Program Execution

Networks and Embedded Software

Module 4.1.3 (optional)

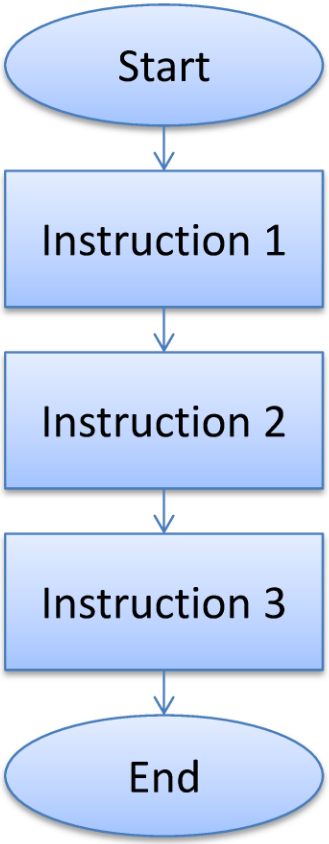
by Wolfgang Neff

Control Flow (1)

- Sequence
  - One instruction at a time
  - One instruction after the other
  - From the beginning to the end

```
int a = 1;
int b = 2;
int c = a+b;
```

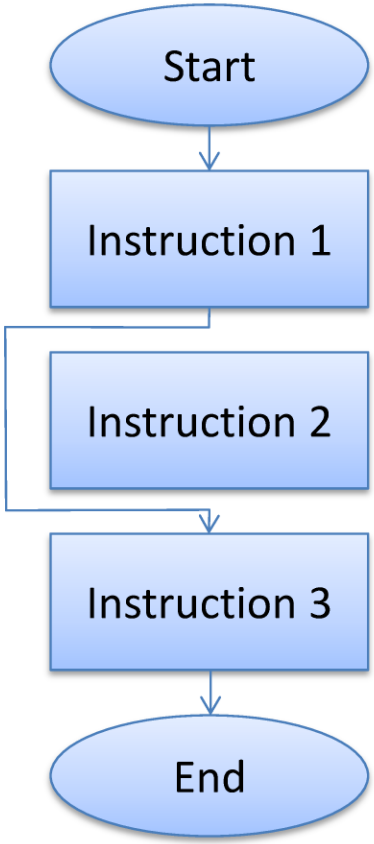
```
st a,=1
st b,=2
ld R0,a
ld R1,b
add R0,R1
st c,R0
```



Control Flow (2)

- Jumps
  - Modifies control flow
  - Forward jumps skip code
  - Backward jumps make loops

```
        a = 1;              st a,=1
        goto label;         jmp label
        b = 2;              st b,=2
label:  c = 3;      label:  st c,=3
```

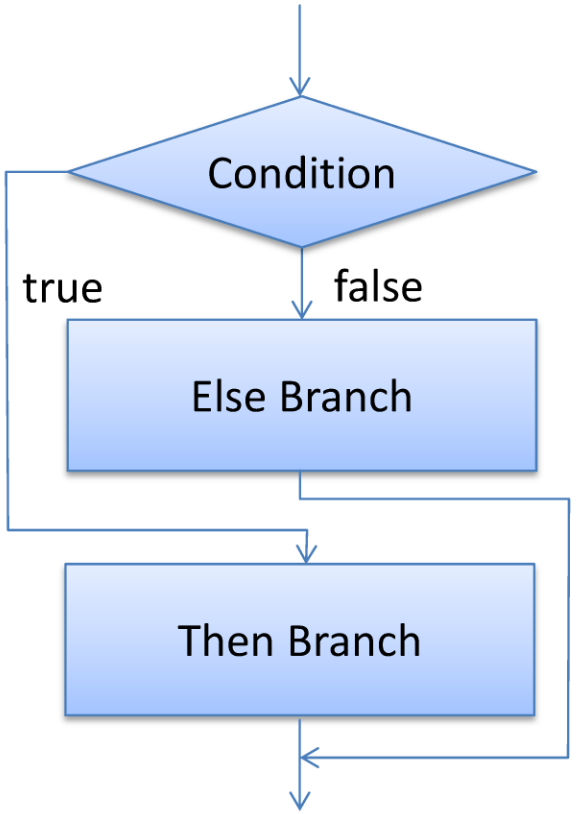


Control Flow (3)

- Branches
  - Conditional jumps
  - Make alternatives

```
if (n<5) {
   n++;
}
else {
   n=5;
}
```

```
        cmp n,=5
        br.lt then
else:   st a,=5
        jmp end
then:   inc a
end:    nop
```

