Team Project Presentation

OLSRd On Gumstix

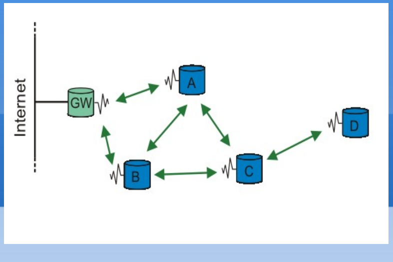
Overview

- Project topic is to run OLSRd protocol on Gumstix.
- In the process , makefile compilation, Gumstix environment setup processes, Gumstix Buildroot configurations etc were encountered.

Goal

- The goal of this project is to run the OLSRd protocol on Gumstix.
- However, it was also run on the Laptop.

OLSR Introduction



- Optimized Link State routing protocol.
- Routing protocol for mobile ad hoc networks.
- Exchanges Hello packets to discover a 2 hop neighborhood.
- Uses selected nodes as MPR's -Multipoint relays.

A little bit about OLSRd

- OLSRd- Optimized Link State routing Daemon
- Started off as a master's thesis by Andreas Tönessen at UNIK- University Graduate Center.
- It has come a long way since then.
- In my project I used olsrd-0-5-6.rc4.
- Downloaded at www.olsr.org

OLSRd on Laptop

- Procedure
- Before building OLSRd, we need to have necessary tools installed.
- To install to a directory different from /(/etc, /usr/bin) use DESTDIR=targetdir. To use other compilers set CC=your compiler.

Continued

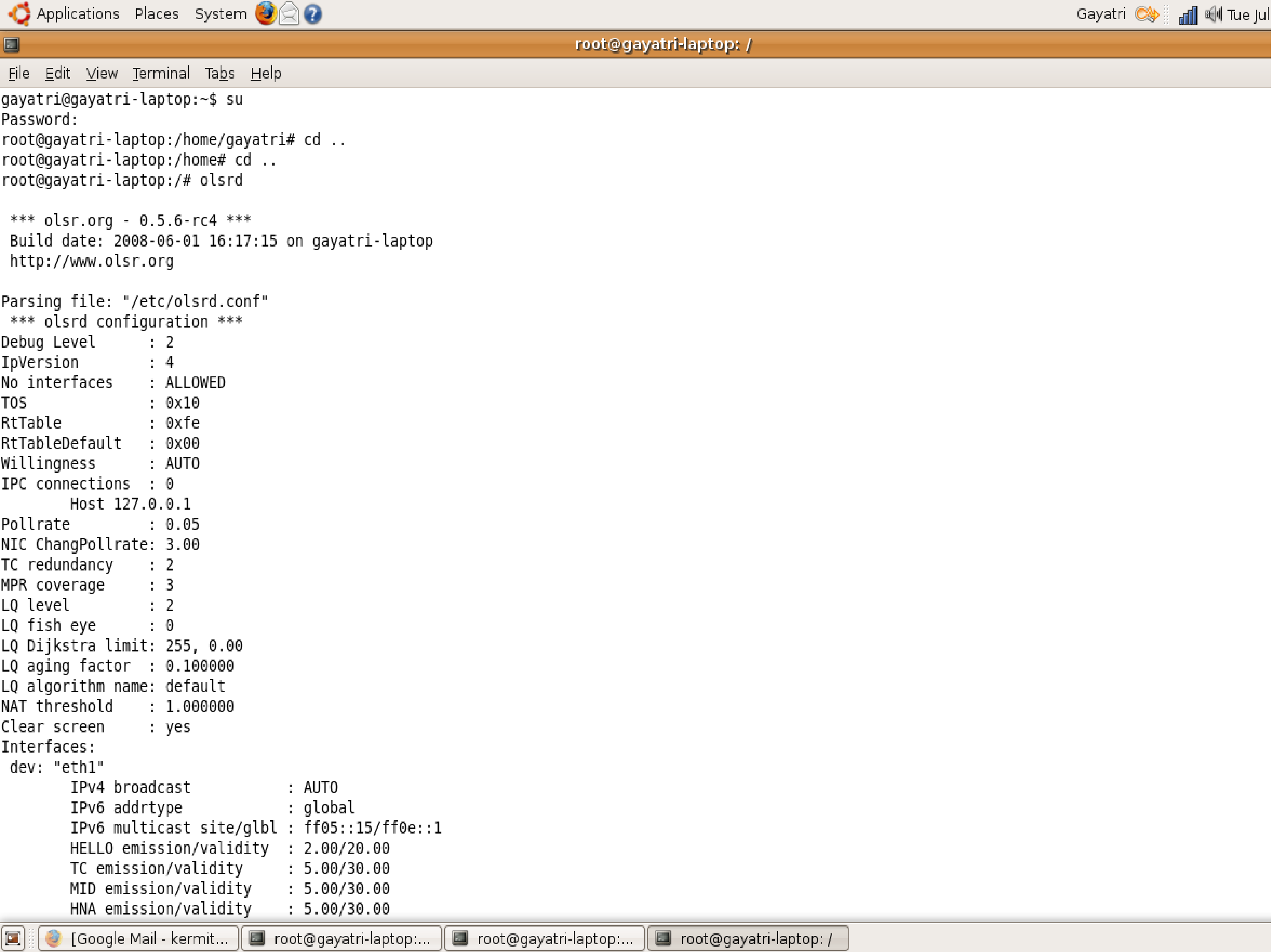
- To build:
- make
- To install(as root):
- make install
- To delete object files run:
- make clean
- Optionally, to clean all generated files:
- make uberclean

