TechU

IBM

L110483
Lab: Red Hat OpenShift on POWER - Part 1

Please bring an EMAIL enabled device:

In Part 1, get a Red Hat Developer Account if you don't already have one

In Part 2, get a github account if you don't already have one

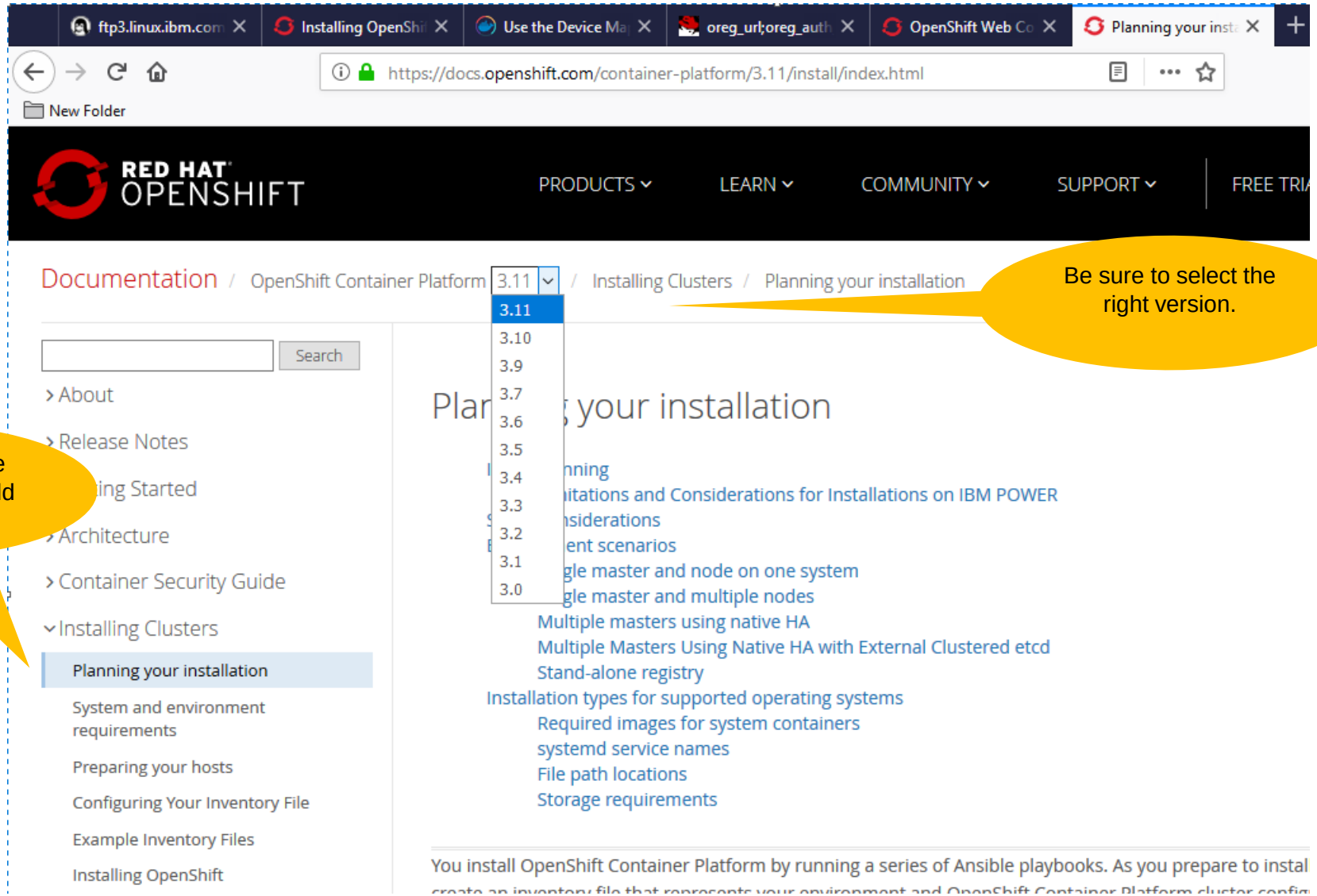
Steven Knudson
sjknuds@us.ibm.com

2019 IBM Systems Technical University
October 2019 | Las Vegas NV

Session Objectives

- PuTTY Login to Red Hat 7 instance provided on the tear-strip
- Configure for OpenShift "all-in-one" development environment
- Establish no charge Red Hat Developer Account, if you don't already have one
- Install and start Red Hat OpenShift 3.11 for Power
- Browser and login to OpenShift on Power

Install Doc https://docs.openshift.com/container-platform/3.11/install/index.html



Feel free to use the doc. I used it to build the lab

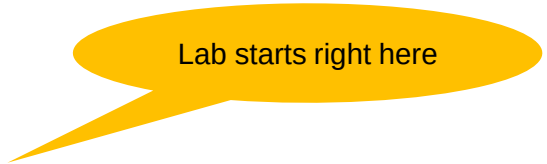
General Info

- Some commands in this lab contain continuation characters "\"
  If you know what that is, go forward
  If you are confused by \, ask for help

