VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE | DEPARTMENT OF COMPUTER SCIENCE

Greedy Technique

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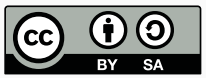
VSB – Technical University of Ostrava



Lecture outline

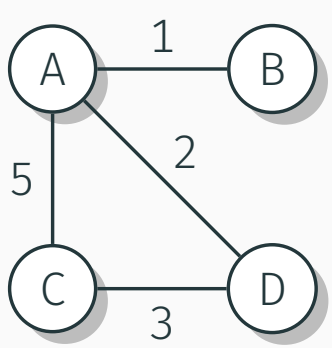
Greedy Technique

Minimum Spanning Tree of a Graph

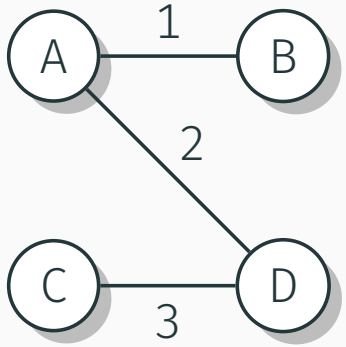
Minimum Spanning Tree of a Graph

Minimum Spanning Tree – Example

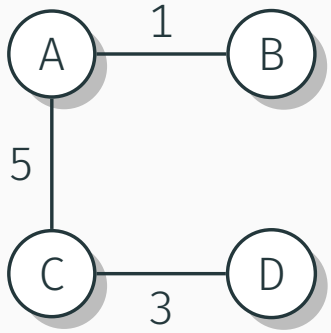
Graph G has a total of 4 spanning trees



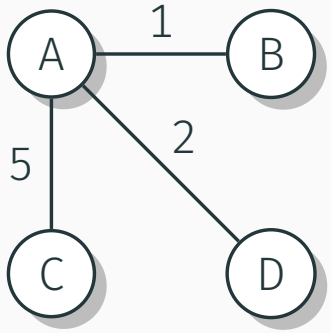
Graph G



$w(K_1) = 6$



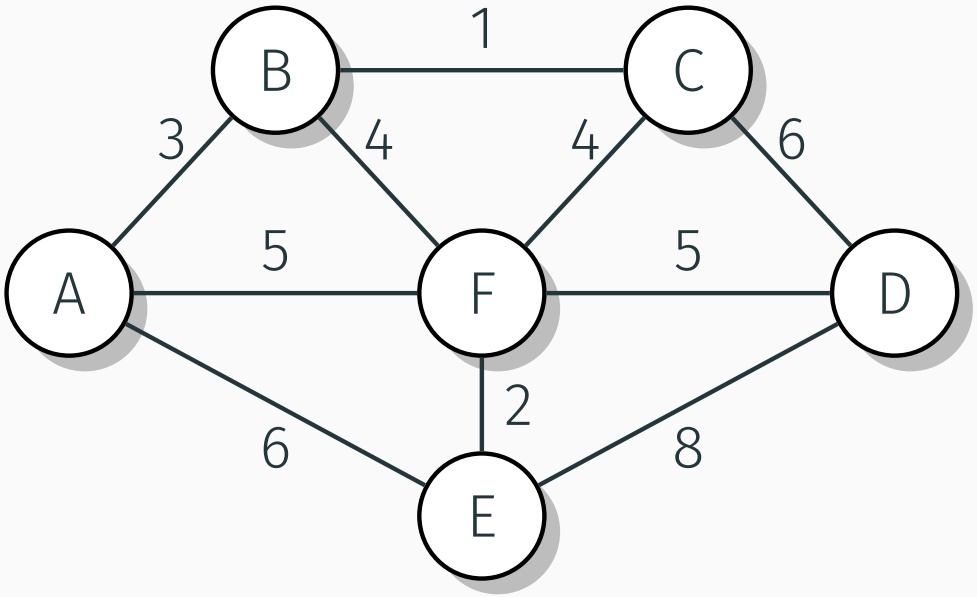
$w(K_2) = 9$



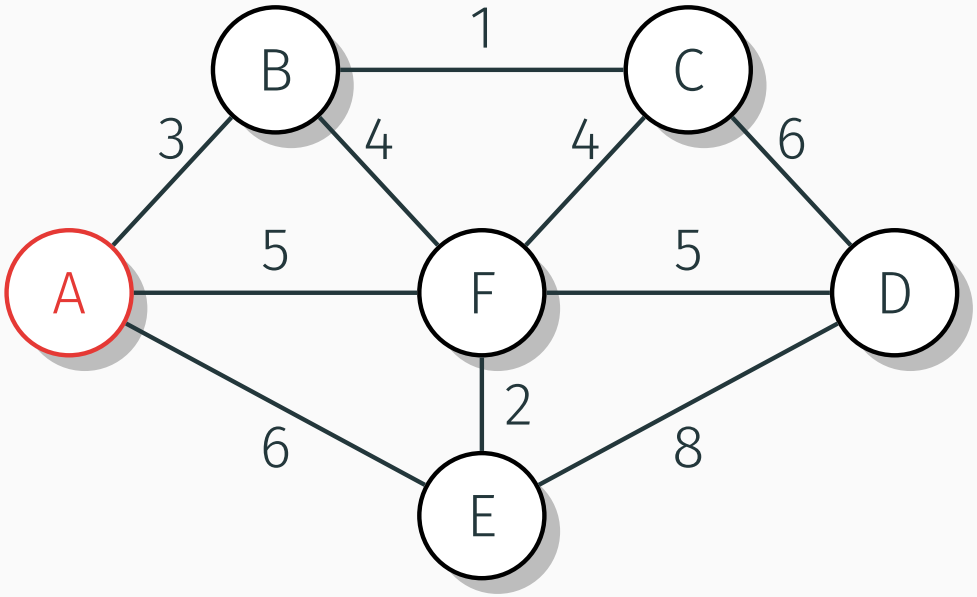
$w(K_3) = 8$

The minimum spanning tree is spanning tree K_1.

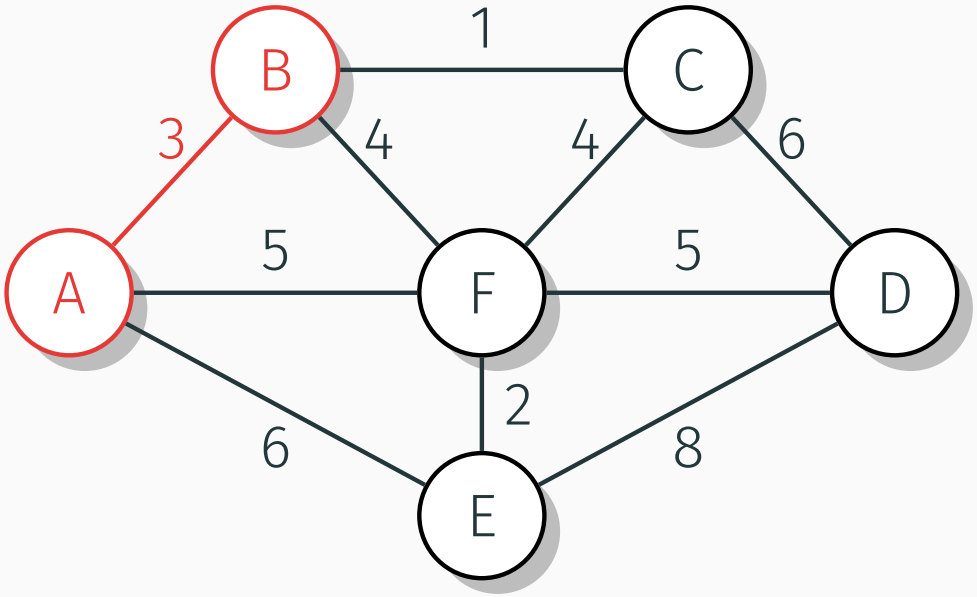
Minimum spanning tree of a graph



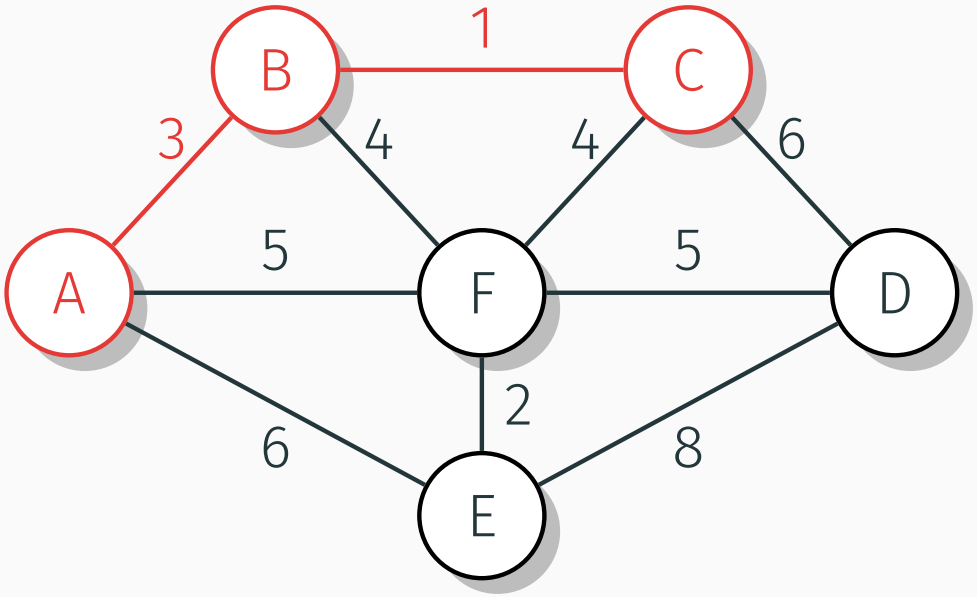
Minimum spanning tree of a graph (cont.)



