Containerization and IPv6 for GlideinWMS
Aidan Himley, University of Virginia, OMNI Intern

Introduction
- Glidein Workflow Management System: used to submit jobs to grid computing nodes, consists of several distinct components that must communicate securely
- Glideins: wrappers around user jobs to provide additional features
- IPv6: newer method of network addressing that will (hopefully) become more common in the future
- Containers: method of bundling software in a virtual operating system to provide a consistent deployment environment

Overview of the GlideinWMS architecture

Purpose
- Test compatibility of the GWMS stack with IPv6
- DOE requires all new systems IPv6-equipped by FY 2023
- Motivation for containers:
  - Quickly deploy the system to test different environments
  - Provide easier installation for end-users

Snippet from the values.yaml configuration file for the GWMS Helm chart

```yaml
# Default values for gwms.
# This is a YAML-formatted file.
# Declare variables to be passed into your templates.

hostHostname: 
hostIP: 

# must be relative paths
condorConfigMountRoot: config/condor
frontendConfigMountRoot: config/frontend
frontendCertsMountRoot: config/frontend/certs
```

Methods
- Used Kubernetes to build a cluster of containers for several components of the GWMS stack
- Automated much of the credentials creation and sharing with a shell script
- Used Helm to make templates for the container manifests and concisely expose a few configuration options
- Deployed all components to IPv6-equipped machines and submitted jobs to test the whole system

Conclusions
- There (are|are not) known IPv6 compatibility issues in GlideinWMS.
- The GWMS Frontend and Condor central pool can be easily installed as containers.
- Further work is needed to ensure adequate configuration options are exposed and to containerize the other components of the GWMS stack.

Acknowledgements
Thanks to Marco Mambelli and the rest of the GWMS team at Fermilab, as well as the OSG team at University of Wisconsin–Madison for their help.

This manuscript has been authored by Fermi Research Alliance, LLC under Contract No. DE-AC02-07CH11359 with the U.S. Department of Energy, Office of Science, Office of High Energy Physics.