

Software distribution for a new era

Software distribution for a new era

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Who am I

- F/OSS

Who am I

- Fedora Project

Who am I

- OpenStack

Who am I

- Tinkerer

Who am I

- ...

Software distribution

Windows

- .exe executable

Windows

- .exe executable
- .msi installer

Windows

- .exe executable
- .msi installer
- Store

Linux

Problem space

- Software packages

Problem space

- Software packages
 - who creates them?

Transactions

- `dnf history list`

Dependency hell

Dependency hell

- `.dll`
- Visual Basic runtime
- Visual C++ runtime

Dependency hell

- `.NET`
- `gac` (global assembly cache)
- local libraries

Mac OS

- executable
- yellow package (`.pkg`)
- `[name].app` (`dmg`)

Structure

```
/
Applications/
  Calculator.app/
    MacOS/
      Calculator
    Resources/
      ...
```

dependency hell

- (g)libc
- GTK

Solutions

Solutions

- static compilation

Solutions

- or ...

Solutions

- containers

Solutions

- containers
- ...

Containers

Containers

... as the 'Delivery Unit'

Docker

Example

Example

- youtube-dl

Example

- youtube-dl
- CentOS 7

Alias

```
$ cat ~/.zshrc.d/alias.sh
```

```
alias stack='docker run -it --rm -v ~/.stack:/root/.stack registry.gitlab.com/gbraad/openstack-client:latest'
alias openstack='docker run -it --rm -v ~/.config/openstack:/root/.config/openstack registry.gitlab.com/gbraad/openstack-client:latest'
alias youtube-dl='docker run --rm -u $(id -u):$(id -g) -v $PWD:/data vimagick/youtube-dl'
```

Invoke

```
$ youtube-dl https://youtu.be/SquTeFYq3K8
```

Invoke

```
$ youtube-dl https://youtu.be/SquTeFYq3K8
```

```
Unable to find image 'vimagick/youtube-dl:latest' locally
latest: Pulling from vimagick/youtube-dl
e110a4a17941: Already exists
a0733e3a9603: Pull complete
eaf92aad0831: Pull complete
Digest: sha256:24a24cbddbfc695f210bbf21769c60eea9626cf90fad4f3f9b41279a0bfd22e7
Status: Downloaded newer image for vimagick/youtube-dl:latest
```

Invoke

```
$ youtube-dl https://youtu.be/SquTeFYq3K8
```

```
Unable to find image 'vimagick/youtube-dl:latest' locally
latest: Pulling from vimagick/youtube-dl
e110a4a17941: Already exists
a0733e3a9603: Pull complete
eaf92aad0831: Pull complete
Digest: sha256:24a24cbddbfc695f210bbf21769c60eea9626cf90fad4f3f9b41279a0bfd22e7
Status: Downloaded newer image for vimagick/youtube-dl:latest
[youtube] SquTeFYq3K8: Downloading webpage
[youtube] SquTeFYq3K8: Downloading video info webpage
[youtube] SquTeFYq3K8: Extracting video information
[youtube] SquTeFYq3K8: Downloading MPD manifest
[download] Destination: Tomorrowland 2015 _ Josh Wink-SquTeFYq3K8.f248.webm
[download] 100% of 2.07GiB in 01:31:12MiB/s ETA 00:008:27
[download] Destination: Tomorrowland 2015 _ Josh Wink-SquTeFYq3K8.f251.webm
[download] 100% of 90.05MiB in 00:05:26MiB/s ETA 00:00505
[ffmpeg] Merging formats into "Tomorrowland 2015 _ Josh Wink-SquTeFYq3K8.webm"
Deleting original file Tomorrowland 2015 _ Josh Wink-SquTeFYq3K8.f248.webm (pass -k to keep)
Deleting original file Tomorrowland 2015 _ Josh Wink-SquTeFYq3K8.f251.webm (pass -k to keep)
```

Software bundle

```
$ docker pull gbraad/mono
Using default tag: latest
Trying to pull repository docker.io/gbraad/mono ...
```

```
latest: Pulling from docker.io/gbraad/mono
7c91a140e7a1: Already exists
f01a995607d8: Downloading [====>
```

```
] 19.97 MB/239.7 MB
```

OpenStack client

```
$ openstack --os-cloud dream server list
```

```
+-----+-----+-----+-----+
| ID                | Name | Status | Networks |
+-----+-----+-----+-----+
| bbeda46a-080d-4941-846a-86170ccc60bf | vps13 | ACTIVE | public=2607:f298:5:101d:f816:3eff:fe9e:53a1, |
+-----+-----+-----+-----+
```

What just happened?

