Flashing and Booting the Target Device

Use the `flash.sh` helper script to flash the board with the bootloader and kernel, and optionally, flash the root file system to internal or an external storage device.

Use the script `l4t_initrd_flash.sh` to flash internal or external media connected to a Jetson device. This script uses the recovery initial ramdisk to do the flashing, and can flash external and internal media with the same procedure. Since this script uses kernel for flashing, it is generally faster than `flash.sh`. See the section Flashing with initrd for more details.

Before You Begin

The following directories must be present:

- `bootloader`: Bootloader plus flashing tools, such as TegraFlash, CFG, BCT, etc.
- `kernel`: A kernel `Image` /`vmlinux.uimg`, DTB files, and kernel modules
- `rootfs`: The root file system that you download

  This directory starts empty. You populate it with the sample file system.
- `nv_tegra`: User space binaries and sample applications

Additionally, before running these commands, you must have the USB cable connected to the recovery port.

Basic Flash Script Usage

Locate the most up-to-date usage information by running `flash.sh –h` (using the `flash.sh` script included in the release). The basic usage is as follows.

```
$ sudo ./flash.sh [options] <board> <rootdev>
```

Where:

- `options` is one or more command line switches. All switches are optional. Switches are described in Flash Script Usage.
- `<board>` specifies the configuration to be applied to the device to be flashed. Values are listed in the table of device names in the topic Quick Start. `flash.sh` gets the configuration from a configuration file named `<board>.conf`.
- `<rootdev>` specifies the type of device that is to be flashed. Use the value `mmcblk0p1` to flash a local storage device (eMMC or SD card, depending on platform), as distinguished from NFS server, for example.

Basic Flashing Procedures

This section describes some common procedures for flashing one or more target devices.

To flash the target device

1. Put the target device into reset/recovery mode.
   1. Power on the carrier board and hold the RECOVERY button.
   2. Press the RESET button.
2. Run the `flash.sh` script that is in the top-level directory of this release. The script must be supplied with the target board (e.g. `jetson-xavier`) for the root file system:

   ```
   $ sudo ./flash.sh <board> <rootdev>
   ```

   Where:

   - `<board>` specifies the configuration of the target device, as described in the table of device names in the topic Quick Start
   - `<rootdev>` specifies the device on which the root file system is located, as described in Basic Flash Script Usage

For a root file system, execute the script like this:

```
$ sudo ./flash.sh <board> mmcblk0p1
```

To flash the target device to mount a rootfs specified by UUID

- For an internal storage device (e.g. eMMC or an SD card), enter this command:

  ```
  $ sudo ./flash.sh <board> internal
  ```

  This command stores the UUID used for the root filesystem partition in the file `bootloader/l4t-rootfs-uuid.txt`. You may specify your own UUID by writing the UUID to this file before executing the command above.
- For an external stage device (e.g. an NVMe or USB device), enter this command:

  ```
  $ sudo ./flash.sh <board> external
  ```

  This command stores the UUID used for the root filesystem partition in the file `bootloader/l4t-rootfs-uuid.txt_ext`. You may specify your own UUID by writing the UUID to this file before executing the command above.

To clone a Jetson device and flash

1. Copy `system.img` from the filesystem partition you want to flash from. Enter this command:

   ```
   $ sudo ./flash.sh -r -k APP -G <clone> <board> mmcblk0p1
   ```

   Where:

- `<clone>` determines the names of the copies.
- `<board>` specifies the configuration of the target device.

This step creates two copies of `<clone>` in the `<top>` directory: a sparsed image (smaller than the original) named `<clone>`, and an exact copy named `<clone>.raw`.

For example, if `<clone>` is `original.img`, `flash.sh` creates a sparsed image named `original.img` and an exact copy named `original.img.raw`.

3. Copy `<clone>.img` to the `<L4T>/bootloader/system.img` directory. Enter this command:

```
$ sudo cp <clone>.img bootloader/system.img
```

4. Flash the image to the target board.
   - If the target board has already been flashed, reflash the clone image to the APP partition. Enter this command:

     ```
     $ sudo ./flash.sh -r -k APP <board> mmcblk0p1
     ```

   - If the target board has never been flashed, flash all of the board's partitions. Enter this command:

     ```
     $ sudo ./flash.sh -r <board> mmcblk0p1
     ```

To RCM boot to NFS

Applies to: Jetson Xavier NX, Jetson AGX Xavier series, and Jetson TX2 series only

> Note
>
> To create a bootable NFS root filesystem, you must first:
>
> - Perform the process described in the section Step 1: Set Up the Root File System in the topic Setting Up Your File System
> - Perform the process described in the section Configuring NFS Root on the Linux Host in the topic BSP Customization.

1. Put the device into reset/recovery mode.
   - Power on the carrier board and hold the RECOVERY button.
   - Then press the RESET button.
2. Execute the command:

```
$ sudo./flash.sh -N <ip_addr>:<root_path> --rcm-boot <board> eth0
```

Where:

- `<ip_addr>` is the IP address of the host system
- `<root_path>` is the path to the NFS rootfs
- `<board>` is the configuration of the target device as specified in the table of device names of the topic Quick Start

Flash Script Usage

This section complements Basic Flash Script Usage by providing detailed information about flash.sh command line options and other aspects of flash.sh usage.

Command line option	Description
-b <bctfile>	**Deprecated.** Pathname of a boot control table configuration file.
-c <cfgfile>	Pathname of a flash partition table configuration file.
-d <dtbfile>	Pathname of a device tree file.
-e <emmc size>	**Deprecated.** Target device's eMMC memory size. Applies only to target devices that use eMMC.
-f <flashapp>	Name of the flash application to be used. Flash applications are stored in the

	bootloader directory. The default flash application is `bootloader/tegraflash.py`.
-h	Prints descriptions of the command line syntax and command line options.
-k <partition_id>	Partition name or number specified in `flash.xml or flash.cfg`.
-m <mts_preboot>	Name of the MTS preboot file to be used, such as `mts_preboot`.
-n <nfs_args>	Static NFS network assignments: `<Client_IP>:<Server_IP>:<Gateway_IP>:<Netmask>`.
-o <odmdata>	ODM data.
-p <bp_size>	Total eMMC hardware boot partition size.
-r	Skips building `system.img`; reuse the existing one.
-s <PKC_ key_ file>	Pathname of a file containing the PKC key used for signing and building `bl_update_payload`. (Obsolete)
-t <tegraboot>	Pathname of a tegraboot binary such as `nvtboot.bin`.
-u <PKC_key_file>	Pathname of a file containing the PKC key used for an ODM fused board.
-v <SBK_key_file>	Pathname of a file containing the Secure Boot Key (SBK) used for an ODM fused board.
-w <wb0boot>	Pathname of a warm boot binary such as `nvtbootwb0.bin`.
-x <tegraid>	Processor chip ID. The default value is: • NVIDIA® Jetson Nano™ devices and NVIDIA® Jetson™ TX1: `0x21` • NVIDIA® Jetson Xavier™ NX and NVIDIA® Jetson AGX Xavier™ series: `0x19` • Jetson TX2 series: `0x18`
-y <fusetype>	**Deprecated.** `PKC` if Secureboot is used, or `NS` otherwise.
-z <sn>	Serial number of the target board.
-B <boardid>	Board ID.
-C <args>	Kernel command line arguments. If this option is specified, it overrides the default values defined for `flash.sh`. If two or more arguments are specified, they must be enclosed in quotation marks and separated by spaces. Kernel command line arguments are documented in the file `kernel-4.9/Documentation/kernel-parameters.txt`. In the case of NFS booting, use this option to set NFS booting related arguments if the `-I` option is omitted.
-F <flasher>	Pathname of a flash server such as `cboot.bin`.
-G <file_name>	Reads the boot partition and saves the image to the specified file.
-I <initrd>	Pathname of the initrd file. The default value is null.
-K <kernel>	Pathname of a kernel image file such as `zImage` or `Image`.
-L <bootloader>	Pathname of a Bootloader such as `cboot.bin` or `u-boot-dtb.bin`.
-M <mts boot>	Pathname of an MTS boot file such as `mts_si`.
-N <nfsroot>	NFS root address, such as `<my_IP_address>:/my/exported/nfs/rootfs`.

-P <ppt_end_plus1>	**Deprecated.** End of the PPT plus 1; primary GPT start address + size of PPT + 1.
-R <rootfs_dir>	Pathname of the sample rootfs directory.
-S <size>	Size of the rootfs in bytes. Valid only for an internal rootdev. KB/MB/GB suffixes represent units of 1000, 1000^2, and 1000^3. KiB/MiB/GiB suffixes represents of 1024, 1024^2, and 1024^3. For example, `2GiB` represents 2×1024×1024×1024 bytes.
--bup	Generates Bootloader update payload (BUP).
--clean-up	Cleans up the BUP buffer when --`multi-spec` is enabled.
--multi-spec	Enables support for building a multi-spec BUP.
--no-flash	Performs all steps except physically flashing the board. The script creates a `system.img` file.
--no-systemimg	Prevents creation or re-creation of `system.img`.
--usb-instance <id>	USB instance to connect to; `<id>` is an integer ID (e.g. 0, 1), a bus/dev (e.g. 003/091), or a USB port path (e.g. 3-14). The last is the recommended form.
--user_key <user_key_file>	Pathname of a file containing a user key which may be used to encrypt and decrypt kernel, kernel-dtb, and initrd binary images. If --`user_key` is specified, then the -`v` option must also be specified.

Flashing to a USB Drive

Applies to: Jetson Xavier NX, Jetson Nano devices, Jetson AGX Xavier series, and Jetson TX1 only

Jetson Xavier NX, Jetson Nano devices, Jetson AGX Xavier series, and Jetson TX1 can be booted from a USB device with mass storage class and bulk only protocol, such as a flash drive. Hot plugging is not supported; the flash drive must be attached before the device is booted.You can manually set up a flash drive for booting as explained in the section To set up a flash drive manually for booting.

For Jetson Xavier NX and Jetson AGX Xavier series, NVIDIA provides a way to simplify flashing to a USB drive that is connected to a Jetson. For details, see To set up a USB drive for booting using flash with initrd.

Note	Jetson AGX Xavier series devices use boot firmware that is stored only on internal eMMC memory. Consequently this type of device cannot boot from USB or NVMe SSD until its internal eMMC has been flashed.

To set up a flash drive manually for booting

1. For this method only, confirm that the device can boot successfully from eMMC. If it cannot, correct the problem by flashing to eMMC first.
2. Connect the flash drive to the host computer.
3. Check the flash drive's device name (e.g. `/dev/sdb`):

   ```
   $ sudo lsblk -p -d | grep sd
   ```

4. Create a new GPT:

   ```
   $ sudo parted /dev/<sdx> mklabel gpt
   ```

   Where `<sdx>` is the device name that your host computer assigned to the flash drive.

   For example, if the host computer assigns the flash drive device name `sdb`, the command is:

   ```
   $ sudo parted /dev/sdb mklabel gpt
   ```

5. Add the `APP` partition:

```
$ sudo parted /dev/<sdx> mkpart APP 0GB <size>
```

Where `<size>` is the size of the partition. It must be at least 16 GB. It may be larger if the flash drive has enough space.

For example, if `<sdx>` is `sdb` and the partition is to contain 16 GB, enter:

```
$ sudo parted /dev/sdb mkpart APP 0GB 16GB
```

The device name of the APP partition will be `/dev/<sdx>1`.

5. Format APP as an ext4 partition and mount it.

   ```
   $ sudo mkfs.ext4 /dev/<sdx>1
   $ sudo mount /dev/<sdx>1 /mnt
   ```

   You may format `APP` as ext2 or ext3, but ext4 is strongly recommended because it is faster, more compact, and more reliable.

6. Connect the Jetson device to a host computer and put it into recovery mode, then enter the following commands to generate the rootfs without flashing the device:

   ```
   $ cd Linux_for_Tegra/
   $ sudo BOOTDEV=sda1 ./flash.sh --no-flash <board> sda1
   $ sudo mkdir tmp_system
   $ sudo mount bootloader/system.img.raw ./tmp_system
   $ sudo rsync -axHAWX --numeric-ids --info=progress2 --exclude=/proc ./tmp_system/
   /mnt
   ```

   Where `sda1` is the device name that the Jetson device will assign to `APP`.

