Petalinux 2017 GPIO with UIO

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```
INFO: [DRC 23-27] Running DRC with 8 threads
INFO: [Vivado 12-3199] DRC finished with 0 Errors
INFO: [Vivado 12-3200] Please refer to the DRC report (report_drc) for more info
rmation.
INFO: [Project 1-821] Please set project.enableDesignId to be 'true'.
INFO: [Designutils 20-2272] Running write_bitstream with 8 threads.
Loading data files...
Loading site data...
Loading route data...
Processing options...
Creating bitmap...
Creating bitstream...
Writing bitstream ./system_wrapper.bit...
INFO: [Vivado 12-1842] Bitgen Completed Successfully.
INFO: [Project 1-120] WebTalk data collection is mandatory when using a WebPACK
part without a full Vivado license. To see the specific WebTalk data collected f
or your design, open the usage_statistics_webtalk.html or usage_statistics_webta
lk.xml file in the implementation directory.
INFO: [Common 17-83] Releasing license: Implementation
97 Infos, 0 Warnings, 0 Critical Warnings and 0 Errors encountered.
write_bitstream completed successfully
write_bitstream: Time (s): cpu = 00:00:09 ; elapsed = 00:00:11 . Memory (MB): pe
ak = 2545.844 ; gain = 218.430 ; free physical = 1607 ; free virtual = 13373
INFO: [Common 17-206] Exiting Vivado at Sun Apr 21 23:43:11 2019...
[Sun Apr 21 23:43:11 2019] impl_1 finished
wait_on_run: Time (s): cpu = 00:01:08 ; elapsed = 00:01:19 . Memory (MB): peak =
 1477.215 ; gain = 0.000 ; free physical = 2611 ; free virtual = 14376
# puts "Implementation Done!"
Implementation Done!
# file mkdir $project_name/$project_name.sdk
# file copy -force $project_name/$project_name.runs/impl_1/system_wrapper.sysdef
 $project_name/$project_name.sdk/system_wrapper.hdf
# launch_sdk -workspace $project_name/$project_name.sdk -hwspec $project_name/$p
roject_name.sdk/system_wrapper.hdf
INFO: [Vivado 12-393] Launching SDK...
INFO: [Vivado 12-417] Running xsdk -workspace sdk_led/sdk_led.sdk -hwspec sdk_le
d/sdk_led.sdk/system_wrapper.hdf
INFO: [Vivado 12-3157] SDK launch initiated. Please check console for any furthe
r messages.
# close_project
INFO: [Common 17-206] Exiting Vivado at Sun Apr 21 23:43:11 2019...
```

TCL 로 HW 작업 수행

