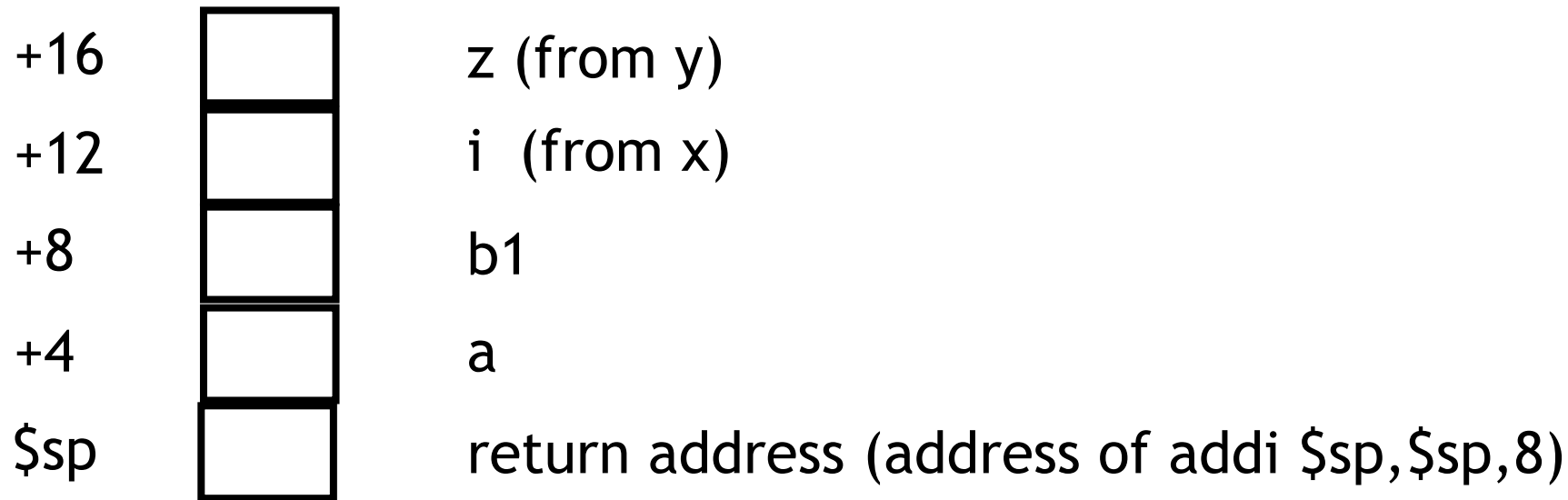


Procedures with Parameters and Local Variables

```
int x;
int y;
void aa(int i, int z) int a; int b1; {
    a = i+z;
    b1 = i * z;
    print i;
    print z;
    print i+z;
    print a;
    print b1;
    print x;
    print y;
    x = b1;
}
x = 10;
y = 20;
aa(x,y);
print x;
```

