# CSE 489/589
# Programming Assignment 2
# Reliable Transport Protocols

# 1 - Academic Integrity Policy Statement

**I have read and understood the course's academic integrity policy.**

# 2 - Group and Contributions

- Name of member 1: Dexson D'souza
    - UBITName: dexsonjo
    - Contributions : ABT, GBN protocol implementation and report.
- Name of member 2: Anuj Shastri
    - UBITName: anujswap
    - Contributions : SR, GBN protocol implementation.

Contribution Percentage – 50% each by both team members

# 3 - SANITY Tests

## [2.0] ABT

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./sanity_tests -p ../dexsonjo/abt -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ... Done!
Run#2 [seed=1111] ... Done!
Run#3 [seed=2222] ... Done!
Run#4 [seed=3333] ... Done!
Run#5 [seed=4444] ... Done!
Run#6 [seed=5555] ... Done!
Run#7 [seed=6666] ... Done!
Run#8 [seed=7777] ... Done!
Run#9 [seed=8888] ... Done!
Run#10 [seed=9999] ... Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ... Done!
Run#2 [seed=1111] ... Done!
Run#3 [seed=2222] ... Done!
Run#4 [seed=3333] ... Done!
Run#5 [seed=4444] ... Done!
Run#6 [seed=5555] ... Done!
Run#7 [seed=6666] ... Done!
Run#8 [seed=7777] ... Done!
Run#9 [seed=8888] ... Done!
Run#10 [seed=9999] ... Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ... Done!
Run#2 [seed=1111] ... Done!
Run#3 [seed=2222] ... Done!
Run#4 [seed=3333] ... Done!
Run#5 [seed=4444] ... Done!
Run#6 [seed=5555] ... Done!
Run#7 [seed=6666] ... Done!
Run#8 [seed=7777] ... Done!
Run#9 [seed=8888] ... Done!
Run#10 [seed=9999] ... Done!
PASS!
```

```
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:1.0, CORRUPTION:0.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:1.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
SANITY TESTS:  PASS
```

# [5.0] GBN

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./sanity_tests -p ../dexsonjo/gbn -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
```

```
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:1.0, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:1.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
SANITY TESTS:  PASS
```

# [8.0] SR

```
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} > ./sanity_tests -p ../anujswap/sr -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
```

```
Testing with MESSAGES:1000, LOSS:0.6, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
```

```
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.6, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
```

```
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.6, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
```

```
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:1.0, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:1.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
SANITY TESTS:  PASS
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} >
advanced_tests*  basic_tests*     kremcb           mulxew           ronavq           run_experiments* ryyidf           sanity_tests*
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} >
```

# 4 - BASIC Tests

## [5.0] ABT

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./basic_tests  -p ../dexsonjo/abt -r ./run_experiments
Testing with MESSAGES:20, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
```

```
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:1000, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
BASIC TESTS:  PASS
```

# [12.0] GBN

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./basic_tests  -p ../dexsonjo/gbn -r ./run_experiments
Testing with MESSAGES:20, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
```

```
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
BASIC TESTS:  PASS
```

# [18.0] SR

```
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} > ./basic_tests -p ../anujswap/sr -r ./run_experiments
Testing with MESSAGES:20, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
```

```
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:20, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:50 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
BASIC TESTS:  PASS
```

# 5 - ADVANCED Tests

## [5.0] ABT

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./advanced_tests  -p ../dexsonjo/abt -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.6, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
```

```
Testing with MESSAGES:1000, LOSS:0.6, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
```

```
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.6, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:0 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
ADVANCED TESTS:  PASS
```

# [10.0] GBN

```
stones {/local/Spring_2022/dexsonjo/cse489589_assignment2/grader} > ./advanced_tests  -p ../dexsonjo/gbn -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
```

```
Testing with MESSAGES:1000, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
```

```
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.6, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
ADVANCED TESTS:  PASS
```

# [20.0] SR

```
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} > ./advanced_tests -p ../anujswap/sr -r ./run_experiments
Testing with MESSAGES:1000, LOSS:0.1, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.2, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.4, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
```