```
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado$ peta
linux-create -t project -n led_sw --template zynq
INFO: Create project: led_sw
INFO: New project successfully created in /home/sdr/project/VehicleIntegrationRe
po/tcl_vivado/led_sw
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado$ cd l
ed_sw
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_s
w$ ls
config.project  project-spec
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_s
w$
```

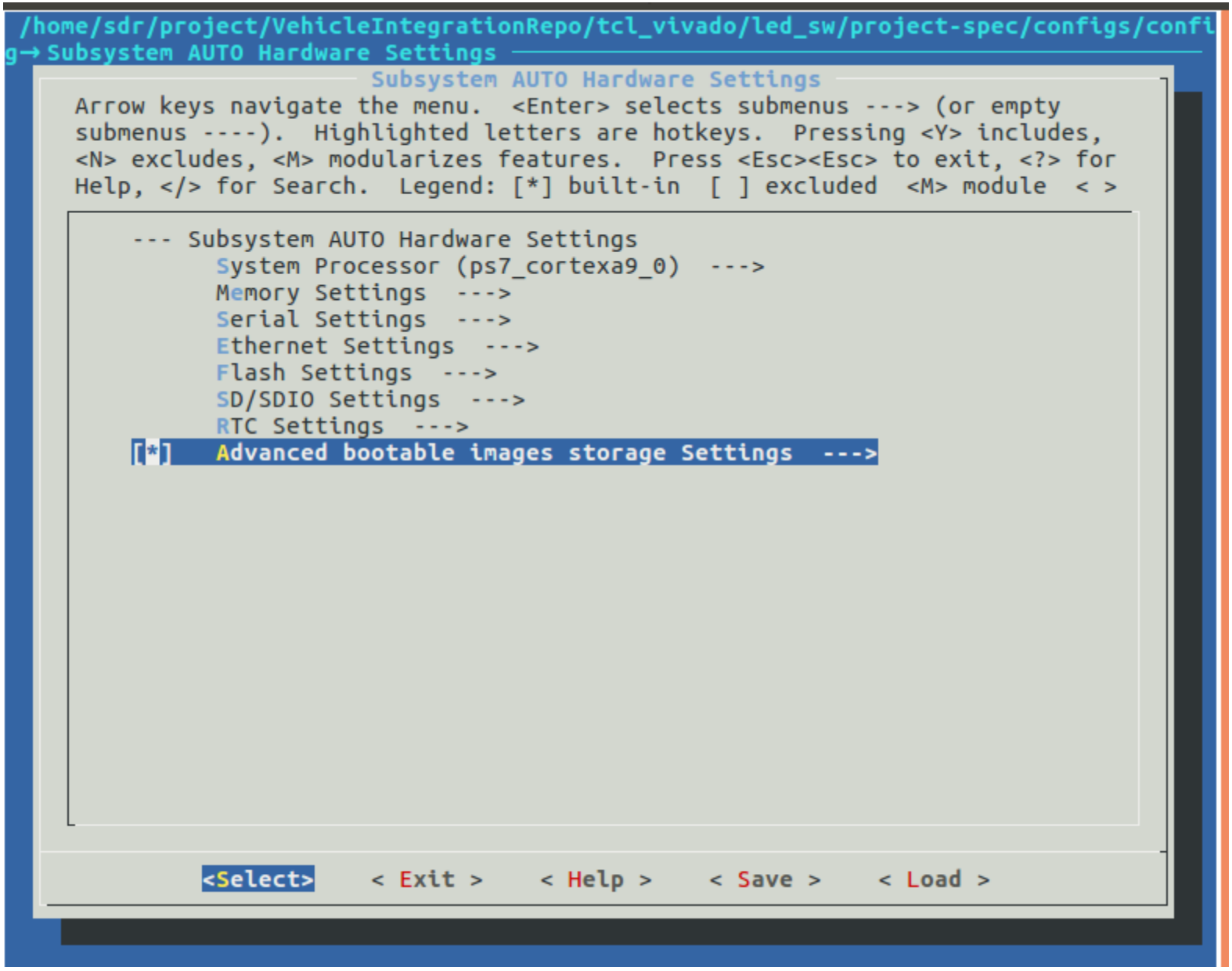
/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/conf
g

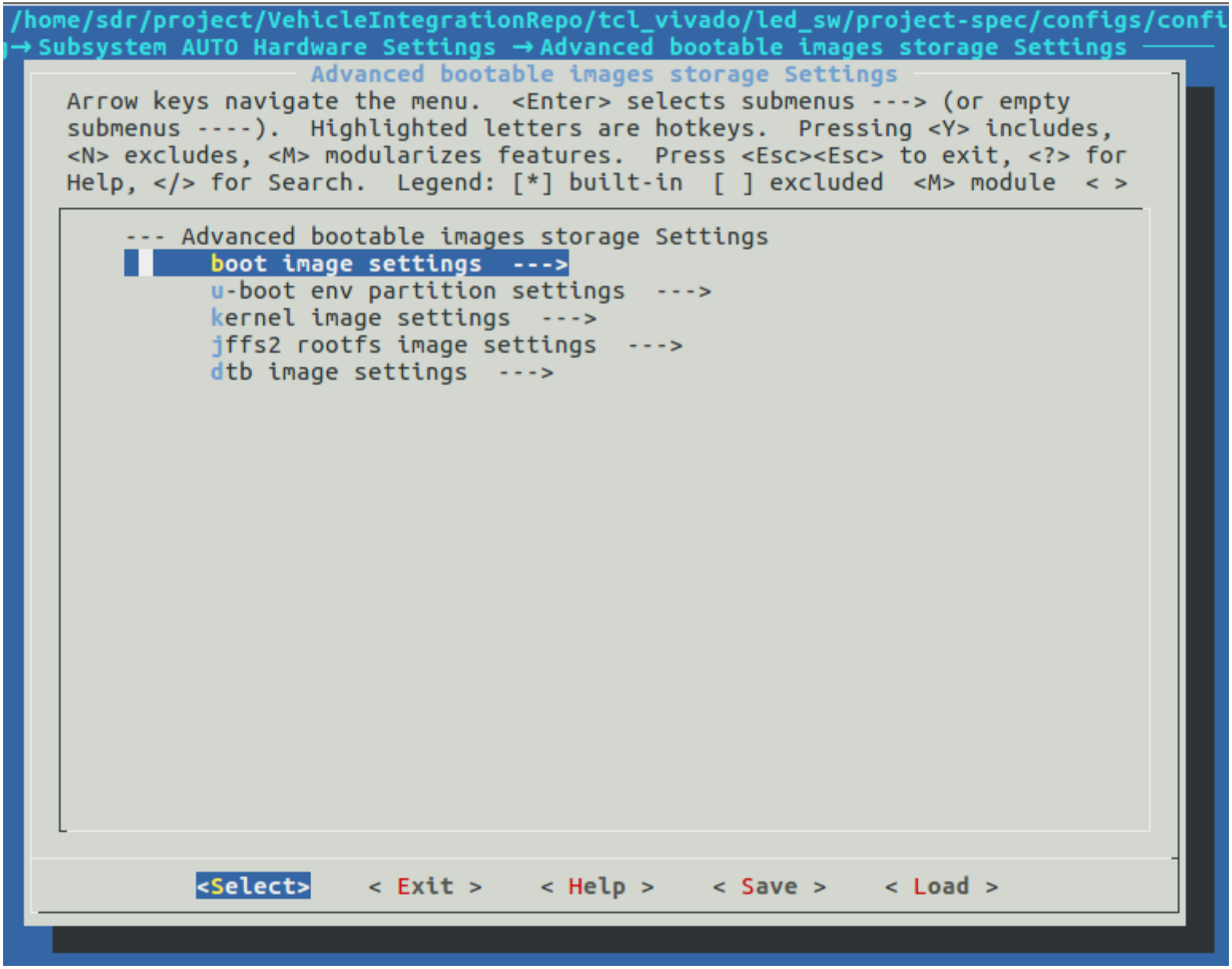
misc/config System Configuration

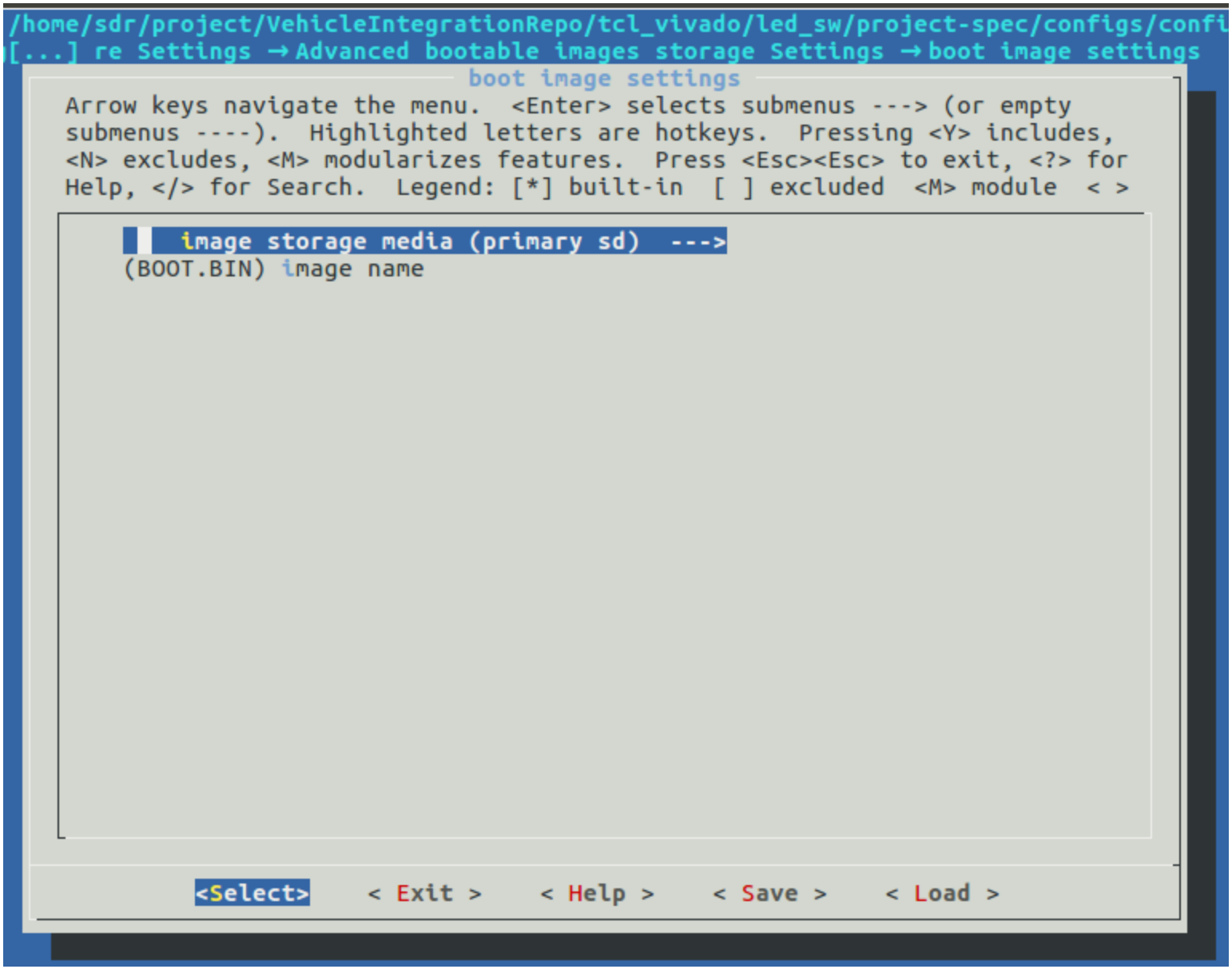
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >

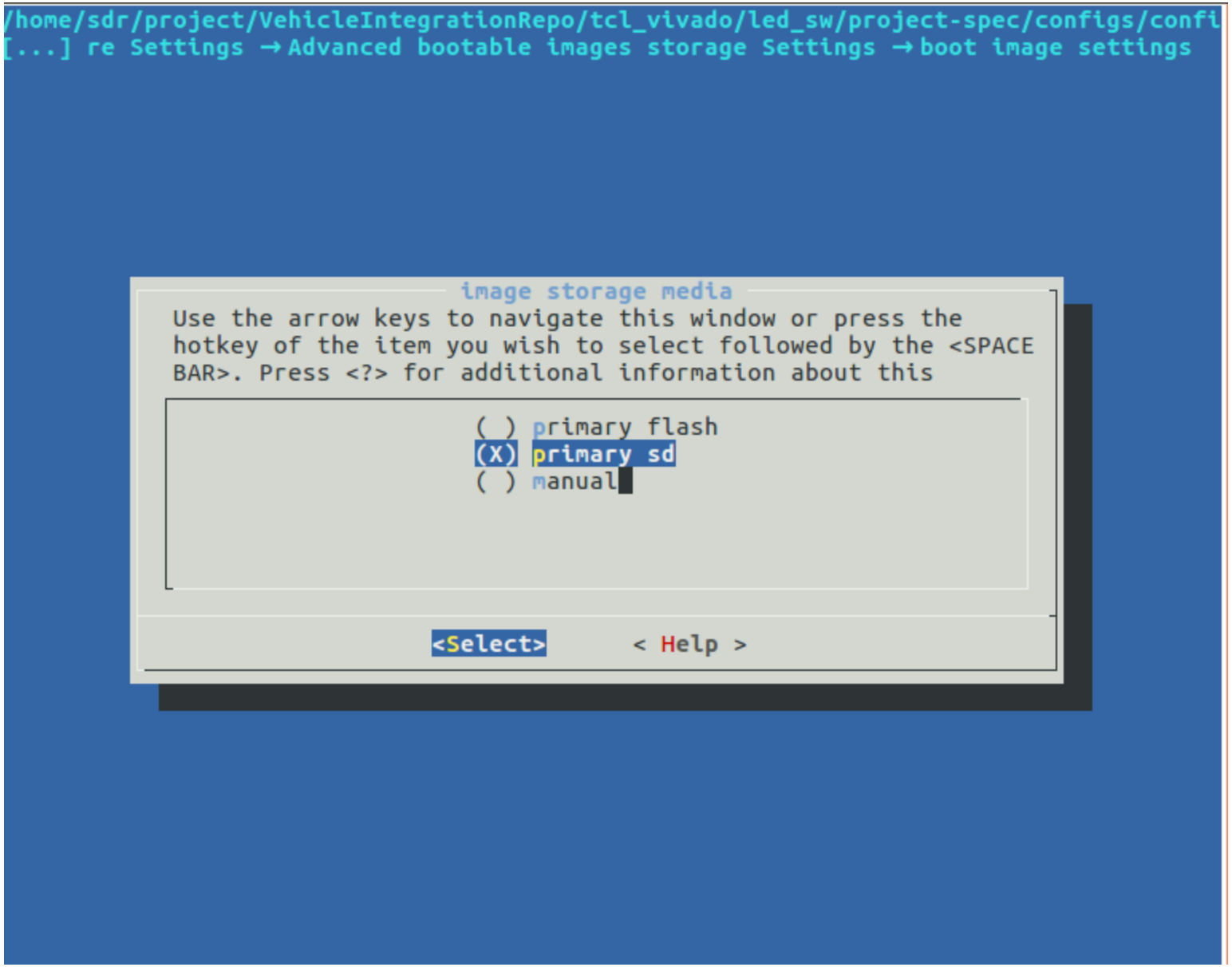
```
        Linux Components Selection  --->
        Auto Config Settings  --->
    -*- Subsystem AUTO Hardware Settings  --->
        DTG Settings  --->
        u-boot Configuration  --->
        Image Packaging Configuration  --->
        Firmware Version Configuration  --->
        Yocto Settings  --->
```

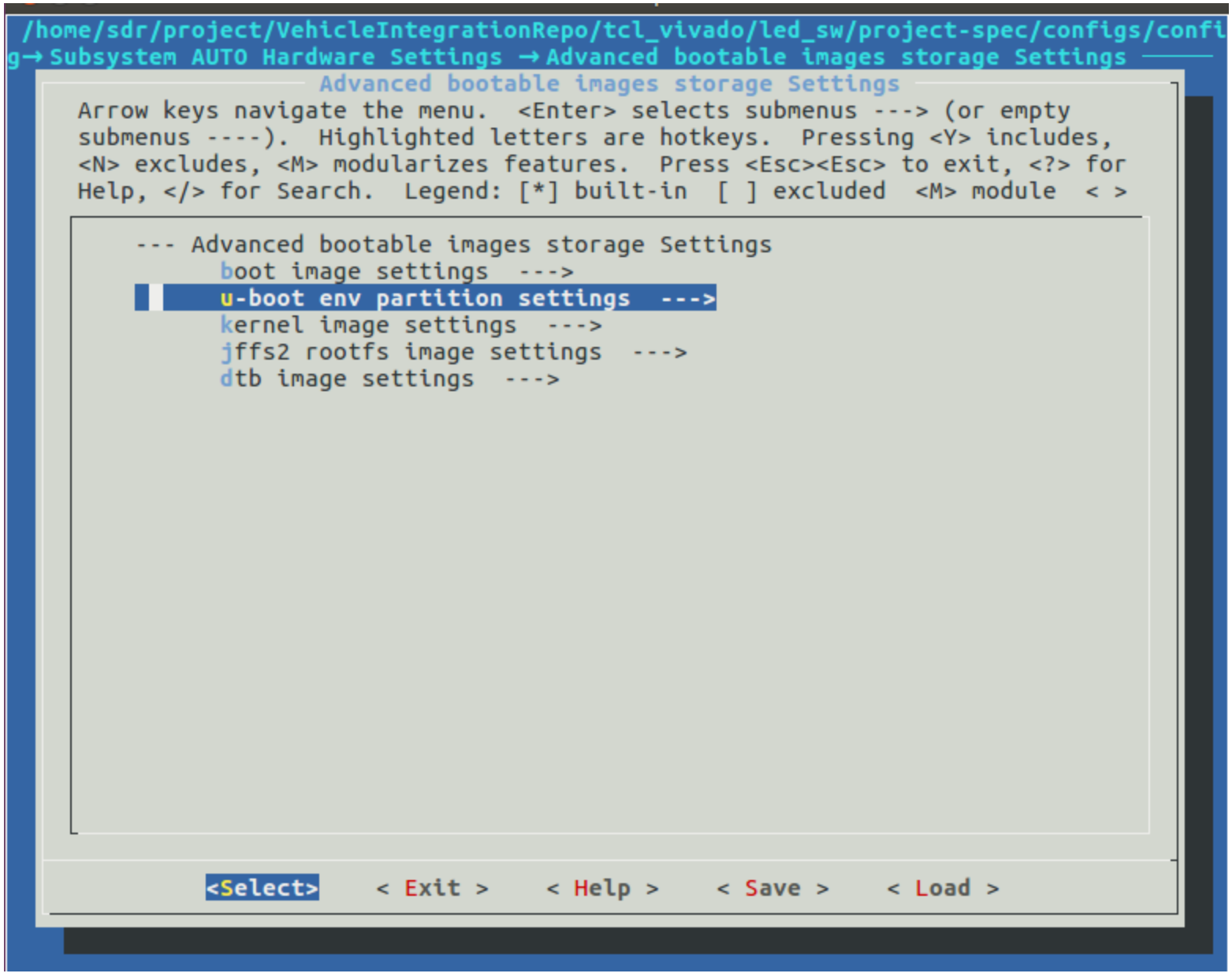
<Select> < Exit > < Help > < Save > < Load >

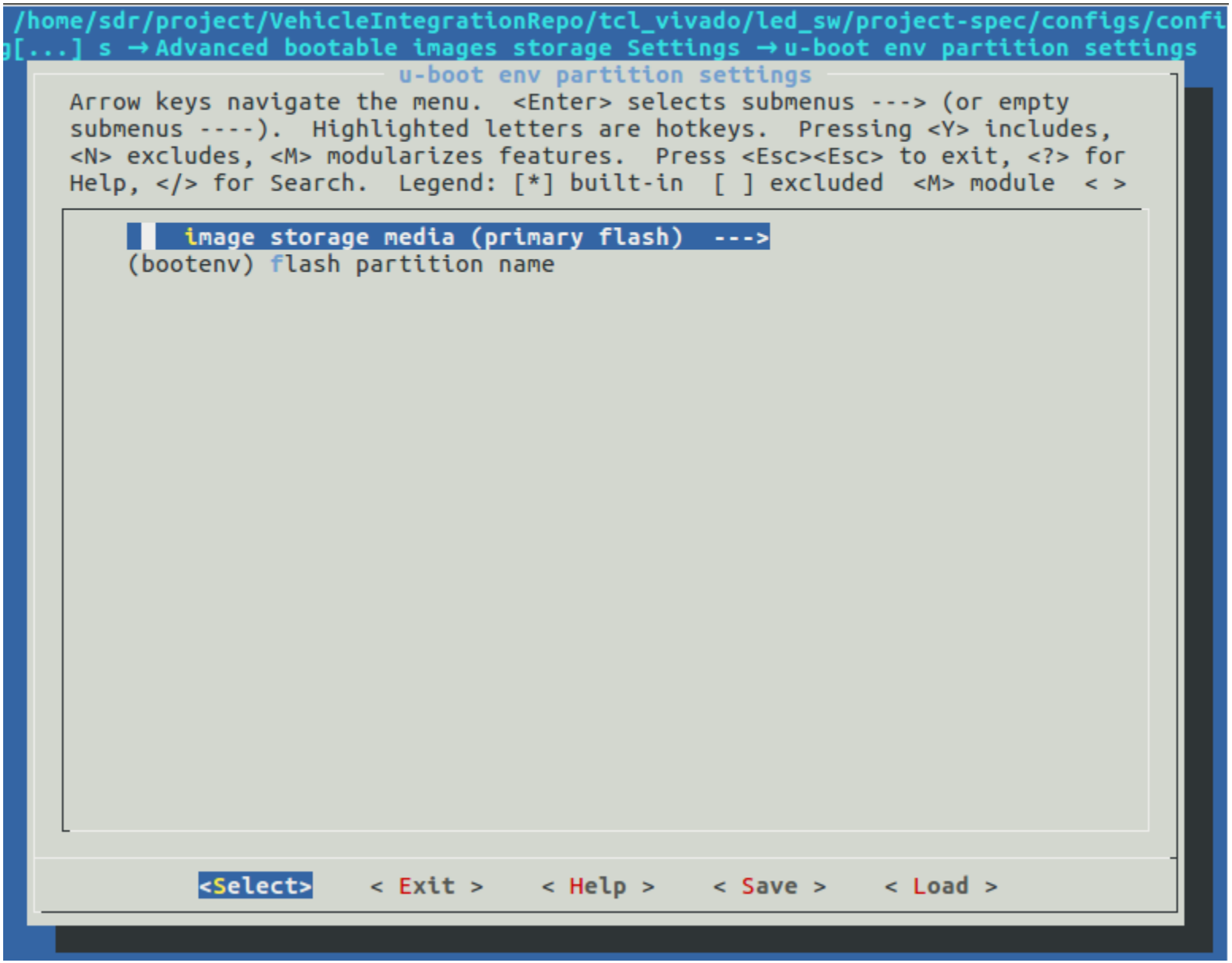

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→ Subsystem AUTO Hardware Settings
Subsystem AUTO Hardware Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
--- Subsystem AUTO Hardware Settings
System Processor (ps7_cortexa9_0) --->
Memory Settings --->
Serial Settings --->
Ethernet Settings --->
Flash Settings --->
SD/SDIO Settings --->
RTC Settings --->
[*] Advanced bootable images storage Settings --->
<Select> < Exit > < Help > < Save > < Load >

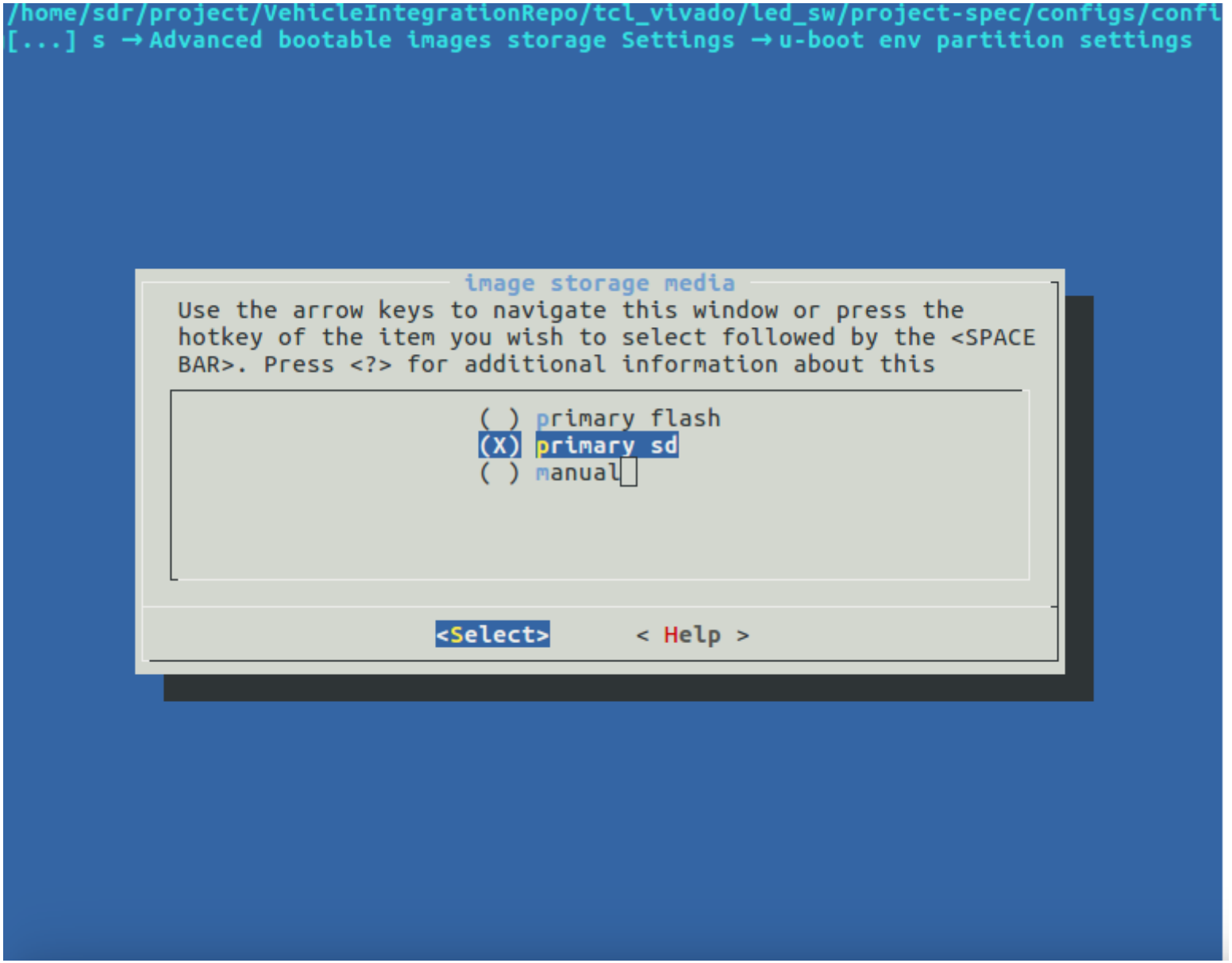

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
→ Subsystem AUTO Hardware Settings → Advanced bootable images storage Settings
Advanced bootable images storage Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
--- Advanced bootable images storage Settings
boot image settings --->
u-boot env partition settings --->
kernel image settings --->
jffs2 rootfs image settings --->
dtb image settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

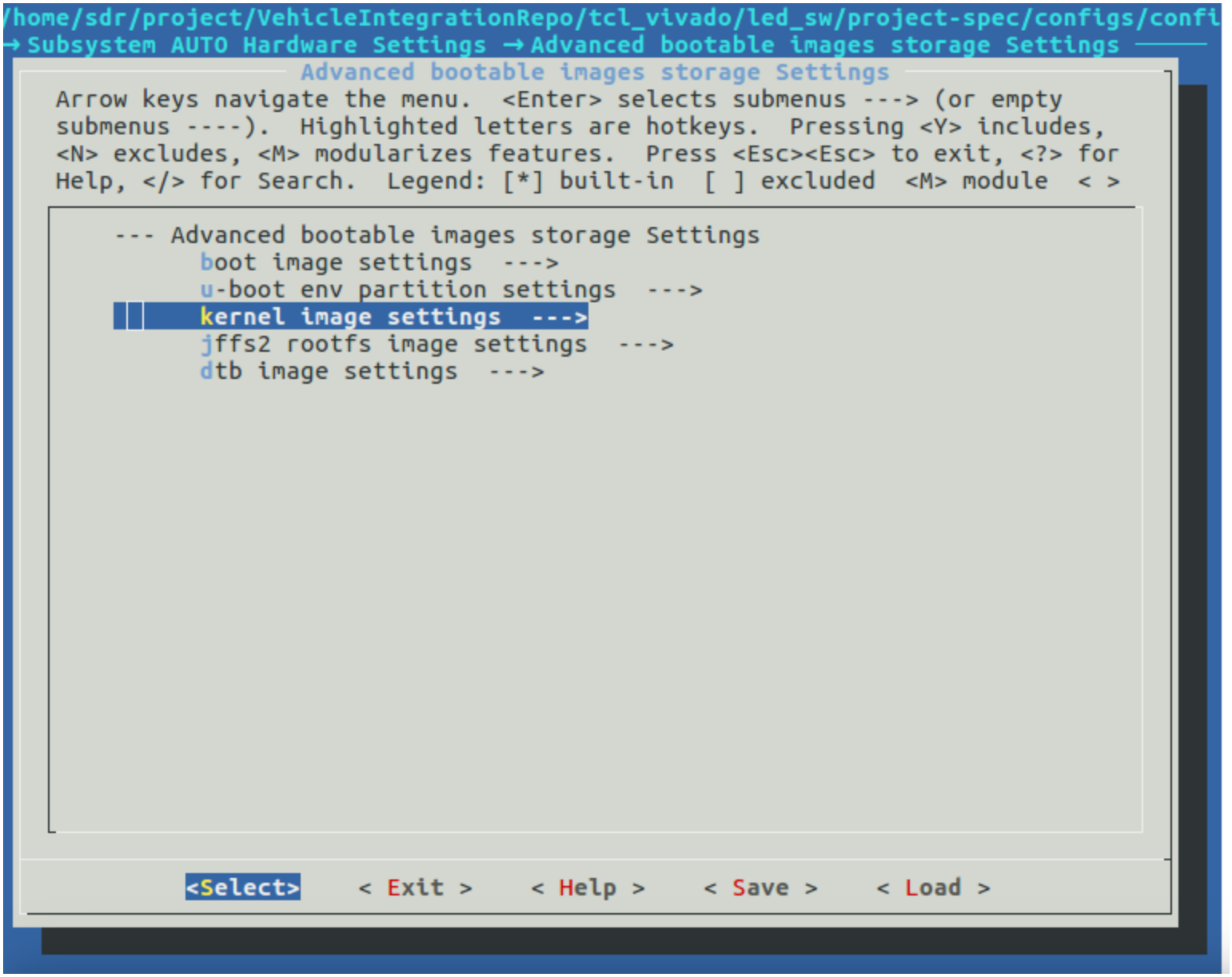

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
[...] re Settings → Advanced bootable images storage Settings → boot image settings
