

# How to add your system call the Linux OS kernel?

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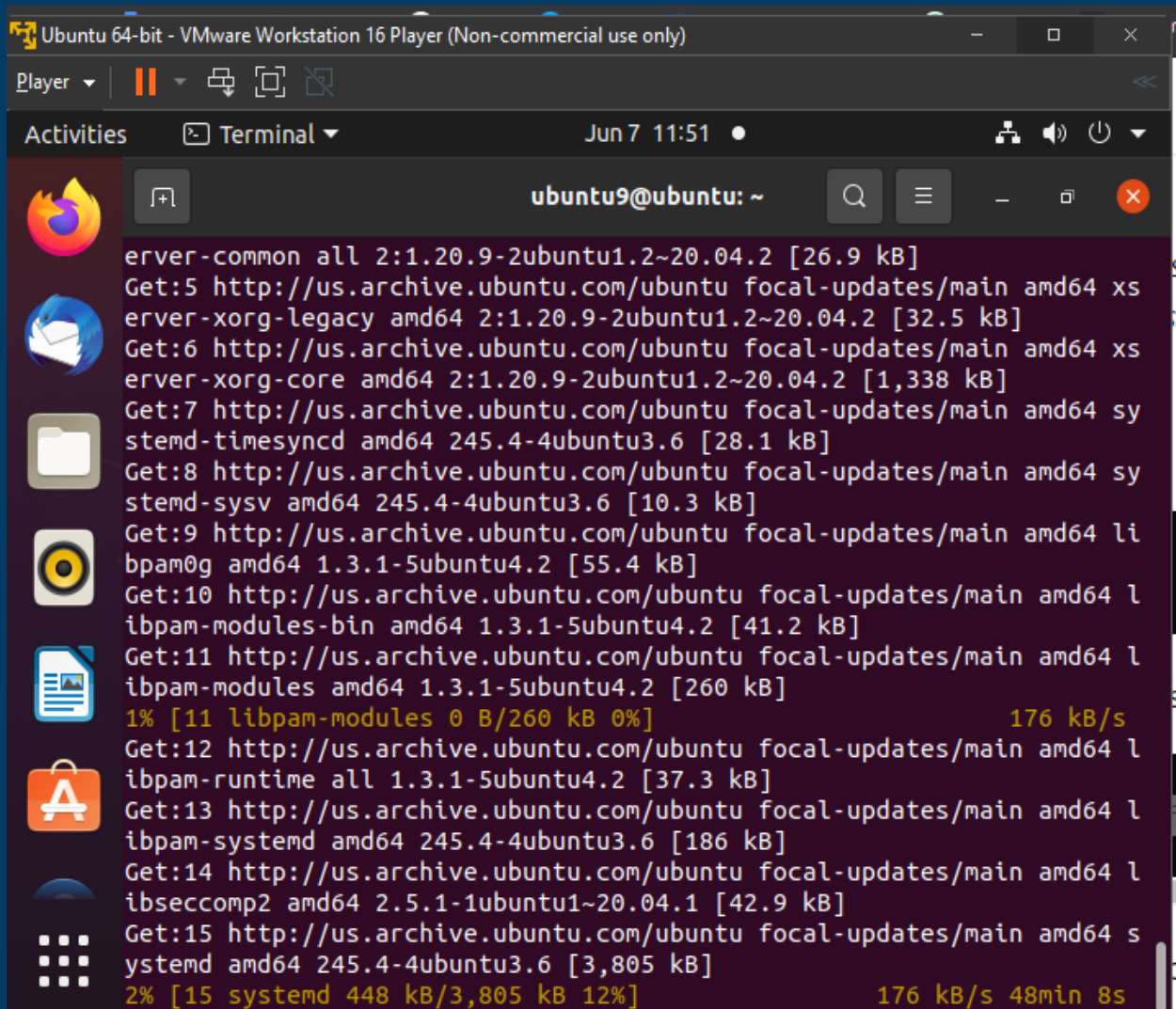
group

