Systems-facing call, 2021-02-18 @ 1p ET/ 12p CT/ 11a MT/ 10a PT

Topic: Geddes Composable Platform - Purdue's Kubernetes-based private cloud solution.

Topic Overview: New usage patterns of computing for research have emerged that rely on the availability of flexible, elastic, and highly specialized services that may not be well suited to traditional batch HPC. Purdue's Research Computing department is working to enhance and evolve the research computing ecosystem to respond to these needs. We will present an overview of the "Geddes Community Composable Platform", a Kubernetes-based private cloud that builds upon Purdue's Community Cluster program to provide cost-effective, highly responsive, and customizable composable computing solutions for domain science and education.

Topic presented by:

- Erik Gough - Purdue
- Brian Werts - Purdue

Slides & Links:

- **https://drive.google.com/file/d/1SzulCsaYUkK2MjosdlDMmVKvE08CWUum/view?usp=sharing**

YouTube Link To Meeting Recording: https://youtu.be/NM78F1mfLwY

CaRCC YouTube Channel: https://www.youtube.com/carcc

CaRCC YouTube Channel Systems-Facing Playlist:
https://www.youtube.com/playlist?list=PLV-SC0CHLTwehApeMg_fJ5VbYndETh3yT

CaRCC Code of Conduct: https://carcc.org/about/carcc-code-of-conduct/

Zoom Meeting Room:
https://utah.zoom.us/my/carcc?pwd=TjFuR3VVM2d5eE5zWnEvWWxDTFBCUT09

Meeting ID: 824 051 8198
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NOTE: **We will be recording today's meeting via Zoom**.
So if there are questions anyone wants to ask but do so anonymously please feel free to use the direct message feature in the chat to send Troy Baer or Brian Haymore your question and we will present the question.

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Additional notes from call (comments, things not on slides, etc):

- Motivation
  - Purdue has done batch for a long time
  - Community clusters on roughly yearly cadence
  - In last ~2-3 years, users want cloud style flexibility
    - DBs
    - Persistent services
    - Containers
    - Quickly starts to look like a cloud system
  - Going to public cloud
    - Doesn't leverage existing investments
    - Make researchers their own security teams
    - Costly for naive scientists
  - Want a path for private cloud that can migrate
- Goals
  - Campus ecosystem for cloud tech
  - Empower faculty to integrate cloud tech
  - Complement the Community Cluster Program with new paradigm
  - Develop the Cyberinfrastructure workforce
- Composable infrastructure
  - "Platform for SciOps" (DevOps principles applied to computational and data science)
  - On-demand provisioning of pools of computing resources
  - Components
    - Containers -- Docker
    - Registry -- Public and private
    - Container orchestration
      - Kubernetes
      - Rancher -- web UI
    - Profit^H^H^H^HScience!
  - Continuous feedback loop
- Geddes Platform
  - Compute
  - Dell Servers
    - AMD 7662 CPUs
    - NVIDIA A100 GPUs
  - Storage
    - Multiple types, tiers
      - Block (NVMe, SATA, HDD)
      - Object (NVMe, HDD)

                - Filesystem (NVMe, HDD)
            - Replication, resiliency, snapshots
        - Software defined networking
            - Auto-provisioned addressing
            - Internal/Campus/Public
        - Community cluster integration is planned
        - Security
            - Top priority in multi-tenant cloud solutions
            - Integrated with campus sso
            - Role based access controls
                - Rancher projects, namespaces, users, groups
                - All managed in rancher by the research group or lab manager
            - Project level network isolation
                - Provides network level security between research groups
            - Container security scanning
                - Done through/using “Harbor” https://goharbor.io/docs/2.0.0/administration/vulnerability-scanning/
            - Monitored by central Research Computing IDS
- Use Cases
    - Notebooks and data analytics tools
    - User facing web services
        - Science gateways
    - Distributed processing pipelines
    - Data streaming
    - Persistent applications
    - Not good for HPC applications requiring high speed/low latency interconnect
- Deployment timeline
    - Alpha/proof-of-concept system currently
    - Beta system (HW refresh) soon w/ additional Kubernetes components
    - Early user late spring/early summer
    - Production mid-summer
    - Working on cost model as well
    - Integration with XSEDE Anvil system at Purdue

Questions:

- May get addressed soon, but: what software is used for security scanning containers?
    - A: Harbor.
- Is Harbor also hosted on the kubernetes cluster?
    - A: Yes
- Q (From chat): Is rancher homegrown or open source ?
    - A: Rancher is an open source project: https://rancher.com/

- How is resource contention handled? Do researchers have their own areas or does it work similar to an HPC scheduler?
    - A: Projects are limited to resources allocated in Rancher
- Q: (from Chat): Why not OpenStack?
    - A: We think that K8s and Docker and Harbor satisfy most of the researcher needs, virtualization environments are available on our other resources.
- How are you planning on integrating non-Ceph project storage from HPC env?
    - A:
- How do you secure the exposed URLs for applications like Jupyter?
    - A: SSL available, but once exposed to internet, containers can be scanned/accessed anywhere
- Do you provide a playground environment for users to build docker containers on your system?
    - A: Good question. We don't have access like login nodes right now. We expect people to have Docker on their own system right now.
- Controlled by RBAC, SSO. What credentials are used inside containers? Do they run as root?
- Why not Singularity?
    - A: Singularity works for containers inside batch, but not as well for persistent services
- Have you been drafting user documentation on how to leverage the unique aspects of this system? I imagine there are opportunities to collaborate across institutions to contribute to documents helping explain these workflows.

Next Month Presentation:
Enabling Science Collaborations with Secure and Flexible Service Deployment - Rob Gardner - Univ of Chicago, OSG, SLATE

Suggested future topic for a systems facing call (Feel free to add one):

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Link to systems-facing topic spreadsheet, please contribute:
https://docs.google.com/spreadsheets/d/1yDRatODXtsO7A63KARu2dD9gVGFmgHo0e0YipK1D0Mw/edit?usp=sharing