Configuring and Managing Multiple Shasta Systems

Best Practices Developed During the Perlmutter Deployment

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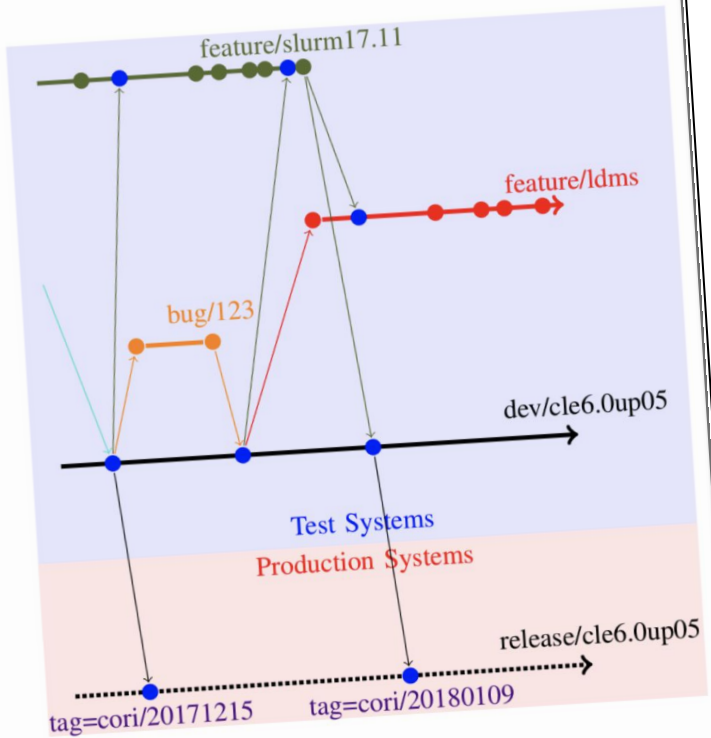
System Development Workflow

Development to Production

- Did you know?
  - Your TDS is the most exciting system on the floor
  - Your production system is a totally boring endpoint
- Recipes static, must test recipe build through operations on TDS
- TDS iteration → regression testing → iterate on TDS → production