- We will likely run long in Part 1. Lets try to get the deploy_cluster playbook (p15, about 32 min) started before break

- An OpenShift cluster is all x86, or all Power; no mixed cluster today
- OpenShift on Power is an rpm install, not atomic, nor CoreOS (at this time)
- Your instance is on 150GB lun, approximately 40GB unused
- You will configure a thinpool for Docker storage in the unused space
- Your host, and a wildcard "route" for your deployments, are already in the lab DNS
- pdf file is on the Windows Desktop, for you to "mouse" commands as needed

General Config



- PuTTY to the IP address of your RHEL7 instance root / abcd1234

- SELINUX enforcing is required

```
# setenforce 1
# vi /etc/selinux/config      (at the middle of file, make it SELINUX=enforcing)
# sestatus                    (verify Current mode, and config file, both show enforcing)
```

- Your hostname is fully qualified

```
# hostname
# hostname -f
```


General Config

- firewalld is already set in the Ansible inventory file (hosts). You will retrieve this later.
  ```
  [OSEv3:vars]
  os_firewall_use_firewalld=True
  ```

- You are starting with RHEL75 minimal image on Power8, will end up at RHEL76 during the process
- Append PATH onto /root/.bashrc
  echo "export PATH=/usr/sbin:/usr/bin:/bin:/sbin:/usr/local/bin" >>/root/.bashrc
  logout and login again

- Generate ssh key
  ```
  # ssh-keygen -t rsa -f ~/.ssh/id_rsa -P ''
  # ssh-copy-id -i ~/.ssh/id_rsa.pub root@<your_node_ip>
  # ssh <your_node_ip> date
  ```
  (want date returned, without password prompt)

General Config

- **At home, but not in this lab,** you'll use subscription-manager to register your Red Hat instance, and also enable repositories like these

  For Power8

```
# subscription-manager repos \
    --enable="rhel-7-for-power-le-rpms" \
    --enable="rhel-7-for-power-le-extras-rpms" \
    --enable="rhel-7-for-power-le-optional-rpms" \
    --enable="rhel-7-server-ansible-2.6-for-power-le-rpms" \
    --enable="rhel-7-server-for-power-le-rhscl-rpms" \
    --enable="rhel-7-for-power-le-ose-3.11-rpms"
```

  And for Power9

```
# subscription-manager repos \
    --enable="rhel-7-for-power-9-rpms" \
    --enable="rhel-7-for-power-9-extras-rpms" \
    --enable="rhel-7-fpr-power-9-optional-rpms" \
    --enable="rhel-7-server-ansible-2.6-for-power-9-rpms" \
    --enable="rhel-7-server-for-power-9-rhscl-rpms" \
    --enable="rhel-7-for-power-9-ose-3.11-rpms"
```


General Config

— **For this lab,** we have the code needed already on the lab network. Bring over a new yum repo file for it.

```
# cd /etc/yum.repos.d
# mv RH75LE.repo RH75LE.repo.save
# wget http://10.31.193.224/RH7LE/311/OSE.repo
# yum clean all
# rm -rf /var/cache/yum
# yum repolist enabled
...
repo id                                repo name                                                status
Advance_Toolchain                      Advance Toolchain                                           844
Extras                                 rhel-7-for-power-le-extras-rpms                             481
IBM_Power_SDK_Tools                    IBM Power SDK Tools                                          17
IBM_Power_Tools                        IBM_Power_Tools                                              17
OSE                                    rhel-7-for-power-le-ose-3.11-rpms                           367
Optional                               rhel-7-for-power-le-optional-rpms                        13,775
ansible-26                             rhel-7-server-ansible-2.6-for-power-le-rpms                  15
rhscl                                  rhel-7-server-for-power-le-rhscl-rpms                     2,260
rpms                                   rhel-7-for-power-le-rpms                                 16,971
repolist: 34,747
```


General Config

- Install the following base packages:

```
# yum install wget git net-tools bind-utils yum-utils \
iptables-services bridge-utils bash-completion kexec-tools sos psacct
# yum update
# reboot
```

PuTTY login again...

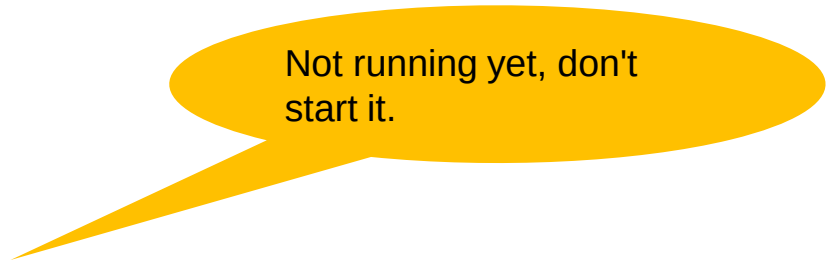
```
# yum install openshift-ansible
# reboot
```

