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## Data Structures Level 2

# What is Hashtable?

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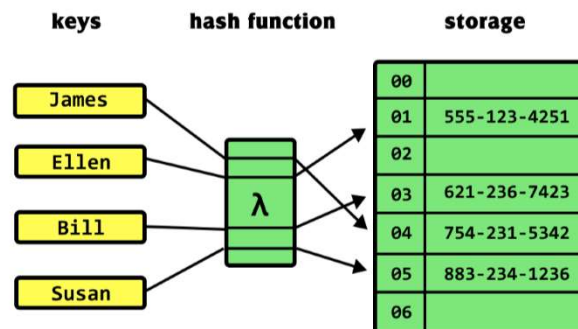
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# What is Hashtable?

- Hash tables are one of the most critical data structures all developers should master.
- They help us solve various algorithmic challenges.
- A hashtable is a data structure that you can use to store data in key-value format with direct access to its items in constant time.
- Hash tables are said to be associative, which means that for each key, data occurs at most once.
- We can use hash tables to store, retrieve, and delete data uniquely based on their unique key.

# What is Hastable?

- Hash tables let us implement things like phone books or dictionaries; in them, we store the association between a value (like a dictionary definition of the word "chair") and its key (the word "chair" itself).



# What is Hashtable?

- A hashtable, also known as a hash map, is a data structure that implements an associative array abstract data type, a structure that can map keys to values.
- It uses a hash function to compute an index into an array of buckets or slots, from which the desired value can be found.
- We can use hash tables to store, retrieve, and delete data uniquely based on their unique key.

# What is Hashtable?

- **Efficient Access:** Hashtables provide very efficient average time complexity for insert, delete, and search operations, ideally in  $O(1)$  time, which means the time to perform these operations is constant and does not grow with the size of the data.
- Benefited by fast data retrieval as a strength, hash tables are foundational to standard tools and techniques like caching and database indexing.

# What is Hashtable in C#?

- A Hashtable in C# is a collection that stores key-value pairs, organized based on the hash code of the key.
- It resides in the System.Collections namespace
- Designed for scenarios where quick searches, additions, and deletions are crucial.
- Unlike generic collections, Hashtable allows for keys and values of any type, adding versatility but requiring careful handling of data types, remember Boxing/Unboxing.



# Key Features

- **Non-Generic:** Operates on objects of any type, requiring casting when retrieving elements. Boxing/Unboxing.
- **Efficient Lookups:** Utilizes hash codes for keys, optimizing search operations.
- **Uniqueness:** Keys must be unique, though values may repeat.
- **Order:** Does not maintain a predictable order of stored elements.

# Key Features

- Hashtable is a powerful, if somewhat dated, collection type in C# that excels in scenarios requiring quick access to elements by key.
- While newer, generic collections like `Dictionary<TKey, TValue>` offer type safety and potentially better performance, understanding how to use Hashtable is still valuable, especially for working with legacy code or APIs that require it.



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