```
PASS!
Testing with MESSAGES:1000, LOSS:0.6, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.8, CORRUPTION:0.0, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.1, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
```

```
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.2, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.4, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.6, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:10 ...
```

```
Testing with MESSAGES:1000, LOSS:0.0, CORRUPTION:0.8, ARRIVAL:50, WINDOW:10 ...
Running simulator [10 Runs] ...
Run#1 [seed=1234] ...  Done!
Run#2 [seed=1111] ...  Done!
Run#3 [seed=2222] ...  Done!
Run#4 [seed=3333] ...  Done!
Run#5 [seed=4444] ...  Done!
Run#6 [seed=5555] ...  Done!
Run#7 [seed=6666] ...  Done!
Run#8 [seed=7777] ...  Done!
Run#9 [seed=8888] ...  Done!
Run#10 [seed=9999] ...  Done!
PASS!
ADVANCED TESTS:  PASS
stones {/local/Spring_2022/anujswap/cse489589_assignment2/grader} >
```

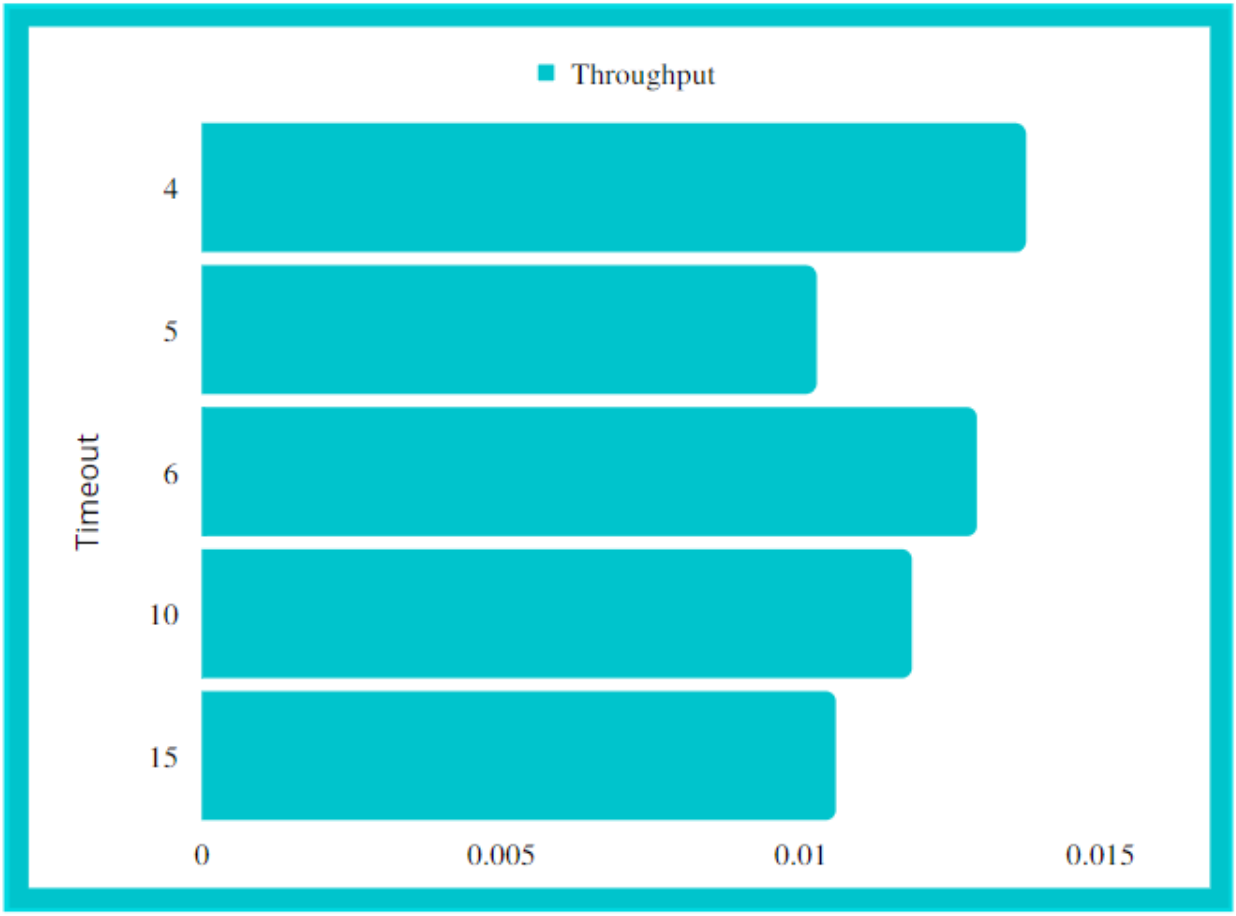
# 6 - ANALYSIS & REPORT [15.0]

We have implemented the following protocols : Alternating Bit, Go Back N and Selective Repeat.

1. **Alternating Bit Protocol**

I ran my protocol for different loss values(0.1, 0.2, 0.4, 0.6, 0.8) which were mentioned in experiments , 1000 messages, 50 mean time, 0.2 corruption  and calculated the average throughput.

| Timeout Value | Average Throughput |
|---|---|
| 4 | 0.01374752 |
| 5 | 0.010253544 |
| 6 | 0.01292636 |
| 10 | 0.01184158 |
| 15 | 0.01057144 |




As we can see, Average Throughput is maximum when Timeout is 4. Hence, We decide to set Timeout 4 for ABT protocol.

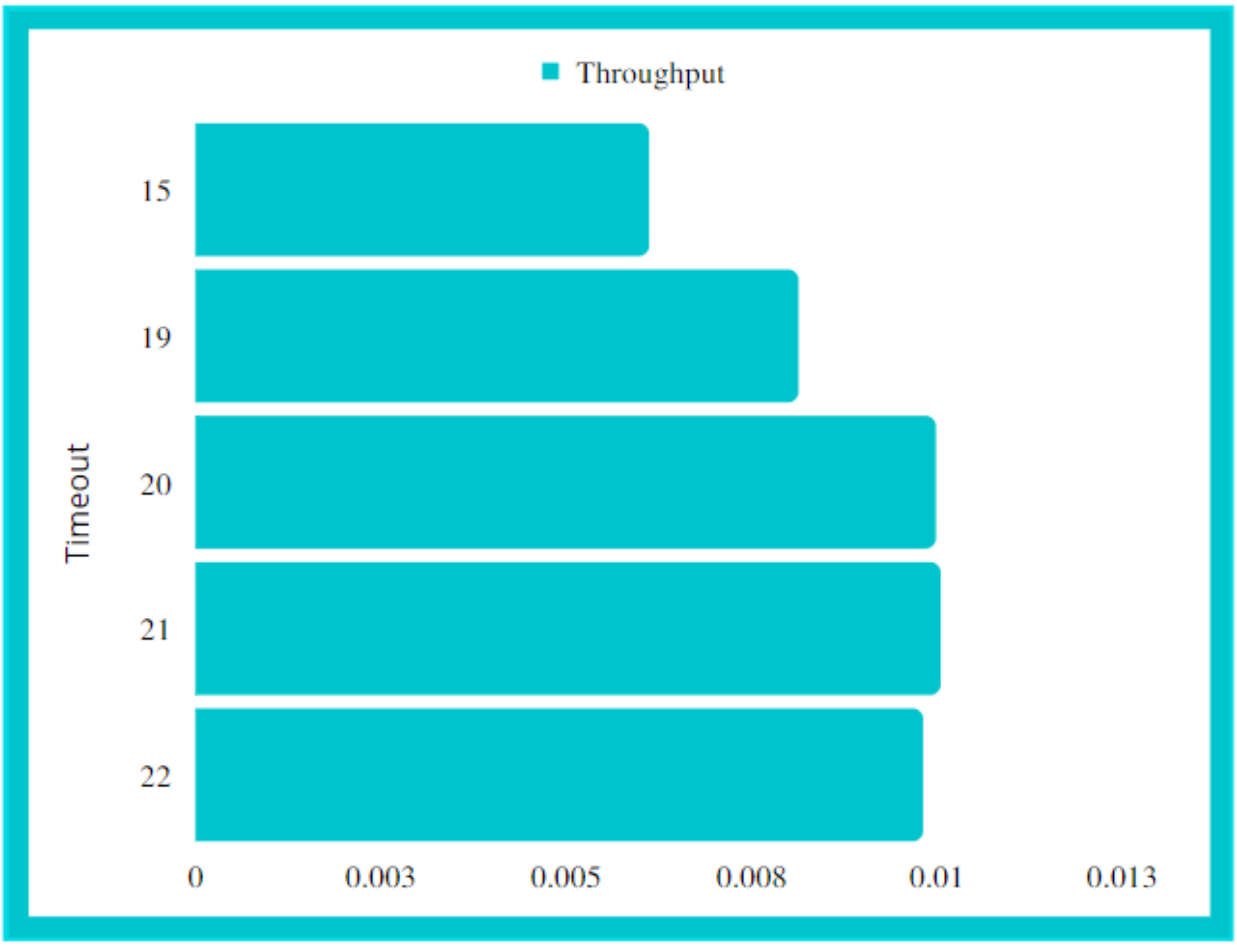
### 2. Go Back N Protocol

I ran my protocol for different loss values(0.1, 0.2, 0.4, 0.6, 0.8) which were mentioned in experiments , 1000 messages, 50 mean time, 0.2 corruption and calculated the average throughput.