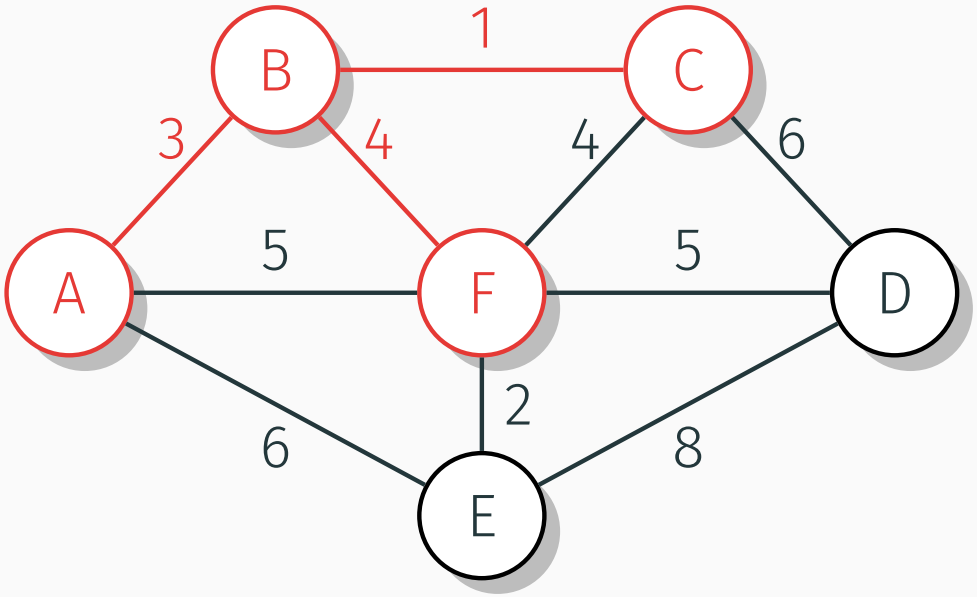
Minimum spanning tree of a graph (cont.)



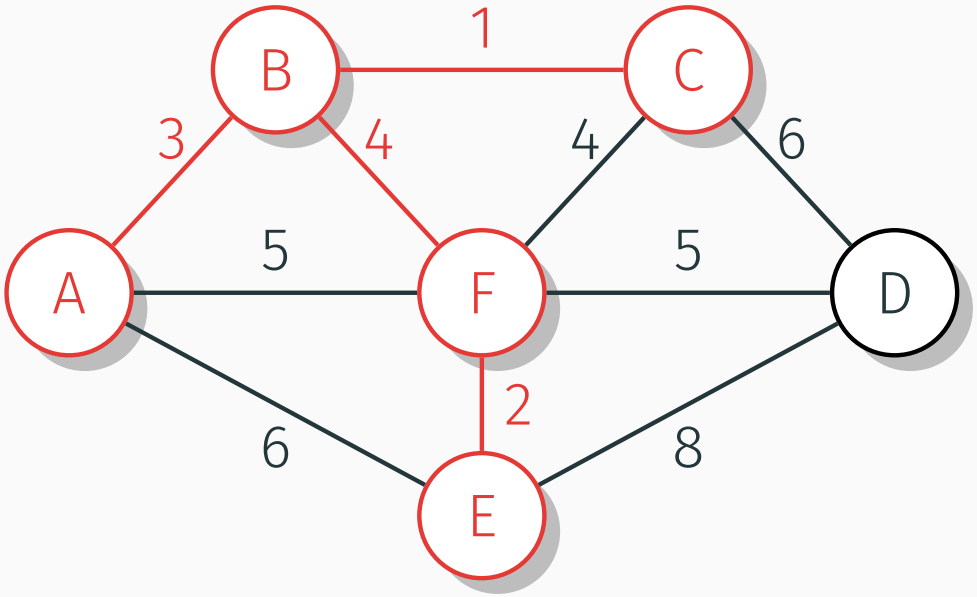
Minimum spanning tree of a graph (cont.)