Continued

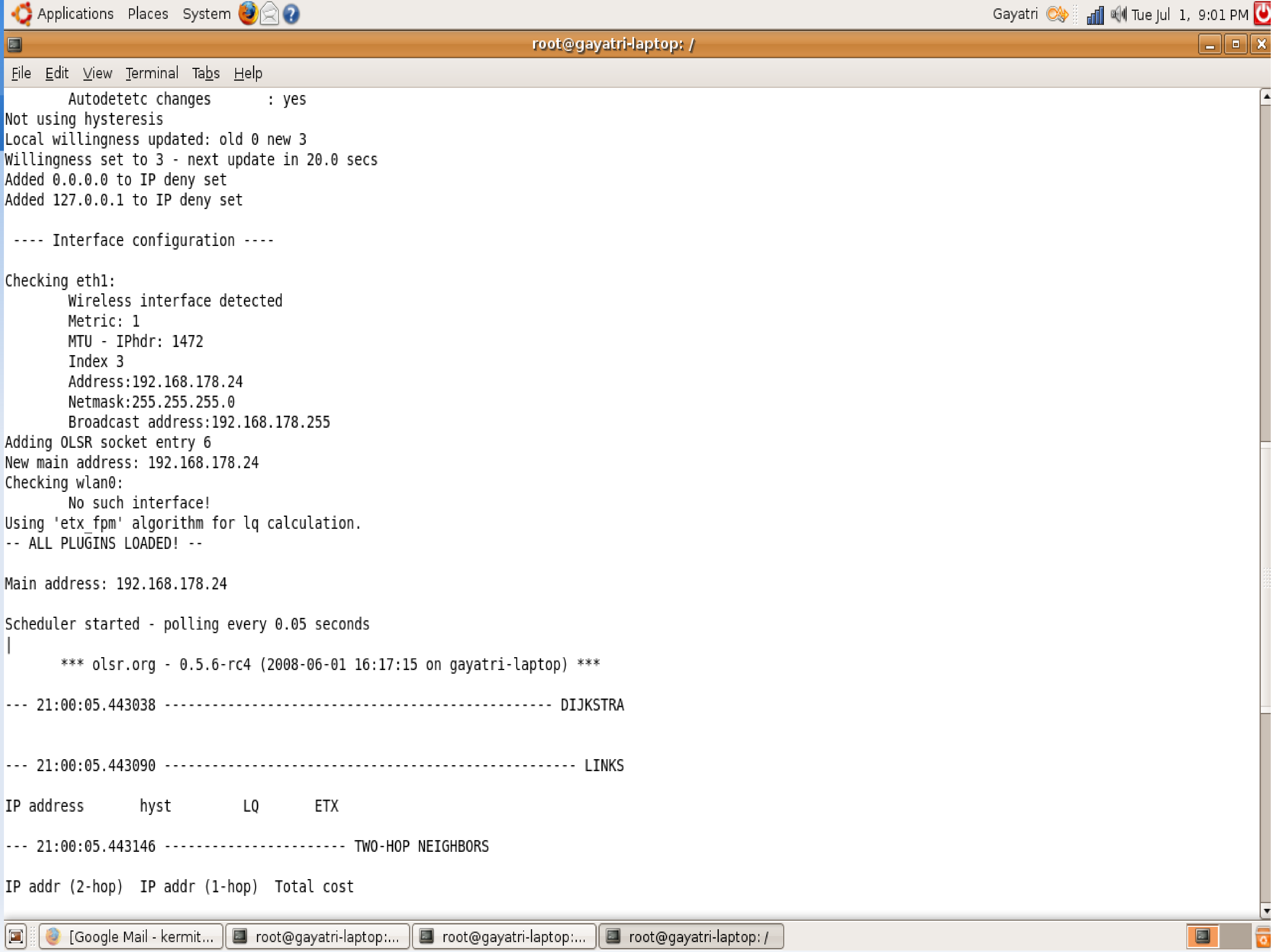
- Before running olsrd you must edit the default configuration file
- One must have root priveleges to run olsrd.
- To run Olsrd simply type olsrd.

Errors

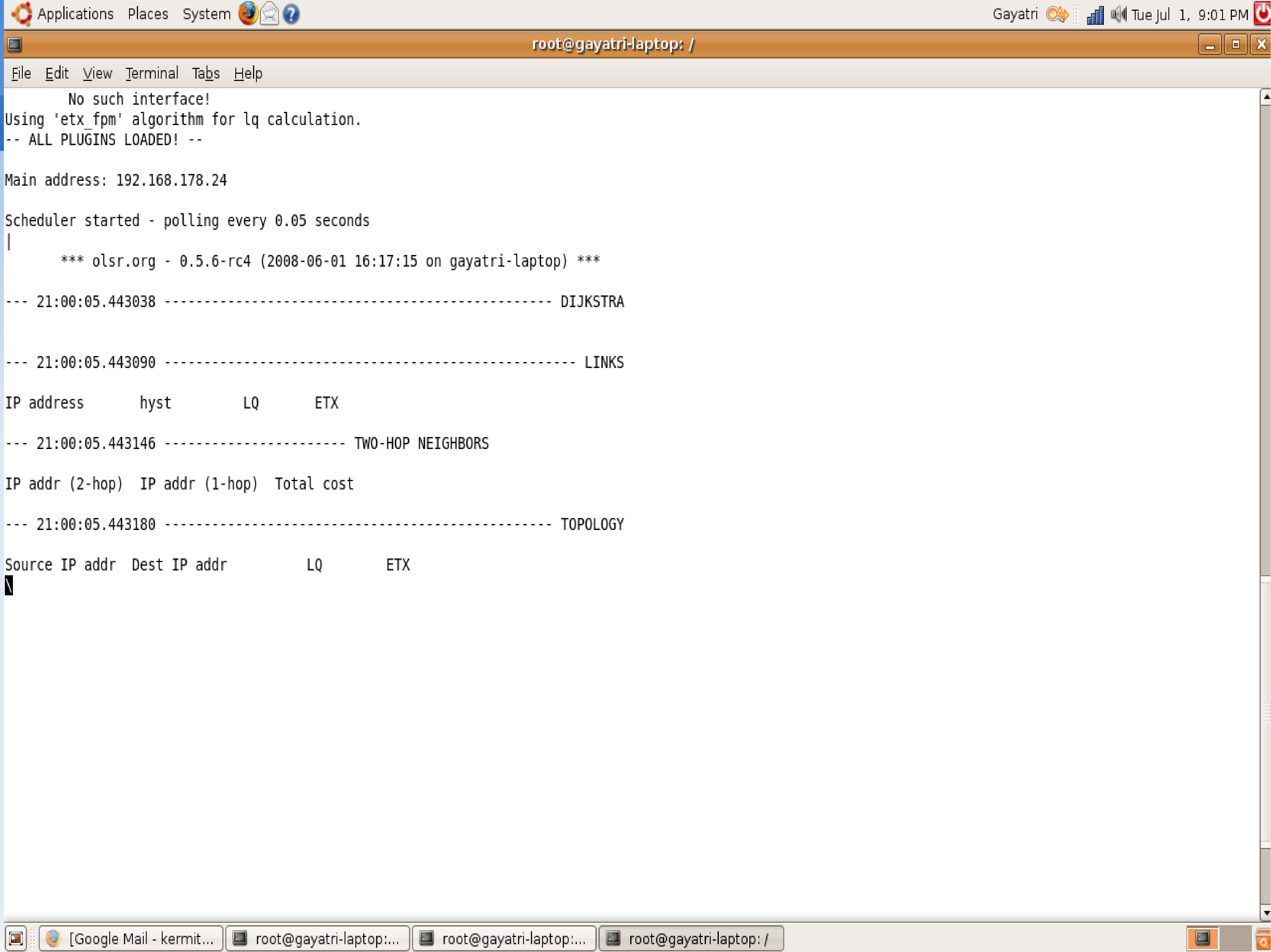
- The errors I primarily got were something to do with the c files in the source.
- Anyhow, I was finally successful in running it.
- These tactics primarily involved changing makefile target directories to store olsrd executables.



```
gayatri@gayatri-laptop:~$ su
Password:
root@gayatri-laptop:/home/gayatri# cd ..
root@gayatri-laptop:/home# cd ..
root@gayatri-laptop:/# olsrd

 *** olsr.org - 0.5.6-rc4 ***
 Build date: 2008-06-01 16:17:15 on gayatri-laptop
 http://www.olsr.org

Parsing file: "/etc/olsrd.conf"
 *** olsrd configuration ***
Debug Level      : 2
IpVersion        : 4
No interfaces    : ALLOWED
TOS              : 0x10
RtTable          : 0xfe
RtTableDefault   : 0x00
Willingness      : AUTO
IPC connections  : 0
        Host 127.0.0.1
Pollrate         : 0.05
NIC ChangPollrate: 3.00
TC redundancy    : 2
MPR coverage     : 3
LQ level         : 2
LQ fish eye      : 0
LQ Dijkstra limit: 255, 0.00
LQ aging factor  : 0.100000
LQ algorithm name: default
NAT threshold    : 1.000000
Clear screen     : yes
Interfaces:
 dev: "eth1"
        IPv4 broadcast           : AUTO
        IPv6 addrtype            : global
        IPv6 multicast site/glbl : ff05::15/ff0e::1
        HELLO emission/validity  : 2.00/20.00
        TC emission/validity     : 5.00/30.00
        MID emission/validity    : 5.00/30.00
        HNA emission/validity    : 5.00/30.00
```

