

Toolbx

Developing GNOME on OSTree based OSes

Debarshi Ray



I am ...

rishi

Red Hat Desktop Team

Fedora Silverblue & Workstation

GNOME

I have talked about Toolbox before ...

Some of you might know about it already

But never before at GUADEC

I will summarize what it is and then talk
about the latest developments

Some context

Linux distributions

Historically, package based

*.deb, *.rpm, ...

Linux distributions

Difficult to test

Difficult to roll back broken updates

Linux distributions

Updates are vulnerable

Power loss, no disk space, dependency problems, ...

Linux distributions

No separation between the operating system and applications

Need to upgrade Fedora to get newer Darktable, Firefox, Inkscape, LibreOffice, ...

Rethinking Linux distributions

OSTree based OS

Containers (Flatpak, Podman, ...) for apps

OSTree based OSes

ostree.readthedocs.io

Next-generation Linux operating systems

OSTree based OSes

Easy to test

Easy to roll back

Robust upgrades

OSTree based OSes

OS is separate from apps

OS is an OSTree image that's hard to modify

Apps are Flatpak or Podman containers

OSTree based OSes

os.gnome.org

Nightly reference builds of GNOME

OSTree based OSes

endlessos.com

Debian derivative with modified GNOME

OSTree based OSes

silverblue.fedoraproject.org

kinoite.fedoraproject.org

... and more.

Next-generation Fedora Workstation, KDE ...

OSTree based OSes

coreos.fedoraproject.org

Minimal Fedora edition for containerized
server applications

OSTree based OSes

No APT, no DNF

Read-only /usr



rishi@svoboda:~



```
[rishi@svoboda ~]$ cat /etc/fedora-release
Fedora release 37 (Thirty Seven)
[rishi@svoboda ~]$
[rishi@svoboda ~]$ which dnf
/usr/bin/which: no dnf in (/var/home/rishi/opt/bin:/opt/bin:/var/home/rishi/.local/bin:/var/home/rishi/bin:/usr/local/bin:/usr/local/sbin:/usr/bin:/usr/sbin)
[rishi@svoboda ~]$
[rishi@svoboda ~]$ rpm-ostree status --version
rpm-ostree:
Version: '2023.4'
Git: 623d58bef9c2a6d88acd4fa0346aba241981c7d0
Features:
- rust
- compose
- container
- fedora-integration
[rishi@svoboda ~]$
```



rishi@svoboda:~



```
[rishi@svoboda ~]$ rpm-ostree status
```

```
State: idle
```

```
Deployments:
```

```
• fedora:fedora/37/x86_64/silverblue
```

```
  Version: 37.20230724.0 (2023-07-24T00:48:20Z)
```

```
  BaseCommit: eea97071a4486b0d50c90f74739e916c8f33f15d18b1a58adedbd444610879cb
```

```
  GPGSignature: Valid signature by ACB5EE4E831C74BB7C168D27F55AD3FB5323552A
```

```
  LayeredPackages: emacs gnupg1 gstreamer1-libav gstreamer1-plugin-openh264 gstreamer1-plugins-ugly mozilla-openh264 zsh
```

```
  LocalPackages: rpmpfusion-free-release-37-1.noarch
```

```
  Pinned: yes
```

```
fedora:fedora/37/x86_64/silverblue
```

```
  Version: 37.20230708.0 (2023-07-08T00:45:21Z)
```

```
  BaseCommit: 0e604878b0642b28c32032349d54220d1deac6c8a35fdc2e5229ffb09baf664d
```

```
  GPGSignature: Valid signature by ACB5EE4E831C74BB7C168D27F55AD3FB5323552A
```

```
  LayeredPackages: emacs gnupg1 gstreamer1-libav gstreamer1-plugin-openh264 gstreamer1-plugins-ugly mozilla-openh264 zsh
```

```
  LocalPackages: rpmpfusion-free-release-37-1.noarch
```

```
  Pinned: yes
```

```
fedora:fedora/37/x86_64/silverblue
```

```
  Version: 37.20230622.0 (2023-06-22T00:47:24Z)
```

```
  BaseCommit: 355f2ad7c90306ee9df13b739933d35197fee704e7cc6542b18de38e03d03d12
```

```
  GPGSignature: Valid signature by ACB5EE4E831C74BB7C168D27F55AD3FB5323552A
```

```
  LayeredPackages: emacs gnupg1 gstreamer1-libav gstreamer1-plugin-openh264 gstreamer1-plugins-ugly mozilla-openh264 zsh
```

```
  LocalPackages: rpmpfusion-free-release-37-1.noarch
```

```
  Pinned: yes
```

```
fedora:fedora/37/x86_64/silverblue
```

```
  Version: 37.1.7 (2022-11-05T06:01:00Z)
```

```
  Commit: bfe9de223c9a4ba4a793d3e01f6b09024c919685ee73c896af767958725cac79
```

```
  GPGSignature: Valid signature by ACB5EE4E831C74BB7C168D27F55AD3FB5323552A
```

```
  Pinned: yes
```

```
[rishi@svoboda ~]$
```

OSTree based OSes

How do you set up a development environment?

Compilers, debuggers, editors, SDKs, ...

OSTree based OSes

GNOME Builder as a Flatpak

OSTree based OSes

GNOME Builder is a container native IDE

- Can be installed in a container (ie., Flatpak)
- Development environment in a container
- Generate a container (ie., Flatpak) as artifact

OSTree based OSes

What about other IDEs?

OSTree based OSes

Lots of development tools not available as
Flatpak runtime extensions

OSTree based OSes

What about good old Emacs, Vim and the usual command-line?

Fedora Silverblue

Package layering with rpm-ostree:

```
$ rpm-ostree install strace
```

OSTree based OSes

Need to reboot can be annoying

Too much use negates some of the benefits of
OSTree based OSes



Toolbx

containertoolbx.org

Mutable package based development
environments on OSTree based OSes

Toolbx

Decoupled from the operating system

Nothing is installed on the OS

Without getting in the way

Toolbx

Formerly Toolbox or Fedora Toolbox



rishi@svoboda:~



```
[rishi@svoboda ~]$ cat /etc/fedora-release
```

```
Fedora release 37 (Thirty Seven)
```

```
[rishi@svoboda ~]$
```

```
[rishi@svoboda ~]$ which dnf
```

```
/usr/bin/which: no dnf in (/var/home/rishi/opt/bin:/opt/bin:/var/home/rishi/.local/bin:/var/home/rishi/bin:/usr/local/bin:/usr/local/sbin:/usr/bin:/usr/sbin)
```

```
[rishi@svoboda ~]$
```

```
[rishi@svoboda ~]$ rpm-ostree status --version
```

```
rpm-ostree:
```

```
Version: '2023.4'
```

```
Git: 623d58bef9c2a6d88acd4fa0346aba241981c7d0
```

```
Features:
```

- rust
- compose
- container
- fedora-integration

```
[rishi@svoboda ~]$
```



```
[rishi@svoboda ~]$ toolbox enter
```

```
◆[rishi@toolbox ~]$
```

```
◆[rishi@toolbox ~]$ cat /etc/fedora-release
```

```
Fedora release 37 (Thirty Seven)
```

```
◆[rishi@toolbox ~]$
```

```
◆[rishi@toolbox ~]$ which dnf
```

```
/usr/bin/dnf
```

```
◆[rishi@toolbox ~]$
```

```
◆[rishi@toolbox ~]$ sudo dnf install strace
```

```
Last metadata expiration check: 0:02:38 ago on Wednesday 26 July 2023 11:04:43 A  
M.
```

```
Dependencies resolved.
```

```
=====
```

Package	Architecture	Version	Repository	Size
Installing:				
strace	x86_64	6.4-1.fc37	updates	1.4 M

```
=====
```

```
Transaction Summary
```

```
=====
```

```
Install 1 Package
```

```
Total download size: 1.4 M
```

```
Installed size: 2.9 M
```

```
Is this ok [y/N]: 
```

Toolbx

Containers

Toolbx

Open Containers Initiative (or OCI)

podman.io

Toolbx

No cognitive overhead of containers

Seamless integration with the host OS

No need to debug why the SSH agent or graphical apps aren't working

Toolbx — primary goal

Restore the usual command-line on OSTree based OSes for development & debugging

Crucial for adoption of these OSes

Toolbx — non goals

Application distribution format

Use Flatpak for client apps

Use Podman for server apps

Toolbx — non goals

Secure development environment

Security is not test-ability

Just as secure as traditional Linux
distributions

Toolbx — non goals

Different container engines

No resources to drive changes and test across

Docker, Podman, ...

