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LINUXCONFAU
ONLINE 2022

Building an Ephemeral World

lasting a very short time; short-lived; transitory

Steven Ellis - Red Hat

Red Hat

Agenda

Why - always start with Why

- and bit of history

What - An overview of the technology

- Image Builder / osbuild & Buildah

How - can you use these tools

- A bit of a demo
  - https://github.com/steven-ellis/ephemeral-world/

Why - did we get there

Ephemeral

Death .. appears to have some sneaking regard and compassion for a race of creatures which are to him as **ephemeral as mayflies**

https://www.theguardian.com/society/2010/feb/02/terry-pratchett-assisted-suicide-tribunal

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WHY?

Security is hard
- and so is change

Cloud has (almost) changed everything
- not everything runs in the cloud

Consistency and repeatability are (can be) difficult
- Physical - Virtual - Cloud - Container
- Plus legacy appliances and the future of IOT

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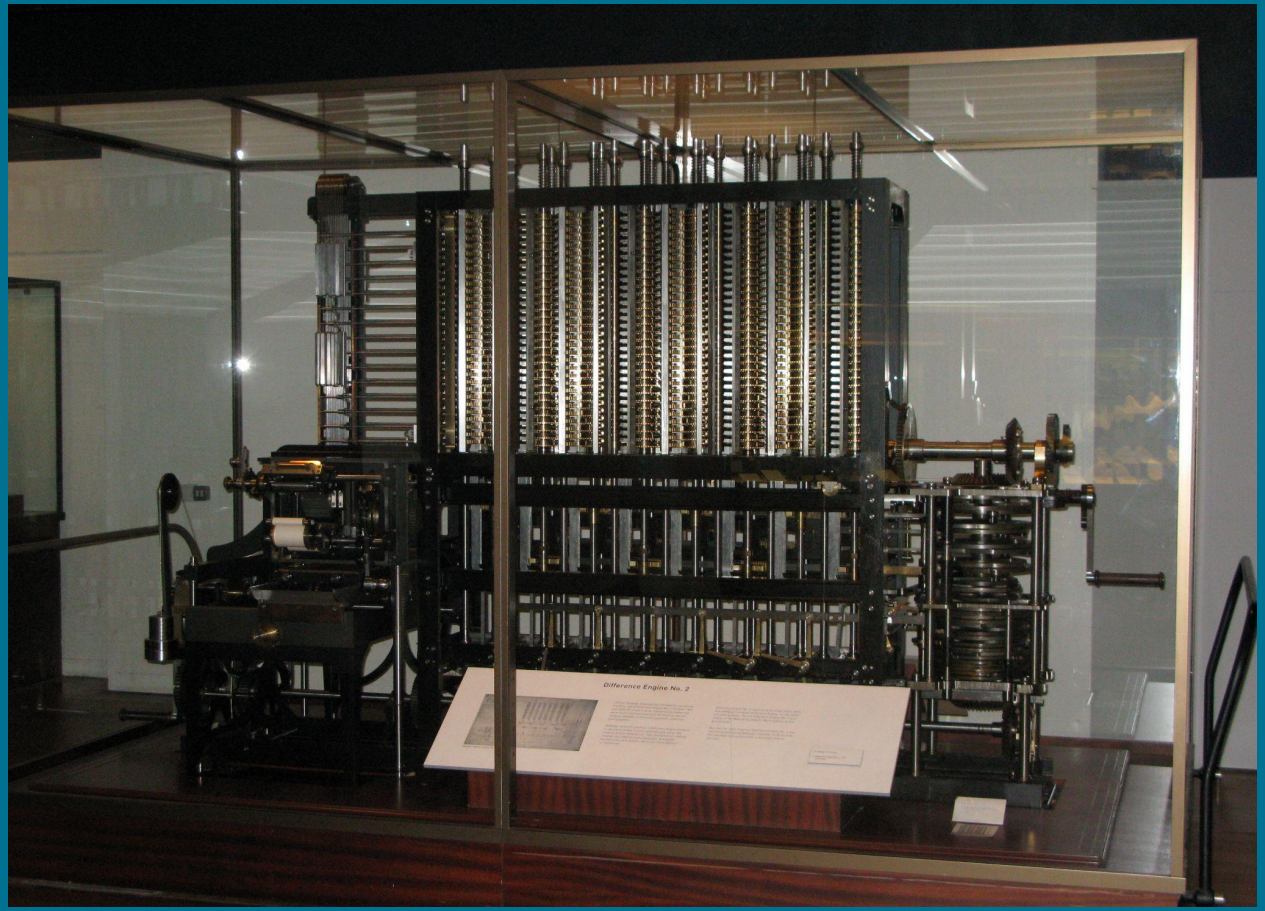