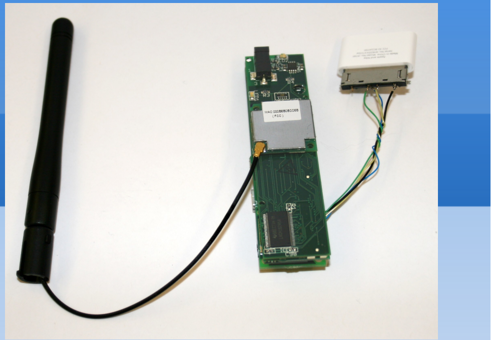


```
        Autodetetc changes       : yes
Not using hysteresis
Local willingness updated: old 0 new 3
Willingness set to 3 - next update in 20.0 secs
Added 0.0.0.0 to IP deny set
Added 127.0.0.1 to IP deny set

 ---- Interface configuration ----

Checking eth1:
        Wireless interface detected
        Metric: 1
        MTU - IPhdr: 1472
        Index 3
        Address:192.168.178.24
        Netmask:255.255.255.0
        Broadcast address:192.168.178.255
Adding OLSR socket entry 6
New main address: 192.168.178.24
Checking wlan0:
        No such interface!
Using 'etx_fpm' algorithm for lq calculation.
-- ALL PLUGINS LOADED! --

Main address: 192.168.178.24

Scheduler started - polling every 0.05 seconds
|
       *** olsr.org - 0.5.6-rc4 (2008-06-01 16:17:15 on gayatri-laptop) ***

--- 21:00:05.443038 ------------------------------------------------- DIJKSTRA



--- 21:00:05.443090 ---------------------------------------------------- LINKS

IP address       hyst         LQ       ETX

--- 21:00:05.443146 ----------------------- TWO-HOP NEIGHBORS

IP addr (2-hop)  IP addr (1-hop)  Total cost
```



```
        No such interface!
Using 'etx_fpm' algorithm for lq calculation.
-- ALL PLUGINS LOADED! --

Main address: 192.168.178.24

Scheduler started - polling every 0.05 seconds
|
       *** olsr.org - 0.5.6-rc4 (2008-06-01 16:17:15 on gayatri-laptop) ***

--- 21:00:05.443038 ------------------------------------------------- DIJKSTRA



--- 21:00:05.443090 ---------------------------------------------------- LINKS

IP address       hyst         LQ       ETX

--- 21:00:05.443146 ---------------------- TWO-HOP NEIGHBORS

IP addr (2-hop)  IP addr (1-hop)  Total cost

--- 21:00:05.443180 ------------------------------------------------- TOPOLOGY

Source IP addr  Dest IP addr          LQ       ETX
\
```

OLSRd on Gumstix



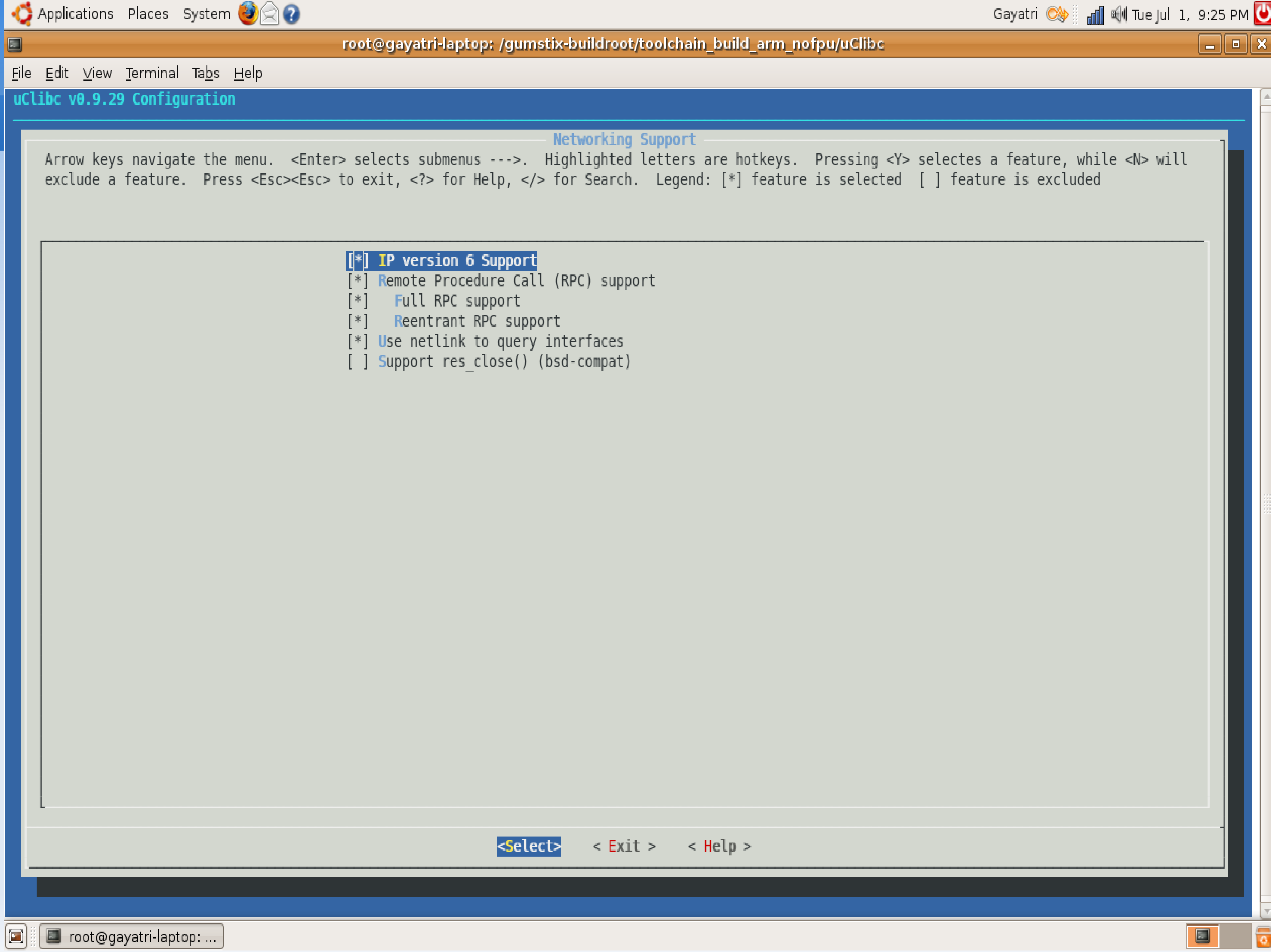
- Setting up the gumstix-build root environment.
- Enabling ipv6 features for olsrd.
- Compiling the jffs2 image of buildroot to be compatible with olsrd.
- Re flashing the Gumstix with new olsrd compatible jffs2 image.
- Running olsrd on Gumstix.

Gumstix Buildroot Environment

- Followed directions on the wiki tutorial for Ubuntu version.
- Successfully compiled the buildroot for gumstix buildroot version 1545.
- Result was a new shiny jffs2 image in the gumstix buildroot directory.

