Arm assembler: conditional branching

Arm assembler: conditional branching

Decisions in C

if (condition)....

Arm assembler: conditional branching

Decisions in C

if (condition)....

while (condition)....

Arm assembler: conditional branching

Decisions in C

if (condition)....

while (condition)....

switch (variable){
case (equal some value):...

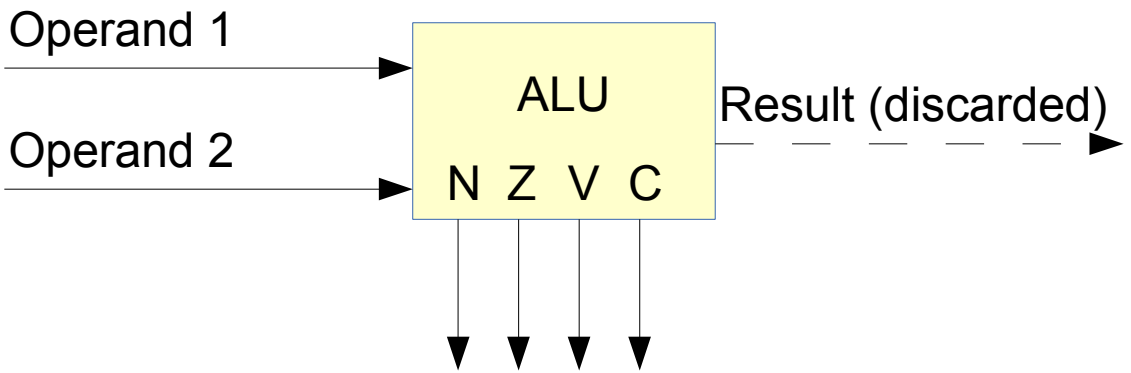
Arm assembler: conditional branching

These decisions are made by ***comparing***

Compare involves subtraction

Arm assembler: conditional branching

Compare involves subtraction



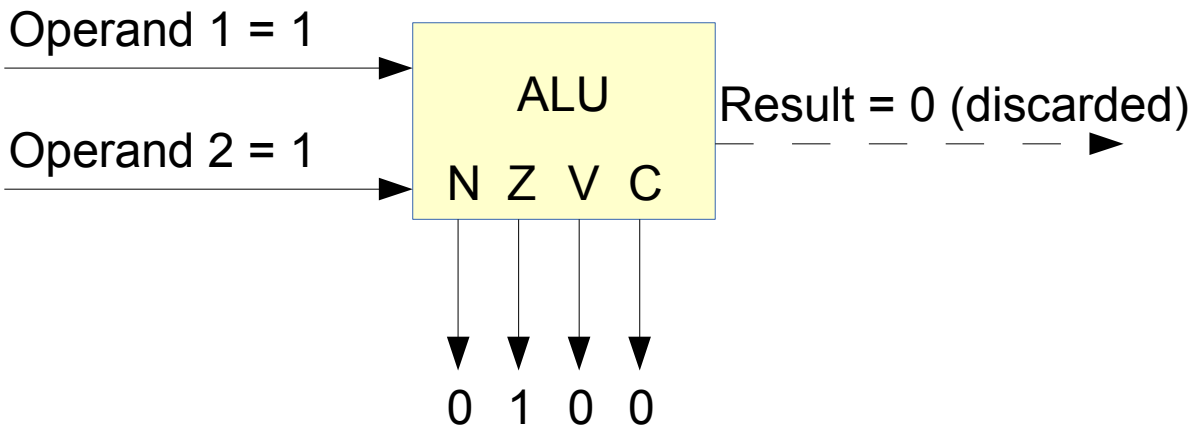
Arithmetic flags

- **N**egative
- **Z**ero
- signed o**V**erflow
- **C**arry (unsigned overflow)

