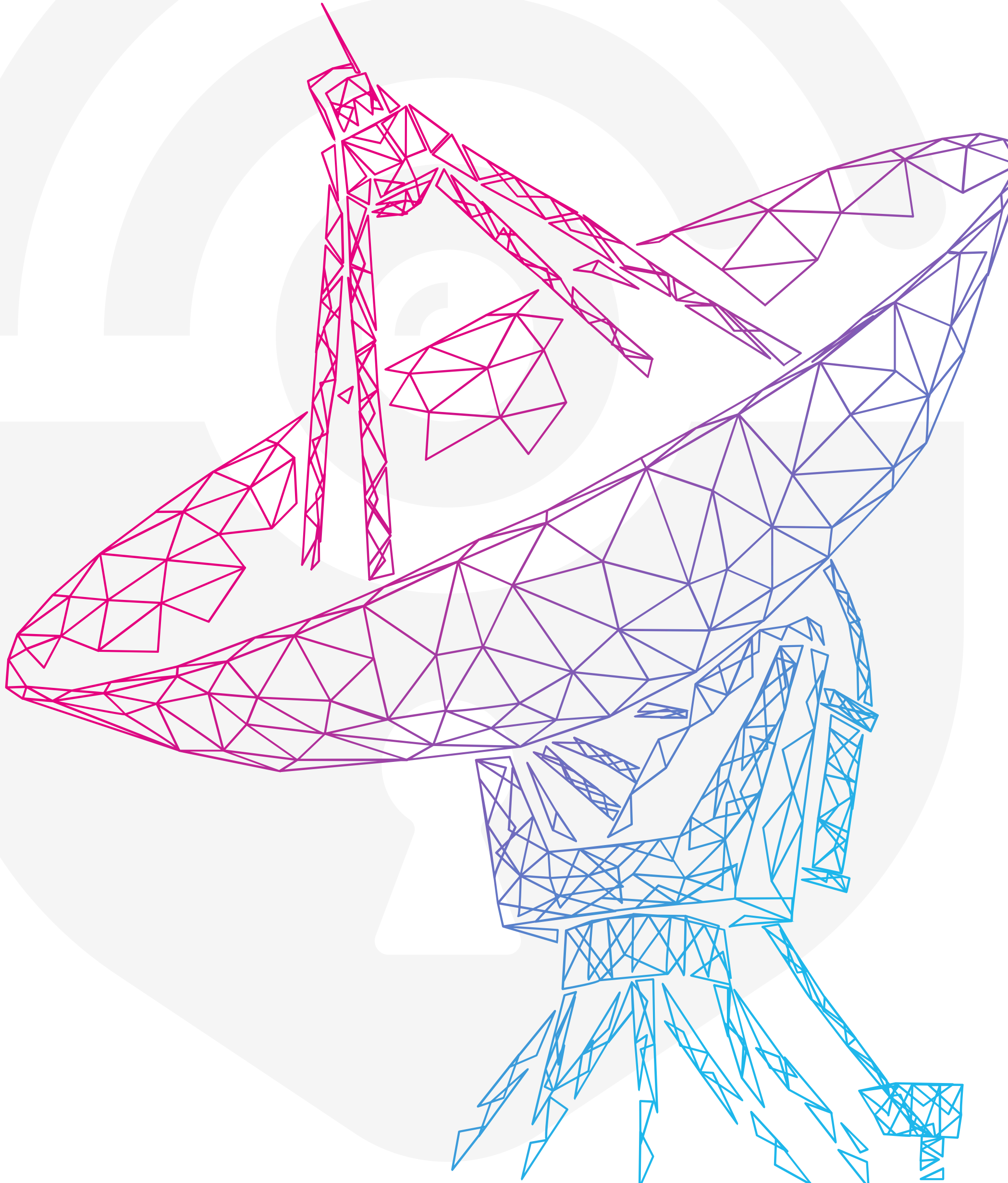
penthertz

RF Swift: a swifty toolbox for all wireless assessments

By Sébastien Dudek

Spectrum 2024



About myself

Founder of Penthertz

- Sébastien Dudek (@FlUxIuS)
- CEO of Penthertz
  - Founded during COVID in 2020
  - Specialized in Wireless communications security
- > 10 years of experience in Software & Hardware security
  - Security researcher
  - Pentester & Red Team
  - Vulnerability researcher

Perfect mix to make Penthertz!