name:Dash

---

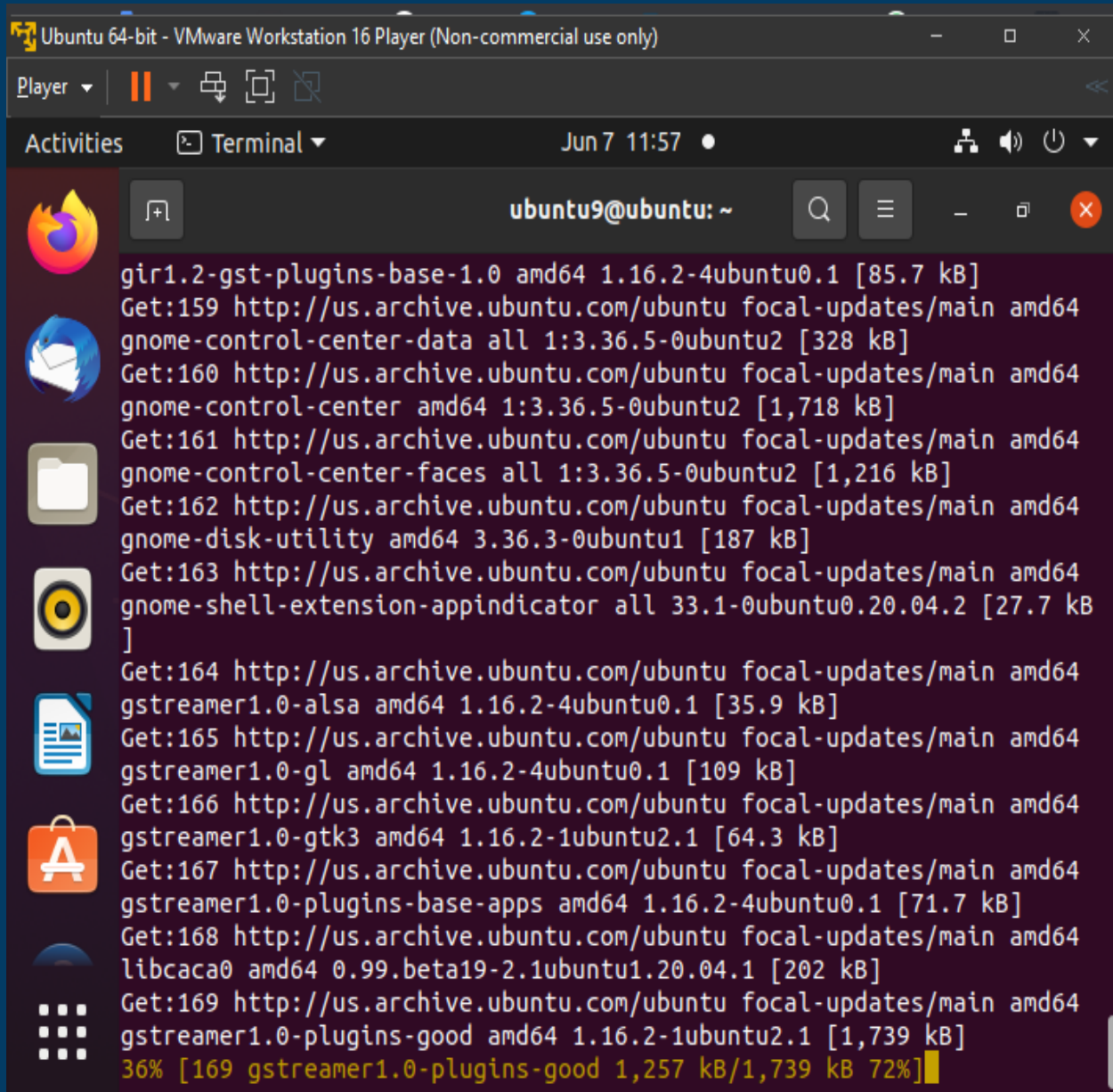
-\*-The steps to add your system call the Linux OS kernel:

→update your operating system and Download and install the essential packages to compile kernels.