IPV6 Enabling

- Change directory to the uClibc build directory
- Run "make menuconfig"
- Under the "Networking Support" menu, check the "IP version 6 Support" box.
- Exit menuconfig, saving the new configuration

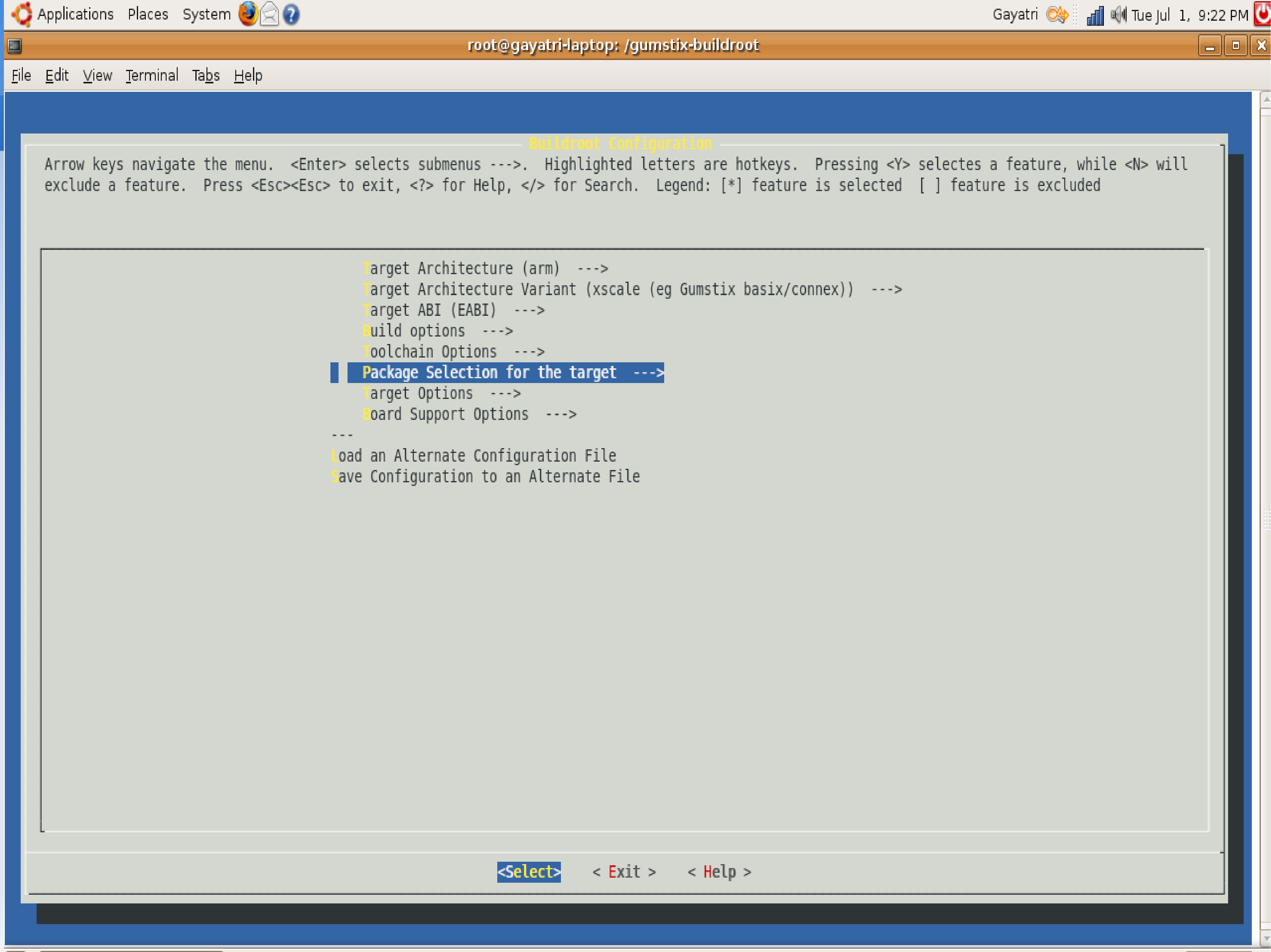


Applications Places System
Gayatri Tue Jul 1, 9:25 PM
root@gayatri-laptop: /gumstix-buildroot/toolchain_build_arm_nofpu/uClibc
File Edit View Terminal Tabs Help

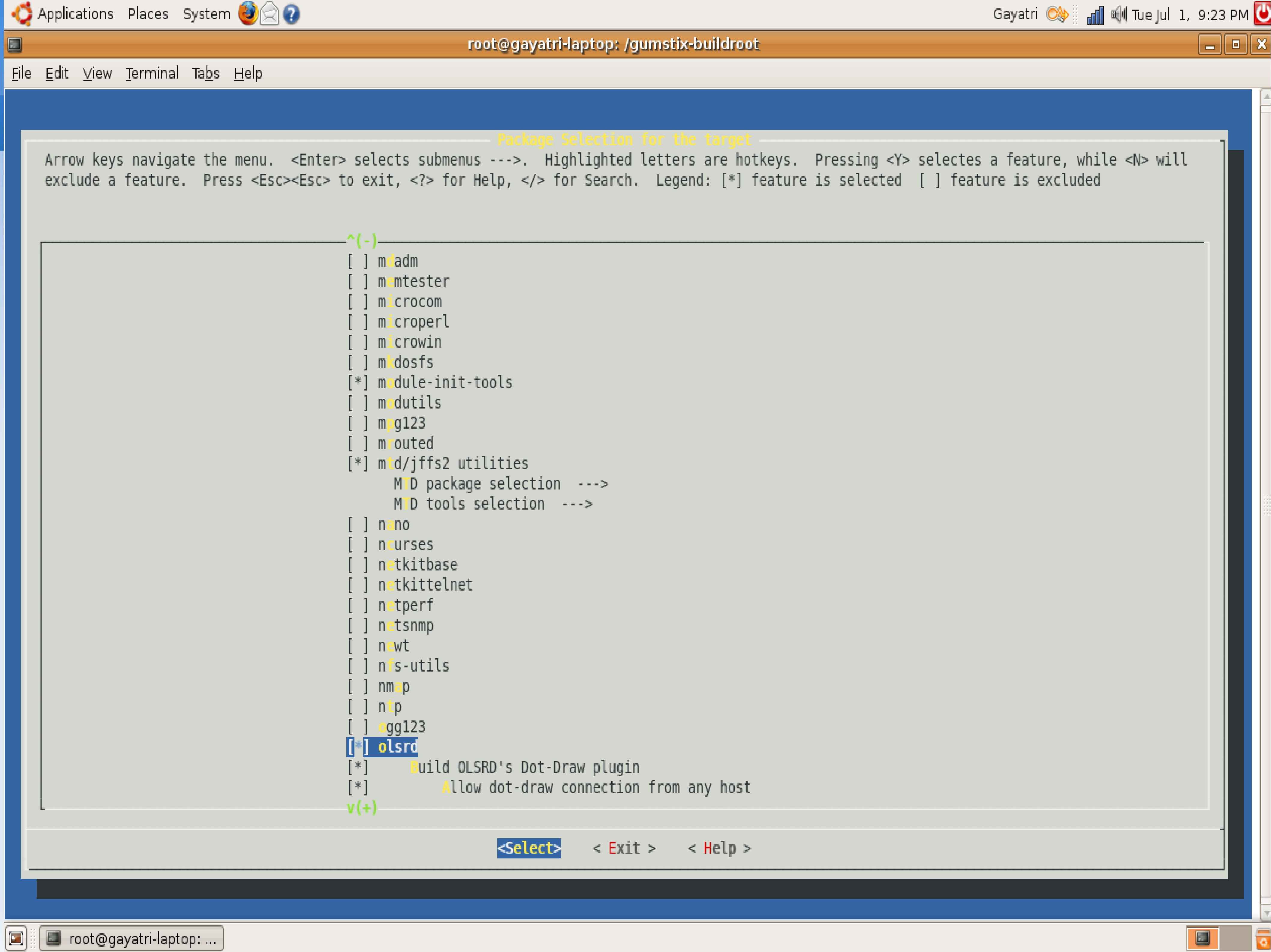
```
uClibc v0.9.29 Configuration

Networking Support

Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted letters are hotkeys.  Pressing <Y> selectes a feature, while <N> will
exclude a feature.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] feature is selected  [ ] feature is excluded

                    [*] IP version 6 Support
                    [*] Remote Procedure Call (RPC) support
                    [*]   Full RPC support
                    [*]   Reentrant RPC support
                    [*] Use netlink to query interfaces
                    [ ] Support res_close() (bsd-compat)

                              <Select>    < Exit >    < Help >
```