Toolbx — non goals

Using every single OCI image out there

Problems with documentation, locales,
OpenGL or Vulkan, missing tools, ...

“podman run” works

Toolbx

containertoolbx.org

github.com/containers/toolbox

Written in Go

Toolbx

31st August, 2018 — first commit

Two months after rootless Podman

github.com/containers/podman/pull/871

Toolbx

Well tested code base

250 tests and growing

CentOS Stream 9, all supported Fedoras and
Rawhide, Ubuntu 22.04

Toolbx — what works ...

Wayland and X applications

OpenGL and Vulkan *

Toolbx — what works ...

D-Bus clients and daemons

Session or user bus is fully operational

System bus might have rough edges

Toolbx — what works ...

Networking

Avahi, DNS, Nmap, ping(8), VPN, ...

Toolbx — what works ...

Timezones

`/etc/localtime` & `/etc/timezone`

Removable devices

SSH agent

Toolbx — what works ...

coredumpctl(1)

journalctl(1)

locate(1)

ulimits

Toolbx — what works ...

Libvirt, including the system instance

minikube.sigs.k8s.io

Toolbx — what works ...

FreeIPA user accounts *

Kerberos, with KCM credential caches

PC/SC smart card daemon

Toolbx — what works ...

Full GNOME session *

Toolbx — what works ...

ctrl+alt+f<n>

Log in

Toolbx — what works ...

```
$ export XDG_CURRENT_DESKTOP=GNOME
```

```
$ toolbox enter
```

```
◆$ sudo dnf install flatpak \
```

```
    gnome-backgrounds gnome-shell
```

```
◆$ dbus-run-session gnome-shell --wayland
```

Settings

- Apps >
- Privacy >
- Online Accounts
- Sharing
- Sound
- Power
- Displays
- Mouse & Touchpad
- Keyboard
- Printers
- Removable Media
- Color
- Region & Language
- Accessibility
- Users
- Default Apps
- Date & Time
- About

About



Device Name
svoboda



Hardware Model	Lenovo ThinkPad X1 Carbon 2nd
Firmware Version	GRET44WW (1.21)
Memory	8.0 GiB
Processor	Intel® Core™ i7-4600U × 4
Graphics	Intel® HD Graphics 4400 (HSW GT2)
Disk Capacity	256.1 GB

OS Name	Fedora Linux 38 (Container Image)
OS Type	64-bit
GNOME Version	44.3
Windowing System	Wayland
Kernel Version	Linux 6.4.4-100.fc37.x86_64

Toolbx — what doesn't work yet ...

Proprietary NVIDIA driver

github.com/containers/toolbox/issues/116

Toolbx — what doesn't work yet ...

Custom CA certificates

github.com/containers/toolbox/issues/626

Toolbx — what doesn't work yet ...

Device hotplugging without root

github.com/containers/toolbox/issues/1203

Toolbx — what doesn't work yet ...

Active Directory user accounts

github.com/containers/toolbox/issues/585

Toolbx — what doesn't work yet ...

Possibly a lot more

Toolbx — environments

Arch Linux *

Fedora

Red Hat Enterprise Linux

Ubuntu *

Toolbx — without OSTree

Doesn't require OSTree based OSes

Works just as well on package based systems
like Fedora Workstation

Toolbx — without OSTree

Value in keeping the OS pristine

Easy access to different toolchains & libraries

Reduces the need for a virtual machine

Toolbx — help needed

Need CI runners for Arch Linux & Debian to run our fast-growing test suite — currently at 250 tests



containertoolbx.org