Babbage's Difference Engine at London's Science Museum

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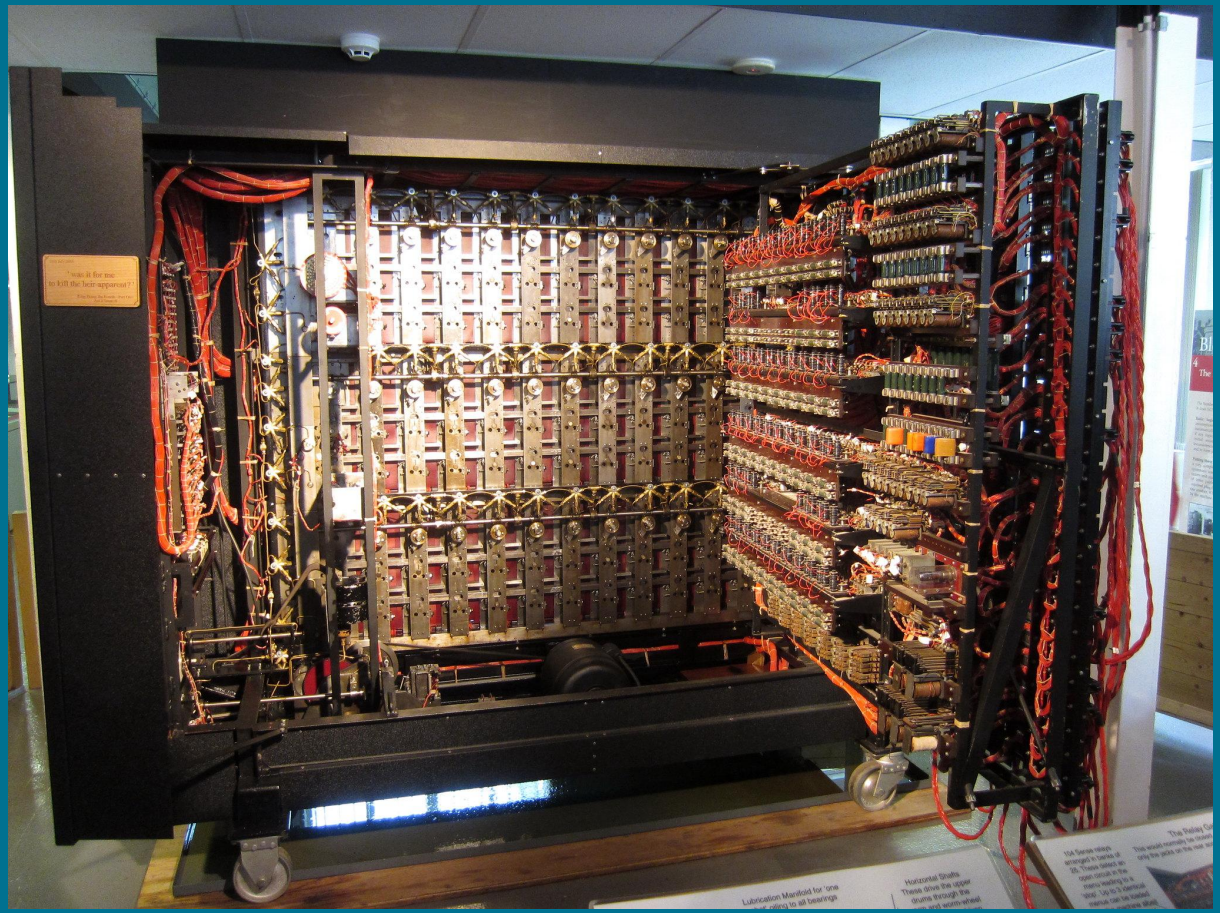

Turing machine
in Bletchley Park

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IBM S/390
Mainframe

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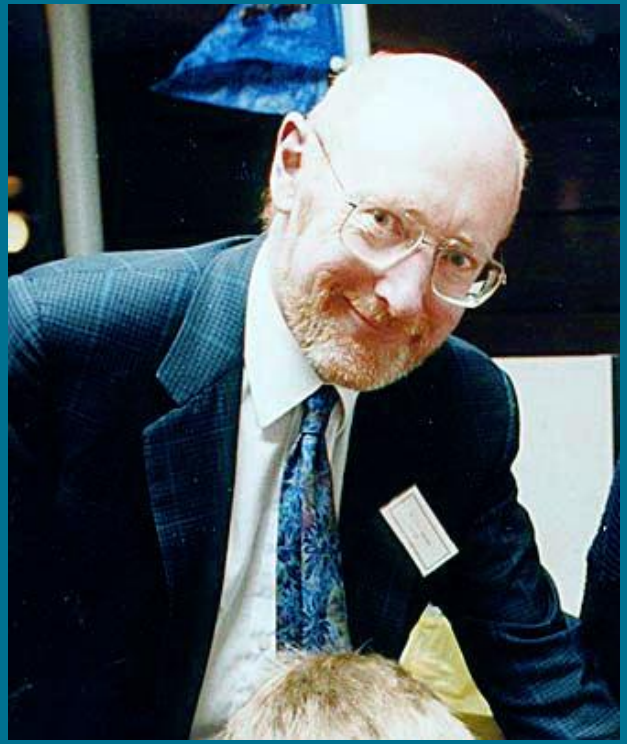