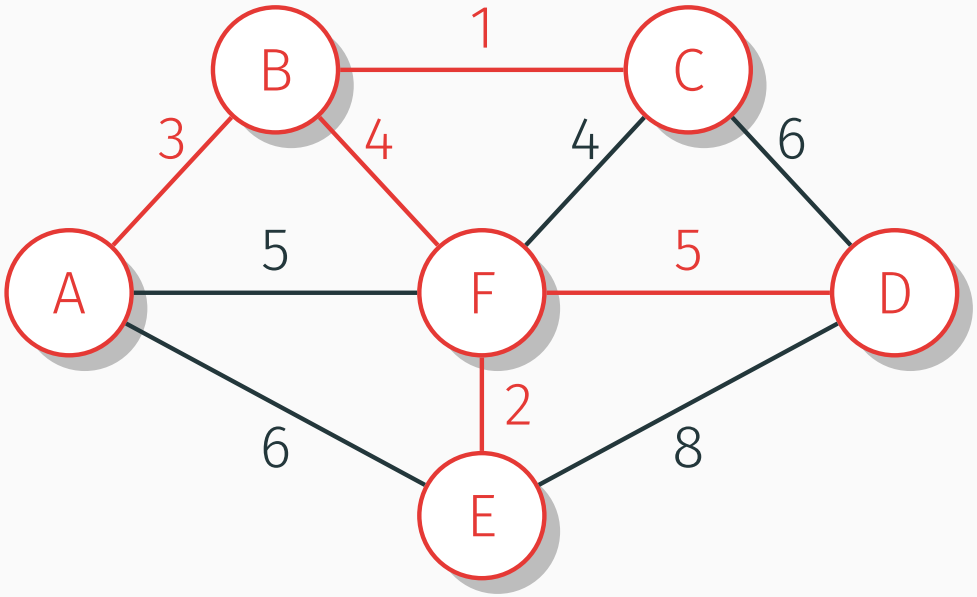
Minimum spanning tree of a graph (cont.)



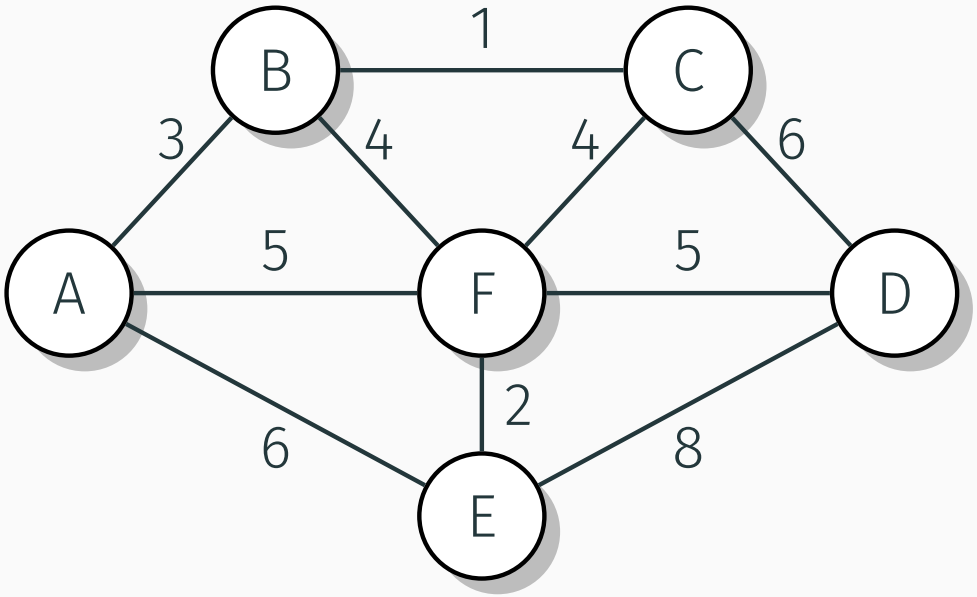
Minimum spanning tree of a graph (cont.)



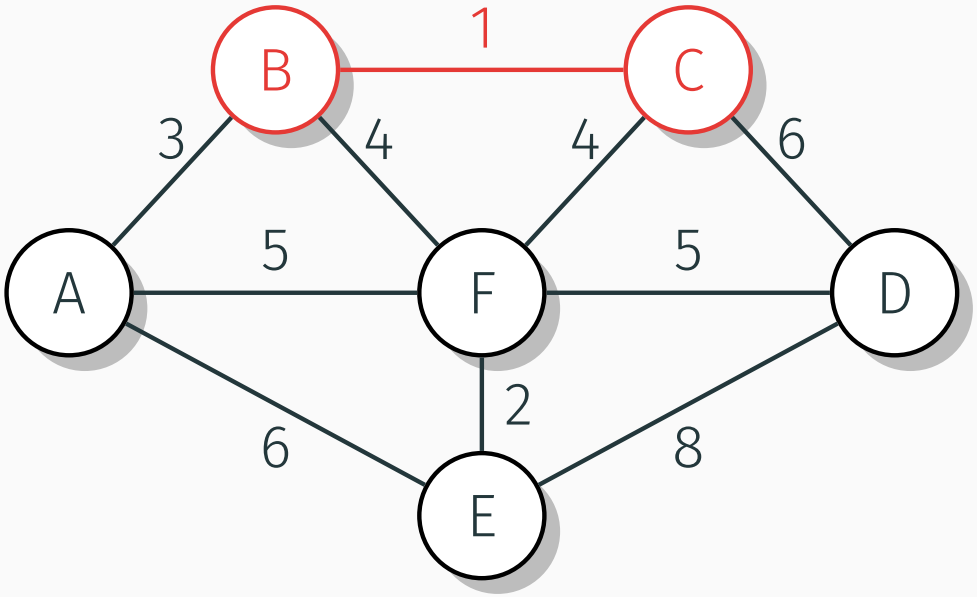
Minimum spanning tree of a graph (cont.)



