
Developus Apparatus Documentation

Release 2017.12.21

VirtualTam

Dec 21, 2017

Community Collaboration

1	Continuous Delivery	3
2	Git	5
3	Git - Split and shrink a repository	7
4	Git - Ten Commandments	9
5	Microcontrollers (µC)	11
6	Yocto	13
7	APT - Debian & Ubuntu packages	15
8	Environment variables	21
9	Filesystem	23
10	Networking	27
11	Processes	33
12	Hardware - Serial port (RS-232)	35
13	Hardware - udev rules	37
14	PostgreSQL	39
15	SSH - Secure SHell	43
16	systemd	45
17	X11	49
18	Linux API	51
19	Docker	53
20	Docker - Usage	55

21 LXC	59
22 LXC - Debian installation	61
23 OpenVZ	63
24 C / C++	65
25 Java	67
26 Lisp	69
27 PHP	71
28 Python	73
29 Shell	77
30 Elastic Stack	79

An assortment of notes and utilities for software development and systems administration. 

1.1 About

- Martin Fowler's introduction to Continuous integration

1.2 C2

From the ContentCreationWiki:

- ContinuousIntegration
- AutomatedTest
- AcceptanceTest
- UnitTest
- TestDrivenDevelopment

1.3 Tools

1.3.1 Code review

- Gerrit
- Review board

1.3.2 Documentation generation

- Doxygen

- Graphviz
- Javadoc
- Read The Docs (RTFD)
- Sphinx

1.3.3 Job schedulers

- Buildbot
- Jenkins CI (formerly Hudson)

1.3.4 SCM

Distributed Source Control Management systems:

- Fossil
- Git
- Mercurial

History, diff & visualisation:

- Diffuse
- Gitk
- Gource
- Meld

1.3.5 Web services

- Coveralls
- Travis CI

1.4 Articles

- A successful Git branching model
- Continuous Dev blog
- Developer to documentarian
- Is unit testing worth the effort?
- Language tools for reducing mistakes

Git is a distributed (decentralized) Source Control Management (SCM) system.

SCM is also known as:

- Revision Control
- Version Control System (VCS)

2.1 Features

- `aliases` - get comfy!
- `rerere` - rebase, rebase, rebase!
- `submodules`
- `undoing things`
- `worktree`

2.2 Social platforms

- GitHub
- GitHub issue etiquette

2.3 Tools

- `diffuse`
- `gitk`

- [gource](#)

2.4 Hosting

2.4.1 Built-in

- [git-daemon](#)
- [gitweb](#)

2.4.2 Community

- [cgit](#)
- [Gitlab](#)
- [gitolite](#)
- [Go Git Service \(Gogs\)](#)

2.5 Resources

2.5.1 Commit log / History

- [A better Git log](#)
- [A successful Git branching model](#)
- [Changing history, or how to Git pretty](#)
 - [diagram](#)
- [Cheat sheet](#)
- [Fix conflicts only once with git rerere](#)
- [Must-have Git aliases](#)
- [Video introduction to Git and GitHub](#)

Git - Split and shrink a repository

Ever wanted to split a repository into several parts, yet keep the corresponding commit histories?

3.1 Procedure

Note: this is a copy of a memo, it needs to be rewritten for clarity

```
# first, clone the original repository
git clone REPO REPO2
cd REPO2

# remove all unneeded files from this version
git filter-branch -f --prune-empty --index-filter "git rm --cached --ignore-unmatch_
↳FILES_AND_DIRS_TO_DELETE"
git gc --aggressive --prune=1day
git fsck --unreachable

# refresh the remote
git remote rm origin
git remote add origin ssh://HOST/REPO

# broforce push!
git push -f origin master

# cleanup our original repository
cd REPO
git filter-branch -f --prune-empty --index-filter "git rm --cached --ignore-unmatch_
↳OTHER_FILES_AND_DIRS_TO_DELETE"
git gc --aggressive --prune=1day
git fsck --unreachable

# broforce push!
git push -f origin master
```

3.2 Articles

- [Extracting Parts of Git Repository and Keeping the History](#)
- [Splitting and shrinking a git repository](#)

4.1 Hitchhiker's Git to the Galaxy

1. Of version control, thou shalt care
2. With Git, thou shalt form, else with SVN thou shalt stay
3. Merging thou shalt avoid, as much as possible
4. Of versioning anything, thou shalt restrain
5. A rewritten commit, thou shalt never push
6. Before testing, thou shalt not push
7. The sixth commandment thou shalt apply, else thou shalt be chastised
8. Thou shalt not cheat
9. Of tags thou shalt abuse
10. Thy God Jenkins thou shalt honor, for thy salvation to find

Source: Geek & Poke

CHAPTER 5

Microcontrollers (μC)

- <https://electronics.stackexchange.com/questions/237740/what-resides-in-the-different-memory-types-of-a-microcontroller/237759#237759>
- <https://github.com/0xAX/linux-insides>

- [Home](#)
- [Documentation](#)
- [Mega Manual](#)

6.1 Toaster

- <https://wiki.yoctoproject.org/wiki/Toaster>
- <https://www.yoctoproject.org/docs/1.8/toaster-manual/toaster-manual.html>
- https://www.yoctoproject.org/sites/default/files/toaster_presentation_elce_2014_interactive_dlr1.pdf
- https://wiki.yoctoproject.org/wiki/Setting_up_a_production_instance_of_Toaster
- **Toaster+Jenkins:** <https://lists.yoctoproject.org/pipermail/yocto/2015-April/024339.html>
- **Toaster+Jenkins:** https://bugzilla.yoctoproject.org/show_bug.cgi?id=7527

6.2 BitBake

- https://wiki.yoctoproject.org/wiki/Enable_sstate_cache

APT - Debian & Ubuntu packages

7.1 Resources

- [Pacman Rosetta](#) - Compendium of usual commands for the main Linux package managers (apt, dnf, pacman, yum)

7.1.1 Man pages

- apt
 - apt-cache
 - apt-file
 - apt-get
- aptitude
- dpkg
- gdebi

7.2 Upgrading packages

7.2.1 aptitude - update package metadata

```
# update package metadata using:  
# - /etc/apt/sources.list  
# - /etc/apt/sources.list.d/*.list  
$ aptitude update
```

```
[...]
```

```
Get: 1 http://security.debian.org jessie/updates InRelease [63.1 kB]
Ign http://ftp.debian.org jessie InRelease
Hit http://repo.saltstack.com jessie InRelease
Get: 2 http://ftp.debian.org jessie-updates InRelease [142 kB]
Get: 3 http://security.debian.org jessie/updates/main amd64 Packages [231 kB]
Hit http://repo.saltstack.com jessie/main amd64 Packages
[...]
Fetched 12.3 MB in 9s (1,334 kB/s)

Current status: 34 updates [+28].
```