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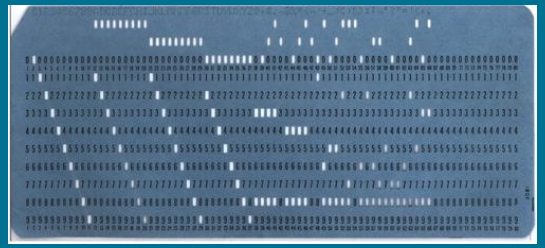
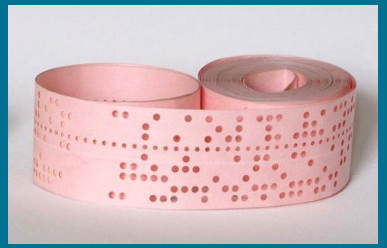
PD - https://commons.wikimedia.org/wiki/File:Sinclair.600pix.crop.jpg

CC BY-SA 2.0 FR https://commons.wikimedia.org/wiki/File:ZX81-IMG_0307_A.JPG

Installing the OS





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Ref - https://www.theregister.com/2013/09/09/feature_history_of_enterprise_storage/
https://www.redhat.com/en/command-line-heroes/season-4

Infrastructure as Code

LCA 2008 - Reliable, Repeatable, Reproducible Infrastructure

- https://sysadmin.miniconf.org/presentations08.html#02
- https://mirror.linux.org.au/pub/linux.conf.au/2008/Tue/mel8-720.ogg
- Imaging systems vs Kickstart
- Physical and Virtual environments
- Patching vs rebuilding
- Security and hardening
- Post build automation using CFEngine or Puppet
- Single Sign On

And yet

Snowflakes & Dwarf Axes

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https://pixabay.com/illustrations/character-dwarf-axe-male-render-5959772/

My Dwarf Axe

KnoppMyth R5
Mythbuntu 9.10
Ubuntu 64 Bit

Socket 939 Athlon 3000+
AMD AM2 + Athlon X2 3600
AMD B450M + Athlon 200GE

First recording: **Saturday February 4th, 2006**

Total Recorded: **2 years 25 days 13 hrs 36 mins**

Single 250GB IDE
Dual 2TB SATA
Dual 4TB SATA
\+ nVME Boot

Single Analog Tuner
\+ DVB-T Tuner
\+ DVB-S Tuner
Dual DVB-T2 + 4 DVB-S2 + IPTV

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https://mirror.linux.org.au/pub/linux.conf.au/2008/slides/054-Consumer%20View%20Of%20Technology.odp
https://mirror.linux.org.au/pub/linux.conf.au/2008/Wed/mel8-054.ogg

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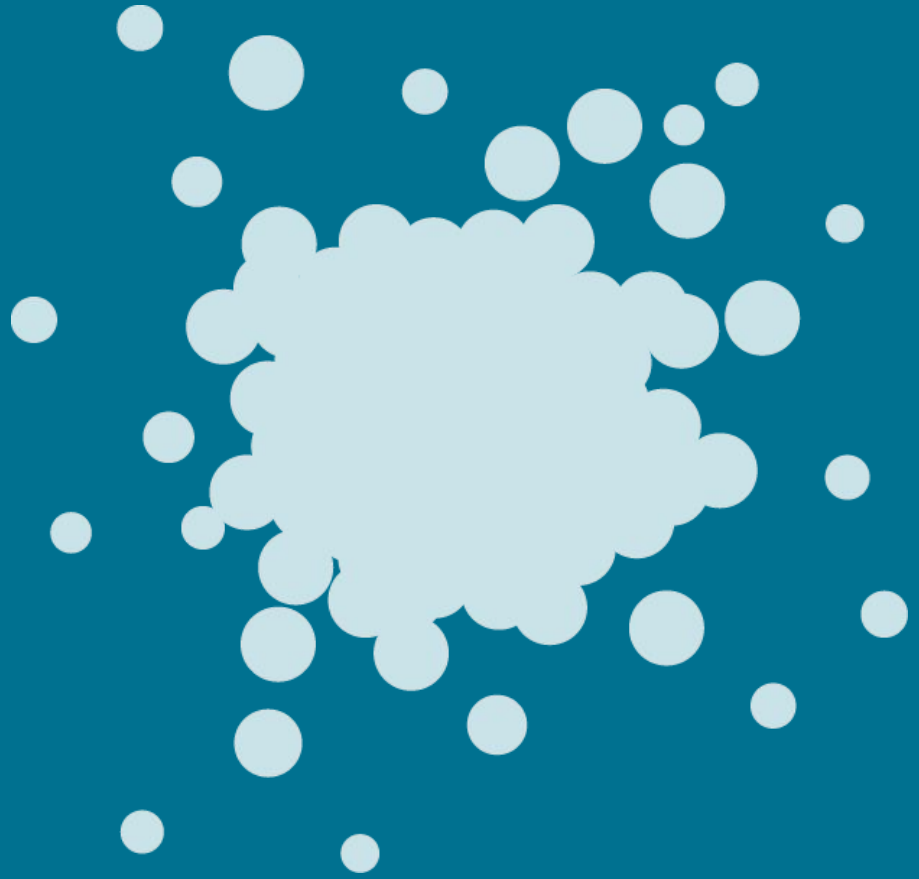

