

## SECCIÓN 1: ESTADO DEL ARTE

### 1.1 Documento Completo

El documento tiene entre 6-8 páginas  
Incluye bibliografía en formato APA o IEEE  
Cubre investigaciones de los últimos 10 años

### 1.2 Contenido del Estado del Arte

Revisión de papers académicos sobre LFS  
Comparación con alternativas (Gentoo, Buildroot, Yocto, Alpine)  
Identificación de problemas y metodologías  
Incluye proyectos académicos y empresariales recientes  
Discusión de tendencias actuales  
Análisis de beneficios del sistema a medida

### 1.3 Calidad Académica

Texto claro y bien estructurado  
Referencias bibliográficas correctamente citadas  
Análisis académico profundo (no solo documentación técnica)

## SECCIÓN 2: INSTALACIÓN DEL LFS

### 2.1 Versión de LFS utilizada



### 2.2 Versión de Rocky Linux (Host)

Ubicación ⓘ	us-central1-b
Imagen de origen del disco de arranque	<a href="#">rocky-linux-10-optimized-gcp-v20251017</a>

### 2.3 Sistema Bootable

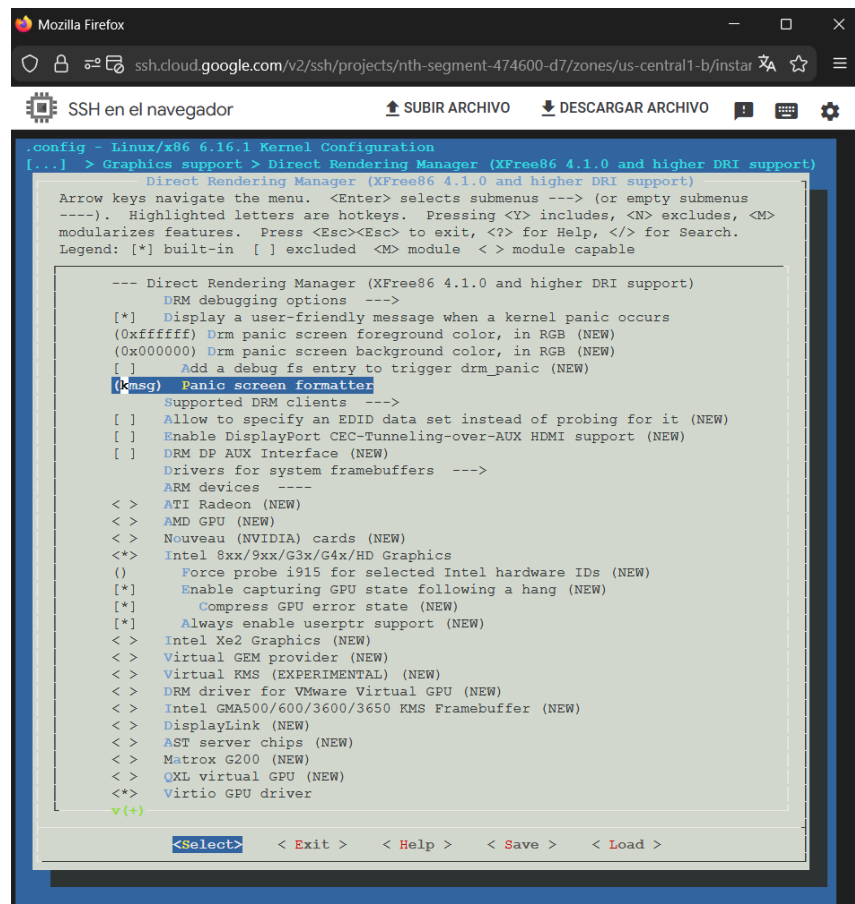
El sistema arranca de manera independiente  
Se puede iniciar sesión correctamente  
Sistema funcional sin depender del host

## 2.4 Documentación Técnica

Comandos principales documentados (En el registro de actividad)

