Composing and Deploying a Cluster of Docker Containers

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Advanced Computing Interfaces

What is Docker?

Containers: Isolation from the OS kernel

Docker: A modern container engine

Very new technology  years

It fits people's brains 

Why it is useful?

Containers: modular, portable, reusable 

No installation: all dependencies packaged 

Docker Hub: a repository of images 

Being used in development, deployment, science, …

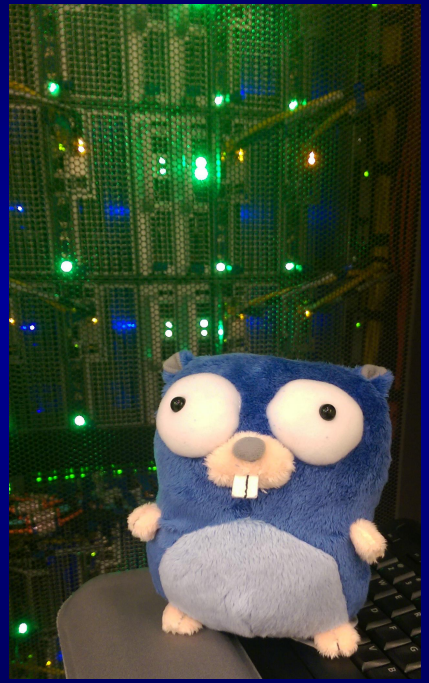
(with caution )

Why it is meaningful for TACC?

Uniform environment for users

Easy to deploy

Reproducible, Shareable



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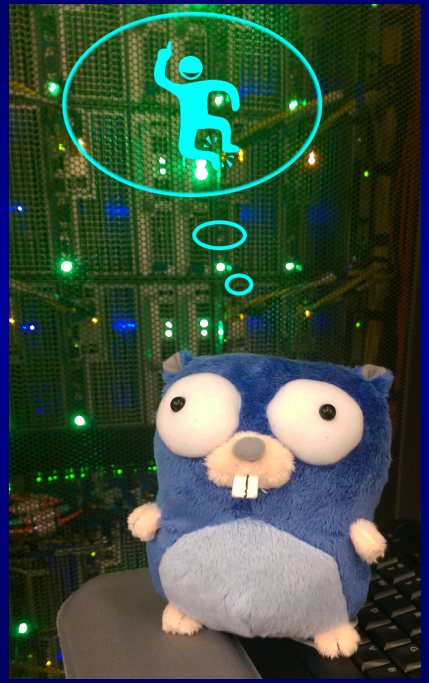

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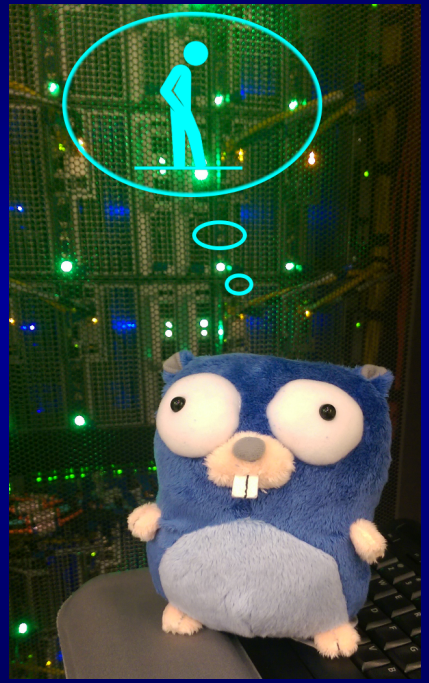
Not there right now, but making progress

HPC: some difficulties

Services: much clear path



How do you use it?

Run a MySQL server


```
docker run --name foo -e MYSQL_ROOT_PASSWORD=mypasswd -d mysql
```

Run an Nginx connected to the SQL server


```
docker run --name bar -v /content:/usr/share/nginx/html:ro \
   --link foo:mysql -d nginx
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Run an IPython Notebook (go to https://localhost)

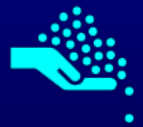
```
docker run -d -p 443:8888 -e PASSWORD=mypasswd ipython/notebook
```

But…, problems!

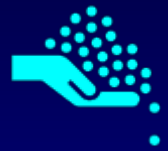
Composition: build images from images 

Service Discovery: many more containers than VM's 

Orchestration: schedule containers across hosts 

Networking, Data Volumes, Supervision, ... 

Many Solutions

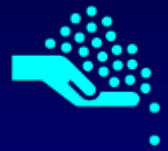


Mesos, Kubernetes, Consul, Brooklyn, Shipyard, Synapse, Maestro, Etcd, Confd, …, so many!

Plus Docker {compose, swarm, machine}

Very rapidly evolving ecosystem

Many Solutions



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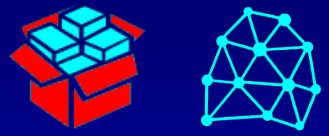
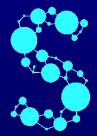
Our View: Serfnode

Fully decentralized, very lightweight,
wrapper for arbitrary images



Provides discovery, cluster membership, supervision

Powered by **Serf** (gossip, SWIM)
Favor Availability over Consistency



Building a Serfnode

- Grab (or build) an useful image (or more) `A`, `B`, `...`
- Write handlers (optional) for events
  [join, leave, fail, custom]
- Write a simple YAML file describing relations
- Build a **new** image `my_serfnode` 

Deploying a Serfnode

Run `docker run -v socket -e PEER=someone -e ROLE=foo my_serfnode`

Deploy by executing on one or more hosts

Containers find themselves via `/etc/hosts` or API

Ansible playbook to kickstart the cluster

Demo

The Future

People waiting to see who will prevail 

Hoping for **lightweight** and **interoperable** solution

Serfnode is used in Adama, Agave

Moving to integrate swarm, machine

Thanks!

Questions?

Links and attributions: github.com/waltermoreira/SEA15