

Routing Topologies

Consider a network as shown in the picture below. Each edge in this network has a given weight corresponding to the energy necessary to transmit one message between the two adjacent nodes. Build the Shallow Light Tree (SLT) of this graph if we assume node 1 as the root node. The path between any node and the root on the SLT has to be at most two times the weight of the shortest path between these two nodes in the initial graph (i.e. $\alpha = 2$).

A simple algorithm that constructs a Shallow Light Tree of a graph G is as follows :

- Compute the MST, H , of G ;
- Compute all shortest paths (SPT) from the root r .
- Compute a preordering of H (generated when ordering the nodes as visited by a DFS).
- For all nodes v in order of their preordering do
 - Compute the shortest path from r to v in H . If the cost of this shortest path in H is more than a factor $\alpha = 2$ than the cost of the shortest path in G , then add the shortest path in G to H .
- Compute the SPT with root r in H .