Evidencia de compilación de paquetes

Configuración del kernel documentada

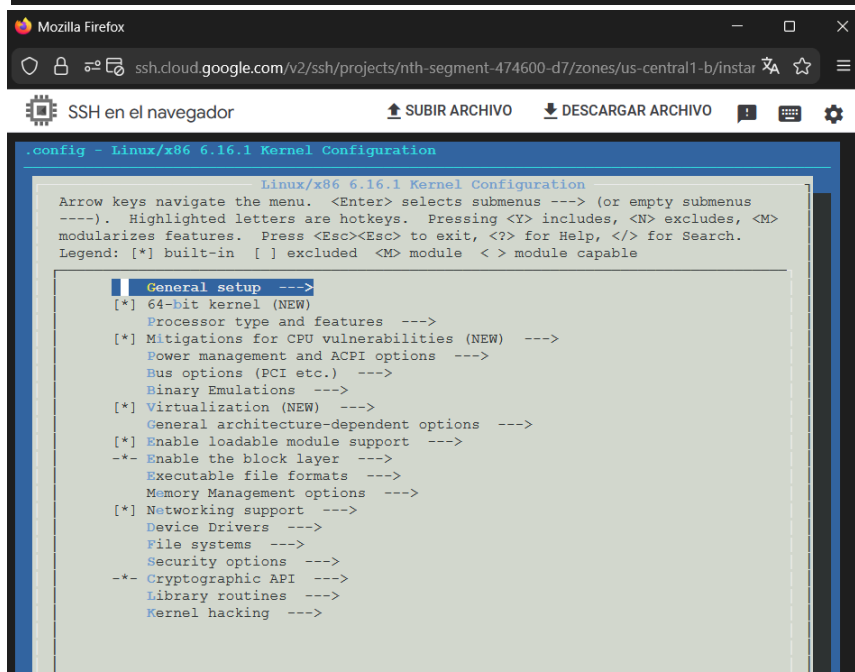


The screenshot shows the 'Direct Rendering Manager (XFree86 4.1.0 and higher DRI support)' configuration menu. The 'Panic screen formatter' option is highlighted with a blue bar. The menu includes options for DRM debugging, panic screen colors, and various DRM clients like ATI, AMD, Nouveau, and Intel. At the bottom, navigation keys like '<Select>', '<Exit>', and '<Help>' are visible.

```
.config - Linux/x86 6.16.1 Kernel Configuration
[...] > Graphics support > Direct Rendering Manager (XFree86 4.1.0 and higher DRI support)
    Direct Rendering Manager (XFree86 4.1.0 and higher DRI support)
    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 <> module capable

    --- Direct Rendering Manager (XFree86 4.1.0 and higher DRI support)
        DRM debugging options ---
        [*] Display a user-friendly message when a kernel panic occurs
            (0xffffffff) Drm panic screen foreground color, in RGB (NEW)
            (0x000000) Drm panic screen background color, in RGB (NEW)
            [ ] Add a debug fs entry to trigger drm_panic (NEW)
            (kmsg) Panic screen formatter
        Supported DRM clients ---
        [ ] Allow to specify an EDID data set instead of probing for it (NEW)
        [ ] Enable DisplayPort CEC-Tunneling-over-AUX HDMI support (NEW)
        [ ] DRM DP AUX Interface (NEW)
        Drivers for system framebuffers ---
        ARM devices ----
        <> ATI Radeon (NEW)
        <> AMD GPU (NEW)
        <> Nouveau (NVIDIA) cards (NEW)
        <*> Intel 8xx/9xx/G3x/G4x/HD Graphics
            ( ) Force probe i915 for selected Intel hardware IDs (NEW)
            [*] Enable capturing GPU state following a hang (NEW)
            [*] Compress GPU error state (NEW)
            [*] Always enable userptr support (NEW)
        <> Intel Xe2 Graphics (NEW)
        <> Virtual GEM provider (NEW)
        <> Virtual KMS (EXPERIMENTAL) (NEW)
        <> DRM driver for VMware Virtual GPU (NEW)
        <> Intel GMA500/600/3600/3650 KMS Framebuffer (NEW)
        <> DisplayLink (NEW)
        <> AST server chips (NEW)
        <> Matrox G200 (NEW)
        <> QXL virtual GPU (NEW)
        <*> Virtio GPU driver
        v(+)

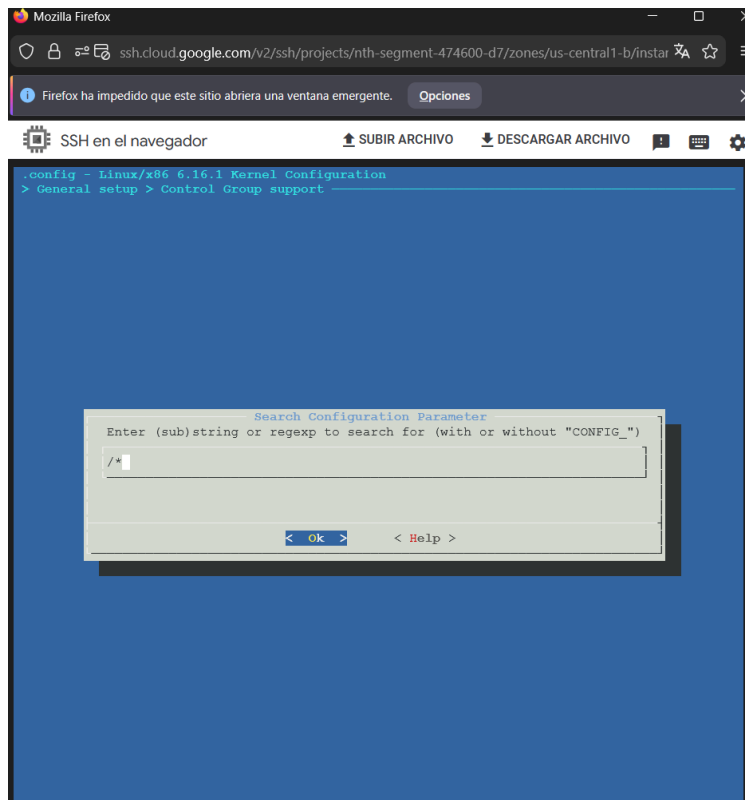
        <Select> <Exit> <Help> <Save> <Load>
```



The screenshot shows the 'General setup' configuration menu. The 'General setup' option is highlighted with a blue bar. The menu includes options for 64-bit kernel, processor type, mitigations for CPU vulnerabilities, power management, bus options, binary emulations, virtualization, general architecture-dependent options, enable loadable module support, enable the block layer, executable file formats, memory management options, networking support, device drivers, file systems, security options, cryptographic API, library routines, and kernel hacking. At the bottom, navigation keys like '<Select>', '<Exit>', and '<Help>' are visible.

```
.config - Linux/x86 6.16.1 Kernel Configuration
Linux/x86 6.16.1 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 <> module capable

[*] General setup --->
    [*] 64-bit kernel (NEW)
    Processor type and features --->
    [*] Mitigations for CPU vulnerabilities (NEW) --->
    Power management and ACPI options --->
    Bus options (PCI etc.) --->
    Binary Emulations --->
    [*] Virtualization (NEW) --->
    General architecture-dependent options --->
    [*] Enable loadable module support --->
    -* Enable the block layer --->
    Executable file formats --->
    Memory Management options --->
    [*] Networking support --->
    Device Drivers --->
    File systems --->
    Security options --->
    -* Cryptographic API --->
    Library routines --->
    Kernel hacking --->
```



La configuración del kernel 6.12 para el proyecto Linux From Scratch 12.4 se centra en asegurar compatibilidad con virtualización, cumplir los requisitos mínimos de systemd y mantener un diseño monolítico y simple para el arranque. Esto implica habilitar funciones esenciales como IPC System V, cgroups y soporte completo para arquitectura x86\_64, además de incluir drivers VirtIO para un rendimiento óptimo en entornos virtualizados. También se activan controladores críticos para discos (SCSI, virtio\_blk), red (E1000, virtio\_net) y el sistema de archivos ext4 integrado directamente en el kernel para evitar fallos de montaje durante el boot.

Asimismo, se habilitan opciones fundamentales para que systemd funcione como PID 1, como devtmpfs, inotify, signalfd, timerfd y epoll. Se incluyen los pseudo-filesystems /proc y sysfs, necesarios para exponer información del sistema al espacio de usuario. Finalmente, se evita compilar información de depuración para reducir el tamaño del kernel y acelerar la compilación, priorizando una configuración limpia y funcional.

### Configuración de GRUB documentada

```
[paredesivan003@rocky-host-lfs ~]$ sudo su -
Last login: Tue Dec 2 22:12:38 UTC 2025 on pts/1
[root@rocky-host-lfs ~]# grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
Found Linux From Scratch (12.4-systemd) on /dev/sdb2
Adding boot menu entry for UEFI Firmware Settings ...
done
[root@rocky-host-lfs ~]#
```

```
insmod video_cirrus
fi
}

serial --speed=115200
terminal_input serial console
terminal_output serial console
if [ "${feature_timeout_style}" = "xy" ]; then
    set timeout_style=menu
    set timeout=30
# Fallback normal timeout code in case the timeout_style feature is
# unavailable.
else
    set timeout=30
fi
### END /etc/grub.d/00_header ###

### BEGIN /etc/grub.d/01_users ###
if [ -f "${prefix}/user.cfg ]; then
    source "${prefix}/user.cfg
    if [ -n "${GRUB2_PASSWORD}" ]; then
        set superusers="root"
        export superusers
        password_pbkdf2 root "${GRUB2_PASSWORD}"
    fi
fi
### END /etc/grub.d/01_users ###

### BEGIN /etc/grub.d/08_fallback_counting ###
insmod increment
# Check if boot_counter exists and boot success=0 to activate this behaviour.
if [ -n "${boot_counter}" -a "${boot_success}" = "0" ]; then
    # if countdown has ended, choose to boot rollback deployment,
    # i.e. default=1 on OSTree-based systems.
    if [ "${boot_counter}" = "0" -o "${boot_counter}" = "-1" ]; then
        set default=1
        set boot_counter=-1
    # otherwise decrement boot_counter
    else
        decrement boot_counter
    fi
fi
-- INSERT --
```

71,17

29%

La configuración de GRUB consistió en la instalación del gestor de arranque directamente en el MBR del disco secundario (/dev/sdb) para mantener aislado el sistema anfitrión y permitir que el disco virtual arranque de forma independiente en cualquier máquina. El archivo grub.cfg se escribe manualmente, definiendo un menú simple con un único kernel y parámetros esenciales: la ruta al vmlinuz compilado, la partición raíz correcta (/dev/sdb2) y el montaje inicial en modo lectura para que systemd pueda realizar verificaciones de integridad. A diferencia de las distribuciones comerciales, donde la configuración se genera automáticamente, en LFS este proceso manual permite comprender con precisión cómo GRUB localiza y carga el kernel, reforzando el aprendizaje sobre el proceso de arranque.