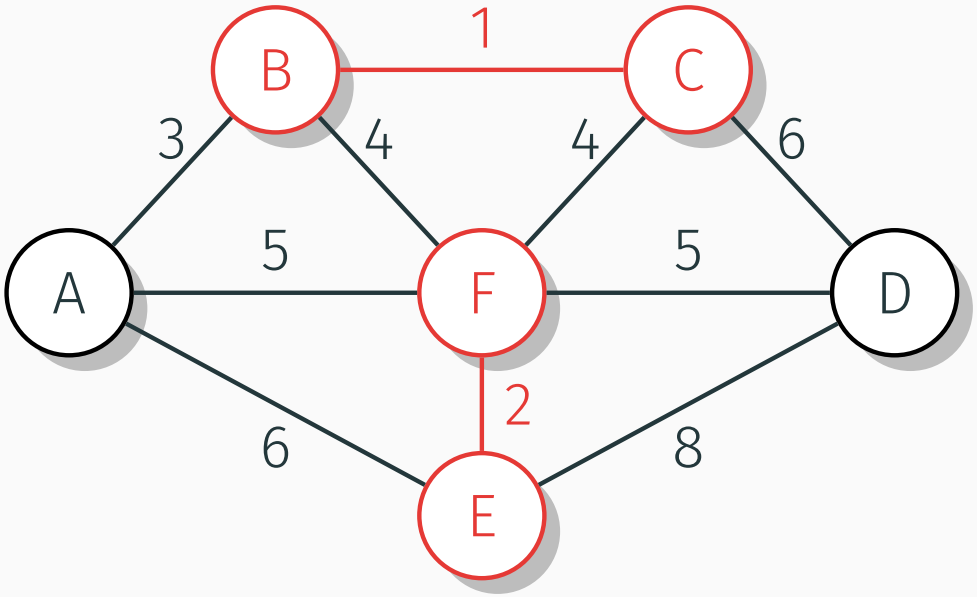
Minimum spanning tree of a graph



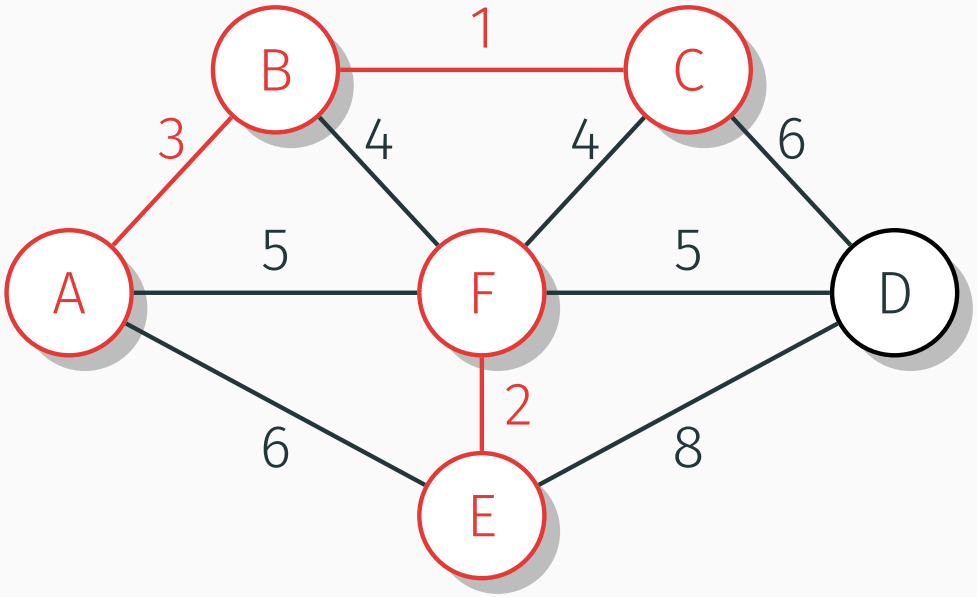
Minimum spanning tree of a graph (cont.)



