Building a Secure Router

What is a Secure Router?

A secure router is a device that provides a secure data plane for packets. The secure data plane provides a secure environment for packets to travel through internet, ensuring that the packets are not compromised or tampered with.

Automation using high speed monitor traffic based on XDP Hook and Artificial Intelligence to detect, preventing possible vulnerabilities and attacks in earlier stages. Saving time and money in quicker reactions.

OpenWRT

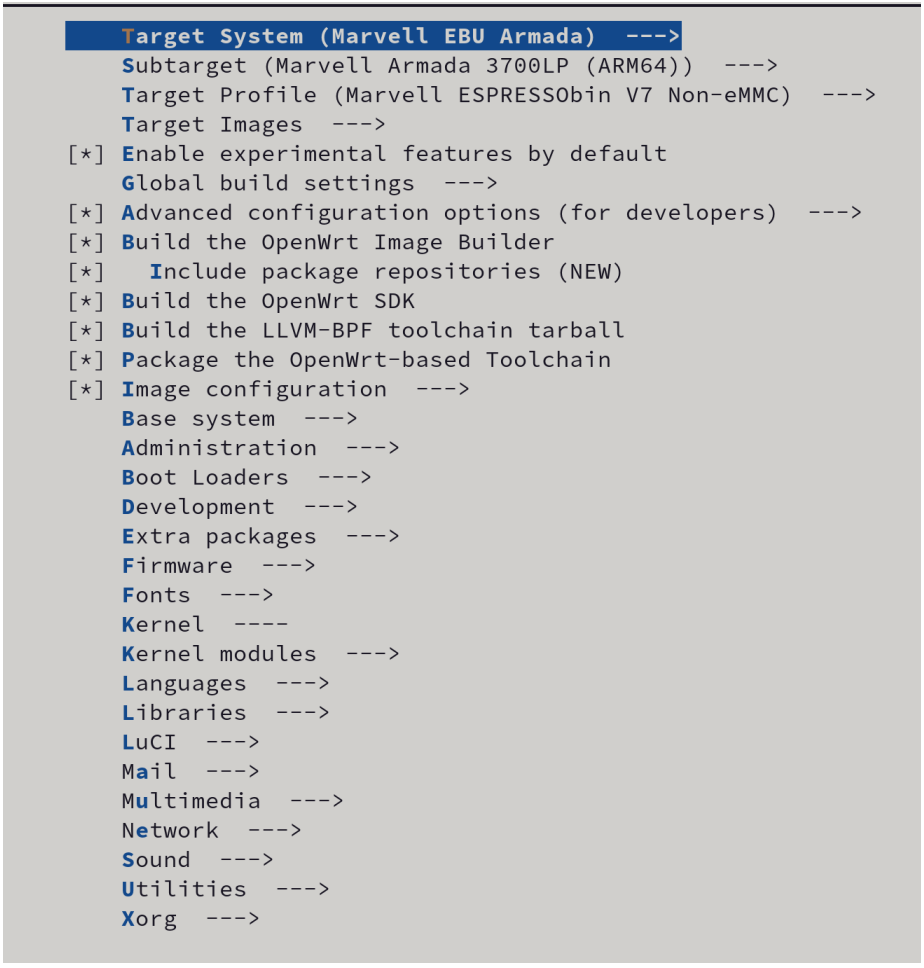
Our secure router is based on the OpenWRT operating system, which provides a secure and reliable platform for the secure data plane. Using the advantages that provide eBPF and XDP.

Build System Usage

```
git clone https://git.openwrt.org/openwrt/openwrt.git
cd openwrt
git pull

# Use
# This Commit “xdp-tools: update to version 1.2.8 - Mon, 19 Sep 2022”
# Or Upper
REV_HASH="4c73c34ec4215deb690bf03faea2a0fe725476f0"
git checkout ${REV_HASH}
REV_BRANCH="$(git rev-parse --abbrev-ref HEAD)"

sed -e "/^src-git\S*/s//src-git-full/" feeds.conf.default > feeds.conf

./scripts/feeds update -a

sed -n -e "/^src-git\S*\s/{s///;s/\s.*$//p}" feeds.conf \
| while read -r FEED_ID
do
REV_DATE="$(git log -1 --format=%cd --date=iso8601-strict)"
REV_HASH="$(git -C feeds/${FEED_ID} rev-list -n 1 --before=${REV_DATE} $
{REV_BRANCH})"
sed -i -e "/\s${FEED_ID}\s.*\.git$/s/$/^${REV_HASH}/" feeds.conf
done

./scripts/feeds update -a
./scripts/feeds install -a

# Configure the firmware image and the kernel
make menuconfig
```