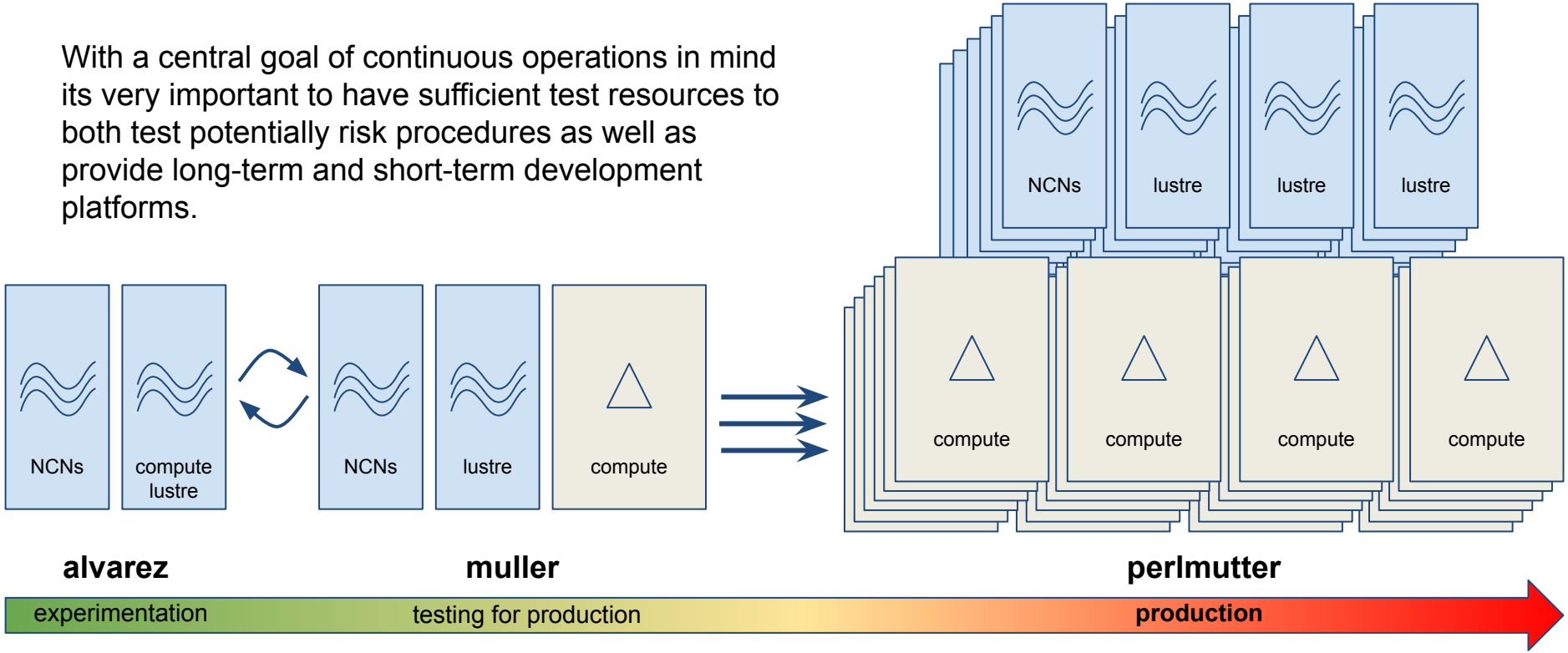


Have a working multi-system, many-contributor administration model for XC.

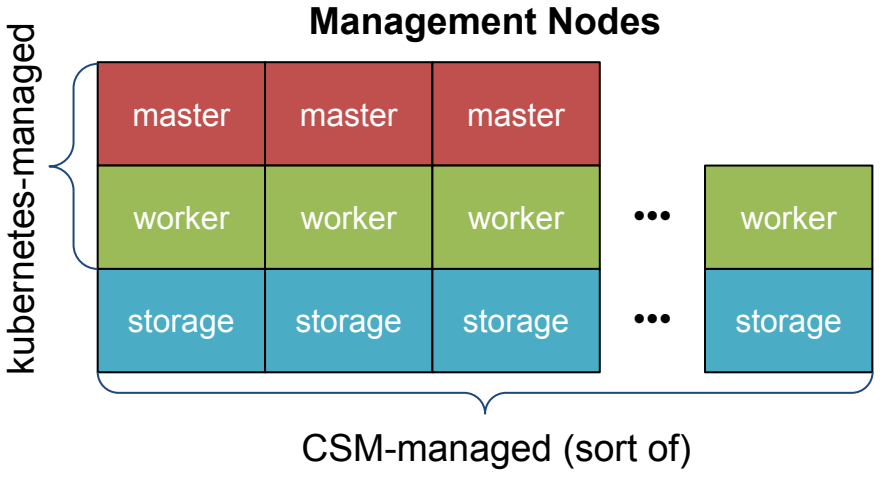
How to do this for Shasta?

Shasta Systems at NERSC

With a central goal of continuous operations in mind its very important to have sufficient test resources to both test potentially risk procedures as well as provide long-term and short-term development platforms.



Anatomy of a Shasta System



All nodes in shasta have a job! Nowhere is appropriate for interactive management of the system.

