TK1 Exercise 7

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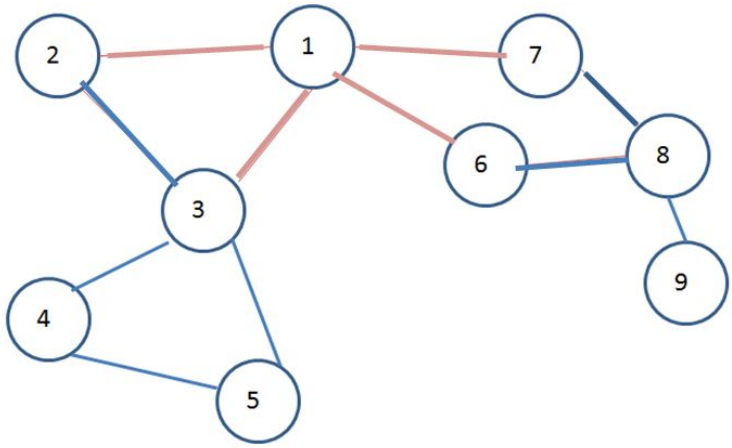
Task 1 : Local View

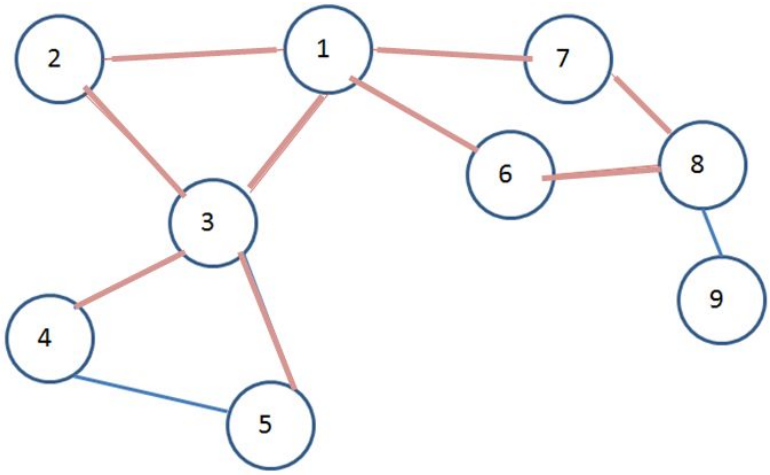
Step 1: $G_1(1)$

Node 1 discovers the nearby nodes



Step 2: $G_2(1)$

The other nodes look for the nearby nodes to them



Task 2: LOCAL Model

1. **Inherently non-local Problem** : A problem is inherently non-local if the output of a node v depends on the initial input of a node outside of $G_k(v)$

   Example: Calculating the shortest path between two nodes in a graph is inherently non-local. Whether a path is the shortest path between 2 nodes or not depends also on the possible shorter paths that may span nodes outside $G_k(v)$.

2. **Impossibility of Symmetry Breaking** - Two nodes with equal view of the graph produce the same output.

   Example: Consider a large, uniform mesh network of routers. Any two routers in this network, not close to the network boundaries, will see an identical neighbourhood. It's impossible to assign addresses in such a highly symmetric network - just like in case of the n-cycle network presented in class.

Task 3: Topology Control

Relative Neighborhood Graph (RNG) - Edge (u, v) exists if the intersection of the disks centered at u and v is free of other nodes.

The algorithm has the property, **Planarity** - required by Greedy Perimeter Stateless Routing.