Wireless Ad Hoc Networks Lab 4

Network Simulator

NS3 Experiment (III) – CW size

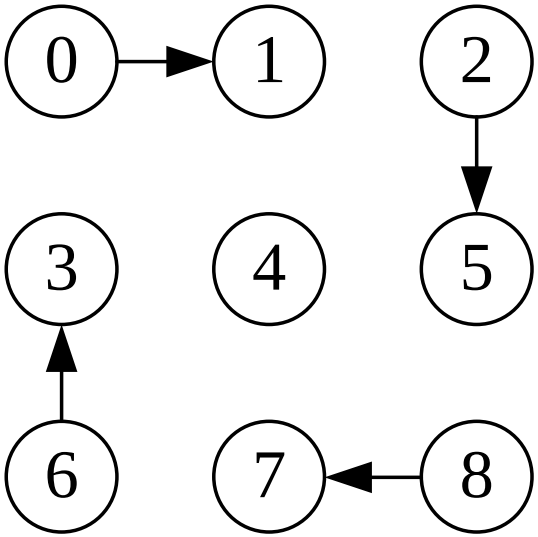
Backoff Mechanism

- This exercise is to investigate
  - the impact of **contention window size** on the performance of the IEEE 802.11 MAC protocol
- To reduce the collision probability
  - the IEEE 802.11 uses a backoff mechanism
  - that guarantees a time spreading of the transmissions
- DCF adopts a slotted binary exponential backoff technique

Backoff Mechanism

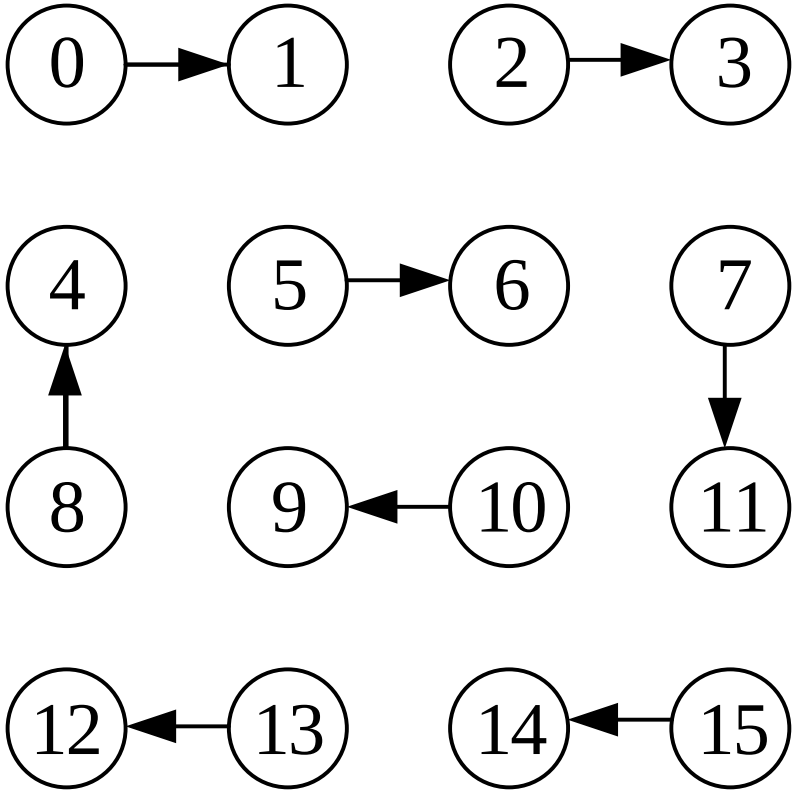
- Construct 3 grid topologies (3*3、4*4、5*5)
  - with nodes spaced by 40 (m)