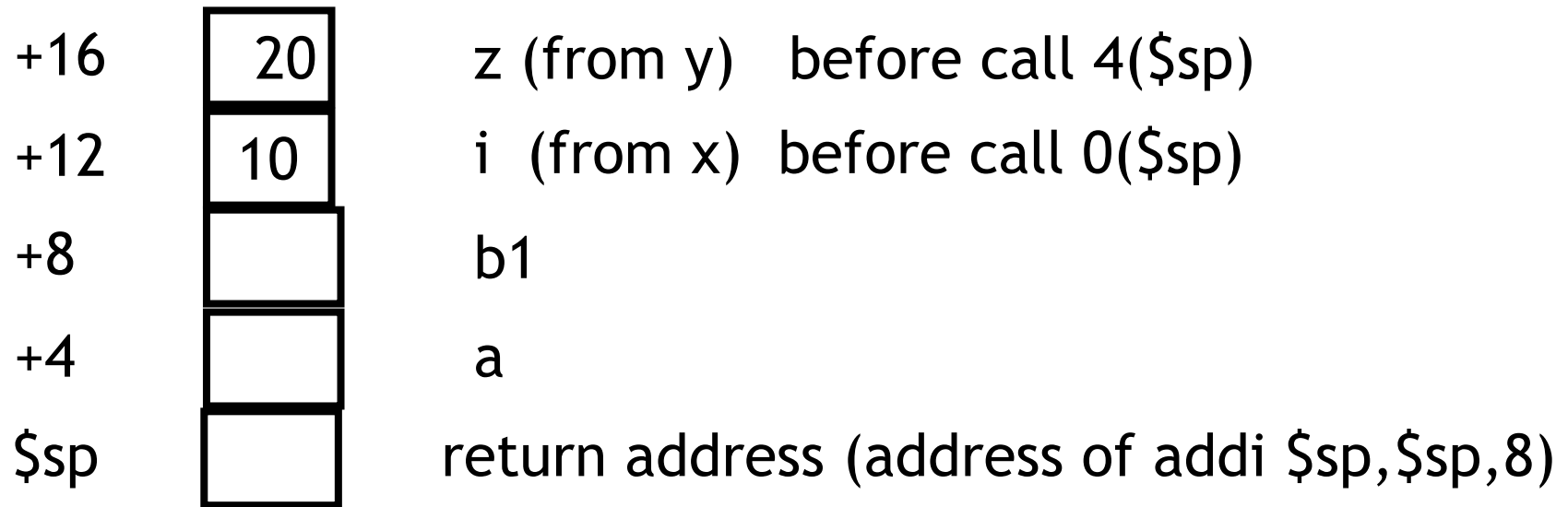
Runtime Stack



Procedures with Parameters and Local Variables

lw	\$t0, x	aa(x, y);
lw	\$t1, y	
subu	\$sp, \$sp, 8	space for parameters
sw	\$t0, 0(\$sp)	put parameters on the stack
sw	\$t1, 4(\$sp)	
jal	aa	call the procedure
addi	\$sp, \$sp, 8	pop parameters

Runtime Stack



Procedures with Parameters and Local Variables

aa:

```
subu    $sp, 12           Space for locals and return address
sw      $ra, ($sp)
lw      $t0, 12($sp)     a = i+z;
lw      $t1, 16($sp)
add     $t2, $t0, $t1
sw      $t2, 4($sp)
lw      $t0, 12($sp)     b1 = i*z;
lw      $t1, 16($sp)
mul     $t2, $t0, $t1
sw      $t2, 8($sp)
lw      $t0, 12($sp)     print i;
li      $v0, 1
move    $a0, $t0
syscall
li      $v0, 4
la      $a0, _nl
syscall
```

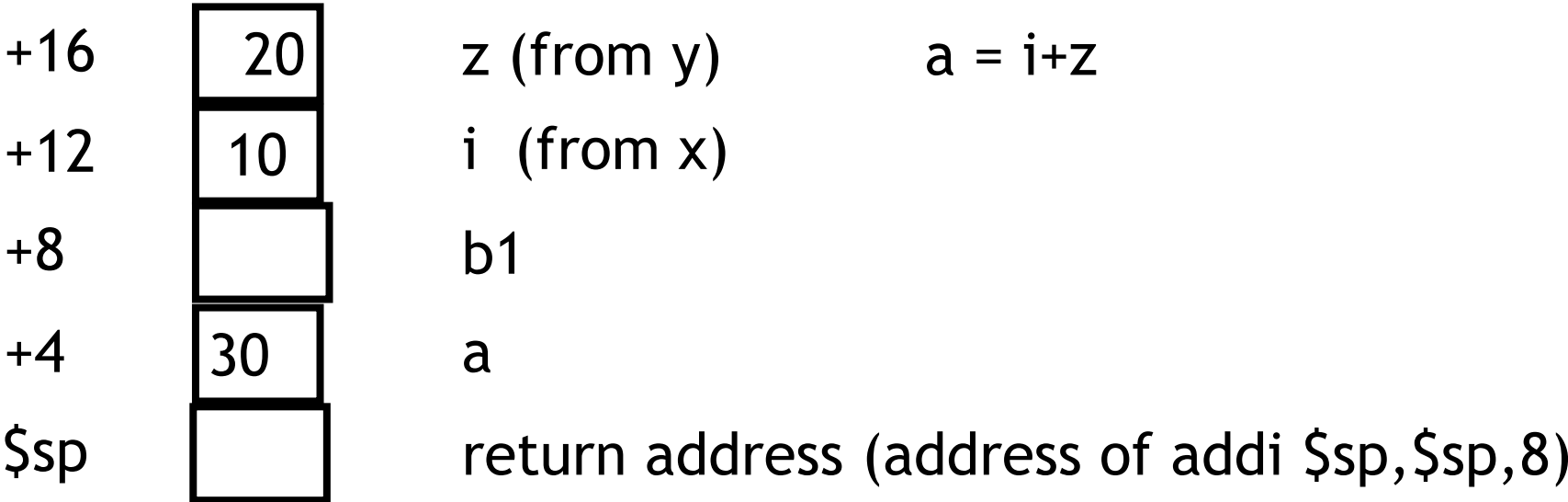
Procedures with Parameters and Local Variables

```
lw      $t0, 12($sp)      print i+z;
lw      $t1, 16($sp)
add     $t2, $t0, $t1
li      $v0, 1
move    $a0, $t2
syscall
li      $v0, 4
la      $a0, _nl
syscall
lw      $t0, 4($sp)      print a;
li      $v0, 1
move    $a0, $t0
syscall
li      $v0, 4
la      $a0, _nl
syscall
```