boot image settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
image storage media (primary sd) --->
(BOOT.BIN) image name
<Select>
< Exit >
< Help >
< Save >
< Load >

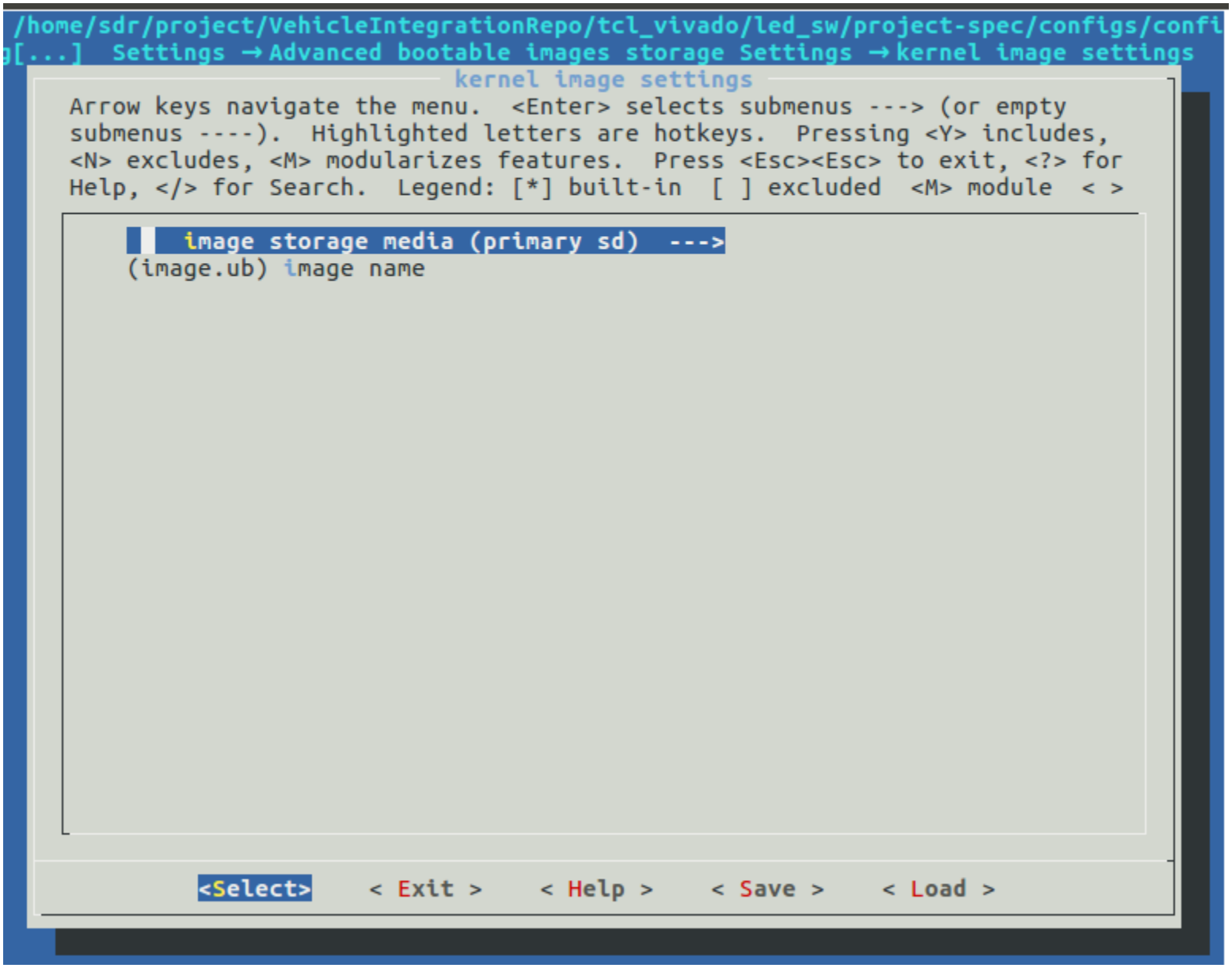

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
[...] re Settings → Advanced bootable images storage Settings → boot image settings
image storage media
Use the arrow keys to navigate this window or press the
hotkey of the item you wish to select followed by the <SPACE
BAR>. Press <?> for additional information about this
( ) primary flash
(X) primary sd
( ) manual
<Select>
< Help >

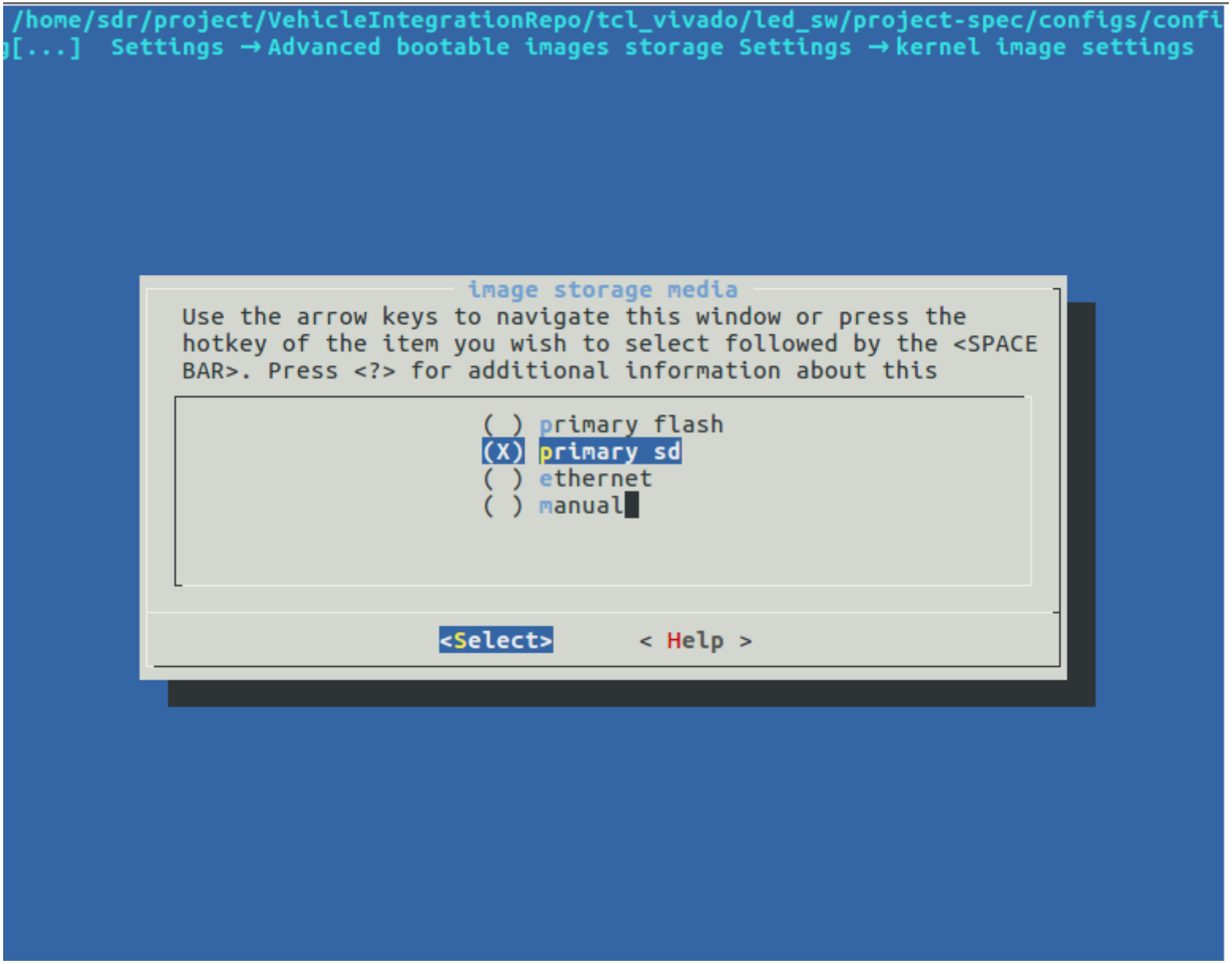

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→ Subsystem AUTO Hardware Settings →Advanced bootable images storage Settings
Advanced bootable images storage Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
--- Advanced bootable images storage Settings
boot image settings --->
u-boot env partition settings --->
kernel image settings --->
jffs2 rootfs image settings --->
dtb image settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

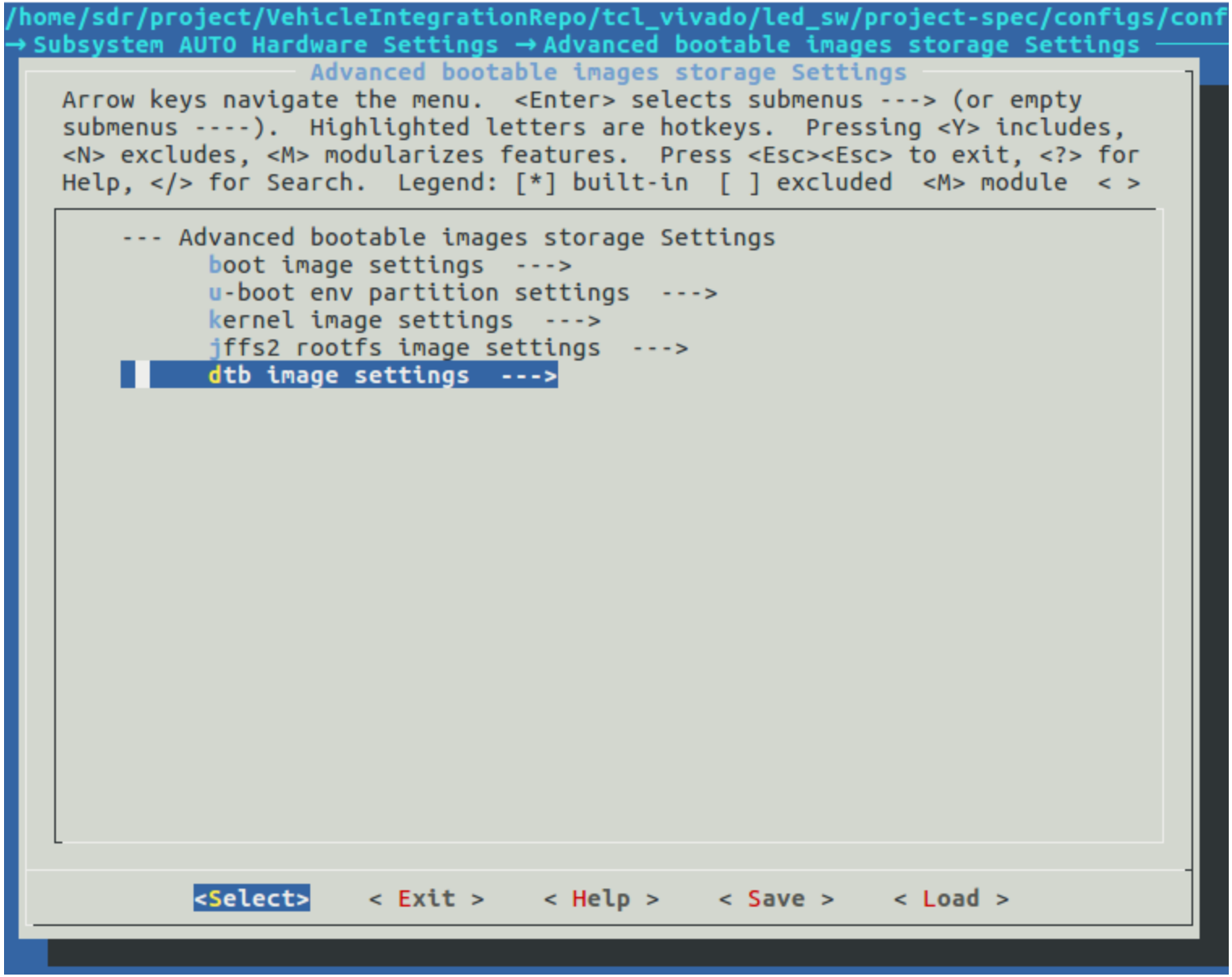

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g[...] s → Advanced bootable images storage Settings → u-boot env partition settings
u-boot env partition settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
image storage media (primary flash) --->
(bootenv) flash partition name
<Select>
< Exit >
< Help >
< Save >
< Load >

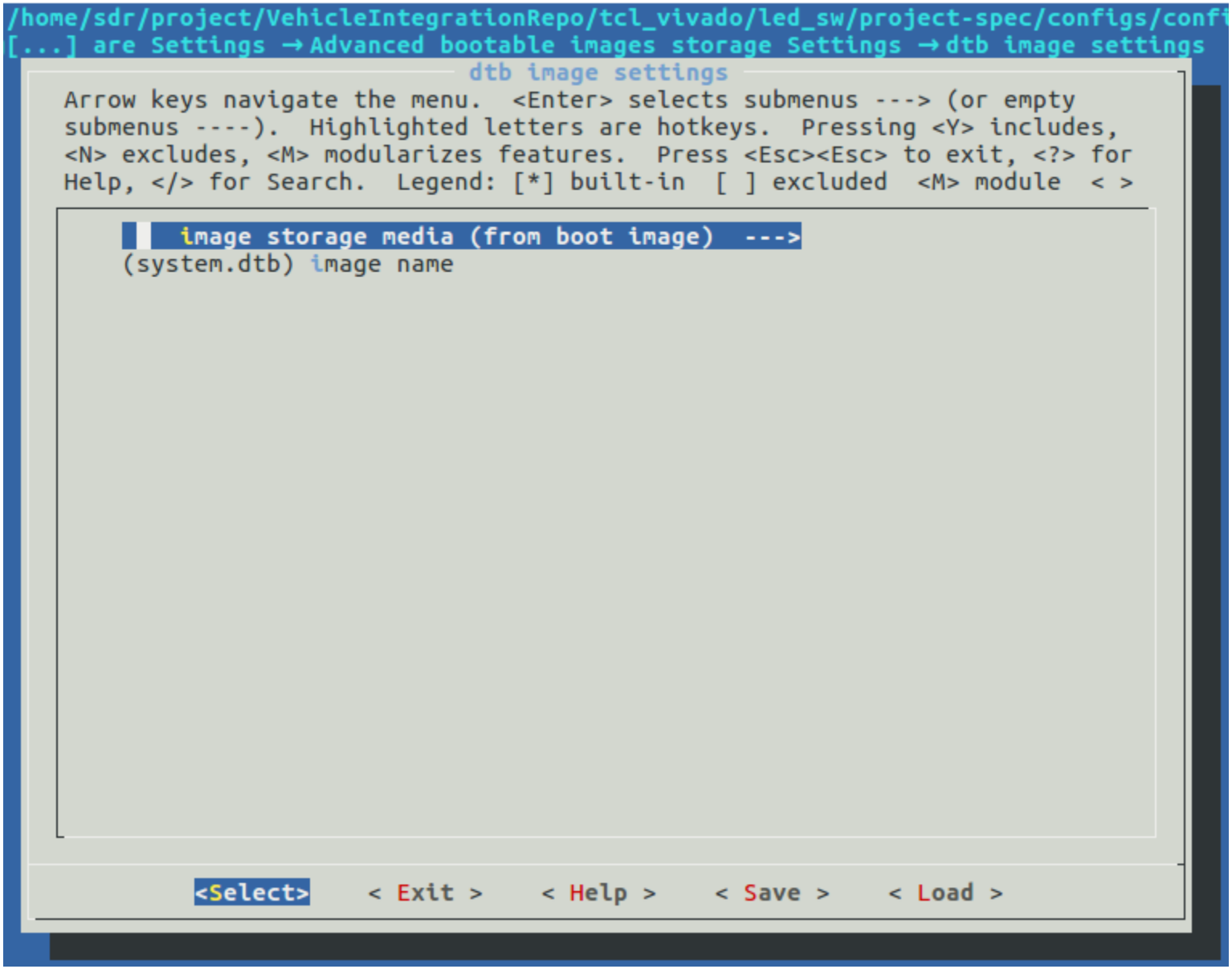

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
[...] s → Advanced bootable images storage Settings → u-boot env partition settings
image storage media
Use the arrow keys to navigate this window or press the
hotkey of the item you wish to select followed by the <SPACE
BAR>. Press <?> for additional information about this
( ) primary flash
(X) primary sd
( ) manual
<Select>
< Help >

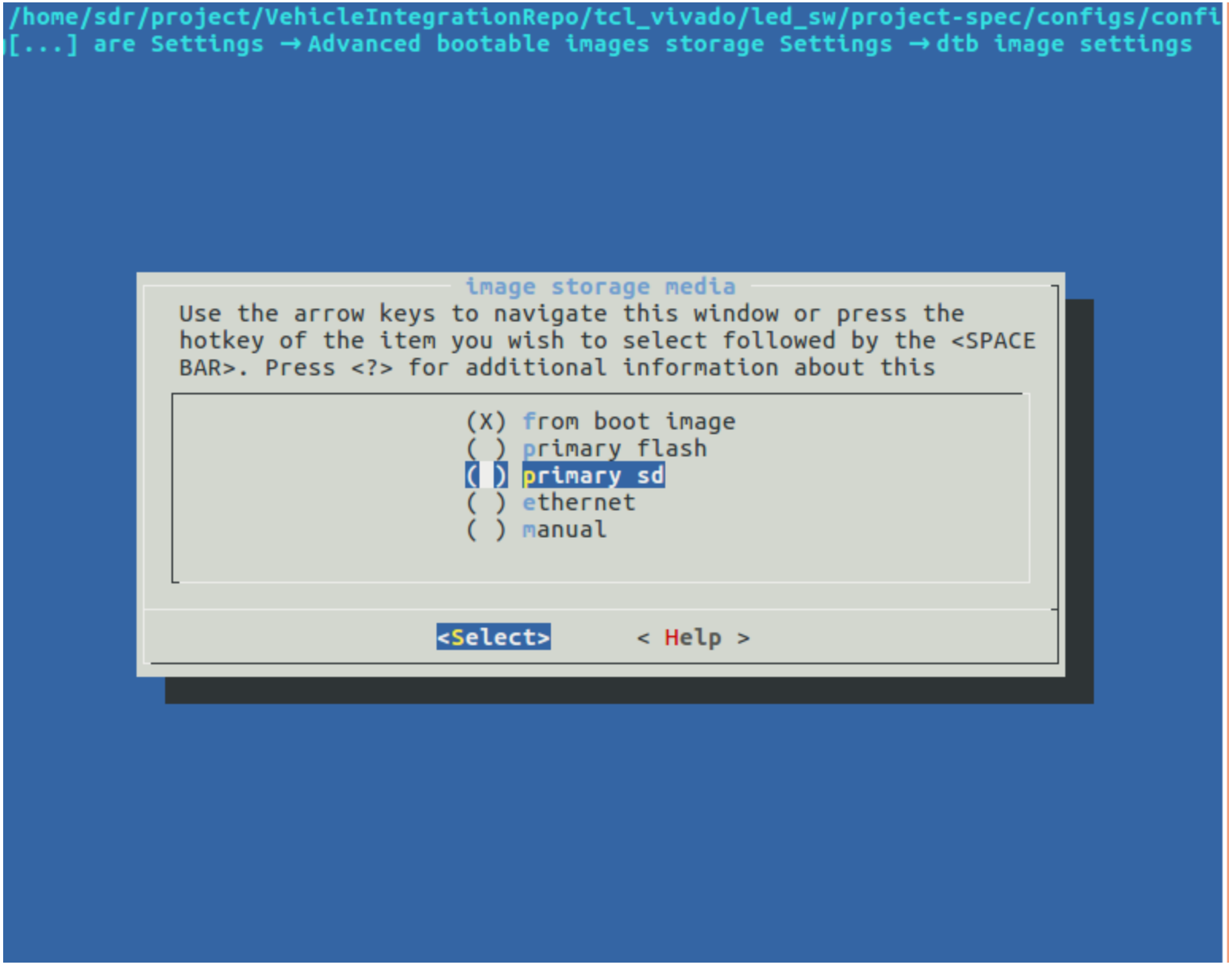

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
→ Subsystem AUTO Hardware Settings → Advanced bootable images storage Settings
Advanced bootable images storage Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
--- Advanced bootable images storage Settings
boot image settings --->
u-boot env partition settings --->
kernel image settings --->
jffs2 rootfs image settings --->
dtb image settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

