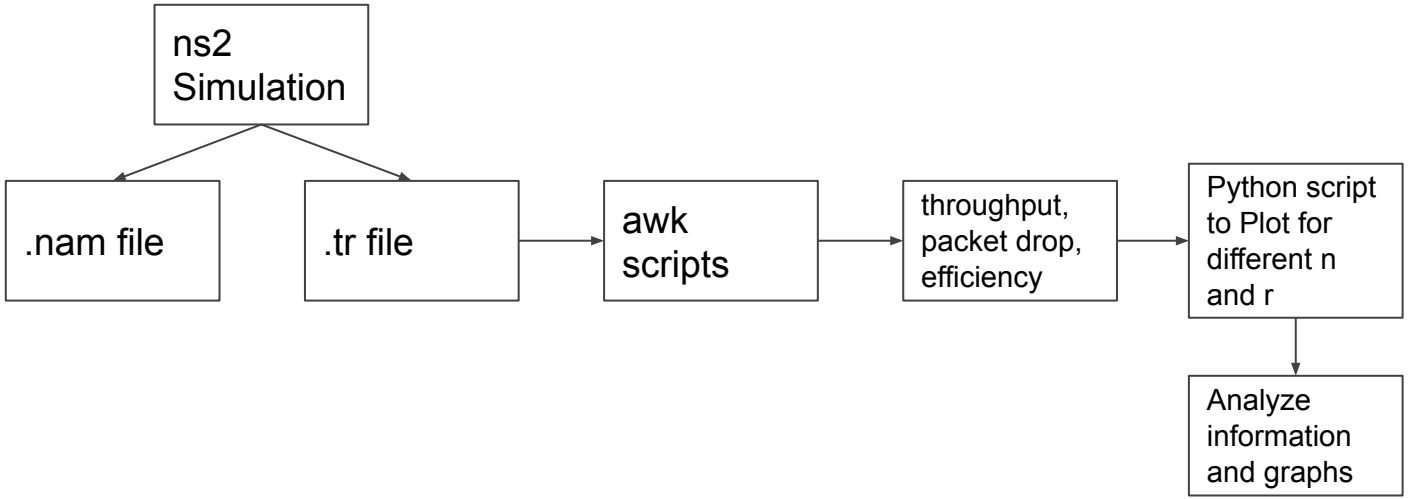
Problem Statement

Simulation Project

Use NS2 to analyze the performance of CSMA/CD. Vary the number of nodes and the traffic rate from each node.

Experimental Setup / Layout



ns2 script

Takes 4 inputs -

- n - Number of nodes
- r - Packet rate from each node
- nc - Network Capacity of the network
- cd - Keep 1 for using Collision Detection

Creates a bus topology of the nodes where each node transmits its packets at rate r according to the specified MAC Protocol.

.tr file structure and awk scripts

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.tr file structure -

#1 - Type of packet

#2 - Time at which packet created

#3 - Source Node

#4 - Destination Node

#6 - Packet Size in bytes

Use this .tr file structure in awk scripts to find -

- Throughput
- Number of Dropped Packets
- System Efficiency

How to get plots ?

There are python scripts which will call awk script and required graphs will be plotted.

```
$ python script_name.py
```

Automation Scripts:-

- **automate_NvsTPUT.py**
  - Throughput (varying N)
- **automate_NvsRATEvsTPUT.py**
  - Throughput (varying N & rate)
- **droppedPkts.py**
  - Packet drops (varying N & rate)
- **efficiency.py**
  - Efficiency (varying N)
- tputAll.awk
  - Throughput from .tr file (called by py scripts)
- droppedAll.awk
  - Dropped packets from .tr file (called by py scripts)

Output file for throughput(varying N):

---

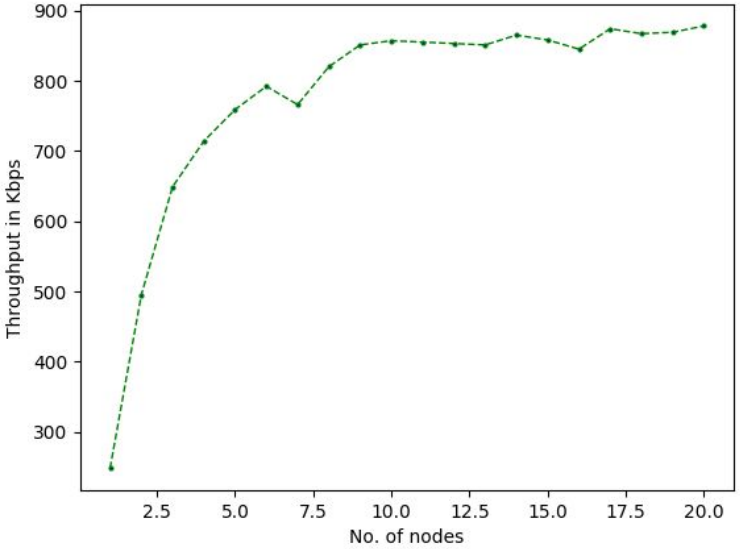
no of nodes, throughput(Kbps)

