

Randomly access array elements

COMP 2655

Array

Remember that an array is defined by:

- its start address
- the number of elements
- the size of an element

1D Array – memory storage

```
int array1[4] = { 12, 24, 36, 48 };
```

i.e.:

```
array1:  dc.w      12,24,36,48 ; assume int = 16  
          ; bits
```

1D Array – indexing formula

Arrays in C and most languages are zero-based – this means that the indices range from 0 to MAX_SIZE -1

Generally, for a zero-based array A with element size “el_size”, A[index] has:

$$\text{offset} = \text{index} * \text{el_size}$$

$$\text{address} = \text{A} + \text{index} * \text{el_size} = \text{address} + \text{offset}$$

$$\text{value} = \text{dereference}(\text{A} + \text{index} * \text{el_size})$$

1D Array – memory storage

So for our previous array example:

0	1	2	3
00	0C		

<u>element</u>	<u>index</u>	<u>offset</u>	<u>address</u>	<u>value</u>
array1[0]	0	0	array1 + 0	12
array1[1]	1	2	array1 + 2	24
array1[2]	2	4	array1 + 4	36
array1[3]	3	6	array1 + 6	48