Managed Nodes

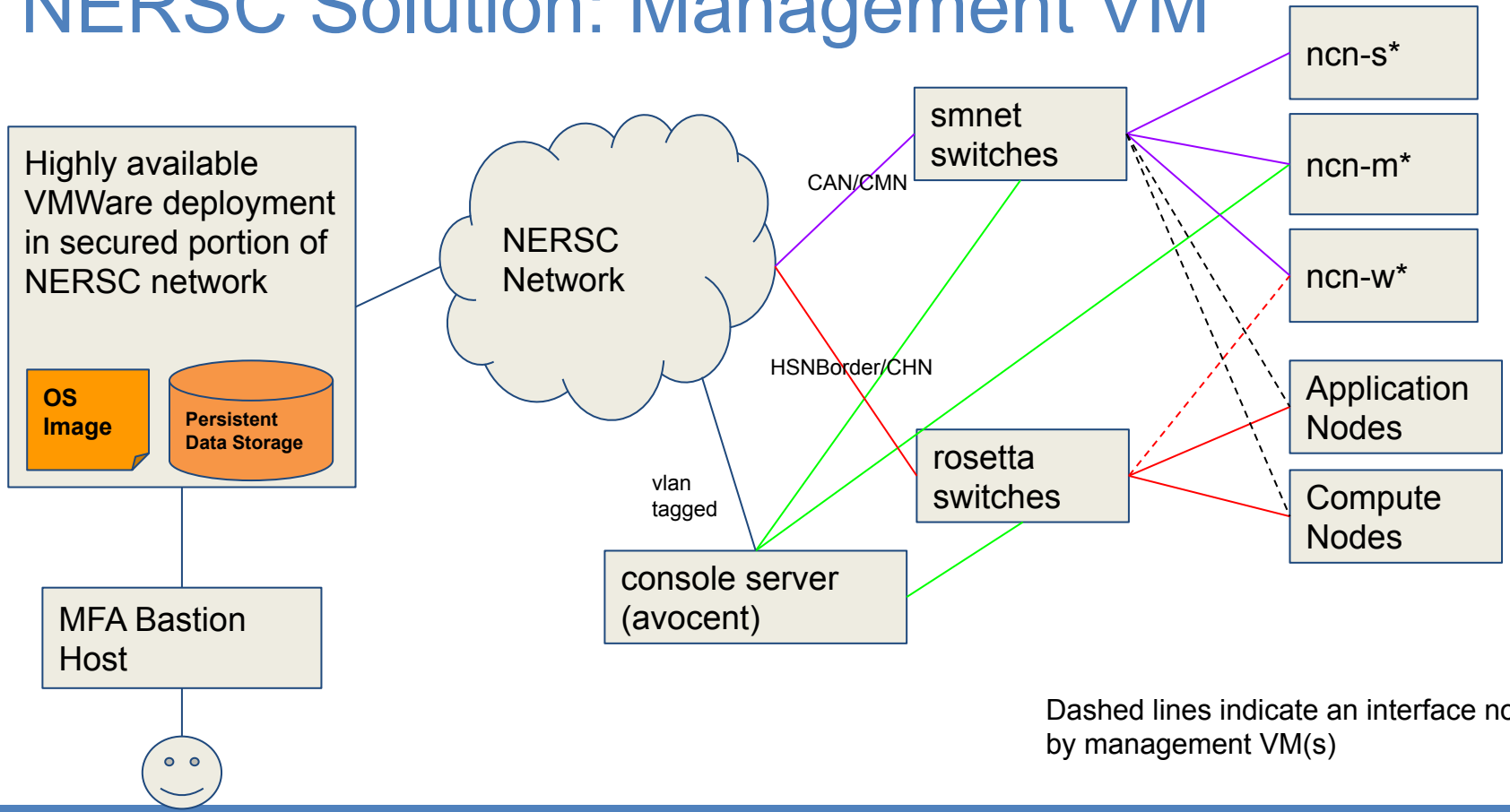
Application Nodes
Login Nodes
Compute Nodes

Managed by CSM

Use Cases for Interactive Systems Management

- System Configuration
  - Need a central location to house configuration, secrets, and manipulate the system securely
- Control administrator access and assure that NERSC security tokens are used
  - NERSC security procedures require administrators log in to a specific admin bastion host
- Interactive Management
  - administrative activities (reboot, debug, etc)
  - log analysis
- Store and manage extremely powerful system secrets
  - admin ssh user certificate authority
  - kubeadm generated kubernetes certificates
  - system root certificates

NERSC Solution: Management VM



Dashed lines indicate an interface not used by management VM(s)