Making the buildroot jffs2 image compatible with olsrd

- Change directory to gumstix-buildroot and run 'make menuconfig'
- In the package selection menu, enable "olsrd". Optionally, enable the dot-draw plug in & patch
- Run "make" in the gumstix-buildroot directory, re-flash your gumstix with the new image.



```
                                   Buildroot Configuration
 Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted letters are hotkeys.  Pressing <Y> selectes a feature, while <N> will
 exclude a feature.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] feature is selected  [ ] feature is excluded

                                   Target Architecture (arm)  --->
                                   Target Architecture Variant (xscale (eg Gumstix basix/connex))  --->
                                   Target ABI (EABI)  --->
                                   Build options  --->
                                   Toolchain Options  --->
                                   Package Selection for the target  --->
                                   Target Options  --->
                                   Board Support Options  --->
                               ---
                               Load an Alternate Configuration File
                               Save Configuration to an Alternate File
```



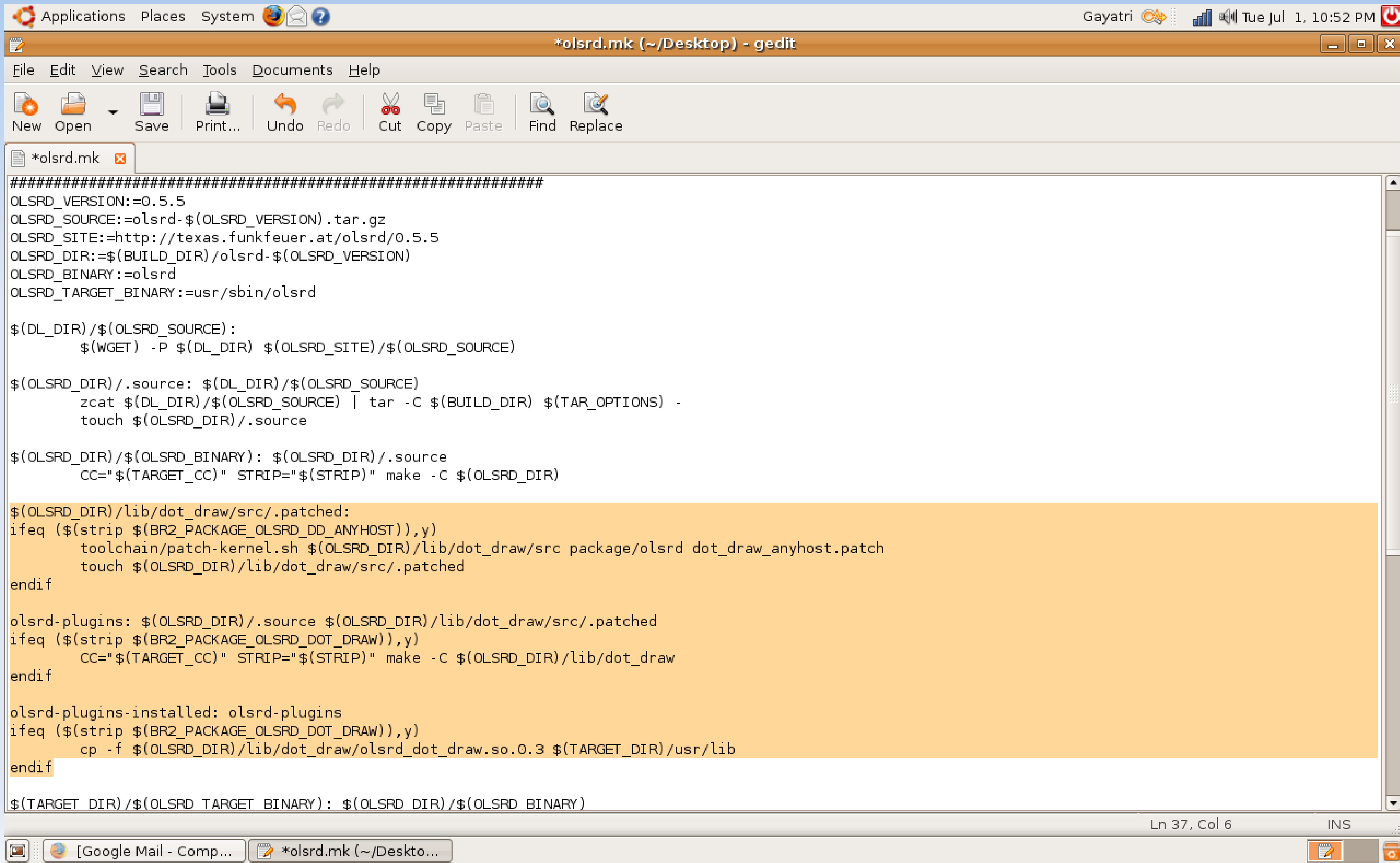
Applications Places System
Gayatri Tue Jul 1, 9:23 PM
root@gayatri-laptop: /gumstix-buildroot
File Edit View Terminal Tabs Help
root@gayatri-laptop: ...

```
                         Package Selection for the target
 Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted letters are hotkeys.  Pressing <Y> selectes a feature, while <N> will
 exclude a feature.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] feature is selected  [ ] feature is excluded

                    ^(-)
                    [ ] mdadm
                    [ ] memtester
                    [ ] microcom
                    [ ] microperl
                    [ ] microwin
                    [ ] mkdosfs
                    [*] module-init-tools
                    [ ] modutils
                    [ ] mpg123
                    [ ] mrouted
                    [*] mtd/jffs2 utilities
                          MTD package selection  --->
                          MTD tools selection  --->
                    [ ] nano
                    [ ] ncurses
                    [ ] netkitbase
                    [ ] netkittelnet
                    [ ] netperf
                    [ ] netsnmp
                    [ ] newt
                    [ ] nfs-utils
                    [ ] nmap
                    [ ] ntp
                    [ ] ogg123
                    [*] olsrd
                    [*]     Build OLSRD's Dot-Draw plugin
                    [*]         Allow dot-draw connection from any host
                    v(+)

                         <Select>    < Exit >    < Help >
```

Errors

- After running make in the gumstix buildroot directory, I received errors
- Due to the olsrd.mk file not being parsed correctly.