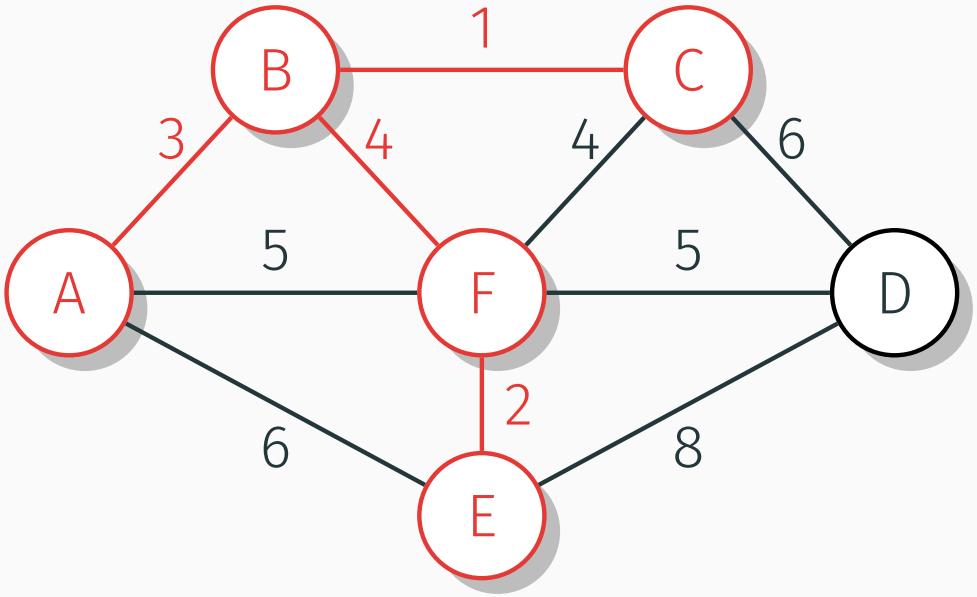
Minimum spanning tree of a graph (cont.)



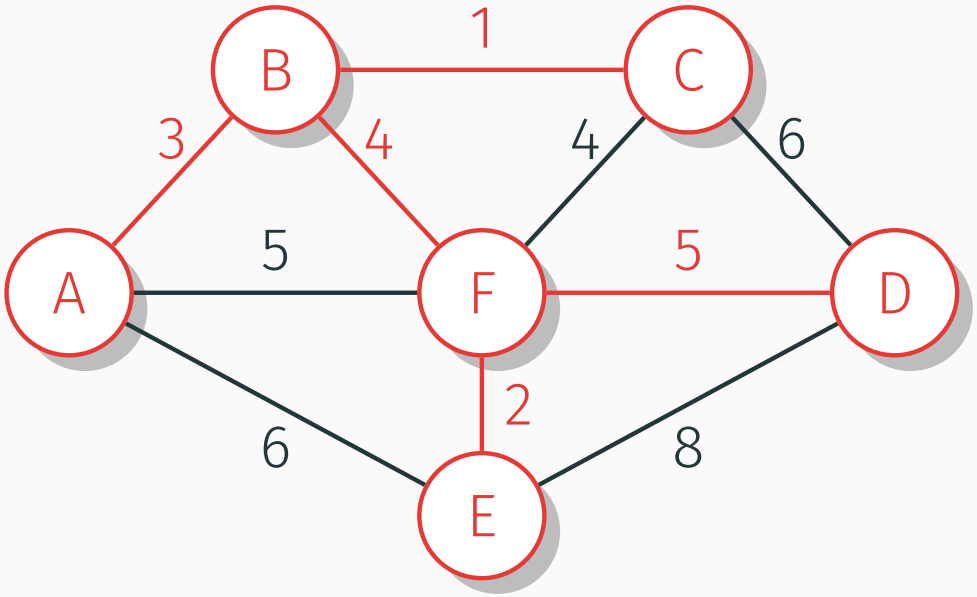
Minimum spanning tree of a graph (cont.)



