Pointer (1A)

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Address and Data in a Memory

	address	data

1K x 8		DEC	HEX	data

address
10 bits

1K x 8
Memory

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
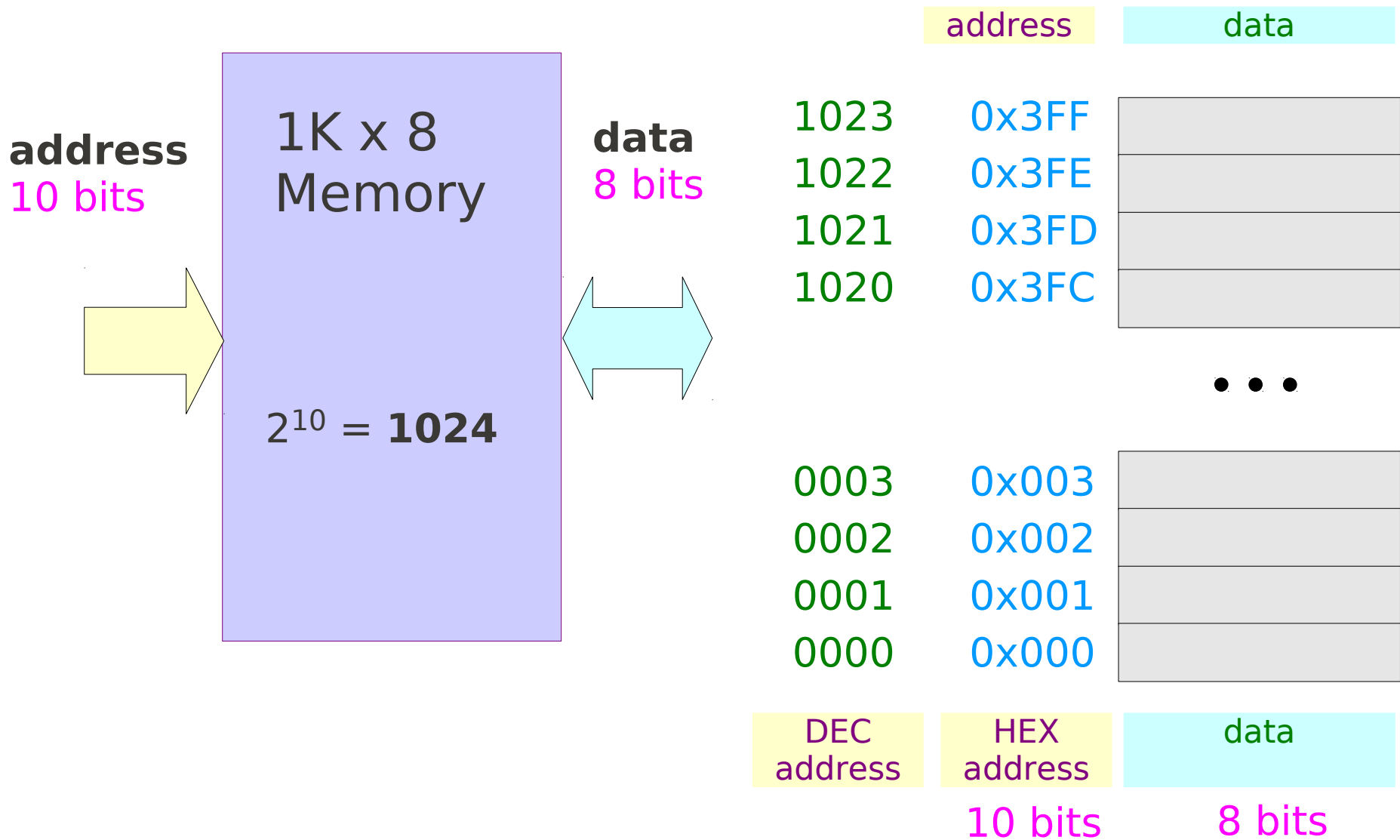
Variable

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	p
	*p

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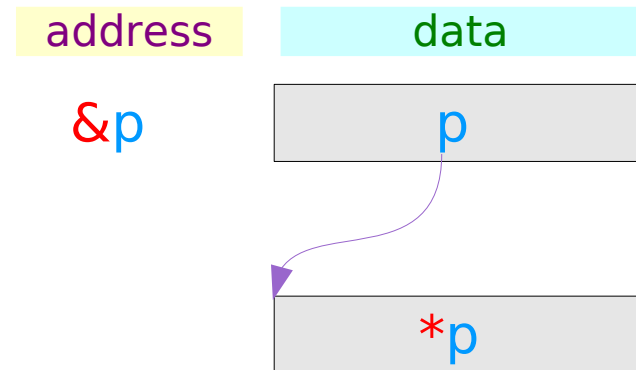
int   *   p;   p can hold an *address*

pointer to int

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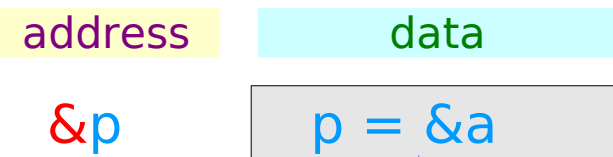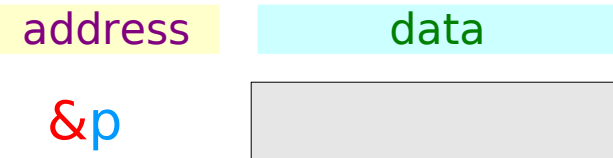
int

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

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* and & Operator

<table>
<tr><td></td><td>address</td><td>data</td></tr>
</table>

	address	data
* address	&p	p = &a
returns the value that is stored at the address	&a	a = 100

*p ➡ 100

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

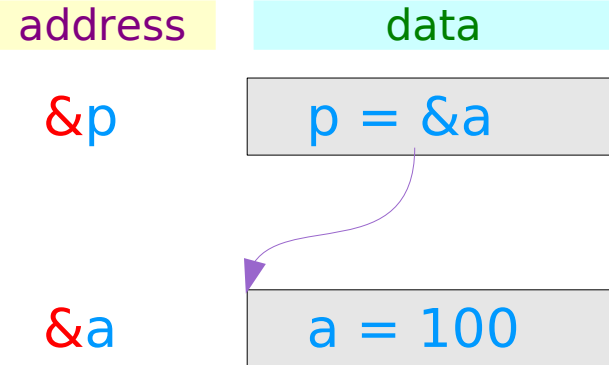# Pointer Variable Initialization

| 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
integer value, since
&a and &b have the same
address

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