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BUILDING BOOTABLE CONTAINER IMAGES IN PULP

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Agenda

- Defining the Challenges
- Introducing the Solution
- How Pulp Fits in
- Real-World Use Cases with a Demo
- Q&A and Discussion

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What Problems Are We Trying to Solve?

- Complexity in System Management
- Fragmented Day 1 and Day 2 Workflows
- Upgrade and Package Management Issues
- Bootable Artifact Distribution
- Inconsistent Artifact Types
- Need for Multiple Image Variants

How Can We Solve These Problems?

- By using **standard container practices**
  - Leverage the existing Container Ecosystem
  - Distribute bootable artifacts via Container Registries
  - Apply and manage OS changes within image layers
  - Integrate with Security Scanning
  - Sign and attest the images

What are Bootable Container Images?

- OCI Images designed to be used as a bootable operating system
- Based on the OSTree technology
- Build the OS by leveraging the build process with Containerfiles

Containerfile

```
# Base image
FROM quay.io/fedora/fedora-bootc:40

# Install the "hello" package using DNF package manager
RUN dnf install -y hello
```

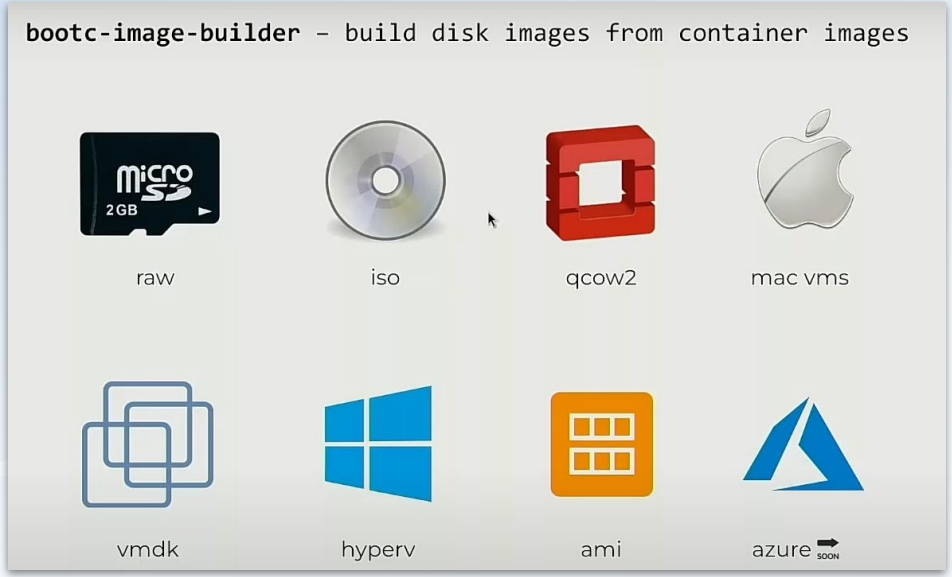
bootc

```
# Step 1: Initialize the system with a Fedora bootable container image
sudo bootc init quay.io/fedora/fedora-bootc:40

# Step 2: Upgrade the system to the latest version of the current image
sudo bootc upgrade

# Step 3: Upgrade to a specific newer version of the Fedora bootable container image
sudo bootc upgrade quay.io/fedora/fedora-bootc:41
```

Running the Image



Here Comes Pulp

- Pulp has a Container Registry
  - You can upload Containerfiles into Pulp
  - (Bootable) images will be automatically built
  - The images will be automatically distributed

Building Images in Pulp

```
# Step 1: Create the Containerfile with the specified content
cat << EOF > /tmp/Containerfile
FROM quay.io/fedora/fedora-bootc:40
RUN dnf install -y hello
COPY [configuration files]
EOF

# Step 2: Create a file repository named 'build_context'
pulp file repository create --name build_context

# Step 3: Upload the Containerfile to the 'build_context' repository
pulp file content upload \
    --relative-path Containerfile \
    --file /tmp/Containerfile \
    --repository build_context
```

Building Images in Pulp

```
# Step 4: Create a container repository named 'building'
pulp container repository create --name building

# Step 5: Build the bootable image in the 'building' repository using 'build_context
pulp container repository build-image \
    --name building \
    --build-context build_context \
    --version 1

# Step 6: Make the built image available by creating a container distribution
pulp container distribution create \
    --name building \
    --repository building \
    --base-path test
```

Consuming Images from Pulp

```
# Step 1: Initialize the system with a Fedora bootable container image
sudo bootc init pulp-container:5001/test

# Step 2: Upgrade the system to the latest version of the current image
sudo bootc upgrade
```