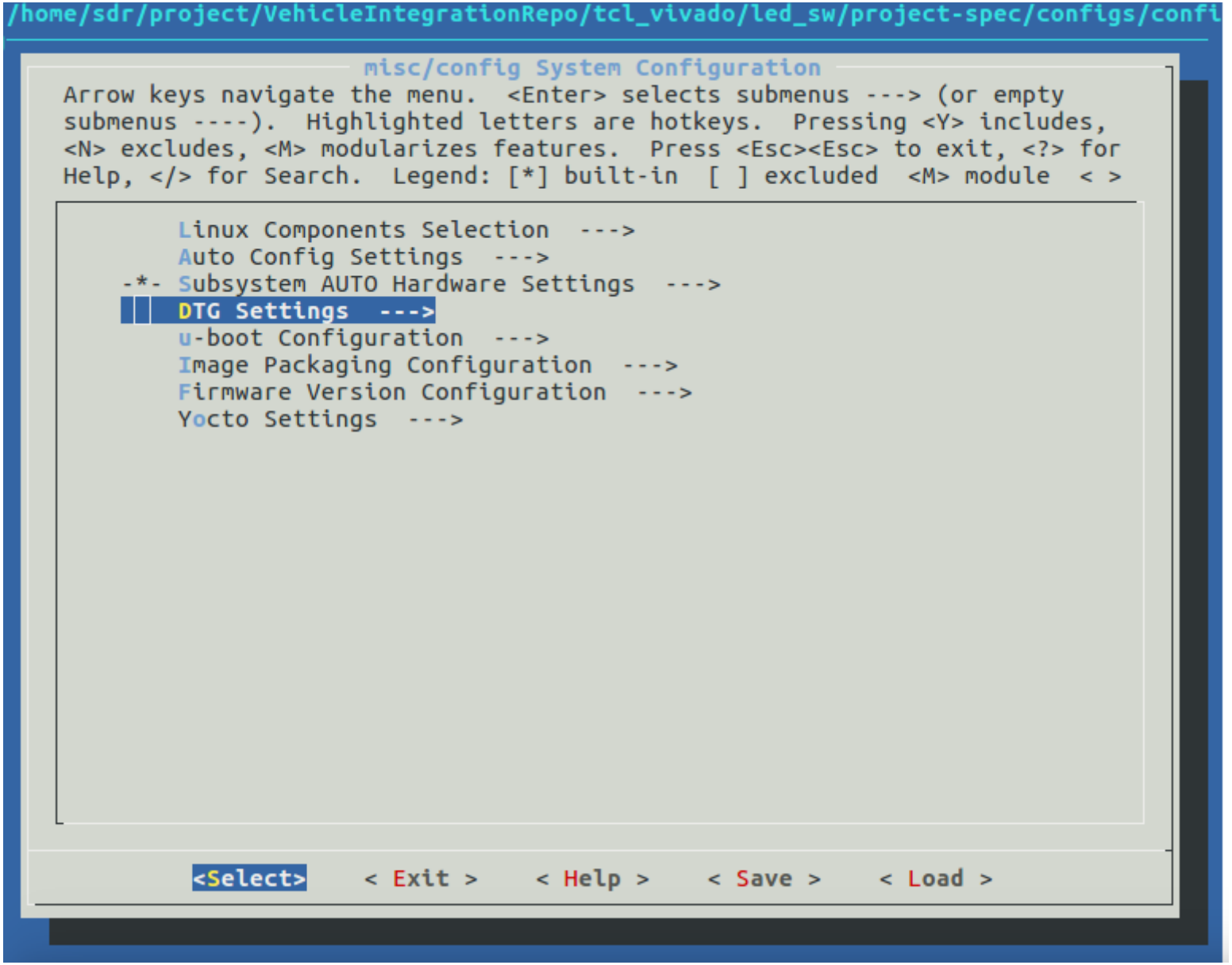

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g[...] Settings → Advanced bootable images storage Settings → kernel image settings
kernel image settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
image storage media (primary sd) --->
(image.ub) image name
<Select>
< Exit >
< Help >
< Save >
< Load >

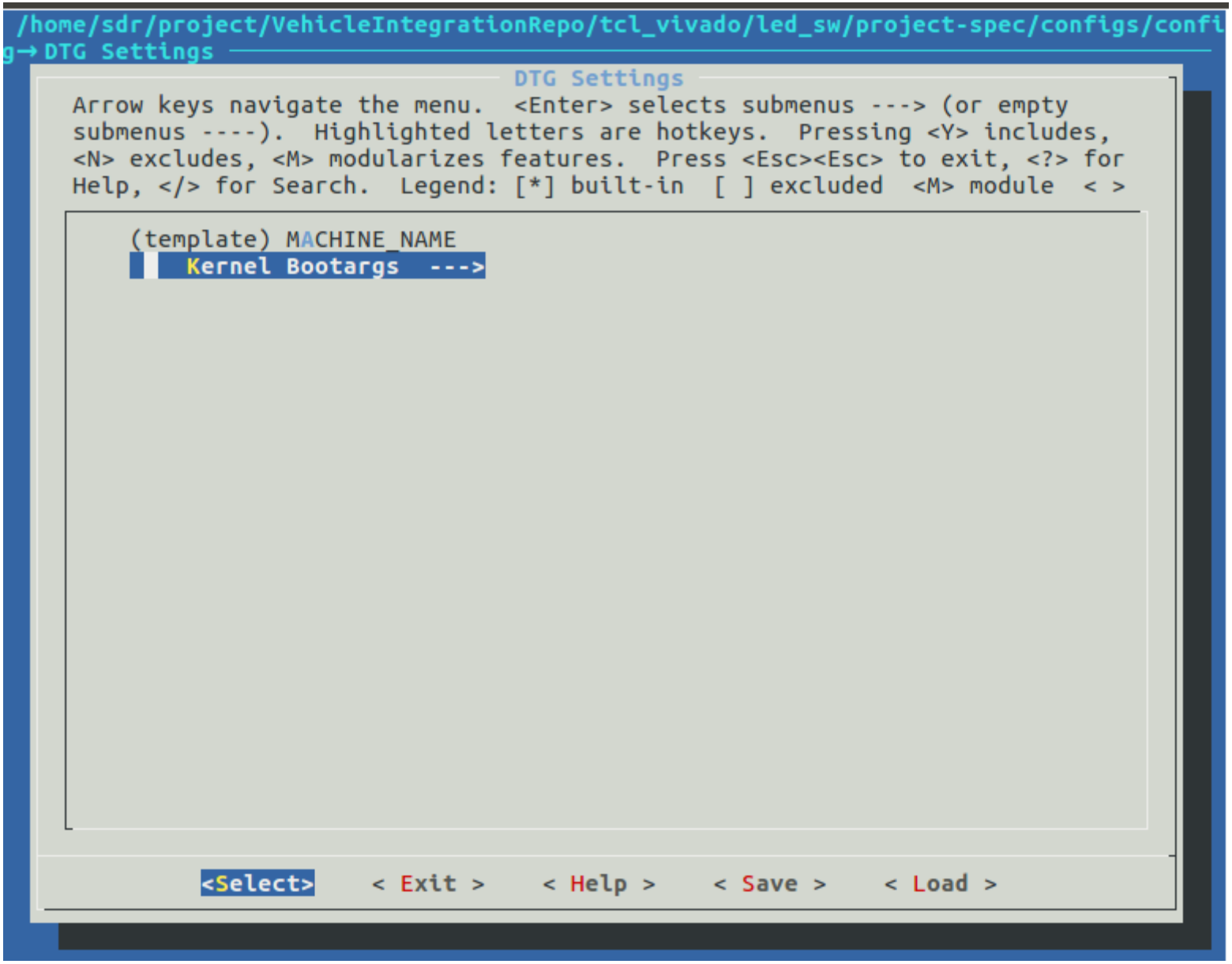

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g[...] Settings → Advanced bootable images storage Settings → kernel image settings
image storage media
Use the arrow keys to navigate this window or press the
hotkey of the item you wish to select followed by the <SPACE
BAR>. Press <?> for additional information about this
( ) primary flash
(X) primary sd
( ) ethernet
( ) manual
<Select>
< Help >

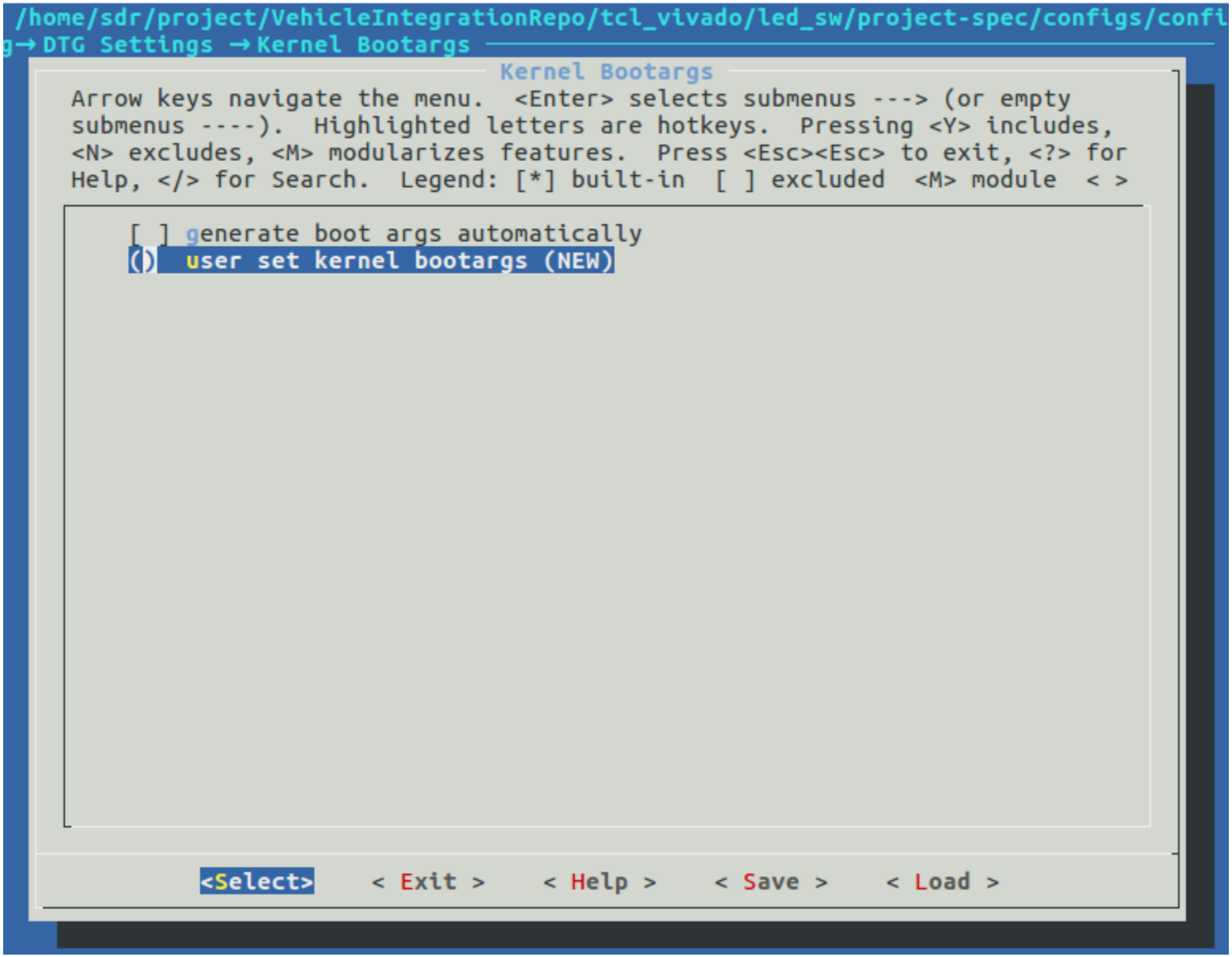

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/conf
→ Subsystem AUTO Hardware Settings → Advanced bootable images storage Settings
Advanced bootable images storage Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
--- Advanced bootable images storage Settings
boot image settings --->
u-boot env partition settings --->
kernel image settings --->
jffs2 rootfs image settings --->
dtb image settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

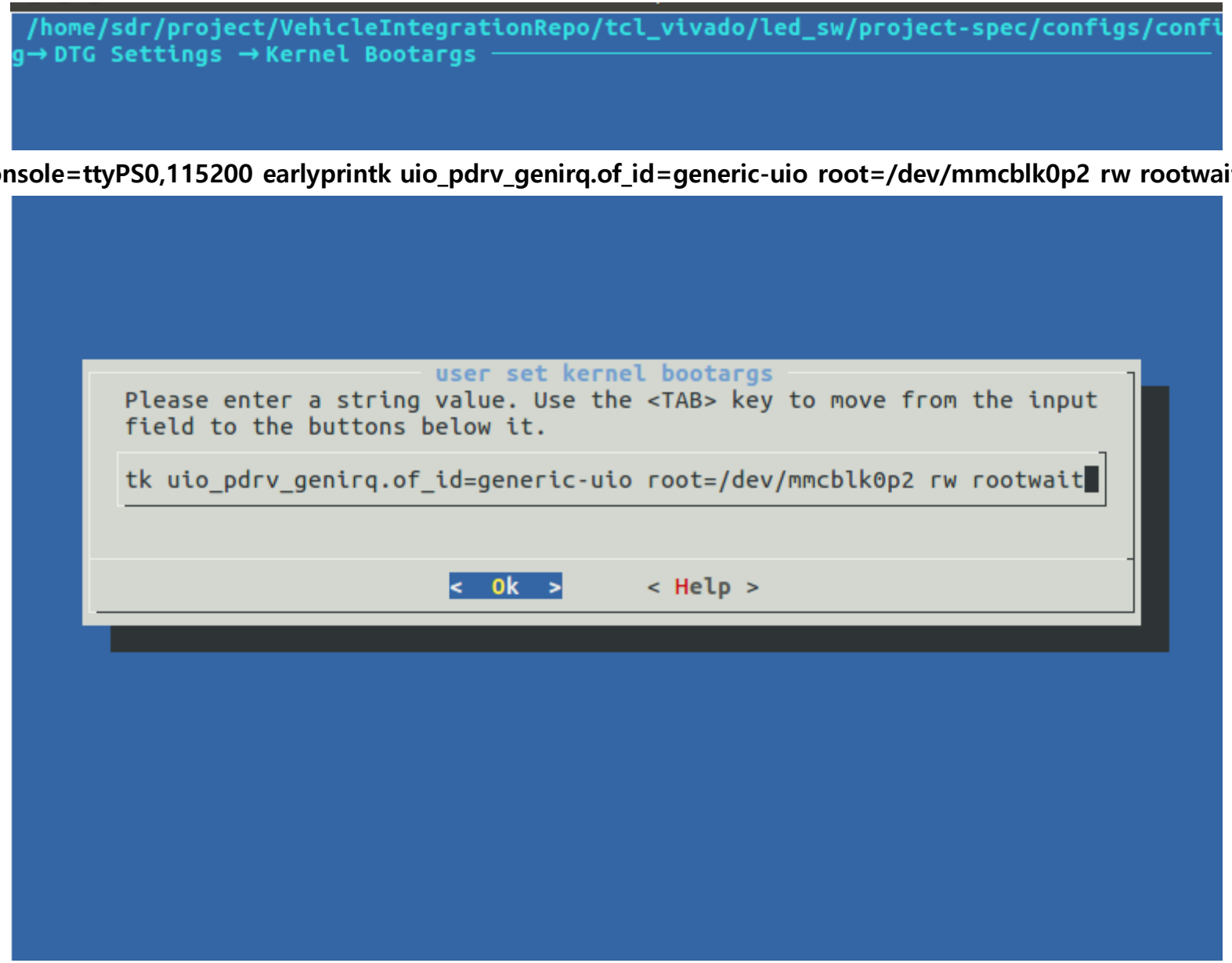

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
[...] are Settings → Advanced bootable images storage Settings → dtb image settings
dtb image settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
image storage media (from boot image) --->
(system.dtb) image name
<Select>
< Exit >
< Help >
< Save >
< Load >


/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
[...] are Settings → Advanced bootable images storage Settings → dtb image settings
image storage media
Use the arrow keys to navigate this window or press the
hotkey of the item you wish to select followed by the <SPACE
BAR>. Press <?> for additional information about this
(X) from boot image
( ) primary flash
( ) primary sd
( ) ethernet
( ) manual
<Select>
< Help >

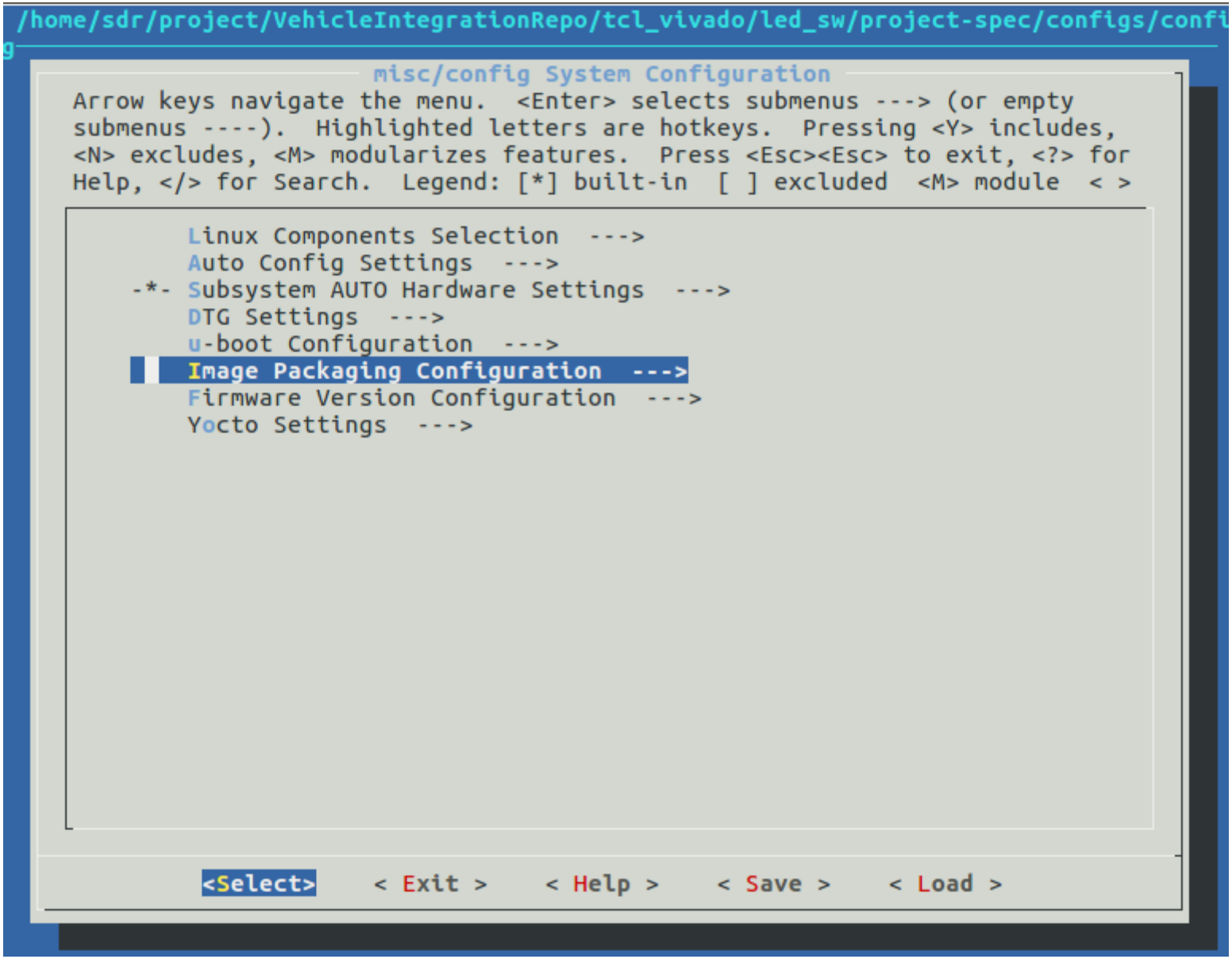

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
misc/config System Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
Linux Components Selection --->
Auto Config Settings --->
-*- Subsystem AUTO Hardware Settings --->
