NERSC Spin
Project Overview

Cory Snavely
Lead, Infrastructure Services Group (ISG)
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What is Spin?

**Spin** is a system to **build and deploy** science gateways, workflow managers, databases, and other “edge services” using Docker containers.

It is designed to be **flexible, scalable, and integrated tightly** with NERSC resources:

- Develop on your laptop; **deploy in minutes**.
- **Scale out** for performance.
- Access **HPC networks and file systems**.
- NERSC manages everything under the hood.

* Scalable Platform Infrastructure at NERSC
Edge Services need a real home.

- Simulation/analysis
- Workflow manager
- Key/value store
- Science gateway
- Database
- Shared facility/resource
- Edge service
What do services look like in Spin?

Deploying is easy:

1. A software load balancer is configured automatically.
2. Containerized app is supplied by a user (or NERSC).
3. Start multiple instances to scale performance.
4. Add a dedicated database.
5. A private network for the service is plumbed on demand.

Everything is a container.

Service up in $O(\text{seconds})$. 
Whereas, conventionally...

Even with automation, we still:

1. Configure and test the load balancer appliance.
2. Install apps and dependencies, resolve conflicts, configure a startup script, etc.
3. Provision access to a shared database, etc.
4. Change firewall or network configuration as needed.

*Service up in $O(\text{days})$ or longer.*
Don’t despair … declare!

docker-compose.yml

version: '2'
services:
  web:
    image: httpd
tty: true
  links:
    - db:db
db:
  image: mysql
environment:
  MYSQL_DATABASE: magic
  MYSQL_USER: cory
  MYSQL_PASSWORD: MyOwnPass
tty: true

rancher-compose.yml

version: '2'
services:
  web:
    scale: 2
    start_on_create: true
db:
    scale: 1
    start_on_create: true
"Orchestrating" with Rancher
Multi-tenancy is immature. We’re building our own
• access controls
  ...so I can’t change (or even see) your services.
• policy enforcement
  ...so you can’t run as root if you access that filesystem.

User namespaces break assumptions for
• filesystem access
  ...because UID 47284 inside might be somebody else.
• remote shell access
  ...because you can’t trust a container like you trust .shosts.

Hence ... more access controls!
What do our users get?

• Focus on developing an app (or reusing a prepared one).
• Ignore the underlying infrastructure.
• Get scalability and fault tolerance for free.
• Get more cores and memory on larger servers.
• Increase utilization and spend less on equipment.
• Free beer and world peace.

The benefits of VMs without the overheads.
The benefits of cloud with tight integration to NERSC.
What does NERSC get?

- Easier to respond to a broader range of (unique) requests.
- Flexible resource allocation; no more islanded capacity here and resource exhaustion there.
- Monitor the entire infrastructure holistically.
- Non-disruptive upgrades and periodic maintenance.
- Better security with each service isolated in containers and private networks.

We’re using Spin internally for our services, too!
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The Networking and Information Technology Research and Development (NITRD) Program

Mailing Address: NCO/NITRD, 2415 Eisenhower Avenue, Alexandria, VA 22314

Physical Address: 490 L'Enfant Plaza SW, Suite 8001, Washington, DC 20024, USA Tel: 202-459-9674, Fax: 202-459-9673, Email: nco@nitrd.gov, Website: https://www.nitrd.gov