Pointer (1A)

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7/16/10

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Address and Data in a Memory

1K x 8
Memory

address
10 bits

data
8 bits

$2^{10} = $ **1024**

address	data

1023	0x3FF	
1022	0x3FE	
1021	0x3FD	
1020	0x3FC	
		• • •
0003	0x003	
0002	0x002	
0001	0x001	
0000	0x000	

DEC address	HEX address	data
	10 bits	8 bits
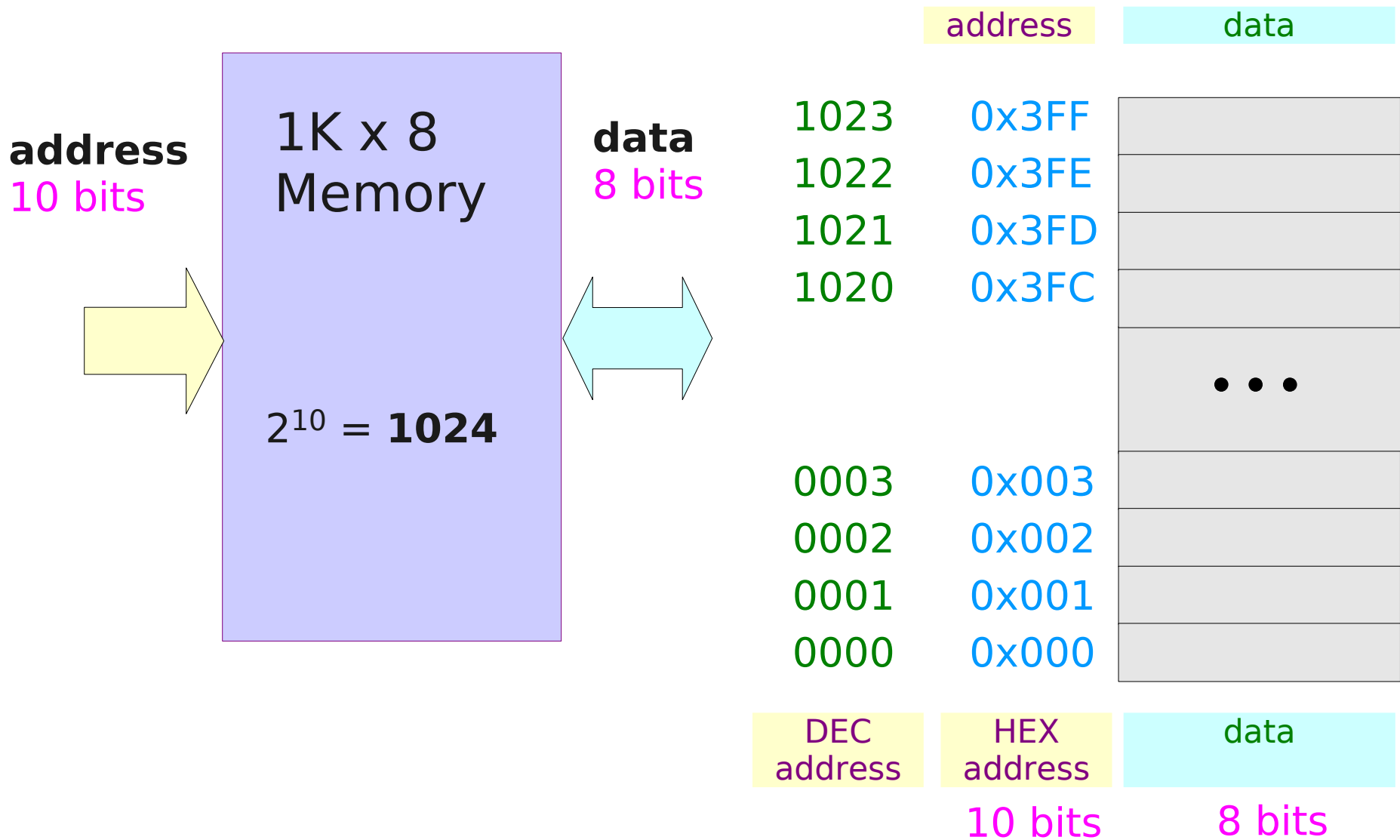
Variable

int   a;

    a can hold an *integer*

address	data
&a	a

a = 100;

    a holds an *integer* 100

address	data
&a	a ← 100

Pointer Variable

int *   p;