DTG Settings --->
u-boot Configuration --->
Image Packaging Configuration --->
Firmware Version Configuration --->
Yocto Settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

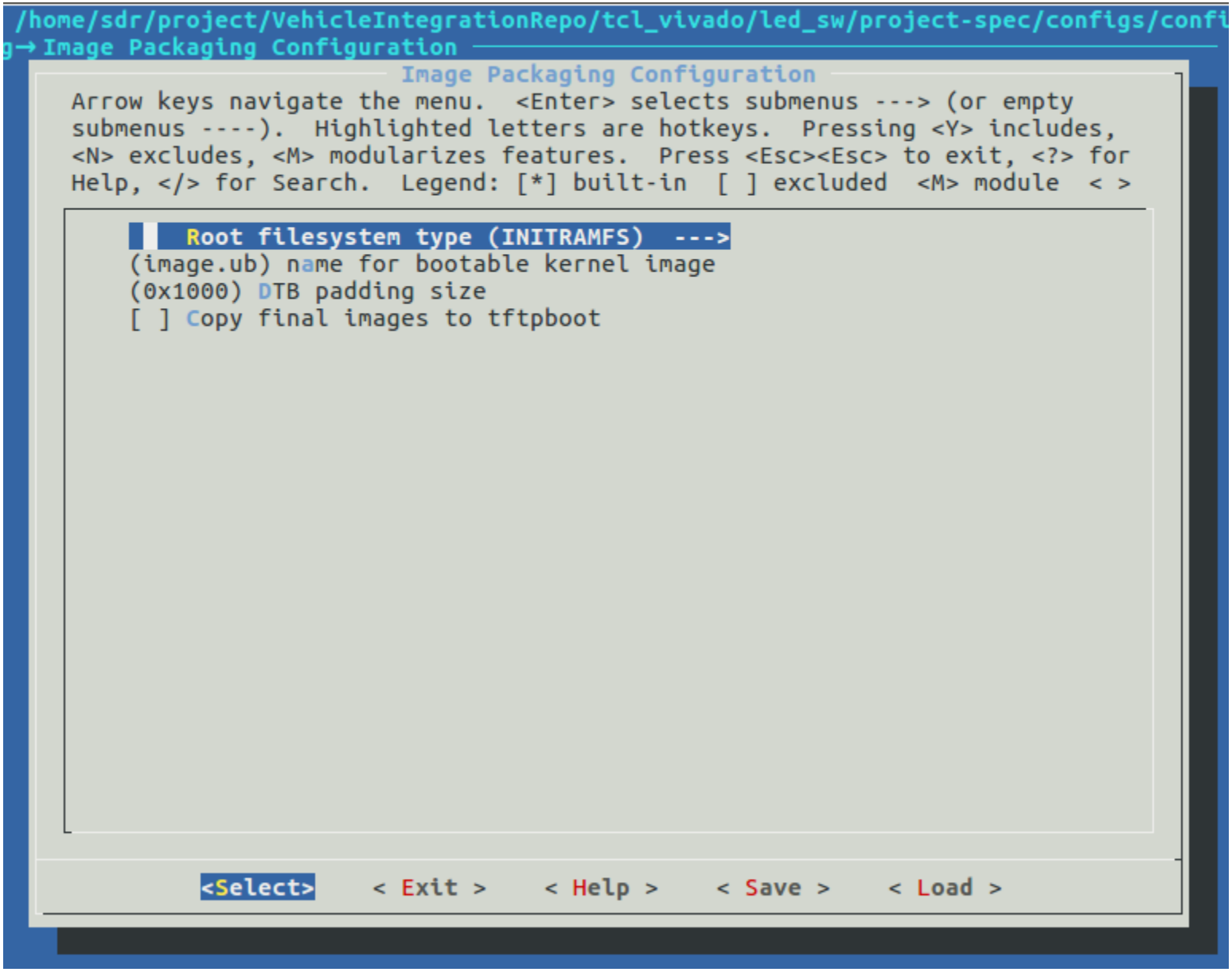

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→DTG Settings
DTG Settings
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
(template) MACHINE_NAME
Kernel Bootargs --->
<Select>
< Exit >
< Help >
< Save >
< Load >

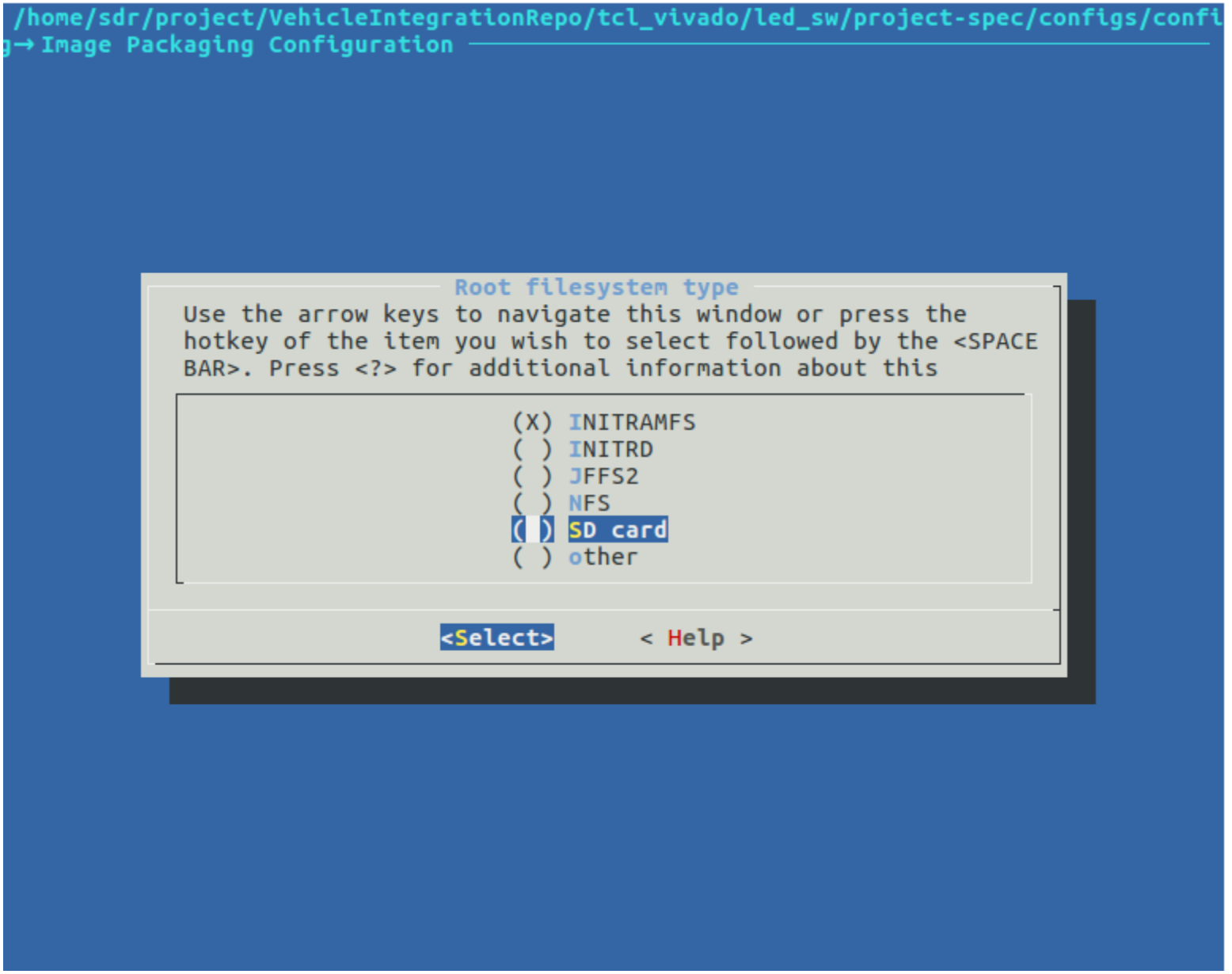

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→DTG Settings →Kernel Bootargs
Kernel Bootargs
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
[ ] generate boot args automatically
() user set kernel bootargs (NEW)
<Select>
< Exit >
< Help >
< Save >
< Load >

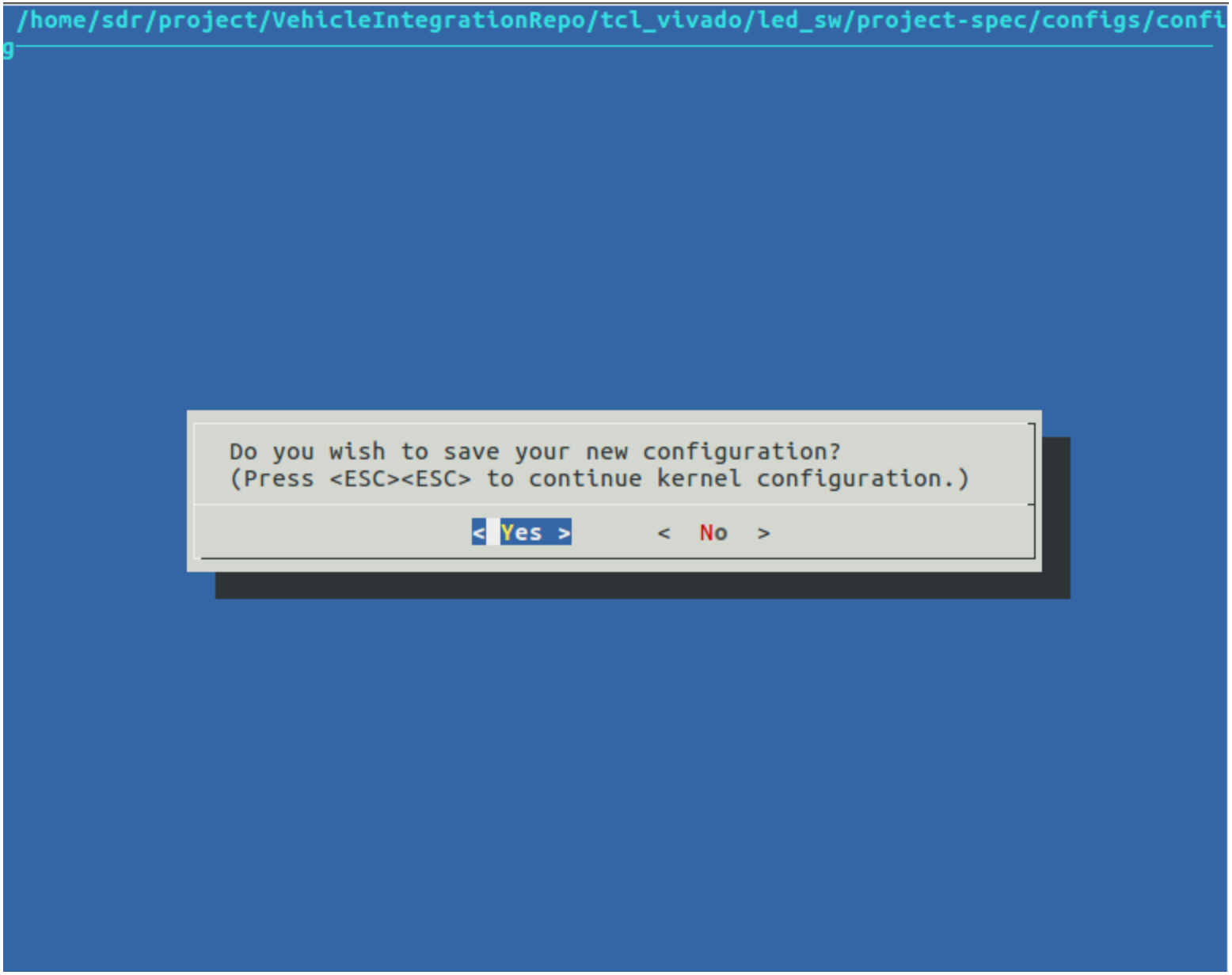


console=ttyPS0,115200 earlyprintk uio_pdrv_genirq.of_id=generic-uio root=/dev/mmcblk0p2 rw rootwait

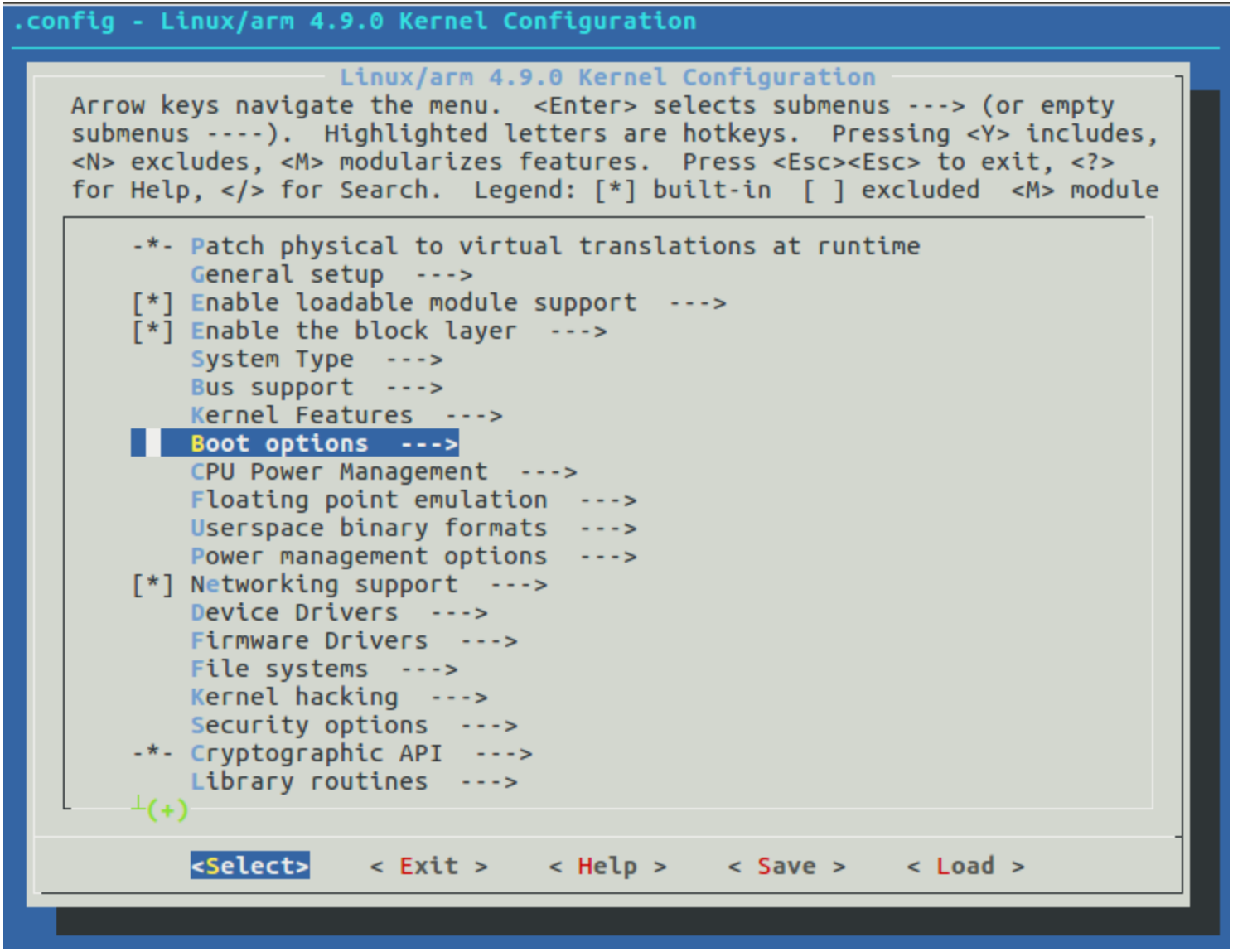

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g
misc/config System Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
Linux Components Selection --->
Auto Config Settings --->
-*- Subsystem AUTO Hardware Settings --->
DTG Settings --->
u-boot Configuration --->
Image Packaging Configuration --->
Firmware Version Configuration --->
Yocto Settings --->
<Select>
< Exit >
< Help >
< Save >
< Load >

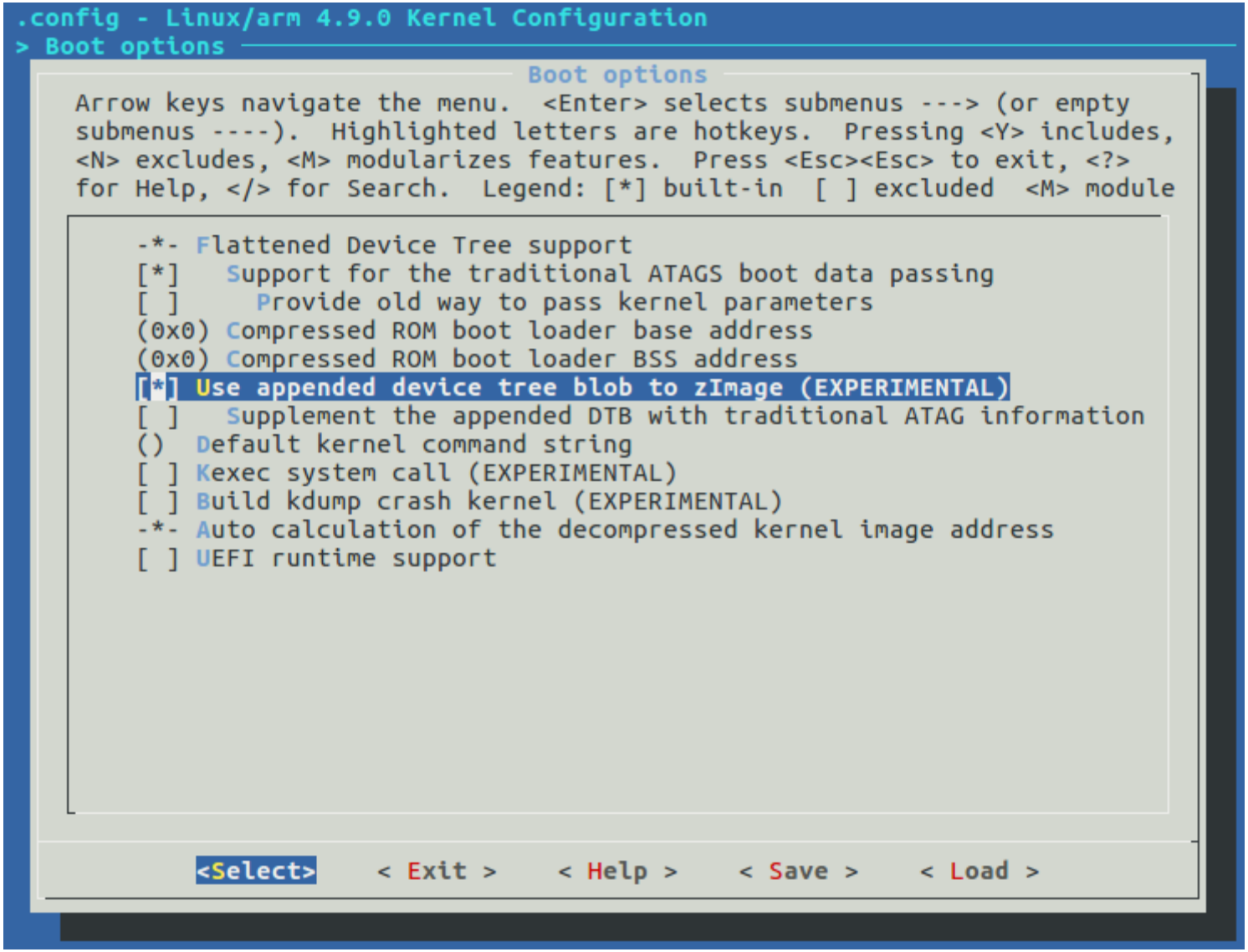

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→ Image Packaging Configuration
Image Packaging Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for
Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < >
Root filesystem type (INITRAMFS) --->
(image.ub) name for bootable kernel image
(0x1000) DTB padding size
[ ] Copy final images to tftpboot
<Select>
< Exit >
< Help >
< Save >
< Load >

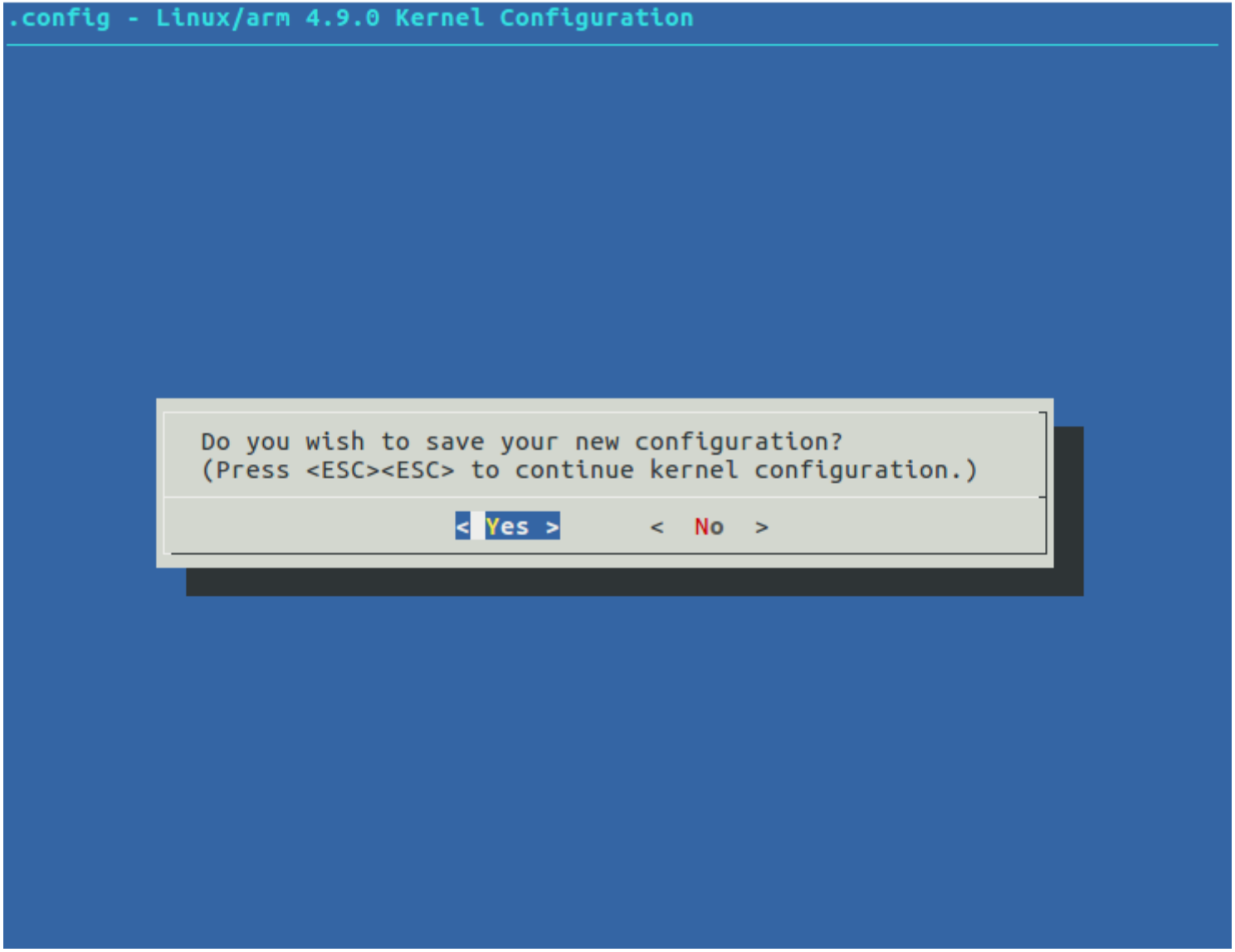

/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g→ Image Packaging Configuration
Root filesystem type
Use the arrow keys to navigate this window or press the
hotkey of the item you wish to select followed by the <SPACE
BAR>. Press <?> for additional information about this
(X) INITRAMFS
( ) INITRD
( ) JFFS2
( ) NFS
( ) SD card
( ) other
<Select>
< Help >


/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/configs/confi
g
Do you wish to save your new configuration?
(Press <ESC><ESC> to continue kernel configuration.)
< Yes >
< No >