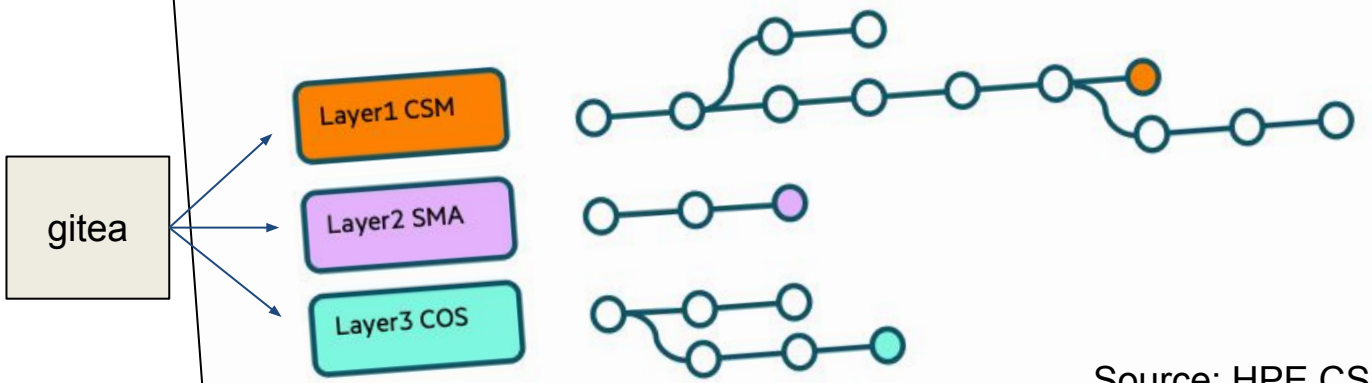
Interactive Management

- ssh
  - Rewrite NCN/UAN/CN to only accept root login from VM-vault signed ssh certificates and CSM-vault signed ssh certificates
  - Only enable root login secured locations
- kubectl
  - move /etc/kubernetes/admin.conf to VM and remove from system
  - ssh port-forward port 6442 from randomly selected master node to access API gateway
- cray / Istio API Gateway / sat
  - Install cray-cli and sat dependencies, (work already done)
  - Configure to use api CAN interface, e.g. `api.perlmutter.nersc.gov`