The screenshot shows a terminal window titled "ubuntu9@ubuntu: ~" within a VMware Workstation 16 Player. The terminal displays the output of a series of apt-get commands, showing the download and installation progress of various Ubuntu packages. The packages listed include server-common, server-xorg-legacy, server-xorg-core, systemd-timesyncd, systemd-sysv, libpam0g, libpam-modules-bin, libpam-modules, libpam-runtime, libpam-systemd, and libseccomp2. The terminal output shows the download progress for each package, including the source URL, architecture, version, size, and download speed. The download speed is consistently 176 kB/s. The terminal also shows the installation progress for the packages, including the size of the files being installed and the overall progress percentage.

```
server-common all 2:1.20.9-2ubuntu1.2~20.04.2 [26.9 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 xs
server-xorg-legacy amd64 2:1.20.9-2ubuntu1.2~20.04.2 [32.5 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 xs
server-xorg-core amd64 2:1.20.9-2ubuntu1.2~20.04.2 [1,338 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 sy
stemd-timesyncd amd64 245.4-4ubuntu3.6 [28.1 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 sy
stemd-sysv amd64 245.4-4ubuntu3.6 [10.3 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 li
bpam0g amd64 1.3.1-5ubuntu4.2 [55.4 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 l
ibpam-modules-bin amd64 1.3.1-5ubuntu4.2 [41.2 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 l
ibpam-modules amd64 1.3.1-5ubuntu4.2 [260 kB]
1% [11 libpam-modules 0 B/260 kB 0%] 176 kB/s
Get:12 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 l
ibpam-runtime all 1.3.1-5ubuntu4.2 [37.3 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 l
ibpam-systemd amd64 245.4-4ubuntu3.6 [186 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 l
ibseccomp2 amd64 2.5.1-1ubuntu1~20.04.1 [42.9 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 s
ystemd amd64 245.4-4ubuntu3.6 [3,805 kB]
2% [15 systemd 448 kB/3,805 kB 12%] 176 kB/s 48min 8s
```



```
gir1.2-gst-plugins-base-1.0 amd64 1.16.2-4ubuntu0.1 [85.7 kB]
Get:159 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gnome-control-center-data all 1:3.36.5-0ubuntu2 [328 kB]
Get:160 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gnome-control-center amd64 1:3.36.5-0ubuntu2 [1,718 kB]
Get:161 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gnome-control-center-faces all 1:3.36.5-0ubuntu2 [1,216 kB]
Get:162 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gnome-disk-utility amd64 3.36.3-0ubuntu1 [187 kB]
Get:163 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gnome-shell-extension-appindicator all 33.1-0ubuntu0.20.04.2 [27.7 kB]
]
Get:164 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gstreamer1.0-alsa amd64 1.16.2-4ubuntu0.1 [35.9 kB]
Get:165 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gstreamer1.0-gl amd64 1.16.2-4ubuntu0.1 [109 kB]
Get:166 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gstreamer1.0-gtk3 amd64 1.16.2-1ubuntu2.1 [64.3 kB]
Get:167 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gstreamer1.0-plugins-base-apps amd64 1.16.2-4ubuntu0.1 [71.7 kB]
Get:168 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
libcaca0 amd64 0.99.beta19-2.1ubuntu1.20.04.1 [202 kB]
Get:169 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64
gstreamer1.0-plugins-good amd64 1.16.2-1ubuntu2.1 [1,739 kB]
36% [169 gstreamer1.0-plugins-good 1,257 kB/1,739 kB 72%]
```

→ Clean up your installed packages

Download the source code of the latest stable version of the Linux

# kernel (which is 5.8.1) .

Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)