7. Unmount the flash drive and disconnect it from the host computer:

   ```
   $ sudo umount /mnt
   $ sudo umount ./tmp_system
   ```

8. Plug the flash drive into the target device and power it on or reboot it.

To prepare files to boot from a flash drive with Secureboot

When the Secureboot package is installed, the kernel file `/boot/Image` must be signed, and the signature file must be saved as `/boot/Image.sig`.

If you use flash.sh to flash a device with Secureboot installed, the script automatically creates and stores the signature file. If you create a signature file manually, you must also save it manually. For more information, see the section Signing of Kernel and Kernel-DTB Binary Files in the topic Jetson Xavier NX and Jetson AGX Xavier Series Boot Flow.

To set up a USB drive for booting using flash with initrd

Applies to: Jetson Xavier NX, Jetson AGX Xavier series, and Jetson TX2 series only

By flashing with initrd you can flash to an external USB device attached to Jetson Xavier NX, Jetson AGX Xavier series, or Jetson TX2 series. For more information, see Flashing to an External Storage Device.

Flashing to an NVMe Drive

Jetson Xavier NX, Jetson Nano devices, Jetson AGX Xavier series, Jetson TX2 series, and Jetson TX1 devices can be booted from an NVMe storage device. Hot-plugging is not supported; the NVMe drive must be attached before the device is booted.

You can manually set up an NVMe drive for booting by following the steps in the section To set up an NVMe drive manually for booting.

For Jetson Xavier NX, Jetson AGX Xavier series, and Jetson TX2 series, NVIDIA provides a way to simplify flashing to an NVMe drive that is connected to a Jetson device. For details, see To set up an NVMe drive for booting using flash with initrd.

Note	Jetson AGX Xavier series devices use boot firmware that is stored only on internal eMMC

	memory. Consequently this type of device cannot boot from USB or NVMe SSD until its internal eMMC has been flashed.

To set up an NVMe drive manually for booting

1. For this method, confirm that the device can boot successfully from eMMC. If it cannot, correct the problem by flashing to eMMC first.
2. Connect the NVMe drive to the host computer.
3. Check the NVMe drive's device name (e.g. `/dev/nvme0n1`):

   ```
   $ lsblk -d -p | grep nvme | cut -d\  -f 1
   ```

   Note that there must be two spaces after the `-d\`.
4. Create a new GPT:

   ```
   $ sudo parted /dev/<nvmeXn1> mklabel gpt
   ```

   Where `<nvmeXn1>` is the device name that your host computer assigns to the NVMe drive.

   For example, if the host computer assigns the NVMe drive device name `nvme0n1`, the command is:

   ```
   $ sudo parted /dev/nvme0n1 mklabel gpt
   ```
5. Add the `APP` partition:

   ```
   $ sudo parted /dev/<nvmeXn1> mkpart APP 0GB <size>
   ```

   Where `<size>` is the size of the partition. It must be at least 16 GB. It may be larger if the NVMe drive has enough space.

   For example, if `<nvmeXn1>` is `nvme0n1` and the partition is to contain 16 GB, enter:

   ```
   $ sudo parted /dev/nvme0n1 mkpart APP 0GB 16GB
   ```

   The device name of the `APP` partition is then `/dev/<nvmeXn1>p1`.
6. Format `APP` as an ext4 partition and mount it.

   ```
   $ sudo mkfs.ext4 /dev/<nvmeXn1>p1
   $ sudo mount /dev/<nvmeXn1>p1 /mnt
   ```

   You may format `APP` as ext2 or ext3, but ext4 is strongly recommended because it is faster, more compact, and more reliable.
7. Connect the Jetson device to a host computer and put it into recovery mode, then enter the following commands to generate the rootfs without flashing the device:

   ```
   $ cd Linux_for_Tegra/
   $ sudo BOOTDEV=nvme0n1p1 ./flash.sh --no-flash <board> nvme0n1p1
   $ sudo mkdir tmp_system
   $ sudo mount bootloader/system.img.raw ./tmp_system
   $ sudo rsync -axHAWX --numeric-ids --info=progress2 --exclude=/proc ./tmp_system/
   /mnt
   ```

   Where `nvme0n1p1` is the device name that the Jetson device will assign to `APP`.
8. Unmount the NVMe drive and disconnect it from the host computer:

   ```
   $ sudo umount /mnt
   $ sudo umount ./tmp_system
   ```
9. Plug the NVMe drive into the target device and power on.
10. Set booting from NVMe drive in U-Boot environment:
    - To test directly, enter `run bootcmd_nvme0` at the U Boot prompt.
    - To set NVMe to boot first with a plain boot command, change the U-Boot variable `boot_targets` to "`nvme0 mmc1 mmc0 usb0 pxe dhcp`", then enter the U-Boot command `run boot`.
    - To make the change permanent, run `saveenv` in U-Boot after changing `boot_targets` but before booting

To prepare files to boot from an NVMe drive with Secureboot

See the section To prepare files to boot from a flash drive with Secureboot.

To set up an NVMe drive for booting using flash with initrd

Applies to: Jetson Xavier NX, Jetson AGX Xavier series, and Jetson TX2 series only

By flashing with initrd you can flash to an external NVMe SSD attached to Jetson Xavier NX, Jetson AGX Xavier series, or Jetson TX2 series. For more information, see Flashing to an External Storage Device.

Flashing to an SD Card

Applies to: Jetson Xavier NX and Jetson Nano development modules only

This section describes procedures for flashing and utilizing an SD card for a Jetson Xavier NX module (P3668-0000) or a Jetson Nano development module (P3448-0000 or P3448-0003). These modules are used only as components of Jetson developer kits.

Prerequisites

- Download Etcher for Linux. Etcher is the tool you will use to copy an image to an SD card. It is available at:

  `https://www.balena.io/etcher/`

  Download Etcher for Linux x64 (64-bit) (AppImage). Make the downloaded file executable.

  > Note
  >
  > NVIDIA recommends using Etcher to copy an image to an SD card because it is an easy and foolproof method. If you prefer, you can also perform this operation with the Linux `dd` command. If you use this method, you need not download Etcher.

To generate an image to be flashed to an SD card

Applies to: Jetson Xavier NX and Jetson Nano devices only

1. If you have not already done so, expand the archive `linux_for_tegra.tbz2`.
2. Go to the directory `Linux_for_Tegra/tools`.
3. Enter this command:

   ```
   $ ./jetson-disk-image-creator.sh -o <blob_name> -b <board> -r <revision>
   ```

   Where:

   - `<blob_name>` is a filename; the script saves the raw image with this name.
   - `<board>` specifies the type of Jetson device the SD card is to be flashed for. The value of `<board>` is specified in the table Jetson Modules and Configurations in the topic Quick Start.
   - `<revision>` is the revision number of the Jetson module to be used:
     - `100` for original Jetson Nano revision A01
     - `200` for original Jetson Nano revision A02
     - `300` for original Jetson Nano revision B00 or B01
     - Nothing for Jetson Nano 2GB or Jetson Xavier NX (do not use the --`r` option)

   This command generates a raw image with partitions per the SPI-SD profile for a Jetson Xavier NX development module, or per the Min-SPI profile for a Jetson Nano development module.

For example, to create a raw image file named `sd-blob.img` for use on a Jetson Nano development module revision A01:

```
$ ./jetson-disk-image-creator.sh -o sd-blob.img -b jetson-nano-devkit -r 100
```

The `jetson-disk-image-creator.sh` script supports use of a modified rootfs. Thus, you can create an SD card image with a specified rootfs directory:

```
$ ROOTFS_DIR=<MODIFIED_ROOTFS_PATH> ./jetson-disk-image-creator.sh -o <blob_name> -b
<board> -r <revision>
```

To flash the image to an SD card with Etcher

1. Insert the SD card into an SD card slot on your host system. If your system does not have an SD card slot, you may use an external SD card reader.
2. Launch Etcher and select the SD blob image file created by the `jetson-disk-image-creator.sh` script.
3. Select the SD card to be flashed.
4. Click Flash to write the SD blob image to the SD card.

To flash the image to an SD card with dd

- Enter the command:

  ```
  $ sudo dd if=<sd_blob_name> of=/dev/mmcblk<n> bs=1M oflag=direct
  ```

  Where:

  - `<sd_blocb_name>` is the name (with pathname, if necessary) of the blob image file created by the `jetson-disk-image-creator.sh` script.
  - `<n>` is the SD card block number detected by your Linux host, i.e. 0 or 1.

For example, to copy an image blob file named `sd-blob.img` from the working directory to SD card block number 1:

```
$ sudo dd if=sd-blob.img of=/dev/mmcblk1 bs=1M oflag=direct
```

To resize the root partition to fill available SD card space

The root partition is always created at the end of the boot device. This allows you to change its size without having to move other partitions.

You change the size of the boot partition with the `resize2fs` tool, which is run by `oem-config` the first time a newly copied image blob file is booted from an SD card.

When a freshly initialized SD card is first booted it runs `oem-config`, one of whose functions is to set the `APP` partition's size. It does the following things:

1. Moves the backup GPT header to the end of the disk
2. Deletes and re-creates the root partition
3. Informs the kernel and OS of the change in the partition table and root partition size
4. Resizes the filesystem on the root partition to fit the expected partition table and root partition size

Flashing to an External Storage Device

Applies to: Jetson Xavier NX, Jetson AGX Xavier series, and Jetson TX2 series only

The initrd flashing tool supports flashing to an external storage device. For an overview of this tool, see the section Flashing with initrd.

To flash an external device, you must create an external partition layout. For information about this, see the section External Storage Device Partition in Bootloader.

The devices that L4T supports as external storage devices are those which appear in the Linux filesystem as SCSI devices (device name `/dev/sd*`) and NVMe devices (`/dev/nvme*n*`) in the Linux "dev" filesystem. NVIDIA provides the necessary tools and instructions as part of the Linux BSP package; they may be found in the directory

Linux_for_Tegra/tools/kernel_flash. For more detailed instructions, see workflows 3, 4, and 5 in the file README_initrd_flash.txt in that directory.

Changing Boot Order with CBoot

For devices that use CBoot to boot, you can change boot order in the CBoot environment after you have flashed the device:

1. Interrupt CBoot while it is loading the boot configurations from extlinux.conf by pressing any key.
2. Enter these commands to change the boot order and verify the change:

   ```
   $ setvar boot-order <dev1> <dev2> <dev3> ...
   $ printvar boot-order
   ```

   You may specify any number of <dev> parameters. The valid values for these parameters are:

   - emmc
   - nvme
   - nvme:C<n> (where <n> is the device number)
   - nvme:pcie@<addr>, net (where <addr> is the device's PCIe address)
   - sd
   - usb
3. To reboot, enter boot.

Changing Boot Order with U-Boot

For devices that use U-Boot to boot, you can change boot order after you have flashed the device. Change the U-Boot variable boot_targets to list the boot devices in priority order, then enter the U-Boot command run boot.

You may specify any number of <dev> parameters. The valid values for these parameters are:

- dhcp
- mmc0
- mmc1
- nvme0
- pxe
- usb0

Flashing a Specific Partition

You can flash a specific partition instead of flashing the whole device by using the command line option -k.

To flash a specific partition

- Enter the command:

  ```
  $ sudo ./flash.sh -k <partition_name> [--image <image_name>] <board> <rootdev>
  ```

  Where:

  - <partition_name> is the name of the partition to be flashed. Possible values depend on the target device. For details, see the section Default Partition Overview in the topic Bootloader.
  - <image_name> is the name of the image file. If omitted, flash.sh chooses the image file that was used to flash whole device.
  - <board> is the configuration of the target device as specified in the section To flash Jetson developer kit operating software in the topic Quick Start.

- `<rootdev>` specifies the device on which the root file system is located, as described in Basic Flash Script Usage.

Examples

To flash the kernel on dtb on Jetson Nano 2GB using the default file `<L4T>/kernel/dtb/tegra210-p3448-0003-p3542-0000.dtb`:

```
$ sudo ./flash.sh -k DTB jetson-nano-2gb-devkit mmcblk0p1
```

To flash the kernel on Jetson AGX Xavier using the default file `<L4T>/kernel/Image`:

```
$ sudo ./flash.sh -k kernel jetson-xavier mmcblk0p1
```

To flash mb1 bct on Jetson AGX Xavier using a predefined list of configuration files:

```
$ sudo ./flash.sh -k MB1_BCT jetson-xavier mmcblk0p1
```

To flash CPU bootloader on Jetson TX2 by using a user-specified image file `<user_path>/cboot.bin`:

```
$ sudo ./flash.sh -k cpu-bootloader --image <user_path>/cboot.bin jetson-tx2
mmcblk0p1
```

Notes on the "-k kernel" option

Since U-Boot is required for Jetson Nano devices and Jetson TX1, and is the default bootloader for Jetson TX2, the image flashed to the kernel partition is actually a U-Boot image. U-Boot loads the Linux kernel `from /boot/Image` in the root file system.

