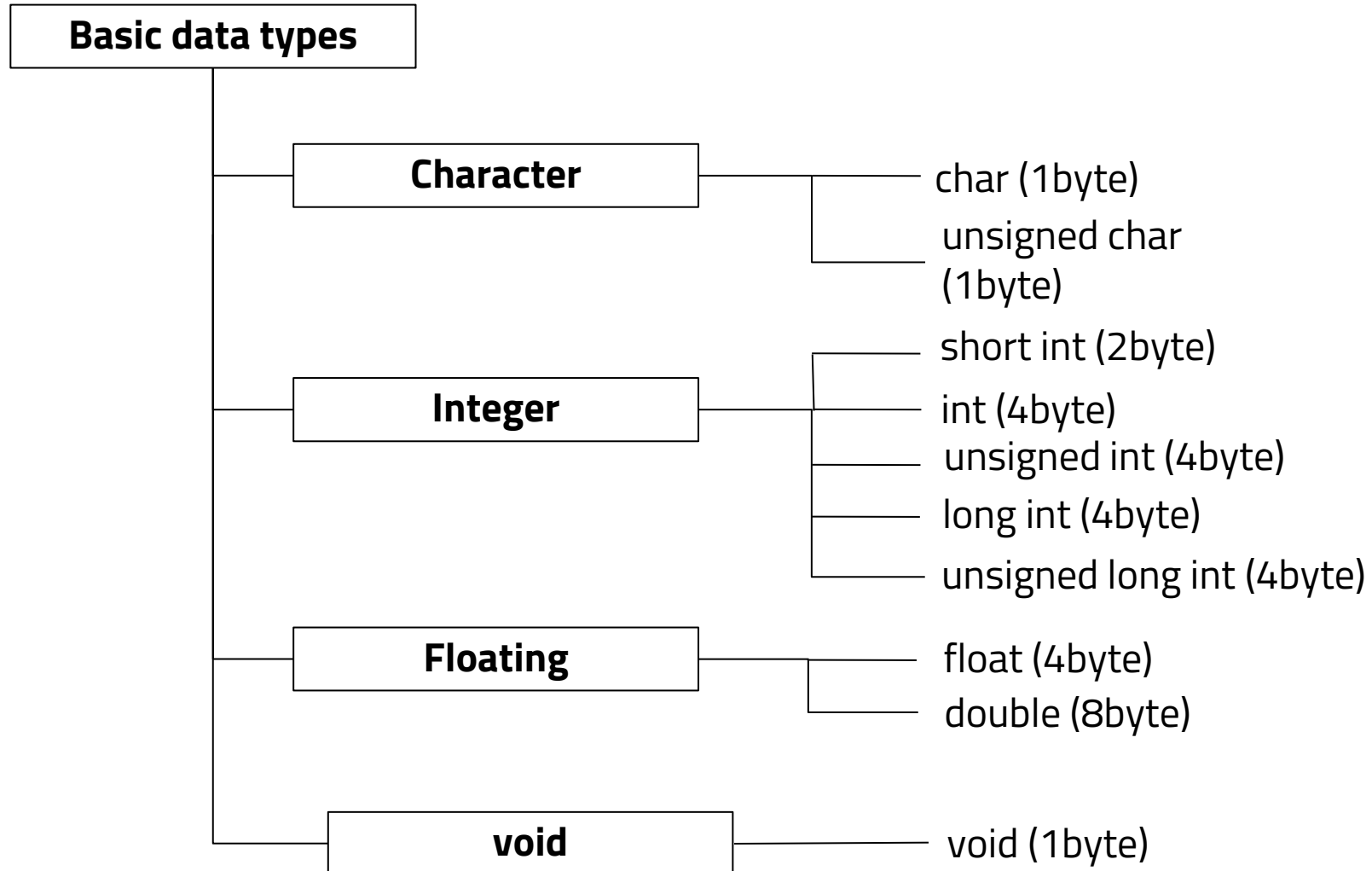# 시스템 프로그래밍을 위한 C언어
Variable & Address & Memory Allocation