    p can hold an *address*

address	data
&p ➡ 0x3CE	p
0x3CE	200

int   *   p;   p can hold an *address*

pointer to int

int   *   p;   *p can hold an *integer*

int
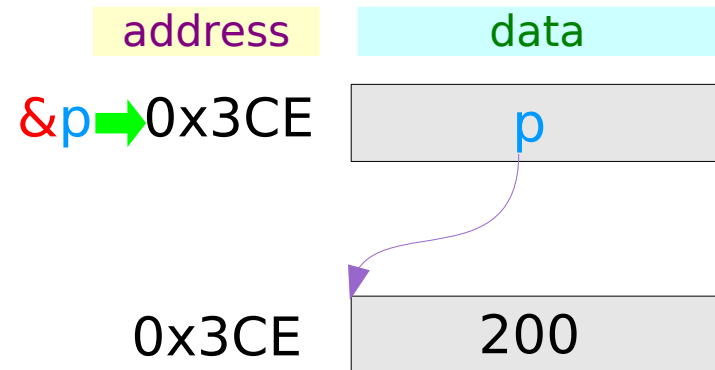
&p ➡ 0x3CE

p ➡ 0x3CE

*p ➡ 200

Variable Assignment Example

int *   p;

    p can hold an *address*

int   a = 100;

    a holds an *integer* 100

address	data
&p	
&a	a ← 100

p = &a;

    p holds the *address* of a

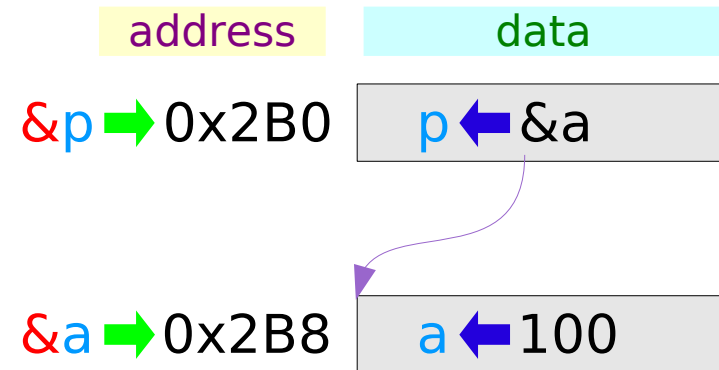| address	data
&p	p ← &a
&a	a ← 100

Pointer

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* and & Operator

* **address**

returns the value
that is stored at the address

& **variable**

returns the address of a
location where the
variable's value is stored

address	data
&p ➡ 0x2B0	p ⬅ &a
&a ➡ 0x2B8	a ⬅ 100

p ➡	0x2B8
*p ➡	100

address	data
&a ➡ 0x2B8	a ⬅ 100

Variable Initialization

int   a = 100 ;

int   b = a ;

a can hold an *integer*

b can hold an *integer*

address	data
&a	a = 100
&b	b = 100

a and b have the same <u>integer</u> value

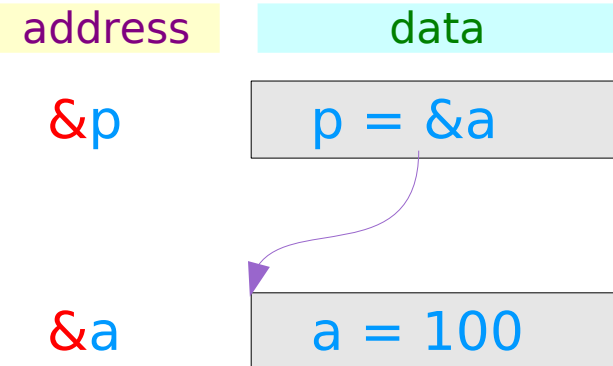# Pointer Variable Initialization

int   a = 100 ;

int *   p = & a ;

p can hold an *address*

p is initialized with the *address* of the integer variable a

address	data
&p	p = &a
&a	a = 100

a and *p have the same <u>integer</u> value, since &a and p have the same <u>address</u>

Reference Variable Initialization (C++)

int   a = 100 ;

int &   b = a ;

b's address is initialized with a's address

b acts like an integer variable

b holds an *integer*

address	data
&a = &b	a = b = 100

variable b is an ***alias*** of a

a and b have the same <u>integer</u> value, since &a and &b have the same <u>address</u>

References

[1] Essential C, Nick Parlante
[2] Efficient C Programming, Mark A. Weiss
[3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
[4] C Language Express, I. K. Chun