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Esercitazione

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Dati i seguenti moduli:

- Modulo “main”:

```
.data
STRUCT: .space 20
VECT:   .space 12
INT:    .int 23

.text
.globl MAIN

MAIN:
    li $t0, 0xFFF0ABCC
    sw $t0, STRUCT
    lw $t1, VECT
    beq $t0, $t0, MODULE
MAINEND:
    syscall
```

- Modulo “module”:

```
.data
ALPHA: .byte 'Y'

.text
.globl MODULE
RESTART:
    lw $t3, INT
MODULE:
    lb $t4, ALPHA
    sub $t4, $t4, $t3
    beq $t4, $0, RESTART
MODEND:
    j MAINEND
```

si compilino le quattro tabelle relative a:

1. i moduli oggetto prodotti dall’assemblatore
2. le basi di rilocazione del codice e dei dati dei moduli
3. La tabella globale dei simboli
4. il contenuto del file eseguibile prodotto dal linker

Soluzione

1. Tabella file oggetto

```
dim text: 0x18          | dim text: 0x14
dim data: 0x24          | dim data: 0x1

text:                   | text:
```

```
0   lui $t0, FFF0       | 0   lw $t3, 0($gp)
4   ori $t0, $t0, ABCC  | 4   lb $t4, 0($gp)
8   sw $t0, 0($gp)      | 8   sub $t4, $t4, $t3
C   lw $t1, 0($gp)      | C   beq $t4, $0, 0xFFFC
10  beq $t0, $t0, 0     | 10  j 0
14  syscall             |

data:                   | data:
0  uninitialized        | 0  0x59
14 uninitialized        |
20 0x17                 |

symbols:                | symbols:
STRUCT  D  0            | ALPHA    D  0
VECT    D  14           | RESTART  T  0
INT     D  20           | MODULE   T  4
MAIN    T  0            | MODEND   T  10
MAINEND T  14           |

relocation:             | relocation:
8  sw  STRUCT           | 0   lw  INT
C  lw  VECT             | 4   lb  ALPHA
10 beq MODULE           | 10  j   MAINEND
```

2. Basi di rilocazione

	main	module
base text	0x00400000	0x00400018
base data	0x10000000	0x10000024

3. Tabella globale dei simboli

simbolo	valore iniziale	base	valore finale
STRUCT	0x0	0x10000000	0x10000000
VECT	0x14	0x10000000	0x10000014
INT	0x20	0x10000000	0x10000020
MAIN	0x0	0x00400000	0x00400000
MAINEND	0x14	0x00400000	0x00400014
ALPHA	0x0	0x10000024	0x10000024
RESTART	0x0	0x00400018	0x00400018
MODULE	0x4	0x00400018	0x0040001C
MODULEND	0x10	0x000400018	0x00400028

4. Eseguibile

```
400000  lui $t0, FFF0
400004  ori $t0, $t0, ABCC
400008  sw $t0, 0x8000($gp)
40000C  lw $t1, 0x8014($gp)
400010  beq $t0, $t0, 0x2
400014  syscall
400018  lw $t3, 0x8020($gp)
40001C  lb $t4, 0x8024($gp)
400020  sub $t4, $t4, $t3
400024  beq $t4, $0, 0xFFFC
400028  j 0x00100005
```