

# Difference Between Static and Dynamic Memory Allocation

Memory allocation is an important concept in programming. Essentially, it is the process of allocating memory space to a certain computer program. Memory allocations are divided into two categories. The difference between static and dynamic memory allocation is an important topic in the GATE CSE syllabus.

## Key Difference Between Static and Dynamic Memory Allocation

Static Memory Allocation	Dynamic Memory Allocation
Static memory refers to memory allocation that occurs during the compilation process.	Dynamic memory allocation refers to memory allocation that occurs during the execution or runtime of a program.
It makes use of a stack to manage memory allocation that is static.	It makes use of a heap to manage dynamic memory allocation.
It is less efficient.	It is more efficient.
Once the memory has been allocated, it will be available throughout the application.	Memory can be allocated at any point throughout the application.
It is faster than dynamic memory allocation.	It is slower than static memory allocation.
The memory in a static memory allocation cannot be altered while the application is running.	During the execution of a program, dynamic memory allocation allows the memory to be altered.

## Static and Dynamic Memory Allocation

Memory allocation takes place either before or during program execution. Memory allocations are divided into two categories:

1. Static Memory Allocation or Compile-time Memory Allocation
2. Memory Allocation at Runtime or Dynamic Memory Allocation

## What is Static Memory Allocation?

When you use Static Memory Allocation, the memory for your data is allocated at the start of the application. When the program is created, the size is set. It applies to

variables in the global scope, variables in the file scope, and variables qualified by statically defined inside functions. This memory allocation is set in stone and cannot be altered, i.e. increased or lowered once it has been allocated. As a result, precise memory needs must be understood ahead of time.

- Memory is allocated during the compilation process.
- It makes use of a stack to keep track of the memory allocation.
- The memory size of this allocation cannot be changed once it has been allocated.
- It is ineffective.

Static memory allocation occurs when the ultimate size of a variable is chosen before the program is performed. Compile-time memory allocation is another name for it.

## What is Dynamic Memory Allocation?

The technique of assigning memory space during execution or run time is known as dynamic memory allocation. During the execution of the program, it generates overhead for each operation over the system, slowing down the overall process. It allows for more flexibility in terms of allocation by performing operations on different areas of the program, which reduces waste. The advantages of allocating memory dynamically are mentioned below.

- When we don't know how much memory will be required for the software ahead of time.
- When we need data structures that don't have a memory restriction.
- When you wish to make better use of your memory space.
- Dynamic memory allocation is required when using the concepts of structures and linked lists in programming.

## Similarities Between Static and Dynamic Memory Allocation

The following are the similarities between the two types of allocation memory:

- They're both memory management systems.
- Both can be done manually with the assistance of a coder.