Here, I tried 2 different windows sizes 10 and 50.

For window 10, I got the following results:

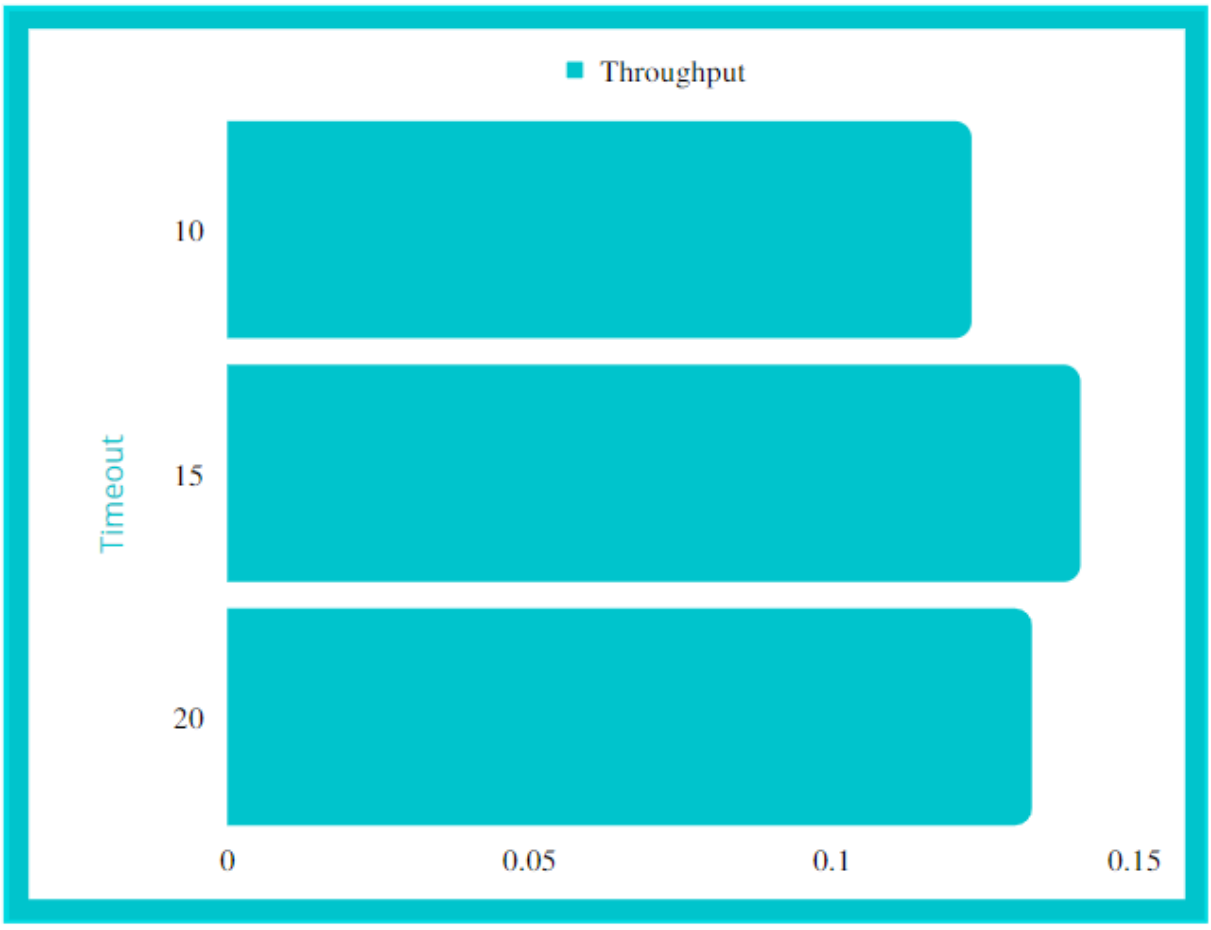
| Timeout Value | Average Throughput |
|---|---|
| 15 | 0.00611178 |
| 20 | 0.00998076 |
| 19 | 0.00812682 |
| 21 | 0.01004526 |
| 22 | 0.00980786 |



As we can see, Average Throughput for window size 10 is maximum when Timeout is 21. Hence, We decide to set Timeout 21 for GBN protocol when win size is 10.

For window 50, I got the following results:

| Timeout Value | Average Throughput |
|---|---|
| 10 | 0.123 |
| 15 | 0.141 |
| 20 | 0.133 |




As we can see, Average Throughput for window size 50 is maximum when Timeout is 15. Hence, We decide to set Timeout 15 for GBN protocol when win size is 50.

### 3. Selective Repeat Protocol

Similar to GBM, I ran my protocol for different loss values(0.1, 0.2, 0.4, 0.6, 0.8) and same configurations but for different window sizes 10 and 50.