7.2.2 aptitude - upgrade all packages

```
$ aptitude upgrade

The following packages will be upgraded:
  apt apt-utils base-files git git-man gnupg gpgv initramfs-tools libapt-inst1.5_
↳libapt-pkg4.12 libc-bin libc-dev-bin libc6 libc6-dev libglib2.0-0 libhogweed2_
↳libnettle4 libpam-modules libpam-modules-bin
  libpam0g libpcre3 libsndfile1 libsystemd0 libudev1 linux-libc-dev locales multiarch-
↳support salt-common salt-minion systemd systemd-sysv tzdata tzdata-java udev
The following packages are RECOMMENDED but will NOT be installed:
  busybox busybox-static dbus gnupg-curl libpam-systemd
34 packages upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 32.6 MB of archives. After unpacking 71.7 kB will be freed.
Do you want to continue? [Y/n/?] y
Get: 1 http://ftp.debian.org/debian/ jessie/main base-files amd64 8+deb8u4 [78.0 kB]
Get: 2 http://repo.saltstack.com/apt/debian/8/amd64/latest/ jessie/main salt-minion_
↳all 2015.8.8+ds-2 [24.5 kB]
Get: 3 http://ftp.debian.org/debian/ jessie/main libc6-dev amd64 2.19-18+deb8u4 [2,
↳002 kB]
Get: 4 http://repo.saltstack.com/apt/debian/8/amd64/latest/ jessie/main salt-common_
↳all 2015.8.8+ds-2 [3,139 kB]
Get: 5 http://ftp.debian.org/debian/ jessie/main libc-dev-bin amd64 2.19-18+deb8u4_
↳[237 kB]
[...]
Fetched 32.6 MB in 16s (1,939 kB/s)
Extracting templates from packages: 100%
Preconfiguring packages ...
(Reading database ... 37422 files and directories currently installed.)
Preparing to unpack ../base-files_8+deb8u4_amd64.deb ...
Unpacking base-files (8+deb8u4) over (8+deb8u3) ...
Processing triggers for install-info (5.2.0.dfsg.1-6) ...
Processing triggers for man-db (2.7.0.2-5) ...
Setting up base-files (8+deb8u4) ...
Installing new version of config file /etc/debian_version ...
(Reading database ... 37422 files and directories currently installed.)
[...]
Processing triggers for libc-bin (2.19-18+deb8u4) ...
Processing triggers for initramfs-tools (0.120+deb8u1) ...

Current status: 0 updates [-34].
```

7.2.3 aptitude - upgrade some packages

```
$ aptitude upgrade git git-email git-man

The following packages will be upgraded:
  git git-email git-man
3 packages upgraded, 0 newly installed, 0 to remove and 231 not upgraded.
Need to get 3,310 kB of archives. After unpacking 311 kB will be used.
Do you want to continue? [Y/n/?] y
Get: 1 http://archive.ubuntu.com/ubuntu/ trusty-updates/main git-man all 1:1.9.1-
↳1ubuntu0.3 [699 kB]
Get: 2 http://archive.ubuntu.com/ubuntu/ trusty-updates/main git amd64 1:1.9.1-
↳1ubuntu0.3 [2,586 kB]
Get: 3 http://archive.ubuntu.com/ubuntu/ trusty-updates/universe git-email all 1:1.9.
↳1-1ubuntu0.3 [25.5 kB]
Fetched 3,310 kB in 5s (601 kB/s)
(Reading database ... 159204 files and directories currently installed.)
Preparing to unpack ../git-man_1%3a1.9.1-1ubuntu0.3_all.deb ...
Unpacking git-man (1:1.9.1-1ubuntu0.3) over (1:1.9.1-1ubuntu0.1) ...
Preparing to unpack ../git_1%3a1.9.1-1ubuntu0.3_amd64.deb ...
Unpacking git (1:1.9.1-1ubuntu0.3) over (1:1.9.1-1ubuntu0.1) ...
Preparing to unpack ../git-email_1%3a1.9.1-1ubuntu0.3_all.deb ...
Unpacking git-email (1:1.9.1-1ubuntu0.3) over (1:1.9.1-1ubuntu0.1) ...
Processing triggers for man-db (2.6.7.1-1ubuntu1) ...
Setting up git-man (1:1.9.1-1ubuntu0.3) ...
Setting up git (1:1.9.1-1ubuntu0.3) ...
Setting up git-email (1:1.9.1-1ubuntu0.3) ...

Current status: 231 updates [-3].
```

7.3 Querying packages

7.3.1 aptitude - search a package

```
$ aptitude search rxvt-unicode

p  rxvt-unicode                               - RXVT-like terminal emulator_
↳with Unicode support
p  rxvt-unicode:i386                           - RXVT-like terminal emulator_
↳with Unicode support
p  rxvt-unicode-256color                       - multi-lingual terminal emulator_
↳with Unicode support for X
p  rxvt-unicode-256color:i386                 - multi-lingual terminal emulator_
↳with Unicode support for X
p  rxvt-unicode-lite                          - RXVT-like terminal emulator_
↳with basic Unicode support
p  rxvt-unicode-lite:i386                     - RXVT-like terminal emulator_
↳with basic Unicode support
p  rxvt-unicode-ml                             - multi-lingual terminal emulator_
↳-- transitional package
p  rxvt-unicode-ml:i386                       - multi-lingual terminal emulator_
↳-- transitional package
```

7.3.2 aptitude - show package metadata

```
$ aptitude show rxvt-unicode-256color

Package: rxvt-unicode-256color
State: not installed
Version: 9.19-1
Priority: optional
Section: universe/x11
Maintainer: Ubuntu Developers <ubuntu-devel-discuss@lists.ubuntu.com>
Architecture: amd64
Uncompressed Size: 3,174 k
Depends: libc6 (>= 2.17), libfontconfig1 (>= 2.9.0), libgcc1 (>= 1:4.1.1), libgdk-
↳pixbuf2.0-0 (>=
    2.22.0), libglib2.0-0 (>= 2.12.0), libperl5.18 (>= 5.18.1), libstartup-
↳notification0 (>= 0.2),
    libx11-6, libxft2 (> 2.1.1), libxrender1, base-passwd (>= 2.0.3.4), ncurses-
↳term (>= 5.8-1)
Recommends: ttf-dejavu, fonts-vlgothic | fonts-japanese-gothic
Conflicts: rxvt-unicode, rxvt-unicode, rxvt-unicode-256color
Provides: rxvt-unicode, x-terminal-emulator
Description: multi-lingual terminal emulator with Unicode support for X11

Homepage: http://software.schmorp.de/pkg/rxvt-unicode.html
```

7.3.3 dpkg - search installed packages

```
$ dpkg --get-selections | grep -E 'install|hold'

Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name          Version          Architecture     Description
+++-----
↳=====
ii  libgudev-1.0-0:amd64 1:204-5ubuntu20 amd64           GObject-based wrapper,
↳library for libudev
un  libudev0             <none>          <none>          (no description available)
ii  libudev1:amd64      204-5ubuntu20.1 amd64           libudev shared library
ii  libudev1:i386       204-5ubuntu20.1 i386           libudev shared library
ii  udev                 204-5ubuntu20.1 amd64           /dev/ and hotplug management,
↳daemon
```

7.3.4 dpkg - show local package metadata

```
$ dpkg --get-architecture /var/cache/apt/archives/libudev1_204-5ubuntu20.18_amd64.deb

new debian package, version 2.0.
size 33514 bytes: control archive=1549 bytes.
 612 bytes, 15 lines   control
 216 bytes,  3 lines   md5sums
 135 bytes,  7 lines   * postinst             #!/bin/sh
 132 bytes,  7 lines   * postrm               #!/bin/sh
  49 bytes,  2 lines   shlibs
```

```
  3982 bytes,   93 lines   symbols
Package: libudev1
Source: systemd
Version: 204-5ubuntu20.18
Architecture: amd64
Maintainer: Ubuntu Developers <ubuntu-devel-discuss@lists.ubuntu.com>
Installed-Size: 133
Pre-Depends: multiarch-support
Depends: libc6 (>= 2.17), libcgmanager0, libdbus-1-3 (>= 1.0.2), libnih-dbus1 (>= 1.0.
↳0), libnih1 (>= 1.0.0)
Section: libs
Priority: important
Multi-Arch: same
Homepage: http://www.freedesktop.org/wiki/Software/systemd
Description: libudev shared library
  This library provides access to udev device information.
Original-Maintainer: Debian systemd Maintainers <pkg-systemd-maintainers@lists.alioth.
↳debian.org>
```

Environment variables

Some places to look at to define/change variables, and which contents to expect.