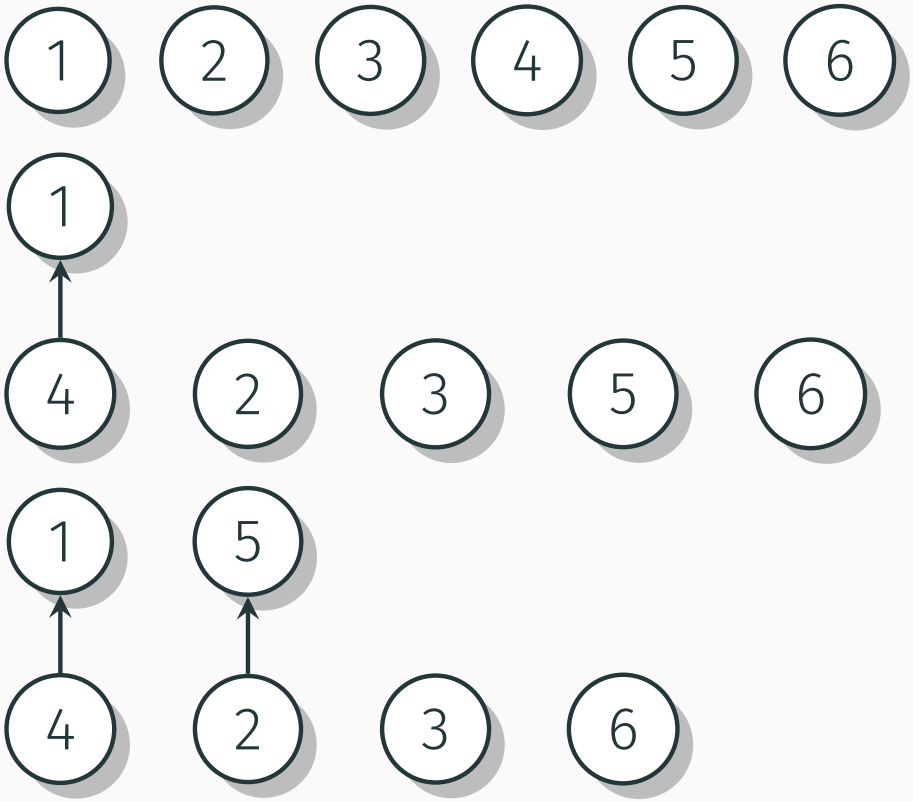
Minimum spanning tree of a graph (cont.)



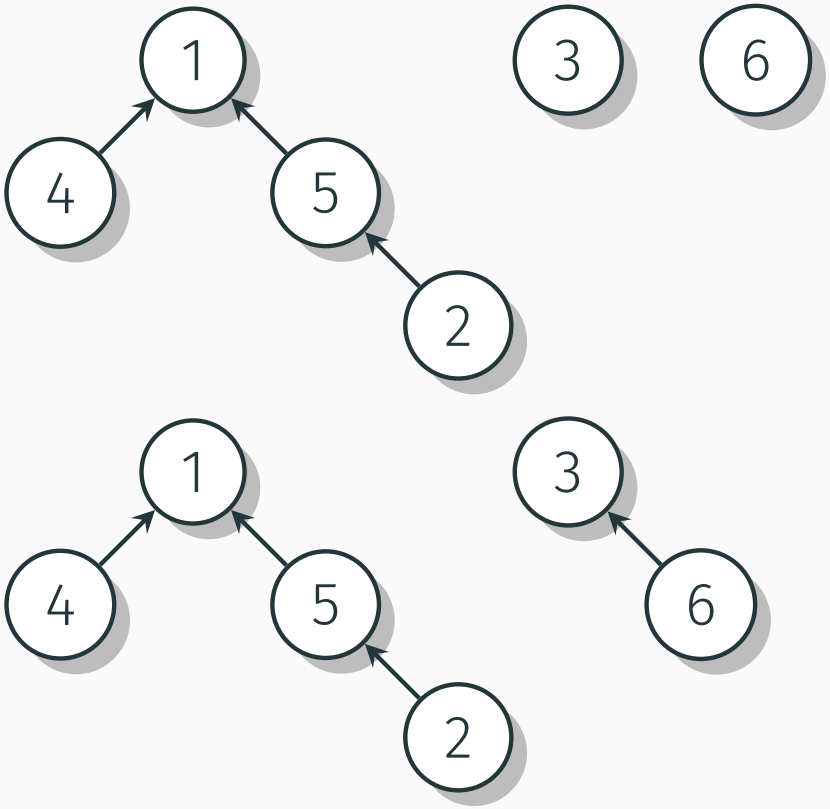
Minimum spanning tree of a graph (cont.)



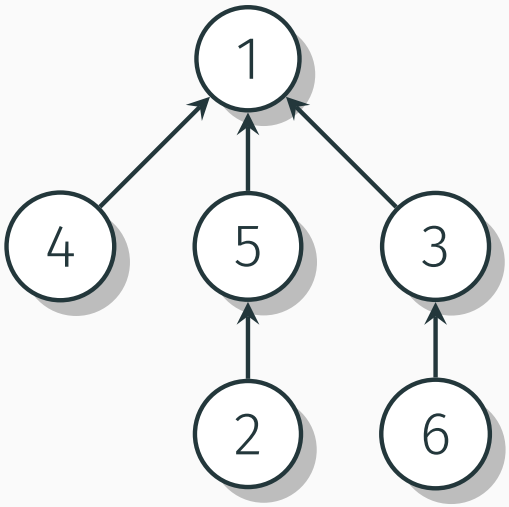
Quick Union



Quick Union (cont.)