현대자동차 입문교육

박대진 교수
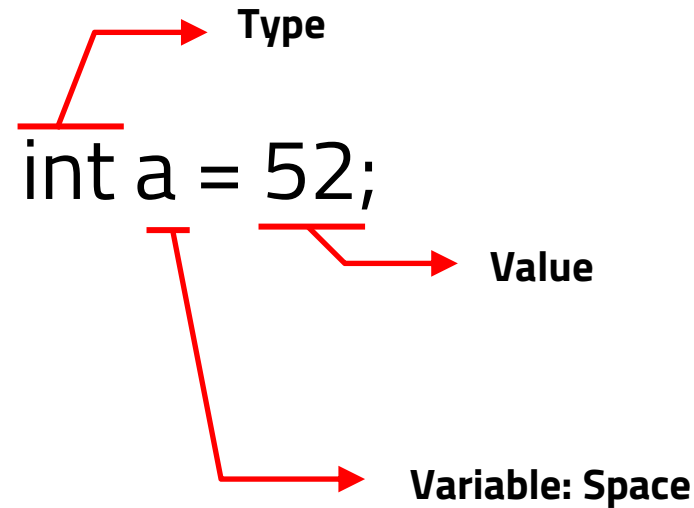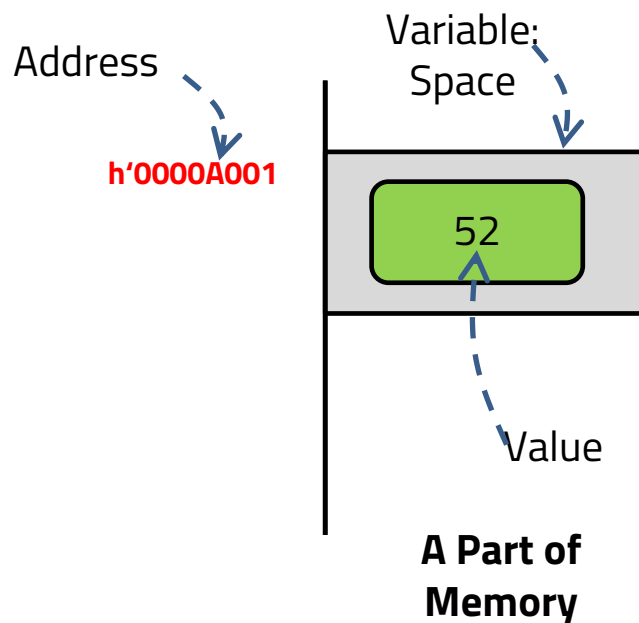
Lecture Lessoned

- C언어 복습
- 변수와 값
- 변수의 타입과 주소
- 포인터 변수
- 지역변수, 전역변수
- static, extern
- 구조체
- 복수의 파일로 구현

Basic Data Types (typical size)


```
Basic data types
 ├── Character ──┬── char (1byte)
 │               └── unsigned char (1byte)
 │
 ├── Integer ────┬── short int (2byte)
 │               ├── int (4byte)
 │               ├── unsigned int (4byte)
 │               ├── long int (4byte)
 │               └── unsigned long int (4byte)
 │
 ├── Floating ───┬── float (4byte)
 │               └── double (8byte)
 │
 └── void ─────────── void (1byte)
```