8.1 Global

`/etc/environment` global variables: HTTP(S) & SOCKS proxies, custom `PATH`

8.2 Session

`/etc/profile` default session variables

`/etc/profile.d/*.sh` extra session variables

`~/.xprofile` user-defined X11 settings -mostly for lightweight session managers (i3, awesome-wm, etc.)

`~/.profile` user-defined variables -superseded by `~/.bash_profile`

8.2.1 Bash

`/etc/bash.bashrc` default Bash settings

`~/.bash_profile` user-defined Bash settings -mostly for X11/startup stuff

`~/.bashrc` user-defined Bash configuration (main file)

`~/.bash_aliases` user-defined Bash command aliases and functions

8.3 Superusers

`/etc/login.defs` console & login configuration

`/etc/sudoers` sudoers configuration -*always* use `visudo` to edit!

8.4 SSH

`/etc/ssh/sshd_config` server-side, can allow the client to pass variables

`/etc/ssh/ssh_config` client-side, can send variables to servers

8.5 SaltStack

`/etc/default/salt-minion` (deprecated in recent versions) can be used to source `/etc/environment`
-not always included in the distro's packages

`/etc/salt/minion` HTTP(S) proxy configuration

9.1 Disk usage

9.1.1 df - filesystem usage

```
$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda1      231G   73G  147G  34% /
udev            1.9G   4.0K  1.9G   1% /dev
tmpfs           389M   972K  388M   1% /run
none            5.0M     0  5.0M   0% /run/lock
none            1.9G   30M  1.9G   2% /run/shm
```

9.1.2 df - inode usage

```
$ df -hi
Filesystem      Inodes  IUsed  IFree  IUse% Mounted on
/dev/sda1       15M    2.6M   13M    18% /
none            486K     2   486K    1% /sys/fs/cgroup
udev            483K    564   483K    1% /dev
tmpfs           486K    594   485K    1% /run
none            486K     3   486K    1% /run/lock
none            486K     4   486K    1% /run/shm
none            486K    22   486K    1% /run/user
```

9.2 Partitions

9.2.1 fdisk - list mounted partitions

```
$ fdisk -l

Disk /dev/sda: 256.1 GB, 256060514304 bytes
255 heads, 63 sectors/track, 31130 cylinders, total 500118192 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x000681e1

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1  *          2048     491870207    245934080   83  Linux
/dev/sda2                491872254    500117503     4122625    5  Extended
/dev/sda5                491872256    500117503     4122624    82  Linux swap / Solaris
```

9.2.2 lsblk - list mounted partitions

```
$ lsblk

NAME MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda   8:0    0 238.5G  0 disk
├─sda1 8:1    0 234.6G  0 part /
├─sda2 8:2    0     1K  0 part
└─sda5 8:5    0     4G  0 part [SWAP]
sr0   11:0   1  1024M  0 rom
```

9.2.3 parted - resize a partition

See Using Parted.

```
$ parted [VOLUME]

(parted) select /dev/sda
(parted) unit GB
(parted) print
Model: ATA MTFDDAK256MAM-1K (scsi)
Disk /dev/sda: 256GB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

Number  Start  End    Size  Type      File system  Flags
  1      0.00GB 252GB 252GB primary  ext4         boot
  2      252GB 256GB 4.22GB extended
  5      252GB 256GB 4.22GB logical  linux-swaps(v1)

(parted) resize 5
Start? [252GB]? 252
End? [256GB]? 256
```

9.3 Disk maintenance

See:

- [Ext4 \(and Ext2/Ext3\) Wiki](#)
- [How long does badblocks take on a 1TB drive?](#)
- [Badblocks \(Arch Wiki\)](#)
- [How To Resize ext3 Partitions Without Losing Data](#)
- [Resize2fs](#)

9.3.1 e2fsck error checking - manual approval

```
$ e2fsck /dev/sda2

e2fsck 1.42.9 (4-Feb-2014)
/dev/sda2 contains a file system with errors, check forced.
Pass 1: Checking inodes, blocks, and sizes
Inode 7484927 has imagic flag set. Clear<y>? yes
Inode 7484927 has compression flag set on filesystem without compression support.
↳Clear<y>? yes
Inode 7484927 has INDEX_FL flag set but is not a directory.
Clear HTree index<y>? yes
[...]
/dev/sda2: ***** FILE SYSTEM WAS MODIFIED *****
/dev/sda2: 3782336/54214656 files (0.2% non-contiguous), 86369865/216833920 blocks
root@aaron:~# e2fsck -p /dev/sda2
/dev/sda2: clean, 3782336/54214656 files, 86369865/216833920 blocks
```

9.3.2 e2fsck error checking - auto approval

```
$ e2fsck -y /dev/sda2
/dev/sda2: clean, 3782336/54214656 files, 86369865/216833920 blocks
```

9.3.3 forced inode auto check & optimization

```
$ e2fsck -p -f -D /dev/sda2
/dev/sda2: 3782336/54214656 files (0.2% non-contiguous), 86367938/216833920 blocks
```


- Linux Home Networking

10.1 DNS records

10.1.1 Common record types

See the [list of DNS record types](#) for more information.

Type	Description	Function
A	Address	Maps a hostname to an IP
CNAME	Canonical Name	Alias to another hostname
MX	Mail eXchange	Maps a domain to a mail transfer agent
SRV	SeRVice locator	Generalized record type

10.1.2 dig

```
$ dig freebsd.org

; <<>> DiG 9.11.0-P1 <<>> freebsd.org
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1134
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;freebsd.org.                IN      A

;; ANSWER SECTION:
freebsd.org.                3600   IN      A      8.8.178.110
```

```
;; Query time: 58 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: lun. déc. 05 19:36:05 CET 2016
;; MSG SIZE rcvd: 45
```

```
$ dig +nocmd +noquestion +nostats archlinux.org

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 25601
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1280
;; ANSWER SECTION:
archlinux.org.      1365    IN      A       138.201.81.199
```

```
$ dig +short debian.org

140.211.15.34
130.89.148.14
128.31.0.62
```

10.1.3 nslookup

```
$ nslookup freebsd.org

Server:      192.168.1.1
Address:     192.168.1.1#53

Non-authoritative answer:
Name:       freebsd.org
Address:    8.8.178.110
Name:       freebsd.org
Address:    2001:1900:2254:206a::50:0
```

Local lookup, e.g. when using `dnsmasq` to cache DNS results:

```
$ nslookup linux.org localhost

Server:      localhost
Address:     ::1#53

Non-authoritative answer:
Name:       linux.org
Address:    192.243.104.10
```

10.2 Port scanning - Nmap / Zenmap

- nmap.org
- [Zenmap GUI for Windows](#)

State	Meaning
closed	the port is open, but no service is running on the remote server
filtered	the port is blocked by a firewall
open	the port is open, and there is a service running

10.2.1 nmap - open

```
$ nmap Gerrit.example.com -p 29418 -Pn

Starting Nmap 6.40 ( http://nmap.org ) at 2015-10-07 15:46 CEST
Nmap scan report for Gerrit.example.com (163.33.26.149)
Host is up (0.072s latency).
rDNS record for 163.33.26.149: irsgerrit001.ir.example.com
PORT      STATE SERVICE
29418/tcp  open  unknown

Nmap done: 1 IP address (1 host up) scanned in 0.17 seconds
```

