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COMPUTING-AS-A-SERVICE INFRASTRUCTURE FOR ACCELERATING DIGITAL ENGINEERING

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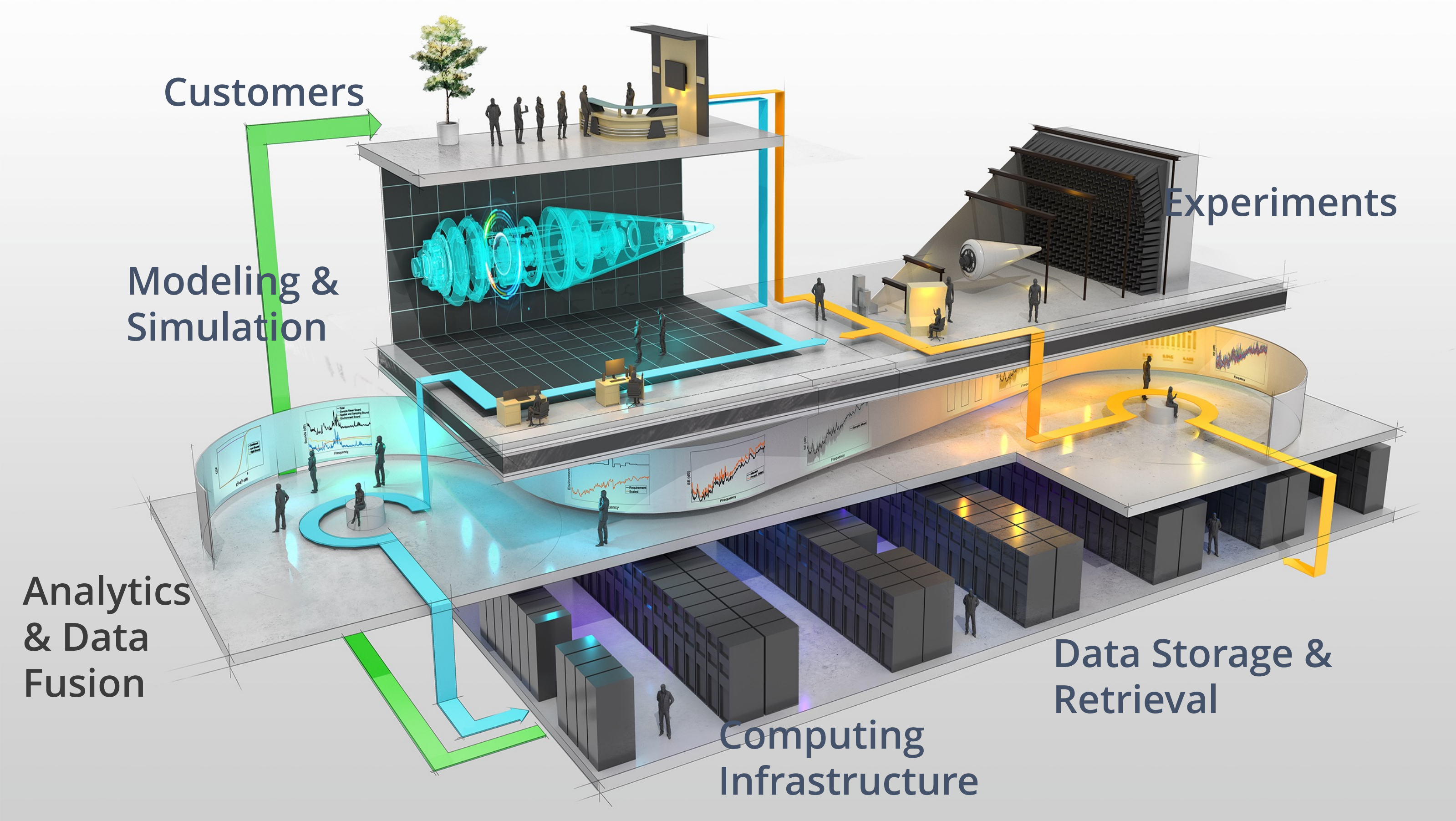
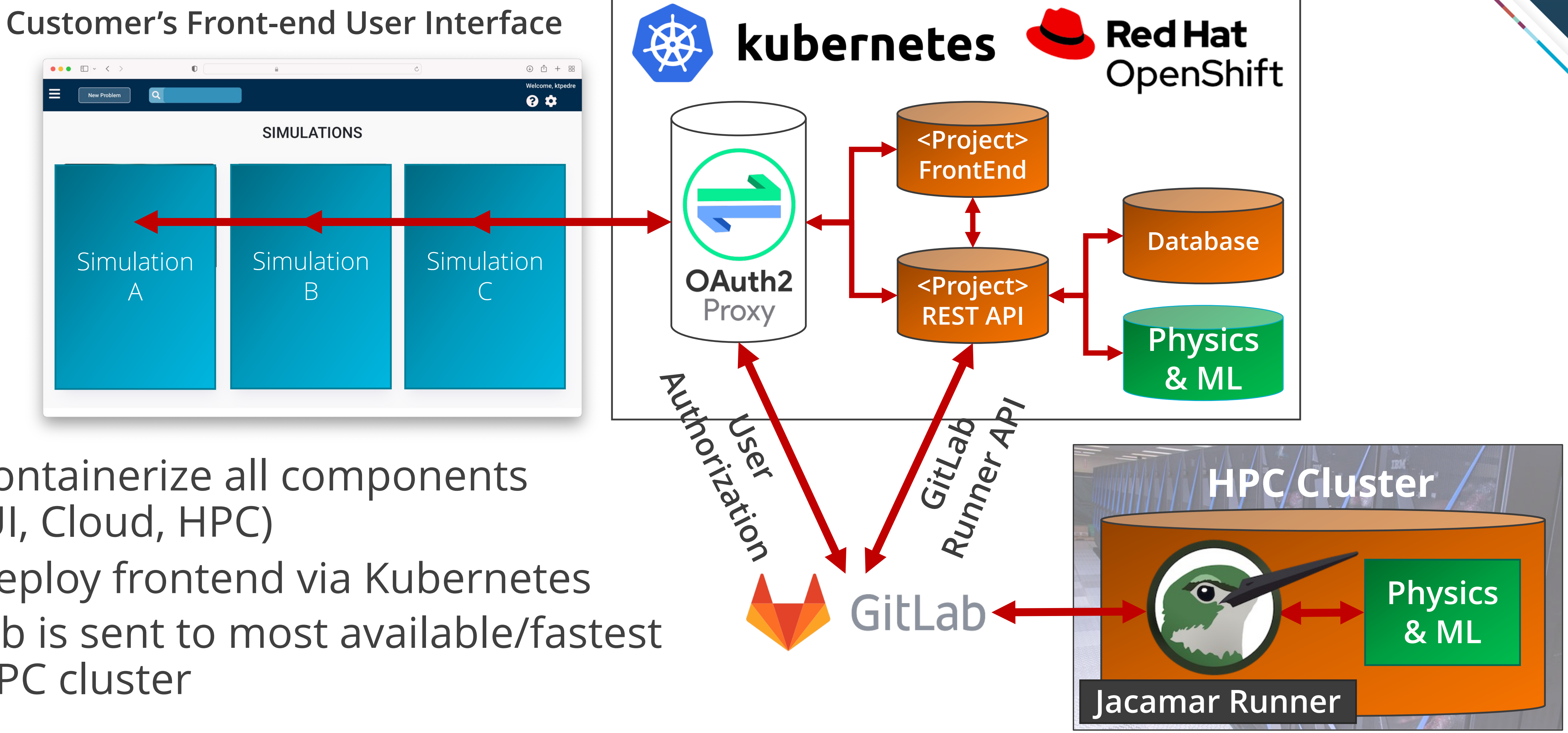
WHAT IS THE COMPUTING-AS-A-SERVICE PROJECT?