Penthertz

Main activities

Security assessments

- Wireless communications (RFID, Wi-Fi, Mobile communications, Bluetooth, etc.)
- Embedded devices
- Backend servers
- Red Team

Trainings

- Software-Defined Radio Hacking
- Wi-Fi Red teaming
- RFID Hacking
- Mobile attacks (2G/3G/4G/5G), and more…

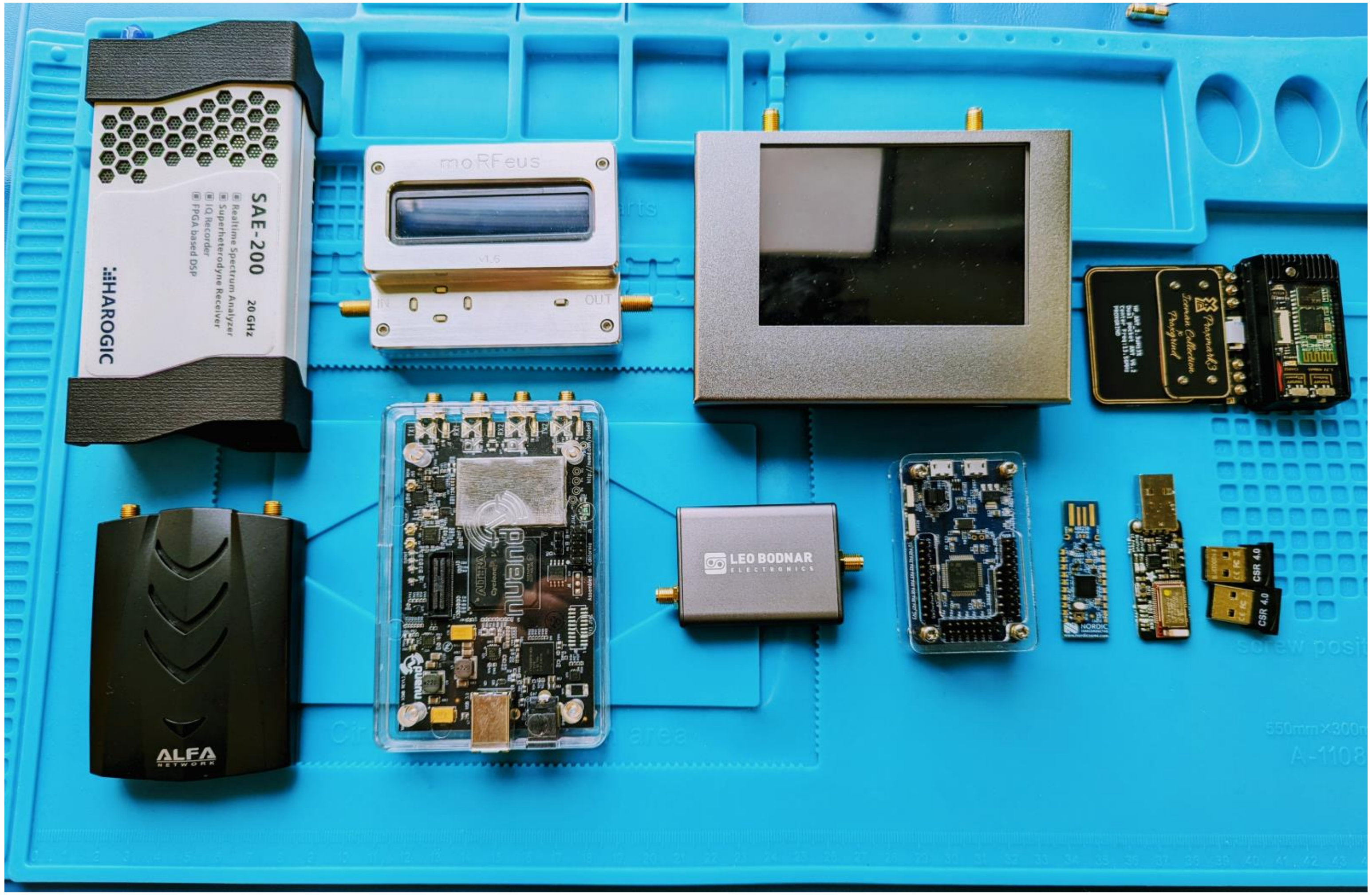
Hardware security

- Firmware extraction
- Chip off
- Secrets extraction
- Library’s analysis
- Vulnerability hunting