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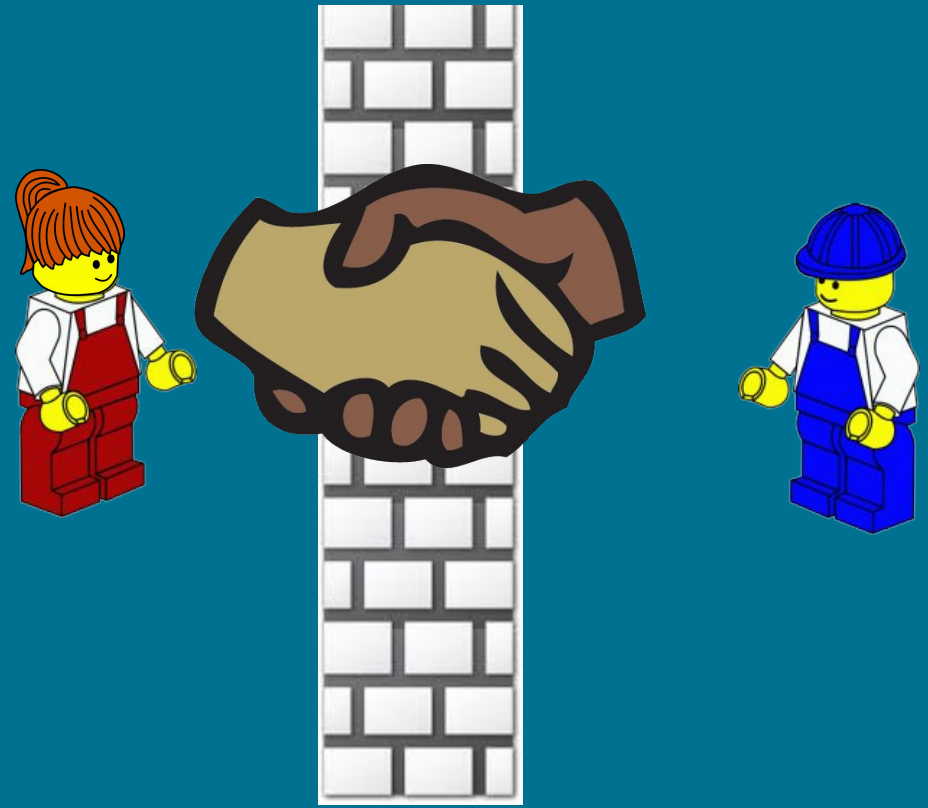
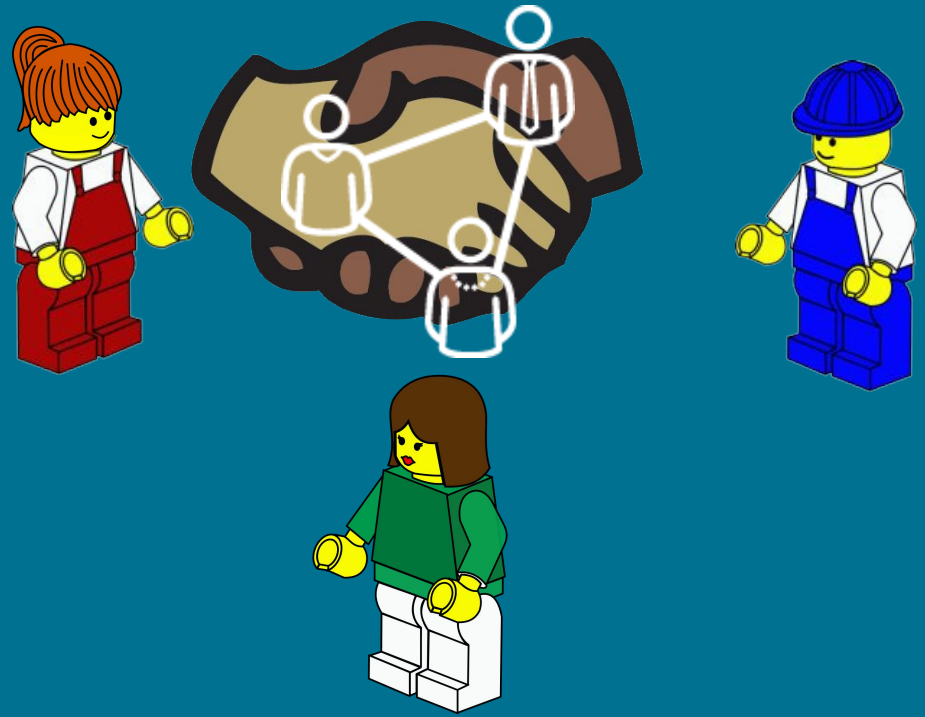
Dev & Ops