Type vs. Address vs. Variable vs. Value

Address

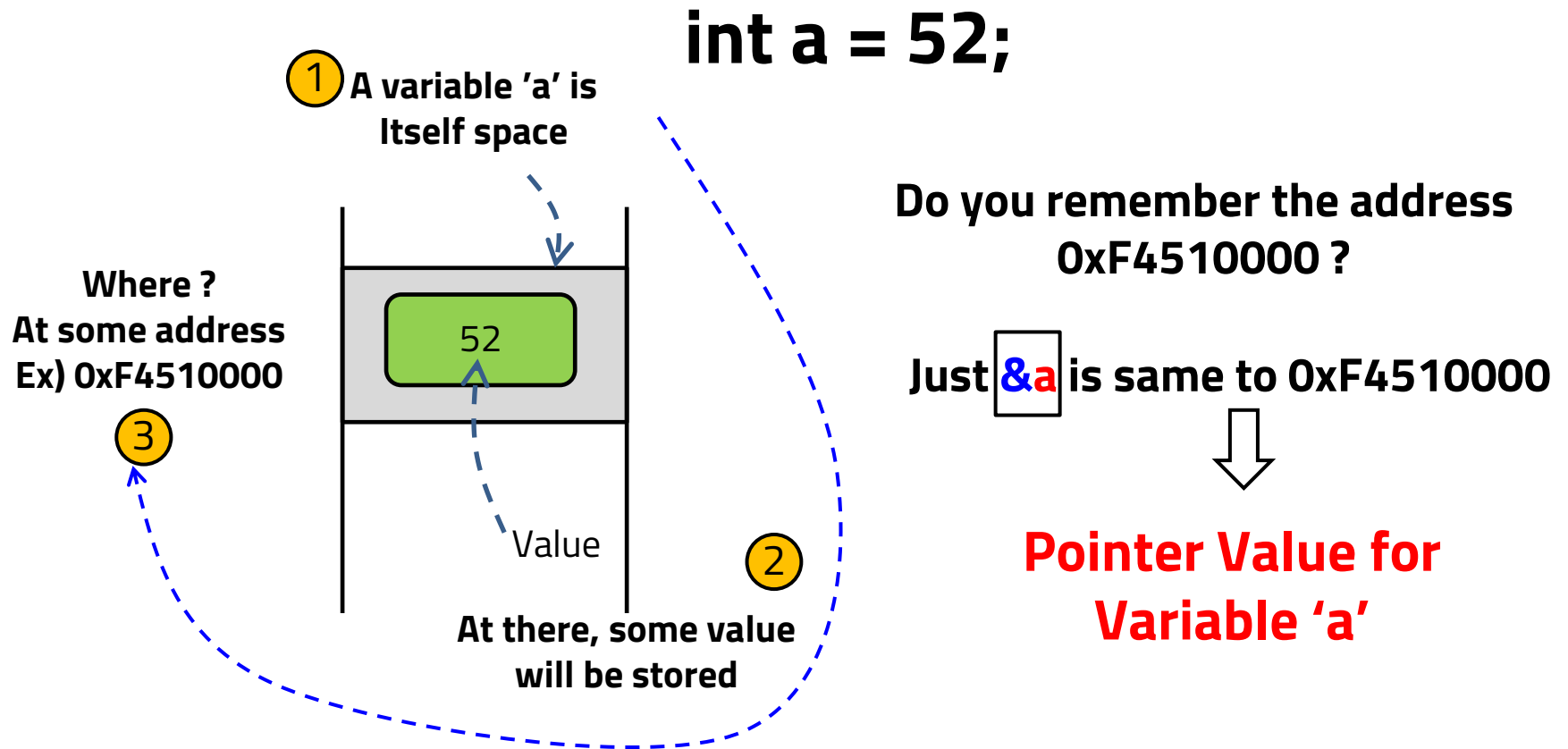h'0000A001

Variable: Space

52

Value

A Part of Memory

Type

int a = 52;

Value

Variable: Space

Address of variable: &a
Space of variable: a
Value of variable: 'd52

Pointer: Address of Variable

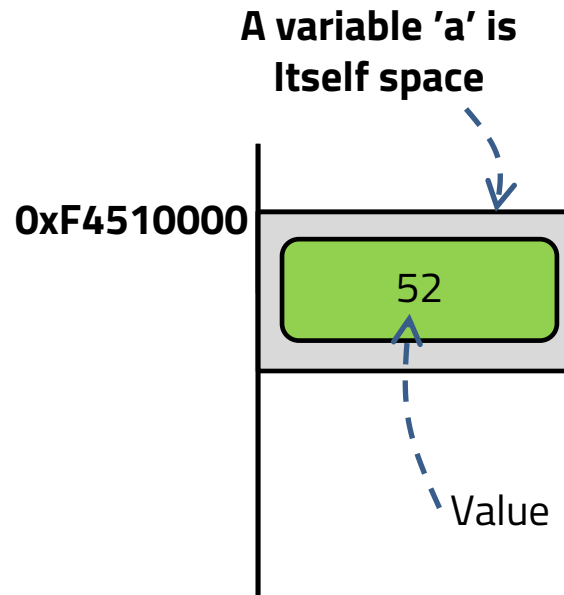- All Variable will be allocated in address space somewhere

int a = 52;

① A variable 'a' is Itself space

Where ?
At some address
Ex) 0xF4510000

③

52

Value

② At there, some value will be stored

Do you remember the address 0xF4510000 ?

Just &a is same to 0xF4510000

⬇

Pointer Value for Variable 'a'

Pointer Type's Variable

- A variable holding an address value of variable

int a = 52;
int* ap;
ap = &a;

