ECE 545 Quiz 3

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Due Date: 3/31/2023

1. To compute the path with the highest delivery probability between a source-destination pair using Dijkstra's algorithm, we can modify the algorithm to consider the packet loss probability pi of each link i by assigning weights based on the complement of the packet loss probability (w(i) = 1 - p(i)), with the weight of a path being the product of the weights of its links. By running the modified algorithm, we can find the path with the highest product of the link weights, which corresponds to the highest delivery probability. Once found, we can either return this path to the user or use it for further processing in the network.

2. The "count to infinity" problem can occur in distance vector routing algorithms when a link cost changes, causing nodes to send outdated information to neighbors, resulting in incorrect routing decisions and network loops. To address this, a technique called link cost changes and poisoned reverse can be employed, whereby instead of immediately broadcasting new link cost information, a node sets a flag indicating that the information is not yet stable and waits for it to propagate. During this waiting period, the node sends poisoned reverse messages to its neighbors, signaling that the destination is no longer reachable through that node, and ensuring that any nodes using it for routing update their tables accordingly. Once the waiting period elapses, the node broadcasts the new link cost information and poisoned reverse messages to all neighbors, allowing nodes to make accurate routing decisions based on the latest information, and mitigating the "count to infinity" problem.

3. Hot potato routing is a type of routing protocol used in computer networks, particularly in packet-switched networks, where packets are routed based on the network congestion level. In hot potato routing, packets are forwarded to the next node as soon as they arrive, without waiting for the node to become available. This contrasts with cold potato routing, where packets are held at each node until it is ready to forward them. The goal of hot potato routing is to minimize the time that packets spend in the network, reducing the overall delay and increasing the network throughput. When a node receives a packet, it immediately checks the congestion level of its output links and forwards the packet to the least congested link, or the link with the shortest queue, without any further processing. This process is repeated at each intermediate node until the packet reaches its destination. Hot potato routing is particularly useful in situations where the network is heavily congested or the traffic is burst, with packets arriving in quick succession. It is also commonly used in real-time applications such as video streaming or voice-over-IP (VoIP) services, where low latency and high throughput are critical for a good user experience. However, hot potato routing can also result in uneven distribution of traffic and may cause congestion at some nodes if the traffic is not properly balanced. As a result, hot potato routing is often used in combination with other routing protocols to provide optimal performance and reliability in computer networks.