Disjoint Set Union

Disjoint Set Union

- Also known as **Union Find**.
- This data structure provides an interface of **3 operations** :
  - **MAKE_SET**
  - ***UNION_SETS***
  - ***FIND_SET***
- **Set** : collection of elements that are related to each other in a particular way

DSU on Graphs

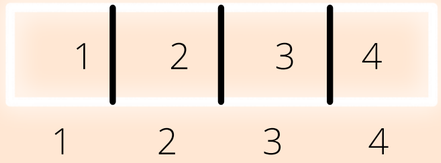
- We are given several **nodes**, each of which is a *separate set*.
- For each incoming **edge**, *combine the sets* of the two nodes belong to.
- Thus, each set is a collection of nodes reachable from each other.
- We will store the sets in the form of trees: each tree will correspond to one set. And the root of the tree will be the representative/leader of the set.

Representation of a Set

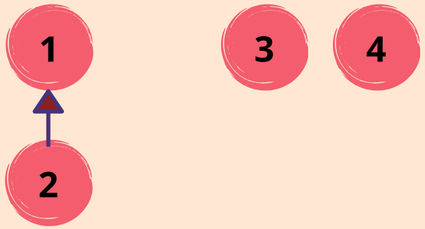
Tree

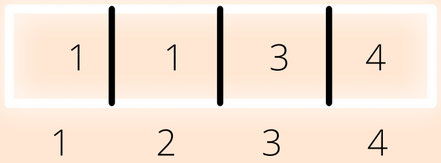
Parent array

Initial Graph - 4 nodes



Edge (1, 2) → UNION_SETS (1, 2)

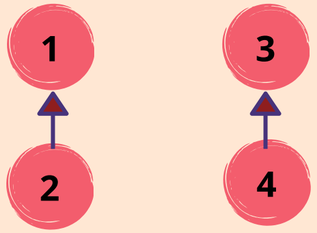


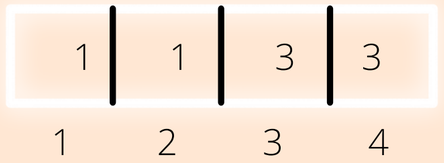


Tree

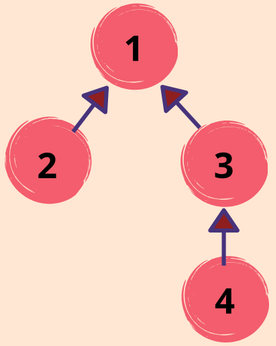
Parent array

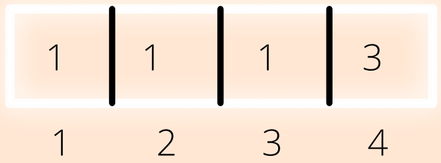
Edge (3, 4) → UNION_SETS (3, 4)





Edge (2, 4) → UNION_SETS (2, 4)





Code

- **Basic Implementation**
- **Optimised Implementation**

Question -

1. Are the two nodes reachable from each other?
2. Number of connected components in a graph

DSU on Grid based graphs