Ubuntu Micro Cloud - Cloud at Home

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Introduction

If you have questions/comments please feel free to ask them anytime. You don't have to hold them until the end of the talk.

If there are other resources similar to these that you think might be useful to people please let the group know.

Hopefully this will be an interactive and productive session.

Slides will be at https://grothe.us

Ubuntu Micro Cloud

Ubuntu Micro Cloud lets you set up your own personal cloud environment

% sudo snap install lxd microceph microovn microcloud

Installs the four components of Ubuntu Microcloud

Ubuntu Micro Cloud - LXD

LXD is Ubuntu's Container/VM Management system

LXD when running containers uses LXC underneath
LXD when running a VM uses QEMU/KVM

LXD has REST/API and CLI interfaces

LXD provides the ability to run Containers/VM on the cluster

LXD is the "compute" part of our cloud

Ubuntu Micro Cloud - MicroCeph

MicroCeph is Ubuntu's light weight/opinonated distribution of the Ceph distribution.

High availability requires 3+ nodes

Provides three types of storage

Block Storage (RBD): virtual hard drive for VM
Object Storage (S3/RGW): S3 compatible storage
File Storage (CephFS): Think Ceph's NFS/SMB

MicroCeph is the "storage" part of our cloud

Ubuntu Micro Cloud - MicroOVN

MicroOVN is Ubuntu's light weight distribution of the OVN (Open Virtual Network).

Provides Software-Defined Network

Overlay networks: private tunnel between physical servers
Distributed routing: each server is part of the virtual lan
Logical switches & firewalls: networking without physical changes

MicroOVN is the "network" part of our cloud

How do these map to AWS

Roughly they map in the following manner

LXD: Compute - Manages containers and VMs : AWS EC2
MicroCeph: Storage - handles data in cluster: AWS EBS/S3
MicroOVN: Networking - SDN: AWS VPC

MicroCloud is the glue that provides a consistent front end, packaging for the above components

Specs

What is a good basic cluster to show the capabilities of MicroCloud?

Ideally 3/5/7 systems - prefer odd numbers for Quorum

3 disks per machine - real disks (OS, Local ZFS, CephFS)
2 NICS - 10gb recommended
Memory - 32g+ for production
OS - Ubuntu 24.04 LTS
CPU - 8-core+ / XEON

Couple of FAQs

How big can an Ubuntu MicroCloud cluster be?

- Ubuntu says the recommended max size of 50 nodes. Bigger clusters are possible.

Does this work with Kubernetes?

- Microk8s - Ubuntu Micro Kubernetes software can run alongside MicroCloud and use the other components of the environment

Couple of FAQs

What OSes does this work with?

Ubuntu LTS is highly recommend as a baseline. MicroCloud requires snap. People have gotten it to work with Debian, but this requires ZFS additions and others to Debian.

Can I run an Docker/Podman/OCI image on the cloud?

Yes, but. LXD can run it as a system container. Lots of images are stripped and don't have init, etc. won't work. Preferred solution is to create docker/podman in standard lxd container.

Demo - Ubuntu MicroCloud

- Time to fire up a quick demo

This is a Virtualbox image of a quick one node system

Specs

Ubuntu 24.04 LTS
3 virtual disks
2 interfaces - both bridged
4 cores
16gb ram

Demo part 1

Need to install MicroCloud

% sudo snap install lxd microceph microovn microcloud

Need to do basic setup of MicroCloud

% sudo microcloud init

Demo part 2

Set up more than one machine?

For this we'll select "No" - skips discovery

Configure local storage?

Select "Yes" - Creates local ZFS storage

Configure distributed storage?

Select "Yes" - Creates Ceph storage pool

Demo part 3

Configure distributed networking (OVN)?

Select yes. Allows you to potentially add additional resources in future

Validate cloud is up and live

% microcloud status
% lxc cluster list - should show one node

Demo part 4

Fire up a container

```
% lxc launch ubuntu:24.04 web-server
```

Install apache inside the container

```
% lxc exec web-server  apt update
% lxc exec web-server apt install apache2 -y
```

Verify working

```
% curl <container-ip>
```

Demo part 5

Expose port so host system can see it

```
% lxc config device add web-server web-proxy proxy
listen=tcp:0.0.0.0:8080 connect=tcp:127.0.0.1:80
```

Hit the webpage from the base system

```
% curl http://localhost:8080
```

WebUI

Does this thing have a GUI? I'm not a CLI kind of guy

Yes. you can hit it localhost:8443

You have to create a certificate for it

We'll go ahead and do that now

Demo 2 - Adding a Node to Cluster

So time to add a node to the cluster. This is a clone of the original cluster node.