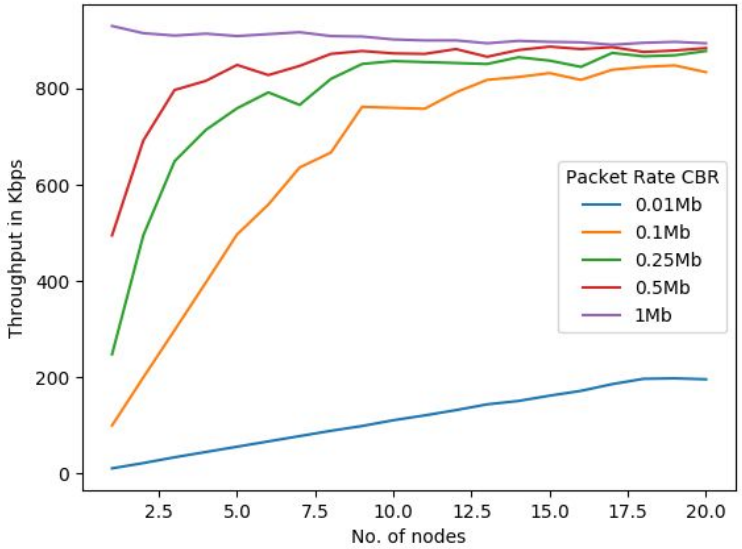
- 1 248.348
- 2 495.727
- 3 649.71
- 4 714.155
- 5 759.797
- 6 792.295
- 7 766.293
- 8 820.259
- 9 851.648
- 10 857.75

no of nodes, throughput(Kbps)

- 11 855.703
- 12 853.631
- 13 851.859
- 14 865.771
- 15 858.904
- 16 845.491
- 17 874.542
- 18 867.179
- 19 869.968
- 20 878.122

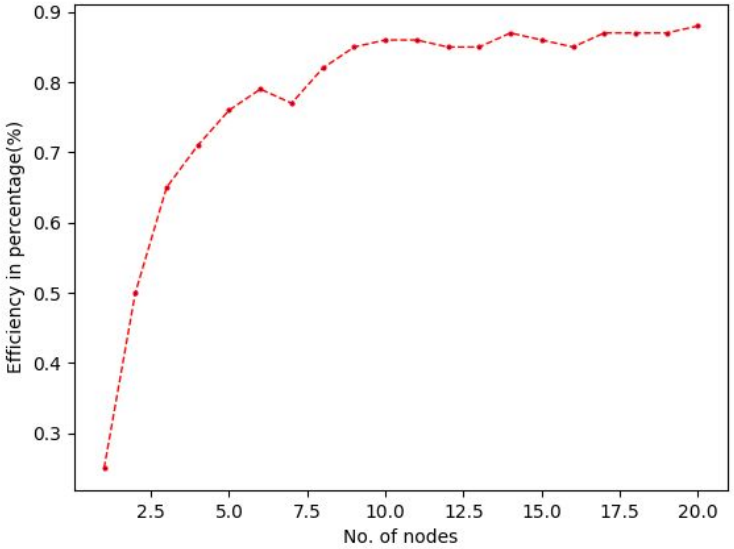
Results - Graphs

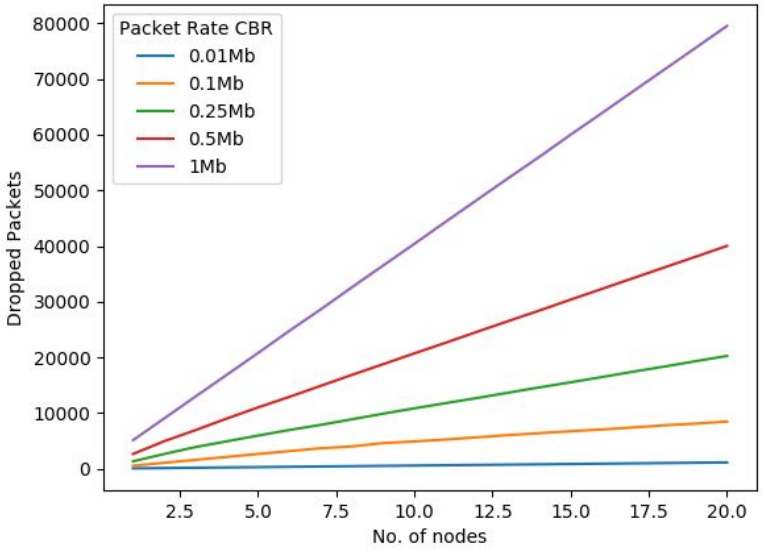




Note: Network Capacity nc = 1Mb in all cases

Results - Graphs





Note: Network Capacity nc = 1Mb in all cases

Observations and Conclusions

- The dropped packets start increasing as packet rate r approaches the network capacity nc.
- Throughput in the network is limited by network capacity nc.
- Throughput increases with increase in number of nodes initially and than slope becomes almost zero at higher number of nodes.

References

- https://www.cse.iitb.ac.in/~sri/cs348/cs378-lab04.pdf
- http://grt.edu.in/ECEinnovate/LAB%20MANUAL/CN%20Lab%20Manual.pdf
- https://www.isi.edu/nsnam/ns/ns-problems.html