PuTTY login again, and

```
# yum install docker-1.13.1
```

Verify Docker level

```
# rpm -V docker-1.13.1
# docker version
Client:
 Version:         1.13.1
 API version:     1.26
 Package version:
Cannot connect to the Docker daemon at unix:///var/run/docker.sock. Is the docker daemon
running?
```



Configuring thinpool storage for Docker

- You may struggle a bit with the command /usr/bin/docker-storage-setup and the config file /etc/sysconfig/docker-storage-setup. Do the following instead:

- We will add the thinpool into the unused space of your root_vg physical volume

We're carving about 20GB here. On a separate disk, in another vg, we might use percentages, like
-l 95%VG
-l 1%VG

```
# lvcreate --wipesignatures y -n thinpool root_vg -L 19G
# lvcreate --wipesignatures y -n thinpoolmeta root_vg -L 300M
# lvconvert -y --zero n -c 512K --thinpool root_vg/thinpool --poolmetadata root_vg/thinpoolmeta

# lvs
 LV       VG      Attr       LSize   Pool Origin Data%  Meta%  Move Log Cpy%Sync Convert
 root     root_vg -wi-ao---- 100.70g
 swap     root_vg -wi-a-----   8.00g
 thinpool root_vg twi-a-t---  19.00g                0.00   5.35
```

Edit up the file:
docker-thinpool.profile

```
# vi /etc/lvm/profile/docker-thinpool.profile
activation {
  thin_pool_autoextend_threshold=80
  thin_pool_autoextend_percent=20
}
```


Configuring thinpool storage for Docker

```
# vi /etc/docker/daemon.json
{
  "insecure-registries": [
   "172.30.0.0/16"
  ]
}
```

Also edit up the file: daemon.json

Also, add content to /etc/sysconfig/docker-storage. Make it look like this, all one line

```
# vi /etc/sysconfig/docker-storage
DOCKER_STORAGE_OPTIONS="--storage-driver overlay2 --storage-opt dm.fs=xfs --storage-opt
dm.thinpooldev=/dev/mapper/root_vg-thinpool --storage-opt dm.use_deferred_removal=true --storage-opt
dm.use_deferred_deletion=true"
```

```
# systemctl daemon-reload
# systemctl enable docker
# systemctl start docker
# systemctl is-active docker
# systemctl status docker
```


Retrieve all-in-one Inventory file (hosts)

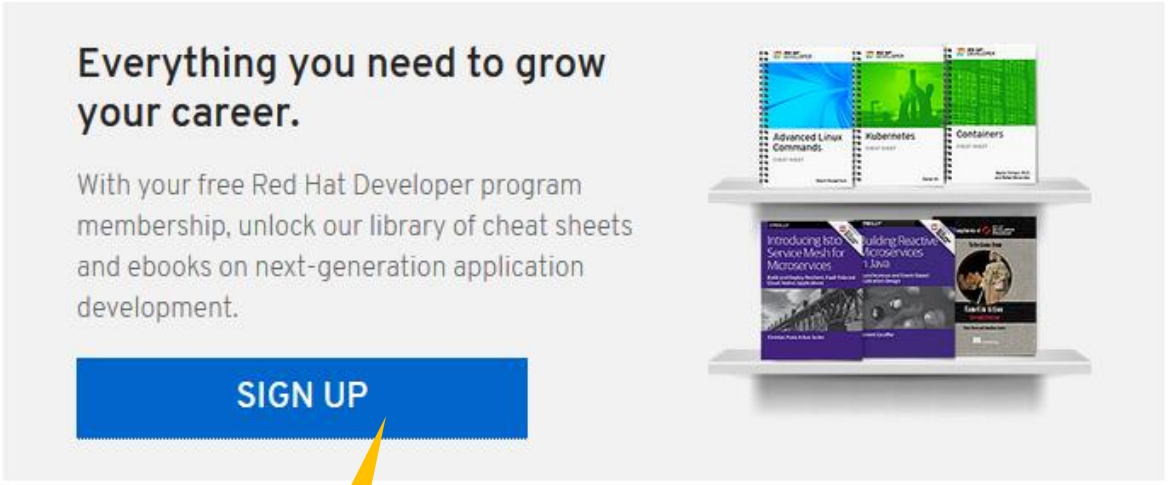
```
# cd /etc/ansible
# mv hosts hosts.default
# wget -O hosts http://10.31.193.224/RH7LE/311/hosts.save
```

In the hosts file, you will fill in oreg fields with your Red Hat Developer account and password (leave off the arrowheads). Don't have RH Developer account? Create one next page

```
# vi hosts
...
oreg_auth_user=<your-red-hat-developer-login>
oreg_auth_password=<your-red-hat-developer-passwd>
```


Red Hat Developer Subscription (free)