```
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ pet
alinux-config -c kernel
[INFO] generating Kconfig for project

[INFO] sourcing bitbake
[INFO] generating plnxtool conf
[INFO] generating meta-plnx-generated layer
~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/misc/plnx-generated ~/project
/VehicleIntegrationRepo/tcl_vivado/led_sw
~/project/VehicleIntegrationRepo/tcl_vivado/led_sw
[INFO] generating machine configuration
[INFO] configuring: kernel
[INFO] generating kernel configuration files
[INFO] bitbake virtual/kernel -c menuconfig
Parsing recipes: 100% |##################################################| Time: 0:00:46
Parsing of 2466 .bb files complete (0 cached, 2466 parsed). 3259 targets, 226 skipped,
 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |###############################################| Time: 0:00:00
NOTE: Executing RunQueue Tasks
NOTE: Tasks Summary: Attempted 2 tasks of which 0 didn't need to be rerun and all succ
eeded.
Parsing recipes: 100% |##################################################| Time: 0:00:44
Parsing of 2466 .bb files complete (0 cached, 2466 parsed). 3259 targets, 226 skipped,
 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |###############################################| Time: 0:00:00
Checking sstate mirror object availability: 100% |#######################| Time: 0:00:01
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
Currently  1 running tasks (318 of 318)  99% |#####################################  |
0: linux-xlnx-4.9-xilinx-v2017.4+gitAUTOINC+b450e900fd-r0 do_menuconfig - 249s (pid 18
779)
```


.config - Linux/arm 4.9.0 Kernel Configuration
Linux/arm 4.9.0 Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?>
for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module
-*- Patch physical to virtual translations at runtime
General setup --->
[*] Enable loadable module support --->
[*] Enable the block layer --->
System Type --->
Bus support --->
Kernel Features --->
Boot options --->
CPU Power Management --->
Floating point emulation --->
Userspace binary formats --->
Power management options --->
[*] Networking support --->
Device Drivers --->
Firmware Drivers --->
File systems --->
Kernel hacking --->
Security options --->
-*- Cryptographic API --->
Library routines --->
(+)
<Select> < Exit > < Help > < Save > < Load >

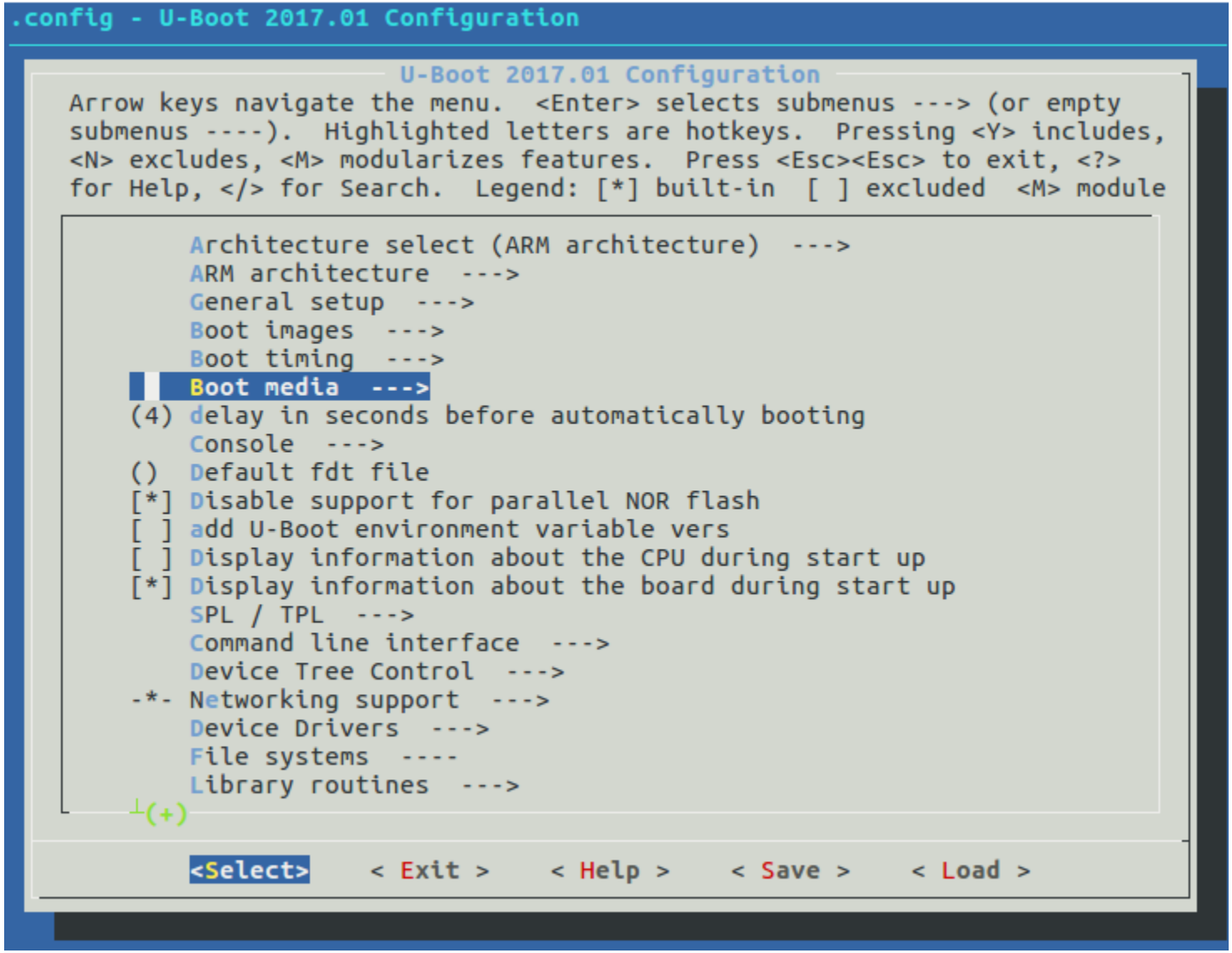

.config - Linux/arm 4.9.0 Kernel Configuration
> Boot options
Boot options
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module
-*- Flattened Device Tree support
[*] Support for the traditional ATAGS boot data passing
[ ] Provide old way to pass kernel parameters
(0x0) Compressed ROM boot loader base address
(0x0) Compressed ROM boot loader BSS address
[*] Use appended device tree blob to zImage (EXPERIMENTAL)
[ ] Supplement the appended DTB with traditional ATAG information
() Default kernel command string
[ ] Kexec system call (EXPERIMENTAL)
[ ] Build kdump crash kernel (EXPERIMENTAL)
-*- Auto calculation of the decompressed kernel image address
[ ] UEFI runtime support
<Select>
< Exit >
< Help >
< Save >
< Load >

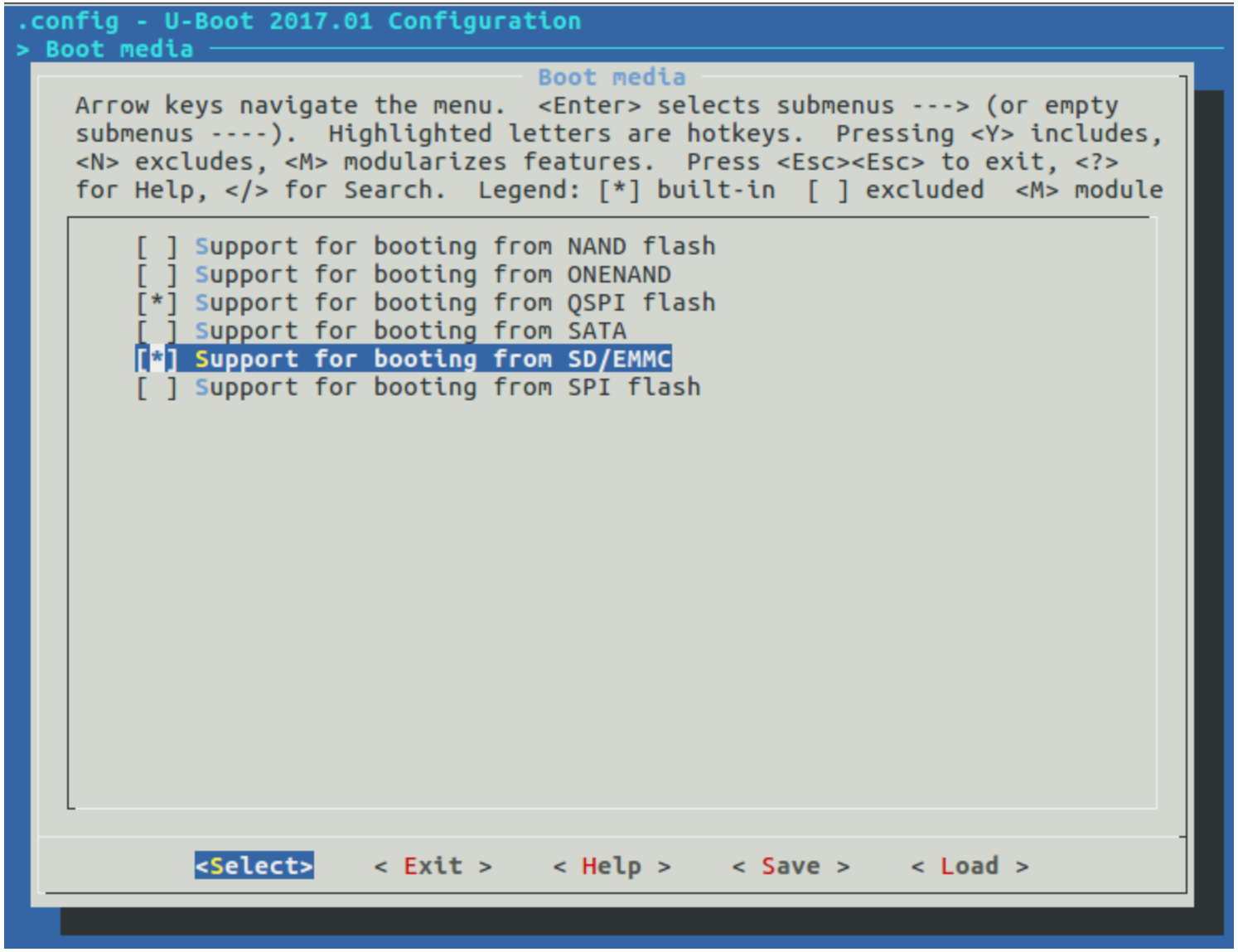

.config - Linux/arm 4.9.0 Kernel Configuration
Do you wish to save your new configuration?
(Press <ESC><ESC> to continue kernel configuration.)
< Yes >
< No >

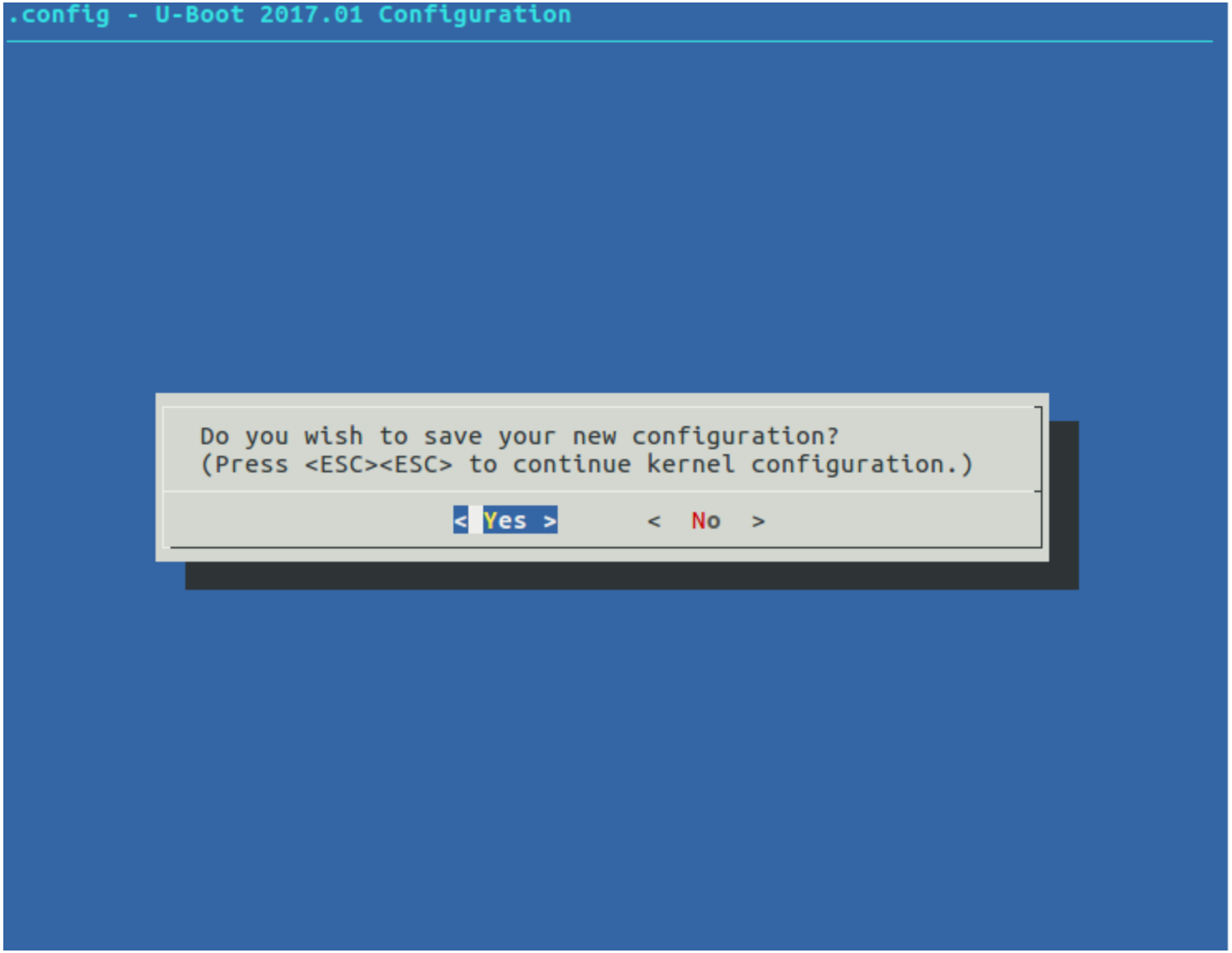
```
has been dumped into:
 /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/tmp/work/plnx_arm-xi
linx-linux-gnueabi/linux-xlnx/4.9-xilinx-v2017.4+gitAUTOINC+b450e900fd-r0/fragment.cfg
NOTE: recipe linux-xlnx-4.9-xilinx-v2017.4+gitAUTOINC+b450e900fd-r0: task do_diffconfi
g: Succeeded
NOTE: Tasks Summary: Attempted 22 tasks of which 21 didn't need to be rerun and all su
cceeded.