DevSecOps



STAGEFRIGHT

Changing Needs

Dev met Ops and talked about Security

Consistency -> Repeatability

Speed of delivery becomes everything

- Months -> Weeks -> Days -> Hours -> Minutes -> Seconds

What

https://www.osbuild.org

Image Builder creates Operating System Images

https://buildah.io/

buildah

Buildah creates OCI compatible container images

Image Builder / OSBuild

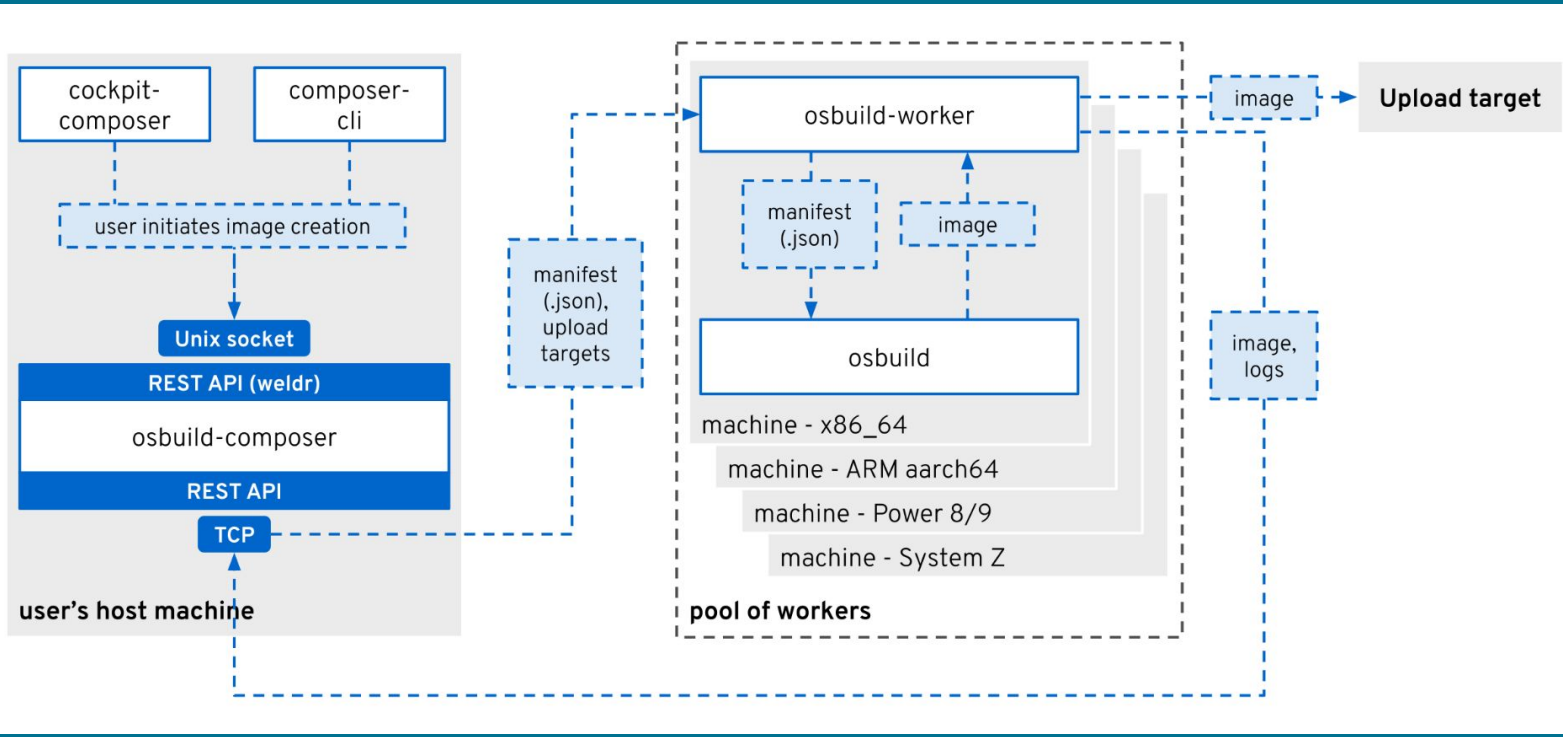
Image Builder represents the UIs for the osbuild services

- WebUI
  - cockpit-composer
- Cli
  - composer-cli
- SaaS
  - clouddot - Red Hat Hosted Service

OSBuild provides the operating system composition service

- REST API - osbuild-composer
- osbuild-worker
- osbuild

Architecture



REF - https://raw.githubusercontent.com/osbuild/osbuild-composer/main/docs/osbuild-composer.svg

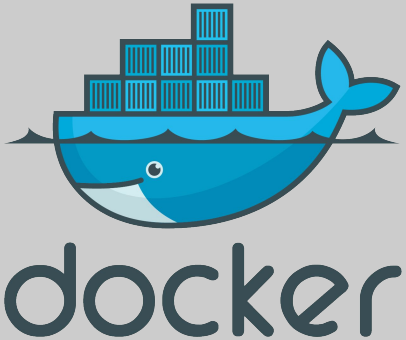
Builds and Targets

Each target platform has a set of standard packages and requirements

- ami
- IOT (OStree-commits)
- openstack
- qcow2
- vhd
- vmdk

- Architectures currently include
  - x86_64
  - aarch64
  - ppc64le
  - s390x

Container Standards : Alternative Tooling

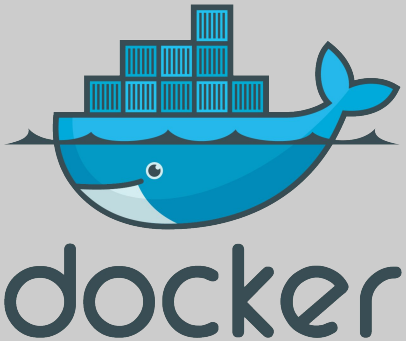


podman

skopeo

buildah

Container Standards : Runtime interfaces



buildah

Experience

- OCI Container images compatible with Docker format
- Multi-stage builds supported with and without dockerfiles
- Customizable image layer caching
- Shares the underlying image and storage components with CRI-O
- Build OCI compatible images as a non-root user

