GCC & Binutils

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Compiling

- From dictionary
  - To put together
  - To compose from many sources
  - To translate (a program) into machine language

- Compilation can involve:
  - preprocessing
  - compiling
  - assembling
  - linking
GNU Compiler Collection

* .C
* .JAVA
* .PAS

GCC

ARM.asm
PPC.asm
IA86.asm
Exercise

- Simple compilation

```c
# cat > test.c
#include <stdio.h>
int main(void)
{
    printf("Hello World\n");
    return 0;
}

^d
# gcc -S test.c
# ls -lh test.*
# cat test.s
```
Executable Files

- *.C
- *asm
- *.obj
- *.exe
- *.h
- *.lib
- crt0.s
- ld.script

- compiler
- assembler
- linker
Linker

file1.OBJ

.text
.data
.bss

file2.OBJ

.text
.data
.bss

file.EXE

.text
.data
.bss
Exercise

■ Simple assembling

# gcc -c test.s
# ls -lh test.*
# cat test.o
# objdump -h
# objdump -p test.o
etc...
C Run Time 0 - CRT0

- CRT0.o
  - Initialize the executable file
    - stack pointer
    - .bss section
  - Defines special symbols like _start
  - Calls main()
Linker Script

- Text file with some configurations
- Memory map for the application
  - Address of Sections
  - Informations to ELF Header
- Features of different (micro)Processors
- Attributes of each section - read/write

```bash
# ld --verbose
```
EXE and OBJ Format

- Information about file
  - How to load the file?
  - Information to linker
  - 'Road Map' of file’s organization

- 3 different kind of ELFs
  - relocatable - link
  - executable - execution
  - shared - both

OBJ / EXE

ELF Header
Exercise

Simple linking

```bash
# gcc -o test.bin test.o
# ls -lh test.*
# objdump -h
# objdump -p test.bin
# nm -h
# nm test.bin
etc...
```
Links

- GNU Pro Toolkit
  http://www.redhat.com/docs/manuals/gnupro/

- ELF Format
  http://stephane.carrez.free.fr/ELF/ch4.intro.html