For this reason, you cannot update Linux kernel image using the `-k kernel` option. You may update `/boot/Image` by either of these means:

- Modify `/boot/extlinux/extlinux.conf` to add a new boot entry.

  Follow the instructions and example provided in `/boot/extlinux/extlinux.conf`. By this means you can always use `cp` or `scp` to replace `/boot/Image` with a custom-built kernel and launch it with U-Boot.

- On T210 (Jetson Nano devices and Jetson TX1) devices only, connect the Jetson device's recovery USB port to your host. Enter this command at the U-Boot command prompt:

  ```
  $ ums 0 mmc 1
  ```

  This connects eMMC (or a Jetson Nano with SD card) to the host as a set of USB mass storage devices (each partition as a device). You then can copy your custom kernel to `/boot/Image` directly.

Flashing for NFS as Root

You can flash the device to use a network file system (NFS) as the root filesystem.

Note	To create a bootable NFS root filesystem, you must first: • Perform the process described in the section Step 1: Set Up the Root File System in the topic Setting Up Your File System • Perform the process described in the section Configuring NFS Root on the Linux Host in the topic BSP Customization.

To flash for a network file system as root filesystem

1. Put the device into Recovery Mode. Power the carrier board on; press and hold the RECOVERY button, then press the RESET button.
2. Enter this command:

   ```
   $ sudo ./flash.sh -N <ip_addr>:<root_path> <board> eth0
   ```

Where:

- `<ip_addr>` is the IP address of the host system.
- `<root_path>` is the path to the NFS root filesystem.
- `<board>` is the configuration of the target device as specified in the table of device names in the topic Quick Start.

This command flashes Bootloader and a filesystem image with a `/boot` directory only to use the network file system at `<ip_addr>:/<root_path>` as the root filesystem at boot time.

Flashing with initrd

Applies to: Jetson Xavier NX and Jetson AGX Xavier series only

You can flash with initrd (initial RAM disk) to both internal media and external media connected to a Jetson device. This procedure uses initrd and USB device mode. It requires that the Secureboot package be installed; see Installing the Secureboot Package in the topic Secureboot.

Tools and instructions for flashing with initrd may be found in the directory `/Linux_for_Tegra/tools/kernel_flash/`. For more detailed information, see `README_initrd_flash.txt` in the same directory.

`README_initrd_flash.txt` contains examples several workflows that flash with initrd:

- Flashing internal storage devices
- Flashing external storage devices such as NVMe SSD and USB drives
- Enabling A/B rootfs on external storage devices
- Enabling disk encryptions on external storage devices
- Flashing individual partitions
- Flashing fused Jetson devices.
- Flashing a Massflash blob to normal and fused Jetson devices
- Generating separate images for external and internal storage devices, then flashing the combined images

Note	Jetson AGX Xavier series devices use boot firmware that is stored only on internal eMMC memory. Consequently this type of device cannot boot from USB or NVMe SSD until its internal eMMC has been flashed.

Requirements

- Initrd flash requires a high-quality USB-C / micro-USB cable. A low-quality cable may make the flashing process fail.
- The host uses NetworkManager, not some other network management application, to configure the network for flashing.
- Automount must temporarily be disabled for the new external storage device during flashing. The tool uses USB mass storage during flashing.

  On most Debian-based distributions of Linux, you can accomplish this with the following command:

  ```
  $ systemctl stop udisks2.service
  ```
- The host must have the following dependencies:

  ```
  $ sudo apt install libxml2-utils simg2img network-manager abootimg sshpass device-tree-compiler
  ```

To flash with initrd

1. Put the Jetson device in Recovery Mode.
2. Enter these commands on the host:

```
$ cd Linux_for_Tegra
$ sudo ./tools/kernel_flash/l4t_initrd_flash.sh <board-name> <rootdev>
```

Where:

- `<board-name>` is the value of the environment variable `BOARD` for the target device. (See the table Jetson Modules and Configurations in the topic Quick Start.)
- `<rootdev>` specifies the device on which the root file system is located, as described in Basic Flash Script Usage.

Flashing from NFS

Applies to: Jetson Xavier NX and Jetson AGX Xavier series only

Note	Flashing from NFS is deprecated. Use Flashing with initrd instead.

You can flash the whole device after you rcm-boot to NFS. NVIDIA provides the necessary tools and instructions as part of the Linux BSP package, which may be found in the directory `Linux_for_Tegra/tools/kernel_flash`.

The following sections provide two basic procedures for using the tools. For more detailed information, see the file `README_nfs_flash.txt` in the same directory.

To set up an NFS with flashing capability

1. Put the device in Recovery Mode.
2. Enter these commands to generate a flash package in your NFS root filesystem:

```
$ cd Linux_for_Tegra
$ # Put device in recovery mode
$ sudo ./tools/kernel_flash/l4t_create_images_for_kernel_flash.sh -N <IPaddr>:
<nfsroot> <board-name> <rootdev>
```

Where:

- `<IPaddr>:<nfsroot>` is the location of the NFS root to be used by the target to boot.
- `<board-name>` is the value of the environment variable `BOARD` for the target device. (See the table Jetson Modules and Configurations in the topic Quick Start.)
- `<rootdev>` specifies the device on which the root file system is located, as described in Basic Flash Script Usage.

The script `l4t_create_images_for_kernel_flash.sh` generates the flash package and stores it in a tarball named `nv_flash_from_nfs_image.tbz2` in the directory `tools/kernel_flash`. If the current host is providing the NFS root filesystem, the script automatically puts the flash package into a folder named `images_to_flash` at the root of that filesystem. Then it triggers the target to start RCM boot to NFS. If the target does not automatically RCM boot to NFS, you can use the procedure To RCM Boot to NFS to boot manually.

If the host is not providing the NFS root filesystem, you must extract `nv_flash_from_nfs_image.tbz2` into the NFS root filesystem on its host. Then you must use the procedure To RCM Boot to NFS to RCM-boot to NFS manually.

The flash package may have multiple folders if you generate the flash package for more than one device. For example, the flash package structure may be:

```
/images_to_flash
    jetson-agx-xavier-devkit
    jetson-xavier-nx-devkit-emmc
    jetson-xavier-nx-devkit
```

To flash the device from RCM boot to NFS

After the flash package is put in the NFS root filesystem and you RCM boot the target to NFS, you can use the device's command terminal to run this command on the target's console to flash the target device:

```
$ sudo <flash>/images_to_flash/<board>/l4t_flash_from_kernel.sh
```

Where:

- `<flash>` is the location of the flash package
- `<board>` is the board name that was used to create the flash package

For more information about the use of `l4t_flash_from_kernel.sh`, see the README file `Linux_for_tegra/tools/kernel_flash/README_nfs_flash.txt`.

Flashing to Multiple Jetson Devices

NVIDIA provides a tool and instructions for flashing Jetson devices efficiently in a factory environment. This tool is part of the Linux BSP package and is available in the `Linux_for_Tegra` folder. Instructions for using the tool are included in `README_Massflash.txt`, located in the same folder.

Flashing for Network Boot

Applies to: Jetson Nano devices only

Jetson Nano devices support network boot through the PXELINUX implementation of PXE protocol.

To flash a Jetson Nano device for PXE boot

1. Download, extract and get the build ready for applicable platform. For instructions, see the open source page How do I install and run a TFTP server?
2. Copy the kernel and DTB to the `server_args` directory:

   ```
   $ sudo cp Linux_for_tegra/kernel/Image /tftpboot/
   $ sudo cp Linux_for_Tegra/kernel/dtb/tegra210-p3448-0002-p3449-0000-b00.dtb
   /tftboot/
   ```

3. Create the configuration directory

   ```
   $ sudo mkdir /tftpboot/pxelinux.cfg
   ```

4. Create a new version of `default` (a boot configuration file) in `pxelinux.cfg/` that contains these entries:

   ```
   PROMPT 0
   TIMEOUT 30
   DEFAULT primary
   MENU TITLE PXELinux boot options
   LABEL primary
         MENU LABEL primary kernel on TFTP
         LINUX Image
         FDT tegra210-p3448-0002-p3449-0000-b00.dtb
         APPEND ${cbootargs} booted-via-pxe=true
   ```

   `default` is the last (lowest priority) of several configuration files that PXE searches for configuration parameters. See Configuration filename in the wiki page PXELINUX for more information.

Note	You can use the dummy flag `booted-via-pxe=true` to confirm that the flags specified in `cbootargs` are actually used. After you boot, check for this flag in the boot configuration by inspecting the node `/proc/device-tree/chosen/bootargs`.

5. Restart the xinetd service (the TFTP server) again.
6. Set the value of `serverip` in U-Boot, then test the configuration:
   - To test directly, enter `run bootcmd_pxe` at the U-Boot prompt.
   - To test with a plain `boot` command, change `boot_targets` to `pxe dhcp mmc1`, then enter `run boot`.

Try PXE boot first, then DHCP, then SD-card. For example (at the U-Boot prompt):

```
pci enum; pci
setenv serverip <your-tftp-server-ip>
setenv autoload no
dhcp
run bootcmd_pxe
```

Increasing Internal Memory Partition for Root File System

The suggested rootfs partition size for Jetson AGX Xavier is 15 gigabytes (GB). It is specified by default in the `<board>.conf` file used by the `flash.sh` script.

Use the `-S <size-in-bytes>` argument to `flash.sh` to change the partition size.

To flash for a larger partition

- Execute the following command:

  ```
  $ sudo ./flash.sh -S <size> <board> <rootdev>
  ```

  Where:

  - `<size>` is the desired size for the partition, such as 8589934592 (or 8 GiB) for 8 GB, if you want to decrease the size of the partition.
  - `<board>` is the configuration of the target device as specified in the section To flash Jetson developer kit operating software in the topic Quick Start
  - `<rootdev>` specifies the device on which the root file system is located, as described in Basic Flash Script Usage.

Determining the Success of a Driver Update

After updating drivers on a target board, verify that the update completed successfully. You can determine the success or failure of a driver update by using the following commands.

To determine the success of a driver update

- Execute the following command on a booted target device:

  ```
  $ sha1sum -c /etc/nv_tegra_release
  ```

If the driver update succeeded, the output displays the word *OK* after the file name. A typical success message looks like this:

```
/usr/lib/xorg/modules/drivers/nvidia_drv.so: OK
```

The driver update fails if the file is missing. A typical error message looks like this:

```
sha1sum: /usr/lib/xorg/modules/drivers/nvidia_drv.so: No such file or directory
/usr/lib/xorg/modules/drivers/nvidia_drv.so: FAILED open or read
```

The driver update also fails if the new file is different from the existing file, producing an error such as:

```
/usr/lib/xorg/modules/drivers/nvidia_drv.so: FAILED
```

Reconfiguring a Jetson Device with oem-config

A target device that is flashed by SDK Manager runs the `oem-config` tool automatically the first time it boots after it is flashed. You can use this tool to change some parts of the device’s configuration.

The `oem-config` tool is useful for custom configuring production devices. In a typical use case, you flash a default configuration and clone it to many production devices. The purchaser of each device can use `oem-config` to set their own username and password, language, time zone, and so on.

On a **headed** target device (one equipped with a display), `oem-config` runs as a GUI application. On a **headless** target device (one without a display), it runs as a character interface application.

After the target device runs `oem-config` on first boot, it disables the tool so that it will not run on subsequent boots. If you install your own package and flash the target device manually (outside SDK Manager), you must re-enable `oem-config` manually if you want it to run on the first subsequent boot. Again, the target device disables `oem-config` after running it once.