How

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https://github.com/steven-ellis/ephemeral-world

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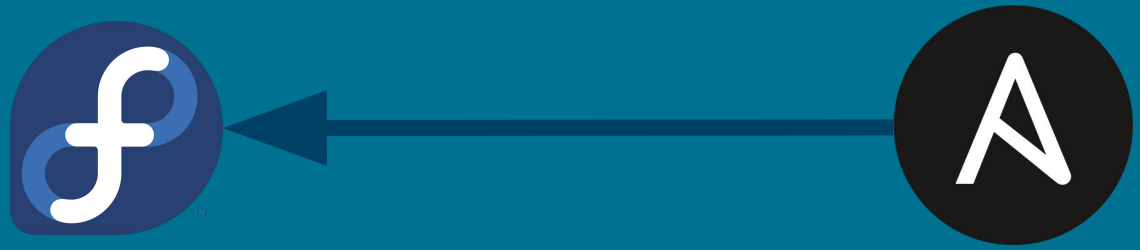
Keeping it Ephemeral



LibVirt

QEMU

KVM

Fedora 35 Host

buildah

Ephemeral Host

Bootstrap our KVM qcow2 image

- https://github.com/steven-ellis/ephemeral-world/blob/main/docs/Demo_VM.adoc
  - Fedora 35
  - RHEL 8.5
  - RHEL 9 Beta

Install / Configure Image Builder, buildah and cockpit

- https://github.com/steven-ellis/ephemeral-world/blob/main/docs/Demo_Setup.adoc

Because it is a demo

We've taken some shortcuts

- ssh login as root with password = password

```
virt-customize -a ${VM_IMAGE} \
-root-password password:password --uninstall cloud-init \
--run-command 'echo PermitRootLogin yes >> /etc/ssh/sshd_config'
```

Hosted Labs

Image Builder

- https://lab.redhat.com/imagebuilder
- https://lab.redhat.com/imagebuilder-cli

Buildah

- https://lab.redhat.com/buildah

FREE - No registration required.

Image Builder Demo

Using the Our Fedora Host VM

- https://github.com/steven-ellis/ephemeral-world/blob/main/docs/ImageBuilder.adoc

WebUI vs CLI

Simple Web Server Demo - and gotchas

Auto-Upload to AWS/Azure

aws-config.toml

```
provider = "aws"

[settings]
accessKeyID = "AWS_ACCESS_KEY_ID"
secretAccessKey = "AWS_SECRET_ACCESS_KEY"
bucket = "AWS_BUCKET"
region = "AWS_REGION"
key = "OBJECT_KEY"
```

```
$ sudo composer-cli compose start base-image-with-tmux
ami IMAGE_KEY aws-config.toml
```

azure.toml

```
provider = "azure"

[settings]
storageAccount = "your storage account name"
storageAccessKey = "storage access key you copied in
the Azure portal"
container = "your storage container name"
```

```
# composer-cli compose start my_blueprint vhd
my_image_key azure.toml
```

Gotchas / Issues

"depsovle" doesn't catch everything

- composer-cli blueprints depsolve <blueprint>

Some targets have additional specific requirements

- My "Podder" image needed "container-selinux" for qcow2 on RHEL85
- It wasn't picked up as a dependency

WebUI sometimes needs a forced refresh

Buildah Demo

Using the Same Fedora Host VM

- https://github.com/steven-ellis/ephemeral-world/blob/main/docs/Buildah.adoc

Standard Docker File based Image

Scripted container creation

Micro image using host tools.