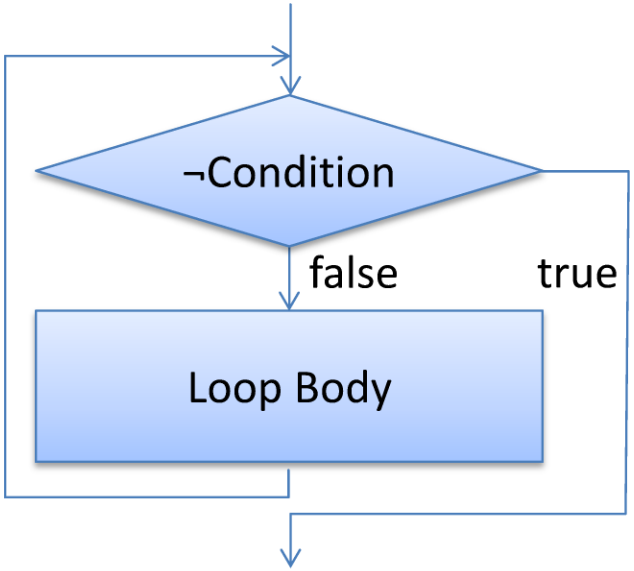


Control Flow (4)

- Loops
  - Backward branches.
  - Types
    - While loop
    - For loop

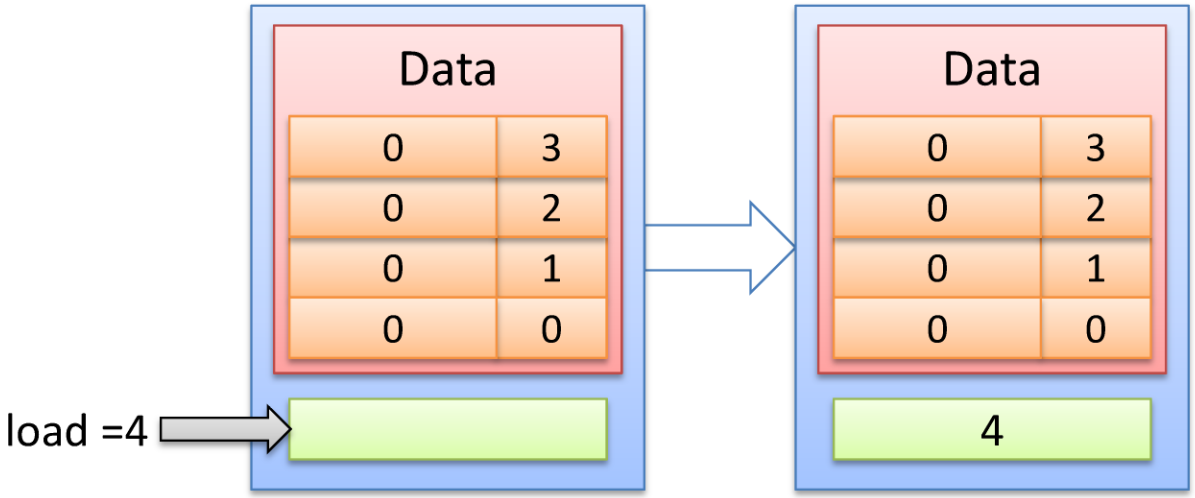
```
i=0;
while (i<10) {
   i++;
}
```

```
        ld R0,=0
loop:   cmp R0,=10
        br.ge end
        inc R0
        jmp
end:    nop
```



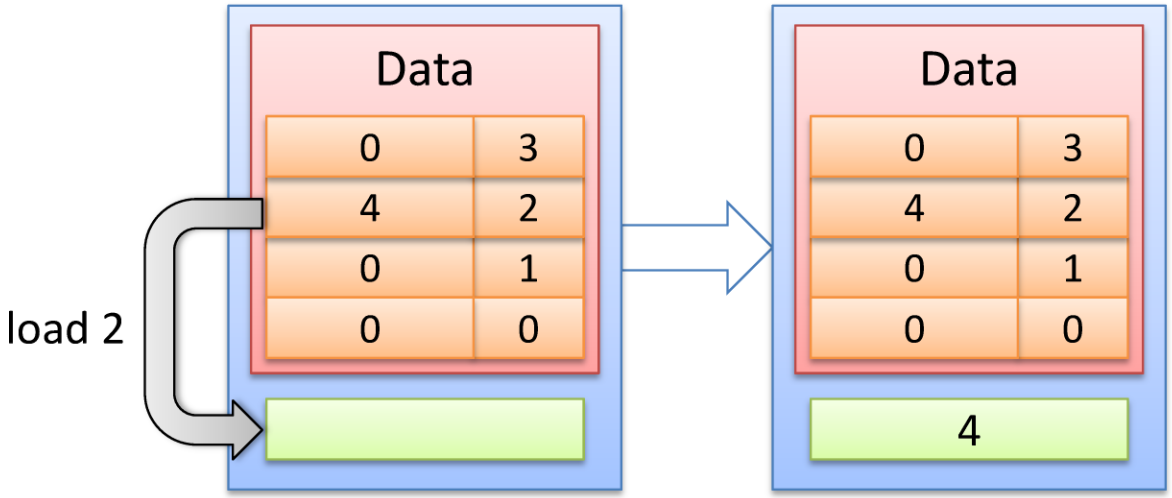
Addressing Modes (1)

- Immediate
  - Data immediately stored in register



Addressing Modes (2)

- Direct
  - Data loaded from a memory cell



Addressing Modes (3)

- Indirect
  - Data loaded from a cell another cell points to