### Iterative algorithm

Using the iterative algorithm provided below, we perform calculations on the state balance equations until they converge, allowing us to determine the steady-state distribution of the system.

#### **Iterative algorithm:**

Step 1: Select a group of initial values for , , where is the total number of feasible states for node , .

Step 2: Calculate , , and based on , .

Step 3: Substitute , , and into eqs. (3-29) - (3-35) to find and , .

Step 4: Substitute into *Case A1* to *Case A190* and *Case B1* to *Case B101* to find , , , respectively.

Step 5: Normalize , , .

Step 6: If , stop the iterative algorithm, where is the stopping criterion. Otherwise, set , and return to Step 2.

In the analytical experiments, we set . It takes about 200 to 7000 iterations for the algorithm to converge.

### Performance measures

To evaluate the network's effectiveness, we obtain several performance measures of interest from the steady-state probability of each node , as presented below.

#### (, the expected number of all packets in node , is provided below.

(3-36)

(3-37)

(3-38)

#### , the expected number of all packets for the network, is provided below.

(3-39)

(3-40)

(3-41)

#### , the expected number of all packets in the queue of node , is provided below.

(3-42)

(3-43)

(3-44)

#### , the expected number of all packets in the queue , is provided below.

(3-45)

(3-46)

(3-47)

#### , the throughput of all packets for node , is provided below.

(3-48)

(3-49)

(3-50)

#### , the throughput of all packets for the network, is provided below.

(3-51)

(3-52)

(3-53)

#### , the blocking probability of each arrived packet for node , regardless of priority, is provided below.

(3-54)

#### , the blocking probability of each arrived packet for the network, regardless of priority, is provided below.

(3-55)

#### , the energy loss probability for node , is provided below.

(3-56)

#### , the energy loss probability for the network, is provided below.

(3-57)

#### , the mean waiting time of all packets in node , including those that have finished their service and those that left the network due to impatience, is provided below.

(3-58)

(3-59)

(3-60)

#### , the mean waiting time of all packets in the network, including those that have finished their service and those that left the network due to impatience, is provided below.

(3-61)

(3-62)

(3-63)

#### , the impatient loss probability of arrived packets for node , is provided below.

(3-64)

(3-65)

(3-66)

#### , the impatient loss probability of arrived packets for the network, is provided below.

(3-67)

(3-68)

(3-69)

#### , the impatient loss probability of admitted packets for node , is provided below.

(3-70)

(3-71)

(3-72)

#### , the impatient loss probability of admitted packets for the network, is provided below.

(3-73)

(3-74)

(3-75)

#### , the total loss probability of arrived packets for node , is provided below.

(3-76)

(3-77)

(3-78)

#### , the total loss probability of arrived packets for the network, is provided below.

(3-79)

(3-80)

(3-81)

#### , the regular energy consumption ratio of all packets for node , is provided below.

(3-82)

(3-83)

(3-84)

#### , the regular energy consumption ratio of all packets for the network, is provided below.

(3-85)

(3-86)

(3-87)