For window 10, I got the following results:

| Timeout Value | Average Throughput |
|---|---|
| 20 | 0.00015378 |
| 35 | 0.00015632 |
| 45 | 0.00013868 |

As we can see, Average Throughput is for window size 10 maximum when Timeout is 35. Hence, We decide to set Timeout 35 for GBN protocol when win size is 10.

For window 50, I got the following results:

| Timeout Value | Average Throughput |
|---|---|
| 20 | 0.00015422 |
| 35 | 0.00016358 |
| 45 | 0.00013396 |

As we can see, Average Throughput for window size 50 is maximum when Timeout is 35. Hence, We decide to set Timeout 35 for GBN protocol when win size is 50.

**Implemented multiple software timers in SR**

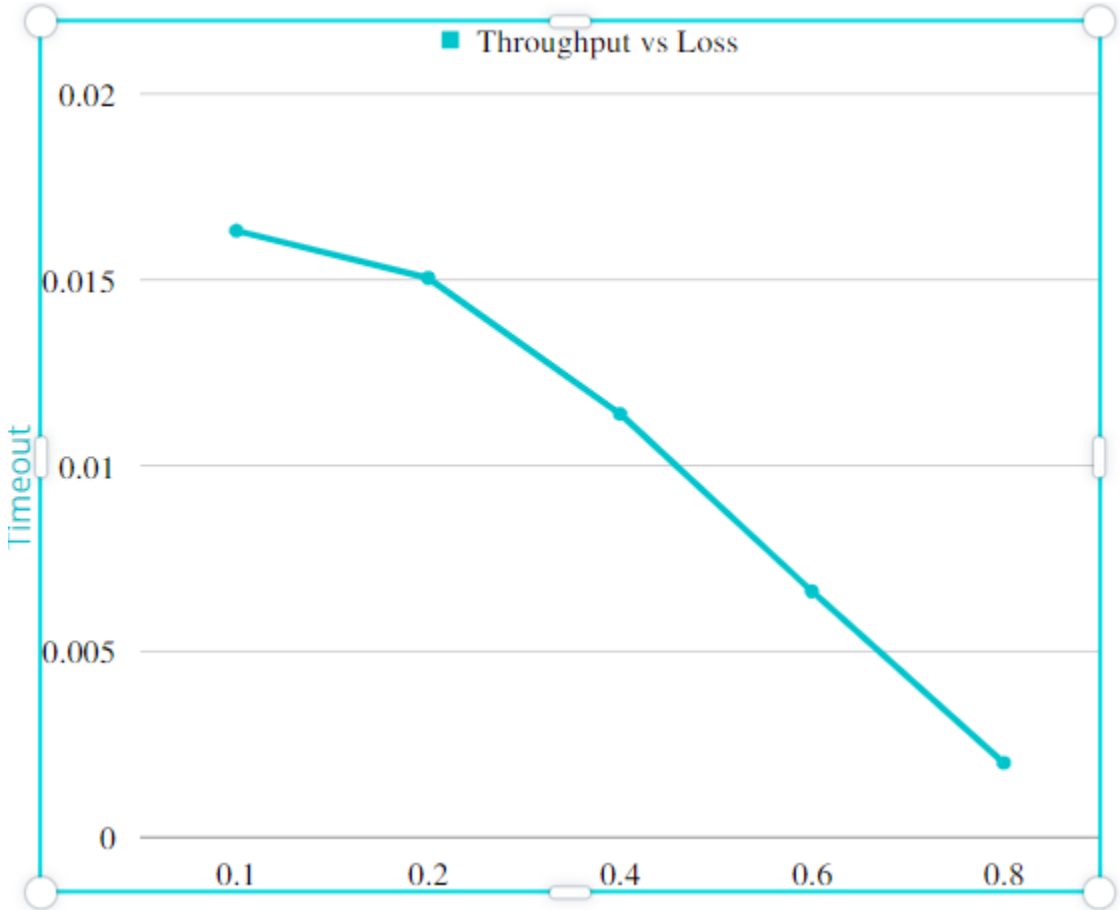
We have used only one timer and a vector (name : timer). I kept a vector list for each packet for selective repeat protocal.Each packet's sequence number corresponds to the index of this vector list.