generate_bbappend /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/tmp
/work/plnx_arm-xilinx-linux-gnueabi/linux-xlnx/4.9-xilinx-v2017.4+gitAUTOINC+b450e900f
d-r0/user_2019-04-22-00-46-00.cfg /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/
led_sw/project-spec/meta-user/
recipetool appendsrcfile -wW /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_s
w/project-spec/meta-user/ virtual/kernel /home/sdr/project/VehicleIntegrationRepo/tcl_
vivado/led_sw/build/tmp/work/plnx_arm-xilinx-linux-gnueabi/linux-xlnx/4.9-xilinx-v2017
.4+gitAUTOINC+b450e900fd-r0/user_2019-04-22-00-46-00.cfg
NOTE: Writing append file /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/p
roject-spec/meta-user/recipes-kernel/linux/linux-xlnx_%.bbappend
NOTE: Copying /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/tmp/wor
k/plnx_arm-xilinx-linux-gnueabi/linux-xlnx/4.9-xilinx-v2017.4+gitAUTOINC+b450e900fd-r0
/user_2019-04-22-00-46-00.cfg to /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/l
ed_sw/project-spec/meta-user/recipes-kernel/linux/linux-xlnx/user_2019-04-22-00-46-00.
cfg

Loading cache: 100% |################################################| Time: 0:00:00
Loaded 3257 entries from dependency cache.
Parsing recipes: 100% |##############################################| Time: 0:00:01
Parsing of 2466 .bb files complete (2433 cached, 33 parsed). 3259 targets, 226 skipped
, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |###########################################| Time: 0:00:00
NOTE: Executing RunQueue Tasks
NOTE: Tasks Summary: Attempted 2 tasks of which 0 didn't need to be rerun and all succ
eeded.
[INFO] successfully configured kernel
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$
```


Terminal File Edit View Search Terminal Help
1 /include/ "system-conf.dtsi"
2 / {
3 chosen {
4 bootargs = "console=ttyPS0,115200 earlyprintk uio_pdrv_genirq.of_id=generic-uio root=/dev/mmcblk0p2 rw rootwait";
5 };
6 };
7
8 &axi_gpio_0 {
9 compatible = "generic-uio";
10 };
"project-spec/meta-user/recipes-bsp/device-tree/files/system-user.dtsi"
All

