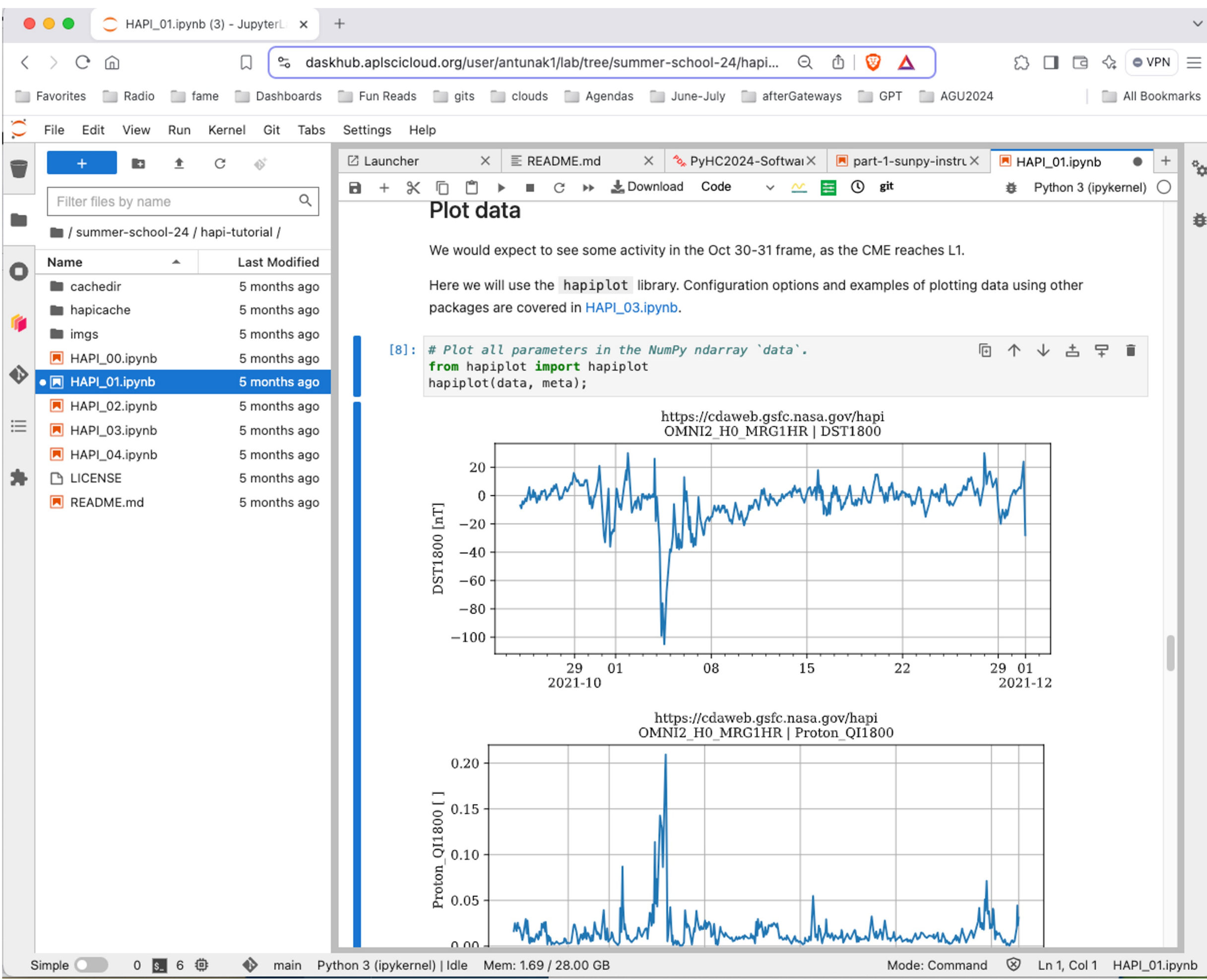
Cloud Computing Simplified

Cloud computing revolutionizes access to remote computational resources by offering scalable, on-demand services over the internet, eliminating the need for complex local infrastructure. HelioCloud builds on these principles to transform short-term workshops with ephemeral, cloud-based Jupyter environments. Designed for accessibility and scalability, it simplifies infrastructure management, promotes open science, and standardizes tools for seamless collaboration and reproducibility. Its cost-efficient, on-demand model is ideal for institutions supporting temporary, high-performance computing in shared, collaborative spaces.



IaC to Collaborative Environment

HelioCloud leverages Infrastructure as Code (IaC) to streamline the creation of collaborative computing environments for workshops. By using AWS CDK, a HelioCloud instance deployment is streamlined, ensuring that all cloud dependencies (storage, networking, computing, etc) are configured before a user logs in. Organizers can also configure Jupyter environments with **pre-configured base images**, ensuring every participant has a consistent and reliable setup. This approach eliminates the complexities of managing varied local configurations, allowing workshops to focus on learning and collaboration. The current HelioCloud base image leverages PyHC packages, enabling an out-of-the-box HelioPhysics research/development/learning environment.



Real Time User/Resource Management

A HelioCloud deployment comes with a range of tools for monitoring user activity. Resource and cost metrics are gathered and maintained by tools including Prometheus, Grafana, and KubeCost. Such tools are useful in system admin operations during a workshop, ensuring that resource and scaling needs are met.

HelioCloud in Action

HelioCloud enabled a pre-configured, cloud-based Jupyter environment for the PyHC Summer School (2022 and 2024) and Science Gateways 2024. The platform allowed attendees to:

1. Focus on Learning, Not Configuration
2. Enhance Collaboration
3. Engage in Scalable Activities
4. Share a common Python Environment

The PyHC 2024 Summer School HelioCloud instance saw a peak of 88 concurrent users, each with a separate 10Gb server.

The total cost of the platform for the week was **\$676**.

- \$126 general system overhead
- \$210 compute cluster overhead (scales)
- \$177 user resource idle time (sad)
- \$163 active users (~\$2 per user per week)

Future Directions

HelioCloud is constantly developing with new technology and with user feedback. Some things that are coming up for HelioCloud include:

- Cloud Agnosticism: deploy HelioCloud to your institute-friendly cloud provider, or even on premise!
- Bring Your Own Container: enable users to load in their own custom container
- PyHC ChatBot integration: have your HelioPhysics Python questions answered with the power of AI!

For contact information and source code, scan:

