



Fedora from Scratch

Michal Schorm



What I will talk about

- How to install GNU/Linux distribution Fedora without it's installer

```
# dd if=/dev/disk_with_installed_fedora/ of=/dev/empty_disk/
```

Why I will talk about it

- Fedora installer Anaconda
 - written (mostly) in Python
 - issues when running on old / odd HW
- Bugs found in the essential software that is the foundation of the OS
- My experience may be useful to anyone who takes care of his own device

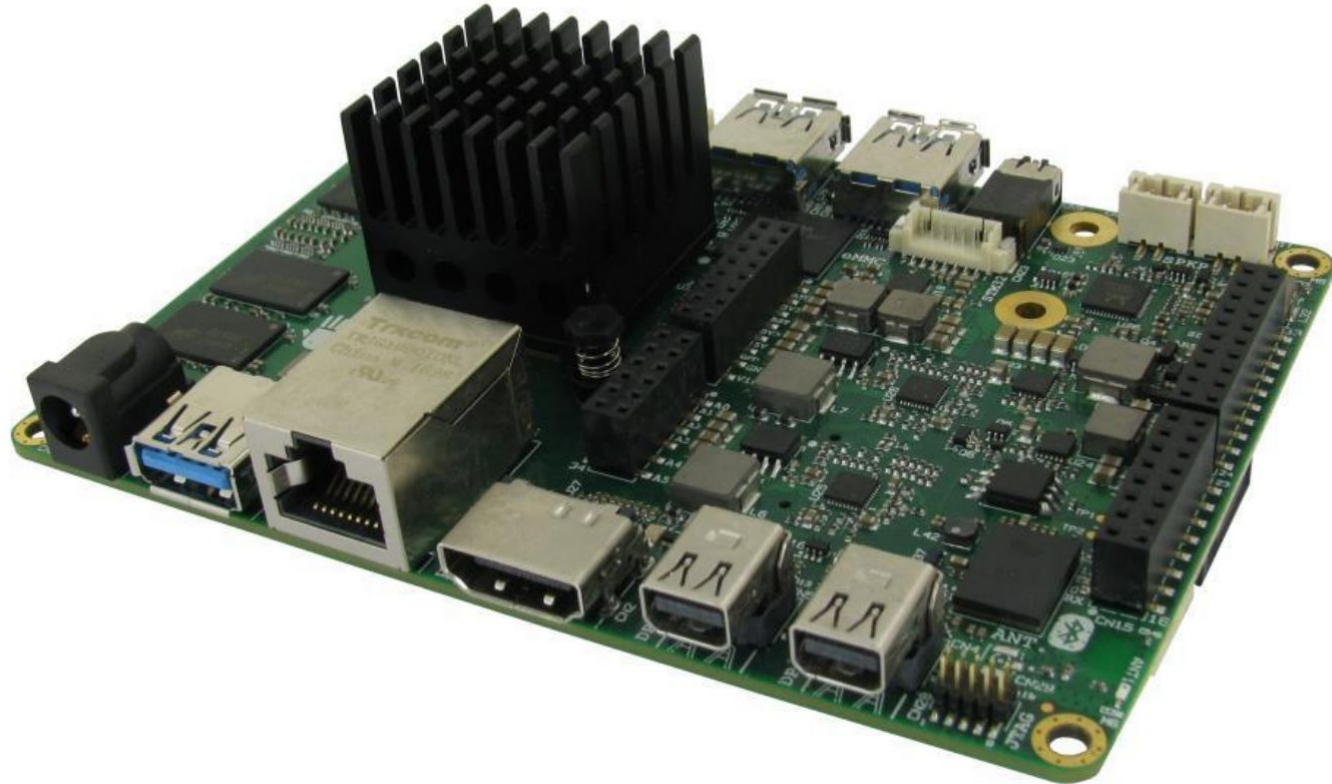
A few information before we start

- Anaconda works ... most of the time
- Some distributions are normally installed “from scratch”
 - Arch Linux, Gentoo, ...
- Understanding of the OS is my hobby

Hardware

UD00 X86:

- Intel® Pentium



Hardware

UDOO X86:

- Intel® Pentium N3710

X86 II Boards - Products - Mozilla Firefox

X86 II Boards - Products x +

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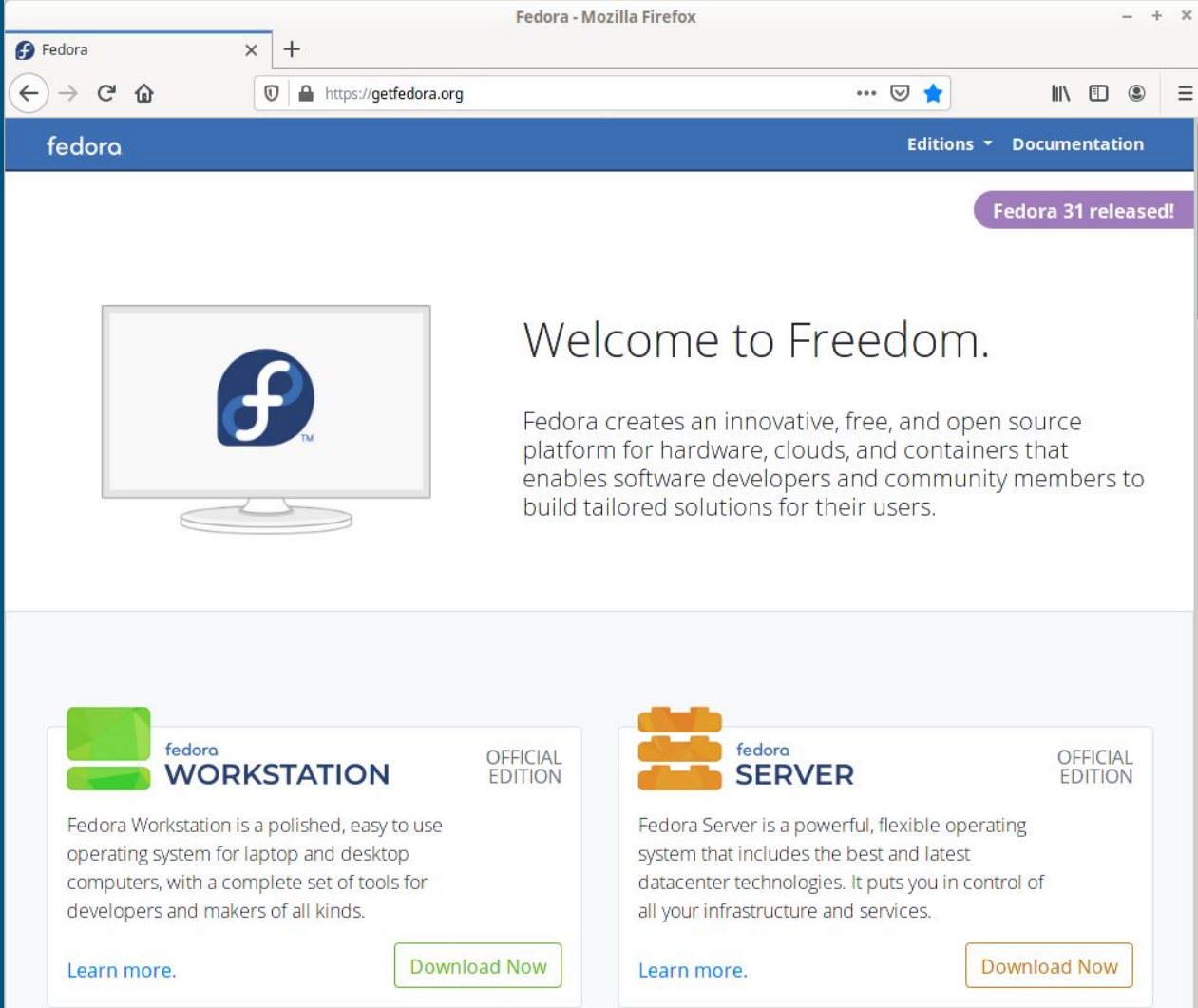
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X86 II Boards

Model	UDOO X86 II ULTRA	UDOO X86 II ADVANCED PLUS
		
	\$267.00 excl. TAX/VAT/SHIPPING VIEW DETAILS 👤 📄 ● Usually ships in 2-4 days	\$174.00 excl. TAX/VAT/SHIPPING VIEW DETAILS 👤 📄 ● Usually ships in 2-4 days
CPU	Intel Pentium N3710 2.56 Ghz & Intel® Quark SE core 32 MHz plus 32-bit ARC core 32 MHz	CPU Intel Celeron N3160 2.24 Ghz & Intel® Quark SE core 32 MHz plus 32-bit ARC core 32 MHz
GPU	Intel HD Graphics 405 Up to 700 MHz 16 execution units	Intel HD Graphics 400 Up to 640 MHz 12 execution units

Software

- “Live” Fedora version



The screenshot shows a Mozilla Firefox browser window with the title "Fedora - Mozilla Firefox". The address bar displays "https://getfedora.org". The page features a blue header with the "fedora" logo and navigation links for "Editions" and "Documentation". A purple banner on the right side of the header announces "Fedora 31 released!". The main content area includes a monitor icon with the Fedora logo, the heading "Welcome to Freedom.", and a paragraph describing Fedora as an innovative, free, and open source platform. Below this, there are two featured sections: "fedora WORKSTATION OFFICIAL EDITION" and "fedora SERVER OFFICIAL EDITION". Each section contains a brief description and a "Download Now" button.

Fedora

https://getfedora.org

fedora Editions Documentation

Fedora 31 released!

Welcome to Freedom.

Fedora creates an innovative, free, and open source platform for hardware, clouds, and containers that enables software developers and community members to build tailored solutions for their users.

fedora WORKSTATION OFFICIAL EDITION

Fedora Workstation is a polished, easy to use operating system for laptop and desktop computers, with a complete set of tools for developers and makers of all kinds.

[Learn more.](#) [Download Now](#)

fedora SERVER OFFICIAL EDITION

Fedora Server is a powerful, flexible operating system that includes the best and latest datacenter technologies. It puts you in control of all your infrastructure and services.

[Learn more.](#) [Download Now](#)

Software

- “Live” Fedora version
- Install scripts

The screenshot shows a web browser window displaying the GitHub repository page for 'FaramosCZ/Fedora_from_scratch'. The browser's address bar shows the URL 'https://github.com/FaramosCZ/Fedora_from_scratch'. The repository page includes a navigation bar with links like 'Why GitHub?', 'Enterprise', 'Explore', 'Marketplace', and 'Pricing'. Below the navigation bar, the repository name 'FaramosCZ / Fedora_from_scratch' is displayed, along with statistics: 1 Watch, 0 Stars, and 0 Forks. The 'Code' tab is selected, showing the repository's description: 'Scripts and knowledge for installing Fedora from scratch (without installer)'. Below this, statistics show 8 commits, 3 branches, 0 releases, and 1 contributor. A green bar highlights the 'Clone or download' button. The repository's file list is shown, including 'os_configuration', 'os_installation', and 'autorun.sh', with their respective commit messages and dates.

GitHub - FaramosCZ/Fedora_from_scratch: Scripts and knowledge for installing Fedora from scratch (without installer) - Mozilla Firefox

https://github.com/FaramosCZ/Fedora_from_scratch

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FaramosCZ / Fedora_from_scratch Watch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Security Insights

Scripts and knowledge for installing Fedora from scratch (without installer)

8 commits 3 branches 0 releases 1 contributor

Branch: master New pull request Find file Clone or download

FaramosCZ Spellcheck Latest commit 7f42a65 yesterday

os_configuration	Making this project public	3 days ago
os_installation	Spellcheck	yesterday
autorun.sh	Making this project public	3 days ago

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Software

- “Live” Fedora version
- Install scripts

```
Fedora_from_scratch]$ tree
```

```
.
├── autorun.sh
└── os_installation
    ├── 00_disk_partitioning.sh
    ├── 01_disk_mounting.sh
    ├── 02_OS_install_headless_server.sh
    ├── 03_OS_in_chroot_configuration.sh
    ├── autogenerated_configuration.sh
    ├── autorun.sh
    ├── disk_partitioning.conf
    └── system_installation.conf
```