- image is pulled from a registry
- composed
 - base
 - application

Composition

Dockerfile

```
FROM fedora:23
RUN dnf install -y python-openstackclient
VOLUME [...]
CMD [...]
```

Composition

Dockerfile

```
FROM fedora:23
RUN dnf install -y python-pip; pip install python-openstackclient
VOLUME [...]
CMD [...]
```

Building

```
$ docker build .
```

Removing

```
$ docker rmi [imagename]
```

Role of packages

- used for composition
- deliverable is a container

Upgrade process

```
diff --git a/Dockerfile b/Dockerfile
index 7a1d40f..b82e50c 100644
--- a/Dockerfile
+++ b/Dockerfile
@@ -1,4 +1,4 @@
-FROM fedora:23
+FROM fedora:24
MAINTAINER Gerard Braad <me@gbraad.nl>
```

Docker

- cgroups
- namespaces

Docker

- possibility to allocate resources
- provide process-isolation

What is a ‘container’

Containers

- possibility to allocate resources
- provide process-isolation

Process isolation

- protect each process from other processes on the operating system

Process isolation

- preventing process X from writing to process Y

Process isolation

- limited (controlled) interaction between processes allowed over inter-process communication

Sandboxing

- a security mechanism for separating running programs
- limit view of the operating system

Solutions

- containers
- ...

Solutions

- containers
- AppImage
- snapcraft
- flatpak

Flatpak

- born under the GNOME umbrella
- safe environment for running applications

Flatpak

- “build once, run everywhere”

Flatpak

Flatpak

- application developers are in control of the release cycle

Flatpak

- “Docker for desktop apps”

Flatpak

- sandboxing
 - cgroups
 - namespaces

Flatpak

```
$ dnf install -y flatpak
```

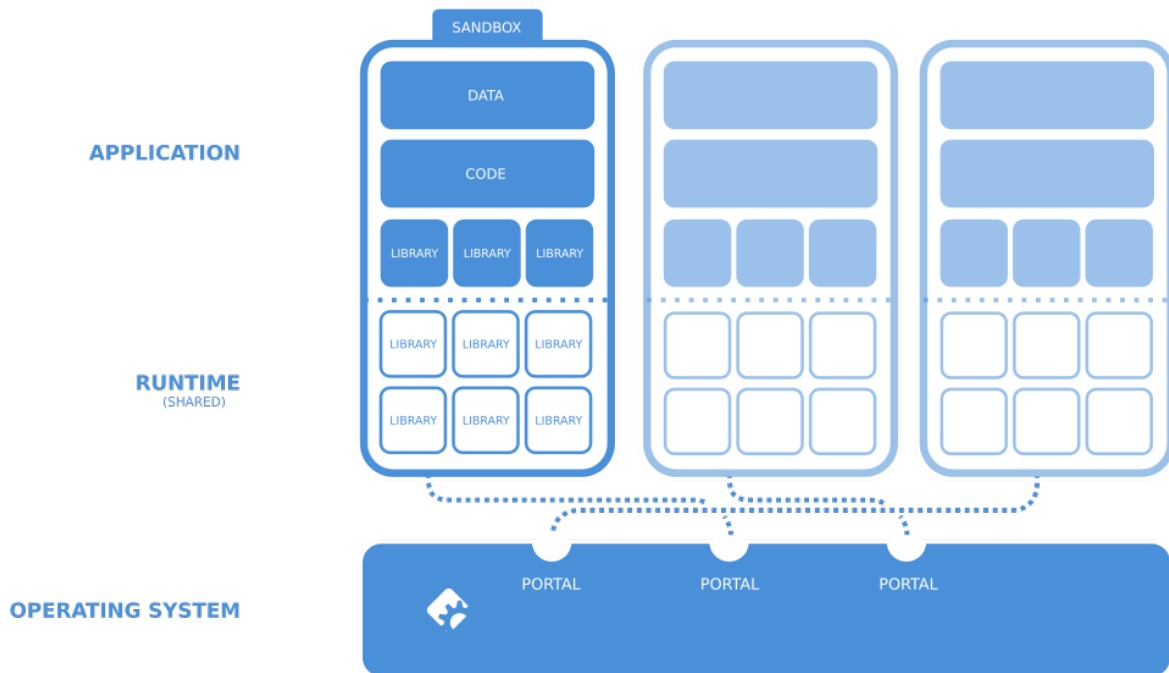


Figure 1:

Add remotes

```
$ wget https://sdk.gnome.org/keys/gnome-sdk.gpg
$ flatpak remote-add --gpg-import=gnome-sdk.gpg gnome https://sdk.gnome.org/repo/
$ flatpak remote-add --gpg-import=gnome-sdk.gpg gnome-apps https://sdk.gnome.org/repo-apps/
```

Flatpak

- runtime

Flatpak

- runtime
- application

Install runtime

```
$ flatpak install gnome org.gnome.Platform 3.20
```

```
9 delta parts, 71 loose fetched; 167139 KiB transferred in 130 seconds
Installing related: org.gnome.Platform.Locale
```

```
2 metadata, 0 content objects fetched; 13 KiB transferred in 2 seconds
```


Install application

```
$ flatpak install gnome-apps org.gnome.gedit stable
1 delta parts, 1 loose fetched; 1725 KiB transferred in 11 seconds
Installing related: org.gnome.gedit.Locale

2 metadata, 0 content objects fetched; 6 KiB transferred in 4 seconds
```

Run application

```
$ flatpak run org.gnome.gedit

** (gedit:2): WARNING **: Couldn't connect to accessibility bus: Failed to connect to socket /tmp/dbus-?
Gtk-Message: Failed to load module "pk-gtk-module"
Gtk-Message: Failed to load module "pk-gtk-module"

(gedit:2): Gtk-WARNING **: Could not load a pixbuf from icon theme.
This may indicate that pixbuf loaders or the mime database could not be found.
```

LibreOffice

```
$ wget http://download.documentfoundation.org/libreoffice/flatpak/latest/LibreOffice.flatpak
$ flatpak install --user --bundle LibreOffice.flatpak
$ flatpak run org.libreoffice.LibreOffice
```

Anatomy

```
[Application]
name=org.gnome.gedit
runtime=org.gnome.Platform/x86_64/3.20
sdk=org.gnome.Sdk/x86_64/3.20
command=gedit
```

Install SDK

```
$ flatpak install gnome org.gnome.Sdk 3.20

Receiving delta parts: 17/17 721.6 kB/s 33.2 MB/184.0 MB 3 minutes 28 seconds remaining
Installing related: org.gnome.Sdk.Locale

2 metadata, 0 content objects fetched; 13 KiB transferred in 2 seconds
```

Enter the sandbox

```
$ flatpak run --devel --command=bash org.gnome.gedit
```

Home

```
bash-4.3$ ls -al
```

```
total 172
drwx----- 22 gbraad  gbraad  4096 Jul 28 13:36 .
drwxr-xr-x  3 nfsnobody nfsnobody 4096 Jul 28 2016 ..
drwx-----  3 gbraad  gbraad  4096 Jul 28 11:44 .ansible
-rw-----  1 gbraad  gbraad  1301 Jul 28 11:54 .bash_history
-rw-r--r--  1 gbraad  gbraad    18 May 17 22:22 .bash_logout
-rw-r--r--  1 gbraad  gbraad   193 May 17 22:22 .bash_profile
-rw-r--r--  1 gbraad  gbraad   231 May 17 22:22 .bashrc
drwx----- 16 gbraad  gbraad  4096 Jul 28 11:26 .cache
drwxr-xr-x 18 gbraad  gbraad  4096 Jul 28 13:36 .config
drwxr-xr-x  2 gbraad  gbraad  4096 Jul 28 13:36 Desktop
drwxr-xr-x  2 gbraad  gbraad  4096 Jul 28 10:38 Documents
[...]
```

Root

```
bash-4.3$ ls -al /
```

```
total 44
drwxr-xr-x 17 gbraad  gbraad  420 Jul 28 13:37 .
drwxr-xr-x 17 gbraad  gbraad  420 Jul 28 13:37 ..
drwxrwxr-x  6 nfsnobody nfsnobody 4096 Jul 28 11:07 app
lrwxrwxrwx  1 gbraad  gbraad    7 Jul 28 13:37 bin -> usr/bin
drwxr-xr-x  4 gbraad  gbraad   300 Jul 28 13:37 dev
drwxr-xr-x 24 gbraad  gbraad  1140 Jul 28 13:37 etc
drwxr-xr-x  3 nfsnobody nfsnobody 4096 Jul 28 2016 home
lrwxrwxrwx  1 gbraad  gbraad    7 Jul 28 13:37 lib -> usr/lib
lrwxrwxrwx  1 gbraad  gbraad    9 Jul 28 13:37 lib64 -> usr/lib64
drwx-----  2 nfsnobody nfsnobody 16384 Jun 15 00:25 lost+found
drwxr-xr-x  2 nfsnobody nfsnobody 4096 Feb  4 06:10 media
drwxr-xr-x  2 nfsnobody nfsnobody 4096 Feb  4 06:10 mnt
drwxr-xr-x  2 nfsnobody nfsnobody 4096 Feb  4 06:10 opt
dr-xr-xr-x 243 nfsnobody nfsnobody  0 Jul 28 13:37 proc
drwxr-xr-x  6 gbraad  gbraad   160 Jul 28 13:37 run
lrwxrwxrwx  1 gbraad  gbraad    8 Jul 28 13:37 sbin -> usr/sbin
drwxr-xr-x  2 nfsnobody nfsnobody 4096 Feb  4 06:10 srv
drwxr-xr-x  7 gbraad  gbraad   140 Jul 28 13:37 sys
drwxr-xr-x  3 gbraad  gbraad    60 Jul 28 13:37 tmp
drwxrwxr-x 14 nfsnobody nfsnobody 4096 Jul 28 13:36 usr
drwxr-xr-x  6 gbraad  gbraad   140 Jul 28 13:37 var
```