Alternatives

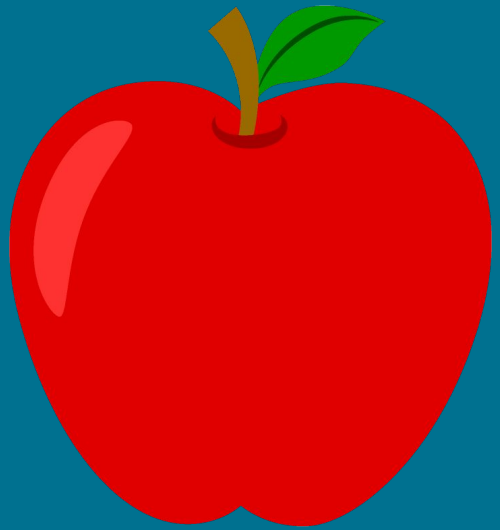
Image Builder

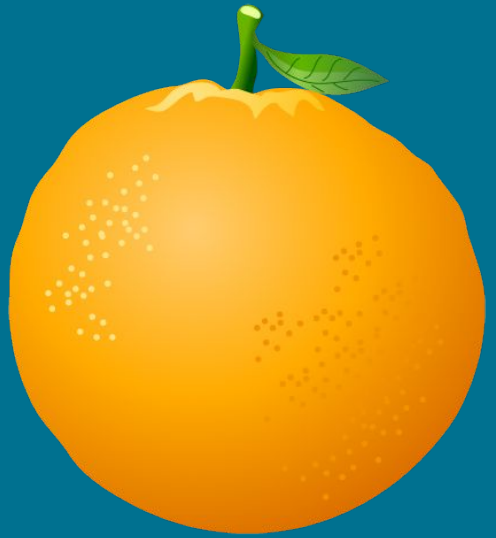
- Packer
- EC2 Image Builder
- kickstart

Buildah

- Docker
- Kaniko
- BuildKit
- S2I
- ....

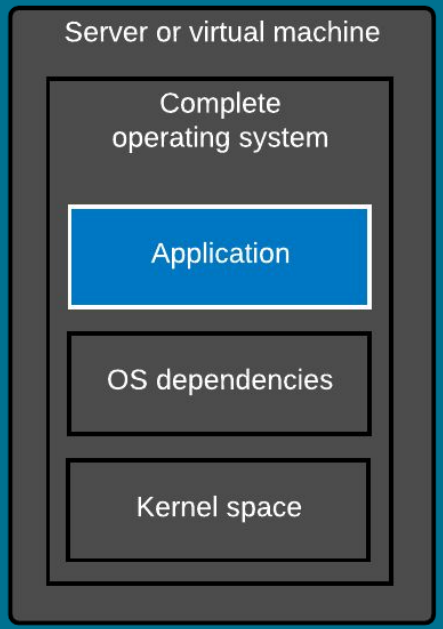
Image Builder vs Buildah



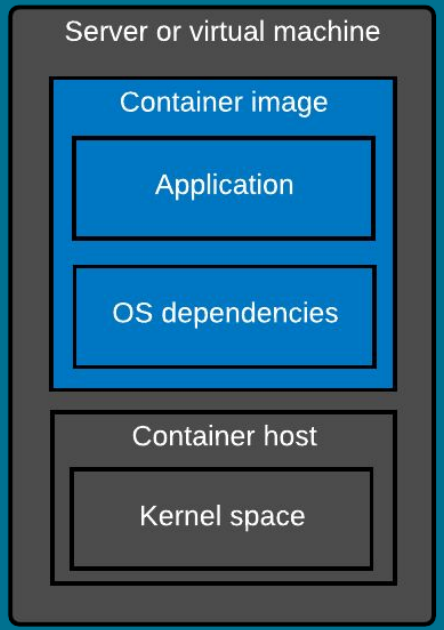


Optimized for agility

Optimized for stability



Traditional
Servers & Applications



Container
Hosts & Images

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REF - http://crunchtools.com/comparison-linux-container-images/

Image Sizes

QCOW Images

360M - Fedora-Cloud-Base-35-1.2.x86_64.qcow2
569M - Fedora Web VM

744M - rhel-8.5-x86_64-kvm.qcow2
877M - RHEL8.5 Podman VM

RPM Package Counts

556 - Fedora Demo VM
401 - Fedora Web VM

609 - RHEL85 Demo VM
476 - RHEL85 Podman VM

Container Images

107 MB - ubi8/ubi-minimal

179 MB - localhost/ubi-minimal-httpd

38.8 MB - ubi8/ubi-micro

140MB - localhost/ubi-micro-httpd

470MB - rhel8/httpd-24

5.9MB - docker.io/libraryalpine

148MB - docker.io/library/httpd

Red Hat

REF - http://crunchtools.com/comparison-linux-container-images/

Image Builder vs Buildah

Full OS Image	Application and dependencies
Multiple running services	Single app/service
Infrastructure Agnostic	Need an OCI Runtime
Versioned Blueprints	Version via version control
Currently supports Fedora/RHEL/Centos/Arch	Distro Independent

Open Source

Infrastructure as Code

Consistent / Repeatable

Roadmap

Image Builder

- Hosted Build Service
- IOT enhancements
  - OSTree
  - OCI support
- Dev Tool Integrations - eg Koji

Buildah

- https://github.com/containers/buildah/blob/main/developmentplan.md
- OCI Compliance
- Dev Tool Integrations - eg Koji
- Closely tied to podman roadmap

Gaps / Issues

Image Builder

- Composer WebUI has limited features
- Troubleshooting is hard
- You need OS / Arch Specific workers
- You can't exclude packages
  - Eg qcow2 images include cockpit
- You can't integrate ad-hoc files
  - yet