- Provide HPC as a cloud based service to teams with little to none HPC experience
- Customers interface with a GUI accessible through a web browser
- Jobs are intelligently routed to available HPC resources
- Customers are unaware of where their job is actually run



COMPUTING-AS-A-SERVICE ARCHITECTURE



- ○ Containerize all components (UI, Cloud, HPC)
- ○ Deploy frontend via Kubernetes
- ○ Job is sent to most available/fastest HPC cluster

Jacamar @ Sandia push from Scot Swan & Allen Robinson

THE NEED FOR AN INTELLIGENT JOB ROUTING LAYER

Where's the best place to run this job?

ADE Frontend Clients

?

SLURM & Flux APIs

Fuzzball API

K8s API

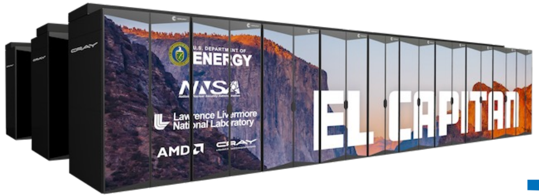
Vendor APIs

Traditional HPC Platforms

slurm

flux

CROSSROADS


U.S. DEPARTMENT OF ENERGY
NNSA
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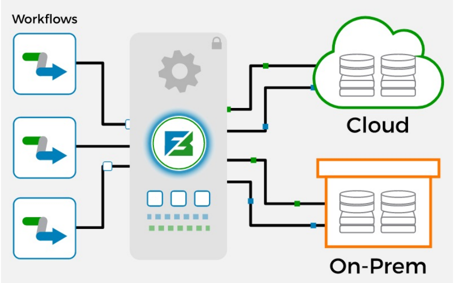
AMD
CRAY
EL CAPITAN

CTS2

Emerging "HPC 2.0"

FUZZBALL https://ciq.co/



Exploring in VANGUARD

HPC & AI Directly In Kubernetes

KUBERNETES BATCH + HPC DAY NORTH AMERICA

kubeflow/mpi-operator

multi-nic-cni-operator

Fluence (KubeFlux)