Player ▾ | Jun 7 12:13 •

Activities Terminal ▾

ubuntu9@ubuntu: ~

```

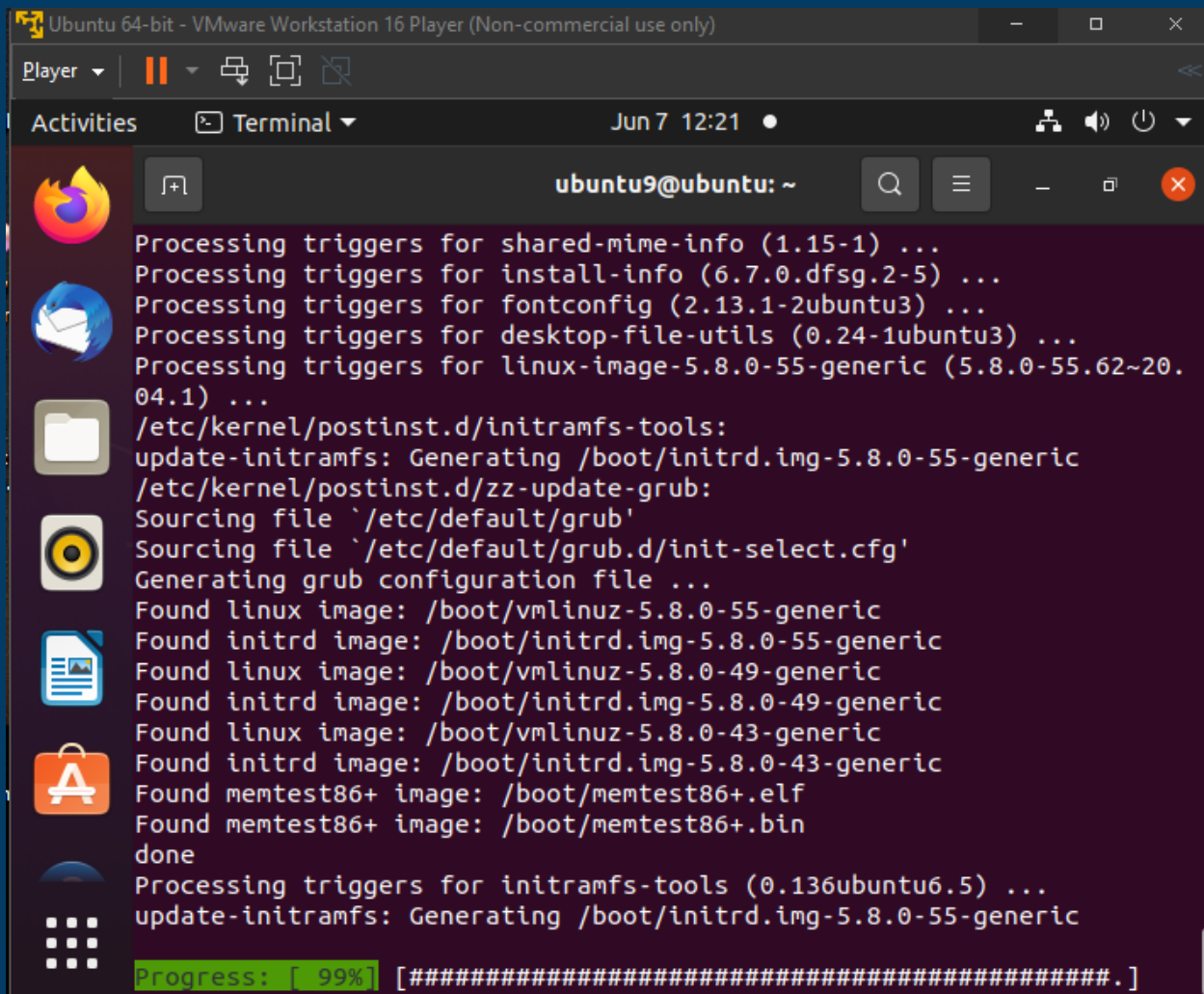
u0.2_all.deb ...
Unpacking libgdk-pixbuf2.0-common (2.40.0+dfsg-3ubuntu0.2) over (2.40.0+dfsg-3ubuntu0.1) ...
Preparing to unpack .../27-libgstreamer-plugins-base1.0-0_1.16.2-4ubuntu0.1_amd64.deb ...
Unpacking libgstreamer-plugins-base1.0-0:amd64 (1.16.2-4ubuntu0.1) over (1.16.2-4) ...
Preparing to unpack .../28-libx11-xcb1_2%3a1.6.9-2ubuntu1.2_amd64.deb ...
Unpacking libx11-xcb1:amd64 (2:1.6.9-2ubuntu1.2) over (2:1.6.9-2ubuntu1.1) ...
Preparing to unpack .../29-libgstreamer-gl1.0-0_1.16.2-4ubuntu0.1_amd64.deb ...
Unpacking libgstreamer-gl1.0-0:amd64 (1.16.2-4ubuntu0.1) over (1.16.2-4) ...
Preparing to unpack .../30-libwebpdecoder2_0.6.1-2ubuntu0.20.04.1_amd64.deb ...
Unpacking libwebpdecoder2:amd64 (0.6.1-2ubuntu0.20.04.1) over (0.6.1-2) ...
Preparing to unpack .../31-libwebkit2gtk-4.0-37_2.32.0-0ubuntu0.20.04.1_amd64.deb ...
Unpacking libwebkit2gtk-4.0-37:amd64 (2.32.0-0ubuntu0.20.04.1) over (2.30.3-0ubuntu0.20.04.1) ...
Progress: [ 16%] [#####.....]
  