To re-enable oem-config manually on a flash drive

1. Select a source device of the same type as the target device(s), on which all necessary packages have been installed.
2. Install these packages on the source device to enable `oem-config` for the next reboot: `ubiquity`, `oem-config`, and `oem-config-gtk`. Enter this command:

   ```
   $ sudo apt-get install --no-install-recommends ubiquity oem-config oem-config-gtk
   ```

3. Remove the package `nvidia-l4f-oem-config`:

   ```
   $ sudo dpkg --purge nvidia-l4t-oem-config
   ```

4. Clone the source device's APP partition to `backup.img` and `backup.img.raw`. For details, see To clone a Jetson device and flash.
5. Mount `backup.img.raw` (an ext4 image file) on the host at a mount point of your choice.
6. Apply any Jetson-specific binaries to the image file. The `nv-oem-config` setup files are included in the `apply_binaries` script. To run this script, enter:

   ```
   $ cd Linux_for_Tegra
   $ sudo ./apply_binaries.sh -r <root>
   ```

   Where `<root>` represents the `backup.img.raw` mount point.
7. Set `nv-oem-config.target` as the default.target:

   ```
   $ cd $root/etc/systemd/system
   $ sudo rm default.target
   $ sudo ln -s /lib/systemd/system/nv-oem-config.target default.target
   ```

8. Unmount the device mounted in step 5:

   ```
   $ umount $root
   ```

9. Make a sparse version of the updated image file `backup.img.raw` and name it `system.img`:

   ```
   $ cd Linux_for_Tegra/bootloader/
   $ sudo ./mksparse -v –fillpattern=0 /path/to/backup.img.raw system.img
   ```

10. Flash `system.img` to the target device(s). For details, see To clone a Jetson device and flash.

To re-enable oem-config manually on an SD card

1. Select a source device of the same type as the target device(s) on which all necessary packages have been installed.
2. Enter this command to install the following packages on the source device to enable `oem-config` for the next reboot: `ubiquity`, `oem-config`, and `oem-config-gtk`:

   ```
   $ sudo apt-get install --no-install-recommends ubiquity oem-config oem-config-gtk
   ```

3. Remove the package `nvidia-l4f-oem-config`:

   ```
   $ sudo dpkg --purge nvidia-l4t-oem-config
   ```

11. Power off the source device and remove the SD card from it, then insert it into in the host system.
12. Mount partition #1 of the SD card (an ext4 filesystem) on the host, using a mount point of your choice.
13. Apply any Jetson-specific binaries to partition #1 of SD card. The appropriate files are listed in nv-oem-config, and are applied by the `apply_binaries` script. Enter these commands to run the script:

    ```
    $ cd Linux_for_Tegra
    $ sudo ./apply_binaries.sh -r <root>
    ```

    Where `<root>` represents the partition #1 of SD card mount point.
14. Set `nv-oem-config.target` as the default.target:

    ```
    $ cd $root/etc/systemd/system
    $ sudo rm default.target
    $ sudo ln -s /lib/systemd/system/nv-oem-config.target default.target
    ```
15. Run `jetson-disk-image-creator.sh` to create a new SD card image with modified rootfs:

    ```
    $ cd Linux_for_Tegra/tools
    $ sudo ROOTFS_DIR=<root> ./jetson-disk-image-creator.sh -o sd-blob.img -b jetson-
    nano-devkit -r 100
    ```

    Where `<root>` represents partition #1 of the SD card on its mount point. For details, see To generate an image to be flashed to an SD card.
16. Enter this command to unmount the device mounted in step 11:

    ```
    $ umount $root
    ```
17. Flash `sd-blob.img` to the new SD card. For details, see Flashing to an SD Card.

About Communication Through the Debugging Port

The serial application on the host computer customarily communicates with `oem-config` through the host computer's `tty` device and the target device USB port that is used for flashing. (See Assumptions in the topic Quick Start.)

Some Jetson developer kits also have a UART port on a 40-pin header. You can edit the `oem-config` configuration file to make `oem-config` use this port instead. You must make this change before you flash images on the target device.

Jetson Nano devices support use of the micro USB connector as a debugging port. This is the easiest way to control a headless Jetson Nano device, since a USB to TTL adapter is not required.

To configure oem-config to use a 40-pin header UART port

1. Locate the appropriate configuration file on the host computer:
    - For Jetson Nano devices and Jetson TX1: `<top>/etc/nv-oem-config.conf.t210`
    - For Jetson Xavier series: `<top>/etc/nv-oem-config.conf.t194`
    - For Jetson TX2 series: `<top>/etc/nv-oem-config.conf.t186`
2. Open the configuration file and file the line that defines the property:

    ```
    nv-oem-config-uart-port=ttyGS0
    ```
3. Change the value of this property from `ttyS0` to `ttyTHS1`.
4. Save and close the configuration file.
5. Proceed to flash the target device as described elsewhere in this topic.

Headless Mode Flow in oem-config

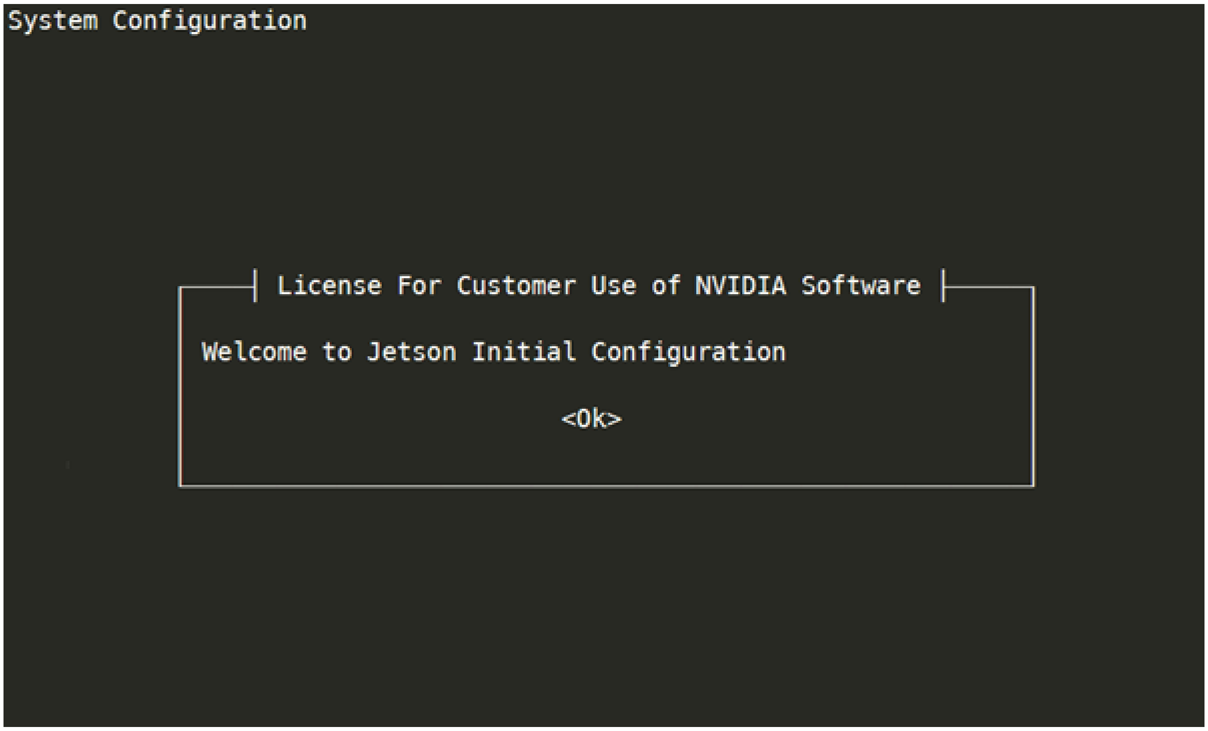
Before the target system boots for the first time, you must start a serial application on the host computer. You may use `putty`, `screen`, or any other serial application that communicates through the host computer's `tty` device and supports the UTF-8 character set.

Note	NVIDIA does not recommend using `minicom` for this application because it has some issues dealing with UTF-8.

When the target device boots for the first time after flashing and finds no display device, it runs `oem-config` in headless mode. Use the following procedure to reconfigure the target device.

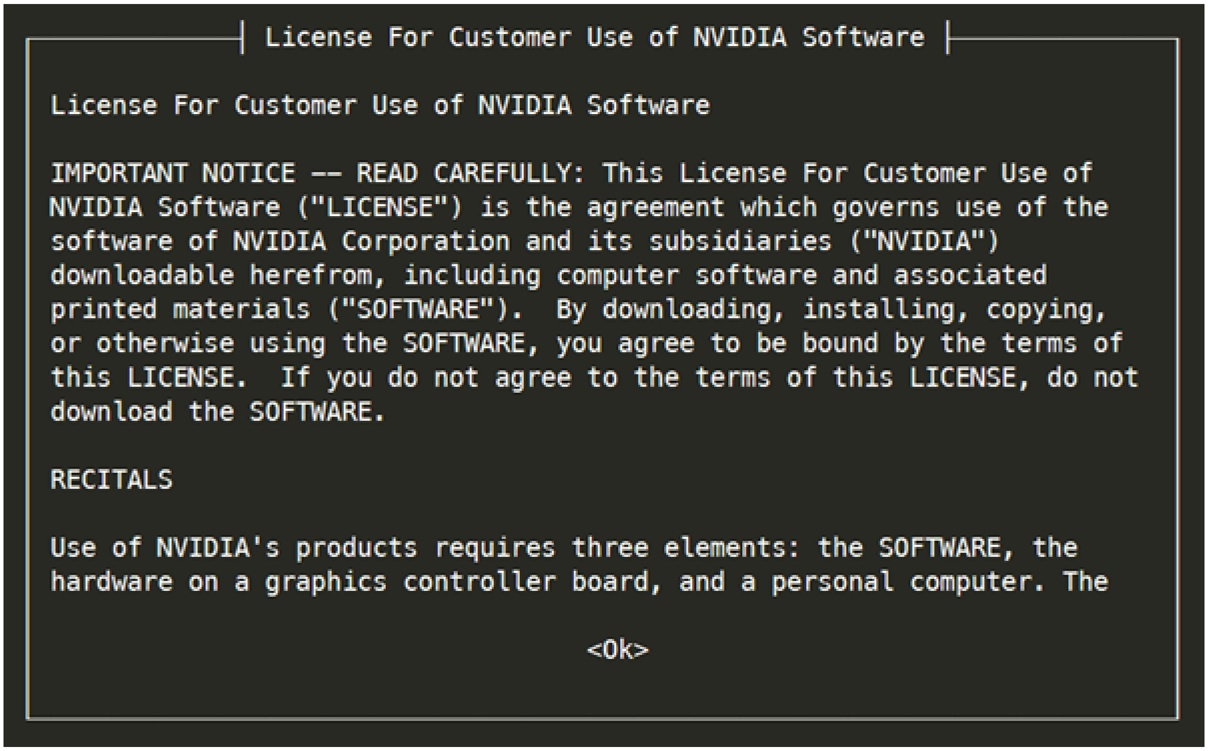
To reconfigure the target device with oem-config

1. `oem-config` displays a welcome screen. To advance to the next screen, press Tab, then Enter.



```
System Configuration




           ┤ License For Customer Use of NVIDIA Software ├

            Welcome to Jetson Initial Configuration

                                <Ok>