Configuration Management: git

USING GIT FOR MANAGING CFS CONFIGURATION

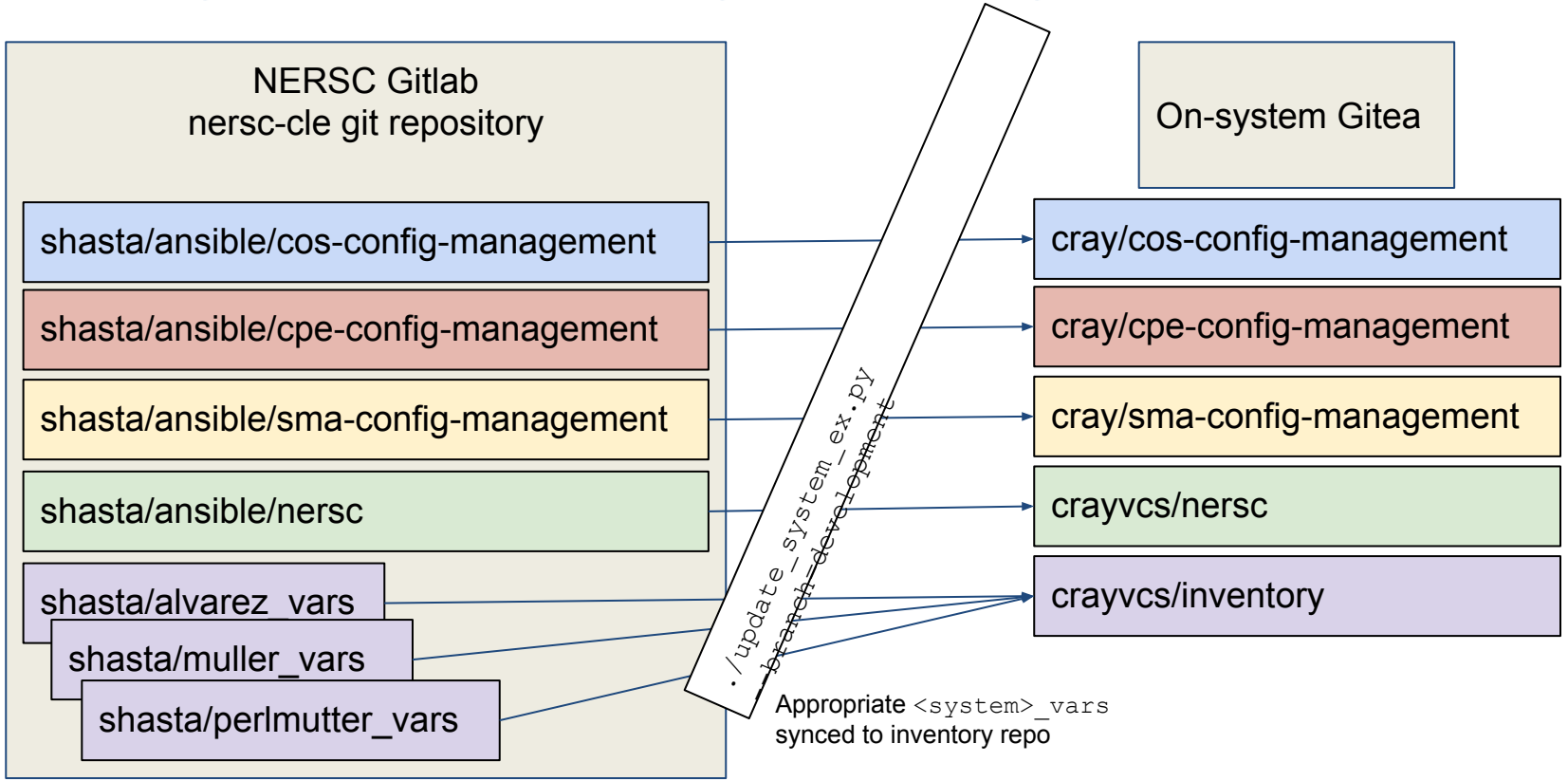
- Stores Ansible to apply to nodes at lifecycle events
- All Ansible in git repositories with branches to allow site customization
- Ordered configuration management across multiple repositories
- CFS sessions as part of pre-boot Image Customization as well as post-boot Node Personalization