Resumen de problemas y soluciones incluido (En el registro de actividad)

## 2.5 Capturas y Evidencias

### Capturas del proceso de compilación.

```
(lfs chroot) root:/sources# tar -xvf man-pages-6.15.tar.xz
man-pages-6.15/.checkpatch.conf
man-pages-6.15/.gitignore
man-pages-6.15/.shellcheckrc
man-pages-6.15/AUTHORS
man-pages-6.15/CONTRIBUTING
man-pages-6.15/CONTRIBUTING.d/bugs
man-pages-6.15/CONTRIBUTING.d/external_pages
man-pages-6.15/CONTRIBUTING.d/git
man-pages-6.15/CONTRIBUTING.d/lint
man-pages-6.15/CONTRIBUTING.d/mail
man-pages-6.15/CONTRIBUTING.d/patches/base
man-pages-6.15/CONTRIBUTING.d/patches/description
man-pages-6.15/CONTRIBUTING.d/patches/diff
man-pages-6.15/CONTRIBUTING.d/patches/patches
man-pages-6.15/CONTRIBUTING.d/patches/range-diff
man-pages-6.15/CONTRIBUTING.d/patches/sendmail
man-pages-6.15/CONTRIBUTING.d/patches/subject
man-pages-6.15/CONTRIBUTING.d/style/c
man-pages-6.15/CONTRIBUTING.d/style/man
man-pages-6.15/CPPLINT.cfg
man-pages-6.15/Changes
man-pages-6.15/Changes.old
man-pages-6.15/GNUMakefile
man-pages-6.15/INSTALL
man-pages-6.15/LICENSES/BSD-2-Clause.txt
man-pages-6.15/LICENSES/BSD-3-Clause.txt
man-pages-6.15/LICENSES/BSD-4-Clause-UC.txt
man-pages-6.15/LICENSES/GPL-1.0-or-later.txt
man-pages-6.15/LICENSES/GPL-2.0-only.txt
man-pages-6.15/LICENSES/GPL-2.0-or-later.txt
man-pages-6.15/LICENSES/GPL-3.0-or-later.txt
man-pages-6.15/LICENSES/LGPL-3.0-linking-exception.txt
man-pages-6.15/LICENSES/LGPL-3.0-or-later.txt
man-pages-6.15/LICENSES/Linux-man-pages-1-para.txt
man-pages-6.15/LICENSES/Linux-man-pages-copyleft-2-para.txt
man-pages-6.15/LICENSES/Linux-man-pages-copyleft-var.txt
man-pages-6.15/LICENSES/MIT.txt
man-pages-6.15/README
man-pages-6.15/RELEASE
man-pages-6.15/SPONSORS
man-pages-6.15/etc/checkpatch/checkpatch.conf
man-pages-6.15/etc/clang-tidy/config.yaml
man-pages-6.15/etc/cppcheck/cppcheck.suppress
man-pages-6.15/etc/cpplint/cpplint.cfg
man-pages-6.15/etc/shellcheck/shellcheckrc
man-pages-6.15/lsm
man-pages-6.15/man/man1/diffman-git.1
man-pages-6.15/man/man1/getent.1
man-pages-6.15/man/man1/iconv.1
man-pages-6.15/man/man1/intro.1
man-pages-6.15/man/man1/ldd.1
man-pages-6.15/man/man1/locale.1
man-pages-6.15/man/man1/localedef.1
man-pages-6.15/man/man1/mansect.1
man-pages-6.15/man/man1/memusage.1
man-pages-6.15/man/man1/memusagestat.1
man-pages-6.15/man/man1/mtrace.1
man-pages-6.15/man/man1/pdfman.1
man-pages-6.15/man/man1/pldd.1
man-pages-6.15/man/man1/sortman.1
man-pages-6.15/man/man1/sprof.1
```

```
(lfs chroot) root:/sources/man-pages-6.15# pwd
/sources/man-pages-6.15
(lfs chroot) root:/sources/man-pages-6.15# ls
AUTHORS      CONTRIBUTING.d  Changes  old  INSTALL  README  SPONSORS  1sm  man1  man2const  man2type  man3attr  man3head  man4  man6  man8  share
CONTRIBUTING  CONTRIBUTING.d  Changes  old  INSTALL  README  SPONSORS  1sm  man1  man2const  man3  man3const  man3type  man5  man7  scripts  src
(lfs chroot) root:/sources/man-pages-6.15# rm -v man3/crypt*
removed 'man3/crypt.3'
removed 'man3/crypt.t.3'
(lfs chroot) root:/sources/man-pages-6.15# make -R GIT=false prefix=/usr install
make: warning: undefined variable 'GNUMAKEFLAGS'
MKDIR      .tmp/man/man1/
MKDIR      /usr/share/man/man1/
MKDIR      .tmp/man/man2/
MKDIR      /usr/share/man/man2/
MKDIR      .tmp/man/man3/
MKDIR      /usr/share/man/man3/
MKDIR      .tmp/man/man3attr/
MKDIR      /usr/share/man/man3attr/
MKDIR      .tmp/man/man4/
MKDIR      /usr/share/man/man4/
MKDIR      .tmp/man/man5/
MKDIR      /usr/share/man/man5/
MKDIR      .tmp/man/man6/
MKDIR      /usr/share/man/man6/
MKDIR      .tmp/man/man7/
MKDIR      /usr/share/man/man7/
MKDIR      .tmp/man/man8/
MKDIR      /usr/share/man/man8/
SED        .tmp/man/man1/diffman-git.1
SED        .tmp/man/man1/getent.1
SED        .tmp/man/man1/loconv.1
SED        .tmp/man/man1/ldd.1
SED        .tmp/man/man1/locale.1
SED        .tmp/man/man1/localedef.1
SED        .tmp/man/man/mansect.1
SED        .tmp/man/man1/memusage.1
SED        .tmp/man/man1/memusagestat.1
SED        .tmp/man/man1/strace.1
SED        .tmp/man/man1/pdftman.1
SED        .tmp/man/man1/pldd.1
SED        .tmp/man/man1/sortman.1
SED        .tmp/man/man1/sprof.1
SED        .tmp/man/man1/time.1
SED        .tmp/man/man2/accept.2
CP          .tmp/man/man2/accept.2
SED        .tmp/man/man2/accept.2
SED        .tmp/man/man2/access.2
SED        .tmp/man/man2/acct.2
SED        .tmp/man/man2/add_key.2
SED        .tmp/man/man2/adjtimex.2
CP          .tmp/man/man2/afs_syscall.2
SED        .tmp/man/man2/alarm.2
SED        .tmp/man/man2/alloc_hugepages.2
SED        .tmp/man/man2/arch_prctl.2
CP          .tmp/man/man2/arm_fadvise.2
CP          .tmp/man/man2/arm_fadvise64.64.2
CP          .tmp/man/man2/arm_sync_file_range.2
SED        .tmp/man/man2/bdflush.2
SED        .tmp/man/man2/bind.2
SED        .tmp/man/man2/bpf.2
CP          .tmp/man/man2/break.2
SED        .tmp/man/man2/break.2
SED        .tmp/man/man2/cacheflush.2
SED        .tmp/man/man2/cachestat.2
SED        .tmp/man/man2/capget.2
CP          .tmp/man/man2/capset.2
SED        .tmp/man/man2/chdir.2
SED        .tmp/man/man2/chmod.2
SED        .tmp/man/man2/chown.2
CP          .tmp/man/man2/chown.2

(lfs chroot) root:/sources# ls
python-3.13.7
python-3.13.7.tar.xz
XML-Parser-2.47.tar.gz
acl-2.3.2.tar.xz
attr-2.5.2.tar.gz
autocore-2.72.tar.xz
automake-1.18.1.tar.xz
bash-5.3
bash-5.3.tar.gz
bc-7.0.3.tar.xz
binutils-2.45
binutils-2.45.tar.xz
bison-3.8.2
bison-3.8.2.tar.xz
bzip2-1.0.8-install_docs-1.patch
bzip2-1.0.8.tar.gz
coreutils-9.7
coreutils-9.7-118n1.patch
coreutils-9.7-upstream_fix-1.patch
coreutils-9.7.tar.xz
(lfs chroot) root:/sources# tar -xvf iana-etc-20250807.tar.gz
iana-etc-20250807/service-names-port-numbers.xml
iana-etc-20250807/services
iana-etc-20250807/protocol-numbers.xml
iana-etc-20250807/protocols
(lfs chroot) root:/sources# cd iana-etc-20250807
(lfs chroot) root:/sources/iana-etc-20250807# ls
protocol-numbers.xml  protocols  service-names-port-numbers.xml  services
(lfs chroot) root:/sources/iana-etc-20250807#
```

```
(lfs chroot) root:/sources# ls
python-3.13.7
python-3.13.7.tar.xz
XML-Parser-2.47.tar.gz
acl-2.3.2.tar.xz
attr-2.5.2.tar.gz
autocore-2.72.tar.xz
automake-1.18.1.tar.xz
bash-5.3
bash-5.3.tar.gz
bc-7.0.3.tar.xz
binutils-2.45
binutils-2.45.tar.xz
bison-3.8.2
bison-3.8.2.tar.xz
bzip2-1.0.8-install_docs-1.patch
bzip2-1.0.8.tar.gz
coreutils-9.7
coreutils-9.7-118n1.patch
coreutils-9.7-upstream_fix-1.patch
coreutils-9.7.tar.xz
(lfs chroot) root:/sources# tar -xvf iana-etc-20250807.tar.gz
iana-etc-20250807/service-names-port-numbers.xml
iana-etc-20250807/services
iana-etc-20250807/protocol-numbers.xml
iana-etc-20250807/protocols
(lfs chroot) root:/sources# cd iana-etc-20250807
(lfs chroot) root:/sources/iana-etc-20250807# ls
protocol-numbers.xml  protocols  service-names-port-numbers.xml  services
(lfs chroot) root:/sources/iana-etc-20250807#
```

```
(lfs chroot) root:/sources/iana-etc-20250807# ls
protocol-numbers.xml  protocols  service-names-port-numbers.xml  services
(lfs chroot) root:/sources/iana-etc-20250807# pwd
/sources/iana-etc-20250807
(lfs chroot) root:/sources/iana-etc-20250807# cp services protocols /etc
(lfs chroot) root:/sources/iana-etc-20250807#
```

```
(lfs chroot) root:/sources/iana-etc-20250807# ls
protocol-numbers.xml  protocols  service-names-port-numbers.xml  services
(lfs chroot) root:/sources/iana-etc-20250807# pwd
/sources/iana-etc-20250807
(lfs chroot) root:/sources/iana-etc-20250807# cp services protocols /etc
(lfs chroot) root:/sources/iana-etc-20250807#
```



```
(lfs chroot) root:/sources# ls
python-3.13.7
python-3.13.7.tar.xz
XML-Parser-2.47.tar.gz
acl-2.3.2.tar.xz
attr-2.5.2.tar.gz
autconf-2.72.tar.xz
automake-1.10.1.tar.xz
bash-5.3
bash-5.3.tar.gz
bc-7.0.3.tar.xz
binutils-2.45
binutils-2.45.tar.xz
bison-3.8.2
bison-3.8.2.tar.xz
bzip2-1.0.8-install_docs-1.patch
bzip2-1.0.8.tar.gz
coreutils-9.7
coreutils-9.7-i18n-1.patch
coreutils-9.7-upstream_fix-1.patch
coreutils-9.7.tar.xz
coreutils-9.7.tar.gz
(lfs chroot) root:/sources# tar -xvf glibc-2.42
tar: glibc-2.42: Cannot read: Is a directory
tar: At beginning of tape, quitting now
tar: Error is not recoverable: exiting now
(lfs chroot) root:/sources# tar -xvf glibc-2.42.tar.xz
glibc-2.42/
glibc-2.42/.b4-config
glibc-2.42/.clang-format
glibc-2.42/.gitattributes
glibc-2.42/.gitignore
glibc-2.42/CONTRIBUTED-BY
glibc-2.42/COPYING
glibc-2.42/COPYING.LIB
glibc-2.42/ChangeLog.old/
glibc-2.42/ChangeLog.old/ChangeLog.1
glibc-2.42/ChangeLog.old/ChangeLog.10
glibc-2.42/ChangeLog.old/ChangeLog.11
glibc-2.42/ChangeLog.old/ChangeLog.12
glibc-2.42/ChangeLog.old/ChangeLog.13
```

```
(lfs chroot) root:/sources# cd glibc-2.42
(lfs chroot) root:/sources/glibc-2.42# ls
CONTRIBUTED-BY  Makefile  SECURITY.md  bits  csu  gmon  inet  login  nptl  resource  stdio-common  test-skeleton.c
COPYING  Makefile  SHARED-FILES  build  ctype  gnulib  intl  mach  nptl_db  rt  stdlib  time
COPYING.LIB  Makefile.help  abi-tags  catgets  debug  io  locale  malloc  nscd  scripts  string  timezone
ChangeLog.old  Makefile.in  aclocal.m4  config.h.in  dirent  htl  libc-abis  manual  nss  setjmp  sunrpc  version.h
INSTALL  Makefiles  advisories  config.make.in  elfcn  hurd  libio  math  o-iterator.mk  shlib-versions  support  wcsmb
LICENSES  NEWS  arpc  configure  elf  iconv  libio-iterator.mk  mathvec  po  signal  sysdeps  wctype
MAINTAINERS  README  assert  configure.ac  extra-lib.mk  iconvdata  locale  misc  posix  socket  sysvipc
Makeconfig  Rules  benchmarks  gen-locales.mk  include  localizedata  nis  resolv  soft-fp
(lfs chroot) root:/sources/glibc-2.42# patch -Np1 -i ../glibc-2.42-fhs-1.patch
patching file Makeconfig
Hunk #1 succeeded at 262 (offset 12 lines).
patching file nsd/nsd.h
Hunk #1 succeeded at 160 (offset 48 lines).
patching file nss/db-Makefile
Hunk #1 succeeded at 21 (offset -1 lines).
patching file sysdeps/generic/paths.h
patching file sysdeps/unix/sysv/linux/paths.h
(lfs chroot) root:/sources/glibc-2.42#
```



