

Кросс-компиляция Zlib + LibreSSL + OpenSSH для armv7

```
user@debian1: ~/zlib-1.3.1
CMakeLists.txt  deflate.h  gzwrite.c  inftrees.c  nintendods  trees.h      zlib.3.pdf
compress.c      doc        INDEX     inftrees.h  old         uncompr.c    zlib.h
configure       examples  infback.c  _install   os400       watcom       zlib.map
configure.log   FAQ      inffast.c  LICENSE    qnx         win32        zlib.pc
contrib        gzclose.c inffast.h  Makefile   README     zconf.h      zlib.pc.cmakein

user@debian1:~/zlib-1.3.1$ CC=arm-linux-gnueabi-gcc CROSS_PREFIX=arm-linux-gnueabi- ./configure --static --prefix ./_install/
Using arm-linux-gnueabi-gcc
Using arm-linux-gnueabi-gcc
Using arm-linux-gnueabi-gcc
Building static library libz.a version 1.3.1 with arm-linux-gnueabi-gcc.
Checking for size_t... Yes.
Checking for off64_t... Yes.
Checking for fseeko... Yes.
Checking for strerror... Yes.
Checking for unistd.h... Yes.
Checking for stdarg.h... Yes.
Checking whether to use vs[n]printf() or s[n]printf()... using vs[n]printf().
Checking for vsnprintf() in stdio.h... Yes.
Checking for return value of vsnprintf()... Yes.
Checking for attribute(visibility) support... Yes.
user@debian1:~/zlib-1.3.1$ make
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -c -o example.o test/example.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o adler32.o adler32.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o crc32.o crc32.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o deflate.o deflate.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o infback.o infback.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o inffast.o inffast.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o inflate.o inflate.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o inftrees.o inftrees.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o trees.o trees.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o zutil.o zutil.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o compress.o compress.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o uncompr.o uncompr.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o gzclose.o gzclose.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o gzlib.o gzlib.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o gzread.o gzread.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c -o gzwrite.o gzwrite.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -c libz.a adler32.o crc32.o deflate.o infback.o inffast.o inflate.o inftrees.o trees.o zutil.o compress.o uncompr.o gzclose.o gzlib.o gzread.o gzwrite.o
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o example example.o -L. libz.a
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -c -o minigzip.o test/minigzip.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o minigzip minigzip.o -L. libz.a
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -D_FILE_OFFSET_BITS=64 -c -o example64.o test/example.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o example64 example64.o -L. libz.a
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -I. -D_FILE_OFFSET_BITS=64 -c -o minigzip64.o test/minigzip.c
arm-linux-gnueabi-gcc -O3 -D_LARGEFILE64_SOURCE=1 -DHAVE_HIDDEN -o minigzip64 minigzip64.o -L. libz.a
user@debian1:~/zlib-1.3.1$ make install
rm -f ./_install/lib/libz.a
cp libz.a ./_install/lib
chmod 644 ./_install/lib/libz.a
rm -f ./_install/share/man/man3/zlib.3
cp zlib.3 ./_install/share/man/man3
chmod 644 ./_install/share/man/man3/zlib.3
rm -f ./_install/lib/pkgconfig/zlib.pc
cp zlib.pc ./_install/lib/pkgconfig
chmod 644 ./_install/lib/pkgconfig/zlib.pc
rm -f ./_install/include/zlib.h ./_install/include/zconf.h
cp zlib.h zconf.h ./_install/include
chmod 644 ./_install/include/zlib.h ./_install/include/zconf.h
user@debian1:~/zlib-1.3.1$
```

Компилируем **zlib**.

```
config.status: executing depfiles commands
config.status: executing libtool commands
user@debian1:~/libressl-4.1.0$ LDFLAGS="--static" CFLAGS="-fPIC" ./configure --prefix=$PWD/_install/ --host=arm-linux-gnueabi
```