The olsrd make file olsrd.mk



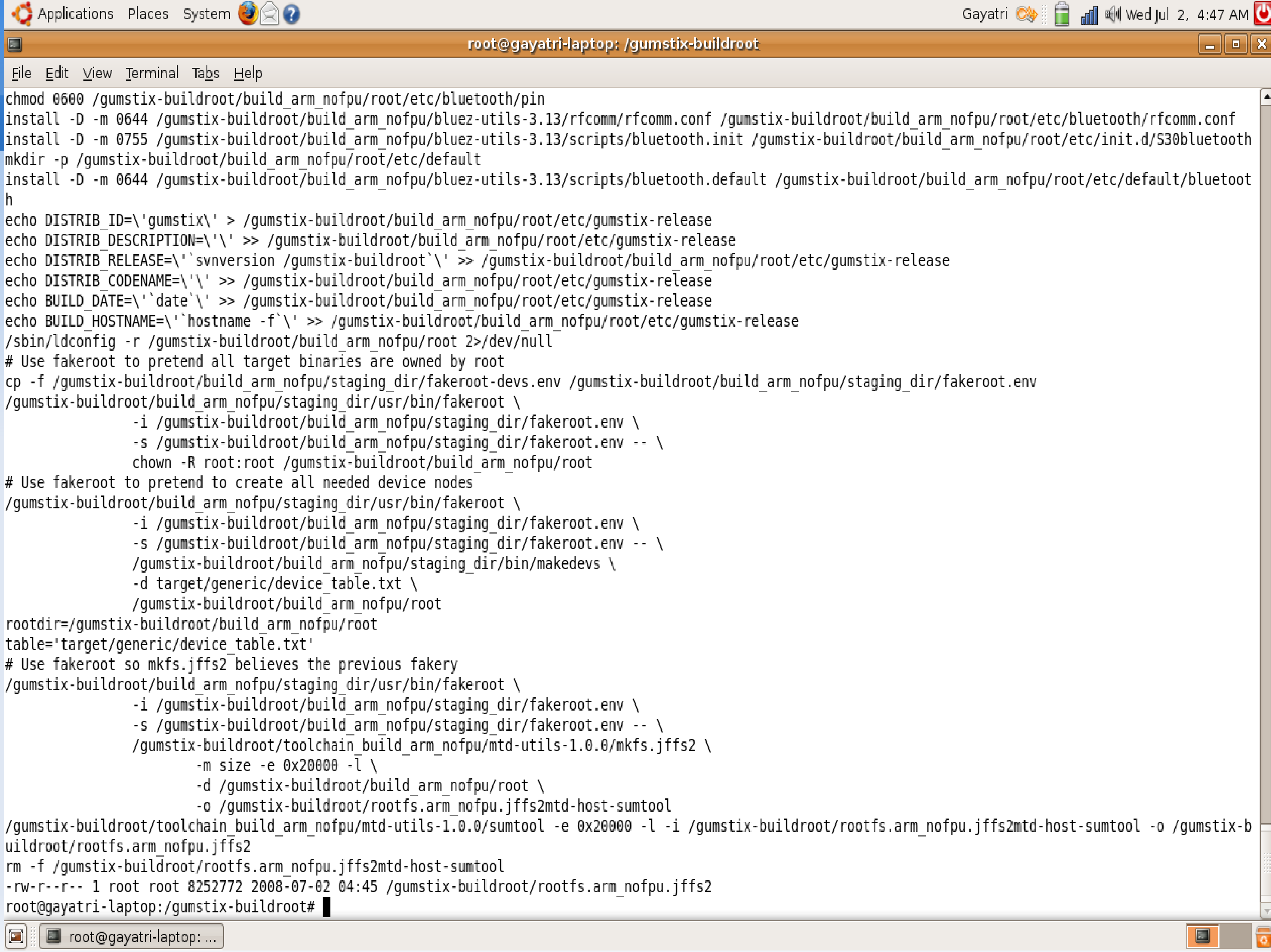
```
#############################################################
OLSRD_VERSION:=0.5.5
OLSRD_SOURCE:=olsrd-$(OLSRD_VERSION).tar.gz
OLSRD_SITE:=http://texas.funkfeuer.at/olsrd/0.5.5
OLSRD_DIR:=$(BUILD_DIR)/olsrd-$(OLSRD_VERSION)
OLSRD_BINARY:=olsrd
OLSRD_TARGET_BINARY:=usr/sbin/olsrd

$(DL_DIR)/$(OLSRD_SOURCE):
        $(WGET) -P $(DL_DIR) $(OLSRD_SITE)/$(OLSRD_SOURCE)

$(OLSRD_DIR)/.source: $(DL_DIR)/$(OLSRD_SOURCE)
        zcat $(DL_DIR)/$(OLSRD_SOURCE) | tar -C $(BUILD_DIR) $(TAR_OPTIONS) -
        touch $(OLSRD_DIR)/.source

$(OLSRD_DIR)/$(OLSRD_BINARY): $(OLSRD_DIR)/.source
        CC="$(TARGET_CC)" STRIP="$(STRIP)" make -C $(OLSRD_DIR)

$(OLSRD_DIR)/lib/dot_draw/src/.patched:
ifeq ($(strip $(BR2_PACKAGE_OLSRD_DD_ANYHOST)),y)
        toolchain/patch-kernel.sh $(OLSRD_DIR)/lib/dot_draw/src package/olsrd dot_draw_anyhost.patch
        touch $(OLSRD_DIR)/lib/dot_draw/src/.patched
endif

olsrd-plugins: $(OLSRD_DIR)/.source $(OLSRD_DIR)/lib/dot_draw/src/.patched
ifeq ($(strip $(BR2_PACKAGE_OLSRD_DOT_DRAW)),y)
        CC="$(TARGET_CC)" STRIP="$(STRIP)" make -C $(OLSRD_DIR)/lib/dot_draw
endif

olsrd-plugins-installed: olsrd-plugins
ifeq ($(strip $(BR2_PACKAGE_OLSRD_DOT_DRAW)),y)
        cp -f $(OLSRD_DIR)/lib/dot_draw/olsrd_dot_draw.so.0.3 $(TARGET_DIR)/usr/lib
endif

$(TARGET_DIR)/$(OLSRD_TARGET_BINARY): $(OLSRD_DIR)/$(OLSRD_BINARY)
```

Why these errors?

- The repository was initially pointing to www.olsr.org/...
- This webpage is not accessible directly, it gets redirected.
- I had to find alternative sources for the repository. This took a while.

Continued

- There also seemed to be problems with the dot draw patch.
- After doing a bit of code reading I decided it was not necessary.
- I commented it out from the makefile.