```

The screenshot shows a terminal window titled "Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)". The terminal prompt is "ubuntu9@ubuntu: ~". The output shows the installation of LibreOffice components:

```

u0.20.04.1_all.deb ...
Unpacking libreoffice-style-breeze (1:6.4.7-0ubuntu0.20.04.1) over (1:6.4.6-0ubuntu0.20.04.1) ...
Preparing to unpack .../101-libreoffice-style-elementary_1%3a6.4.7-0ubuntu0.20.04.1_all.deb ...
Unpacking libreoffice-style-elementary (1:6.4.7-0ubuntu0.20.04.1) over (1:6.4.6-0ubuntu0.20.04.1) ...
Preparing to unpack .../102-libwacom-bin_1.3-2ubuntu3_amd64.deb ...
Unpacking libwacom-bin (1.3-2ubuntu3) over (1.3-2ubuntu1) ...
Preparing to unpack .../103-libwebpmux3_0.6.1-2ubuntu0.20.04.1_amd64.deb ...
Unpacking libwebpmux3:amd64 (0.6.1-2ubuntu0.20.04.1) over (0.6.1-2) ...
Preparing to unpack .../104-libxmlb1_0.1.15-2ubuntu1~20.04.1_amd64.deb ...
Unpacking libxmlb1:amd64 (0.1.15-2ubuntu1~20.04.1) over (0.1.15-2) ...
Preparing to unpack .../105-yelp_3.36.2-0ubuntu1_amd64.deb ...
Unpacking yelp (3.36.2-0ubuntu1) over (3.36.0-1) ...
Preparing to unpack .../106-libyelp0_3.36.2-0ubuntu1_amd64.deb ...
Unpacking libyelp0:amd64 (3.36.2-0ubuntu1) over (3.36.0-1) ...
Preparing to unpack .../107-linux-firmware_1.187.12_all.deb ...
Unpacking linux-firmware (1.187.12) over (1.187.9) ...
  