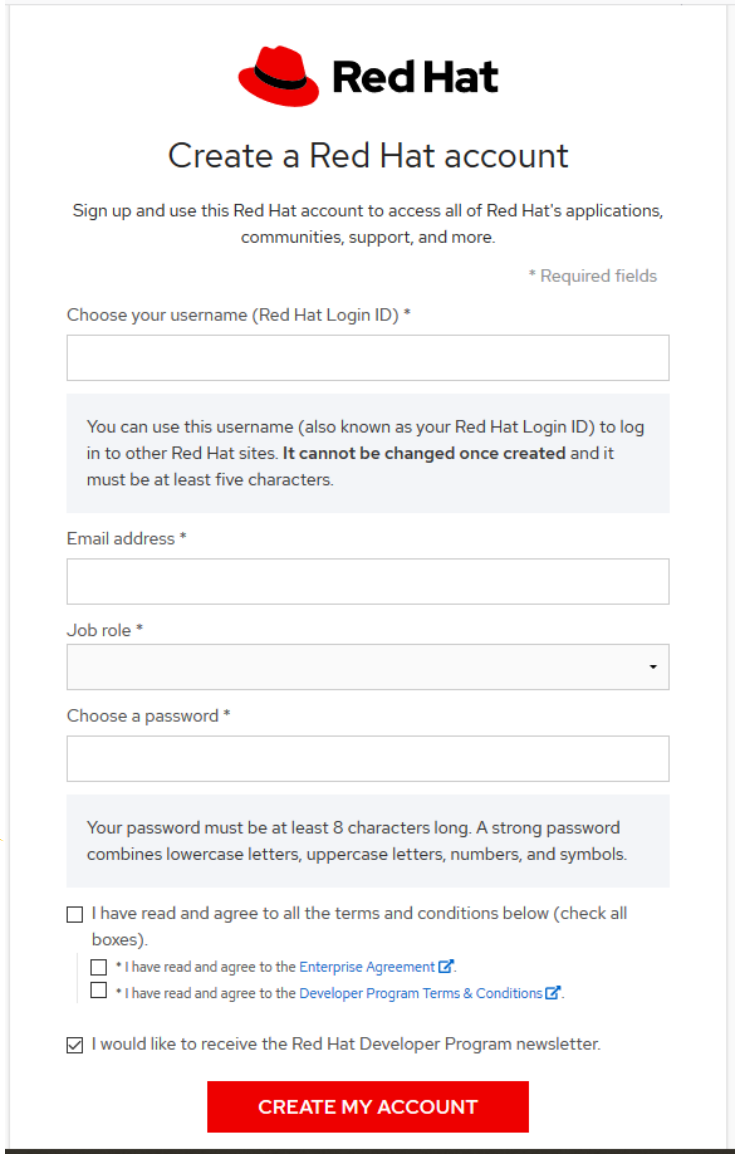
https://developers.redhat.com/blog/2016/03/31/no-cost-rhel-developer-subscription-now-available/



1) Hit SIGN UP

2) Fill in form and hit CREATE

3) AFTER you create the account, you **MUST** login, edit profile, and fill in mandatory first name, last name.



prerequisites ansible playbook

With your developer login and password in /etc/ansible/hosts, run prereq ansible playbook

```
# time ansible-playbook -i /etc/ansible/hosts /usr/share/ansible/openshift-ansible/playbooks/prerequisites.yml
\
| tee ~/preq.txt 2>&1

...
...
PLAY RECAP *********************************************************************
localhost                  : ok=91   changed=19   unreachable=0    failed=0


INSTALLER STATUS ***************************************************************
Initialization  : Complete (0:01:14)
```