```

2. `oem-config` displays the license that governs its use. Read the license, then accept it by pressing Tab, then Enter.



```
              ┤ License For Customer Use of NVIDIA Software ├

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  RECITALS

  Use of NVIDIA's products requires three elements: the SOFTWARE, the
  hardware on a graphics controller board, and a personal computer. The

                                  <Ok>
```
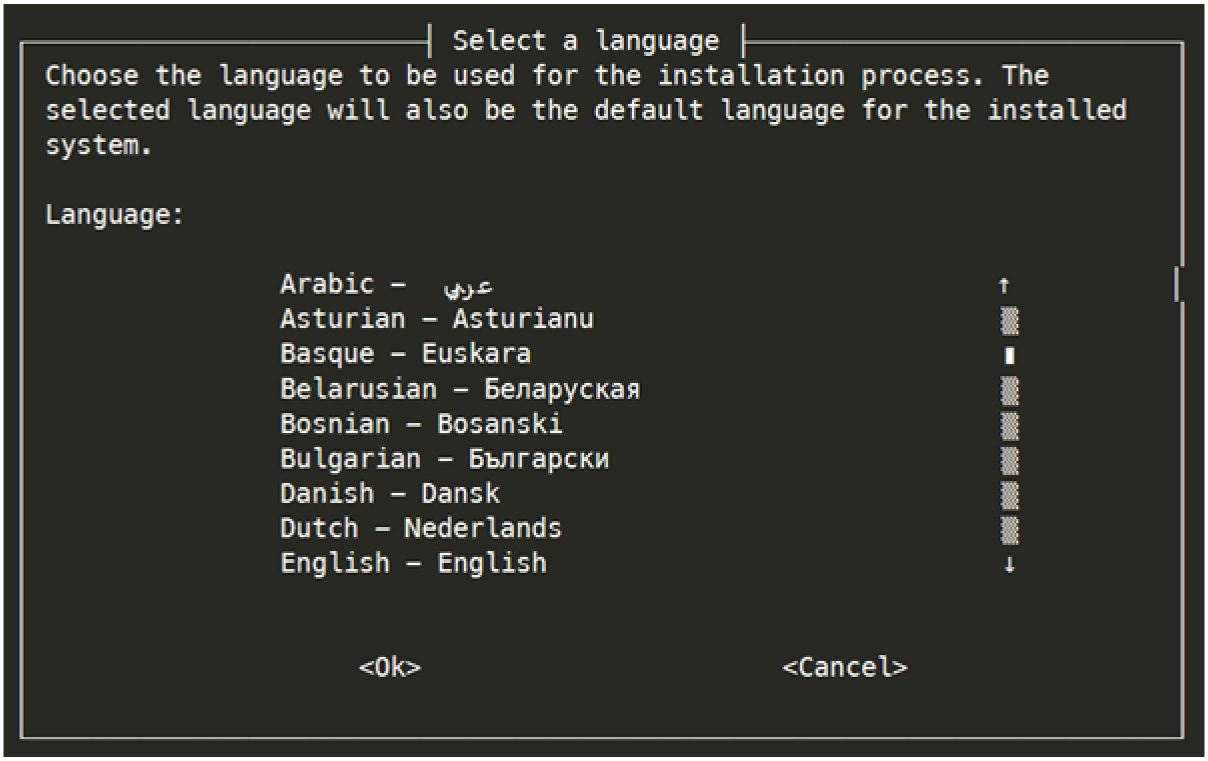
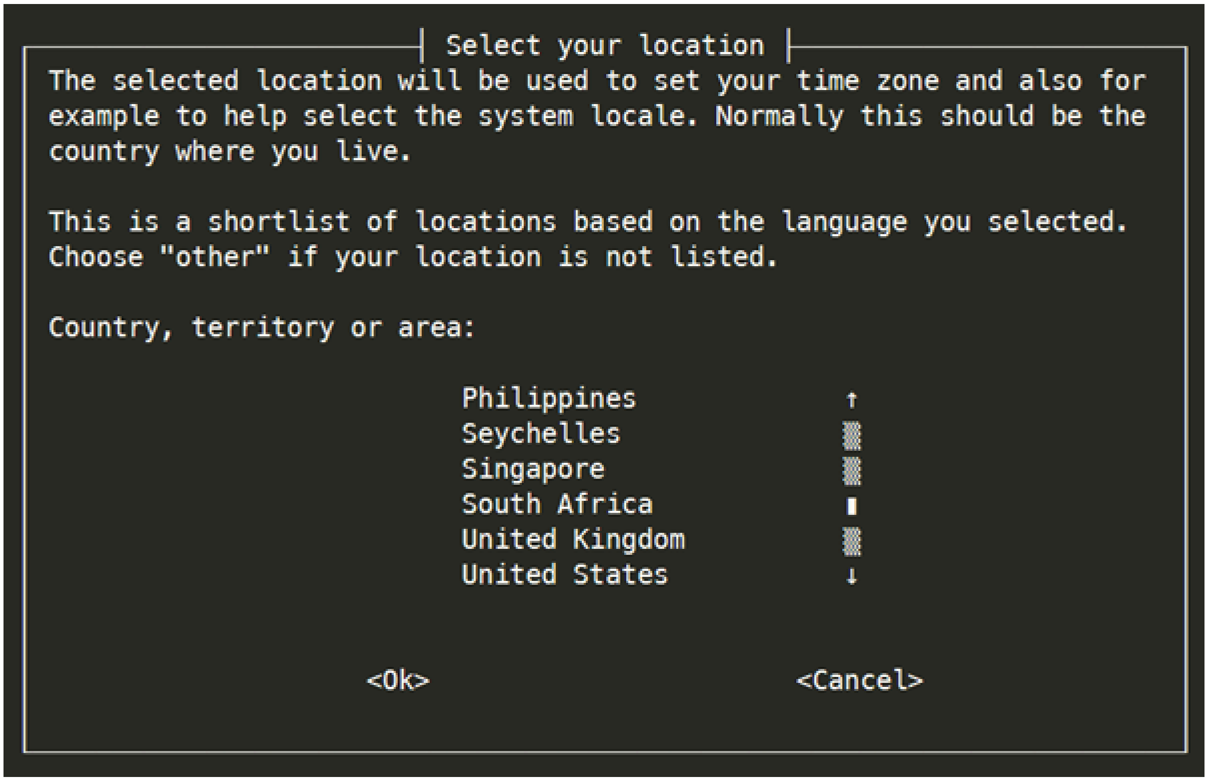

3. `oem-config` displays a screen that lists languages. Use the up and down-arrow keys to select the language you want to use for the installation process. Then press the left and right-arrow keys to select “OK,” and press Enter.



```
                        ┤ Select a language ├
 Choose the language to be used for the installation process. The
 selected language will also be the default language for the installed
 system.

 Language:

               Arabic -  عربي                                 ↑
               Asturian - Asturianu                           ▒
               Basque - Euskara                               ▮
               Belarusian - Беларуская                        ▒
               Bosnian - Bosanski                             ▒
               Bulgarian - Български                          ▒
               Danish - Dansk                                 ▒
               Dutch - Nederlands                             ▒
               English - English                              ↓


                    <Ok>                       <Cancel>
```

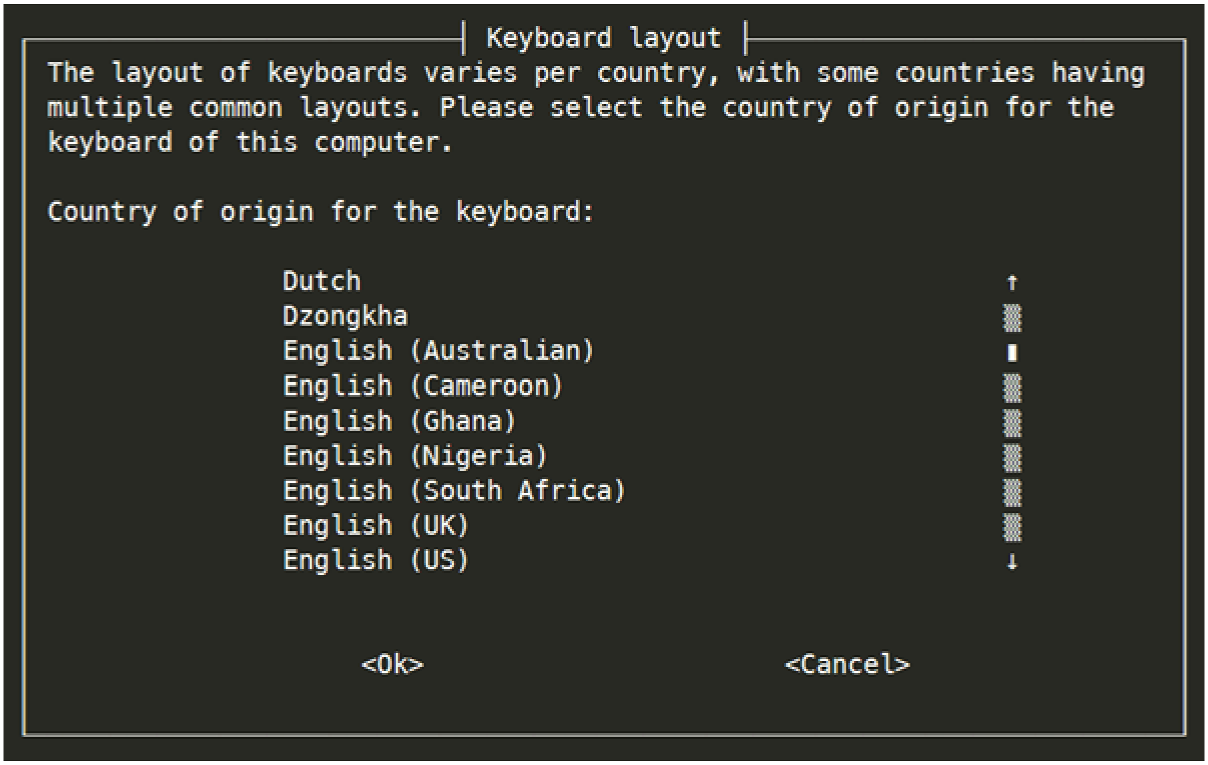
Note	To go back from any screen to the preceding one, select “Cancel” and press Enter. You can go back more than one screen by doing this more than once.

4. `oem-config` displays a screen that lists locations in which the language you selected is used. Select your location; then select “OK” and press Enter.



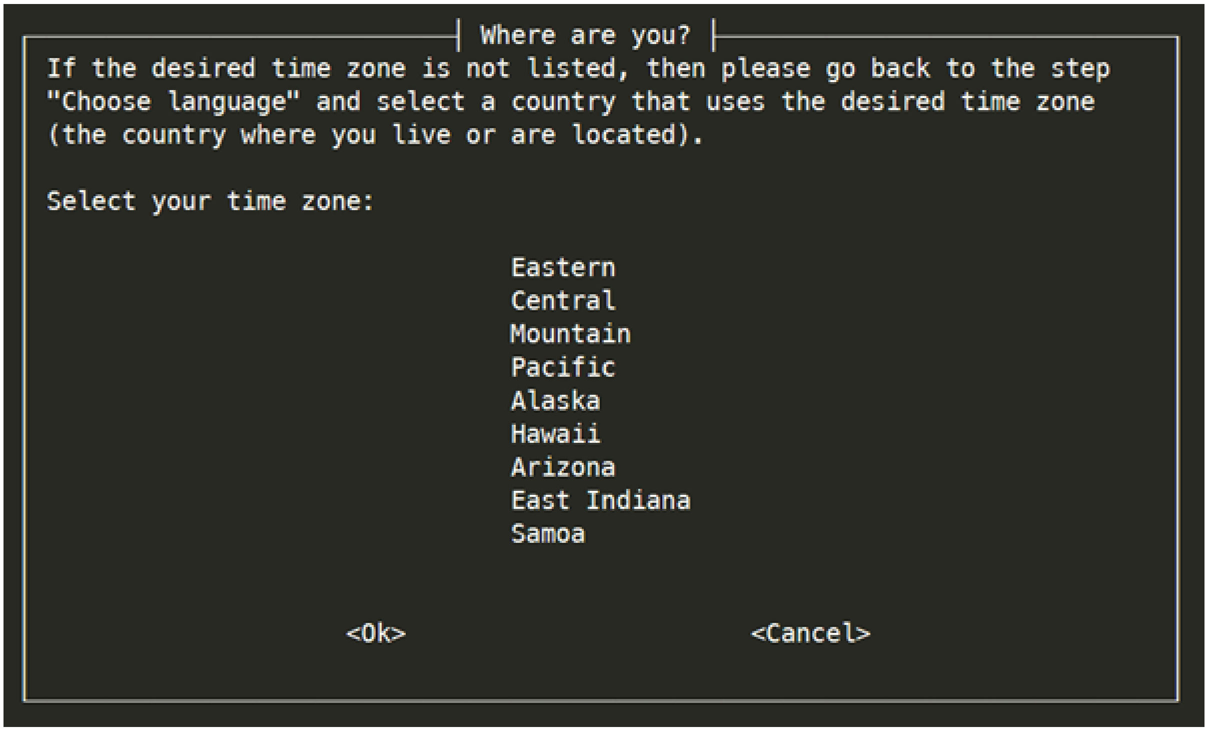
```
                        ┤ Select your location ├
 The selected location will be used to set your time zone and also for
 example to help select the system locale. Normally this should be the
 country where you live.

 This is a shortlist of locations based on the language you selected.
 Choose "other" if your location is not listed.

 Country, territory or area:

                          Philippines           ↑
                          Seychelles            ▒
                          Singapore             ▒
                          South Africa          ▮
                          United Kingdom        ▒
                          United States         ↓


                    <Ok>                        <Cancel>
```

