

2-D Arrays Exemplar – Multi-Storey Car Park

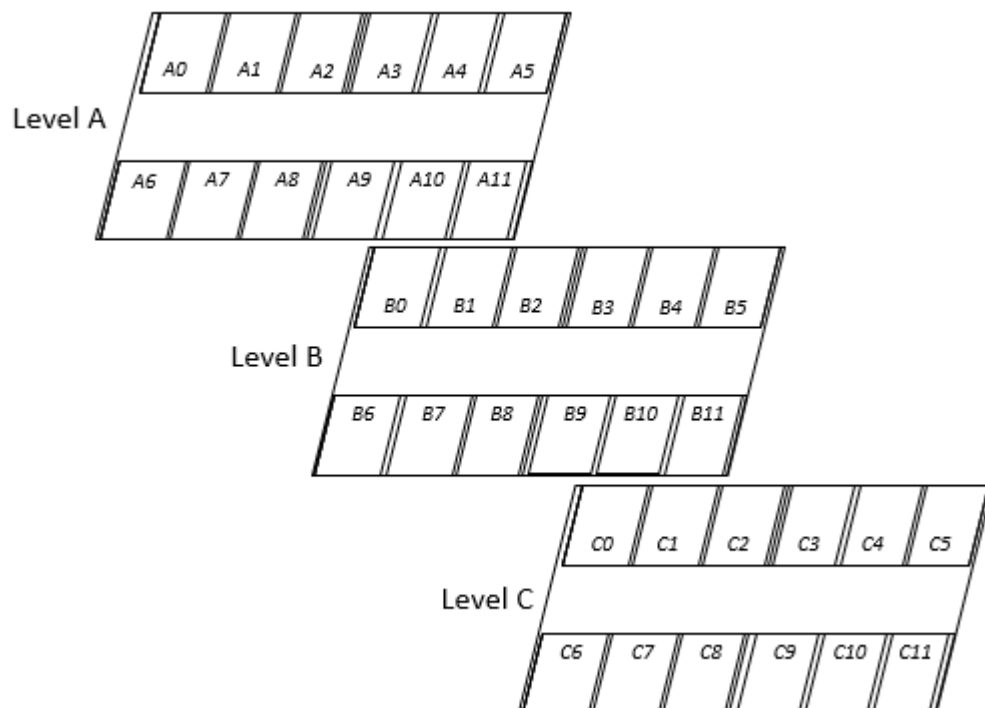
In the video of this section, we are going to explore how 2-D arrays can be applied to a problem for which the information which needs to be stored is conceptually arranged in a grid-like manner.

The scenario we will be following is a small multi-storey car park, which uses sensors to detect whether designated parking spaces are vacant or occupied and displays information to potential customers at the entrance to the car park regarding parking space availability.

We will begin by considering the information storage requirements for the scenario and then look ahead to see how we may be able to use a 2-D array to help store the required information in an efficient and cohesive manner.

The problem - car park structure

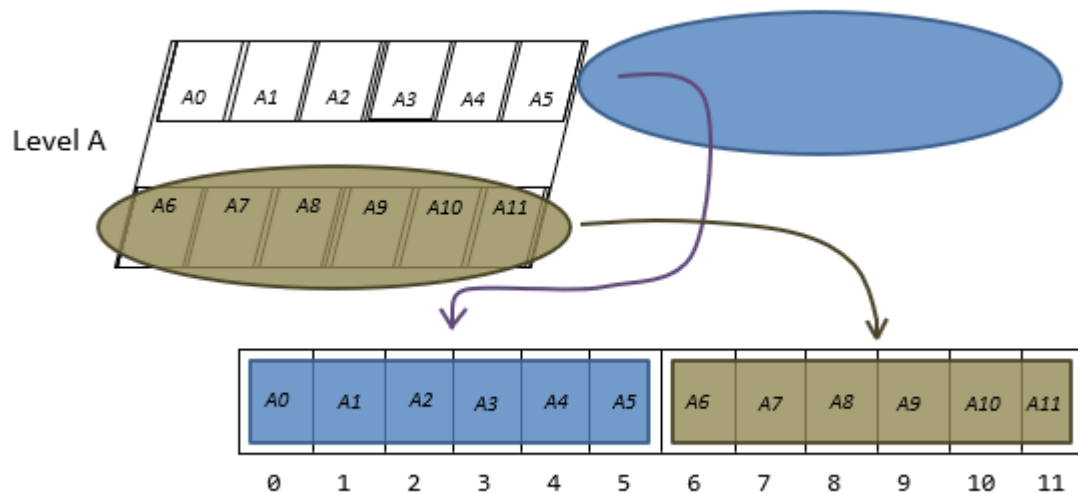
The car park in question is split over three levels and has 12 designed parking spaces available per level. The diagram below visualises how the spaces are organised.



Designing a data storage structure

Given that the car park itself is essentially a grid-based structure, it makes sense that we can model the car park within our program using arrays.

Let's consider how we may be able to map just one level onto an array in our program. As shown below, we can render a level in the car park as an array, but how can we model the multi-storey car park?



The answer is simple – we can use a 2-D array to model the car park, where each row in the array represents a level in the car park and the elements within each row represent the parking spaces on the corresponding level.

The diagram below visualises what the 2-D array structure will look like and how the parking spaces on each level will be mapped into it by our program.

	0	1	2	3	4	5	6	7	8	9	10	11	
0	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	Level A
1	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	Level B
2	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	Level C

Now we can look at how this data structure can be implemented and how we can work with it to facilitate functionality for monitoring the individual car park spaces within the multi-storey car park.