## SSH-in-browser

```
(lfs chroot) root:/sources/glibc-2.42# sed -e '/unistd.h/i #include <string.h>' \
-e '/libc_rwlock_init/c\
__libc_rwlock define initialized (, reset lock);\
memcpy (&lock, &reset_lock, sizeof (lock));' \
-i stdlib/abort.c
(lfs chroot) root:/sources/glibc-2.42# mkdir -v build
```

```
(lfs chroot) root:/sources/glibc-2.42/build# echo "rootbindir=/usr/sbin" > configparms
(lfs chroot) root:/sources/glibc-2.42/build# ../configure --prefix=/usr \
--disable-werror \
--disable-nscd \
libc_cv_slibdir=/usr/lib \
--enable-stack-protector=strong \
--enable-kernel=5.4
checking build system type... x86_64-pc-linux-gnu
checking host system type... x86_64-pc-linux-gnu
checking for gcc... gcc
checking for suffix of object files... o
checking whether the compiler supports GNU C... yes
checking whether gcc accepts -g... yes
checking for gcc option to enable c11 features... none needed
checking for g++... g++
checking whether the compiler supports GNU C++... yes
checking whether g++ accepts -g... yes
checking for g++ option to enable C++11 features... none needed
checking whether g++ can link programs... yes
checking for sysdeps preconfigure fragments... aarch64 alpha arc arm csky hppa i386 loongarch m68k microblaze checking for egrep -e... /usr/bin/grep -E
mips ork powerpc riscv s390 sh checking for egrep -e... (cached) /usr/bin/grep -E
sparc x86_64 checking whether gcc compiles in -mx32 mode by default... no

checking for a BSD-compatible install... /usr/bin/install -c
checking whether ln -s works... yes
checking for /usr/lib/gcc/x86_64-linux-gnu/15.2.0/../../../../x86_64-linux-gnu/bin/ld... /usr/lib/gcc/x86_64-linux-gnu/15.2.0/../../../../x86_64-linux-gnu/bin/ld
checking version of /usr/lib/gcc/x86_64-linux-gnu/15.2.0/../../../../x86_64-linux-gnu/bin/ld... 2.45, ok
checking for gnumake... no
checking for make... no
checking for make... make
checking version of make... 4.4.1, ok
checking for gnumsgfmt... no
checking for msgfmt... no
checking for msgfmt... msgfmt
checking version of msgfmt... 0.26, ok
checking for makeinfo... makeinfo
checking version of makeinfo... 7.2, ok
checking for sed... sed
checking version of sed... 4.9, ok
checking for gawk... gawk
checking version of gawk... 5.3.2, ok
```