10.2.2 nmap - filtered

```
$ nmap Gerrit.dev.example.com -p 29418 -Pn

Starting Nmap 6.40 ( http://nmap.org ) at 2015-10-07 15:50 CEST
Nmap scan report for Gerrit.dev.example.com (10.96.8.73)
Host is up.
rDNS record for 10.96.8.73: fmygit6003.fm.example.com
PORT      STATE SERVICE
29418/tcp  filtered unknown

Nmap done: 1 IP address (1 host up) scanned in 2.11 seconds
```

10.2.3 nmap - scan several ports, and get information on the remote services

```
$ nmap server.domain.example.com -p 22,80,5432,8080 -Pn -sV

Starting Nmap 6.40 ( http://nmap.org ) at 2015-10-07 16:01 CEST
Nmap scan report for server.domain.example.com (10.237.188.47)
Host is up (0.062s latency).
rDNS record for 10.225.127.36: server.domain.example.com
PORT      STATE SERVICE      VERSION
22/tcp    open  ssh          OpenSSH 5.9p1 Debian 5ubuntu1.7 (Ubuntu Linux; protocol 2.
↪0)
80/tcp    open  http         nginx 1.1.19
5432/tcp  closed postgresql
8080/tcp  open  tcpwrapped

Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at http://nmap.org/
↪submit/ .
Nmap done: 1 IP address (1 host up) scanned in 6.52 seconds
```

10.3 Routing

10.3.1 traceroute - show routes between two hosts

```
$ traceroute example.com

traceroute to example.com (166.70.10.23), 30 hops max, 60 byte packets
 1 176.221.87.1 (176.221.87.1) 1.474 ms 1.444 ms 1.390 ms
 2 f126.broadband2.quicknet.se (92.43.37.126) 10.047 ms 19.868 ms 23.156 ms
 3 10.5.12.1 (10.5.12.1) 24.098 ms 24.340 ms 25.311 ms
 4 212.247.178.9 (212.247.178.9) 25.777 ms 27.184 ms 27.625 ms
 5 vst-ncore-1.bundle-ether1.tele2.net (130.244.39.46) 30.632 ms 31.610 ms 32.194
↪ms
 6 kst5-core-1.bundle-ether6.tele2.net (130.244.71.178) 33.608 ms 15.274 ms 16.
↪449 ms
 7 kst5-peer-1.ae0-unit0.tele2.net (130.244.205.125) 252.53 ms 11.169 ms 12.158 ms
 8 avk6-peer-1.ae0-unit0.tele2.net (130.244.64.71) 19.661 ms 25.765 ms 26.730 ms
 9 peer-as3257.avk6.tele2.net (130.244.200.106) 25.390 ms 24.863 ms xe-5-0-0.nyc30.
↪ip4.tinet.net (89.149.181.109) 23.626 ms
10 fortress-gw.ip4.tinet.net (216.221.158.90) 29.943 ms 31.112 ms 29.002 ms
11 208.116.63.254 (208.116.63.254) 32.102 ms 29.862 ms 29.337 ms
```

10.3.2 iptables - show local routes

```
$ sudo iptables -L

Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain FORWARD (policy ACCEPT)
target     prot opt source                destination
DOCKER-ISOLATION all -- anywhere             anywhere
DOCKER     all -- anywhere            anywhere
ACCEPT     all -- anywhere            anywhere           ctstate RELATED,
↪ESTABLISHED
ACCEPT     all -- anywhere            anywhere
ACCEPT     all -- anywhere            anywhere

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination

Chain DOCKER (1 references)
target     prot opt source                destination

Chain DOCKER-ISOLATION (1 references)
target     prot opt source                destination
RETURN     all -- anywhere            anywhere
```

10.4 Sockets

10.4.1 lsof - list active sockets

```
$ lsof -Pnl +M -i
rpcbind  1192      0    8u  IPv4  28745      0t0  TCP *:111[portmapper] (LISTEN)
rpcbind  1192      0   11u  IPv6  28748      0t0  TCP *:111[portmapper] (LISTEN)
cupsd    1221      0    8u  IPv6 16414694   0t0  TCP [::]:631 (LISTEN)
rpc.statd 1238     116  11u  IPv6  11496      0t0  TCP *:55536 (LISTEN)
sshd     1295      0    3r  IPv4   1511      0t0  TCP *:22 (LISTEN)
ypbind   1395      0    5u  IPv4  28818      0t0  TCP *:724[ypbind] (LISTEN)
nrpe     1687     119    4u  IPv4  28924      0t0  TCP *:5666 (LISTEN)
nginx    1715      0   10u  IPv4   1720      0t0  TCP *:80 (LISTEN)
```


CHAPTER 11

Processes

See <http://www.binarytides.com/linux-ps-command/> for more examples!

11.1 Running

11.1.1 top - show resource usage & most consuming processes

```
$ top
```

11.1.2 htop - show resource usage & most consuming processes

```
$ htop
```

11.1.3 ps - list all running processes

```
$ ps -ef      # *nix style
```

```
$ ps aux     # BSD style
```

11.1.4 ps - process tree

```
$ ps faux
```

USER	PID	%CPU	%MEM	VSZ	RSS	TTY	STAT	START	TIME	COMMAND
root	2	0.0	0.0	0	0	?	S	09:02	0:00	[kthreadd]
root	3	0.0	0.0	0	0	?	S	09:02	0:11	_ [ksoftirqd/0]
root	4	0.0	0.0	0	0	?	S	09:02	0:41	_ [ktimersoftd/0]

```

root      6  0.0  0.0    0    0 ?      S<   09:02  0:00  \_ [kworker/0:0H]
root      8  0.0  0.0    0    0 ?      S    09:02  0:16  \_ [rcu_preempt]
root      9  0.0  0.0    0    0 ?      S    09:02  0:00  \_ [rcu_sched]

```

11.1.5 ps - list by user

```

$ ps -f -u http

UID          PID  PPID  C  STIME TTY          TIME CMD
http         2546  2451  0  09:03 ?           00:00:00 /usr/bin/httpd -k start -DFOREGROUND
http         2550  2451  0  09:03 ?           00:00:00 /usr/bin/httpd -k start -DFOREGROUND
http         2552  2451  0  09:03 ?           00:00:00 /usr/bin/httpd -k start -DFOREGROUND

```

11.1.6 ps - list by process name

```

$ ps -C python3

  PID TTY          TIME CMD
18667 pts/3    00:00:01 python3

```

11.1.7 pgrep - find processes by name

```

$ pgrep -a watchdog

10 watchdog/0
11 watchdog/1
16 watchdog/2
21 watchdog/3

```

11.2 Zombies and defuncts

11.2.1 ps - display zombie processes' PIDs

```

$ ps aux | awk '{ print $8 " " " $2 }' | grep -w Z

```

11.2.2 ps - display a family tree (in case we've a defunct parent/child job)

```

$ ps -aef

```

12.1 Device baud rate

12.1.1 stty - read a value

```
$ stty -F /dev/ttyUSB0
speed 9600 baud; line = 0;
min = 1; time = 0;
-brkint -icrnl -imaxbel
-opost -onlcr
-isig -icanon -echo
```

12.1.2 stty - set a value

```
$ stty -F /dev/ttyUSB0 115200
speed 115200 baud; line = 0;
min = 1; time = 0;
-brkint -icrnl -imaxbel
-opost -onlcr
-isig -icanon -echo
```


Udev rules are located under `/etc/udev/rules.d`. A rule matches a set of devices, according to their vendor and product IDs, and allows to set attributes that will be applied when the device is plugged:

- device ownership (group/user)
- read/write permissions
- additional mount points
- ...

