

# Assembly Language Program in a single file (p1.asm)

main:

```
sw $31, -4($30)
lis $29
.word fred
jalr $29
```

```
lis $29
.word derf
jalr $29
```

```
lw $31, -4($30)
jr $31
```

x: .word 0

fred:

```
; store $1 in x
lis $29
.word x
sw $1, 0($29)
```

```
; store $2 in y
lis $29
.word y
sw $2, 0($29)
jr $31
```

derf:

```
; load x into $2
lis $29
.word x
lw $2, 0($29)
```

```
; load y into $1
lis $29
.word y
lw $1, 0($29)
```

```
jr $31
y: .word 0
```

## What problems occur if split in the natural way?

p1main.asm	p2fred.asm	p2derf.asm
<pre>main:sw \$31, -4(\$30)       lis \$29       .word fred       jalr \$29        lis \$29       .word derf       jalr \$29        lw \$31, -4(\$30)       jr \$31  x:    .word 0</pre>	<pre>fred:       ; store \$1 in x       lis \$29       .word x       sw \$1, 0(\$29)        ; store \$2 in y       lis \$29       .word y       sw \$2, 0(\$29)        jr \$31</pre>	<pre>derf:       ; load x into \$2       lis \$29       .word x       lw \$2, 0(\$29)        ; load y into \$1       lis \$29       .word y       lw \$1, 0(\$29)        jr \$31  y:    .word 0</pre>

# Importing and Exporting Symbols

p1main.asm	p2fred.asm	p2derf.asm
<pre><b>.import fred</b> <b>.import derf</b> <b>.export x</b>  <b>main:sw \$31, -4(\$30)</b> <b>lis \$29</b> <b>.word fred</b> <b>jalr \$29</b>  <b>lis \$29</b> <b>.word derf</b> <b>jalr \$29</b>  <b>lw \$31, -4(\$30)</b> <b>jr \$31</b>  <b>x: .word 0</b></pre>	<pre><b>.import x</b> <b>.import y</b> <b>.export fred</b>  <b>fred:</b> <b>; store \$1 in x</b> <b>lis \$29</b> <b>.word x</b> <b>sw \$1, 0(\$29)</b>  <b>; store \$2 in y</b> <b>lis \$29</b> <b>.word y</b> <b>sw \$2, 0(\$29)</b>  <b>jr \$31</b></pre>	<pre><b>.import x</b> <b>.export derf</b> <b>.export y</b>  <b>derf:</b> <b>; load x into \$2</b> <b>lis \$29</b> <b>.word x</b> <b>lw \$2, 0(\$29)</b>  <b>; load y into \$1</b> <b>lis \$29</b> <b>.word y</b> <b>lw \$1, 0(\$29)</b>  <b>jr \$31</b>  <b>y: .word 0</b></pre>

# Merl Code

```
.import fred
.import derf
.export x
main:sw $31, -4($30)
  lis $29
  .word fred
  jalr $29
  lis $29
  .word derf
  jalr $29
  lw $31, -4($30)
  jr $31
x: .word 0

000: 1000 0002 ; merl cookie
004: 0000 008c ; overall length
008: 0000 0034 ; header + code
00c: afdf fffc ;
010: 0000 e814
014: 0000 0000
018: 03a0 0009
01c: 0000 e814
020: 0000 0000
024: 03a0 0009
028: 8fdf fffc
02c: 03e0 0008
030: 0000 0000
034: 0000 0001 ; relocate
038: 0000 0014
03c: 0000 0001 ; relocate
040: 0000 0020
044: 0000 0005 ; export x [ESD]
048: 0000 0030 ; location of x
04c: 0000 0001 ; name length
050: 0000 0078 ; 'x' in hex
054: 0000 0011 ; import fred [ESR]
058: 0000 0014 ; location where used
```

```
05c: 0000 0004 ; length of name
060: 0000 0066 ; 'f' in hex
064: 0000 0072 ; 'r' in hex
068: 0000 0065 ; 'e' in hex
06c: 0000 0064 ; 'd' in hex
070: 0000 0011 ; import derf [ESR]
074: 0000 0020 ; location where used
078: 0000 0004 ; length of name
07c: 0000 0064 ; 'd' in hex
080: 0000 0065 ; 'e' in hex
084: 0000 0072 ; 'r' in hex
088: 0000 0066 ; 'f' in hex
```