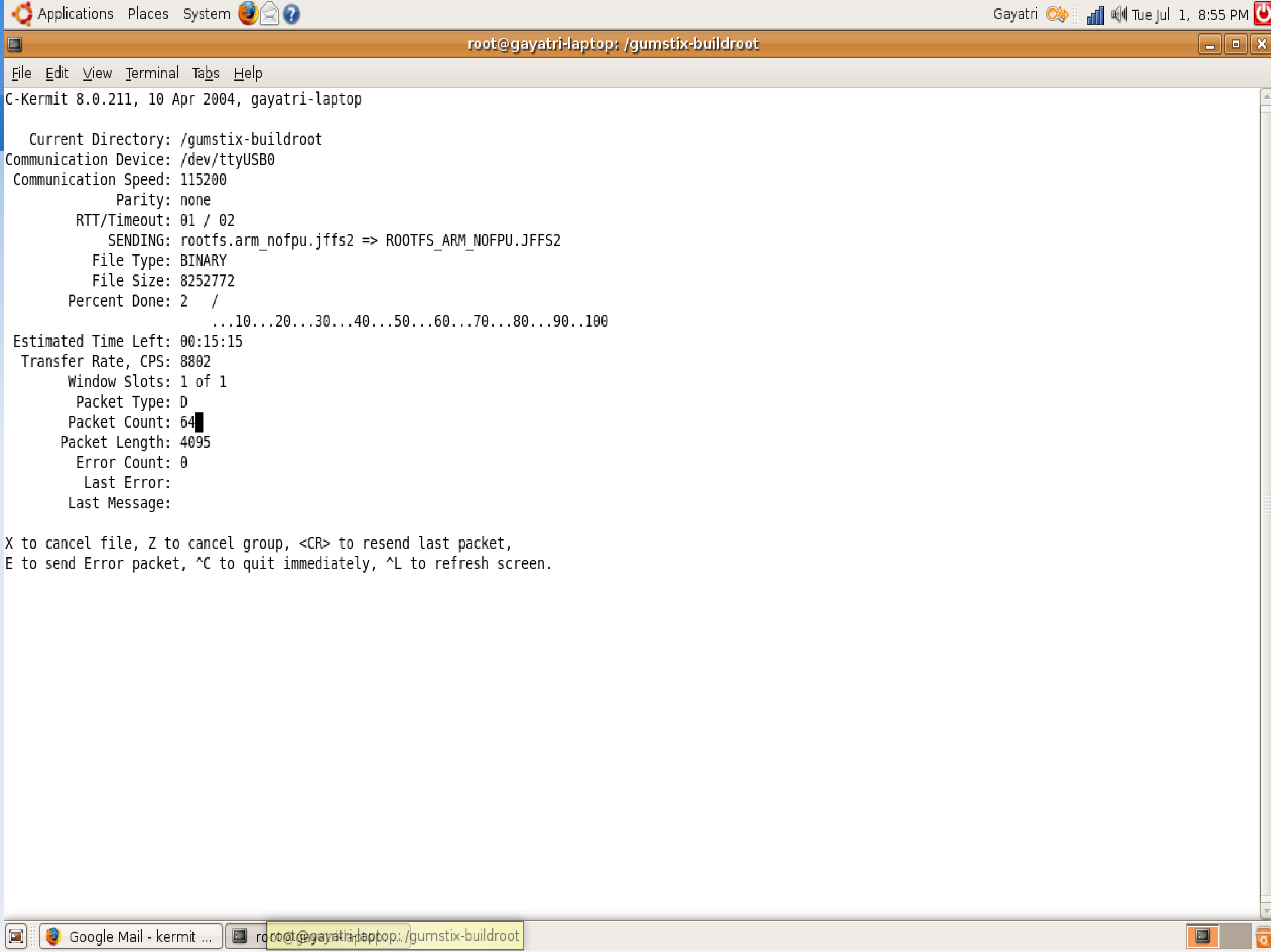
```
chmod 0600 /gumstix-buildroot/build_arm_nofpu/root/etc/bluetooth/pin
install -D -m 0644 /gumstix-buildroot/build_arm_nofpu/bluez-utils-3.13/rfcomm/rfcomm.conf /gumstix-buildroot/build_arm_nofpu/root/etc/bluetooth/rfcomm.conf
install -D -m 0755 /gumstix-buildroot/build_arm_nofpu/bluez-utils-3.13/scripts/bluetooth.init /gumstix-buildroot/build_arm_nofpu/root/etc/init.d/S30bluetooth
mkdir -p /gumstix-buildroot/build_arm_nofpu/root/etc/default
install -D -m 0644 /gumstix-buildroot/build_arm_nofpu/bluez-utils-3.13/scripts/bluetooth.default /gumstix-buildroot/build_arm_nofpu/root/etc/default/bluetoot
h
echo DISTRIB_ID=\'gumstix\' > /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
echo DISTRIB_DESCRIPTION=\'\' >> /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
echo DISTRIB_RELEASE=\'`svnversion /gumstix-buildroot`\' >> /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
echo DISTRIB_CODENAME=\'\' >> /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
echo BUILD_DATE=\'`date`\' >> /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
echo BUILD_HOSTNAME=\'`hostname -f`\' >> /gumstix-buildroot/build_arm_nofpu/root/etc/gumstix-release
/sbin/ldconfig -r /gumstix-buildroot/build_arm_nofpu/root 2>/dev/null
# Use fakeroot to pretend all target binaries are owned by root
cp -f /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot-devs.env /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env
/gumstix-buildroot/build_arm_nofpu/staging_dir/usr/bin/fakeroot \
                -i /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env \
                -s /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env -- \
                chown -R root:root /gumstix-buildroot/build_arm_nofpu/root
# Use fakeroot to pretend to create all needed device nodes
/gumstix-buildroot/build_arm_nofpu/staging_dir/usr/bin/fakeroot \
                -i /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env \
                -s /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env -- \
                /gumstix-buildroot/build_arm_nofpu/staging_dir/bin/makedevs \
                -d target/generic/device_table.txt \
                /gumstix-buildroot/build_arm_nofpu/root
rootdir=/gumstix-buildroot/build_arm_nofpu/root
table='target/generic/device_table.txt'
# Use fakeroot so mkfs.jffs2 believes the previous fakery
/gumstix-buildroot/build_arm_nofpu/staging_dir/usr/bin/fakeroot \
                -i /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env \
                -s /gumstix-buildroot/build_arm_nofpu/staging_dir/fakeroot.env -- \
                /gumstix-buildroot/toolchain_build_arm_nofpu/mtd-utils-1.0.0/mkfs.jffs2 \
                        -m size -e 0x20000 -l \
                        -d /gumstix-buildroot/build_arm_nofpu/root \
                        -o /gumstix-buildroot/rootfs.arm_nofpu.jffs2mtd-host-sumtool
/gumstix-buildroot/toolchain_build_arm_nofpu/mtd-utils-1.0.0/sumtool -e 0x20000 -l -i /gumstix-buildroot/rootfs.arm_nofpu.jffs2mtd-host-sumtool -o /gumstix-b
uildroot/rootfs.arm_nofpu.jffs2
rm -f /gumstix-buildroot/rootfs.arm_nofpu.jffs2mtd-host-sumtool
-rw-r--r-- 1 root root 8252772 2008-07-02 04:45 /gumstix-buildroot/rootfs.arm_nofpu.jffs2
root@gayatri-laptop:/gumstix-buildroot# 
```

