binutils Binary inspection tools

CONCEPTS

Most tools read a file and never run it, so they are safe on untrusted binaries. ldd is the exception: it may execute the file.

Source cc -g -c
↓ compiles to
Object .o nm, objdump
↓ ar / ld
Archive .a / ELF readelf, size
↓ loaded as
Process ldd, addr2line

Add -C to demangle C++ names; readelf, objdump and nm all accept it (readelf -C only for symbols).

Stripped binaries have no .symtab: use nm -D or readelf --dyn-syms for the dynamic symbols that remain.

Source lines and local variable names need a build with -g; without it addr2line only knows functions, if that.

SYMBOLS (NM)

nm -C *<file>*
List symbols, demangled

nm -D *<file>*
Dynamic symbols of a shared lib

nm -u *<file>*
Undefined symbols it needs

nm --defined-only *<file>*
Only symbols it provides

nm -S --size-sort -C *<file>*
Biggest symbols last, with size

nm -n *<file>*
Sort by address

nm -A *<file>*...
Prefix each line with file name

nm -g *<file>*
External (global) symbols only

nm type letters

Letter	Meaning
T / t	code, global / local
D / d	initialised data
B / b	zero-filled bss
R / r	read-only data
U	undefined, resolved later
W / w	weak symbol

ELF STRUCTURE (READELF)

readelf -h *<elf>*
ELF header: type, arch, entry

readelf -S *<elf>*
Section headers

readelf -l *<elf>*
Program headers (segments)

readelf -d *<elf>*
Dynamic section: NEEDED, RPATH

readelf -s -W *<elf>*
Symbol tables, wide lines

readelf --dyn-syms *<elf>*
Dynamic symbols only

readelf -n *<elf>*
Notes such as the build ID

readelf -p .comment *<elf>*
Dump a section as strings

DISASSEMBLY (OBJDUMP)

objdump -d *<file>*
Disassemble code sections

objdump -d -C *<file>*
Disassemble, demangled names

objdump -d -M intel *<file>*
Intel syntax instead of AT&T

objdump -D *<file>*
Disassemble all sections, even data

objdump -S *<file>*
Interleave source (needs -g)

objdump -d --no-show-raw-insn *<file>*
Hide the opcode bytes

objdump -d --disassemble=*<sym>* *<file>*
Only one function

objdump -d --start-address=*<a>* **--stop-address=***<b>* *<file>*
Only an address range

objdump -h *<file>*
Section headers with sizes

objdump -t *<file>*
Symbol table

objdump -T *<file>*
Dynamic symbol table

DISASSEMBLY (OBJDUMP) (cont.)

objdump -s -j *<sect>* *<file>*
Hex dump of one section

objdump -p *<file>*
Private headers, NEEDED libs

STRINGS AND SIZES

strings *<file>*
Printable strings, 4+ chars

strings -n *<len>* *<file>*
Set minimum string length

strings -a *<file>*
Scan the whole file (default)

strings -t x *<file>*
Prefix each with hex offset

size *<file>*
Text, data, bss totals

size -A *<file>*
Per-section sizes

c++filt *<name>*
Demangle a C++ name

ADDRESSES AND LIBRARIES

addr2line -e *<elf>* *<addr>*
Address to file:line

addr2line -e *<elf>* **-f -C -i** *<addr>*
Add function, demangle, inlines

ldd *<bin>*
Shared libs it needs

readelf -d *<bin>* **| grep NEEDED**
Direct dependencies, no execution

file *<bin>*
Type, arch, stripped or not

STRIP, COPY, ARCHIVES

strip *<file>*
Remove all symbols and debug info

ar t *<lib.a>*
List archive members

ar rcs *<lib.a>* *<obj.o>*...
Create or update static lib