### Performance measures

Based on the simulation results, we evaluate the performance of each node and the overall network by calculating several performance measures. The following definitions are provided for these metrics:

1. Expected number of all packets in node ,

This performance measure represents the mean number of all packets present in node upon packet arrival. The calculation formulas for this metric are as follows:

1. Expected number of all packets in the network,

This performance measure represents the mean number of all packets present in the network upon packet arrival. The calculation formulas for this metric are as follows:

1. Expected number of all packets in the queue of node ,

This performance measure represents the mean number of all packets present in the packet queue of node upon packet arrival. The calculation formulas for this metric are as follows:

1. Expected number of all packets in the queue,

This performance measure represents the mean number of all packets present in the packet queue upon packet arrival. The calculation formulas for this metric are as follows:

1. Throughput for node ,

This performance measure represents the rate at which all packets complete service and exit node over a specified time period. The calculation formulas for this metric are as follows:

1. Throughput,

This performance measure represents the rate at which all packets complete service and exit the network over a specified time period. The calculation formulas for this metric are as follows:

1. Mean waiting time in node ,

This performance measure represents the average duration that an arbitrary packet spends in node , taking into account the time spent in the queue, the service time, and the duration before becoming impatient. The calculation formulas for this metric are as follows:

1. Mean waiting time in the network,

This performance measure represents the average duration that an arbitrary packet spends in the network, taking into account the time spent in the queue, the service time, and the duration before becoming impatient. The calculation formulas for this metric are as follows:

1. Blocking probability of all arrived packets for node ,

This performance measure represents the probability that all arrived packets are unable to enter node due to a full packet queue. It quantifies the likelihood of packet loss under these conditions. The calculation formulas for this metric are as follows:

1. Total blocking probability of all arrived packets,

This performance measure represents the probability that all arrived packets are unable to enter the network due to a full packet queue. It quantifies the likelihood of packet loss under these conditions. The calculation formulas for this metric are as follows:

1. Energy loss probability for node ,

This performance measure represents the probability that harvested energy units are unable to enter the energy queue of node because it is already full. It quantifies the likelihood of energy loss in such situations. The calculation formula for this metric is as follows:

1. Total energy loss probability,

This performance measure represents the probability that harvested energy units are unable to enter the energy queue because it is already full. It quantifies the likelihood of energy loss in such situations. The calculation formula for this metric is as follows:

1. Impatient loss probability of all arrived packets for node ,

This performance measure represents the probability that all arrived packets in node , including those that are blocked, leave node due to impatience. It quantifies the likelihood of packet loss due to impatience. The calculation formulas for this metric are as follows:

1. Total impatient loss probability of all arrived packets,

This performance measure represents the probability that all arrived packets, including those that are blocked, leave the network due to impatience. It quantifies the likelihood of packet loss due to impatience. The calculation formulas for this metric are as follows:

1. Impatient loss probability of all admitted packets for node ,

This performance measure represents the probability that all admitted packets in node , excluding those that are blocked, leave node due to impatience. It quantifies the likelihood of packet loss due to impatience for only the packets that have been successfully admitted into the system. The calculation formulas for this metric are as follows:

1. Total impatient loss probability of all admitted packets,

This performance measure represents the probability that all admitted packets, excluding those that are blocked, leave the network due to impatience. It quantifies the likelihood of packet loss due to impatience for only the packets that have been successfully admitted into the system. The calculation formulas for this metric are as follows:

1. Total loss probability of all arrived packets for node ,

This performance measure represents the probability that all arrived packets in node , including both blocked and impatient packets, are dropped or lost in node . It quantifies the likelihood of complete packet loss due to either blocking or impatience. The calculation formulas for this metric are as follows:

1. Total loss probability of all arrived packets,

This performance measure represents the probability that all arrived packets, including both blocked and impatient packets, are dropped or lost in the network. It quantifies the likelihood of complete packet loss due to either blocking or impatience. The calculation formulas for this metric are as follows:

1. Regular energy consumption ratio for serving all packets in node ,

This performance measure represents the ratio of the energy provided by the regular battery to the total energy consumption for node . It quantifies the contribution of the regular battery in meeting the energy demands of the system. The calculation formulas for this metric are as follows:

1. Regular energy consumption ratio for serving all packets,

This performance measure represents the ratio of the energy provided by the regular battery to the total energy consumption in the network. It quantifies the contribution of the regular battery in meeting the energy demands of the system. The calculation formulas for this metric are as follows: