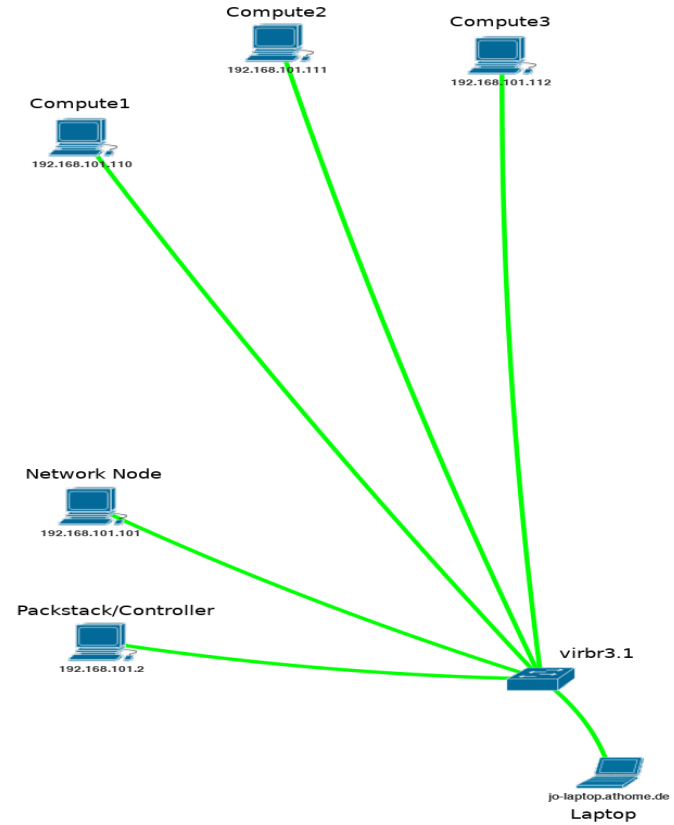


# Containerize your life!

How to live with always not enough resources

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# Demo



# AGENDA

The Promise

How to Virtualize without  
Virtualization?

The culprits of misusing a Container

Let's get our fingers dirty...

First Steps with LXD

And now the heavy stuff!

First Steps with libvirt

OpenStack: Install Packstack

# Disclaimer

# Warning

... this is not a traditional lab!

This Lab differs from others! It is not meant to be a guided tour through a technology! See it more as an experimental session to figure out the borders of technology...

So expect failures, questions and “agile customization”!

**And:** You **must not** copy+paste blindly as you will have to adapt commands to your environment!

# Instead of an USB Stick...

Content URL

The slides can be found under the following URL:

**[https://github.com/jthadden/OpenStack\\_Summit\\_2018\\_Vancouver/doc](https://github.com/jthadden/OpenStack_Summit_2018_Vancouver/doc)**

# The Promise

**You can (mis-)use a Container as a full  
blown Virtual Machine!  
Even better: You can virtualize without  
nesting!**



# The Culprit of Virtualization

The reason why we don't like it if we are not an enterprise!

- Resources
- Ressourcessss
- Ressourcessssssss

# OpenStack

... is a Whale!

A full blown OpenStack consists of at least

- 1 Installer (Director or other) (16GB RAM, 4CPUs, 100GB Disk)
- 3 Controllers (>12GB RAM, >4 CPUs, 100GB Disk)
- >2 Computes (>4GB RAM, >4 CPUs, 100GB Disk)
- Some Storage (e.g. for live migration) (>4GB RAM, 2 CPUs, >100GB Disk)

**At least 60GB RAM, 30 CPUs, 700GB Disk.**

I can do it with 24GB RAM, 2 CPUs + HT, 100GB Disk :-)

# How to Virtualize without Virtualization?

# How to Virtualize without Virtualization?

Some type of Container is your friend!

- chroot
- Container
- Other Ideas?

# Useful Container Technologies...

... and why we can't or don't want to use them (and I tried them all!)

I tried them all:

- Chroot
  - lacking of namespace separation and no own networking stack (because of the former)
- Docker
  - working but problems with (needed) privileged actions
- Legacy OpenVZ (vzctl)
  - does the job, but you might need to use the upstream package
  - not supported very well
- Lxc
  - does the job, but horrible to configure and use
- Systemd-nspawn
  - nested virtualization is a problem

# The best way today

- and why we have to cry

## LXD - the LXC Daemon

- It's actually a daemon for LXC.
- Coming from Canonical - so will probably die when Shuttleworth dies
  - BUT it's OpenSource! So who cares!
- LXD is based on LXC and that's running out of support of Red Hat (and might be removed in the future)
  - Never mind, we will use Fedora...

## If you don't like the LXD approach

- you can do it as well with Legacy OpenVZ (install vzctl-core)

# The culprits of misusing a Container

# Containers have several restrictions

- no nested selinux
- restricted systemd
- no auditd
- no sysctl
- no module loading
- problems with subscribing
- error with iscsi
  - open bug since YEARS now with missing namespacing in scsi-modules
- Probably more you will face!

**And many of them can not even been circumvented by running the container privileged!**



# **BUT:**

## **so many things are working like a charm**

- Booting :-)
- 99% networking
- firewalling
- namespaces
- virtualization
- 99.9% feeling of real machine

**Let's get our fingers dirty...**

# Need a VM?

There is a VM-Image of an already installed and configured Fedora-26 VM (qcow2):

<http://<IP>/isos/Fedora-26-RHTE.qcow2>

- make one with at least 16GB, 4CPU, 100GB HDD based on Fedora 26, copy CPU config
- start the VM and install Fedora 26
  - on other distros see: <https://linuxcontainers.org/lxd/getting-started-cli/>
- install needed Software

```
dnf -y upgrade
```

```
dnf -y groupinstall cloud-management
```

```
dnf -y install libguestfs-tools
```

# Enabling LXD

```
dnf -y copr enable ganto/lxd
dnf -y install lxd lxd-client lxd-tools
```

```
getent group lxd > /dev/null || groupadd -f -r lxd
echo "root:1000000:65536" >> /etc/subuid
echo "root:1000000:65536" >> /etc/subgid
setenforce 0
systemctl start lxd.service
usermod --append --groups lxd rhte
```

To make it permanent (e.g. in a special VM):

```
sed -i -e "s/SELINUX=enforcing/SELINUX=permissive/" /etc/selinux/config
systemctl enable lxd.service
```

# LXD can be used as a Server daemon

E.g. if you have some stronger machine in the cellar.

Add the following:

```
lxc config set core.https_address "[::]"  
lxc config set core.trust_password <your PW>  
firewall-cmd --add-port=8443/tcp --permanent  
firewall-cmd --reload
```

# Add some storage

There are numerous storage options like

- ZFS
- Btrfs
- LVM
- Plain Filesystem <- we will use that

Re-login as normal user rhte and execute:

```
lxc storage create default dir
```

```
lxc profile device add default root disk path=/ pool=default
```

# First Steps with LXD

# Start your first lightweight VM

All lxc commands should be issued as user rhte!

```
lxc image list images:|grep -i centos      # remote repository images
lxc image list                             # local available images
lxc launch images:centos/7 my-centos7-container
lxc exec my-centos7-container /bin/bash
lxc list [regexp]                          # to list containers with state
```



# Some more Commands

```
lxc info my-centos7-container          # getting Info
lxc {network|profile|config|storage} list
lxc {network|profile|config|storage} show
lxc config show compute0 --expanded   # getting all configs
                                         # (like image, storage, security)
ps aux | grep "containers compute0"   # find the monitoring process of a
                                         # container (e.g. if hanging)
lxc list security.privileged=true      # list all privileged containers
lxc start|stop|restart|pause
lxc file pull|push|edit <container>/<path> [-] # - means stdout

lxc config device add mycontainer vartest disk source=/var/www path=/var/test
                                         # attach a dir to a container
```

# Prepare a CentOS image for our special usage with LXD

- learn here the easy way
  - to do the things which are not working in an LXD-Container
- we need
  - a profile
  - the CentOS image in lxc (you know how to get it)
  - a rc.local file:  
[https://raw.githubusercontent.com/jthadden/OpenStack\\_Summit\\_2018\\_Vancouver/master/roles/layer2\\_bootstrap\\_container/files/rc.local-container](https://raw.githubusercontent.com/jthadden/OpenStack_Summit_2018_Vancouver/master/roles/layer2_bootstrap_container/files/rc.local-container)

# Create a new Profile

Remember: user is always rhte!

```
lxc profile create rhosp  
lxc network attach-profile virbr0 rhosp eth0  
lxc profile device add rhosp root disk path=/ pool=default  
lxc profile set rhosp security.privileged true
```

# rc.local

→ let us go through it, to understand what to do ←

on the git repo go to:  
`roles/layer2_bootstrap_container/files/rc.local-container`