5. `oem-config` displays a screen that lists keyboard layouts. Select your keyboard's layout, then select "OK" and press Enter.



```
Keyboard layout
The layout of keyboards varies per country, with some countries having
multiple common layouts. Please select the country of origin for the
keyboard of this computer.

Country of origin for the keyboard:

            Dutch
            Dzongkha
            English (Australian)
            English (Cameroon)
            English (Ghana)
            English (Nigeria)
            English (South Africa)
            English (UK)
            English (US)


                <Ok>                        <Cancel>
```

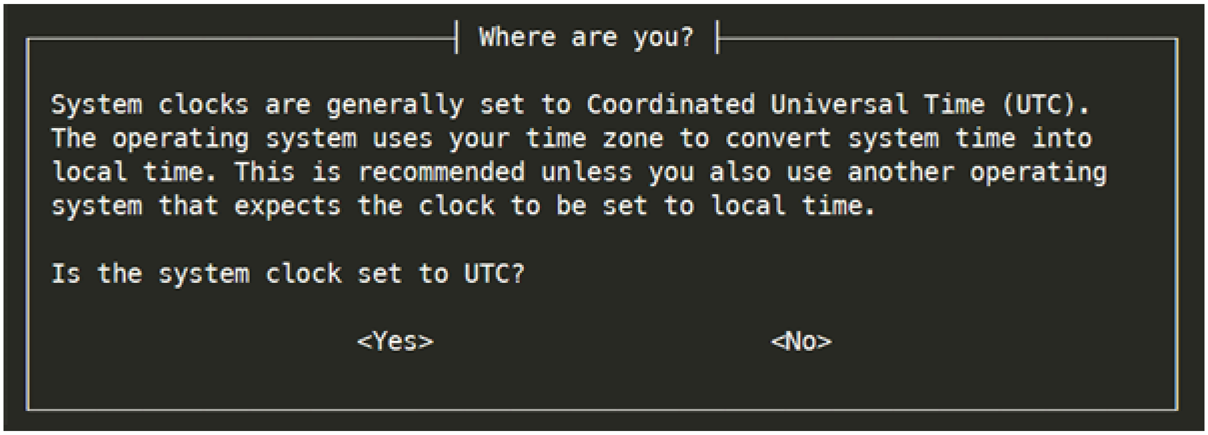
6. `oem-config` displays a screen that lists time zones that exist in the location you select. Select your time zone, then select "OK" and press Enter.



```
Where are you?
If the desired time zone is not listed, then please go back to the step
"Choose language" and select a country that uses the desired time zone
(the country where you live or are located).

Select your time zone:

                         Eastern
                         Central
                         Mountain
                         Pacific
                         Alaska
                         Hawaii
                         Arizona
                         East Indiana
                         Samoa


                <Ok>                        <Cancel>
```

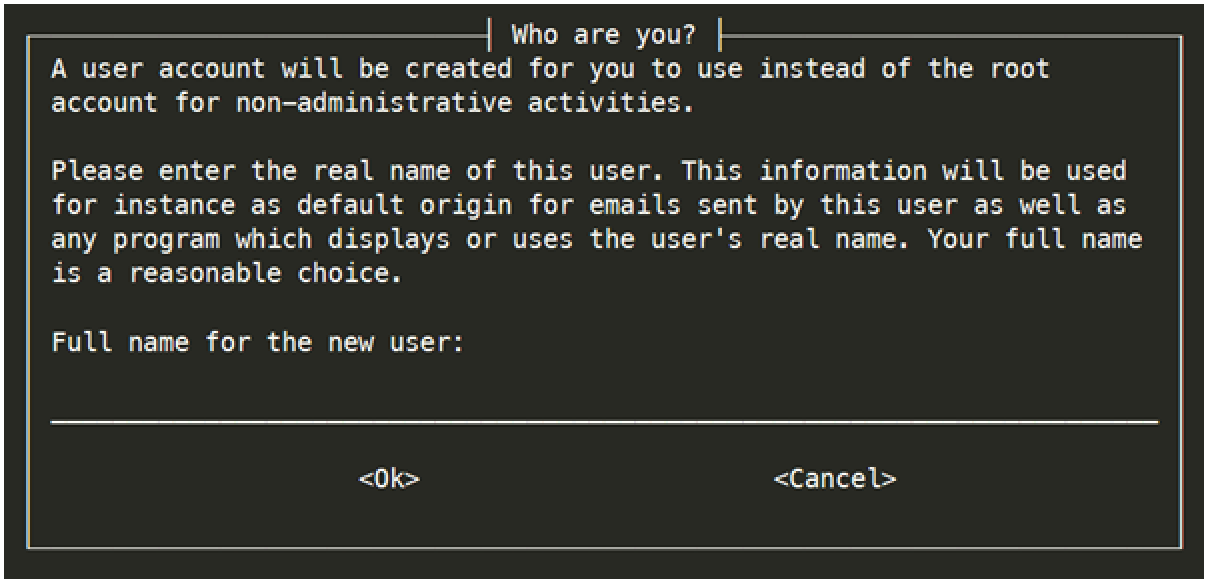
If your time zone is not listed, select "Cancel" as many times as necessary to go back to the screen that lists locations, and choose a different location.

7. `oem-config` asks whether you want to set the system clock to Universal Coordinated Time (UTC, or Greenwich Mean Time). Linux expects the system clock to be set to UTC; therefore, NVIDIA recommends that you select "Yes" and press Enter. If you are using another operating system that expects the system clock to set to local time, however, select "No."



```
System clocks are generally set to Coordinated Universal Time (UTC).
The operating system uses your time zone to convert system time into
local time. This is recommended unless you also use another operating
system that expects the clock to be set to local time.

Is the system clock set to UTC?
```

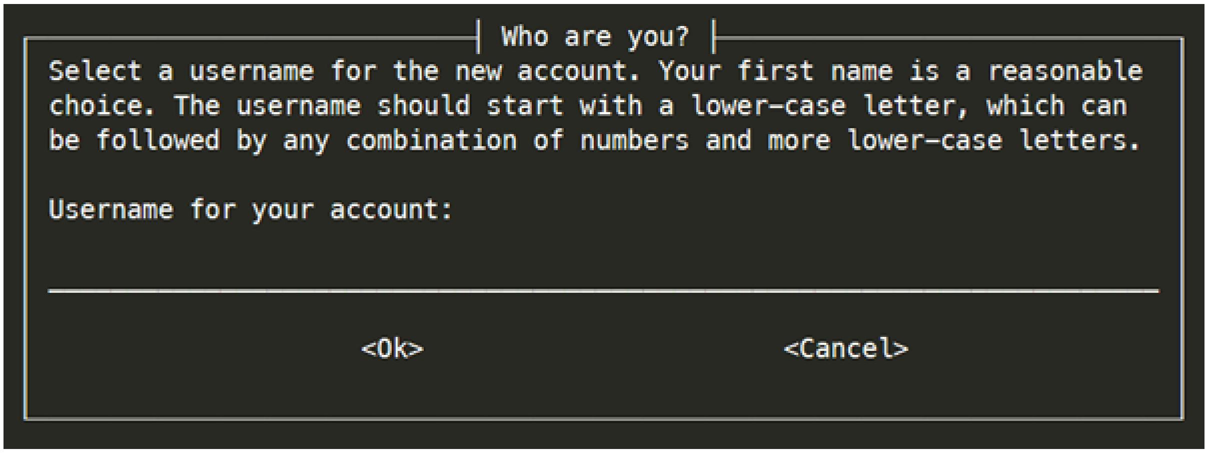
8. `oem-config` asks you to specify your name. Enter your full name (e.g. `John Smith`), then select “OK” and press Enter.



```
A user account will be created for you to use instead of the root
account for non-administrative activities.

Please enter the real name of this user. This information will be used
for instance as default origin for emails sent by this user as well as
any program which displays or uses the user's real name. Your full name
is a reasonable choice.

Full name for the new user:
```

9. `oem-config` asks you to specify a username for your user account. `oem-config` creates a user account for this name. then select “OK” and press Enter.

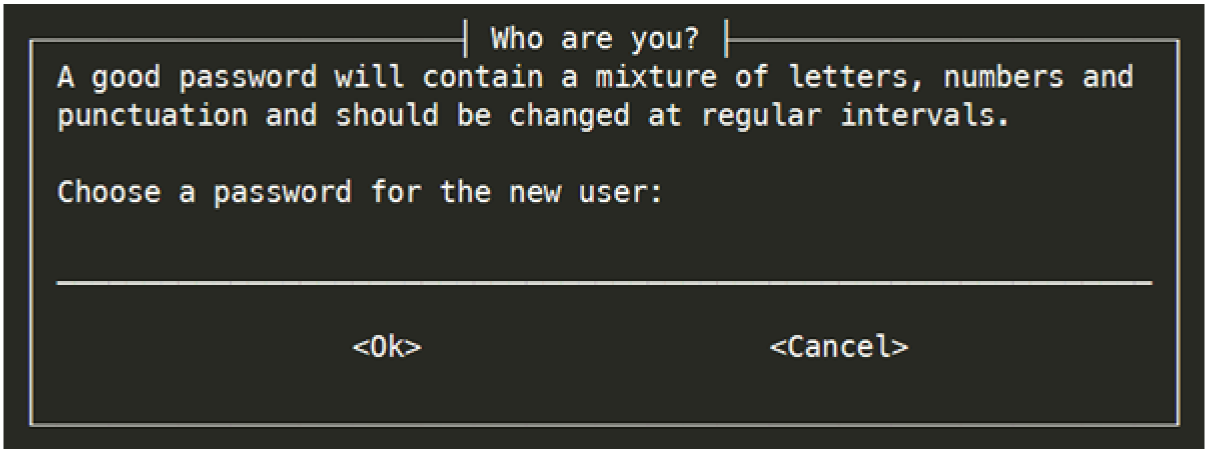
   NVIDIA suggests using your first name, using lower case letters only. Use this account instead of the root account for non-administrative activities.



```
Select a username for the new account. Your first name is a reasonable
choice. The username should start with a lower-case letter, which can
be followed by any combination of numbers and more lower-case letters.

Username for your account:
```

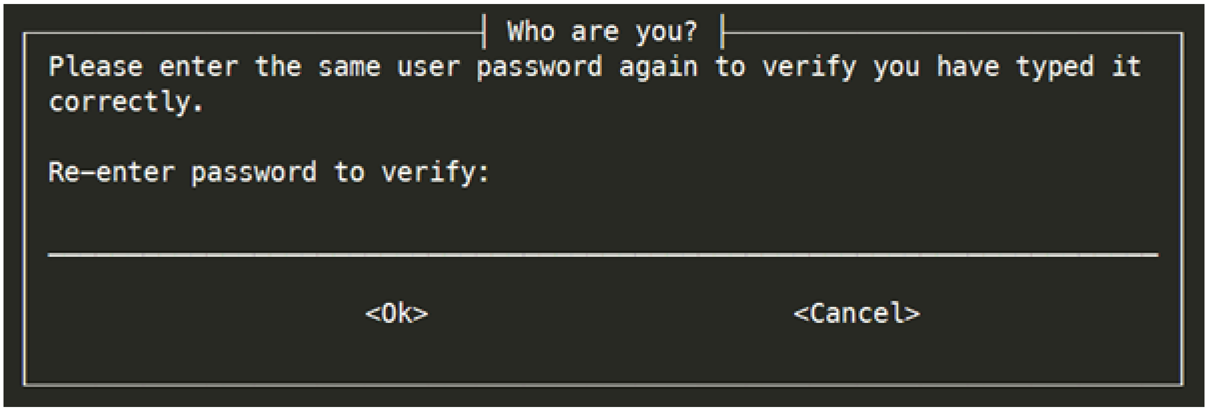
10. `oem-config` asks you to specify a password for your user account. Enter a password, then select “OK” and press Enter.

NVIDIA recommends that you specify a strong password, i.e. one that is more than eight characters long and contains at least one each of upper and lower case letters, numerals, and punctuation characters. If you enter a weak password, oem-config will ask you to confirm that you want to use it.