App

```
bash-4.3$ ls -al /app
```

```
total 28
drwxrwxr-x  6 nfsnobody nfsnobody 4096 Jul 28 11:07 .
drwxr-xr-x 17 gbraad  gbraad   420 Jul 28 13:37 ..
drwxrwxr-x  2 nfsnobody nfsnobody 4096 Jan  1 1970 bin
drwxrwxr-x  7 nfsnobody nfsnobody 4096 Jan  1 1970 lib
```

```
drwxrwxr-x 3 nfsnobody nfsnobody 4096 Jan 1 1970 libexec
-rwxrw-r-- 2 nfsnobody nfsnobody 2223 Jan 1 1970 manifest.json
-rw-r--r-- 1 nfsnobody nfsnobody 0 Jul 28 11:07 .ref
drwxrwxr-x 15 nfsnobody nfsnobody 4096 Jan 1 1970 share
```

Libraries

```
bash-4.3$ ls -al /usr/lib/ |wc -l
1287
bash-4.3$ exit
exit
[gbraad@yoga ~]$ ls -al /usr/lib/ |wc -l
406
```

Flatpak

- runtime
- application

Flatpak

- /usr
- /app

Install location

- System wide
/var/lib/flatpak/
- User
~/.local/share/flatpak/

Flatpak for server?

- desktop session

Flatpak for server?

- we already have Docker?

Flatpak for server?

- we already have runc?

Project Atomic

- immutable infrastructure

Project Atomic

- Atomic Host
- Atomic App and Nucleule
- Atomic Registry

Atomic Host

- runs containers

Atomic Host

- seamless updates using ostree

OSTree

- “git-like” model for committing and downloading bootable filesystem trees
- checksums individual files
- content-addressed-object store

OSTree

- Unlike git
 - it “checks out” the files via hardlinks
 - immutable

Example

```
$ mkdir repo
$ alias ost="ostree --repo=`pwd`/repo"

$ ost init
$ ls repo
config objects refs remote-cache tmp
```

Example

```
$ mkdir tree
$ cd tree
$ echo "x" > 1
$ echo "y" > 2

$ ost commit --branch=my-branch \
  --subject="Initial commit" \
  --body="My commit"

$ ost ls my-branch
d00755 1002 1002      0 /
-00644 1002 1002      2 /1
```

-00644 1002 1002 2 /2

Example

```
$ ost checkout my-branch
$ ls my-branch/
1 2
```

Provides

- something between ‘package-based’ and ‘image-based’ deployment

Ostree

- flatpak
- rpm-ostree
- project atomic

RPM ostree

- RPMs are composed on a server into an OSTree repository

Install

- CentOS Atomic host

Upgrade

```
$ rpm-ostree upgrade
/ostree/repo/config
```

Other OS

- Have you already updated to Fedora 24 !?

Add remote

```
$ ostree remote add fedora-atomic --set=pgp-verify=false https://dl.fedoraproject.org/pub/fedora/linux/
```

Rebase

```
$ rpm-ostree rebase fedora-atomic:fedora-atomic/24/x86_64/docker-host
• Note: setenforce 0
```