A variable 'a' is Itself space

0xF4510000

52

Value

A pointer variable 'ap' is Itself space

0xF4510000
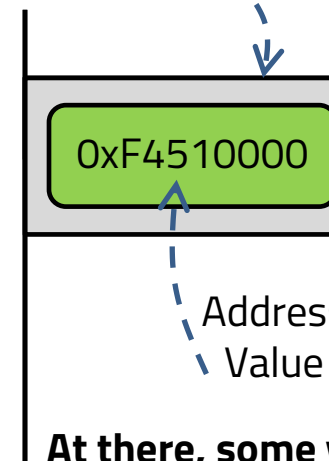
Address
Value

At there, some value will be stored
But value is specially address

Accessing Original Variable by using Pointer Variable
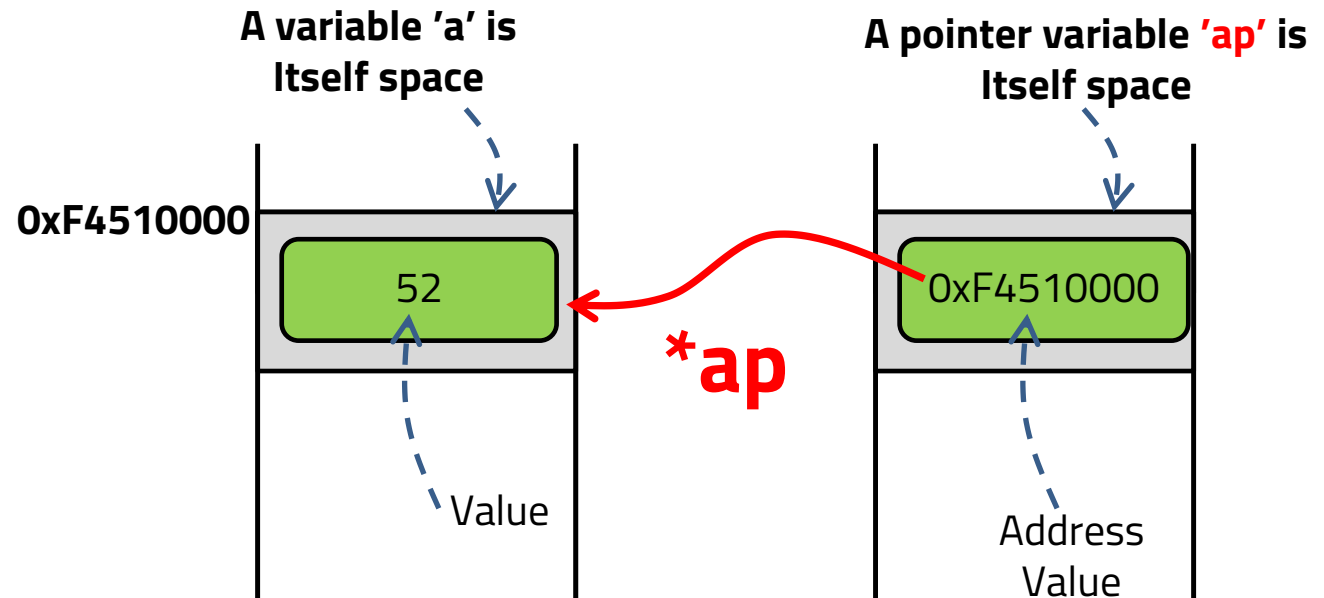
- Dereferencing

int a = 52;
int* ap;
ap = &a;

*ap = 100;

⬇ same

*(&a) = 100;

⬇ same

a =100

A variable 'a' is Itself space

0xF4510000

52

Value

A pointer variable 'ap' is Itself space

0xF4510000

*ap

Address Value

Constant

◆ Integer constants value

```
int decimal = 123;                              ←——— decimal
int octal = 0123;                               ←——— octal
int hex = 0x123;                                ←——— hexadecimal
unsigned int unsigned_decimal = 123U;           ←——— unsigned      2 bytes
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
long int long_decimal = 123L;                   ←——— long          4 bytes
```

◆ Floating constants value

```
float pi1 = 3.14F;          4 bytes
double pi2 = 3.14;          8 bytes              Size of vars is depend on processors
long double pi3 = 3.14L;    16 bytes
```

◆ const keyword in variable declaration

```
const float pi = 3.14;          float pi = 3.14;
pi = 3.1415;                    pi = 3.1415;
```
⇒ **Error** – constant variable can not be changed by assignment

Constant

char ch = 'a';

◆ Character constants

❖ A character constant is 1 character enclosed in single quotes ' '
(exception : escape sequence)

❖ The value of character constant is the numeric value of the
character in the machine's character set.

● Ex. ASCII character set
the vaule of '0' = 48

❖ Escape Sequence

\a	alert (bell) character	\\	backslash
\b	backspace	\?	question mark
\f	formfeed	\'	single quote
\n	newline	\"	double quote
\r	carriage return		
\t	horizontal tab		
\v	vertical tab		