```
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ pet
alinux-config -c u-boot
[INFO] generating Kconfig for project

[INFO] sourcing bitbake
[INFO] generating plnxtool conf
[INFO] generating meta-plnx-generated layer
~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/misc/plnx-generated ~/project
/VehicleIntegrationRepo/tcl_vivado/led_sw
~/project/VehicleIntegrationRepo/tcl_vivado/led_sw
[INFO] generating machine configuration
[INFO] configuring: u-boot
[INFO] generating u-boot configuration files

[INFO] bitbake virtual/bootloader -c menuconfig
Loading cache: 100% |#################################################| Time: 0:00:00
Loaded 3257 entries from dependency cache.
Parsing recipes: 100% |################################################| Time: 0:00:01
Parsing of 2466 .bb files complete (2434 cached, 32 parsed). 3259 targets, 226 skipped
, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |############################################| Time: 0:00:00
Checking sstate mirror object availability: 100% |####################| Time: 0:00:00
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
Currently  1 running tasks (275 of 275)  99% |######################################## |
0: u-boot-xlnx-v2017.01-xilinx-v2017.4+gitAUTOINC+5fa7d2ed06-r0 do_menuconfig - 238s (
pid 22750)
```


.config - U-Boot 2017.01 Configuration
U-Boot 2017.01 Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module
Architecture select (ARM architecture) --->
ARM architecture --->
General setup --->
Boot images --->
Boot timing --->
Boot media --->
(4) delay in seconds before automatically booting
Console --->
() Default fdt file
[*] Disable support for parallel NOR flash
[ ] add U-Boot environment variable vers
[ ] Display information about the CPU during start up
[*] Display information about the board during start up
SPL / TPL --->
Command line interface --->
Device Tree Control --->
-*- Networking support --->
Device Drivers --->
File systems ----
Library routines --->
(+)
<Select>
< Exit >
< Help >
< Save >
< Load >


.config - U-Boot 2017.01 Configuration
> Boot media
Boot media
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y> includes,
<N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?>
for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module
[ ] Support for booting from NAND flash
[ ] Support for booting from ONENAND
[*] Support for booting from QSPI flash
[ ] Support for booting from SATA
[*] Support for booting from SD/EMMC
[ ] Support for booting from SPI flash
<Select>
< Exit >
< Help >
< Save >
< Load >


.config - U-Boot 2017.01 Configuration
Do you wish to save your new configuration?
(Press <ESC><ESC> to continue kernel configuration.)
< Yes >
< No >

```
tcl_vivado/led_sw/build/tmp/work/plnx_arm-xilinx-linux-gnueabi/u-boot-xlnx/v2017.01-xilinx-v2017.4+gitAUTOINC+5fa7d2ed06-r0/user_2019-04-22-01-16-00.cfg
NOTE: Writing append file /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-bsp/u-boot/u-boot-xlnx_%.bbappend
NOTE: Copying /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/build/tmp/work/plnx_arm-xilinx-linux-gnueabi/u-boot-xlnx/v2017.01-xilinx-v2017.4+gitAUTOINC+5fa7d2ed06-r0/user_2019-04-22-01-16-00.cfg to /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-bsp/u-boot/files/user_2019-04-22-01-16-00.cfg

[INFO] successfully configured u-boot
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ petalinux-create -t apps -n led-app --enable
INFO: Create apps: led-app
INFO: New apps successfully created in /home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps/led-app
INFO: Enabling created component...
INFO: sourcing bitbake
INFO: oldconfig rootfs
INFO: led-app has been enabled
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ cd project-spec/meta-user/recipes-apps
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps$ ls
gpio-demo  led-app  peekpoke
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps$
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps$ cd led-app/files
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps/led-app/files$ ls
led-app.c  Makefile
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/project-spec/meta-user/recipes-apps/led-app/files$ vi led-app.c
```

```c
#include <stdio.h>
#include <fcntl.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/mman.h>

#define IN                  0
#define OUT                 1

#define GPIO_MAP_SIZE       0x10000
#define GPIO_DATA_OFFSET    0x00
#define GPIO_TRI_OFFSET     0x04

void usage(void)
{
    printf("*argv[0] -d <UIO_DEV_FILE> -i|-o <VALUE>\n");
    printf("    -d              UIO device file. e.g. /dev/uio0");
    printf("    -i              Input from GPIO\n");
    printf("    -o <VALUE>      Output to GPIO\n");
    return;
}

```

```
23 int main(int argc, char *argv[])
24 {
25     int c;
26     int fd;
27     int direction=IN;
28     char *uiod;
29     int value = 0;
30
31     void *ptr;
32
33     printf("GPIO UIO test.\n");
34     while((c = getopt(argc, argv, "d:io:h")) != -1) {
35         switch(c) {
36         case 'd':
37             uiod=optarg;
38             break;
39         case 'i':
40             direction=IN;
41             break;
42         case 'o':
43             direction=OUT;
44             value=atoi(optarg);
45             break;
46         case 'h':
47             usage();
48             return 0;
49         default:
50             printf("invalid option: %c\n", (char)c);
51             usage();
52             return -1;
53         }
54
55     }
56
```

```
57      fd = open(uiod, O_RDWR);
58      if (fd < 1) {
59          perror(argv[0]);
60          printf("Invalid UIO device file:%s.\n", uiod);
61          usage();
62          return -1;
63      }
64
65      ptr = mmap(NULL, GPIO_MAP_SIZE, PROT_READ|PROT_WRITE, MAP_SHARED, fd, 0);
66
67      if (direction == IN) {
68          *((unsigned *)(ptr + GPIO_TRI_OFFSET)) = 255;
69          value = *((unsigned *) (ptr + GPIO_DATA_OFFSET));
70          printf("%s: input: %08x\n",argv[0], value);
71      } else {
72          *((unsigned *)(ptr + GPIO_TRI_OFFSET)) = 0;
73
74          *((unsigned *)(ptr + GPIO_DATA_OFFSET)) = value;
75      }
76
77      munmap(ptr, GPIO_MAP_SIZE);
78
79      return 0;
80  }
```

```
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/proj
ect-spec/meta-user/recipes-apps/led-app/files$ cd ../../../../../
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ pet
alinux-build -x mrproper
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ pet
alinux-build
Loading cache: 100% |#################################################| Time: 0:00:00
Loaded 3259 entries from dependency cache.
Parsing recipes: 100% |################################################| Time: 0:00:01
Parsing of 2467 .bb files complete (2431 cached, 36 parsed). 3260 targets, 226 skipped
, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |############################################| Time: 0:00:04
Checking sstate mirror object availability: 100% |####################| Time: 0:00:08
NOTE: Executing SetScene Tasks
NOTE: Exec BOOT.bin, system.dtb, image.ub 를 SD 카드의 /boot 파티션으로 복사한다.
fsbl-2017. rootfs 에도 루트 파일 시스템을 배치하고 부팅하도록 한다.                  n external s
ource tree 부팅 이후에 led-app –d /dev/uio0 –o 1
NOTE: Task 혹은 led-app –d /dev/uio0 –o 0 을 입력하면 LED 가 켜지고 꺼진다.          rerun and al
l succeeded.
INFO: Copying Images from deploy to images
INFO: Creating images/linux directory
NOTE: copy to TFTP-boot directory is not enabled !!
[INFO] successfully built project
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw$ cd
images/linux/
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/imag
es/linux$ petalinux-package --boot --force --fsbl zynq_fsbl.elf --fpga system_wrapper.
bit --u-boot
INFO: File in BOOT BIN: "/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/im
ages/linux/zynq_fsbl.elf"
INFO: File in BOOT BIN: "/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/im
ages/linux/system_wrapper.bit"
INFO: File in BOOT BIN: "/home/sdr/project/VehicleIntegrationRepo/tcl_vivado/led_sw/im
ages/linux/u-boot.elf"
INFO: Generating zynq binary package BOOT.BIN...
INFO: Binary is ready.
sdr@sdr-Samsung-DeskTop-System:~/project/VehicleIntegrationRepo/tcl_vivado/led_sw/imag
es/linux$
```