Result

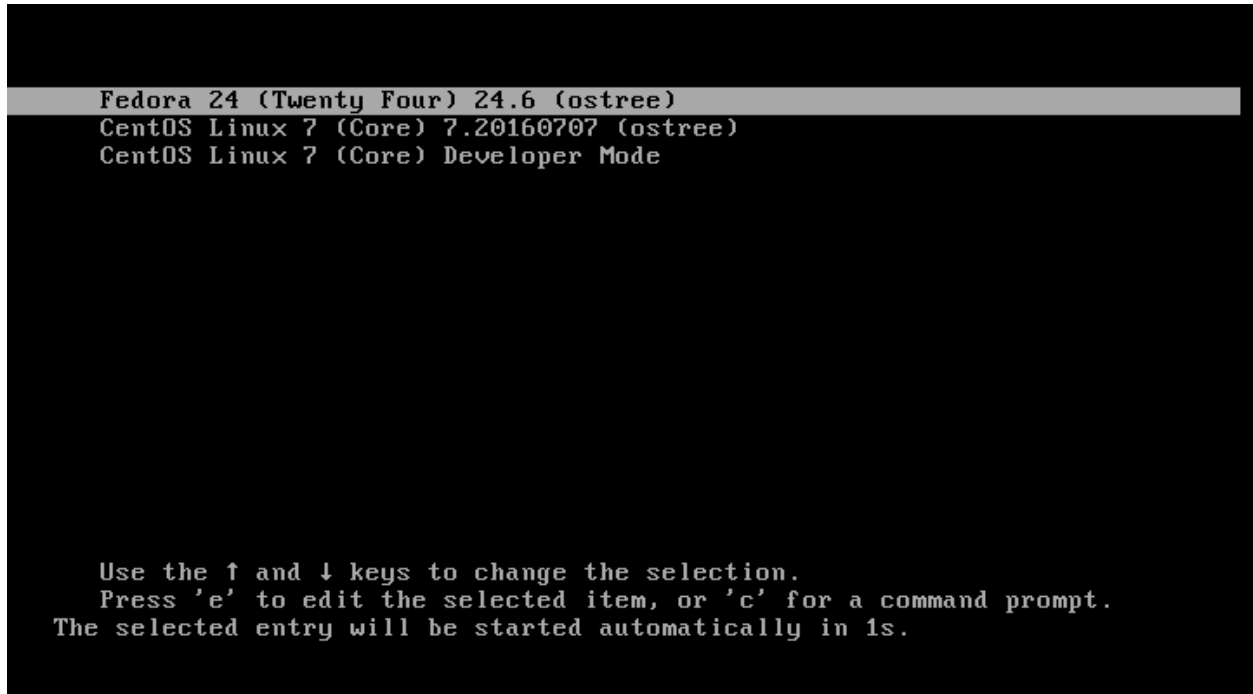


Figure 2: Frankenbuild

Rollback

```
$ rpm-ostree rollback.
```

- Note: hold SHIFT during startup

Why this matters

- Imagine

Why this matters

- Imagine
 - CentOS 6 to 7

Why this matters

- Imagine
 - CentOS 6 to 7
 - CentOS 7.1 to 7.2

Why this matters

- Imagine
 - CentOS 6 to 7
 - CentOS 7.1 to 7.2
 - OpenStack Liberty to Mitaka

Deploying a composed tree

```
$ ostree remote add --set=pgp-verify=false byo-atomic-rdo https://gbraad.gitlab.io/byo-atomic-rdo/
$ rpm-ostree rebase byo-atomic-rdo:centos-atomic-host/7/x86_64/openstack
$ systemctl reboot
```

Results

```
$ ssh centos@208.113.134.150
[centos@atomic-01 ~]$ openstack-status
== Nova services ==
openstack-nova-api:                inactive (disabled on boot)
openstack-nova-compute:            inactive (disabled on boot)
openstack-nova-network:           inactive (disabled on boot)
openstack-nova-scheduler:         inactive (disabled on boot)
openstack-nova-cert:              inactive (disabled on boot)
[...]
== Support services ==
libvirtd:                          active
openvswitch:                       inactive (disabled on boot)
dbus:                              active
rabbitmq-server:                   inactive (disabled on boot)
memcached:                         inactive (disabled on boot)
== Keystone users ==
Warning keystoneerc not sourced
```

Closing thoughts

- packages will not go away
 - role in composition

Resources

- <http://fedoraproject.org/>
- <http://flatpak.org>
- <https://github.com/flatpak/flatpak/wiki/Examples>
- <https://wiki.gnome.org/action/show/Projects/OSTree>
- <https://projectatomic.io>
- <https://wiki.gnome.org/Projects/GnomeContinuous>
- <https://github.com/gbraad/docker-flatpak>
- <https://gitlab.com/gbraad/byo-atomic>
- <https://gbraad.gitbooks.io/scratchpad/content/technology/ostree.html>

Stay in touch

me@gbraad.nl

Figure 3:

Stay in touch



Figure 4:

Q & A