KERNEL CONFIGURATION FOR ATHEROS DRIVERS TO SUPPORT OCB MODE

Throughout this document, an example of kernel configuration will be explained, the purpose is configuring your own kernel Linux in order to support OCB (Outside the Context of a BSS) mode.

This section takes care of the following points:

- To add the OCB mode configuration to the cfg80211 subsystem.
- To modify a wireless network interface controller driver to support OCB mode as well as enabling the operation in 5.9GHz frequency band.
- To add the OCB mode support to the mac80211 subsystem.

OCB wireless mode is available from Kernel 3.19 version, this is, the kernel configuration could be done in any upper version. In this document the configuration steps are described for 4.2.8 and 4.7.rc3 versions.

The changes are always the same, and they are described in the main kernel project of 802.11p on Linux. (see more). If you are using a 4.2.8 or 4.7.rc3 versions, you can follow the instructions that you can find in the following links:

- Linux Kernel 4.2.8 – ath9k drivers.
- Linux Kernel 4.7.rc3 – ath9k drivers.

After updating the modified drivers you must configure your kernel before compiling, by means of activating the following flags:

- We are using an Atheros 9000 driver, which means that we have to load the necessaries modules. It is advisable keep the default flags as it is shown Figure 1. We have not checked if the system can work without the modules that are not related with Atheros 9000. So, this can be a future work in order to optimize the kernel.

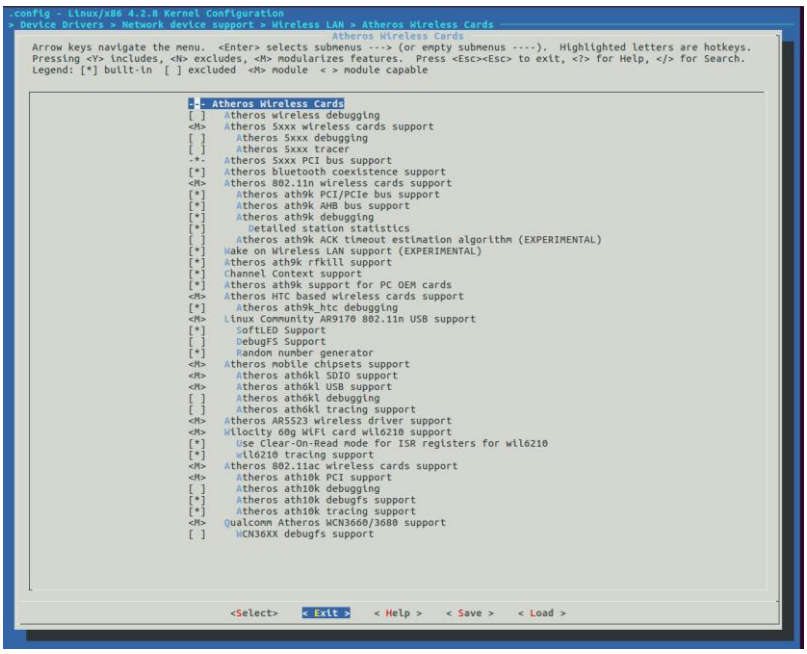

Figure 1. Kernel configuration of Atheros ath9k driver

- The last changes are to add the OCB mode support to the mac80211 subsystem. You need to activate the debugging mode of HT, STATION, IBSS and OCB, as shown in Figure 2.

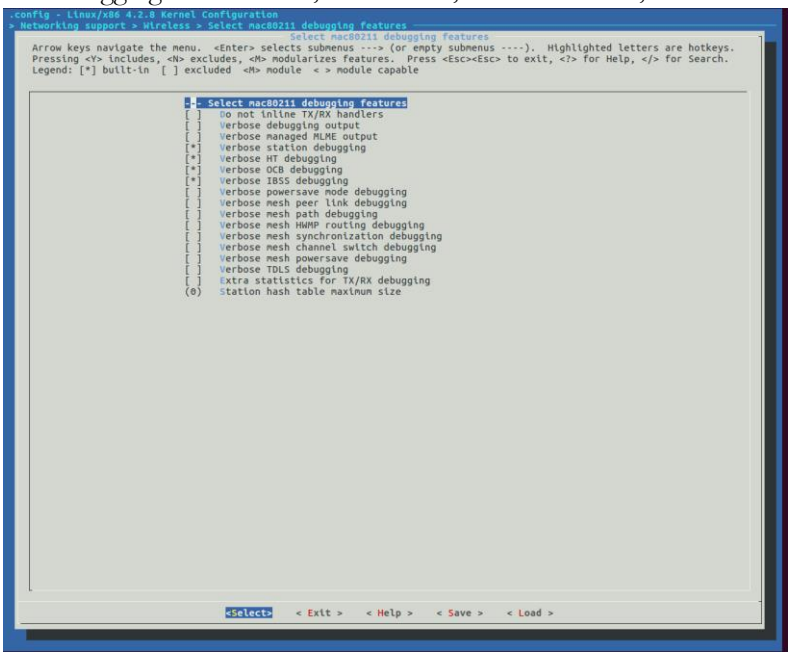

Figure 2. Kernel configuration of mac80211 debugging features

Finally, you have only to save the configuration and it is ready to compile the kernel. If you want to be sure that all the changes have been successfully implemented you can check it following the instructions of the next section.