Pitfalls of manual installation

Pitfalls of manual installation

- Disks formatting
 - special “BIOS boot partition” and EFI partitions

```
# When BIOS && GPT is used, we need to create "BIOS Boot partition" at the beginning of the disk
if [ "$PARTITIONING_STANDARD" = "GPT" ] && [ "$FIRMWARE_INTERFACE" = "BIOS" ] ; then
    SFDISK_INPUT[0]=";1M;21686148-6449-6E6F-744E-656564454649;"
# When UEFI is used, we need to create EFI partition at the beginning of the disk
# However it's identifier differs for MBR and GPT
elif [ "$FIRMWARE_INTERFACE" = "UEFI" ] ; then
    PARTITION_SIZES[0]="200M"
    if [ "$PARTITIONING_STANDARD" = "MBR" ] ; then
        SFDISK_INPUT[0]=";${PARTITION_SIZES[0]};ef;"
    elif [ "$PARTITIONING_STANDARD" = "GPT" ] ; then
        SFDISK_INPUT[0]=";${PARTITION_SIZES[0]};C12A7328-F81F-11D2-BA4B-00A0C93EC93B;"
    fi
fi
```

Pitfalls of manual installation

- Disks mounting
 - need to mount `'/sys'`, `'/proc'` and `'/dev'` from the running system

```
# Mount the rest of the directories from the running system
# Mount before installing anything since many scriptlets assume existence of /dev/*
mkdir "$MOUNTPOINT"/sys "$MOUNTPOINT"/proc "$MOUNTPOINT"/dev || :

# To fix the bug in SELinux labeling rhbz#1467103 rhbz#1714026
chcon --reference=/dev "$MOUNTPOINT"/dev || exit

mount -t sysfs none "$MOUNTPOINT"/sys || exit
mount -t proc none "$MOUNTPOINT"/proc || exit
mount -o bind /dev "$MOUNTPOINT"/dev || exit
```

Pitfalls of manual installation

- Non-intuitive behavior (for many)

```
dnf --installroot=<installroot> --setopt=reposdir=<path> --config /path/dnf.conf upgrade
```

Upgrades packages inside the installroot from a repository described by `--setopt` using configuration from `/path/dnf.conf`.

Pitfalls of manual installation

- Don't forget
 - configuration files
 - ``/etc/fstab', `/etc/resolv.conf'`
 - kernel installation
 - GRUB installation

```
Error: unknown filesystem.  
Entering rescue mode ...
```

```
grub rescue>
```

Live demo

Installation steps overview

- Disks preparation
 - MBR vs GPT; BIOS vs UEFI ?
 - dedicated partitions (“BIOS boot partition” || EFI)
 - ‘sfdisk’
 - ‘mkfs.*’
 - labels

Installation steps overview

- Disks mounting
 - tree structure
 - `/etc/fstab`
 - mounting of `/sys`, `/proc` and `/dev` from the running system
 - correct SELinux context

Installation steps overview

- Core system installation into the prepared chroot
 - `dnf --installroot=...`
 - `dnf groupinstall core`
 - basic configuration
 - `hostname`
 - `'/etc/resolv.conf'`

Installation steps overview

- Before the first run
 - password for the 'root' user
 - `touch /.autorelabel`
 - check that the correct kernel and matching kernel modules are installed
 - check the GRUB loader is correctly installed
 - ``/etc/fstab'`

First boot

- SELinux relabeling

```
[ OK ] Reached target System Initialization.  
      Starting Relabel all filesystems...
```

```
*** Warning -- SELinux targeted policy relabel is required.  
*** Relabeling could take a very long time, depending on file  
*** system size and speed of hard drives.
```

Installation steps overview

- Disks preparation
 - MBR vs GPT; BIOS vs UEFI; dedicated partitions (“BIOS boot partition” || EFI)
 - ‘sfdisk’, ‘mkfs.*’, labels
- Disks mounting
 - tree structure, forging of ‘/etc/fstab’
 - mounting of ‘/sys’, ‘/proc’ and ‘/dev’ from the running system
 - correct SELinux context
- Core system installation into the prepared chroot
 - `dnf --installroot=... groupinstall core`
 - basic configuration: hostname, ‘/etc/resolv.conf’
- Before the first run
 - ‘root’ user password
 - `touch /.autorelabel`
 - GRUB loader
 - ‘/etc/fstab’

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https://github.com/FaramosCZ/Fedora_from_scratch