Securing your daemons using systemd

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FOSDEM, Brussels, 2020.2.2

About me

systemd upstream
Fedora (FESCo, systemd maint., Python SIG, Rust SIG)

Before we begin...
Why use systemd for this at all?

- centralization
- abstraction of hardware architecture / kernel version
- unprivileged operation

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Numbers:

```
$ dnf repoquery --releasever=32 -l --whatprovides \
    '/usr/lib/systemd/system/*' \
    rg -i '^/usr/lib/systemd/system/[a-z0-9_@.\\-]+$' | \
    sort -u | wc -l
1740!!!
```

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Unit files

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```
# /etc/systemd/system/mydaemon.service
[Service]
ExecStart=/usr/local/bin/mydaemon
```

```
$ sudo systemctl start mydaemon.service
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$ sudo /usr/local/bin/mydameon

$ sudo systemd-run /usr/local/bin/mydameon
$ sudo systemd-run -t /usr/local/bin/mydameon
```

Basics

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```
User=
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```
$ systemd-run whoami
root

$ systemd-run --uid=zbyszek whoami
zbyszek
$ systemd-run -p User=zbyszek whoami
zbyszek
```

Limiting access to the file system

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- `BindPaths=`
- `ReadOnlyBindPaths=`

Limiting access to the file system

- `PrivateTmp=yes`

Limiting access to the file system a better way

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▶ `RuntimeDirectory=`*foo*	/run/*foo*/
▶ `StateDirectory=`*foo*	/var/lib/*foo*/
▶ `CacheDirectory=`*foo*	/var/cache/*foo*/
▶ `LogsDirectory=`*foo*	/var/log/*foo*/
▶ `ConfigurationDirectory=`*foo*	/etc/*foo*/

```
$ sudo systemd-run -t -p User=zbyszek \
                      -p RuntimeDirectory=foo \
                      ls -ld /run/foo
```

- automatic *creation* and *ownership*
- automatic *removal*

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"`PrivateNetwork=yes` is the recommeded way to run network services"

Socket Activation

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Two types of socket activation:

`Accept=yes`
→ a single instance of the service is started for each connection
→ "wait" under inetd/xinetd

`Accept=no`
→ a single instance of the service is started for each connection
→ "nowait" under inetd/xinetd

Per-service network firewall

- `IPAddressAllow=10.20.30.0/24 1.2.3.4`
- `IPAddressDeny=*`
- `IP{Ingress,Egress}FilterPath=`

BPF!

Low-level stuff

- `MemoryDenyWriteExecute=yes`
- `PrivateDevices=yes`
- `NoNewPrivileges=yes`
- `RestrictSUIDSGID=yes`
- `ProtectKernelTunables=yes`
- `ProtectClock=yes`
- `ProtectHostname=yes`
- `ProtectKernelLogs=yes`
- `LockPersonality=yes`

Capability limits

- `CapabilityBoundingSet=`
- `Capability=`
- `DropCapability=`
- `AmbientCapabilities=`

System call filtering

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- `SyscallFilter=...`
  implemented using `libseccomp`
- `syscall1 | syscall2 | @group`
- `@basic-io`
- `@obsolete`

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- `SystemCallArchitectures=native|x86_64|i386|...`
- `RestrictAddressFamilies=AF_UNIX|AF_INET|AF_INET6`
  `|AF_CAN|AF_APPLETALK|...`