I first check for timeout condition “get_sim_time() - timer[sbase] < RTtime”, if true I resend the packet.

When I send a packet from the sender side, I use get sim time() in my timer to keep track of the current time. Then set the timer to "TimeOutVal" as a constant value and If this packet arrives on schedule, I will note it, Stop the timer as agreed upon and then restart the timer using the oldest setting.I then set the timer to "RTtime - (get_sim_time() - timer[sbase])" as this much time has passed since this packet was last delivered,

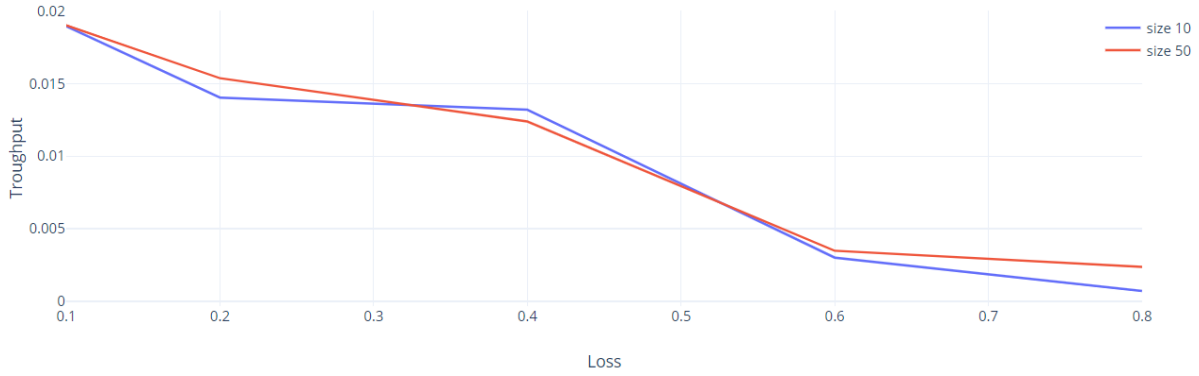
Then I update timer[i] with current time.

**Plot for ABT throughput VS loss probability**



For ABT, We can see that Throughput decrease as the loss probability increases. This is expected behaviour of ABT as it is a very simple protocol for simple applications and when loss probability is high, it cannot handle lost packets efficiently.