```

The progress bar at the bottom indicates 47% completion.



```
Processing triggers for shared-mime-info (1.15-1) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...
Processing triggers for fontconfig (2.13.1-2ubuntu3) ...
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
Processing triggers for linux-image-5.8.0-55-generic (5.8.0-55.62~20.04.1) ...
/etc/kernel/postinst.d/initramfs-tools:
update-initramfs: Generating /boot/initrd.img-5.8.0-55-generic
/etc/kernel/postinst.d/zz-update-grub:
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.8.0-55-generic
Found initrd image: /boot/initrd.img-5.8.0-55-generic
Found linux image: /boot/vmlinuz-5.8.0-49-generic
Found initrd image: /boot/initrd.img-5.8.0-49-generic
Found linux image: /boot/vmlinuz-5.8.0-43-generic
Found initrd image: /boot/initrd.img-5.8.0-43-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
Processing triggers for initramfs-tools (0.136ubuntu6.5) ...
update-initramfs: Generating /boot/initrd.img-5.8.0-55-generic
Progress: [ 99%] [#####.]
```

→ you will write a basic system call in C and integrate it into the new kernel and Change your working directory to the root directory of the recently unpacked source code and Create the home directory of your system call. Decide a name for your



system call, and keep it consistent from this point onwards. I have chosen **Dash**

```
Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)
Player ▾ | [Pause] [Full Screen] [Close]
Activities [Terminal] Jun 7 12:31
ubuntu9@ubuntu: ~
Found linux image: /boot/vmlinuz-5.8.0-43-generic
Found initrd image: /boot/initrd.img-5.8.0-43-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
Processing triggers for initramfs-tools (0.136ubuntu6.5) ...
update-initramfs: Generating /boot/initrd.img-5.8.0-55-generic
ubuntu9@ubuntu:~$ wget -P ~/ https://cdn.kernel.org/pub/linux/kernel/
v5.x/linux-5.8.1.tar.xz
--2021-06-07 12:23:17-- https://cdn.kernel.org/pub/linux/kernel/v5.x/
linux-5.8.1.tar.xz
Resolving cdn.kernel.org (cdn.kernel.org)... 199.232.81.176, 2a04:4e4
2:54::432
Connecting to cdn.kernel.org (cdn.kernel.org)|199.232.81.176|:443...
connected.
HTTP request sent, awaiting response... 200 OK
Length: 114458544 (109M) [application/x-xz]
Saving to: '/home/ubuntu9/linux-5.8.1.tar.xz'

linux-5.8.1.tar.x 100%[=====>] 109.16M  2.39MB/s   in 51s

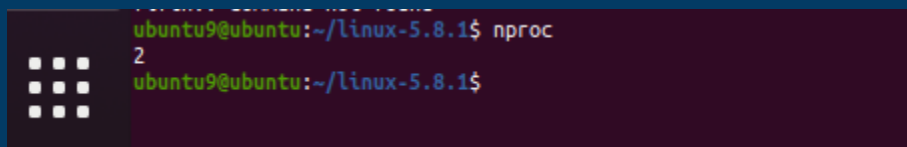
2021-06-07 12:24:09 (2.12 MB/s) - '/home/ubuntu9/linux-5.8.1.tar.xz'
saved [114458544/114458544]

ubuntu9@ubuntu:~$
```

```
ubuntu9@ubuntu:~$ cd ~/linux-5.8.1/
ubuntu9@ubuntu:~/linux-5.8.1$ mkdir Dash
ubuntu9@ubuntu:~/linux-5.8.1$ nano Dash/Dash.c
ubuntu9@ubuntu:~/linux-5.8.1$ nano Dash/Makefile
ubuntu9@ubuntu:~/linux-5.8.1$ nano Makefile
ubuntu9@ubuntu:~/linux-5.8.1$ nano include/linux/syscalls.h
ubuntu9@ubuntu:~/linux-5.8.1$ nano arch/x86/entry/syscalls/syscall_64.tbl
```

→ you will install the new kernel and prepare your operating system to boot into it.

Find out how many logical cores you have.

A terminal window with a dark background. On the left is a logo consisting of a 3x3 grid of white squares. The terminal text shows a prompt 'ubuntu9@ubuntu:~/linux-5.8.1\$' followed by the command 'nproc'. The output '2' is displayed on the next line, followed by another prompt 'ubuntu9@ubuntu:~/linux-5.8.1\$'.

Compile the kernel's source code and Prepare the installer of the kernel and Install the kernel.