13.1 Usage

13.1.1 Reload rules

```
$ udevadm control --reload-rules
```

13.1.2 Trigger device detection

```
$ udevadm trigger
```


- PostgreSQL manuals
 - current
 - 9.6
 - 9.4
- psql
- Debian overview

14.1 Basics

14.1.1 psql - Command-Line Interface (CLI)

psql - start

```
root@ic-tpl:~$ su - postgres
postgres@ic-tpl:~$ psql
psql (9.4.3)
Type "help" for help.

postgres=#
```

psql - SQL help

```
# get help on SQL instructions
postgres=# \h
Available help:
ABORT                ALTER TYPE           CREATE SCHEMA
```

```
ALTER AGGREGATE
[...]

ALTER USER

CREATE SEQUENCE

postgres=# \h DROP TABLE
Command:      DROP TABLE
Description:  remove a table
Syntax:
DROP TABLE [ IF EXISTS ] name [, ...] [ CASCADE | RESTRICT ]
```

psql - Get help on the CLI (backslash commands)

```
postgres=# \?

General
 \copyright          show PostgreSQL usage and distribution terms
 \g [FILE] or ;     execute query (and send results to file or |pipe)
 \gset [PREFIX]     execute query and store results in psql variables
 \h [NAME]          help on syntax of SQL commands, * for all commands
 \q                quit psql
 \watch [SEC]       execute query every SEC seconds

Query Buffer
 \e [FILE] [LINE]   edit the query buffer (or file) with external editor
 \ef [FUNCNAME [LINE]] edit function definition with external editor
 \p                show the contents of the query buffer
 \r                reset (clear) the query buffer
 \s [FILE]          display history or save it to file
 \w FILE            write query buffer to file
 [...]
```

14.2 Users and roles

14.2.1 Databases

List databases

```
postgres=# \l

                          List of databases
  Name          | Owner   | Encoding | Collate   | Ctype     | Access privileges
-----+-----+-----+-----+-----+-----
 postgres      | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 |
 template0     | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres
 postgres      | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres
 template1     | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres
 postgres      | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres
(4 rows)
```

```
# the information is held by global PG tables, and can be obtained through SQL queries
postgres=# SELECT datname, datcollate FROM pg_database ORDER BY datname;
 datname      | datcollate
-----+-----
icinga2_ido   | en_US.UTF-8
postgres     | en_US.UTF-8
template0    | en_US.UTF-8
template1    | en_US.UTF-8
(4 rows)
```

Connect to a database

```
postgres=# \c icinga2_ido
You are now connected to database "icinga2_ido" as user "postgres".
```

List tables

```
postgres=# \dt
                List of relations
 Schema |          Name          | Type |   Owner
-----+-----+-----+-----
 public | icinga_acknowledgements | table | icinga2_ido
 public | icinga_commands        | table | icinga2_ido
 public | icinga_commenthistory  | table | icinga2_ido
 public | icinga_comments        | table | icinga2_ido
```

Describe table

```
icinga2_ido=# \d icinga_commands
                Table "public.icinga_commands"
 Column      | Type      | Modifiers
-----+-----+-----
command_id  | bigint    | not null default nextval('icinga_commands_command_id_seq
↳ '::regclass)
instance_id | bigint    | default 0
config_type | integer   | default 0
object_id   | bigint    | default 0
command_line | text      | default ''::text
Indexes:
  "pk_command_id" PRIMARY KEY, btree (command_id)
  "uq_commands" UNIQUE CONSTRAINT, btree (instance_id, object_id, config_type)
  "command_object_idx" btree (object_id)
  "commands_i_id_idx" btree (instance_id)
```


CHAPTER 15

SSH - Secure Shell

- [SSH with authentication key instead of password](#)
- [How To Create an SSH CA to Validate Hosts and Clients with Ubuntu](#)

16.1 systemctl - daemon management

Note: Some distributions (Debian, Ubuntu & derivatives) automatically enable and start daemons after they have been installed, whereas other ones let the user manage which units are enabled and started (Archlinux, CentOS).

16.1.1 enable

Creates a symlink from `/etc/systemd/system/<my_service>` to `/lib/systemd/system/<my_service>` so `my_service` will be launched after booting.

```
$ root@icinga:~# systemctl enable ssh.service

Synchronizing state for ssh.service with sysvinit using update-rc.d...
Executing /usr/sbin/update-rc.d ssh defaults
Executing /usr/sbin/update-rc.d ssh enable
Created symlink from /etc/systemd/system/sshd.service to /lib/systemd/system/ssh.
↳service.
```

16.1.2 disable

```
$ root@icinga:~# systemctl disable ssh.service

Synchronizing state for ssh.service with sysvinit using update-rc.d...
Executing /usr/sbin/update-rc.d ssh defaults
Executing /usr/sbin/update-rc.d ssh disable
Removed symlink /etc/systemd/system/sshd.service.
```

16.1.3 start / stop / restart

```
$ root@icinga:~# systemctl start php5-fpm.service
```

```
$ root@icinga:~# systemctl stop nginx.service
```

```
$ root@icinga:~# systemctl restart nginx.service
```

16.1.4 list-units - active services

```
$ root@icinga:~# systemctl list-units -t service
```

UNIT	LOAD	ACTIVE	SUB	DESCRIPTION
console-getty.service	loaded	active	running	Console Getty
cron.service	loaded	active	running	Regular background program
↳processing daemon				
exim4.service	loaded	active	running	LSB: exim Mail Transport Agent
getty-static.service	loaded	active	exited	getty on tty2-tty6 if dbus
↳and login are not available				
getty@tty1.service	loaded	active	running	Getty on tty1
getty@tty2.service	loaded	active	running	Getty on tty2
getty@tty3.service	loaded	active	running	Getty on tty3
getty@tty4.service	loaded	active	running	Getty on tty4
getty@tty5.service	loaded	active	running	Getty on tty5
getty@tty6.service	loaded	active	running	Getty on tty6
icinga2.service	loaded	active	running	Icinga host/service/network
↳monitoring system				
modules_dep.service	loaded	active	exited	LSB: modules.dep creation.
nagios-nrpe-server.service	loaded	active	running	LSB: Start/Stop the Nagios
↳remote plugin execution daemon				
networking.service	loaded	active	running	LSB: Raise network interfaces.
nginx.service	loaded	active	running	A high performance web server
↳and a reverse proxy server				
ntp.service	loaded	active	exited	LSB: Start NTP daemon
php5-fpm.service	loaded	active	running	The PHP FastCGI Process
↳Manager				
postgresql.service	loaded	active	exited	PostgreSQL RDBMS
postgresql@9.4-main.service	loaded	active	running	PostgreSQL Cluster 9.4-main
quota.service	loaded	active	exited	Check And Enable File System
↳Quotas				
rc-local.service	loaded	failed	failed	/etc/rc.local Compatibility
rsyslog.service	loaded	active	running	System Logging Service
ssh.service	loaded	active	running	OpenBSD Secure Shell server
systemd-journald.service	loaded	active	running	Journal Service
systemd-random-seed.service	loaded	active	exited	Load/Save Random Seed
systemd-remount-fs.service	loaded	active	exited	Remount Root and Kernel File
↳Systems				
systemd-resolved.service	loaded	active	running	Network Name Resolution
systemd-setup-dgram-qlen.service	loaded	active	exited	Increase datagram queue length
systemd-sysctl.service	loaded	active	exited	Apply Kernel Variables
systemd-tmpfiles-setup.service	loaded	active	exited	Create Volatile Files and
↳Directories				
systemd-udev-trigger.service	loaded	active	exited	udev Coldplug all Devices
systemd-udevd.service	loaded	active	running	udev Kernel Device Manager
systemd-update-utmp.service	loaded	active	exited	Update UTMP about System Boot/
↳Shutdown				

```

systemd-user-sessions.service    loaded active exited  Permit User Sessions
udev-finish.service            loaded active exited  Copy rules generated while_
↪the root was ro

LOAD    = Reflects whether the unit definition was properly loaded.
ACTIVE  = The high-level unit activation state, i.e. generalization of SUB.
SUB     = The low-level unit activation state, values depend on unit type.

35 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
    
```