# Prepare your CentOS with the rc.local

```
lxc image list
lxc launch -p rhosp images:centos/7 my-centos7-container
lxc exec my-centos7-container /bin/bash
# install and start sshd
yum -y install openssh-server file
systemctl enable sshd && systemctl start sshd
passwd root
# and try to sshd into it
lxc list
ssh root@<IP>
# get rc.local and execute
curl <...> -o /etc/rc.local
chmod 755 /etc/rc.local
systemctl enable rc-local
reboot
# look into logfile for execution of rc.local
```

# Let's try some real work!

# Install an IPA

# Prepare the Container

Set hostname, enable repos and install firewalld

```
# ssh into the container
hostnamectl set-hostname `hostname`.rhte.internal

yum repolist
yum install firewalld
systemctl enable firewalld && systemctl start firewalld
```



# Install and Configure IPA

```
yum -y install ipa-server ipa-server-dns
ipa-server-install --setup-dns --forwarder=8.8.8.8 -r \
`dnsdomainname|tr a-z A-Z` -p "changeme" -a "changeme" -U 2>&1 | \
tee ipa-install.out--setup-dns

# open the firewall accordingly
firewall-cmd --permanent \
--add-port={80/tcp,443/tcp,389/tcp,636/tcp,88/tcp,464/tcp,53/tcp,88/
udp,464/udp,53/udp,123/udp}
firewall-cmd --reload
```

# Test IPA

```
kinit admin  
klist  
ipa user-find admin
```

1. if you want to see the webinterface, use on your host something like  
`sshuttle -r root@<yourVMsIP> <yourContainersIP>`

2. add the host to your `/etc/hosts`  
`echo "<IPofContainer> my-centos7-container.rhte.internal" >> /etc/hosts`

3. Browse to your IPA  
`https://my-centos7-container.rhte.internal`

# Now try out VMs in Containers!

# Install libvirt

```
yum -y install libvirt libvirt-daemon-kvm  
systemctl enable libvirtd  
systemctl start libvirtd
```

# Try out libvirt in a container

*Note: You should always ssh -AX to your host...*

Attention: The following is done on the VM/your host, not in the container!

Map an image into the Container:

```
curl http://download.cirros-cloud.net/0.3.5/cirros-0.3.5-x86_64-disk.img \
-o cirros-0.3.5-x86_64-disk.img
```

```
lxc config device add my-centos7-container image disk \
source=`pwd`/cirros-0.3.5-x86_64-disk.img \
path=/var/lib/libvirt/images/cirros-0.3.5-x86_64-disk.img
```

Start virt-manager:

- Either install in the VM or use the sshuttle connection from the IPA test on your host.
- Add a new connection to your Container via ssh.
- Add a new VM, select the Image and start it.
- Look at your Host and Container for the VM: `pgrep -af kvm|grep kvm` .

You might want to stop this container now!

**And now the heavy stuff!**

**If OpenStack is working on that,  
then everything will do!**

**The git repo has the code for an ansible  
install of RDO in it:**

**[https://github.com/jthadden/OpenStack\\_Summit\\_2018\\_Vancouver.git](https://github.com/jthadden/OpenStack_Summit_2018_Vancouver.git)**



# git it and start it

*Note: You should always ssh -AX to your host...*

We are now working of the VM/Host again...

```
yum -y install git ansible libselinux-python python-firewall
git clone https://github.com/jthadden/OpenStack_Summit_2018_Vancouver.git
cd OpenStack_Summit_2018_Vancouver/
# add a host entry for localhost (see config_infrastructure.yml)
echo "<yourVMorHostIP> myserver" >> /etc/hosts
# when working with a VM: generate an ssh key or copy it over from your host:
ssh-keygen && ssh-add
./create.sh

# be patient...
```

# playbook usage

- to stop the containers use:  
`ansible-playbook -v -i hosts-OSSummit-minimal -e @config/config_OSSummit_minimal.yml -e @config/config_infrastructure.yml stop.yml`
- to start again the containers use:  
`ansible-playbook -v -i hosts-OSSummit-minimal -e @config/config_OSSummit_minimal.yml -e @config/config_infrastructure.yml start.yml`
- to destroy the cloud use:  
`ansible-playbook -v -i hosts-OSSummit-minimal -e @config/config_OSSummit_minimal.yml -e @config/config_infrastructure.yml destroy.yml`
- to install an extended version with 3 computes and a network node use:  
`ansible-playbook -v -i hosts-OSSummit -e @config/config_OSSummit.yml -e @config/config_infrastructure.yml create.yml`



**Please provide feedback.  
Please clone.**

# Thank you!