Quick Union (cont.)



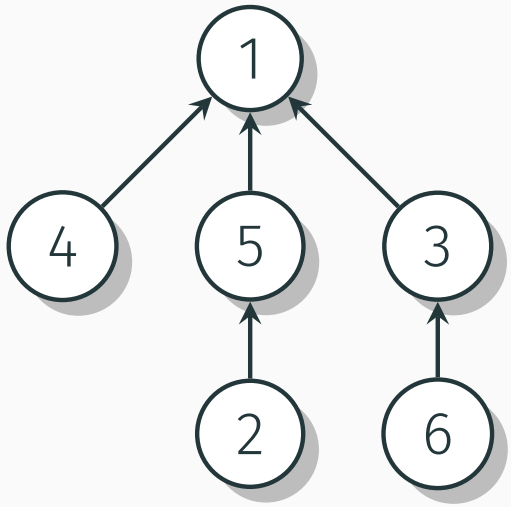
QuickUnion, representation of the tree in an array

Initial state after performing *makeset*(1), ... , *makeset*(6)

Element	Parent
1	null
2	null
3	null
4	null
5	null
6	null

QuickUnion, representation of the tree in an array (cont.)

Final state after performing all *union* operations



Element	Parent
1	null
2	5
3	1
4	1
5	1
6	3

Greedy Technique

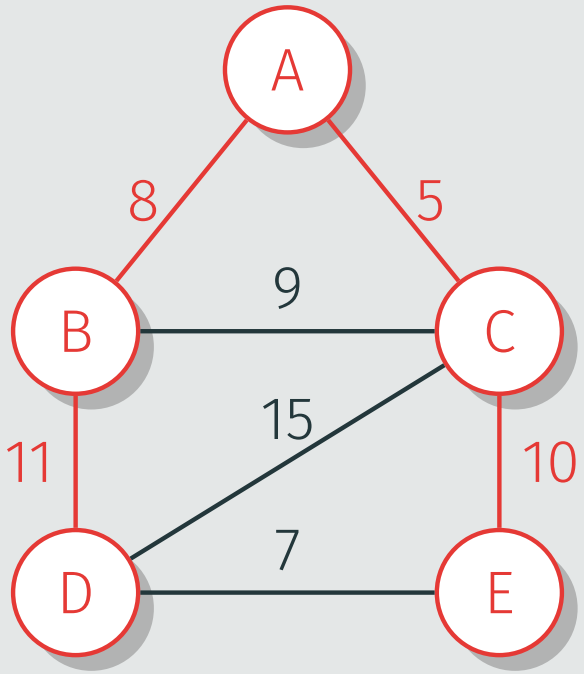
Dijkstra's algorithm

Shortest path tree vs. minimum spanning tree of the graph

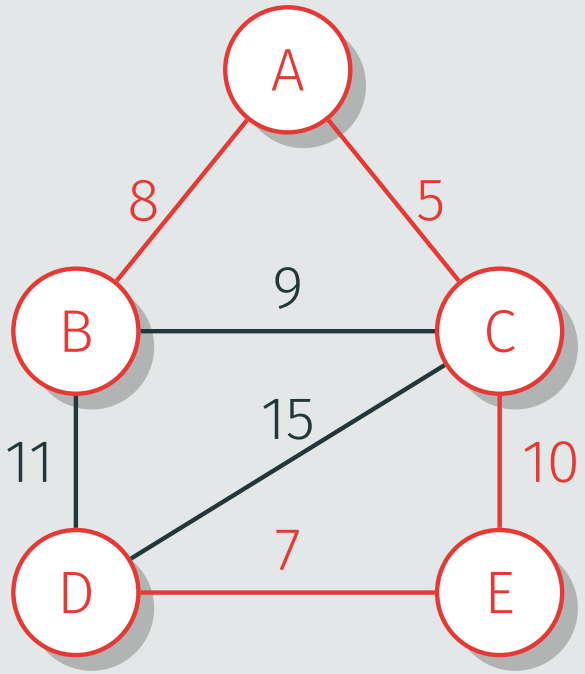
- The result of Dijkstra's algorithm is not the minimum spanning tree of the graph.
- The result is **the shortest path tree** from a given initial vertex.
- The shortest path tree is just one of the graph's spans, but it does not have to be minimal.
- The minimum spanning tree of the graph minimizes **the sum of edge weights** in the span.
- The shortest path tree minimizes **path length** from a given initial vertex. The shape of the tree **depends** on the initial vertex.

Shortest paths tree vs. minimum spanning tree of the graph, example

Shortest paths tree from A



Minimum spanning tree of the graph



Greedy Technique

Huffman code

Thanks for your attention