[illegible]

```

UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-g
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-G-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-e
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-e-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-f
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-f-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-g
UNSUPPORTED: stdio-common/tst-printf-format-vsn-double-g-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-E
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-E-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-F
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-F-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-G
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-G-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-e
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-e-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-f
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-f-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-g
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ldouble-g-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-long
UNSUPPORTED: stdio-common/tst-printf-format-vsn-long-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-long
UNSUPPORTED: stdio-common/tst-printf-format-vsn-long-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ullong
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ullong-mem
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ulong
UNSUPPORTED: stdio-common/tst-printf-format-vsn-ulong-mem
UNSUPPORTED: stdio-common/tst-setvbuf2
UNSUPPORTED: stdio-common/tst-setvbuf2-ind
UNSUPPORTED: stdlib/tst-system
UNSUPPORTED: string/tst-strerror
UNSUPPORTED: string/tst-strsignal
UNSUPPORTED: support/tst-support-panpty-c
UNSUPPORTED: time/tst-clock-ptime
UNSUPPORTED: time/tst-settimeofday
UNSUPPORTED: time/tst-settimeofday

=== Summary of results ===

1 FAIL
6580 PASS
507 UNSUPPORTED
16 XPASS
4 XPASS

make[1]: *** [Makefile:678: tests] Error 1
make[1]: Leaving directory /sources/glibc-2.42'
make: *** [Makefile:23: check] Error 2
(lfs chroot) root:/sources/glibc-2.42/build#

```



```
(lfs chroot) root://sources/glibc-2.42/build# ls
Makefile
Versions.all
Versions.def
Versions.mk
Versions.tmp
Versions.v
Versions.v.i
abi-versions.h
argp
assert
bits
c++-types-check.out
c++-types-check.test-result
catgets
check-installed-headers-c.out
check-installed-headers-c.test-result
check-installed-headers-cxx.out
check-installed-headers-cxx.test-result
check-local-headers.out
check-local-headers.test-result
check-wrapper-headers.out
check-wrapper-headers.test-result
cmath
config.h
config.log
config.make
config.status
(lfs chroot) root://sources/glibc-2.42/build#
```

## Captura del sistema arrancado

SSH en el navegador

SUBIR ARCHIVODESCARGAR ARCHIVO

```
lfs login:

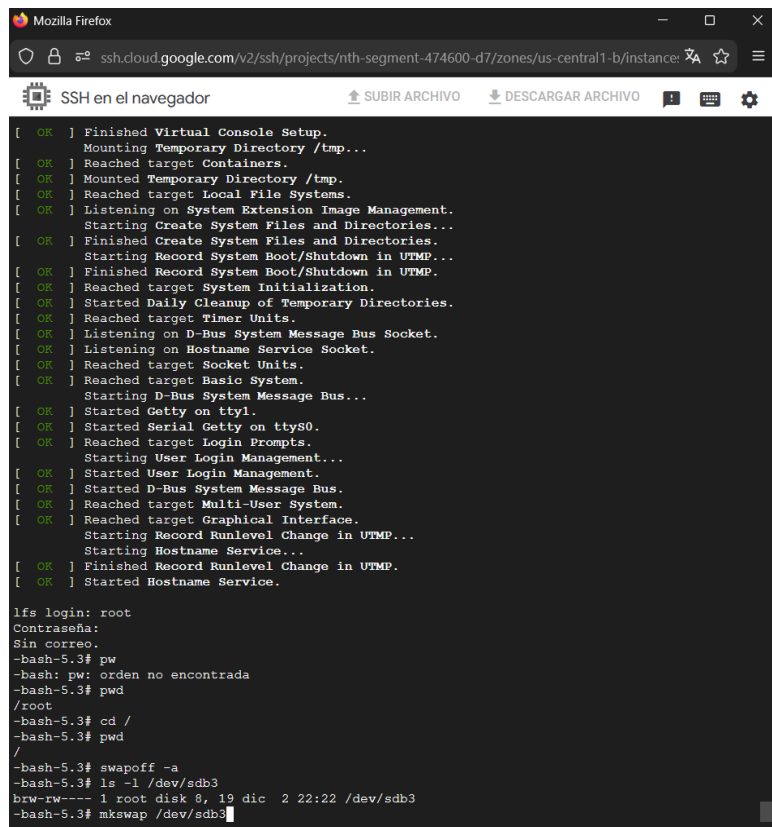
Rocky Linux (6.12.0-124.13.1+2.1.el10_1.ciq.x86_64) 10.0 (Red Quartz)
Rocky Linux (6.12.0-55.43.1+2.2.el10_0.ciq.x86_64) 10.0 (Red Quartz)
Rocky Linux (6.12.0-55.32.1.el10_0.cld_next.2.1.x86_64) 10.0 (Red Quartz)
Rocky Linux (0-rescue-d3e3479acf4d47c3b470aa345dfa211a) 10.0 (Red Quartz)
*GNU/Linux, Linux 6.16.1-lfs-12.4-systemd (on /dev/sdb2)
UEFI Firmware Settings
```