Arm assembler: conditional branching

```
A=1;
:
B=1;
:
if (A==B)
{
}
```

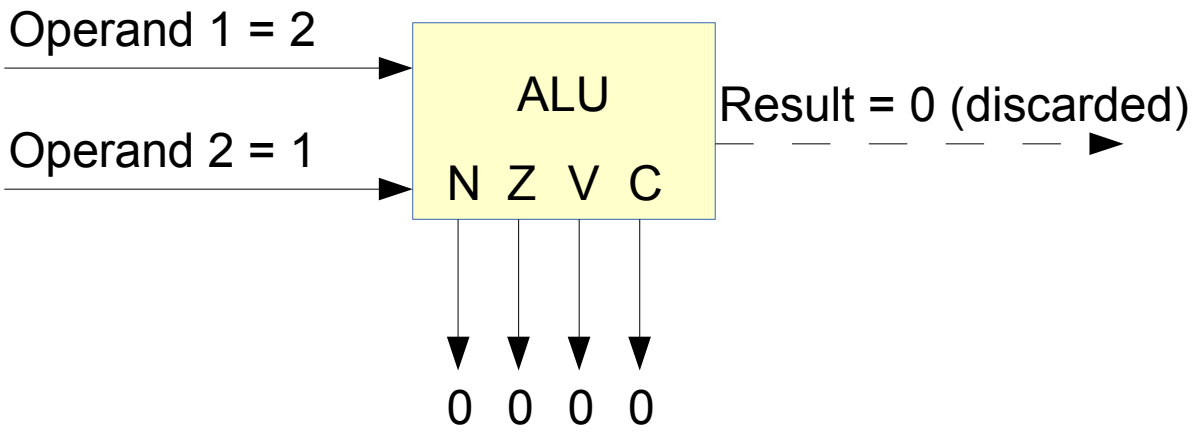
Arm assembler: conditional branching



Arm assembler: conditional branching

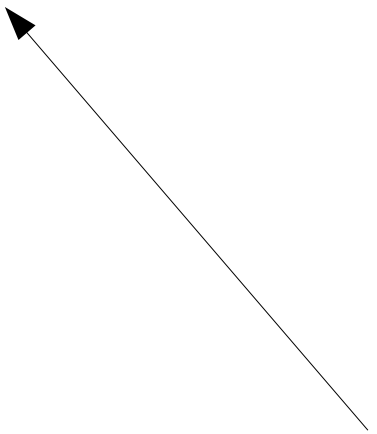
```
A=2;
:
B=1;
:
if (A==B)
{
}
```

Arm assembler: conditional branching



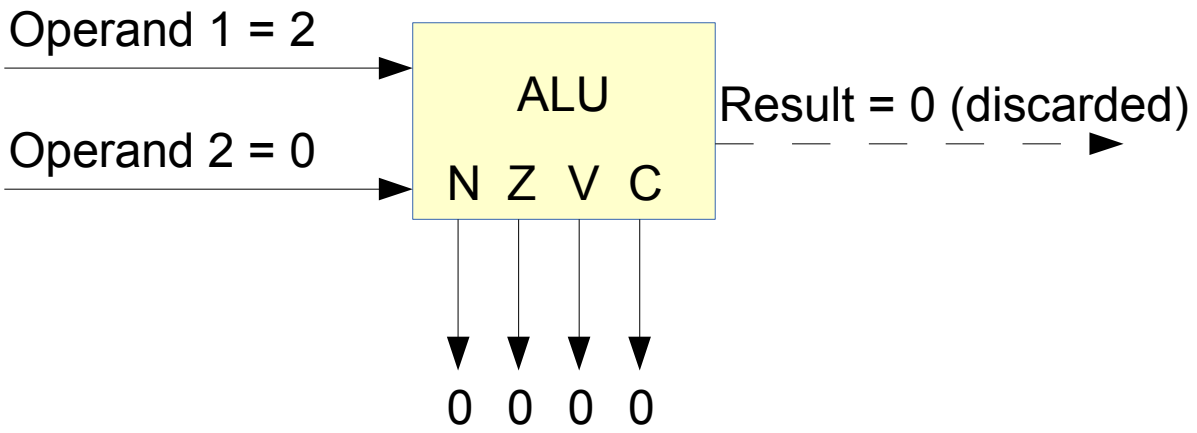
Arm assembler: conditional branching

```
A=2;
while(A)
{
}
```



Implied comparison
with ZERO

Arm assembler: conditional branching



Arm assembler: conditional branching

Assembler implementation of decision making: Part 1
The compare instruction:
28.5.5.4.1 Syntax

CMN Rn, Rm
CMP Rn, #imm
CMP Rn, Rm

where:

Rn is the register holding the first operand.
Rm is the register to compare with.
imm is the immediate value to compare with.