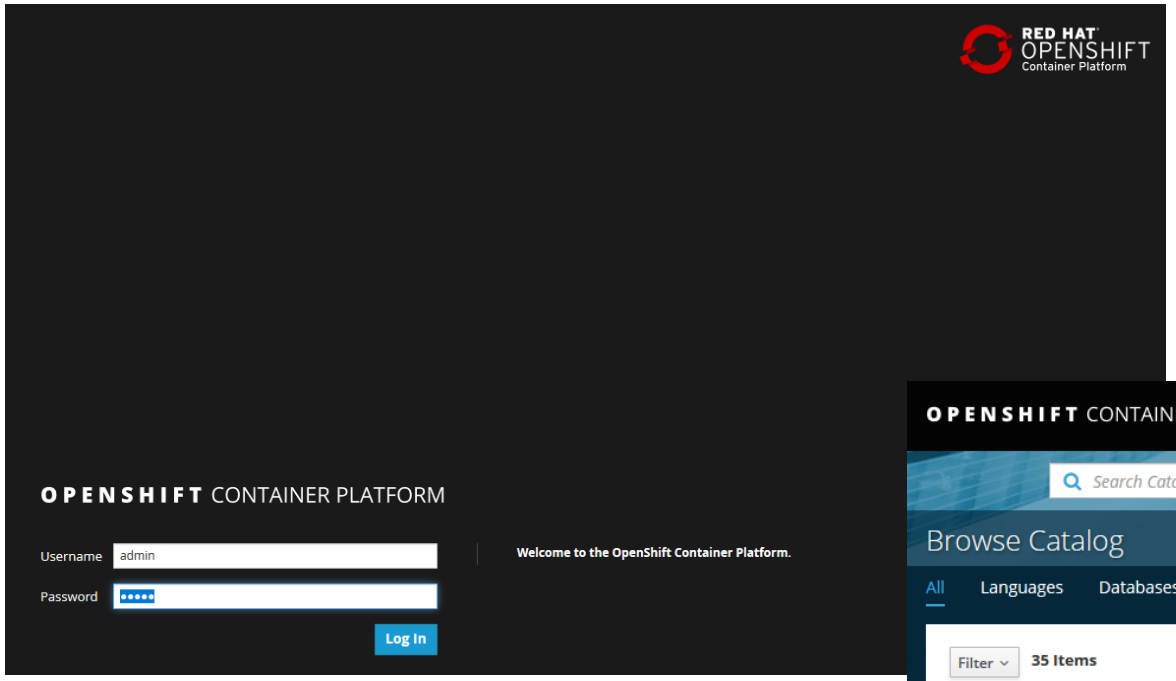

deploy_cluster ansible playbook

```
#  time ansible-playbook -i /etc/ansible/hosts /usr/share/ansible/openshift-ansible/playbooks/deploy_cluster.yml \
| tee ~/deploy.txt 2>&1
...
...
PLAY RECAP *********************************************************************
localhost                  : ok=729  changed=325  unreachable=0    failed=0


INSTALLER STATUS ***************************************************************
Initialization               : Complete (0:00:37)
Health Check                 : Complete (0:01:21)
Node Bootstrap Preparation   : Complete (0:05:21)
etcd Install                 : Complete (0:01:36)
Master Install               : Complete (0:09:21)
Master Additional Install    : Complete (0:01:54)
Node Join                    : Complete (0:00:45)
Hosted Install               : Complete (0:02:00)
Cluster Monitoring Operator  : Complete (0:03:02)
Web Console Install          : Complete (0:01:25)
Console Install              : Complete (0:01:01)
metrics-server Install       : Complete (0:00:04)
Service Catalog Install      : Complete (0:06:52)

real    32m15.141s
user    26m58.294s
sys     2m23.482s
```

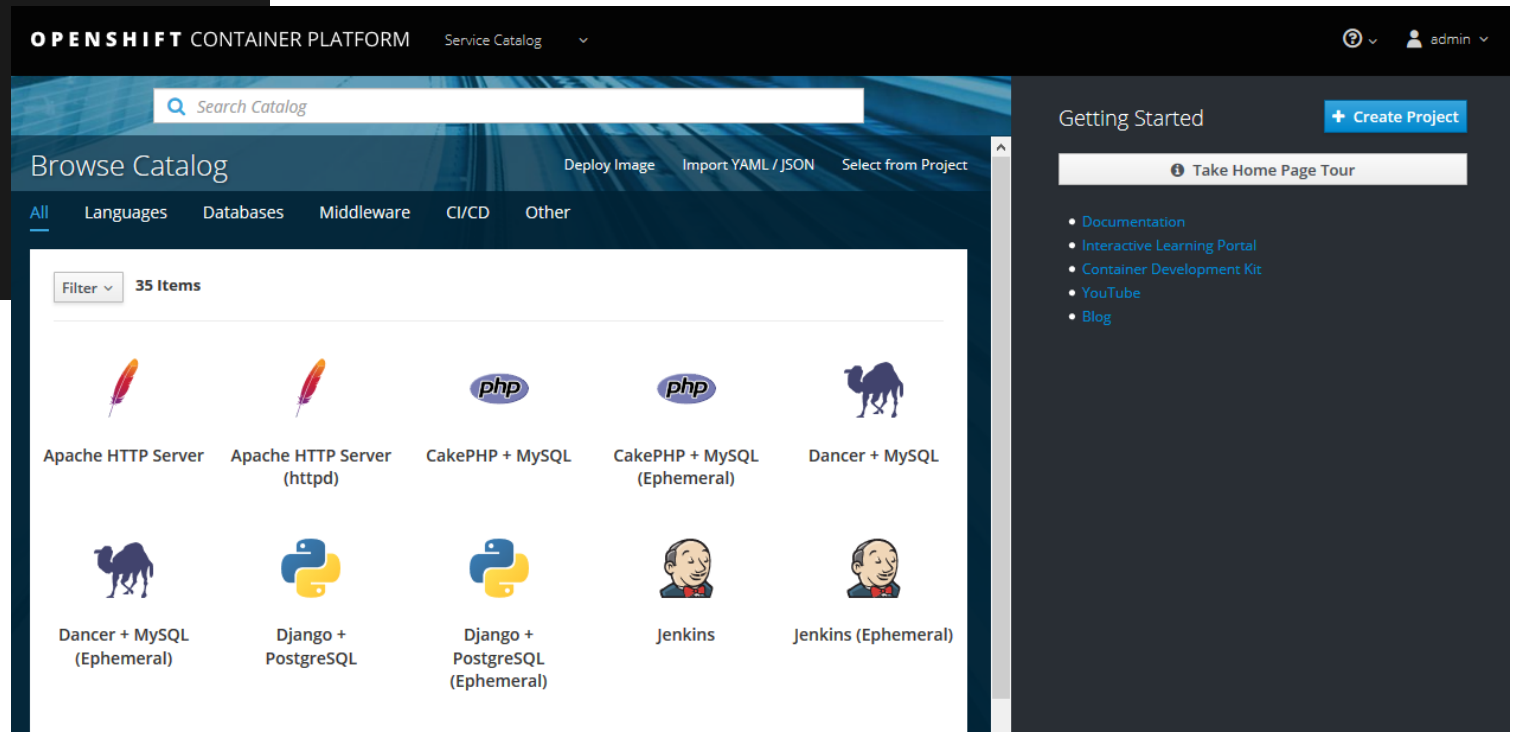
Finally, browser into your cluster
https://your.ip.addr:8443 admin / admin