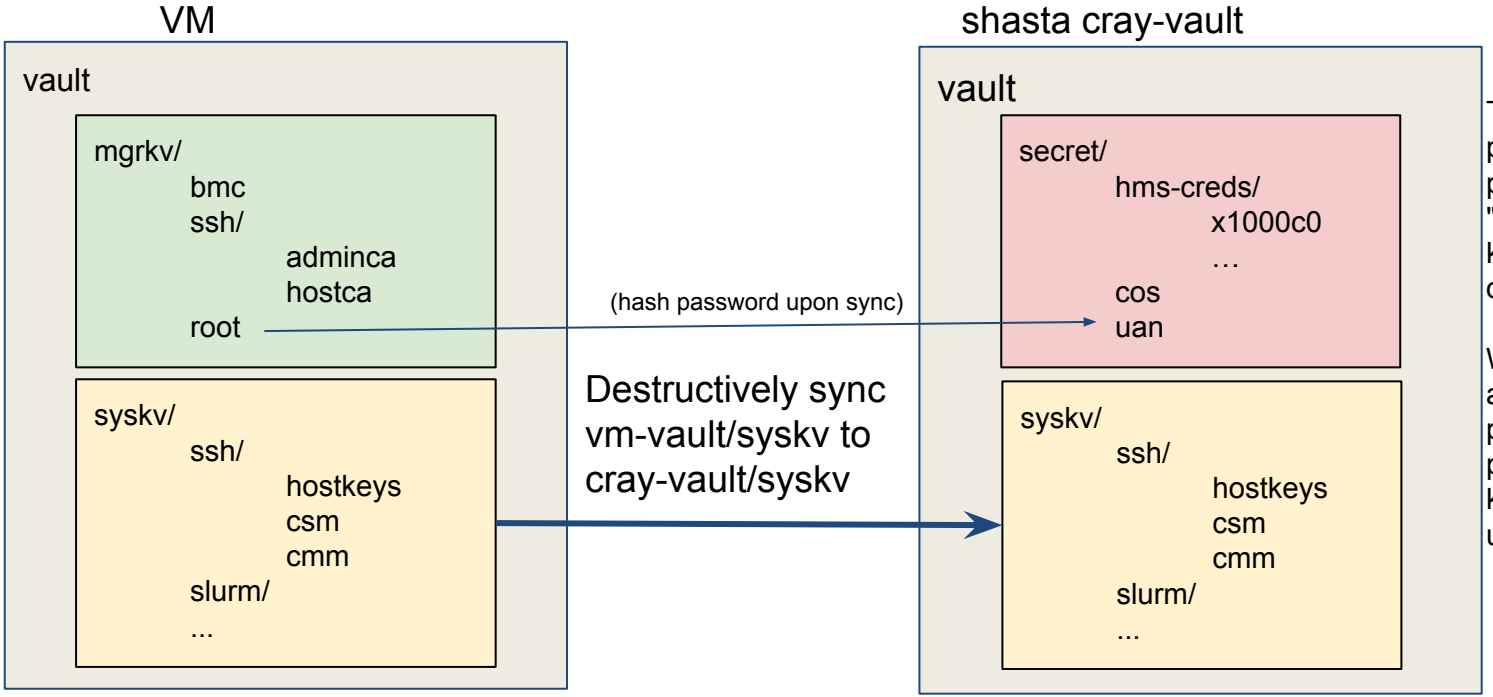
Each layer is provided by a separate gitea git repository.

Source: HPE CSM v1.4 Overview Presentation

Configuration Management: git



Configuration Management - Secrets



This requires policy changes by patching the Cray "vault/cray-vault" kubernetes object.

We have an automated process for patching this and keeping it up-to-date.

mgrkv has secrets that are only known on the manager VM, such as plaintext passwords, private keys for the host and admin CAs

syskv is sync'ed from the VM to cray-vault (using kubectl port forwarding) for use with CFS.
cray-vault also gets hashed passwords for deployment on the system

Configuration Management

The container/chart synchronization is a HUGE area for discussion, more depth in paper!

- RPMs
  - "nersc" product layer RPMs synced to appropriate on-system nexus repositories using `./update_system_ex.py` (direct integration with nexus API)
- Helm Charts
  - NERSC-custom charts are stored in `nersc-cle` git repository
  - Deployed with Cray's `loftsman` from manager VM (leveraging end-user's privileges with kubernetes)
- Containers
  - Based on parse of nersc-cle charts, use skopeo to sync containers from external source, registry.nersc.gov, or VM-constructed container to on-system nexus

Configuration Management: Workflow

```
$ cd nersc-cle
$ git checkout development
$ ./update_system_ex.py --branch=development
    # record timestamp as `suffix`
    # syncs secrets
    # writes feature/a ansible directories to dmjtest branches in gitea
    # generates CFS configuration objects, uploads using CFS API
        # compute-development-<suffix>
        # login-development-<suffix>
        # gateway-development-<suffix>
    # generates bos-sessiontemplates-<suffix> with unconfigured images
$ ./shasta/scripts/build_latest_images.sh development
$ cd bos-sessiontemplates-<suffix>
$ ../shasta/scripts/update_bos_latest_images.sh -i development -d development
    # generates and uploads usable BOS sessiontemplates
    # compute-development, login-development, gateway-development
$ cray bos session create --template-uuid login-development --operation reboot
```

Conclusions

The manager VM:

- Adds layers on control to add features and enable rich role-based administration capabilities
- Leverages keycloak-enabled role-based workflows by allowing RBAC integration and secrets delegation
- Provides a locale for interactive development and administration
- Enables a straightforward administrative and development workflow that sets relatively simple norms on the system
- Provides a high-fidelity method to develop on a development system and deploy on a production system