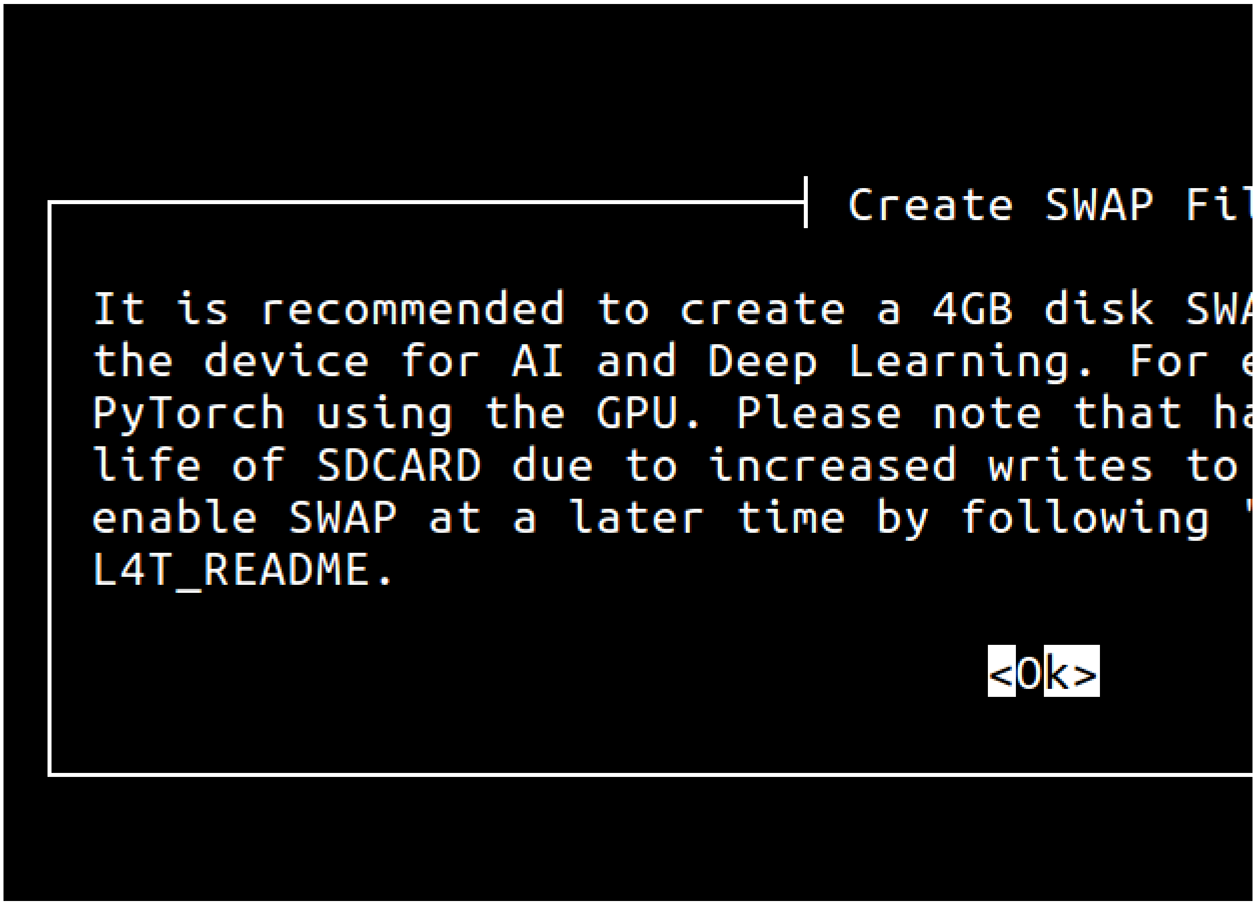
```
Who are you?
A good password will contain a mixture of letters, numbers and
punctuation and should be changed at regular intervals.

Choose a password for the new user:
```

11. `oem-config` asks you to enter your password again to confirm that you entered it correctly. If you enter the same password both times, it sets the password and goes on to the next step. If not, it prompts you to specify a password again.



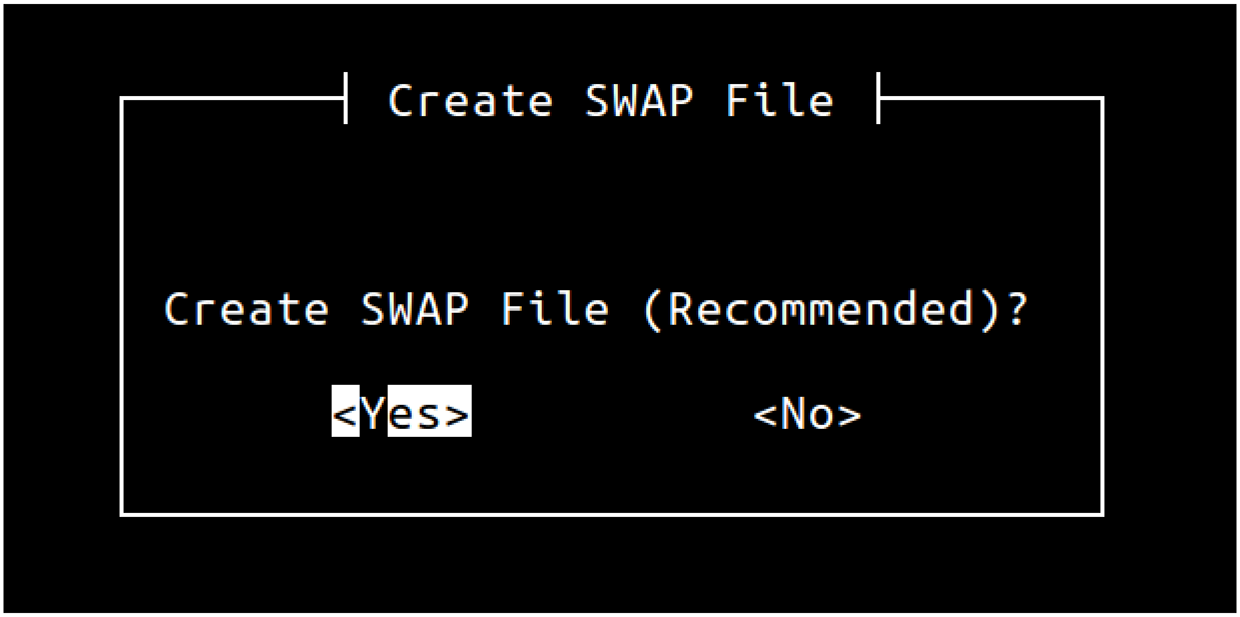
```
Who are you?
Please enter the same user password again to verify you have typed it
correctly.

Re-enter password to verify:
```

12. oem-config prompts you to create and enable a 4 GB SWAP file. It first displays a message which summarizes the pluses and minuses of doing so:



```
Create SWAP Fi
It is recommended to create a 4GB disk SWA
the device for AI and Deep Learning. For e
PyTorch using the GPU. Please note that ha
life of SDCARD due to increased writes to
enable SWAP at a later time by following '
L4T_README.
```

Read the message and decide whether to create a SWAP file. Then press Enter to advance to the next screen:



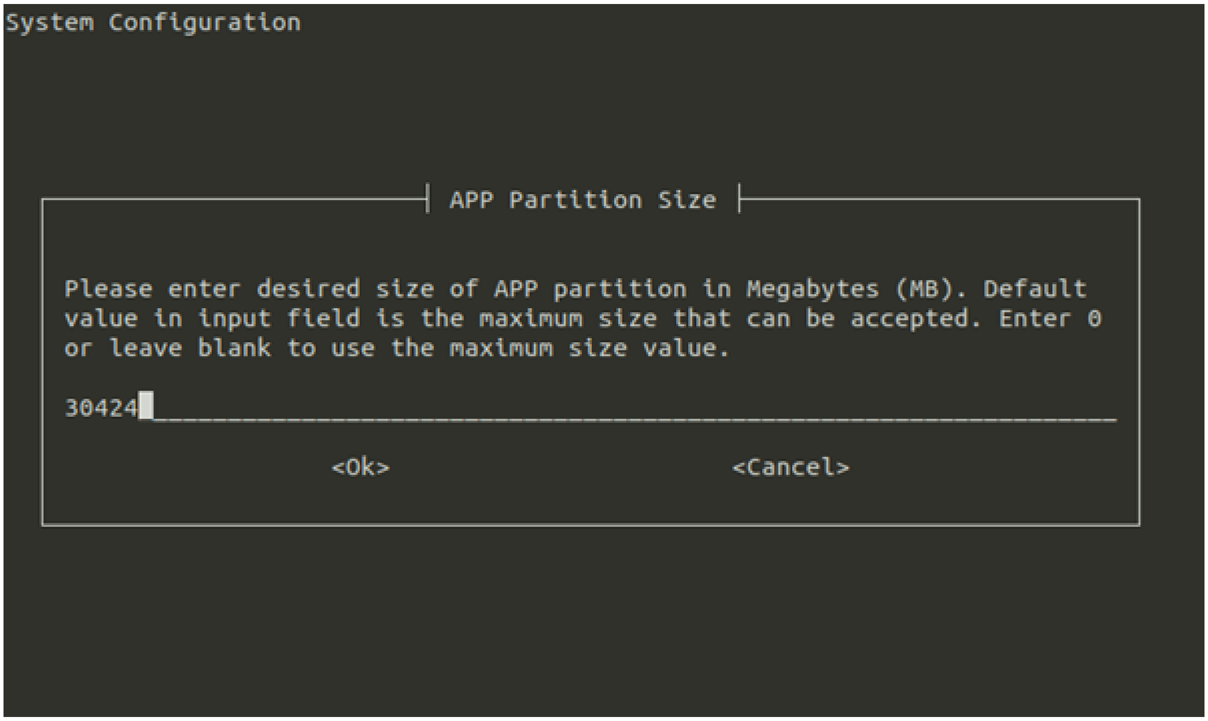
```
Create SWAP File
Create SWAP File (Recommended)?
```

To create and enable a SWAP file, select “Yes” and press Enter. To skip this step, select “No” and press Enter.

Note	As the “Create SWAP File” screen explains, NVIDA recommends that you create and enable a SWAP file if you plan to use your Jetson device for artificial intelligence (AI) and deep learning applications. Note that having a SWAP file may shorten life of you SD card due to increased writes to the medium.

	If you do not create a SWAP file in oem-config, you can later create one manually as described in the section To create and enable a SWAP file manually.

13. oem-config prompts you to specify the desired size of the APP partition in megabytes. To request the maximum possible size, leave the field empty or enter 0 (zero).

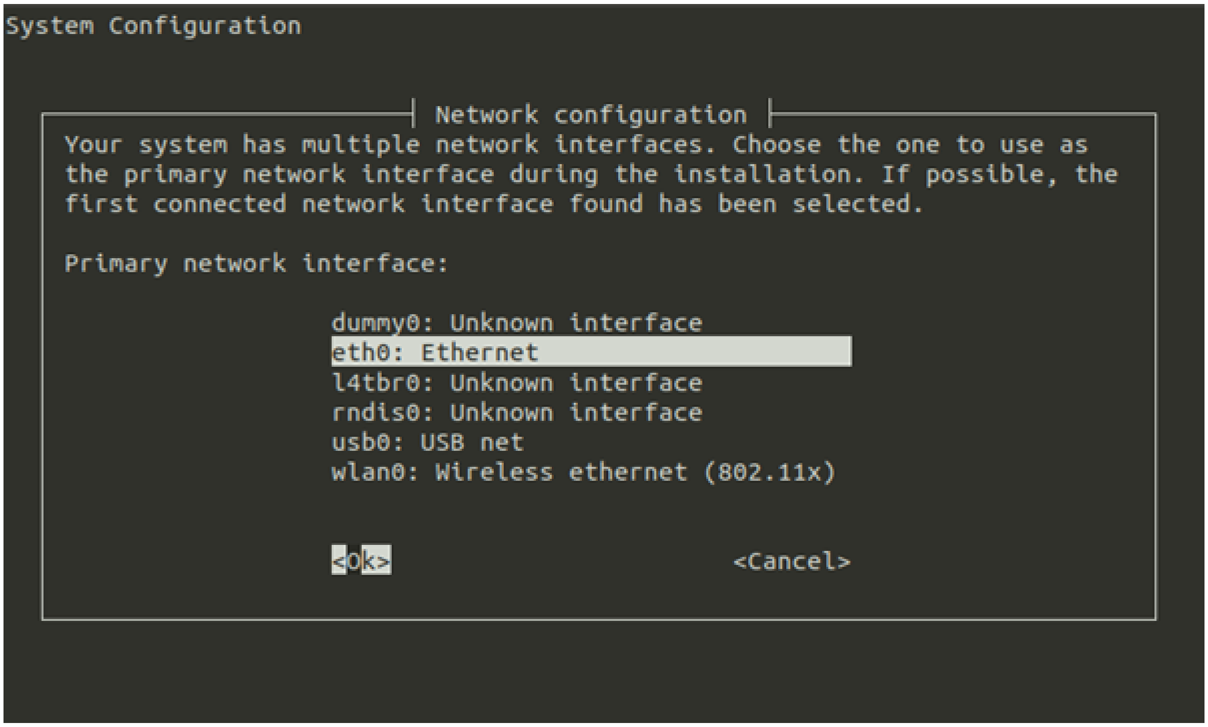


```
System Configuration

                      ┤ APP Partition Size ├

 Please enter desired size of APP partition in Megabytes (MB). Default
 value in input field is the maximum size that can be accepted. Enter 0
 or leave blank to use the maximum size value.

 30424

                 <Ok>                          <Cancel>
```

Note	Note: This is only the case of "Flashing to an SD card." For the other case, which uses `flash.sh`, you can of course enlarge the APP partition statically with flash option `-S`.