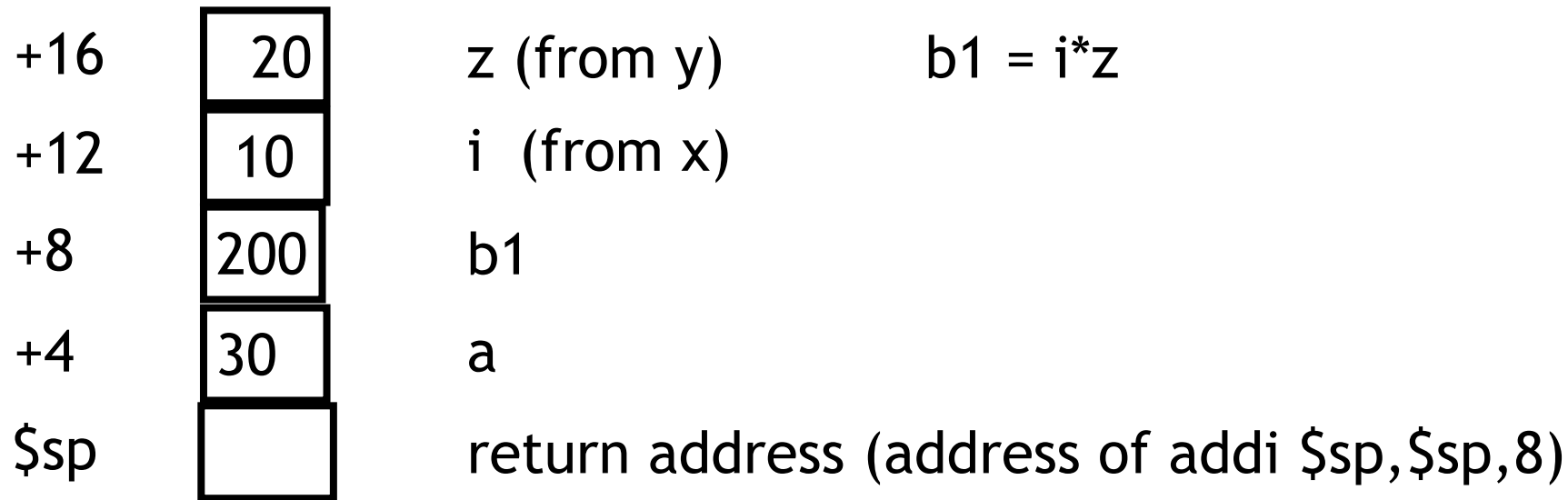
Procedures with Parameters and Local Variables

```
lw      $t0, y           print y;
li      $v0, 1
move    $a0, $t0
syscall
li      $v0, 4
la      $a0, _nl
syscall
lw      $t0, 8($sp)      x = b1;
sw      $t0, x
lw      $ra, ($sp)
addi    $sp, 12          pop local variables and return address
jr      $ra
```

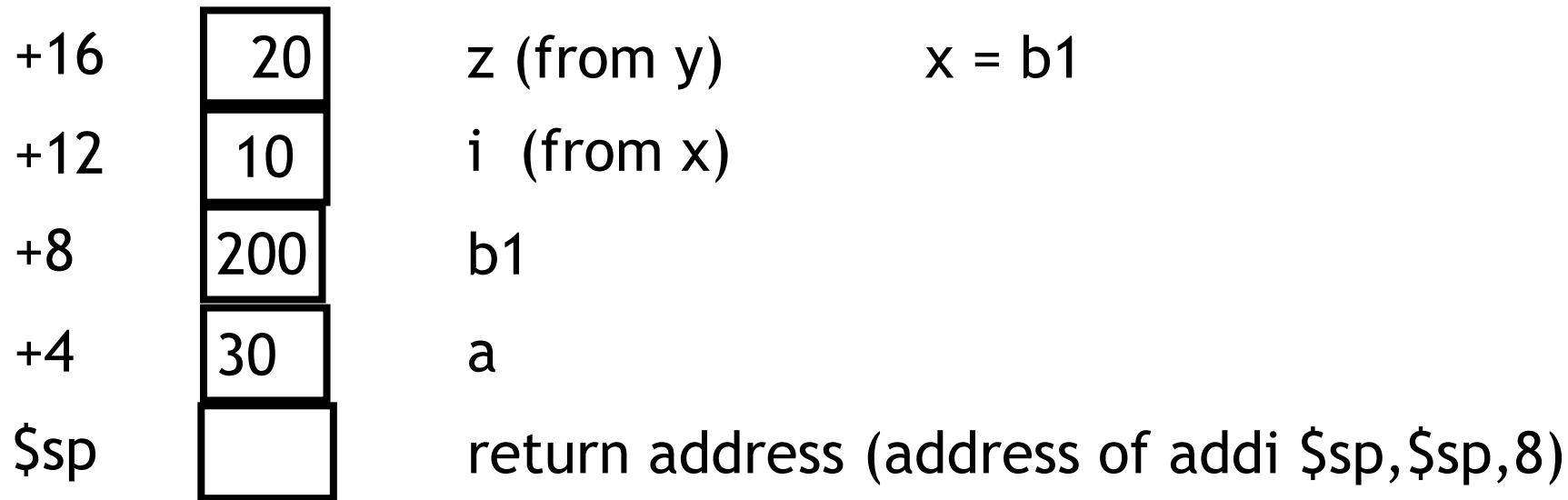
Runtime Stack



Runtime Stack



Runtime Stack



Procedures with Parameters and Local Variables

- Where to make changes from yacc4?
 - IdList
 - Formal parameters and local variables
 - ExprResList
 - Actual parameters
 - ProcSymTab
 - SymTab Attributes
 - doRval
 - doAssign
 - Any other place you use id