RF Pentester 010: Having a good setup

Setup

A minimum setup for assessments



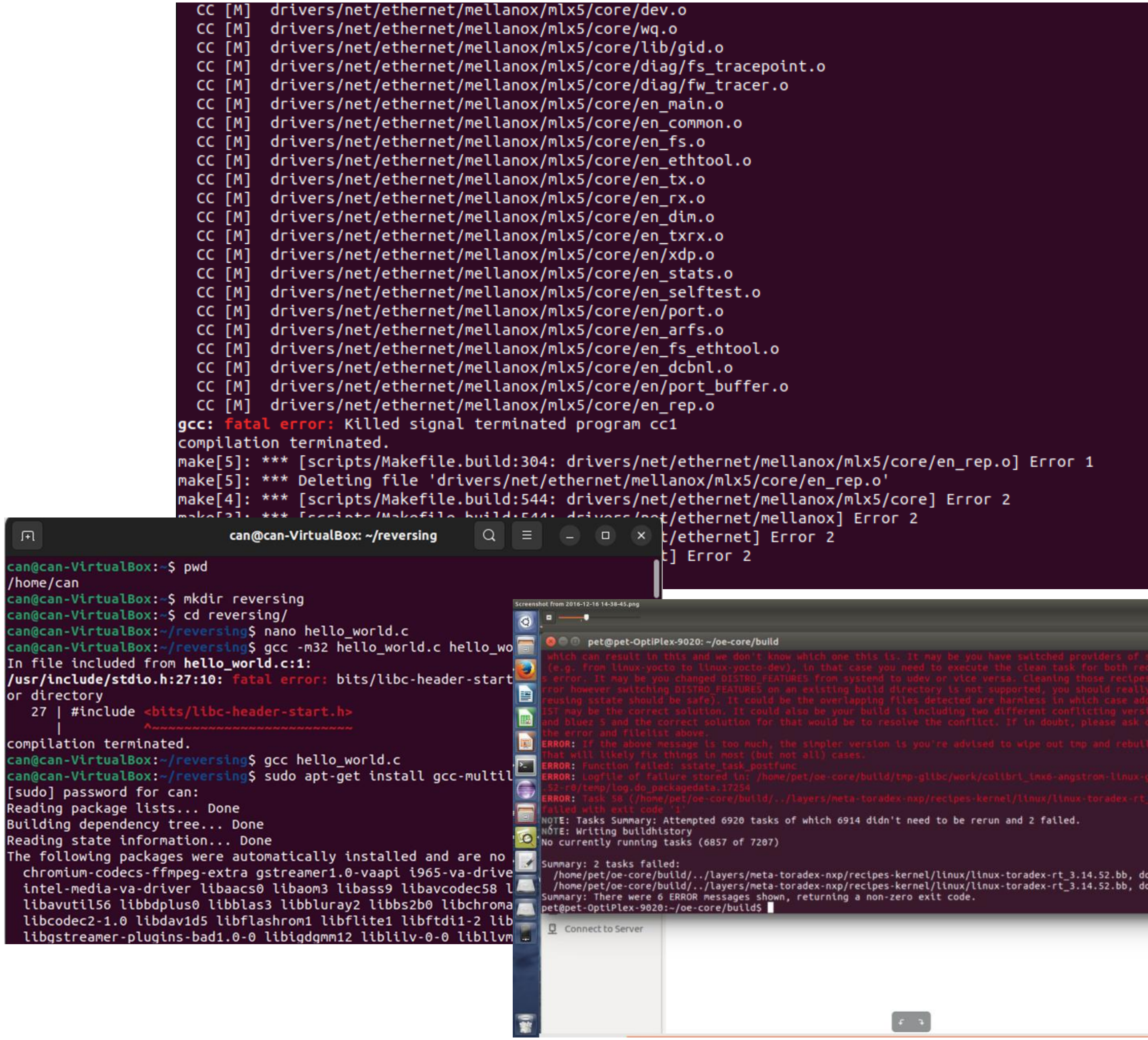
Software setup

- We need all required pentests tools for different context:
  - Wi-Fi
  - RFID
  - Bluetooth Classic & LE 4/5
  - Telecom
  - And even exotic communications
- In addition: report generator, common network tools, web tools, etc.
- But: takes at least 1-5 days to setup properly (depending on number of tools)

