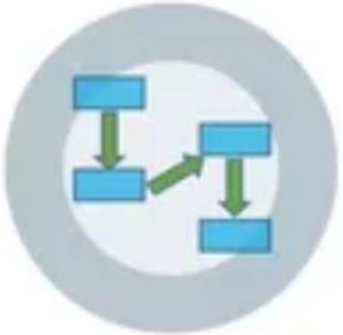
M-way Trees



Data Structures and Algorithms

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Data Structures and Algorithms
Course Contents:
Abstract data types, complexity analysis, Big Oh notation, Stacks (linked lists and array implementations), Recursion and analyzing recursive algorithms, divide and conquer algorithms, Sorting algorithms (selection, insertion, merge, quick, bubble, heap, shell, radix, bucket), queue, dequeuer, priority queues (linked and array implementations of queues), linked list & its various types, sorted linked list, searching an unsorted array, binary search for sorted arrays, hashing and indexing, open addressing and chaining, trees and tree traversals, binary search trees, heaps, M-way tress, balanced trees, graphs, breadth-first and depth-first traversal, topological order, shortest path, adjacency matrix and adjacency list implementations, memory management and garbage collection

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M-way Trees

- M-way trees, also known as multiway trees, are a type of tree data structure in which each node has up to m children.
- In other words, an m-way tree is a generalization of a binary tree, where each node can have more than two children.
- M-way trees are commonly used in applications where nodes can have a large number of children, such as file systems or databases.

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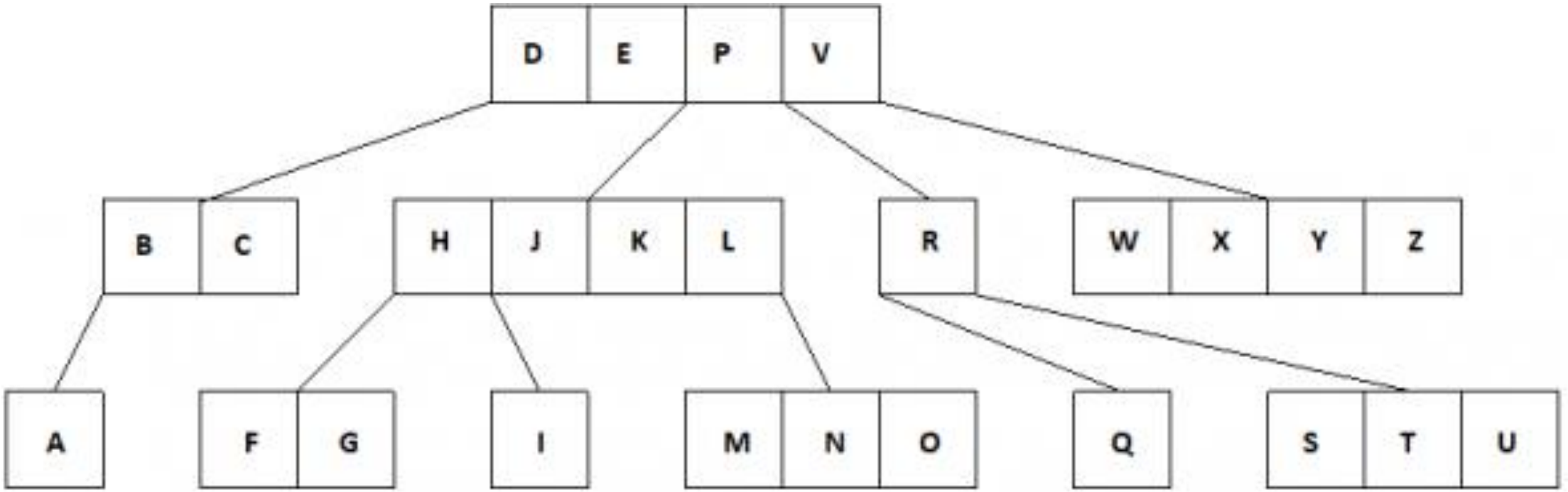
M-way Trees cont…

- M-way tree of order 5



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M-way Trees cont…

- By definition an m-way search tree is a m-way tree in which following condition should be satisfied:-

1. Each node is associated with m children and m-1 key fields
2. The keys in each node are arranged in ascending order.
3. The keys in the first j children are less than the j-th key.
4. The keys in the last m-j children are higher than the j-th key.