OCP login

https://your.ip.addr:8443 admin / admin

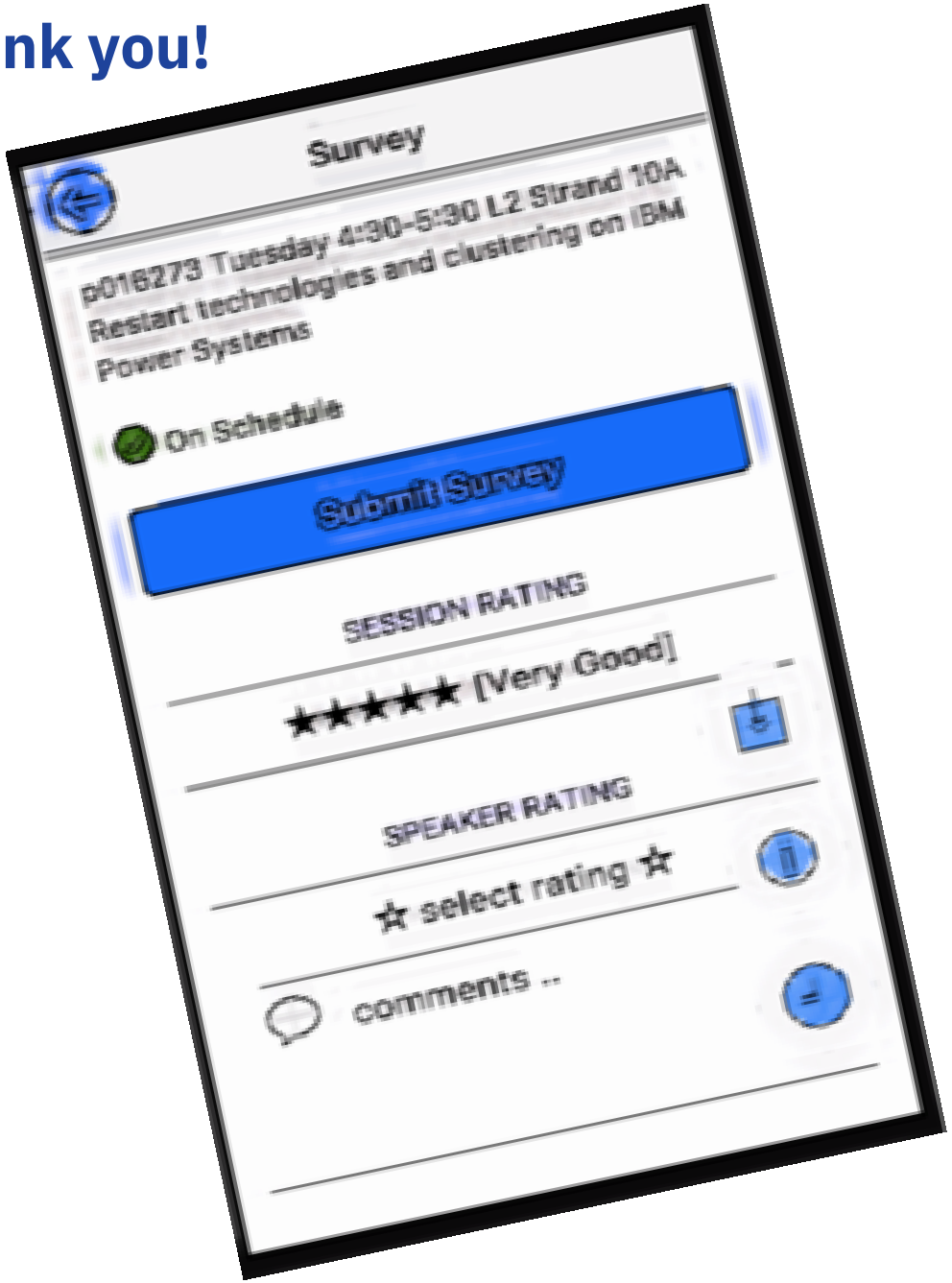


You might have to attempt login a few times



End of Part 1!

Thank you!



L110483 OpenShift on Power Part 1
Steven Knudson
IBM Power CTS COMM/CSI

sjknuds@us.ibm.com

Please complete the Session Evaluation!

Notices and disclaimers

Notices and disclaimers continued

- Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products about this publication and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. IBM does not warrant the quality of any third-party products, or the ability of any such third-party products to interoperate with IBM's products. **IBM expressly disclaims all warranties, expressed or implied, including but not limited to, the implied warranties of merchantability and fitness for a purpose.**
- The provision of the information contained herein is not intended to, and does not, grant any right or license under any IBM patents, copyrights, trademarks or other intellectual property right.
- IBM, the IBM logo, ibm.com and [names of other referenced IBM products and services used in the presentation] are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at: www.ibm.com/legal/copytrade.shtml

Try out OpenShift 4

- https://try.openshift.com
- Cloud based instance, surely x86 based
- Likely a valuable and different exercise than what we are doing in this lab
- You might be wondering, why Power? See next 4 slides

IBM Cloud Paks and Red Hat OpenShift on Power Systems

Working 4Q plan for Power

IBM Cloud Pak for Applications

Build, deploy and run applications

- IBM containerized software
- Operational services
  - ICP 4.1
- Container platform
  - RH OpenShift 3.11

Working plan for Power

IBM Cloud Pak for Data

Collect, organize, and analyze data

- IBM containerized software
- Operational services
- Container platform
  - RH OpenShift 4.x

Working 4Q plan for Power

IBM Cloud Pak for Integration

Integrate applications, data, cloud services, and APIs

- IBM containerized software
- Operational services
  - ICP 4.1
- Container platform
  - RH OpenShift 3.11

Working 4Q plan for Power

IBM Cloud Pak for Automation

Transform business processes, decisions, and content

- IBM containerized software
- Operational services
- Container platform
  - RH OpenShift 4.x

Available in 3Q for Power

IBM Cloud Pak for Multicloud Management

Multicloud visibility, governance, and automation

- IBM containerized software
- Operational services
  - ICP 4.1
- Container platform
  - RH OpenShift 3.11

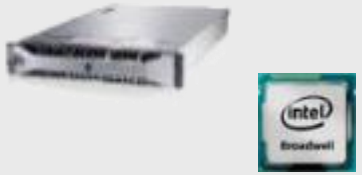
Runs on choice of IBM Power Systems Infrastructure-as-a-Service (IaaS)

PowerVC
PowerVM

Bare-metal

Why Power for Containers?

Modernization: WAS Liberty and Db2

Acme Air  **Open source Docker containers** **Websphere Application Server Liberty Profile**	**IBM Power S822LC for BD** (20-core, 512GB)	**HP DL380** (24-core, 512GB)
		
Server price -3-year warranty	**$18,080**	**$26,711**
System Cost -Server + WAS Liberty ND Annual Subscription @ $4,606 per core (3yrs)	**$110,200**	**$137,255**
Total Throughput (tps)	**48,780**	**33,420**
Number of containers	**120**	**76**
$/container	**$919/container**	**$1,805/container**

1.96X better

Improved Container Density at Lower Solution Price

1.45X
Throughput per Server

1.57X
Containers per Server

1.96X
Price-Performance

WebSphere Application Server V9 Liberty on IBM Power S822LC for BD with open source Docker delivers 1.57X more containers and 1.96X *better price-performance* than Intel Xeon E5-2650 v4 Broadwell

•Results are based on IBM internal testing of single system and OS image running with Acme Air work load (https://github.com/acmeair) on a private network with a dedicated JMETER driver machine and dedicated MongoDB server machine: One MongoDB instance per 8 WAS containers. Each WAS container was bound to a full core to run with 20 users and a 25ms think time between transactions. The number of containers were increased for each system until average throughput dropped below 400 transactions/second or latency exceeded 25ms. Tests were run on November 29th, 2016. Individual results will vary depending on individual workloads, configurations and conditions. IBM Power System S822LC for Big Data; 20 cores / 160 threads, POWER8; 2.92GHz, kernel 4.4.0-12-generic, CPU frequency governor of performance, and hardware prefetch disabled. HP Proliant DL380, 24 cores / 48 threads; Intel E5-2650 v4; 2.2 GHz; CPU frequency governor of performance, and hardware prefetch disabled. Both configurations ran Ubuntu 16.04, had 512 GB memory, included 1TB SATA 7.2K rpm HDD, 10 Gb 4-port, 1 x 16gbps FCA; Websphere Application Server V9.0 Liberty profile;Java options: -Xmx512m -Xms512m -Xgcthreads8 -Xnocompactgc -Xnoclassgc -Xconcurrentlevel0 –Xdisableexplicitgc; Open source Docker Version: 1.12.0 / API : 1.24 / Go : 1.6.3; Docker storage driver: overlay2 and aufs had similar results. Pricing is based on: S822LC for Big Data http://www-03.ibm.com/systems/power/hardware/linux-lc.html and HP DL380 https://h22174.www2.hp.com/SimplifiedConfig/Index on December 7th, 2016. Pricing for Websphere Application Server based on 20% discount from Passport Advantage pricing on: https://www-01.ibm.com/software/passportadvantage/pao_customer.html on December 7th, 2016