Update the bootloader of the operating system with the new kernel.

```
Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)
Player ▾ | [Pause] [Full Screen] [Refresh] [Close]
Activities | Terminal ▾ | Jun 7 14:07 | [Search] [Menu] [Window] [Close]

ubuntu9@ubuntu: ~

Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  linux-headers-5.8.0-43-generic linux-hwe-5.8-headers-5.8.0-43 linux-image-5.8.0-43-generic
  linux-modules-5.8.0-43-generic linux-modules-extra-5.8.0-43-generic
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu gcc-9 libasan5 libatomic1 libbinutils libc-dev-bin libc6-dev
  libcrypt-dev libctf-nobfd0 libctf0 libgcc-9-dev libitm1 liblsan0 libquadmath0 libtsan0 libubsan1 linux-libc-dev
  manpages-dev
Suggested packages:
  binutils-doc gcc-multilib make autoconf automake libtool flex bison gcc-doc gcc-9-multilib gcc-9-doc gcc-9-locales
  glibc-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu gcc gcc-9 libasan5 libatomic1 libbinutils libc-dev-bin libc6-dev
  libcrypt-dev libctf-nobfd0 libctf0 libgcc-9-dev libitm1 liblsan0 libquadmath0 libtsan0 libubsan1 linux-libc-dev
  manpages-dev
0 upgraded, 21 newly installed, 0 to remove and 0 not upgraded.
Need to get 20.3 MB of archives.
After this operation, 93.0 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils-common amd64 2.34-6ubuntu1.1 [207 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libbinutils amd64 2.34-6ubuntu1.1 [475 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libctf-nobfd0 amd64 2.34-6ubuntu1.1 [47.1 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libctf0 amd64 2.34-6ubuntu1.1 [46.6 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils-x86-64-linux-gnu amd64 2.34-6ubuntu1.1 [1,613
kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils amd64 2.34-6ubuntu1.1 [3,380 B]
Get:7 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libitm1 amd64 10.2.0-Subunit1-20.04 [26.4 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libatomic1 amd64 10.2.0-Subunit1-20.04 [9,300 B]
Get:9 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libasan5 amd64 9.3.0-17ubuntu1-20.04 [394 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 liblsan0 amd64 10.2.0-Subunit1-20.04 [144 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libtsan0 amd64 10.2.0-Subunit1-20.04 [320 kB]
Get:12 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libubsan1 amd64 10.2.0-Subunit1-20.04 [136 kB]
Get:13 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libquadmath0 amd64 10.2.0-Subunit1-20.04 [146 kB]
Get:14 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libgcc-9-dev amd64 9.3.0-17ubuntu1-20.04 [2,360 kB]
