Slide 1

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

```
MODULE D1;

PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;          (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.
```

Call by Value:
- **Lokale Kopie** voor de procedure "Do"

Slide 2

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

```
MODULE D1;

PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;          (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.
```
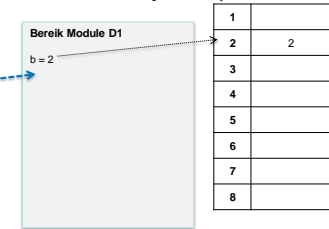
Call by Value:
- **Lokale Kopie** voor de procedure "Do"

Bereik Module D1

b = 2

1	
2	2
3	
4	
5	
6	
7	
8	

Slide 3

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
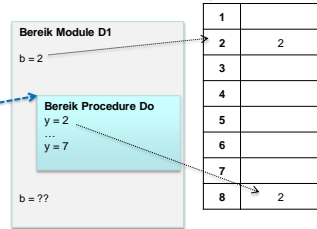# *Call by Reference*

```
MODULE D1;

PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;          (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.
```

Call by Value:
- **Lokale Kopie** voor de procedure "Do"

Bereik Module D1

b = 2

Bereik Procedure Do
y = 2
…
y = 7

b = ??

1	
2	2
3	
4	
5	
6	
7	
8	2

Slide 4

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
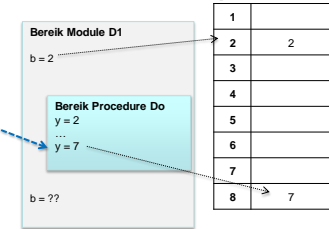# *Call by Reference*

```
MODULE D1;

PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;          (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.
```

Call by Value:
- **Lokale Kopie** voor de procedure "Do"

Bereik Module D1

b = 2

Bereik Procedure Do
y = 2
…
y = 7

b = ??

1	
2	2
3	
4	
5	
6	
7	
8	7

1

Slide 1 (pag. 5)

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

MODULE D1;

PROCEDURE Do(**VAR** x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;   (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.

Call by Value:
- **Lokale Kopie** voor de procedure "Do"

Bereik Module D1

b = 2

b = ??

1	
2	2
3	
4	
5	
6	
7	
8	

Slide 2 (pag. 6)

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

MODULE D1;

PROCEDURE Do(**VAR** x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;   (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.

Call by Reference:
- Een verwijzing/referentie naar het adres van de actuele parameter
- Gebruik het keywoord **VAR**

Slide 3 (pag. 7)

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

MODULE D1;

PROCEDURE Do(**VAR** x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;   (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.

Call by Reference:
- **Adres van de actuele paremeter**

Bereik Module D1

a = 1

1	1
2	
3	
4	
5	
6	
7	
8	

Slide 4 (pag. 8)

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
Call by Reference

MODULE D1;

PROCEDURE Do(**VAR** x: CARDINAL; y: CARDINAL);
  BEGIN
    x := 10; (* we change values of x & y *)
    y := 7;
  END Do;

  VAR
    a, b: CARDINAL;   (* variable-declarations *)
BEGIN
  WrLn;
  (* a & b get initiial values *)
  a := 1;
  b := 2;
  WrStr("Values BEFORE Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
  Do(a, b);
  WrStr("Values AFTER Do procedure:");WrLn;
  WrStr(" a = ");WrCard(a, 0);WrLn;
  WrStr(" b = ");WrCard(b, 0);WrLn;
END D1.

Call by Reference:
- **Adres van de actuele paremeter**

Bereik Module D1

a = 1

Bereik Procedure Do
x = 1
…
x = 10

a = ??

1	1
2	
3	
4	
5	
6	
7	
8	

2

Slide 1:

Vrije Universiteit Brussel

TOPIC I: *Call by Value*
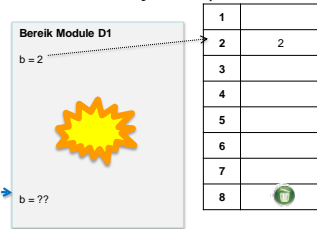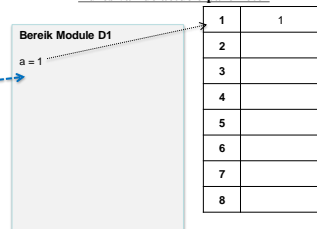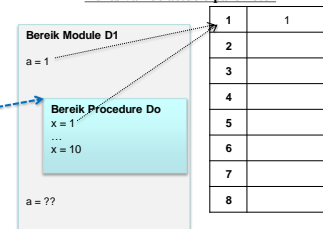## *Call by Reference*

```
MODULE D1;

  PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
    BEGIN
      x := 10; (* we change values of x & y *)
      y := 7;
    END Do;

    VAR
    a, b: CARDINAL;          (* variable-declarations *)
  BEGIN
    WrLn;
    (* a & b get initiial values *)
    a := 1;
    b := 2;
    WrStr("Values BEFORE Do procedure:");WrLn;
    WrStr(" a = ");WrCard(a, 0);WrLn;
    WrStr(" b = ");WrCard(b, 0);WrLn;
    Do(a, b);
    WrStr("Values AFTER Do procedure:");WrLn;
    WrStr(" a = ");WrCard(a, 0);WrLn;
    WrStr(" b = ");WrCard(b, 0);WrLn;
  END D1.
```

Call by Reference:
- **Adres van de actuele paremeter**

Bereik Module D1

a =1

Bereik Procedure Do
x = 1
…
x = 10

a = ??

1	10
2	
3	
4	
5	
6	
7	
8	

Slide 2:

```
MODULE D1;

  PROCEDURE Do(VAR x: CARDINAL; y: CARDINAL);
    BEGIN
      x := 10; (* we change values of x & y *)
      y := 7;
    END Do;

    VAR
    a, b: CARDINAL;          (* variable-declarations *)
  BEGIN
    WrLn;
    (* a & b get initiial values *)
    a := 1;
    b := 2;
    WrStr("Values BEFORE Do procedure:");WrLn;
    WrStr(" a = ");WrCard(a, 0);WrLn;
    WrStr(" b = ");WrCard(b, 0);WrLn;
    Do(a, b);
    WrStr("Values AFTER Do procedure:");WrLn;
    WrStr(" a = ");WrCard(a, 0);WrLn;
    WrStr(" b = ");WrCard(b, 0);WrLn;
  END D1.
```

Call by Reference:
- **Adres van de actuele paremeter**

Bereik Module D1

a = 1

a = ??

1	10
2	
3	
4	
5	
6	
7	
8	

Slide 3:

Vrije Universiteit Brussel

TOPIC I: Oefeningen

Oefeningen S2, S3, S4

3