16.1.5 status

```

$ root@icinga:~# systemctl status php5-fpm.service

php5-fpm.service - The PHP FastCGI Process Manager
  Loaded: loaded (/lib/systemd/system/php5-fpm.service; enabled)
  Active: active (running) since Thu 2015-09-03 11:49:59 CEST; 5h 18min ago
  Main PID: 31259 (php5-fpm)
  Status: "Processes active: 0, idle: 2, Requests: 52, slow: 0, Traffic: 0req/sec"
  CGroup: /system.slice/php5-fpm.service
          └─31259 php-fpm: master process (/etc/php5/fpm/php-fpm.conf)
             └─31260 php-fpm: pool www
                └─31261 php-fpm: pool www

Sep 03 11:49:59 icinga systemd[1]: Started The PHP FastCGI Process Manager.
    
```

16.1.6 status - units matching a pattern

```

$ root@icinga:~# systemctl status po*

postgresql.service - PostgreSQL RDBMS
  Loaded: loaded (/lib/systemd/system/postgresql.service; enabled)
  Active: active (exited) since Thu 2015-09-03 11:53:06 CEST; 5h 50min ago
  Main PID: 31552 (code=exited, status=0/SUCCESS)
  CGroup: /system.slice/postgresql.service

Sep 03 11:53:06 icinga systemd[1]: Started PostgreSQL RDBMS.

postgresql@9.4-main.service - PostgreSQL Cluster 9.4-main
  Loaded: loaded (/lib/systemd/system/postgresql@9.4-main.service; disabled)
  Active: active (running) since Thu 2015-09-03 11:53:06 CEST; 5h 50min ago
  Main PID: 31520 (postgres)
  CGroup: /system.slice/system-postgresql.slice/postgresql@9.4-main.service
          └─31520 /usr/lib/postgresql/9.4/bin/postgres -D /var/lib/postgresql/9.4/
↪main -c config_file=/etc/postgresql/9.4/main/postgresql.conf
             └─31522 postgres: checkpoint process
                └─31523 postgres: writer process
                   └─31524 postgres: wal writer process
                      └─31525 postgres: autovacuum launcher process
                         └─31526 postgres: stats collector process
                            └─31534 postgres: icinga2idopgsql icinga2idopgsql ::1(36874) idle in_
↪transaction

Sep 03 11:53:06 icinga systemd[1]: Started PostgreSQL Cluster 9.4-main.
    
```

16.2 journalctl

16.2.1 journalctl - logs for a given daemon

```
$ root@icinga:~# journalctl -b -u ssh.service

-- Logs begin at Tue 2015-09-01 17:27:04 CEST, end at Thu 2015-09-03 17:21:06 CEST. --
Sep 01 17:27:04 icinga systemd[1]: Starting OpenBSD Secure Shell server...
Sep 01 17:27:04 icinga systemd[1]: Started OpenBSD Secure Shell server.
Sep 01 17:27:04 icinga sshd[172]: Server listening on 0.0.0.0 port 22.
Sep 01 17:27:04 icinga sshd[172]: Server listening on :: port 22.
Sep 01 17:27:04 icinga sshd[172]: Could not load host key: /etc/ssh/ssh_host_rsa_key
Sep 01 17:27:04 icinga sshd[172]: Could not load host key: /etc/ssh/ssh_host_dsa_key
Sep 01 17:27:04 icinga sshd[172]: Could not load host key: /etc/ssh/ssh_host_ecdsa_key
Sep 01 17:27:04 icinga sshd[172]: Could not load host key: /etc/ssh/ssh_host_ed25519_
↳key
Sep 01 17:27:05 icinga systemd[1]: Stopping OpenBSD Secure Shell server...
Sep 01 17:27:05 icinga systemd[1]: Starting OpenBSD Secure Shell server...
Sep 01 17:27:05 icinga systemd[1]: Started OpenBSD Secure Shell server.
Sep 01 17:27:05 icinga sshd[203]: Server listening on 0.0.0.0 port 22.
Sep 01 17:27:05 icinga sshd[203]: Server listening on :: port 22.
Sep 01 17:50:24 icinga sshd[1566]: Accepted password for root from 10.102.167.30 port_
↳39590 ssh2
Sep 01 17:50:24 icinga sshd[1566]: pam_unix(sshd:session): session opened for user_
↳root by (uid=0)
```

16.2.2 journalctl - list system boots

```
$ root@icinga:~# journalctl --list-boots

0 897795c2801a4197bbe425f0d6d59ce3 Tue 2015-09-01 17:27:04 CEST--Thu 2015-09-03_
↳17:24:06 CEST
```

CHAPTER 17

X11

- [X.org Foundation](#)
- [X Virtual FrameBuffer \(xvfb\)](#)

CHAPTER 18

Linux API

- Linux Control Groups v1
- Linux Control Groups v2
 - FOSDEM 2017 talk and slides
- namespaces(7)
- setns(2)
- ptrace(2)

19.1 Docker

- Where are Docker images stored?
- Dockerfile reference
- Dockerfile best practices
- Volumes

19.2 DockerHub

- Repositories
- Teams and organizations
- GitHub automated build

19.3 Service management

- Using supervisord
- Nginx in the foreground
- supervisord

20.1 Basics

Install **Docker**, by following the instruction relevant to your OS / distribution, and start the service.

20.2 Search an image on DockerHub

```
$ docker search debian
```

NAME	DESCRIPTION	STARS	OFFICIAL
↪AUTOMATED			
ubuntu	Ubuntu is a Debian-based Linux operating s...	2065	[OK]
debian	Debian is a Linux distribution that's comp...	603	[OK]
google/debian		47	
↪[OK]			

20.3 Show available tags for a repository

```
$ curl https://index.docker.io/v1/repositories/debian/tags | python -m json.tool
```

% Total Dload	% Received Upload	% Xferd Total	Average Speed Spent	Left	Speed	Time	Time	Time	Current		
100	1283	0	1283	0	0	433	0	--:--:--	0:00:02	--:--:--	433

Sample output:

```
[  
  {  
    "layer": "85a02782",
```

```

    "name": "stretch"
  },
  {
    "layer": "59abecbc",
    "name": "testing"
  },
  {
    "layer": "bf0fd686",
    "name": "unstable"
  },
  {
    "layer": "60c52dbe",
    "name": "wheezy"
  },
  {
    "layer": "c5b806fe",
    "name": "wheezy-backports"
  }
]