Reduce operating costs with Power L922 Server running IBM Cloud Private

1.66X price-performance per rack unit over tested Intel Xeon SP Gold 6130 servers (Skylake)

IBM Cloud Private	IBM Power L922 (16-core, 256GB, 2 VMs)	Intel Xeon SP based 2-socket server (32-core, 256GB, 2 VMs)
Server price [2,3,4] -3-year warranty	**$25,932**	**$29,100**
Solution Cost [5] -Server + RHEL OS + Virtualization + ICP Cloud Native VPC Annual Subscription @ $250 per core per month x 36 months	**$180,049** ($25,932 + $10,117 + $144,000)	**$321,019** ($29,100 + $3,919 + $288,000)
Acme Air workload [1] Total Transactions per Second - With 2 VM's	**36,566 tps**	**39,312 tps**
TPS/K$	**203.1 tps/K$**	**122.5 tps/K$**

1.86X
per core performance

43%
Lower solution costs

1.66X
Better Price-performance

1. Based on IBM internal testing of a VM image running the Acme Air workload (https://github.com/acmeair) with containers bound to a socket including a MongoDB microservice. Results valid as of 3/17/18. and conducted under laboratory condition with speculative execution controls to mitigate user-to-kernel and user-to-user side-channel attacks on both systems, individual result can vary based on workload size, use of storage subsystems & other conditions.
2. IBM Power L922 (2x8-core/3.4 GHz/256 GB memory) 2 x 600GB SATA 7.2K rpm LFF HDD, 10 Gb two-port, 1 x 16gbps FCA, EDB Postgres Advanced Server 10, RHEL 7.4 with PowerVM (2partitions@8-cores each),
3. Competitive stack: 2-socket Intel Xeon Skylake Gold 6130 (2x20-core/2.1 GHz/256 GB memory), 2 x 600GB SATA 7.2K rpm LFF HDD, 1 Gb two-port, 1 x 16gbps FCA , RHEL 7.4, KVM (2 VMs@16-cores each)
4. Pricing is based on Power L922 http://www-03.ibm.com/systems/power/hardware/linux-lc.html, Typical industry standard x86 pricing **https://www.synnexcorp.com/us/govsolv/pricing/**
5. IBM software pricing for ICP Cloud Native VPC Monthly Subscription .

Power LC922 Server: Improved Price-Performance for Clients

Better Performance and Lower Cost running YCSB with MongoDB than tested Intel Xeon SP servers

Power LC922

472,927 Ops/sec

4 VMs @ 118,232 ops/sec

Intel Xeon SP Gold 6150 server:

$30,587

Intel Xeon SP Gold 6150

322,738 Ops/sec

3 VMs @ 107,579 ops/sec

Power LC922

$21,878

POWER9 + mongoDB

Power LC922 Delivers

2X

Price-performance

1. Based on IBM internal testing of MongoDB 3.6.2 using YCSB workload, Results valid as of 4/11/18 and conducted under laboratory condition with speculative execution controls to mitigate user-to-kernel and user-to-user side-channel attacks on both systems, individual results can vary based on workload size, use of storage subsystems & other conditions.
2. IBM Power LC922 (2x22-core/2.6 GHz/256 GB memory) using 2 x internal HDD, 10 GbE two-port, 1 x 16gbps FCA running 4VM's of Mongo 3.6 and RHEL 7.5 LE for Power9, running 4 VM's Mongo 3.6 and RHEL 7.5
3. Competitive stack: 2-socket Intel Xeon SP (Skylake) Gold 6150 (2x18-core/2.7 GHz/256 GB memory) using 2 x 300GB SATA 15K rpm HDD, 10 GbE two-port, 1 x 16gbps FCA , running 3 VM's Mongo 3.6 and RHEL 7.5
4. Pricing is based on Power LC922 http://www-03.ibm.com/systems/power/hardware/linux-lc.html and publicly available x86 pricing.

This presentation uses the IBM Plex™ font

	IBM Plex™ is our new typeface. It's global, it's versatile and it's distinctly IBM.
IBM Plex Sans	The IBM company is freeing itself from the cold, modernist cliché and replacing Helvetica with a new corporate typeface. Also replaces Arial, Calibri, Lucida Grande, Trebuchet, etc.
IBM Plex Mono	`A little` *`something`* `for` **`developers`**`. Replaces Courier New, Letter Gothic, Lucida Console, etc.`
IBM Plex Serif	A hybrid of the third kind (combining the best of Plex, *Bodoni*, and **Janson** into a contemporary serif). Replaces Cambria, Garamond, Lucida Bright, Times New Roman, etc.

IBM Plex is freely available as TrueType and OpenType at: https://github.com/IBM/plex/releases
and looks consistently good across Windows, Linux and Mac