SSH en el navegador

SUBIR ARCHIVODESCARGAR ARCHIVO

```
Starting Virtual Console Setup...
[ OK ] Activated swap /dev/sdb3. Priority:1 extents:1 across:563196k SS
[ OK ] Reached target Swaps.
[ OK ] Finished Enable Persistent Storage in systemd-networkd.
[ OK ] Finished File System Check on /dev/sdb4.
[ OK ] Finished Virtual Console Setup.
Mounting /home...
Mounting Temporary Directory /tmp...
[ OK ] Reached target Containers.
[ OK ] Mounted Temporary Directory /tmp.
[ 3.561452] EXT4-fs (sdb4): mounted filesystem 1f6f80f6-6ed1-4e8c-9337-02306b4fc679 r/w with ordered data mode. Quota mode: none.
[ OK ] Mounted /home.
[ OK ] Reached target Local File Systems.
[ OK ] Listening on System Extension Image Management.
Starting Create System Files and Directories...
[ OK ] Finished Create System Files and Directories.
Starting Record System Boot/Shutdown in UTMP...
[ OK ] Finished Record System Boot/Shutdown in UTMP.
[ OK ] Reached target System Initialization.
[ OK ] Started Daily Cleanup of Temporary Directories.
[ OK ] Reached target Timer Units.
[ OK ] Listening on D-Bus System Message Bus Socket.
[ OK ] Listening on OpenSSH Server Socket.temd-ssh-generator, AF_UNIX Local).
[ OK ] Listening on Hostname Service Socket.
[ OK ] Reached target Socket Units.
[ OK ] Reached target Basic System.
Starting D-Bus System Message Bus...
[ OK ] Started OpenSSH Daemon.
Starting User Login Management...
Starting Permit User Sessions...
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttyS0.
[ OK ] Reached target Login Prompts.
[ OK ] Started D-Bus System Message Bus.
Starting Hostname Service...
[ OK ] Started User Login Management.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
Starting Record Runlevel Change in UTMP...
[ OK ] Finished Record Runlevel Change in UTMP.
[ OK ] Started Hostname Service.

lfs login:
```



```
[ OK ] Finished Virtual Console Setup.
[ OK ] Mounting Temporary Directory /tmp...
[ OK ] Reached target Containers.
[ OK ] Mounted Temporary Directory /tmp.
[ OK ] Reached target Local File Systems.
[ OK ] Listening on System Extension Image Management.
[ OK ] Starting Create System Files and Directories...
[ OK ] Finished Create System Files and Directories.
[ OK ] Starting Record System Boot/Shutdown in UTMP...
[ OK ] Finished Record System Boot/Shutdown in UTMP.
[ OK ] Reached target System Initialization.
[ OK ] Started Daily Cleanup of Temporary Directories.
[ OK ] Reached target Timer Units.
[ OK ] Listening on D-Bus System Message Bus Socket.
[ OK ] Listening on Hostname Service Socket.
[ OK ] Reached target Socket Units.
[ OK ] Reached target Basic System.
[ OK ] Starting D-Bus System Message Bus...
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttyS0.
[ OK ] Reached target Login Prompts.
[ OK ] Starting User Login Management...
[ OK ] Started User Login Management.
[ OK ] Started D-Bus System Message Bus.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
[ OK ] Starting Record Runlevel Change in UTMP...
[ OK ] Starting Hostname Service...
[ OK ] Finished Record Runlevel Change in UTMP.
[ OK ] Started Hostname Service.

lfs login: root
Contraseña:
Sin correo.
-bash-5.3# pw
-bash: pw: orden no encontrada
-bash-5.3# pwd
/root
-bash-5.3# cd /
-bash-5.3# pwd
/
-bash-5.3# swapoff -a
-bash-5.3# ls -l /dev/sdb3
brw-rw---- 1 root disk 8, 19 dic  2 22:22 /dev/sdb3
-bash-5.3# mkswap /dev/sdb3
```

Logs relevantes incluidos (En el registro de actividad)

## SECCIÓN 3: SYSTEMD (OBLIGATORIO)

### 3.1 Implementación de Systemd

El sistema usa systemd como init (Si)

Systemd aparece como PID 1 (Si)

### 3.2 Verificación y Evidencias (Todas estas verificaciones se hacen con el script check\_server.sh, revisar la guía de pruebas)

Incluye salida del comando systemctl

Incluye salida de pstree mostrando systemd como PID 1

Captura de systemctl status

### 3.3 Servicio Implementado

Nombre del servicio demostrado (SSH, nginx, etc.)

### 3.4 Evidencia del Servicio

Al menos un servicio levantado con systemd

Evidencia de que el servicio está activo

Comandos de habilitación/inicio documentados (En la guía de pruebas)