```

20.4 Pull an image from DockerHub

```

$ docker pull repository[:tag]

$ docker pull debian:wheezy
wheezy: Pulling from debian
4c8cbfd2973e: Pull complete
60c52dbe9d91: Pull complete
Digest: sha256:c584131da2ac1948aa3e66468a4424b6aea2f33acba7cec0b631bdb56254c4fe
Status: Downloaded newer image for debian:wheezy

```

20.5 Run!

20.6 Get the Shaarli image

```

$ docker pull shaarli/shaarli
latest: Pulling from shaarli/shaarli
32716d9fcddb: Pull complete
84899d045435: Pull complete
4b6ad7444763: Pull complete
e0345ef7a3e0: Pull complete
5c1dd344094f: Pull complete
6422305a200b: Pull complete
7d63f861dbef: Pull complete
3eb97210645c: Pull complete
869319d746ff: Already exists
869319d746ff: Pulling fs layer
902b87aaaec9: Already exists
Digest: sha256:f836b4627b958b3f83f59c332f22f02fcd495ace3056f2be2c4912bd8704cc98
Status: Downloaded newer image for shaarli/shaarli:latest

```

20.7 Create and start a new container from the image

```
# map the host's :8000 port to the container's :80 port
$ docker create -p 8000:80 shaarli/shaarli
d40b7af693d678958adedfb88f87d6ea0237186c23de5c4102a55a8fcb499101

# launch the container in the background
$ docker start d40b7af693d678958adedfb88f87d6ea0237186c23de5c4102a55a8fcb499101
d40b7af693d678958adedfb88f87d6ea0237186c23de5c4102a55a8fcb499101

# list active containers
$ docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS        PORTS
↳ d40b7af693d6   shaarli/shaarli     /usr/bin/supervisor     15 seconds ago Up 4 seconds  0.0.0:8000->80/tcp
↳ backstabbing_galileo
```

20.8 Stop and destroy a container

```
$ docker stop backstabbing_galileo # those docker guys are really rude to physicists!
backstabbing_galileo

# check the container is stopped
$ docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS        PORTS
↳ d40b7af693d6   shaarli/shaarli     /usr/bin/supervisor     5 minutes ago Exited (0) 48 seconds ago
↳ backstabbing_galileo

# list ALL containers
$ docker ps -a
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS        PORTS
↳ d40b7af693d6   shaarli/shaarli     /usr/bin/supervisor     5 minutes ago Exited (0) 48 seconds ago
↳ backstabbing_galileo

# destroy the container
$ docker rm backstabbing_galileo # let's put an end to these barbarian practices
backstabbing_galileo

$ docker ps -a
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS        PORTS
↳ d40b7af693d6   shaarli/shaarli     /usr/bin/supervisor     5 minutes ago Exited (0) 48 seconds ago
↳ backstabbing_galileo
```


21.1 About

- List of all manpages
- Standard image repository
- Getting started with LXC, 2014, Flockport

21.1.1 Linux templates

A template is a script allowing to populate a container's pseudo-filesystem for it to run a given Linux distribution.

To display a template's options:

```
$ lxc-create -t <template> -h
```

For more information:

```
$ emacs /usr/share/lxc/templates/lxc-<template>
```

21.1.2 Useful commands

List existing containers and their network address (if running):

```
$ lxc-ls --fancy
NAME                STATE  AUTOSTART  GROUPS  IPV4        IPV6
example-centos-test RUNNING 0          -       10.0.3.176 -
example-ubuntu-test RUNNING 0          -       10.0.3.179 -
```

21.2 Container lifecycle

21.2.1 CentOS 7

Prerequisite: yum

```
$ lxc-create -t centos -n example-centos-test -- -R 7
$ lxc-start -n example-centos-test
$ lxc-attach -n example-centos-test
# do something with the container
$ lxc-stop -n example-centos-test
$ lxc-destroy -n example-centos-test
```

21.2.2 Debian 8

Prerequisite: debootstrap

```
$ lxc-create -t debian -n example-debian-test
$ lxc-start -n example-debian-test
$ lxc-attach -n example-debian-test
# do something with the container
$ lxc-stop -n example-debian-test
$ lxc-destroy -n example-debian-test
```

21.2.3 Ubuntu 16.04

Prerequisite: debootstrap (recent version)

```
$ lxc-create -t ubuntu -n example-ubuntu-test -- -r xenial
$ lxc-start -n example-ubuntu-test
$ lxc-attach -n example-ubuntu-test
# do something with the container
$ lxc-stop -n example-ubuntu-test
$ lxc-destroy -n example-ubuntu-test
```


22.1 Packages

Let's follow the Debian LXC guide!

```
$ aptitude update
# let's get a decent LXC version ;-)
$ aptitude -t jessie-backports install lxc
# required for recent Debian/Ubuntu containers
$ aptitude -t jessie-backports install debootstrap
# required for CentOS containers
$ aptitude install yum
```

22.2 Network configuration

Listing 22.1: /etc/default/lxc-net

```
USE_LXC_BRIDGE="true"
```

Listing 22.2: /etc/lxc/default.conf

```
lxc.network.type = veth
lxc.network.link = lxcbr0
lxc.network.flags = up
lxc.network.hwaddr = 00:16:3e:xx:xx:xx
```

22.3 Applying the modifications

Restart `lxc-net` so the modifications are taken into account, and the `lxcbr0` network bridge is created:

```
$ systemctl restart lxc-net

$ ip -4 addr show lxcbr0
5: lxcbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN
↪group default
   inet 10.0.3.1/24 scope global lxcbr0
      valid_lft forever preferred_lft forever
```

- OpenVZ philosophy

23.1 Container management

- Operations on containers
- Managing resources

23.2 Template creation

- Debian template creation
- Updating Debian template

23.3 Proxmox

- Debian Appliance Builder
- Template naming convention

23.4 Scripts

23.4.1 mkvztpl.sh

Creates an OpenVZ template from an existing container instance.

Listing 23.1: mkvztpl.sh

```
#!/bin/bash
#
# Creates an OpenVZ template from a container instance
#
# $1 ID of the container to use for template creation
# $2 Name of the template, without extension
ID=${1}
NAME=${2}

CUR_DIR=${PWD}

VZ_DIR=/var/lib/vz
ROOT_DIR=${VZ_DIR}/root/${ID}
TPL=${VZ_DIR}/template/cache/${NAME}.tar.gz

echo "> ${ID}: Cleaning package cache"
sudo vzctl restart ${ID}
sudo vzctl exec ${ID} apt-get clean
sudo vzctl stop ${ID}

echo "> ${ID}: Mounting filesystem"
sudo vzctl mount ${ID}

echo "> ${ID}: Cleaning up configuration"
cd ${ROOT_DIR}/etc
sudo rm -f hostname resolv.conf
sudo cp rc.local.first rc.local

cd ssh
sudo rm -f ssh_host_*

echo "> ${ID}: Archiving to ${TPL}"
cd ${ROOT_DIR}
sudo tar --numeric-owner -zcf ${TPL} .

echo "> ${ID}: Unmounting filesystem"
cd ${CUR_DIR}
sudo vzctl umount ${ID}
```

Usage:

```
$ ./mkvztpl.sh <CT_ID> <TPL_NAME>
```

24.1 C

- The C Book
- Understanding ELF using readelf and objdump
- IOCCC, The International Obfuscated C Code Contest

24.2 C++

- C++ WikiBook
- C++ Core Guidelines
- Google C++ Style Guide
- When should `static_cast`, `dynamic_cast`, `const_cast` and `reinterpret_cast` be used?
- How do you explain the differences among `static_cast`, `reinterpret_cast`, `const_cast`, and `dynamic_cast` to a new C++ programmer?