**Plot for GBN throughput for Window size 10 and 50 VS loss probability**




We can see that GBN works great when loss probability is low for any window size. However, when the losses become high GBN with window 50 performed worse.

Also GBN takes a lot of time when window size is high, this is because the window does not move for a long time when packets are lost. Hence, we consider an implementation to increase RTT for GBN when Window size increases.

**Plot for SR throughput for Window size 10 and 200 VS loss probability**

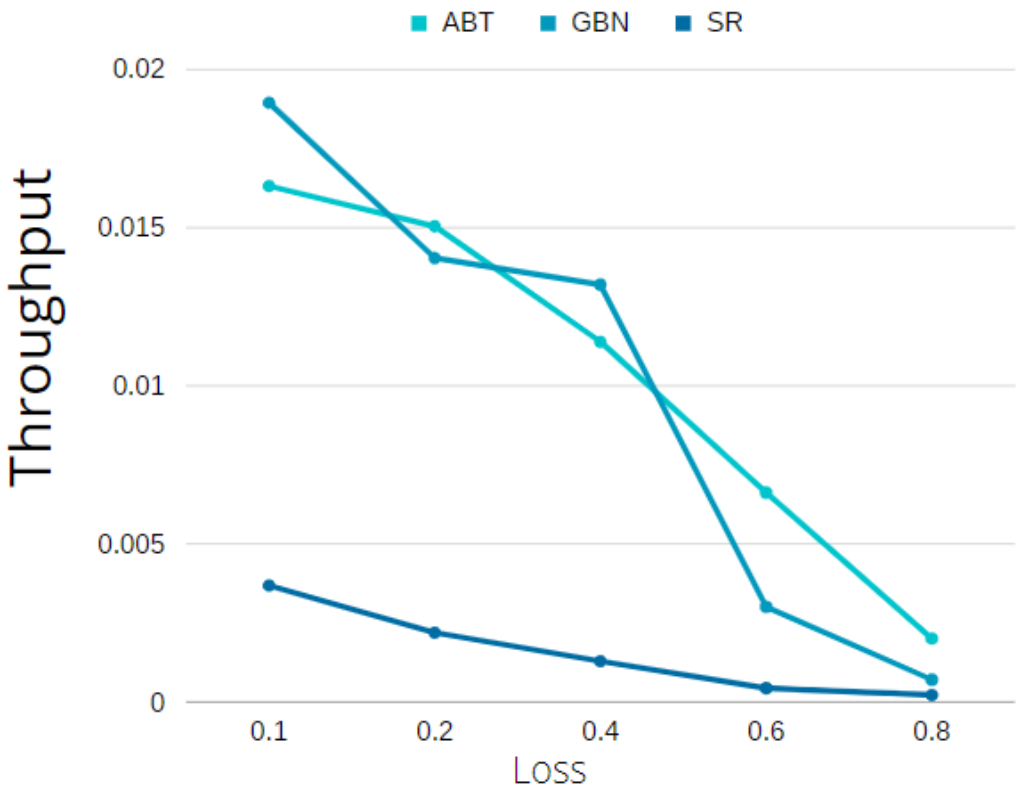

SRN performs bad with small window size i.e.10 but when window size increases to 200 its performance is better. Higher windows size is better for SR protocol. If we use Adaptive Timeout Policies for SR, its performance will improve more. This is stated in the following paper: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.80.1268&rep=rep1&type=pdf