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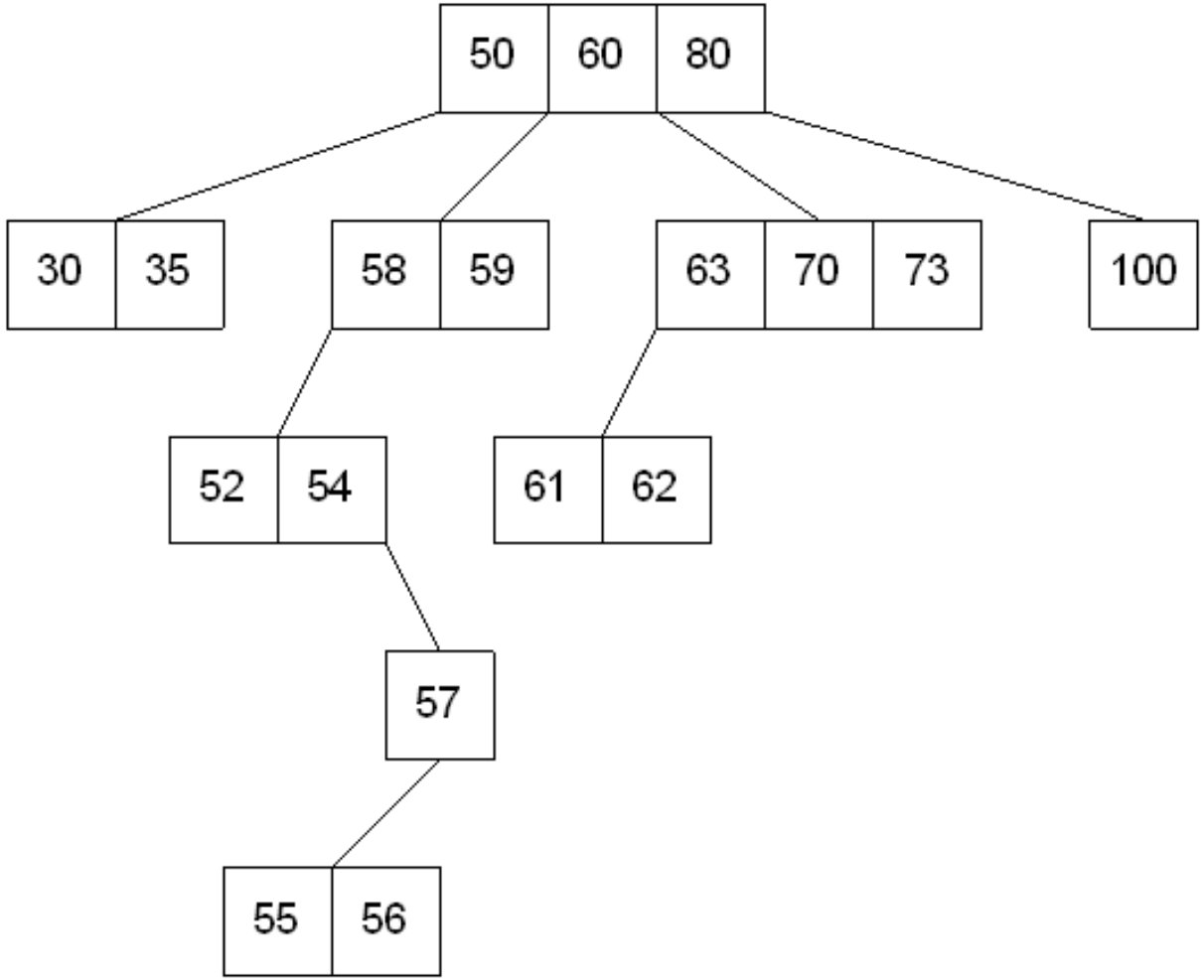
M-way Trees cont…

- 4-way search tree:



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M-way Trees cont…

- They can be used to represent hierarchical data where each node has multiple attributes or properties.
- In an m-way tree, each node contains m-1 keys that divide its children into m subtrees.
- The keys in each node are sorted in ascending order.

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M-way Trees cont…

- The first key in a node determines the range of values that belong to its first child, the second key determines the range of values that belong to its second child, and so on.
- M-way trees can be balanced or unbalanced.
- A balanced m-way tree has all its leaves at the same level, while an unbalanced m-way tree can have leaves at different levels.

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M-way Trees cont…

- M-way trees can be used for efficient searching, insertion, and deletion of data.
- They are also used in B-trees, which are a special case of m-way trees that are commonly used in databases and file systems.

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