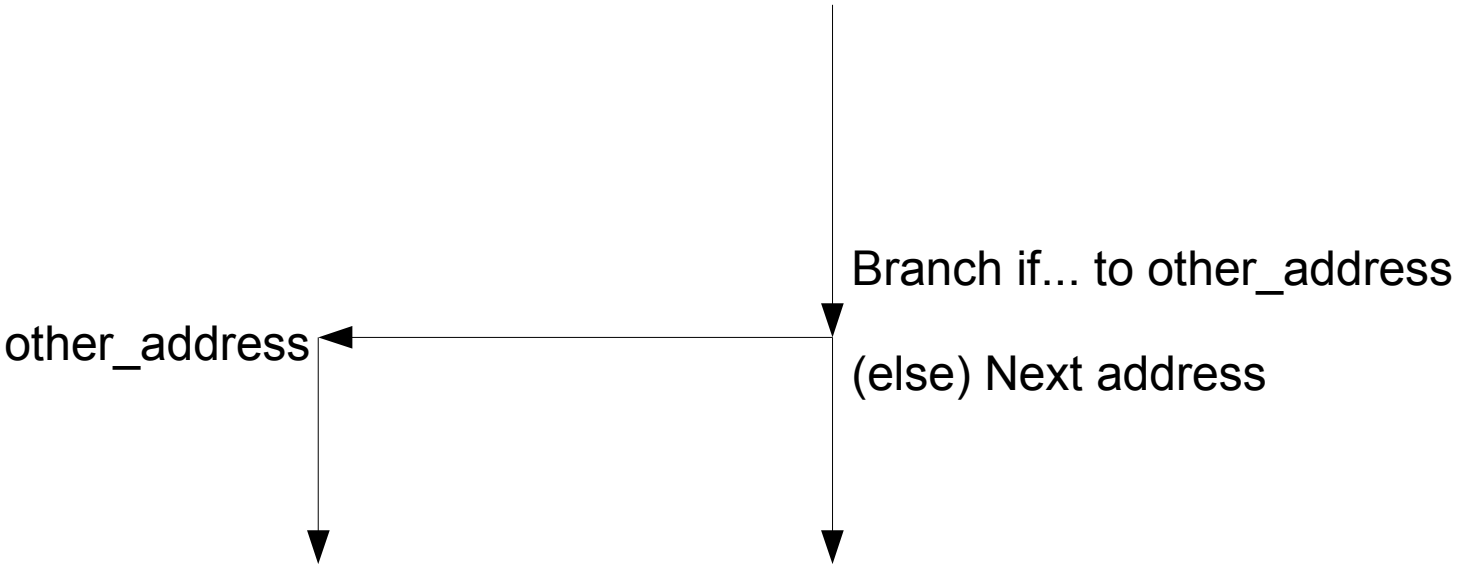
28.5.5.4.2 Operation
These instructions compare the value in a register with either the value in another register or an immediate value. **They update the condition flags on the result, but do not write the result to a register**.
The CMP instruction subtracts either the value in the register specified by Rm, or the immediate imm from the value in Rn and updates the flags. This is the same as a SUBS instruction, except that the result is discarded.
The CMN instruction adds the value of Rm to the value in Rn and updates the flags. This is the same as an ADDS instruction, except that the result is discarded.

Arm assembler: conditional branching

Assembler implementation of decision making: Part 2
Conditional Branches:

28.5.6.1.1 Syntax

B{cond} label



Arm assembler: conditional branching

Table 432. Condition code suffixes

Suffix	Flags	Meaning
EQ	Z = 1	Equal, last flag setting result was zero
NE	Z = 0	Not equal, last flag setting result was non-zero
CS or HS	C = 1	Higher or same, unsigned
CC or LO	C = 0	Lower, unsigned
MI	N = 1	Negative
PL	N = 0	Positive or zero
VS	V = 1	Overflow
VC	V = 0	No overflow
HI	C = 1 and Z = 0	Higher, unsigned
LS	C = 0 or Z = 1	Lower or same, unsigned
GE	N = V	Greater than or equal, signed
LT	N != V	Less than, signed
GT	Z = 0 and N = V	Greater than, signed
LE	Z = 1 and N != V	Less than or equal, signed
AL	Can have any value	Always. This is the default when no suffix is specified.

Ref: UM10398 LP1114 Reference guide

Arm assembler: conditional branching

- Examples (A,B unsigned)
  - `if (A==B) …`
  - `if (A != B) …`
  - `if (A > B) …`
  - `if (A < B) …`
  - `if (A >=B) …`
  - `if (A <= B) …`

Arm assembler: conditional branching

- `if (A==B) …`

C Code

```
if (A == B)
{
    Equal:
}
else
{
    NotEqual:
}
Done:
```

ARM Assembler

Assume A is in R0 and B is in R1

```
            CMP R0,R1
            BZ Equal
NotEqual    (do some stuff)
            B Done
Equal       (do some other stuff)
            B Done
```

Finish remaining examples.

Arm assembler: conditional branching

- Examples (A,B signed)
  - `if (A==B) …`
  - `if (A != B) …`
  - `if (A > B) …`
  - `if (A < B) …`
  - `if (A >=B) …`
  - `if (A <= B) …`