What happened further

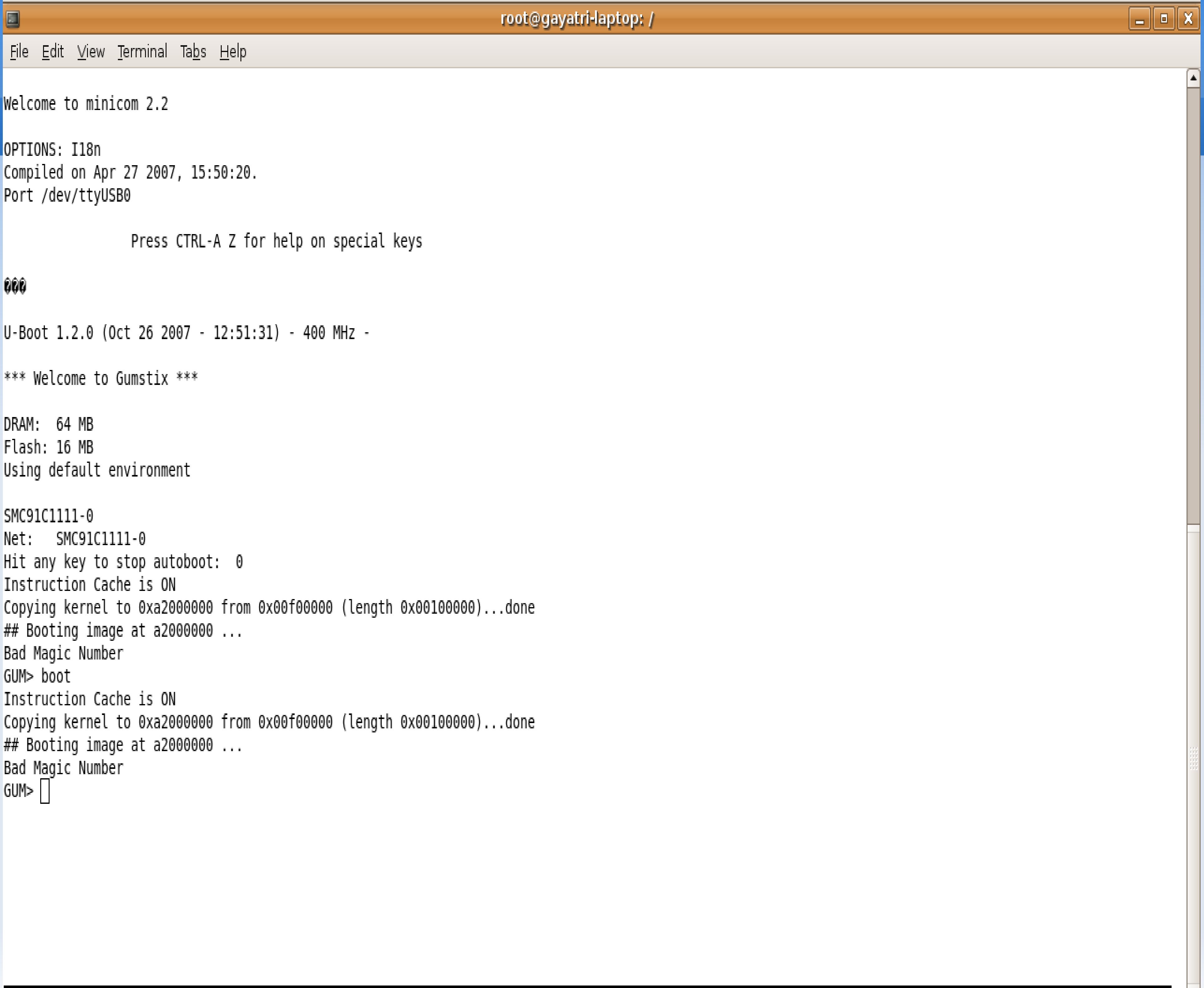
- I re ran make.
- It was successful in getting the new image
- Now I had to reflash this new image into the Gumstix

Flashing the gumstix with the new image

- To flash the new image I used C-kermit
- All instructions were from the gumstix wiki
- Image was successfully transferred
- However on rebooting , the gumstix seemed to be stuck at the gum prompt.

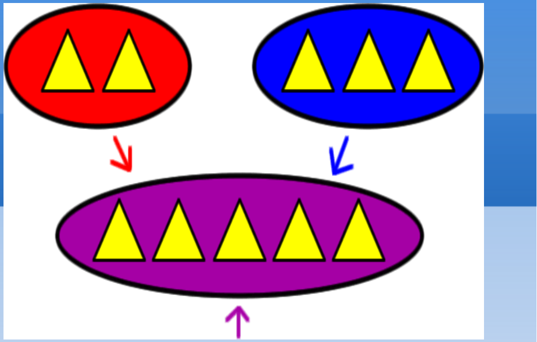

Applications Places System
Gayatri
Tue Jul 1, 8:55 PM
root@gayatri-laptop: /gumstix-buildroot
File Edit View Terminal Tabs Help
Google Mail - kermit ...
root@gayatri-laptop: /gumstix-buildroot

```
C-Kermit 8.0.211, 10 Apr 2004, gayatri-laptop

   Current Directory: /gumstix-buildroot
Communication Device: /dev/ttyUSB0
 Communication Speed: 115200
              Parity: none
         RTT/Timeout: 01 / 02
             SENDING: rootfs.arm_nofpu.jffs2 => ROOTFS_ARM_NOFPU.JFFS2
           File Type: BINARY
           File Size: 8252772
        Percent Done: 2   /
                          ...10...20...30...40...50...60...70...80...90..100
 Estimated Time Left: 00:15:15
  Transfer Rate, CPS: 8802
        Window Slots: 1 of 1
         Packet Type: D
        Packet Count: 64
       Packet Length: 4095
         Error Count: 0
          Last Error:
        Last Message:

X to cancel file, Z to cancel group, <CR> to resend last packet,
E to send Error packet, ^C to quit immediately, ^L to refresh screen.
```



```
Welcome to minicom 2.2

OPTIONS: I18n
Compiled on Apr 27 2007, 15:50:20.
Port /dev/ttyUSB0

                 Press CTRL-A Z for help on special keys

���

U-Boot 1.2.0 (Oct 26 2007 - 12:51:31) - 400 MHz -

*** Welcome to Gumstix ***

DRAM:  64 MB
Flash: 16 MB
Using default environment

SMC91C1111-0
Net:   SMC91C1111-0
Hit any key to stop autoboot:  0
Instruction Cache is ON
Copying kernel to 0xa2000000 from 0x00f00000 (length 0x00100000)...done
## Booting image at a2000000 ...
Bad Magic Number
GUM> boot
Instruction Cache is ON
Copying kernel to 0xa2000000 from 0x00f00000 (length 0x00100000)...done
## Booting image at a2000000 ...
Bad Magic Number
GUM> 
```

Summary of steps



- Buildroot set up for Gumstix: success
- Enabling ipv6 and olsrd support: success
- remaking the buildroot to incorporate above changes: success
- Transferring the image: success
- Rebooting gumstix:failure

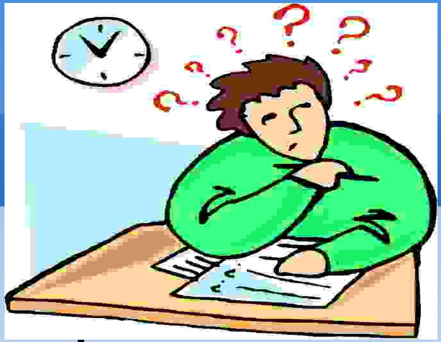
If it was successful

- Configure interfaces on gumstix in olsrd.conf
- To start the olsrd daemon, run "/etc/init.d/s80olsrd start"

Final Results

- Successful running of olsrd on 1 laptop.
- Successful Buildroot compilation.
- Successful makefile compilation to incorporate olsrd features in image for gumstix.

Conclusions



- It could be possible that the image may not be completely compiled to run on gumstix , although it shows it is.
- due to removal of certain entities in makefile.
- Deeper kernel debugging is required.
- Time constraints.
- Perhaps a networking of 2 laptops can be done.

Acknowledgements

- Prof.Dr. Christian Schindelahuer
- Miss Chia Ching Ooi
- Aaron Kaplan, Security Analyst, National Cert Austria.

Thank You for your attention

Vielen Dank!