Setup

Compile your tools

- Need to deal with:
  - Compilation issues
  - Dependencies
  - Collisions/conflicts
- A good setup can take a day to a week depending on needed tools
- Time is running
- Not good when rushing on an assessment...



```
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/dev.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/wq.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/lib/gid.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/diag/fs_tracepoint.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/diag/fw_tracer.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_main.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_common.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_fs.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_ethtool.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_tx.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_rx.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_dim.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_txrx.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en/xdp.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_stats.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_selftest.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en/port.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_arfs.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_fs_ethtool.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_dcbnl.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en/port_buffer.o
  CC [M]  drivers/net/ethernet/mellanox/mlx5/core/en_rep.o
gcc: fatal error: Killed signal terminated program cc1
compilation terminated.
make[5]: *** [scripts/Makefile.build:304: drivers/net/ethernet/mellanox/mlx5/core/en_rep.o] Error 1
make[5]: *** Deleting file 'drivers/net/ethernet/mellanox/mlx5/core/en_rep.o'
make[4]: *** [scripts/Makefile.build:544: drivers/net/ethernet/mellanox/mlx5/core] Error 2
                                                  t/ethernet/mellanox] Error 2
                                                  t/ethernet] Error 2
                                                  t] Error 2
```

```
can@can-VirtualBox:~$ pwd
/home/can
can@can-VirtualBox:~$ mkdir reversing
can@can-VirtualBox:~$ cd reversing/
can@can-VirtualBox:~/reversing$ nano hello_world.c
can@can-VirtualBox:~/reversing$ gcc -m32 hello_world.c hello_wo
In file included from hello_world.c:1:
/usr/include/stdio.h:27:10: fatal error: bits/libc-header-start
or directory
   27 | #include <bits/libc-header-start.h>
      |          ^~~~~~~~~~~~~~~~~~~~~~~~~~
compilation terminated.
can@can-VirtualBox:~/reversing$ gcc hello_world.c
can@can-VirtualBox:~/reversing$ sudo apt-get install gcc-multil
[sudo] password for can:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi i965-va-drive
  intel-media-va-driver libaacs0 libaom3 libass9 libavcodec58 l
  libavutil56 libbdplus0 libblas3 libbluray2 libbs2b0 libchroma
  libcodec2-1.0 libdav1d5 libflashrom1 libflite1 libftdi1-2 lib
  libgstreamer-plugins-bad1.0-0 libigdgmm12 liblilv-0-0 libllvm
```

Screenshot from 2016-12-16 14-38-45.png
pet@pet-OptiPlex-9020: ~/oe-core/build
Connect to Server

```
 which can result in this and we don't know which one this is. It may be you have switched providers of
 (e.g. from linux-yocto to linux-yocto-dev), in that case you need to execute the clean task for both re
s error. It may be you changed DISTRO_FEATURES from systemd to udev or vice versa. Cleaning those recipe
rror however switching DISTRO_FEATURES on an existing build directory is not supported, you should reall
reusing sstate should be safe). It could be the overlapping files detected are harmless in which case ad
IST may be the correct solution. It could also be your build is including two different conflicting vers
and bluez 5 and the correct solution for that would be to resolve the conflict. If in doubt, please ask
the error and filelist above.
ERROR: If the above message is too much, the simpler version is you're advised to wipe out tmp and rebui
That will likely fix things in most (but not all) cases.
ERROR: Function failed: sstate_task_postfunc
ERROR: Logfile of failure stored in: /home/pet/oe-core/build/tmp-glibc/work/colibri_imx6-angstrom-linux-
.52-r0/temp/log.do_packagedata.17254
ERROR: Task 58 (/home/pet/oe-core/build/../layers/meta-toradex-nxp/recipes-kernel/linux/linux-toradex-rt
failed with exit code '1'
NOTE: Tasks Summary: Attempted 6920 tasks of which 6914 didn't need to be rerun and 2 failed.
NOTE: Writing buildhistory
No currently running tasks (6857 of 7207)

Summary: 2 tasks failed:
  /home/pet/oe-core/build/../layers/meta-toradex-nxp/recipes-kernel/linux/linux-toradex-rt_3.14.52.bb, do
  /home/pet/oe-core/build/../layers/meta-toradex-nxp/recipes-kernel/linux/linux-toradex-rt_3.14.52.bb, do
Summary: There were 6 ERROR messages shown, returning a non-zero exit code.
pet@pet-OptiPlex-9020:~/oe-core/build$
```

Setup

Alternative distributions

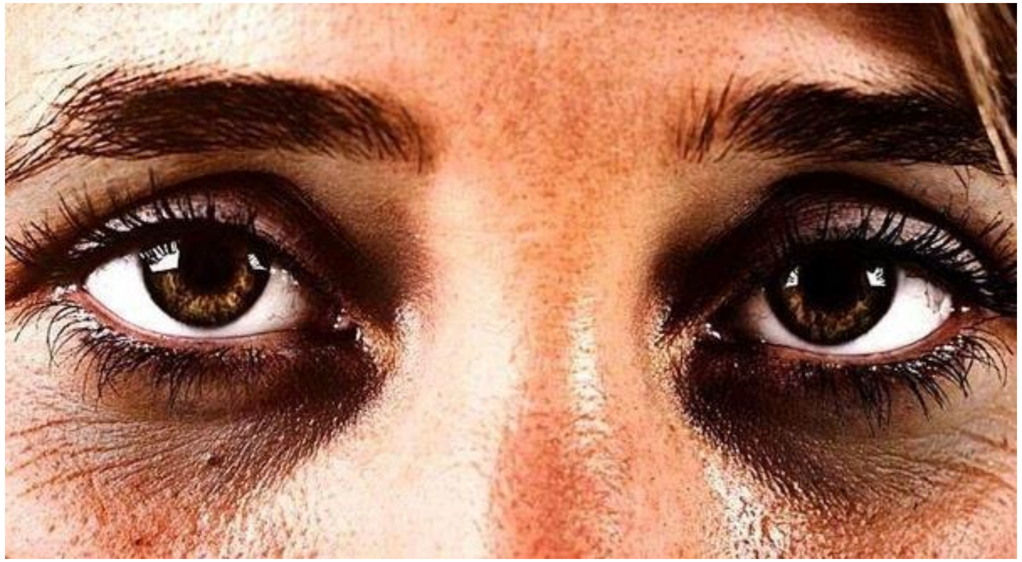
- Existing alternative distributions:
  - Kali: packages for Wi-Fi, Bluetooth, RFID, SDR and many other pentest tools
  - Pentoo: Like Kali with extra GNU Radio tools and modules, SDR tools as well (https://github.com/pentoo/pentoo-overlay/tree/master/net-wireless)
  - Dragon OS: Really focusing on radio tools and much more complete that other distributions
  - Others

Alternative distributions (2)

- **Pros**:
  - Packages as much tools as possible --> reducing installation time
    - Tools not yet package can be installed after
  - Less troubleshooting during our setup --> tools are ready to be used
  - Perfect for less experienced people
- **Cons**:
  - Need to reinstall the computer with the distribution
  - Dependencies issues with new installed tools --> breaking the setup

Breaking the setup

- **Need to reinstall everything! Sometimes until 5am during a pentest...**



Breaking the setup (2)