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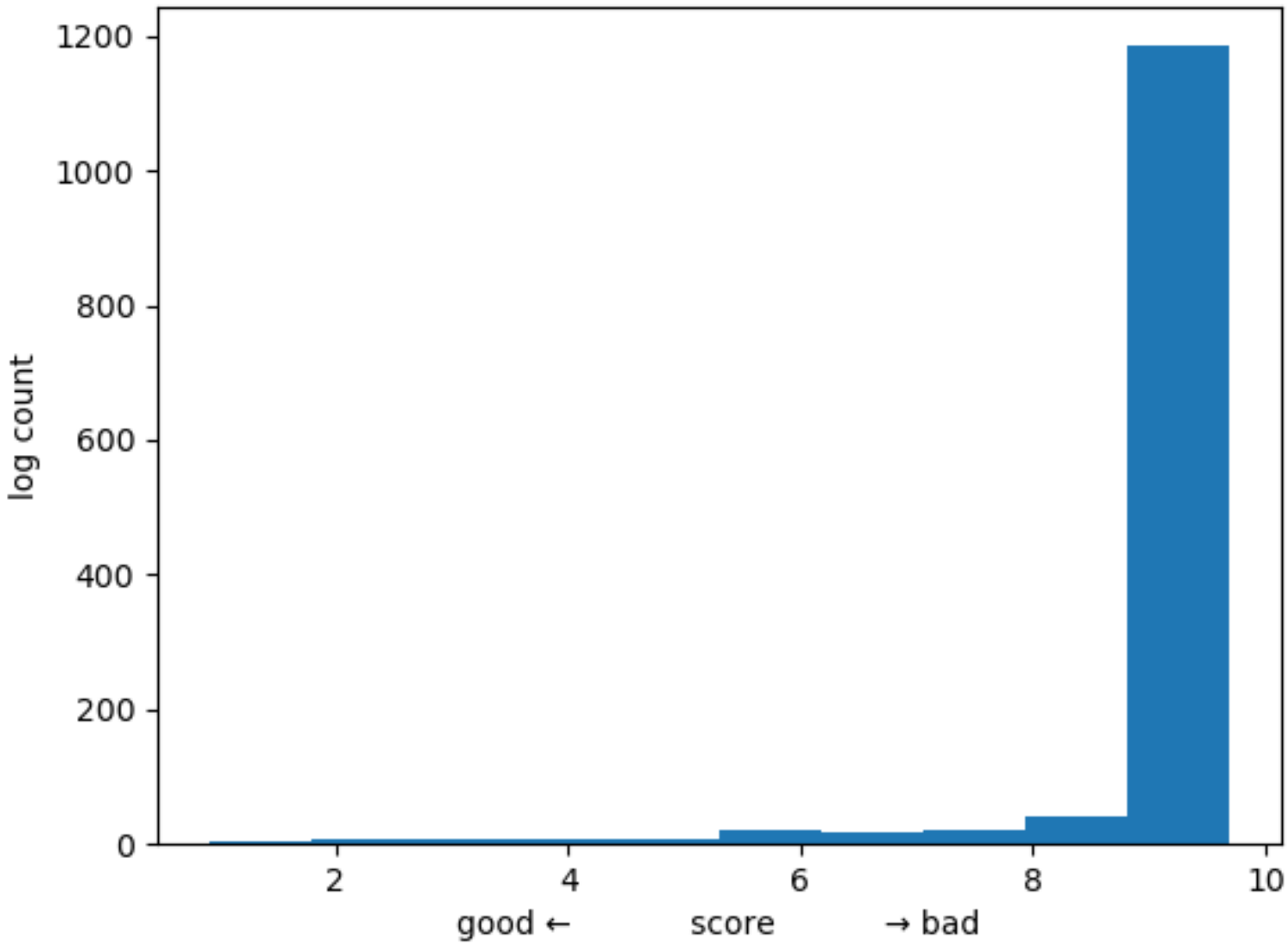
```
$ systemd-analyze syscall-filter @obsolete
```

systemd-analyze security

```
$ systemd-analyze security systemd-resolved.service
```

Fedora 32: `systemd-analyze security *`



Stacking

the application
systemd sandboxing
selinux | apparmor | ...
kernel

The End

https://github.com/systemd/systemd
docs: https://systemd.io/
https://www.freedesktop.org/wiki/Software/systemd/

this:
https://github.com/keszybz/systemd-security-talk/blob/master/systemd-security.pdf