Конфигурируем **libressl**.


```
user@debian: ~
make[2]: Entering directory '/home/user/libressl-4.1.0/tests'
make[2]: Nothing to be done for 'install-exec-am'.
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/home/user/libressl-4.1.0/tests'
make[1]: Leaving directory '/home/user/libressl-4.1.0/tests'
make[1]: Entering directory '/home/user/libressl-4.1.0'
make[2]: Entering directory '/home/user/libressl-4.1.0'
make install-exec-hook
make[2]: Entering directory '/home/user/libressl-4.1.0'
make[3]: Leaving directory '/home/user/libressl-4.1.0'
make[3]: Leaving directory '/home/user/libressl-4.1.0'
/usr/bin/mkdir -p '/home/user/libressl-4.1.0_install/usr/lib/pkgconfig'
/usr/bin/install -c -m 644 libtls.pc libcrypto.pc libssl.pc openssl.pc '/home/user/libressl-4.1.0_install/usr/lib/pkgconfig'
make[2]: Leaving directory '/home/user/libressl-4.1.0'
make[1]: Leaving directory '/home/user/libressl-4.1.0'
user@debian:~/libressl-4.1.0_install$ ls
usr
user@debian:~/libressl-4.1.0_install$ ls usr/
bin etc include lib share
user@debian:~/libressl-4.1.0_install$ ls
usr
user@debian:~/libressl-4.1.0_install$ cd usr/
user@debian:~/libressl-4.1.0_install/usr$ cp -r * ~/openssh-10.0p1/libressl/
user@debian:~/libressl-4.1.0_install/usr$ ls
bin etc include lib share
user@debian:~/libressl-4.1.0_install/usr$ cd ..
user@debian:~/libressl-4.1.0_install$ ls
usr
user@debian:~/libressl-4.1.0_install$ cp -r . ~/busybox-1.37.0_install/
user@debian:~/libressl-4.1.0_install$

cmp      factor      killall    nl          realpath  shred      tee        unlink     xz
comm     fallocate  last      nmeter     renice    shuf       test      unlnma     xzcat
crc32    fgconsole  less      nrohp      reset     smemcap    test      unshare    yes
crontab  find       logger    nproc      resize    softlimit  tftp      unixz

user@debian:~/busybox-1.37.0_install$ cd ..
user@debian:~/busybox-1.37.0$ ls
applets  configs      install     make_single_applets.sh  selinux
apptets_sh  console-tools  INSTALL    miscutils              shell
arch       coreutils    klibc-utils  modutils              size_single_applets.sh
archival   debianutils  libbb       networkd              sysklogd
AUTHORS    docs         libpwdgrp   NOFORN_NOEXEC.sh     test suite
busybox    editors      LICENSE     NOFORN_NOEXEC.sh     TODO
busybox_ldscript.README.txt  loginutils  printutils
busybox.links  examples    mailutils  procps
busybox_unstripped  findutils  Makefile   qemu_multiarch_testing  util-linux
busybox_unstripped.map  gcc_14.patch  Makefile.custom  README
busybox_unstripped.out  include     Makefile.flags  runit
Config.in      init       Makefile.help   scripts

user@debian:~/busybox-1.37.0$ ls _install/
bin sbin usr var
user@debian:~/busybox-1.37.0$ cd _install/
user@debian:~/busybox-1.37.0_install$ ls
bin sbin usr var
user@debian:~/busybox-1.37.0_install$ find . -path ./initramfs.cpio.gz -prune -o -print0 | \
> cpio -null -o -H newc | gzip -9 > initramfs.cpio.gz.tmp && \
z> mv initramfs.cpio.gz.tmp initramfs.cpio.gz
132740 blocks
user@debian:~/busybox-1.37.0_install$ ls
bin initramfs.cpio.gz sbin usr var
user@debian:~/busybox-1.37.0_install$

cp @bussh"
"debian" 07:04 00-Sep-25
```

Скомпилированный **openssh** устанавливаем в **rootfs** с **busybox**-ом и упаковываем всё это в **cpio** архив.

```

[[ eject logname printf split tty size
ascii env lpq pscan ssh udhcpc6
awk envdir lpr pstree ssh-add udpsvd
basename envuidgid lsof pwdx ssh-agent unexpand
bc expand lspci readlink ssh-keygen uniq
beep expr lsscsi realpath ssh-keyscan unix2dos
blkdiscard factor lsusb renice ssl_client unlink
bunzip2 fallocate lzcat reset strings unlzma
bzip2 fgconsole lzma resize sum unshare
cal find man rpm2cpio sv unxz
chpst flock md5sum runsv svc unzip
chrt free mesg runsvdir svok uptime
chvt ftpget mkfifo scp tail uudecode
cksum ftpput mkpasswd script taskset uuencode
clear fuser nc seq tcpsvd vlock
cmp getfattr netcat setfattr tee volname
comm groups nl setkeycodes telnet w
crc32 hd nmeter setsid test wall
crontab head nohup setuidgid tftp wc
cryptpw hexdump nproc sftp time wget
cut hexedit nsenter sha1sum timeout which
dc hostid nslookup sha256sum top who
deallocvt id od sha3sum tr whoami
diff install openvt sha512sum traceroute whois
dirname ipcrm passwd showkey traceroute6 xargs
dos2unix ipcs paste shred tree xxd
dpkg killall patch shuf truncate xz
dpkg-deb last pgrep smemcap ts xzcat
du less pkill softlimit tsort yes

/usr/bin # ssh -v
usage: ssh [-46AaCfGgKkMMNnqsTtVvXxYy] [-B bind_interface] [-b bind_address]
[-c cipher_spec] [-D [bind_address:]port] [-E log_file]
[-e escape_char] [-F configfile] [-I pkcs11] [-i identity_file]
[-J destination] [-L address] [-l login_name] [-m mac_spec]
[-O ctl_cmd] [-o option] [-P tag] [-p port] [-R address]
[-S ctl_path] [-W host:port] [-w local_tun[:remote_tun]]
destination [command [argument ...]]

ssh [-Q query_option]

/usr/bin # ./ssh-keygen -t rsa -f /usr/etc/ssh_host_rsa_key -N ""
Generating public/private rsa key pair.
/usr/etc/ssh_host_rsa_key already exists.
Overwrite (y/n)? y
Your identification has been saved in /usr/etc/ssh_host_rsa_key
Your public key has been saved in /usr/etc/ssh_host_rsa_key.pub
The key fingerprint is:
SHA256:azk0pNxjA7CP9+x6vhoUk1IVCd251VKytWOPzFgGLno root@(none)
The key's randomart image is:
+----[RSA 3072]-----+
| . o+o+ .ooo |
| + .o o.o=... |
| o = . .oo.* |
| = B ... B + |
| . * S E . + . |
| o = B |
| . B |
| +.. |
| o=+. |
+-----[SHA256]-----+

/usr/bin # uname -a
Linux (none) 6.17.0-rc4 #1 SMP Sun Sep 7 08:57:49 EDT 2025 armv7l GNU/Linux
/usr/bin #

```

Всё успешно работает в QEMU!