- **And doing that all the time, your turn like:**

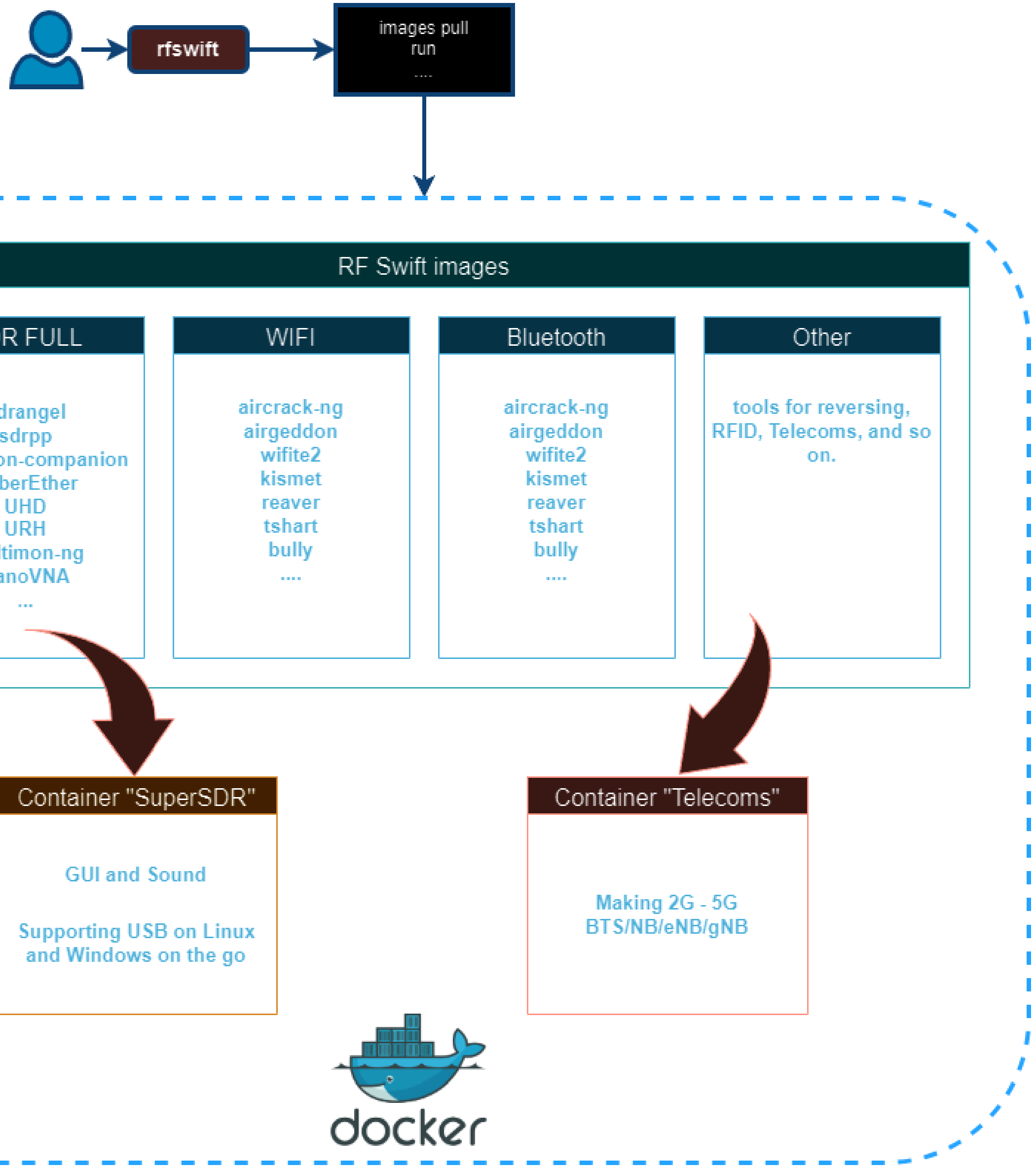
Meet RF Swift!

What is it?

- Tool made in Go --> Instrumenting Docker + host
    - Inspirated from Exegol project ;)
- Docker files "recipes"
- Registry with built images
- Scripts for automating installations of various tools
- Supported and tested architectures: x86_64, and ARM64
- Supported and tested OSes: Linux and Windows

RF Swift

Architecture



rfswift

images pull
run
....

RF Swift images

SDR FULL

sdrangel
sdrpp
gnuradion-companion
CyberEther
UHD
URH
multimon-ng
NanoVNA
...

WIFI

aircrack-ng
airgeddon
wifite2
kismet
reaver
tshart
bully
....

Bluetooth

aircrack-ng
airgeddon
wifite2
kismet
reaver
tshart
bully
....

Other

tools for reversing, RFID, Telecoms, and so on.

Container "SuperSDR"

GUI and Sound

Supporting USB on Linux and Windows on the go

Container "Telecoms"

Making 2G - 5G BTS/NB/eNB/gNB

Demo time!

Conclusion

Going further

To conclude

- You can travel and assess devices safely with RF Swift
- Keep you setup light based on your own "recipes"
- RF Swift is 3 months old --> will grow with more tools
- Need also contributors:
  - Documentation: https://rf-swift.readthedocs.io/
  - Go binary for instrumentation and user experience
- Our discord: https://discord.com/invite/NS3HayKrpA

penthertz

Thank You

Please contact us:

✉ contact@penthertz.com

☎ +33 1 73 13 82 77

🌐 penthertz.com

Watch us on YouTube