# DOGE SAS

## Definitions

1. Path/Route - A collection of nodes and edges through which a single packet reaches its destination.
2. Single path routing– A single path exists in a routing table between a source and destination node.
3. Multipath routing – Multiple paths may exist in a routing table between a source and destination node.
4. Routing processor - Edison

# Web Interface/Routing Processor Requirements

1. By default, the Web UI shall display all nodes and neighbor edges present in the network.
2. The Web UI shall present the user with GUI element(s) to visibly hide nodes and neighbor edges in the network graph.
   1. These element should have no impact on the network topology. They are just there to aid in network visualization.
3. When nodes and edges are visible, the Web UI shall present the user with GUI element(s) to remove nodes and neighbor edges in the network graph.
4. When nodes and edges are visible, the Web UI shall present the user with GUI element(s) to add nodes and neighbor edges to the network graph.
5. When nodes are visible, the WebUI shall provide a mechanism for a user to select one or two nodes.
6. When two nodes in the network graph are selected, all routes between the two nodes shall be made visible.
7. When routes between two nodes are visible, the user shall be able to select any of the visible routes.
8. When the Web UI is initialized, the routing processor shall:
   1. TODO: This needs to be expanded on.
   2. Check its neighbor table for new nodes.
   3. Calculate single-path routing tables for every source, destination pair in the network.
   4. Update the routing table for every node in the network.
   5. Send the updated network state (nodes, neighbor edges, routes) to the Web UI.
9. The routing processor shall check every network element removal request to prevent creation of orphan nodes.
10. When a user has selected a route and requested its deletion, the routing processor shall:
    1. TODO: This needs to be expanded on
11. When a user has selected two nodes and requested that a route be added to connect them, the routing processor shall:
    1. TODO: This needs to be expanded on.
12. When a user deletes a neighbor edge in the Web UI, the routing processor shall:
    1. Check the routing impact of deleting this edge by calculating the number of affected of routes.
       1. If there are no routes using this neighbor edge, then the routing processor shall proceed with edge deletion.
       2. If there are 1 or more routes using this neighbor edge, the routing processor shall attempt to recalculate replacement routes which do not include the deleted neighbor edge.
          1. If there are no routes that can replace the affected routes, the routing processor shall halt the edge deletion process, request that the Web UI prompt the user for confirmation, and then continue with edge deletion once the operation is confirmed by the user.
          2. If there are routes that can replace the affected routes, the routing processor shall add the new routes by updating the relevant node routing tables and then proceed with edge deletion.
    2. Remove the nodes connected by the edge from node neighbor tables.
    3. Remove any routes present in all routing tables that uses this edge for multi-hop communication.
13. When a user deletes a node in the Web UI, the routing processor shall:
    1. Check the routing impact of deleting this node by calculating the number of affected of routes.
       1. If there are no routes using this node, then the routing processor shall proceed with node deletion.
       2. If there are 1 or more routes using this node, the routing processor shall recalculate replacement routes which do not include the deleted node.
          1. FIXME to explain that orphan nodes cannot be created: If there are no routes that can replace the affected routes, the routing processor shall halt the node deletion process, prompt the user for confirmation, and then continue with node deletion once the operation is confirmed by the user.
          2. If there are routes that can replace the affected routes, the routing processor shall add the new routes by updating the relevant node routing tables and then proceed with node deletion.
       3. Invalidate the node in all neighbor tables by adjusting the edge LQE.
       4. Remove any routes present in all routing tables that uses this node for multi-hop communication.
14. When a user deletes a route in the Web UI, the routing processor shall:
    1. TODO: This needs to be expanded on.
15. When a user adds a previously deleted node to the network, the routing processor shall:
    1. Request a user confirmation from the WebUI to initiate full route recalculations.
       1. If the user accepts, the routing processor shall recalculate all routes between every two nodes in the network and perform the following steps.
          1. The routing processor shall add non-existent routes to all routing tables.
          2. If there are new routes available with a better multi-hop LQE than existing routes, then the routing processor shall replace the worst routes with the newly computed ones.
       2. Reset the invalid LQE links for neighboring nodes, and send a message to the new node in order for LQE to be reset to a normal value.
16. When a user adds an edge to the network, the routing processor shall:
    1. TODO: FINISH ME