DEMO

- BUILDING THE IMAGE IN PULP
  - create a container repository
  - create a file repository
  - create the Containerfile and push it to Pulp
  - build the image in Pulp
  - create a container distribution

- RUNNING THE CONTAINER IMAGE AS A VM
  - create a config file to add the admin user to the disk image
  - build the disk image using bootc-image-builder
  - run a vm using the qcow2 image

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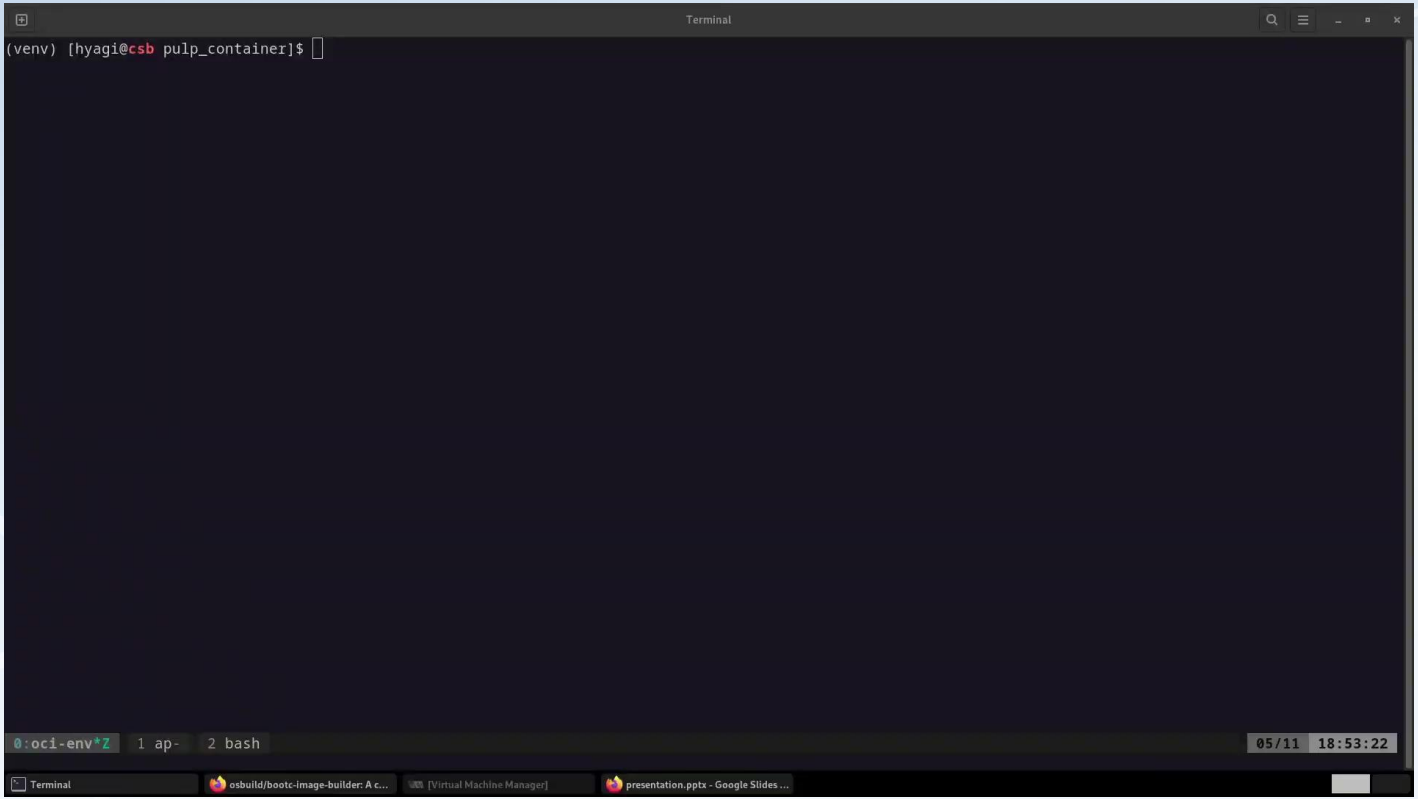

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REFERENCES

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https://docs.fedoraproject.org/en-US/bootc/getting-started/

https://github.com/osbuild/bootc-image-builder

https://www.youtube.com/watch?v=ERVyBc_fElY
https://www.youtube.com/watch?v=QaKl5z6dFlM