Laboratory 4: Routing

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The nodes are connected to their immediate neighbors and communication between the gateway and any node is done using routing . The communication between the nodes is peer – peer .

Each node has a routing table associated with the network . The routing table gives the cost of the route to all nodes on the network.
The routing tables are computed using the distance vector routing . Each node shares its routing table with all its nodes and each node computes its routing tables based on the DV packets it receives from its neighbors.

The threshold for the RSSI to say that a node is a neighbor is set at 200 . So if a node is neighbor then the cost to the neighbor is set to 1 . The cost to other neighbors are set based on the number of hops to that node from the current node. The RSSI value is also stored in the routing table . The node also keeps waiting for the next neighbor message. A time to live is set for a node and if it doesn't receive a neighbor message for a certain time then link to that node is assumed to be broken .

The routing tables decides how the packets have to forwarded and sent . When a packet is transmitted the next hop is found from the routing table and added to the packet.

The routing tables are shared between the nodes periodically and once a node receives the routing table from one of it nodes , it updates its routing table.

The gateway receives the light sensor, temperature sensor data periodically . Also in the same packet it receives the neighbors of that particular node and also RSSI value of the link to that node.

The performance metrics that we have tried to optimize:

Throughput : We have developed our algorithm to ensure maximum throughput. The algorithm has a retransmission mechanism associated . So every packet that is transmitted to the gateway waits for an ACK from the gateway and if the ACK is not received within the timeout duration then the packet is retransmitted. This ensures that a packet that is transmitted is received . Also to ensure maximum throughput the receive task is given the lowest priority with the lowest period . So this ensures that the task is execute very often and ensure all the packets received are serviced as quickly as possible.
We chose this metric as our project involves transmission of tasks and the throughput is a very important metric when large packets of data are being exchanged.

Timeliness : The algorithm ensures that the tasks are scheduled at particular intervals and also the Transmit task is scheduled at the prescribed time intervals. The packets that are received by a node are forwarded immediately once they are received. The packets whose destination node is itself is processed immediately. Also the packet sizes are not too large , with minimum data exchange to ensure that there is not a significant transmission delay.
We chose this metric as in our project we need to ensure that the task migration occurs at the right time

intervals to ensure that the whole state of the system is maintained.

Reliability: This is the most important metric that we have selected. The algorithm has send expect ACK mechanism . So every message that is sent from a node to the gateway expects an ACK from the gateway . If the node doesn't receive an ACK it shall retransmit the packet till a new packet is ready to be transmitted.
We chose this metric as reliability in the transmission of tasks is the most important factor.

Energy : The packet are handled only if the packet is destined for that node . Each packet has a destination node on it and if a packet is received it checks destination and then handles the packet. This ensures that all packets are not handled by each node .

Mobility: Each node can adapt easily to a change in the network . The routing tables of each node are update dynamically over time and a change in the network configuration is picked up immediately and routing tables and routing is adapted .

Comparison to flooding algorithm:
In our algorithm we do not flood the network with packets . The neighbor message packets are shared between nodes and each node knows about almost the whole network . Also a packet which has to be sent to another node is always routed through other nodes and not flooded through the network and expected to reach the destination hoping that the other nodes would also flood the network . The packet that has to be forwarded looks for the next hop to which the packet has to be sent and then forwards the packet to the next hop . Once a packet is received by a node it shall check if it is destined for itself or has to be forwarded to another node . If it has to be forwarded it is forwarded to that particular node. In this case there is guaranteed delivery to the destination as there exists a route to the destination and the source knows about the route. In the case of flooding the packet is blindly flooded into the network . Also when compared to flooding the amount of traffic being exchanged is relatively lower as packets are routed.