### 3.5 Documentación de Systemd

Logs o capturas de configuración de unidades

Documentación de archivos .service creados/modificados (En la guía de pruebas)

```
C:\Program Files\WindowsAp x + v
root@lfs:/# pstree -p | head -20
systemd(1)---agetty(271)
|
|---agetty(272)
|---dbus-daemon(266)
|---sshd(267)---sshd-session(296)---sshd-session(314)---bash(315)---+--head(780)
|                                                              ^-pstree(779)
|
|---systemd(303)---(sd-pam)(306)
|---systemd-journal(134)
|---systemd-logind(268)
|---systemd-network(207)
|---systemd-nsresou(164)---+--systemd-nsresou(712)
|                           |---systemd-nsresou(713)
|                           |---systemd-nsresou(716)
|                           |---systemd-nsresou(717)
|                           ^-systemd-nsresou(718)
|---systemd-oomd(139)
|---systemd-resolve(165)
|---systemd-timesyn(193)---[systemd-timesyn](196)
^-systemd-udev(194)
root@lfs:/# journalctl
dic 02 21:39:29 lfs kernel: Linux version 6.16.1 (root@rocky-host-lfs) (gcc (GCC) 15.2.0, GNU ld (GNU Binutils) 2.45) #1 SMP PREEMPT_DYNAMIC Tue Dec  2 20:2
dic 02 21:39:29 lfs kernel: Command line: BOOT_IMAGE=/boot/vmlinuz-6.16.1-lfs-12.4-systemd root=/dev/sdb2 ro net.ifnames console=ttyS0
dic 02 21:39:29 lfs kernel: [Firmware Bug]: TSC doesn't count with P0 frequency!
dic 02 21:39:29 lfs kernel: BIOS-provided physical RAM map:
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x0000000000000000-0x0000000000000fff] reserved
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x0000000000001000-0x00000000000054fff] usable
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x00000000000055000-0x0000000000005ffff] reserved
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x00000000000060000-0x00000000000097fff] usable
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x00000000000098000-0x00000000000099fff] reserved
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000100000-0x000000000000bd2e6fff] usable
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bd2e7000-0x000000000000bd2f0fff] ACPI data
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bd2f1000-0x000000000000bfb6cfff] usable
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bfb6d000-0x000000000000bfb6cfff] reserved
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bfb6d000-0x000000000000bfb7efff] ACPI data
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bfb7f000-0x000000000000bfb7efff] ACPI NVS
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bfbff000-0x000000000000bfffdf] usable
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x000000000000bffe0000-0x000000000000bfffdf] reserved
dic 02 21:39:29 lfs kernel: BIOS-e820: [mem 0x00000000100000000-0x00000000000083ffffff] usable
```

```
C:\Program Files\WindowsAp x + v
root@lfs:/# /srv/http-lfs/start_server.sh
=== Iniciando Servidor HTTP TP LFS ===

Recargando systemd...
Iniciando servicio lfs-http...

=== Estado del Servicio ===
● lfs-http.service - Servidor HTTP TP LFS
   Loaded: loaded (/usr/lib/systemd/system/lfs-http.service; disabled; pre
  set: enabled)
   Active: active (running) since Thu 2025-12-11 23:09:06 -03; 1s ago
 Invocation: b8f8943084054b599ebfd1f910586f57
    Main PID: 394 (python3)
      Tasks: 1 (limit: 38449)
     Memory: 8.9M (peak: 8.9M)
        CPU: 81ms
    CGroup: /system.slice/lfs-http.service
            └─394 /usr/bin/python3 /srv/http-lfs/mini_server.py

dic 11 23:09:06 lfs systemd[1]: Started Servidor HTTP TP LFS.

=== Información de Conexión ===
🔗 Accede desde:
  Local: http://localhost:8081/
  Red:    http://<tu-ip>:8081/

📄 Comandos útiles:
  Ver logs:    journalctl -u lfs-http -f
  Ver estado:  systemctl status lfs-http
  Parar:       systemctl stop lfs-http
root@lfs:/#
```

```
C:\Program Files\WindowsAp x + v
Ver estado: systemctl status lfs-http
Parar: systemctl stop lfs-http
root@lfs:/# /srv/http-lfs/check_server.sh
=== Verificación Servidor HTTP TP LFS ===
Fecha: jue 11 dic 2025 23:09:28 -03

1. 🐧 PID 1 del sistema:
systemd
✅ Systemd es el PID 1

2. ⚙️ Estado del servicio lfs-http:
✅ ACTIVO
Main PID: 394 (python3)
Tasks: 1 (limit: 38449)
Memory: 8.9M (peak: 8.9M)
CPU: 85ms
CGroup: /system.slice/lfs-http.service
└─394 /usr/bin/python3 /srv/http-lfs/mini_server.py

3. 🌐 Puerto 8081:
✅ EN ESCUCHA
LISTEN 0 0 0.0.0.0:8081 0.0.0.0:* users:(("python3",
pid=394,fd=3))

4. 📡 Prueba de conexión:
✅ Servidor responde (via Python)

5. 📄 Logs recientes:
dic 11 17:05:12 lfs systemd[1]: lfs-http.service: Deactivated successfully.
dic 11 17:05:12 lfs systemd[1]: Stopped Servidor HTTP TP LFS.
-- Boot d2e970741c4e4d31a532748f46b09d37 --
dic 11 23:09:06 lfs systemd[1]: Started Servidor HTTP TP LFS.

6. 🌐 Información de acceso:
URL: http://:8081/
URL local: http://localhost:8081/
root@lfs:/#
```

```
C:\Program Files\WindowsAp x + v

2. ⚙️ Estado del servicio lfs-http:
✅ ACTIVO
Main PID: 394 (python3)
Tasks: 1 (limit: 38449)
Memory: 8.9M (peak: 8.9M)
CPU: 85ms
CGroup: /system.slice/lfs-http.service
└─394 /usr/bin/python3 /srv/http-lfs/mini_server.py

3. 🌐 Puerto 8081:
✅ EN ESCUCHA
LISTEN 0 0 0.0.0.0:8081 0.0.0.0:* users:(("python3",
pid=394,fd=3))

4. 📡 Prueba de conexión:
✅ Servidor responde (via Python)

5. 📄 Logs recientes:
dic 11 17:05:12 lfs systemd[1]: lfs-http.service: Deactivated successfully.
dic 11 17:05:12 lfs systemd[1]: Stopped Servidor HTTP TP LFS.
-- Boot d2e970741c4e4d31a532748f46b09d37 --
dic 11 23:09:06 lfs systemd[1]: Started Servidor HTTP TP LFS.

6. 🌐 Información de acceso:
URL: http://:8081/
URL local: http://localhost:8081/
root@lfs:/# python3 -c "import urllib.request; print(urllib.request.urlopen(
'http://localhost:8081/').read().decode()[:200])"
<html>
<head><title>LFS Systemd TP</title></head>
<body>
<h1>✅ LFS con Systemd funcionando!</h1>
<p><strong>PID 1:</strong> systemd</p>
```

```
C:\Program Files\WindowsAp x + v
root@lfs:/# ps -p 1 -o pid,comm,args
PID COMMAND COMMAND
1 systemd /sbin/init
root@lfs:/# systemctl status lfs-http
● lfs-http.service - Servidor HTTP TP LFS
   Loaded: loaded (/usr/lib/systemd/system/lfs-http.service; disabled; pr>
   Active: active (running) since Thu 2025-12-11 23:09:06 -03; 2min 15s a>
  Invocation: b8f8943084054b599ebfd1f910586f57
    Main PID: 394 (python3)
      Tasks: 1 (limit: 38449)
     Memory: 8.9M (peak: 8.9M)
        CPU: 104ms
    CGroup: /system.slice/lfs-http.service
            └─394 /usr/bin/python3 /srv/http-lfs/mini_server.py

dic 11 23:09:06 lfs systemd[1]: Started Servidor HTTP TP LFS.
... skipping ...
● lfs-http.service - Servidor HTTP TP LFS
   Loaded: loaded (/usr/lib/systemd/system/lfs-http.service; disabled; pr>
   Active: active (running) since Thu 2025-12-11 23:09:06 -03; 2min 15s a>
  Invocation: b8f8943084054b599ebfd1f910586f57
    Main PID: 394 (python3)
      Tasks: 1 (limit: 38449)
     Memory: 8.9M (peak: 8.9M)
        CPU: 104ms
    CGroup: /system.slice/lfs-http.service
            └─394 /usr/bin/python3 /srv/http-lfs/mini_server.py

dic 11 23:09:06 lfs systemd[1]: Started Servidor HTTP TP LFS.
~
~
~
~
~
~
~
```

Reflexión sobre beneficios de systemd vs métodos antiguos.

Construir Linux From Scratch utilizando systemd ofrece una formación mucho más alineada con las prácticas modernas y estándares de la industria, ya que este init es el estándar en la mayoría de las distribuciones actuales y permite comprender cómo funcionan realmente los sistemas usados en entornos profesionales. Su capacidad de paralelizar el arranque y activar servicios bajo demanda mejora la eficiencia, mientras que su gestión declarativa de dependencias reduce errores y enseña a trabajar con *unit files*. El control de procesos con cgroups aporta trazabilidad y control preciso de procesos, journald unifica y potencia el análisis de logs, y herramientas como *hostnamectl* o *timedatectl* estandarizan configuraciones antes dispersas. Esto convierte el proyecto LFS en un entrenamiento moderno para administrar sistemas complejos y de alto rendimiento.

## SECCIÓN 4: REGISTRO DE PROCESO / DIARIO

### 4.1 Formato y Ubicación

Archivo incluido en repositorio GitLab

shell: [Red343/flsh](#)

Documentación LFS: [Red343/Documentaci-n-LFS: LFS](#)

Formato adecuado (Markdown o PDF)



## 4.2 Contenido del Diario

Fecha y hora registradas en cada sesión  
Tareas realizadas documentadas  
Comandos principales ejecutados  
Problemas encontrados descritos  
Soluciones aplicadas documentadas  
Participantes de cada sesión identificados

## 4.3 Evidencias Visuales

Capturas de pantalla de errores  
Fragmentos de logs relevantes  
Evidencias de avances progresivos

## 4.4 Control de Versiones

Commits con mensajes claros y consistentes  
Se identifica quién realizó qué en cada commit  
Narración en primera persona plural