Buildah

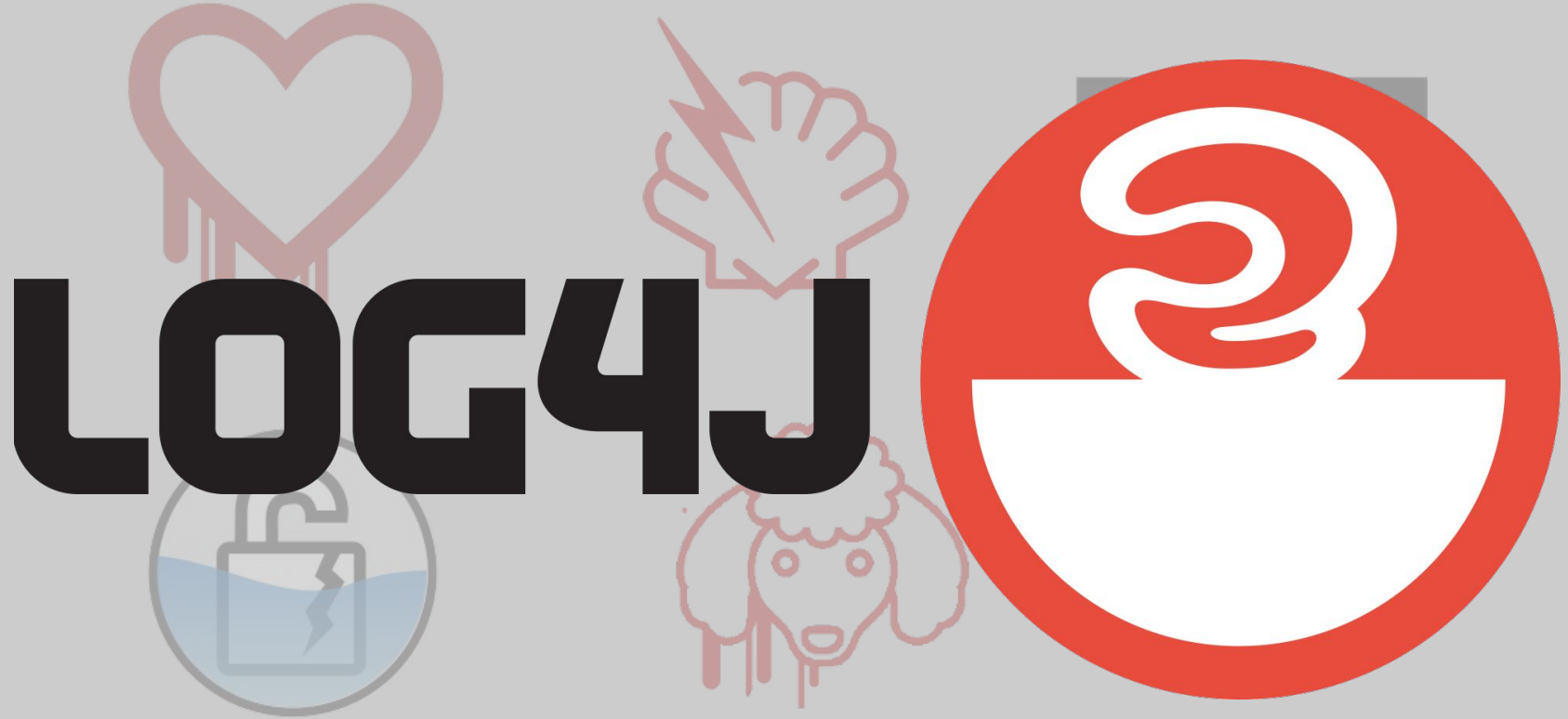
- Host and target conflicts
  - RPM DB changes
- Getting easier to use as a drop in replacement with CI/CD tools

WHY

Security is hard
- Infrastructure as code can help

Cloud has (almost) changed everything
- not everything runs in the cloud

Consistency -> Repeatability
- Physical - Virtual - Cloud - Container - Edge - IOT
- Seeing some convergence within the tools


LOG4J

Questions?

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References

- https://people.redhat.com/sellis
- https://github.com/steven-ellis/ephemeral-world/
- https://www.osbuild.org/
- https://buildah.io
- https://fedoramagazine.org/introduction-to-image-builder/
- https://major.io/2020/06/19/build-aws-images-with-imagebuilder/
- https://www.redhat.com/en/command-line-heroes/season-4

Hosted Labs

- https://lab.redhat.com/imagebuilder
- https://lab.redhat.com/imagebuilder-cli
- https://lab.redhat.com/buildah

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Images

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ZX 81 - CC BY-SA 2.0 FR

- https://commons.wikimedia.org/wiki/File:ZX81-IMG_0307_A.JPG

OSBuild Architecture

- https://raw.githubusercontent.com/osbuild/osbuild-composer/main/docs/osbuild-composer.svg

Snowflake CC BY 2.0

- https://www.flickr.com/photos/chaoticmind75/49268744233

Dwarf & Axe - PD

- https://pixabay.com/illustrations/character-dwarf-axe-male-render-5959772/

Log4J - Apache License, Version 2.0

- https://commons.wikimedia.org/wiki/File:Apache_Log4j_Logo.png

Fedora Logo - © Red Hat

- https://fedoraproject.org/wiki/Logo