24.3 Compilers

- An introduction to gcc

24.4 Performance & traces

- FlameGraph

24.5 Tools & QA

24.5.1 CMake

- CMake tutorial, Beamer presentation & source code
- What is an out-of-source build?
- CMake and out-of-source build
- CMake output/build directory

CMakeLists.txt:

- Basic setup

Integrations:

- Astyle or similar code beautifier
- cppcheck and clang-format for a cmake project
- doxygen
- gcov/lcov and valgrind

24.5.2 Lint

- Uncrustify
- Vera++

24.5.3 Package management

- #include, The Qt library archive
- Conan

24.5.4 Travis

- Travis CI and Modern C++

25.1 Look & Feel

Add to ~/.profile or ~/.bashrc:

```
export _JAVA_OPTIONS='-Dswing.defaultlaf=com.sun.java.swing.plaf.gtk.GTKLookAndFeel'
```


CHAPTER 26

Lisp

- [Common Lisp](#)
- [Practical Common Lisp](#)
- [SLIME, The Superior Lisp Interaction Mode for Emacs](#)
- [Let Over Lambda, 50 years of Lisp](#)
- [Structure and Interpretation of Computer Programs](#)
- [The Common Lisp Cookbook](#)
- [Common Lisp Web Application environment](#)
- [Steel Bank Common Lisp](#)
- [Running Lisp in Production - Grammarly Lab Journal](#)

27.1 Basics

- [Composer](#)
- [PHP Standard Recommendations \(PSR\)](#)
- [PSR-1 - Basic Coding Standard](#)
- [PSR-2 - Coding Style Guide](#)

27.2 Code quality

27.2.1 Static analysis

- [Code Sniffer](#)
- [Copy/Paste Detector](#)
- [Mess Detector](#)

27.2.2 Test frameworks

- [PHPUnit](#)
- [SeleniumHQ](#)

27.2.3 Links

- [Internationalization with gettext](#)
- [Testing your privates](#)

- [Review of PHP Static Analysis Tools](#)
- [sk89q's PHP Security Checklist](#)
- [PHP Sadness](#)

28.1 Basics

28.1.1 Packages

- [Python Package Index \(PyPi\)](#)
- [pip - the package installation tool \(PyPi - code - doc\)](#)
- [Wheel - a built-package format for Python \(PyPi - code - doc\)](#)
- [Christoph Gohlke 's unofficial Windows wheel repository](#)

28.1.2 Virtualenv

- [virtualenv - creates virtual environments \(PyPi - code - doc\)](#)
- [virtualenvwrapper - manages projects and virtual environments \(PyPi - code - doc\)](#)
- [pew - Python Env Wrapper \(PyPi - code\)](#)

28.2 Code quality

28.2.1 Static Analysis

- [isort - sorts imported packages and modules \(PyPi - code\)](#)
- [pep8 - checks some of the style conventions in PEP 8 \(PyPi - code - doc\)](#)
- [pylint - checks for errors, tries to enforce a coding standard and looks for bad code smells \(PyPi - code - doc\)](#)

28.2.2 Test frameworks

- unittest
- Coverage (PyPi - code - doc)
- Nose (PyPi - code - doc)
- Pytest (PyPi - code - doc)

28.3 Useful packages

28.3.1 Networking

- Paramiko - SSH2 protocol library (PyPi - code - doc)
- Requests (PyPi - code - doc)

28.3.2 Science

- IPython - interactive Python shell (PyPi - code - doc)
- Jupyter Notebook (formerly IPython Notebook) (PyPi - code - doc)
- Numpy - N-dimensional array manipulation (PyPi - code - doc)
- Scipy - mathematics, science, and engineering (PyPi - code - doc)

28.3.3 SCM

- Dulwich - native implementation of Git in Python (PyPi - code - doc)
- GitPython - Git wrapper (PyPi - code - doc)
 - note: the documentation is *very scarce*, delving into the code is required to understand object relationship

28.3.4 Service management

- Supervisor - A process control system

28.3.5 Templating

- Jinja2 (PyPi - code - doc)

28.3.6 Web

- Iss0 - A commenting server
- Python's Web Framework Benchmarks

28.3.7 WSGI

- [aiohttp](#) - HTTP client/server for asyncio (PyPi - code - doc)
- [Django](#) - The web framework for perfectionists with deadlines
- [Flask](#) - A microframework based on Werkzeug, Jinja 2 and good intentions
- [Gunicorn](#) - WSGI server
- [Pylons](#) - Pyramid

29.1 Usage

- [60 commands of Linux - A Guide from Newbies to System Administrator](#)

29.2 Best practices

- [Declare and use boolean variables in a shell script](#)
- [Design patterns or best practices for shell scripts](#)
- [Gentoo development guide](#)
 - [bash](#)
 - [find](#)
- [ShellCheck \(code\)](#)

30.1 Overview

The **Elastic Stack**, formerly known as **ELK**, is a software suite composed of the following core components:

- the [Elasticsearch](#) search engine and indexer;
- the [Logstash](#) client;
- the [Kibana](#) web dashboard.

A typical installation might also feature:

- the [X-Pack](#) security, machine learning and monitoring plugin collection;
- several [Beats](#) lightweight data shippers.

30.2 Documentation

- [Elasticsearch: The Definitive Guide](#)
- [Exploring Elasticsearch](#)
- [The complete guide to the ELK stack - Logz.io](#)

30.3 Setup

30.3.1 Security

The X-Pack plugin comes with a subscription plan and a 30-day trial license:

- [Subscriptions](#)
- [License expiration](#)

- [After X-Pack license expiration - Elastic forum](#)

Once the license has expired, a number of features become unavailable, among which is user management (authentication, authorization).

This limitation can be circumvented by serving the Elastic Stack services behind a reverse HTTP proxy, using Basic Authentication features to manage user authentication and provide simple authorization:

- [Playing HTTP Tricks with Nginx](#)

30.3.2 Cluster management

- [Pending tasks](#)
- [Pending cluster tasks](#)
- [How to monitor Elasticsearch performance](#)

30.4 Community

- [/r/elastic](#)
- [/r/elasticsearch](#)
- [/r/logstash](#)
- [/r/kibana](#)

30.5 Real-world use cases

30.5.1 Elastic highlights

- [Use cases](#)
- [Uses of Elasticsearch, and Things to Learn](#)
- [Dealing with Human Language](#)
- [Using Elastic Graph + Kibana to Analyze Panama Papers](#)
- [Introducing Machine Learning for the Elastic Stack](#)

30.5.2 Community resources

- [What are use cases of Elasticsearch? - Quora](#)
- [Engineering Uber Predictions in Real Time with ELK - Uber Engineering Blog](#)
- [How to use Elasticsearch for Natural Language Processing and Text Mining - Dataconomy](#)

30.6 Tutorials and examples

30.6.1 ELK Hello World Example

- [Logstash setup](#)
- [Elasticsearch setup](#)
- [Kibana setup](#)

30.6.2 Apache HTTPD 2.4 logs

- [How to Use Elasticsearch, Logstash, and Kibana to Manage Apache Logs](#)
- [Logstash basic configuration examples](#)
- [Logstash patterns for HTTPD logs](#)

30.6.3 Kibana visualizations

- [Creating the perfect Kibana dashboard](#)

30.6.4 Python bindings

- [elasticsearch-py low-level API](#)
- [elasticsearch-dsl high-level Domain-Specific Language \(DSL\)](#)
- [Having fun: Python and Elasticsearch, Part 1, Part 2, Part 3](#)