Install the packages

```
% sudo snap install lxd microovn microceph microcloud
```

On the original node

```
% sudo microcloud add
```

Demo 2 - Adding a Node to Cluster

On the node adding to cluster

```
% sudo microcloud join
```

Will be asked to put the code in for the joining

Validate the cluster is working

```
% lxc cluster list
```

Demo 2 - Adding a Node to Cluster

Validate storage

```
% lxc storage list
```

Demo 2 - Move image to New Node

Move the instance

```
% lxc move web-server –target node-02 –stateless
```

Shuts down the job, moves it to node-02

VMs works without issue, containers require CRUI to be installed on both nodes and can be a bit finicky about it

Demo 2 - Move image to New Node

Validate move

```
% lxc info web-server
% lxc info web-server | grep Location
```

Grab the apache test page

```
% curl http://localhost:8080
```

Demo 2 - Turn off Node 1

Shutdown Node 1

```
% shutdown -h now
```

Grab the apache test page

```
% curl http://localhost:8080
```

Demo 2 - Turn off Node 1

Try and get cluster information

```
% lxc cluster list
```

Why does this fail?

I've only got two nodes in this demo, so when it fails it doesn't have a quorum. So you should have odd number of nodes.

Grab the apache test page

```
% curl http://localhost:8080
```

Demo 2 - Turn Node 1 back on

Turn the first node back on and give it a couple of minutes to recover

Validate cluster is recovered

```
% lxc cluster list
```

Couple of Other things

Show the storage allocated in system

```
% lxc storage volume list
```

Show remote storage

```
% lxc storage volume list remote
```

Couple of Other things

Create a storage volume

```
% lxc storage volume create remote volume data size=1GB
```

Attach remote storage

```
% lxc storage volume attach remote data web-server /mnt/data
```

Does these on top of Ceph system

Tips - 6 Tips for a Better Experience

1. You need reserved IP addresses. If you use DHCP you need to make sure you've got reservations
2. It requires whole disks, you can't partition a disk and have part of it be Local Storage, and part of it be distributed storage
3. You can put all your nodes into the cluster when you do the initial build. This can be a lot smoother
4. Use an Ubuntu LTS version. Debian and the Normal Ubuntu releases are possible, but aren't worth the effort
5. Setup a Virtual environment to try it out before committing to real hardware, snapshots are your friend
6. Lxd uses the lxc commands, keep that in mind. It can be frustrating to type lxd when you should have done lxc

Comparing MicroCloud to ProxMox

ProxMox and MicroCloud both have their uses and benefits

MicroCloud is designed to be a full environment running on top of Ubuntu, providing cloud like services

ProxMox is an Operating system designed to enhance virtualization, improving virtualization utilization and abilities

MicroCloud is more demanding in terms of network interfaces/disk drives and so on

Either can be a fine addition to your home lab

Summary

Ubuntu MicroCloud has been around for almost 5 years, they keep adding capabilities: E.g. MicroOVN was added about 2 years ago. Documentation and system keep improving. Integration needs to keep improving between components.

Ubuntu MicroCloud can be a good way for you to get experience on setting up your own private cloud at home

Having worked with OpenStack and Eucalyptus in the past. Can say this is the easiest cloud I've ever built

Make a few VMs on a machine and give it a shot, don't think you'll be disappointed.

Thanks

Thanks for Listening

Any Questions?

Links

Ubuntu MicroCloud Homepage

- https://documentation.ubuntu.com/microcloud/v2-edge/microcloud/

Github page for MicroCloud

- https://github.com/canonical/microcloud

Links

Good Youtube Video on Ubuntu MicroCloud

- https://www.youtube.com/watch?v=tSJqjZjLrig

Ubuntu MicroCloud Overview

- https://www.youtube.com/watch?v=hzK0ZUj9TLs

Installing MicroCloud on Debian for Masochists only :-)

- https://www.youtube.com/watch?v=PKEGBt6xRt8