

**PROGRAMMING CONCEPTS AND**  
**EMBEDDED PROGRAMMING IN**  
**C, C++ and JAVA:**  
**Lesson-7: Data Structures: Trees**

# Tree

- When the list becomes long traversing through it, insertions, deletion, and search of an element in-between the list becomes lengthier process.

# Tree

- Suppose a list element instead of just pointing to the next element through LIST\_NEXT, it points to two elements using LIST\_NEXT\_LEFT and LIST\_NEXT\_RIGHT or to more than two elements by LIST\_NEXT1, LIST\_NEXT2, .... Then instead of List, we form a Tree.

# Tree

- 1) There is a root element.
- 2) Root has two or more branches each having a daughter element.
- 3) Each daughter element has two or more daughter elements.
- 4) Last one (leaf) does not have any daughter element and points to Null.

# Tree

- 5) Only the root element is identifiable and it is done by the treetop pointer (Header). Each element points to TNodeNextLeft and TNodeNextRIGHT in a binary tree and or to more than two elements by TNodeNext1, TNodeNext2, ..., TNodeNextN in tree with N-branches (maximum) at a node.

# Tree

- 6) Since no other element is identifiable directly, by traversing the root element, then proceeding continuously through all the succeeding daughters, a tree element can be read or read and deleted, or can be added to another daughter or replaced by another element.

# Tree

- 7) Last element in the node points to NULL like in a list.
- 8) A tree has data elements arranged as branches. The last daughter, called node has no further daughters. A binary tree is a tree with a maximum of two daughters (branches) in each element.

## Application Examples of a Tree

1. A directory - Number of file-folders, Each file-folder having a number of other file folders and so on and a file is at the least node (leaf).
2. USB Devices nodes connected to hubs and nodes, and finally to a host controller at root



3. Files in a sub-directory and each sub-directory to parent directory, and finally to a root directory
4. A root has number of file-folders. Each file-folder has a number of other file folders and so on in the end there is a file each.
5. Network architecture in which a central server connects to multiple servers and clients

# Summary

# We learnt

- Tree— a data structure to organize a large set of data elements

End of Lesson 7 of Chapter 7  
on  
**Data Structures: Trees**