- 3 x 3



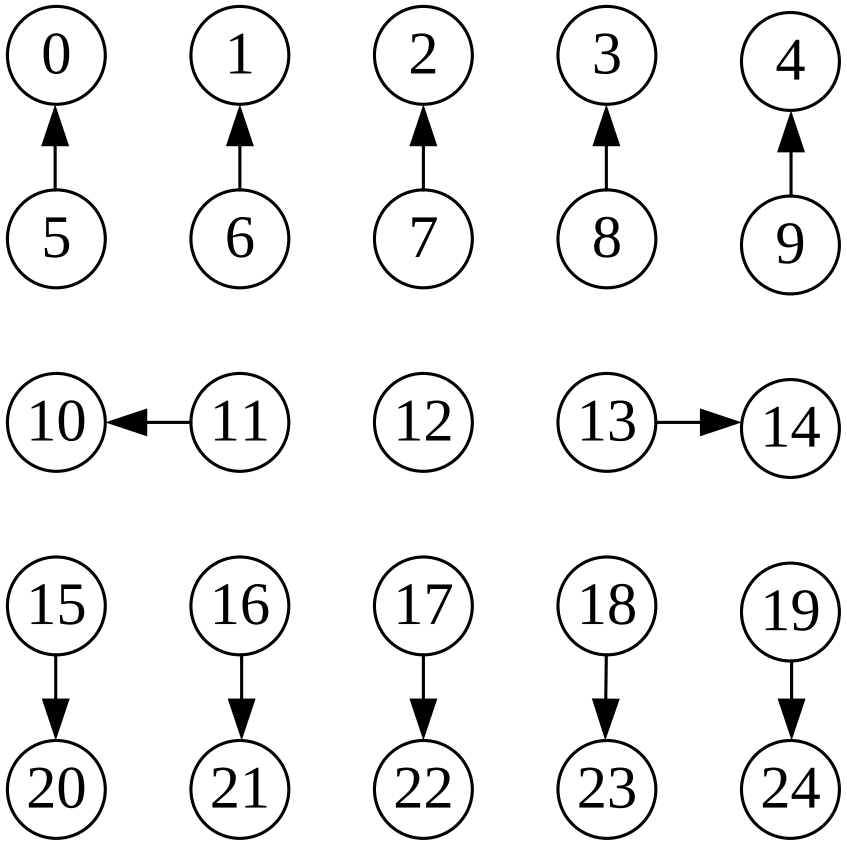
Backoff Mechanism

- 4 x 4



Backoff Mechanism

- 5 x 5



Backoff Mechanism

- Network scenario
  - Simulation time = 4
  - simulation area = 500m * 500m (m^2)
  - CWMin=CWMax=2
    - Change CW value to **2, 7, 15, 31, 63**
    - RTSThreshold= 100000 (Turn OFF RTS/CTS)

Backoff Mechanism

- Network scenario
  - Set the allocation for nodes
    - <Mobilityhelper>. SetPositionAllocator(

“ns3::GridPositionAllocator“,
”MinX”, ___,
“MinY”, ___,
“DeltaX“, ___,
”DeltaY“, ___,
”GridWidth”, ___,
"LayoutType" ,StringValue ("RowFirst"));

  - Set up transmitters and receivers

Backoff Mechanism

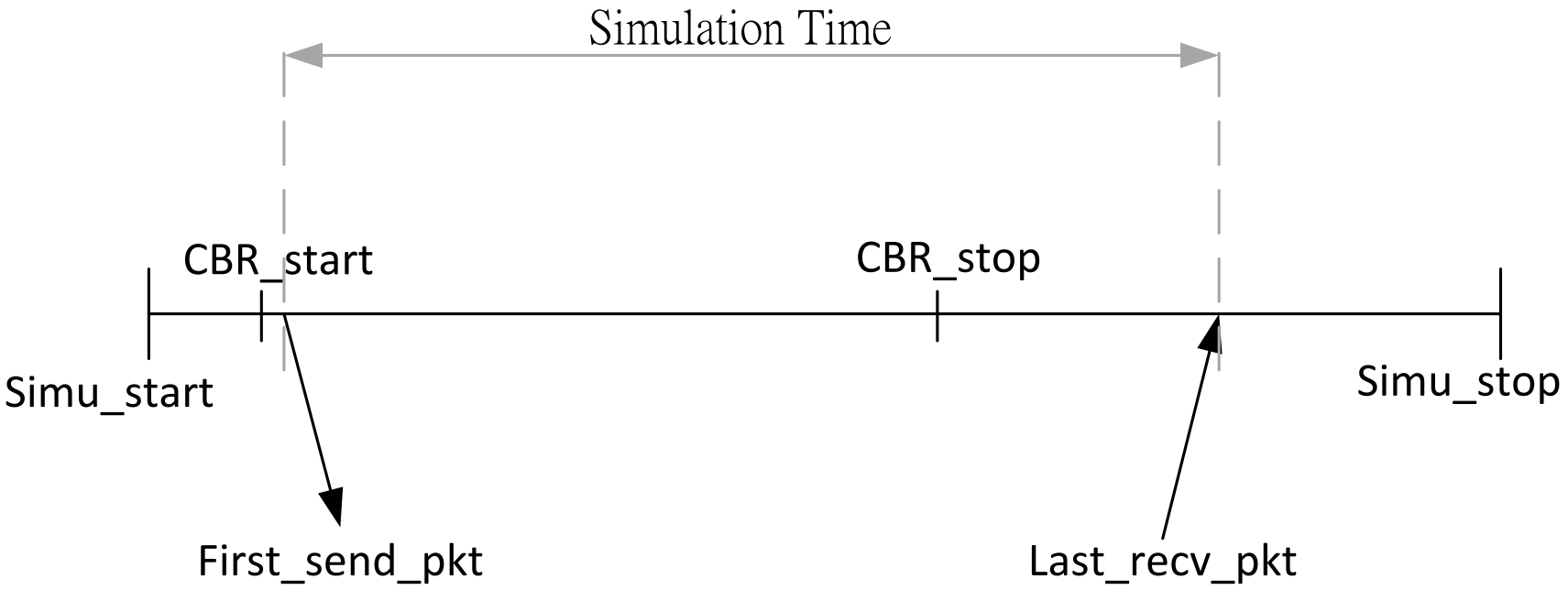
- Network scenario
  - Please make sure flow configuration as instructed!!
  - CBR packet size = 1024 (bytes)
  - CBR rate = 500kbps
  - CBR traffic
    - start at 1.0
    - stop at 3.0

Backoff Mechanism

- Network scenario
  - Run the program for
    - the three topologies (**3*3、4*4、5*5**)
    - five kinds of contention window size (**2, 7, 15, 31, 63**)
    - A total of 15 combinations.
  - NOTE：remember to change number of nodes & communication pair !!

Analysis

- a. System throughput
- b. total lost packets



Analysis

- System throughput
- Total lost packets
- $$\text{throughput} = \frac{\text{total received data size (bytes)} \times 8 \text{ (bits)}}{\text{simulation time}} \text{ (bps)}$$
- bps/1024/1024 = Mbps

What you are going to do

- Set mobility allocation
- Set up transmitters and receivers
- Set the rts/cts threshold
- Set the topology size
- Set the contention window size
- Finish the calculation of system throughput and total loss packets