Advanced configuration options (for developers)

- Target options checked
- BPF toolchain (Build LLVM toolchain for eBPF)
- Toolchain Options
    - Binutils Version 2.39
    - GCC Compiler Version 12.x
    - C library musl



Target images

```
[*] ramdisk (NEW)  --->
    *** Root filesystem archives ***
[ ] cpio.gz (NEW)
[*] tar.gz (NEW)
    *** Root filesystem images ***
[*] ext4 (NEW)  --->
[*] squashfs (NEW)  --->
[*] GZip images (NEW)
    *** Image Options ***
(16) Kernel partition size (in MiB) (NEW)
(104) Root filesystem partition size (in MiB) (NEW)
[ ] Make /var persistent (NEW)
```

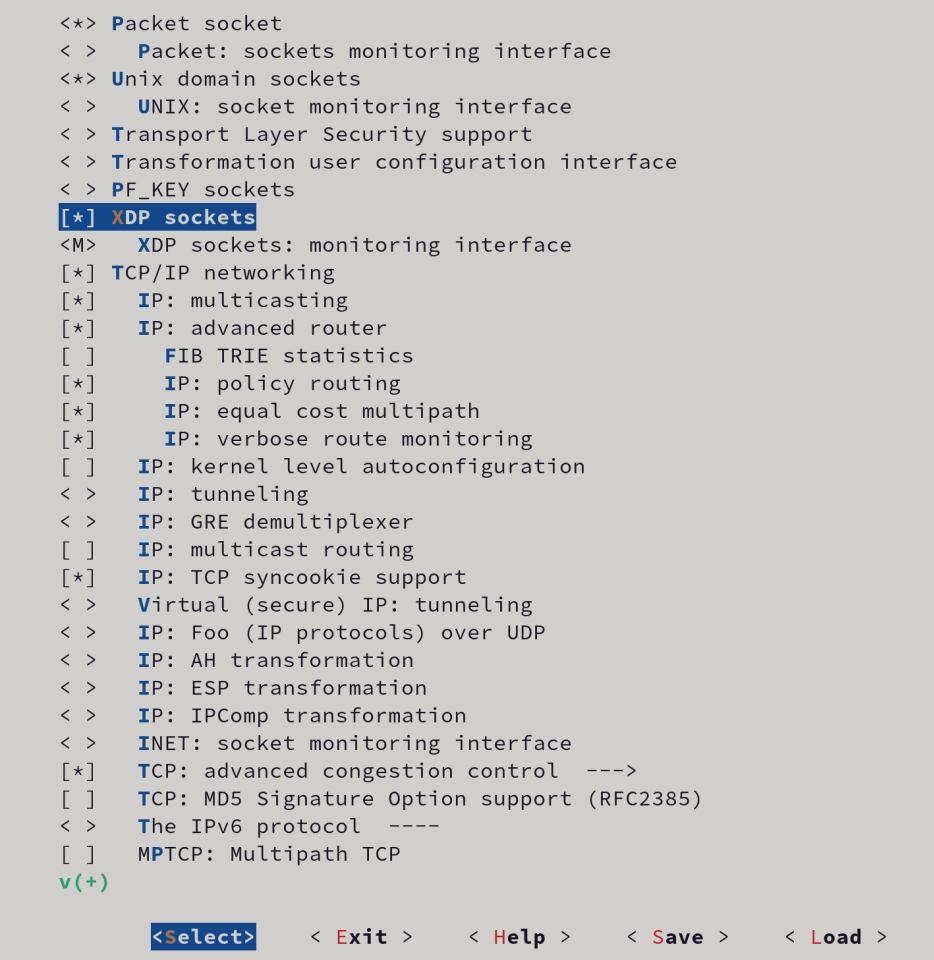
Toolchain Options

```
-*- Toolchain Options
[ ]   Enable an extra toolchain target architecture (NEW)  ----
      *** Binary tools ***
      Binutils Version (Binutils 2.39)  --->
()    Additional binutils configure options (NEW)
[ ]   Build pahole (NEW)
      *** Compiler ***
      GCC compiler Version (gcc 12.x)  --->
[ ]   Compile in support for the new Graphite framework in GCC 4.4+ (NEW)
()    Additional gcc configure options (NEW)
[ ]   Build executable with PIE enabled by default (NEW)
[ ]   Build executable with Stack-Smashing Protection enabled by default (NEW)
[ ]   Use setjump()/longjump() exceptions (NEW)
[ ]   Build/install fortran compiler? (NEW)
      *** C Library ***
      C Library implementation (Use musl)  --->
[*]   Include crypt() support for SHA256, SHA512 and Blowfish ciphers (NEW)
      *** Debuggers ***
[ ]   Build gdb
```

```
make -j $(nproc) kernel_menuconfig
```