TESTING THE LINUX DRIVER MODIFICATION

In order to test all the changes made in the previous part, it is necessary to allow users to configure and use them. First of all, it is necessary to install a modified version of *iw* utility. In this new version of the utility *ocb join* and *ocb leave* commands are added. This section covers the next points:

- To add the notion of the OCB mode to the configuration tool *iw*.
- To add the 5.9 GHz band rules into the regulatory database *wireless-regdb*.

You should follow the next steps (Figure 3). If you have made any error in the kernel compilation, during the installation of these utilities some error would be appeared. Please, take into account that in point 2 some modifications must be included in the regulatory domain database in order to activate all the channels that we need. For this reason, you should add a new country called, for example, "AA" with all frequency ranges enable and all maximum power selected, as you can see in Figure 4. The example database that we have used, *db.txt,* can be found in the attached files.

```
1) iw -- wifi configuration tool
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Essential packages

You need the libnl1 library version. It depends of your operative system.

        >libnl1 https://www.infradead.org/~tgr/libnl/
                tar -zxvf libnl-1.1.4.tar.gz
                cd libnl-1.1.4
                ./configure
                make
                make install
        >libnl-3-devel or libnl-devel. It depends of your operative system.
        >libnl-genl-3-dev

cd /usr/src/
#Clone the repository
git clone https://github.com/CTU-IIG/802.11p-iw.git
#Compile and install iw program
cd 802.11p-iw
        git checkout its-g5_v3
        make
        make install
#Check if your installation been sucessfull
/sbin/iw | grep -i ocb
        dev <devname> ocb leave
        dev <devname> ocb join <freq in MHz> <5MHZ|10MHZ> [fixed-freq]

#If this error happens, you should solve a bug in your libraries
#"/sbin/iw: error while loading shared libraries: libnl.so.1: cannot open shared object file: No
such #file or directory"
        #libnl-1
        nano /usr/include/netlink/object.h
        #libnl-3
        nano /usr/include/libnl3/netlink/object.h
        #Coment the following declarations:
                extern int                      nl_object_get_refcnt(struct nl_object *);
                extern struct nl_cache *        nl_object_get_cache(struct nl_object *);
                static inline void *            nl_object_priv(struct nl_object *obj);
        #then you have to compile again the 802.11p-iw repository

2) wireless-regdb -- regulatory information
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Essential packages
        >python-m2crypto

cd /usr/src
git clone https://github.com/CTU-IIG/802.11p-wireless-regdb.git
cd ./802.11p-wireless-regdb
        git checkout its-g5_v1
        cp db.txt ./ (You shoud have the modified database)
        make
        make install

3) CRDA -- Central Regulatory Domain Agent
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Essential packages:
        >libgcrypt11-dev
        >if your distribution does not support an stable package, you can install an unstable
version,
        you can find here: https://software.opensuse.org/package/libgcrypt11
        for example: "home:pontostroy:X11", then you have to install the next package:
                >libgcrypt-devel

#Clone the repository
git clone https://github.com/CTU-IIG/802.11p-crda.git
cd ./802.11p-crda
        git checkout its-g5_v1
        # We are using our own key for regulatory.bin and CRDA
        cp    /lib/crda/pubkeys/username.key.pub.pem    pubkeys    #(It    is    sometimes    in
/usr/lib/crda/pubkeys)
```

```
        cp /lib/crda/pubkeys/linville.key.pub.pem pubkeys
        #compile and install it
        make
        make install
# Test CRDA + generated regulatory.bin
/sbin/regdbdump ../802.11p-wireless-regdb/regulatory.bin | grep -i ocb
        country 00: invalid
        (5850.000 - 5925.000 @ 20.000), (20.00), NO-CCK, OCB-ONLY
```

Figure 3. Steps for installing *iw* modified program and the new REG-DOMAIN.

```
country AA:
         (2402 - 2482 @ 40), (20)
         (5170 - 5250 @ 80), (17)
         (5250 - 5330 @ 80), (24)
         (5490 - 5730 @ 80), (24)
         (5735 - 5835 @ 80), (30)
        # For ITS-G5 evaluation
         (5840 - 5935 @ 10), (20)
```

Figure 4. New added country to database