14. `oem-config` displays a list of interfaces which it can use as the primary network interface during installation.

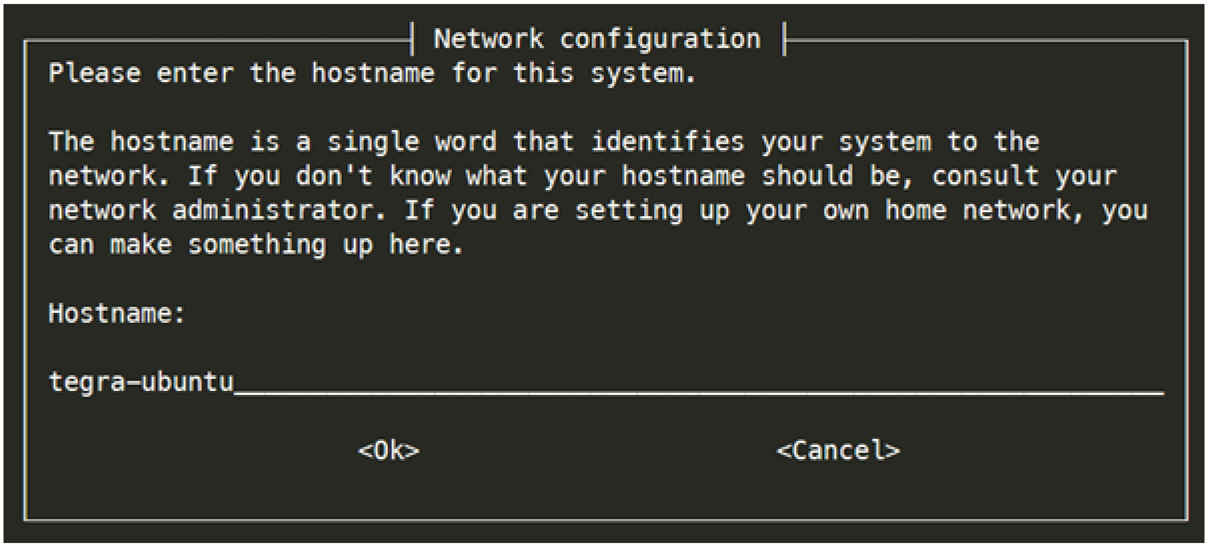
    If you are using Ethernet as the primary network interface, make sure the Ethernet cable is connected. Then select the `eth0: Ethernet` option, select "OK," and press Enter.



```
System Configuration

                      ┤ Network configuration ├
 Your system has multiple network interfaces. Choose the one to use as
 the primary network interface during the installation. If possible, the
 first connected network interface found has been selected.

 Primary network interface:

                  dummy0: Unknown interface
                  eth0: Ethernet
                  l4tbr0: Unknown interface
                  rndis0: Unknown interface
                  usb0: USB net
                  wlan0: Wireless ethernet (802.11x)


                  <Ok>                         <Cancel>
```

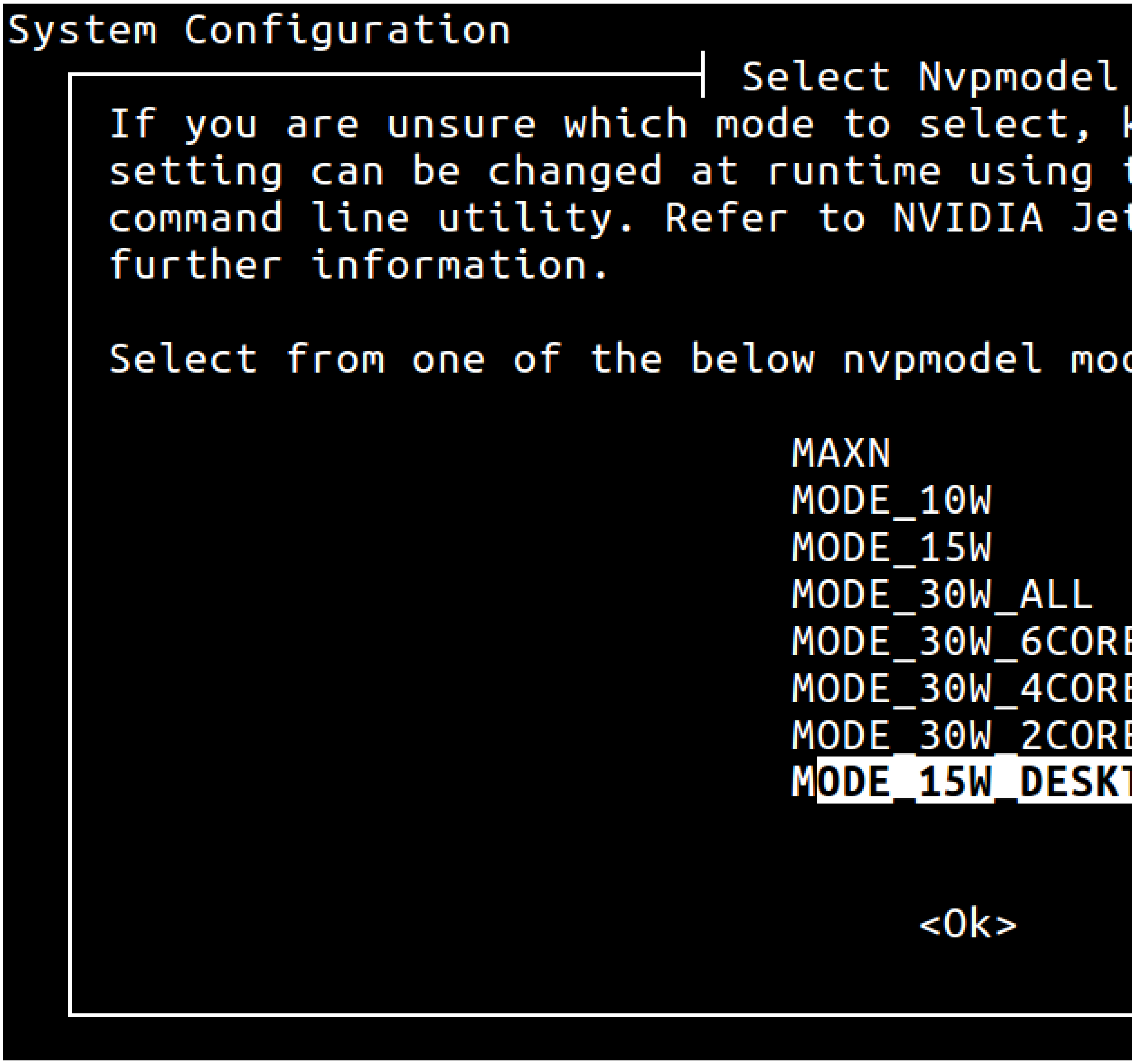
Note	Due to a known wireless network configuration bug in in this wizard, you must either enter the SSID manually instead for selecting it from the list, or wait until after initial setup is complete, then use the `nmcli` command to configure wireless networking. For more details see the ubuntu.com documentation page [Configure WiFi Connections]().

15. `oem-config` prompts you to enter your host computer's hostname. If you don't know the host's name, ask your network administrator. If you are setting up a dedicated network, you may choose any name. Enter the hostname, then select "OK," and press Enter.



```
┤ Network configuration ├
Please enter the hostname for this system.

The hostname is a single word that identifies your system to the
network. If you don't know what your hostname should be, consult your
network administrator. If you are setting up your own home network, you
can make something up here.

Hostname:

tegra-ubuntu____________________________________________________________

                    <Ok>                          <Cancel>
```

16. `oem-config` prompts you to select an nvpmodel mode:



```
System Configuration
                          ┤ Select Nvpmodel
  If you are unsure which mode to select, k
  setting can be changed at runtime using t
  command line utility. Refer to NVIDIA Jet
  further information.

  Select from one of the below nvpmodel mod


                         MAXN
                         MODE_10W
                         MODE_15W
                         MODE_30W_ALL
                         MODE_30W_6CORE
                         MODE_30W_4CORE
                         MODE_30W_2CORE
                         MODE_15W_DESKT


                             <Ok>
```

If you don’t know which mode to select, keep the default setting (highlighted on the screen).

You can change the nvpmodel mode at runtime through the nvpmodel GUI. For more information go to the topic Clock Frequency and Power Management, and read the “nvpmodel GUI” subsection in the appropriate “Power Management” section for your Jetson platform.

17. `oem-config` reconfigures the system with the selections you have made, then proceeds to the system’s log-in prompt.

To create and enable a SWAP file manually

This procedure is an alternative to step 12 of the section To reconfigure the target device with oem-config. You may perform it at any time after you run oem-config.

1. To create the SWAP file, enter these commands:

   ```
   sudo fallocate -l 4G /swapfile
   sudo chmod 600 /swapfile
   sudo mkswap /swapfile
   sudo swapon /swapfile
   ```

2. To automount the swap file on boot, open `/etc/fstab` in a text editor, add this line, and save:

   ```
   /swapfile   swap   swap   defaults   0 0
   ```

Note	The fields in this line may be separated by any combination and number of tabs and spaces. NVIDIA recommends spacing the fields to align with the fields in the file’s other lines.

Skipping oem-config

If you don't want to run `oem-config` to set up your system, you can run the host script `l4t_create_default_user.sh` before you flash to make the first-time boot process skip it. The boot process runs `oem-config` if no default user is defined; `l4_create_default_user.sh` creates a default user, and thus prevents `oem-config` from running.

The script’s usage is:

```
$ l4t_create_default_user.sh [-u <user>] [-p <pswd>] [-n <host>] [-a] [-h]
```

This table describes the command line options:

Command line option	Description
-u <user> --username <user>	Creates a default user with the specified username. If omitted, the script creates a default user named `nvidia`.
-p <pswd> --password <pswd>	Creates the default user with the specified password. If omitted, script generates a random password.
-n <host> --hostname <host>	Creates the default user with the specified hostname. If this option is omitted, the script uses the hostmane `tegra-ubuntu`.
-a --autologin	Configures Jetson Linux to log in to the default user automatically when booted. If omitted, the user must log in manually.
--accept-license	Accepts the EULA for NVIDIA software. If omitted, the script prompts you to accept the EULA.
-h --help	Prints a description of the script’s usage.

Examples

- Creates a user named `nvidia` with the password `NDZjMWM4` and the hostname `tegra-ubuntu`.

```
$ l4t_create_default_user.sh -u nvidia -p NDZjMWM4
```

- Creates a user named `ubuntu` with a randomly generated password and the host name `tegra-ubuntu`, and configures Jetson Linux to log in to it automatically at boot.

```
$ l4t_create_default_user.sh -u ubuntu -a
```

- Creates a user named `nvidia` with a randomly generated password and the hostname `tegra`.

```
$ l4t_create_default_user.sh -n tegra
```

Modifying Jetson RAM Disk

Use the following procedure to modify the default configuration of a Jetson device’s RAM disk.

To modify RAM disk

1. Unpack your initrd:

```
$ sudo su
$ cp /boot/initrd /tmp
$ mkdir /tmp/temp
$ cd /tmp/temp
$ gunzip -c /tmp/initrd | cpio -i
```

2. Modify your initrd content in the `tmp/temp/` folder:
3. Package your initrd:

```
$ sudo su
$ cd /tmp/temp
$ find . | cpio -H newc -o | gzip -9 -n > ../initrd
```

4. Replace the initrd with your customized initrd:

```
$ cp /tmp/initrd /boot/initrd
```