Add XDP Hook

- Networking Support -> Networking Option -> XDP Socket




```
# Build the firmware image
make -j $(nproc) defconfig download clean world
```

Secure Channel Traffic

Our secure channel will be implemented using Wireguard VPN, creating a secure point to point connection between them and providing security to all your devices inside of your LAN.

Configuring Wireguard on OpenWRT

https://openwrt.org/docs/guide-user/services/vpn/wireguard/start
https://www.wireguard.com/

Monitoring Traffic using XDP and eBPF

https://github.com/tohojo/xdp-paper/blob/master/xdp-the-express-data-path.pdf

Reference Links
https://openwrt.org/docs/guide-developer/toolchain/use-buildsystem

XDP – Tutorial
https://github.com/xdp-project/xdp-tutorial
https://www.tigera.io/learn/guides/ebpf/ebpf-xdp/

eBPF – Kernel Observability
https://github.com/bpftools/linux-observability-with-bpf

XDP – Loader
https://github.com/xdp-project/xdp-tools/tree/master/xdp-loader

BPF – Docs
https://github.com/iovisor/bpf-docs/blob/master/bpf-internals-2.md

Cilium – XDP
https://docs.cilium.io/en/stable/bpf/
Life Packet
https://docs.cilium.io/en/stable/concepts/ebpf/lifeofapacket/

NetOptimizer
https://github.com/netoptimizer/prototype-kernel

NetDev 2.1
https://legacy.netdevconf.info/2.1/slides/apr7/gospodarek-Netdev2.1-XDP-for-the-Rest-of-Us_Final.pdf

MocchaBin Getting Started
https://espressobin.net/mochabin_wiki/tiki-index.php?page=Build+Instruction

Compiling u-boot
https://github.com/globalscaletechnologies/u-boot-marvell

Documentation u-boot
https://u-boot.readthedocs.io/en/latest/
https://u-boot.readthedocs.io/en/latest/develop/index.html

MocchaBin – u-boot-marvell
http://weng-blog.com/2017/03/24/ARMv8-manual-boot.html

MocchaBin – u-boot-marvell version

U-Boot 2018.03-devel-18.12.3-gb794de0054 (Sep 05 2022 - 14:38:22 +0800)

aarch64-linux-gnu-gcc (Linaro GCC 7.3-2018.05) 7.3.1 20180425 [linaro-7.3-2018.05 revision d29120a424ecfbc167ef90065c0eeb7f91977701]
GNU ld (Linaro_Binutils-2018.05) 2.28.2.20170706

MocchaBin ATF-marvell
https://github.com/globalscaletechnologies/atf-marvell
https://github.com/globalscaletechnologies/atf-marvell/blob/atf-v1.5-armada-18.12/docs/user-guide.rst

Serial Connection – Kermit
http://wiki.espressobin.net/tiki-index.php?page=Serial+connection+-+Linux

x86_64 Linux Error: gnu/stubs-32.h Missing Error and Solution
https://www.cyberciti.biz/faq/x86_64-linux-error-gnustub-32h-missing-error-and-solution/