Cloud Services & HW

AWS Lambda & Batch

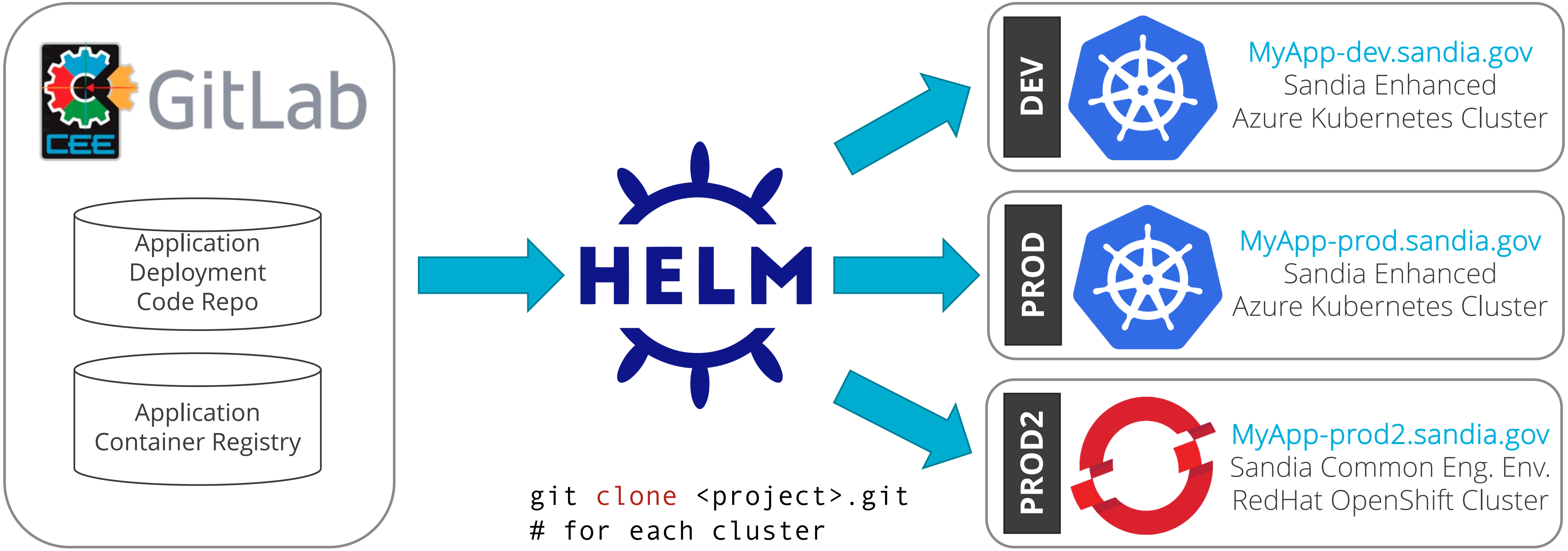
Azure Functions & Batch

Google Cloud Dataflow

THE NEED FOR AUTOMATED DEPLOYMENT

Versioned Code & Containers

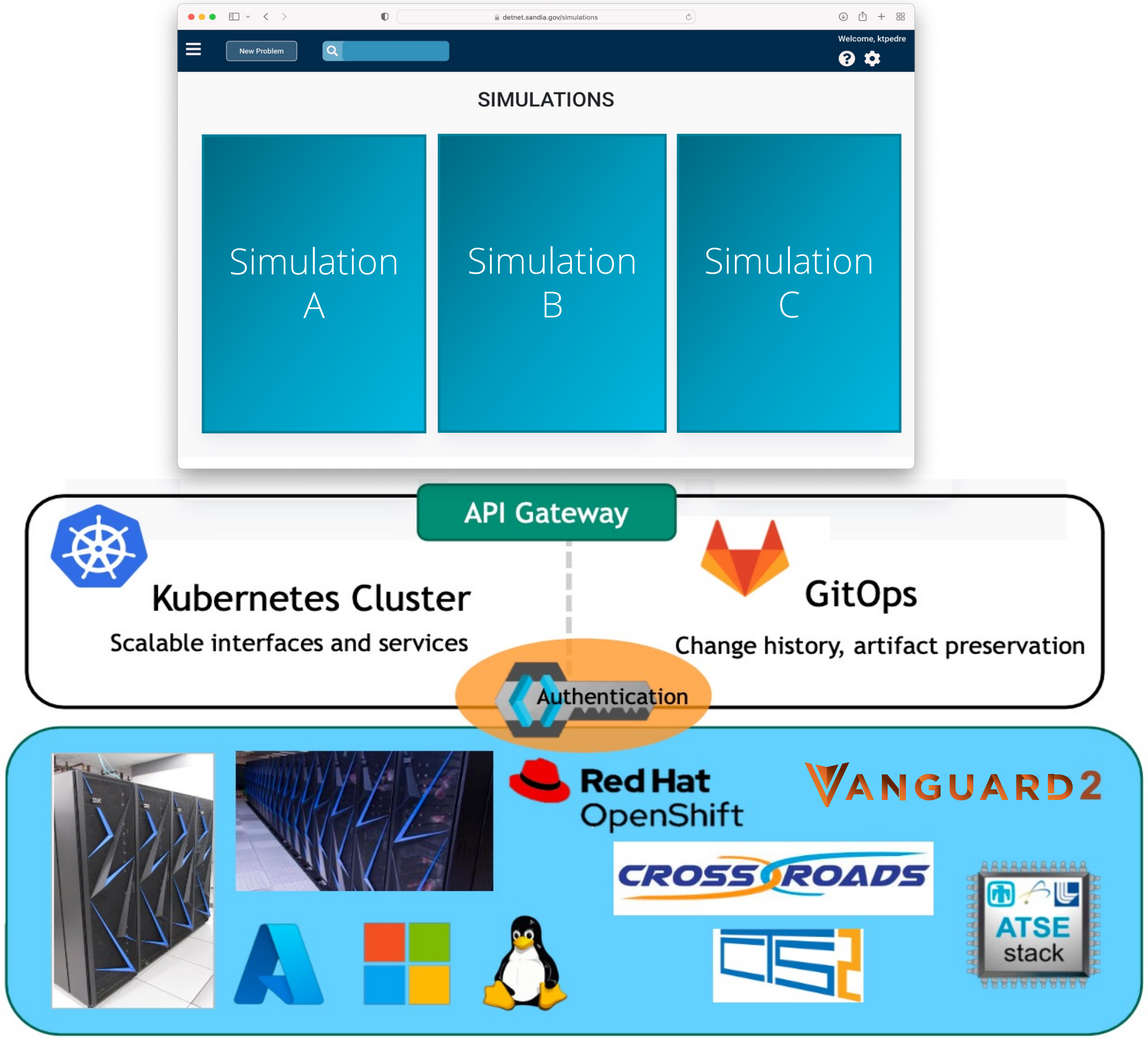
Kubernetes Clusters @ Sandia



```
git clone <project>.git
# for each cluster
helm install <project> .
```

CURRENT SUCCESSES AND CHALLENGES

- Deployed OpenShift Kubernetes testbed system to accelerate development
- 2 Production “Clusters”.
  - OpenShift Kubernetes System
  - A100 DGX Station with Slurm
- Added GPU resources to the production OpenShift Kubernetes system so CaaS jobs have more nodes to run parallel codes
- Working with 4 different teams to provide CaaS to their projects. Each team requires unique frontend, backend, and hpc containers.
- Continue to develop, test, and deploy containerized apps for projects using CaaS



API Gateway

Kubernetes Cluster

Scalable interfaces and services

GitOps

Change history, artifact preservation

Authentication