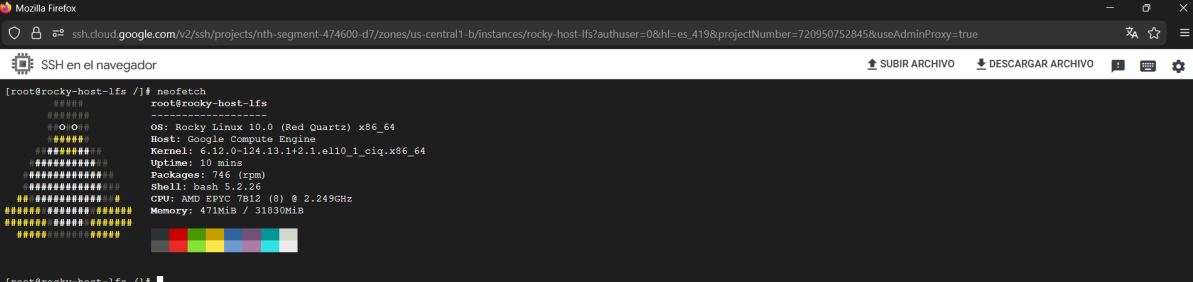
## 4.5 Calidad del Proceso

Muestra el proceso real de construcción  
Incluye reflexión sobre errores y aprendizajes  
Evidencia de trabajo grupal colaborativo

# SECCIÓN 5: HOST Y REQUISITOS TÉCNICOS

## 5.1 Informe Técnico del Host

### Captura de neofetch



```
[root@rocky-host-lfs /]# neofetch
root@rocky-host-lfs
#####
##O.O##  OS: Rocky Linux 10.0 (Red Quartz) x86_64
#####  Host: Google Compute Engine
#####  Kernel: 6.12.0-124.13.1.el10_1.ciq.x86_64
#####  Uptime: 10 mins
#####  Packages: 746 (rpm)
#####  Shell: bash 5.2.26
#####  CPU: AMD Ryzen 7512 (8) @ 2.249GHz
#####  Memory: 471MiB / 31830MiB
#####  ██████████
#####

[root@rocky-host-lfs /]#
```

## Captura de lscpu

SSH-in-browser

```
[root@rocky-host-lfs ~]# lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:          46 bits physical, 48 bits virtual
Byte Order:             Little Endian
CPU(s):                 8
On-line CPU(s) list:   0-7
Vendor ID:              GenuineIntel
BIOS Vendor ID:         Google
Model name:             Intel(R) Xeon(R) CPU @ 2.20GHz
  BIOS Model name:      CPU @ 2.0GHz
  BIOS CPU family:      1
  CPU family:           6
  Model:                79
  Thread(s) per core:   2
  Core(s) per socket:   4
  Socket(s):            1
  Stepping:             0
  BogoMIPS:             4399.99
  Flags:                fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mm
x fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant tsc rep_good nopl xtop
ology nonstop_tsc cpuid tsc_known_freq pni pclmulqdq ssse3 fma cx16 pcid sse4_1 ss
e4_2 x2apic movbe popcnt aes xsave avx f16c rdrand hypervisor lahf_lm aba 3dnowpre
fetch ptl sdbg ibrs ibpb stibp fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms in
vpcid rtm rdseed adx smap xsaveopt arat md_clear arch_capabilities

Virtualization features:
Hypervisor vendor:     KVM
Virtualization type:   full
Caches (sum of all):
  L1d:                  128 KiB (4 instances)
  L1i:                  128 KiB (4 instances)
  L2:                   1 MiB (4 instances)
  L3:                   55 MiB (1 instance)
NUMA:
  NUMA node(s):         1
  NUMA node0 CPU(s):    0-7
Vulnerabilities:
Gather data sampling:   Not affected
Indirect target selection: Mitigation: Aligned branch/return thunks
Itlb multihit:         Not affected
L1tf:                  Mitigation: PTE Inversion
Mds:                   Mitigation: Clear CPU buffers; SMT Host state unknown
Meltdown:              Mitigation: PTI
Mmio stale data:       Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
Reg file data sampling: Not affected
Retbleed:              Mitigation: IBRS
Spec rstack overflow:   Not affected
Spec store bypass:     Mitigation: Speculative Store Bypass disabled via prctl
Spectre v1:            Mitigation: usercopy/swapgs barriers and __user pointer sanitization
Spectre v2:            Mitigation: IBRS; IBPB conditional; STIBP conditional; RSB filling; PBSRB-eIBRS No
t affected; BHI SW loop, KVM SW loop
Srbds:                 Not affected
Taa:                   Not affected
Tsx async abort:       Mitigation: Clear CPU buffers; SMT Host state unknown
Vmscape:               Not affected
[root@rocky-host-lfs ~]#
```

## Captura de free -h

SSH-in-browser

⬆️ UPLOAD FILE ⬇️ DOWNLOAD

```
[root@rocky-host-lfs ~]# free -h
              total        used        free      shared  buff/cache   available
Mem:           31Gi       939Mi       29Gi         8.6Mi       904Mi       30Gi
Swap:           0B           0B           0B
[root@rocky-host-lfs ~]#
```

## Captura de df -h

SSH-in-browser

⬆️ UPLOAD FILE ⬇️ DOWNLOAD FILE ⓘ ⌨️ ⚙️

```
[root@rocky-host-lfs ~]# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda2       20G   17G   3.5G   83% /
devtmpfs        16G    0    16G    0% /dev
tmpfs           16G    0    16G    0% /dev/shm
efivarfs        56K   24K   27K   48% /sys/firmware/efi/efivars
tmpfs           6.3G   8.6M   6.3G    1% /run
tmpfs           1.0M    0    1.0M    0% /run/credentials/systemd-journald.service
/dev/sda1       200M   8.6M  192M    5% /boot/efi
tmpfs           1.0M    0    1.0M    0% /run/credentials/getty@tty1.service
tmpfs           1.0M    0    1.0M    0% /run/credentials/serial-getty@ttyS0.service
tmpfs           3.2G   4.0K   3.2G    1% /run/user/1003
[root@rocky-host-lfs ~]#
```

## 5.6 Cumplimiento de Requisitos

Cumple requisitos mínimos de CPU (4+ núcleos)

Cumple requisitos mínimos de RAM (8+ GB)

Cumple requisitos mínimos de almacenamiento (20+ GB)

Espacio suficiente asignado a /mnt/lfs (10+ GB)

```
[root@rocky-host-lfs ~]# lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda          8:0    0   20G  0 disk
├─sda1       8:1    0  200M  0 part /boot/efi
└─sda2       8:2    0  19.8G  0 part /
sdb          8:16   0   50G  0 disk
├─sdb1       8:17   0    2M  0 part
├─sdb2       8:18   0   30G  0 part /mnt/lfs
├─sdb3       8:19   0  550M  0 part
└─sdb4       8:20   0  19.3G  0 part
```

## 5.7 Justificación y Evidencias

Justificación clara del cumplimiento de requisitos

Evidencia de funcionamiento correcto del entorno

Documentación de tiempos de compilación

Sin errores por falta de recursos

## SECCIÓN 6: OPCIONES INNOVADORAS

### Opción 1 - Contenedores

LFS empaquetado en imagen de contenedor

Dockerfile o Podmanfile incluido

Contenedor ejecutable y funcional

Explicación de limitaciones documentada

Reflexión sobre virtualización vs contenerización

#Las pruebas del Docker se encuentran en el archivo de pruebas dentro del repositorio Github#

### Opción 2 - Servicio en Red

Servicio funcional (SSH, lighttpd, nginx, etc.)

Servicio accesible desde la red

Configuración documentada

Pruebas de conectividad incluidas

Capturas de servicio activo

#Las pruebas del Servicio en Red se encuentran en el archivo de pruebas dentro del repositorio Github#