Get:15 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 gcc-9 amd64 9.3.0-17ubuntu1-20.04 [8,241 kB]
38% [15 gcc-9 380 kB/8,241 kB 5%] 371 kB/s 37s
```

```
Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)
Player ▾ | [Pause] [Full Screen] [Refresh] [Close]
Activities | Terminal ▾ | Jun 7 13:18 | [Search] [Menu] [Window] [Close]

ubuntu9@ubuntu: ~/linux-5.8.1

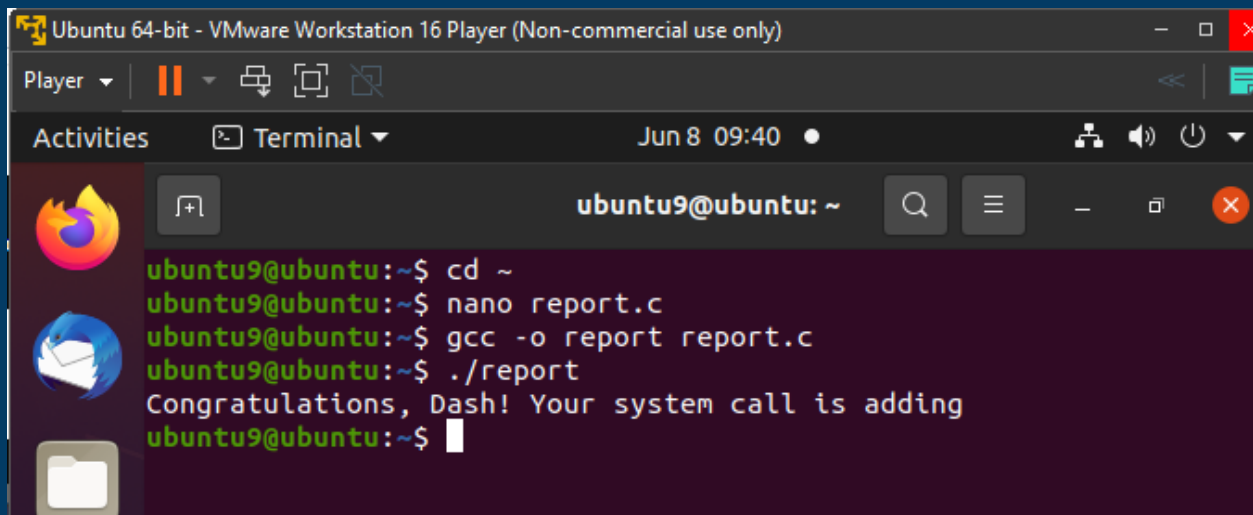
GNU nano 4.8 arch/x86/entry/syscalls/syscall_64.tbl Modified
327 64 preadv2 sys_preadv2
328 64 pwritev2 sys_pwritev2
329 common pkey_mprotect sys_pkey_mprotect
330 common pkey_alloc sys_pkey_alloc
331 common pkey_free sys_pkey_free
332 common statx sys_statx
333 common io_pgetevents sys_io_pgetevents
334 common rseq sys_rseq
# don't use numbers 387 through 423, add new calls after the last
# 'common' entry
424 common pidfd_send_signal sys_pidfd_send_signal
425 common io_uring_setup sys_io_uring_setup
426 common io_uring_enter sys_io_uring_enter
427 common io_uring_register sys_io_uring_register
428 common open_tree sys_open_tree
429 common move_mount sys_move_mount
430 common fsopen sys_fsopen
431 common fsconfig sys_fsconfig
432 common fsmount sys_fsmount
433 common fspick sys_fspick
434 common pidfd_open sys_pidfd_open
435 common clone3 sys_clone3
437 common openat2 sys_openat2
438 common pidfd_getfd sys_pidfd_getfd
439 common faccessat2 sys_faccessat2
440 common Dash sys_Dash
#
# x32-specific system call numbers start at 512 to avoid cache impact
# for native 64-bit operation. The __x32_compat_sys stubs are created
# on-the-fly for compat_sys_*( ) compatibility system calls if X86_X32
# is defined.
#
512 x32 rt_sigaction compat_sys_rt_sigaction
513 x32 rt_sigreturn compat_sys_x32_rt_sigreturn
514 x32 ioctl compat_sys_ioctl
515 x32 readv compat_sys_readv

[Get Help] [Write Out] [Where Is] [Cut Text] [Justify] [Cur Pos] [U]
[Exit] [Read File] [Replace] [Paste Text] [To Spell] [Go To Line] [E] [Redo]
```



→ you will write a C program to check whether your system call works or not. After that, you will see your system call in action. Check the version of your current kernel. It display (5.8.1)

Change your working directory to your home directory and Create a C file to generate a report of the success or failure of your system call.



```
Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)
Player
Activities Terminal Jun 8 09:40
ubuntu9@ubuntu: ~
ubuntu9@ubuntu:~$ cd ~
ubuntu9@ubuntu:~$ nano report.c
ubuntu9@ubuntu:~$ gcc -o report report.c
ubuntu9@ubuntu:~$ ./report
Congratulations, Dash! Your system call is adding
ubuntu9@ubuntu:~$
```

\*/My system include CPU cores =2,  
RAM capacity 2GB and Kernel version  
5.8.1