EXPERIMENT- 1

1. With loss probabilities: {0.1, 0.2, 0.4, 0.6, 0.8}, compare the 3 protocols' throughputs at the application layer of receiver B. Use 2 window sizes: {10, 50} for the Go-Back-N version and the Selective-Repeat Version.

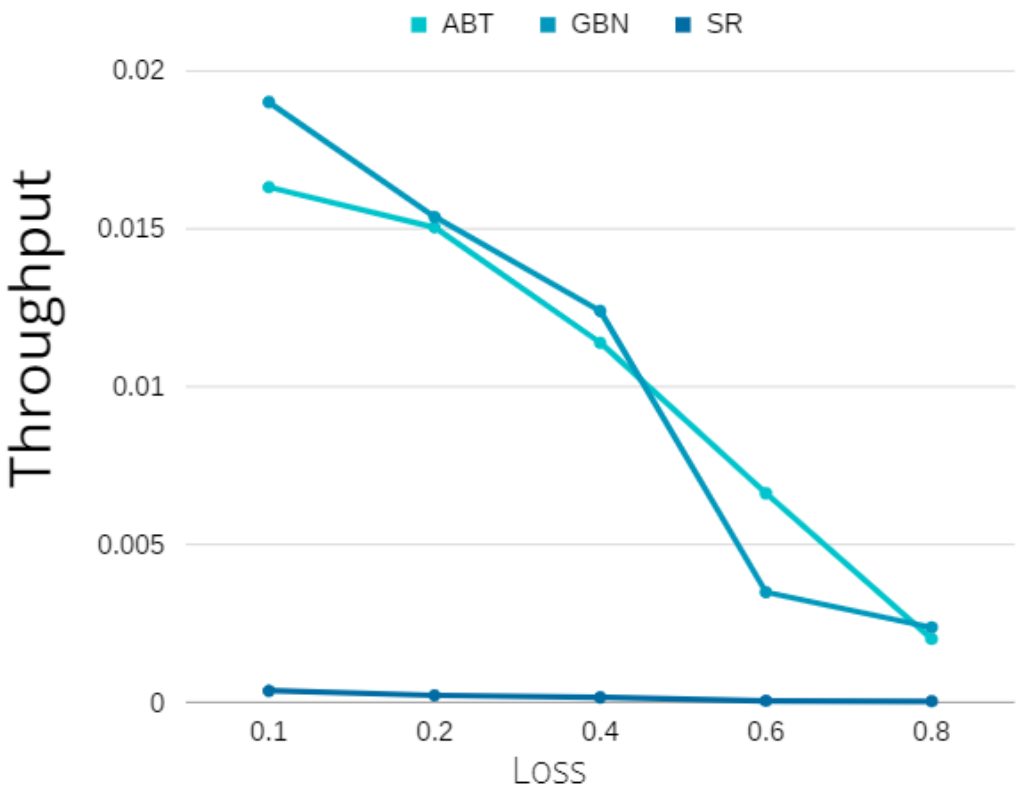
Window size=10

| Loss Probability | ABT | GBN | SR |
|---|---|---|---|
| 0.1 | 0.0163168 | 0.0189503 | 0.0003682 |
| 0.2 | 0.0150473 | 0.0140403 | 0.0002189 |
| 0.4 | 0.0113887 | 0.0131991 | 0.0001289 |
| 0.6 | 0.0066189 | 0.0030086 | 0.0000436 |
| .8 | 0.0020061 | 0.0007055 | 0.000022 |




Window size = 50

| Loss Probability | ABT | GBN | SR |
|---|---|---|---|
| 0.1 | 0.0163168 | 0.0190157 | 0.0003633 |
| 0.2 | 0.0150473 | 0.0153779 | 0.0002187 |
| 0.4 | 0.0113887 | 0.012398 | 0.0001544 |
| 0.6 | 0.0066189 | 0.0034867 | 0.0000477 |
| .8 | 0.0020061 | 0.0023752 | 0.0000338 |

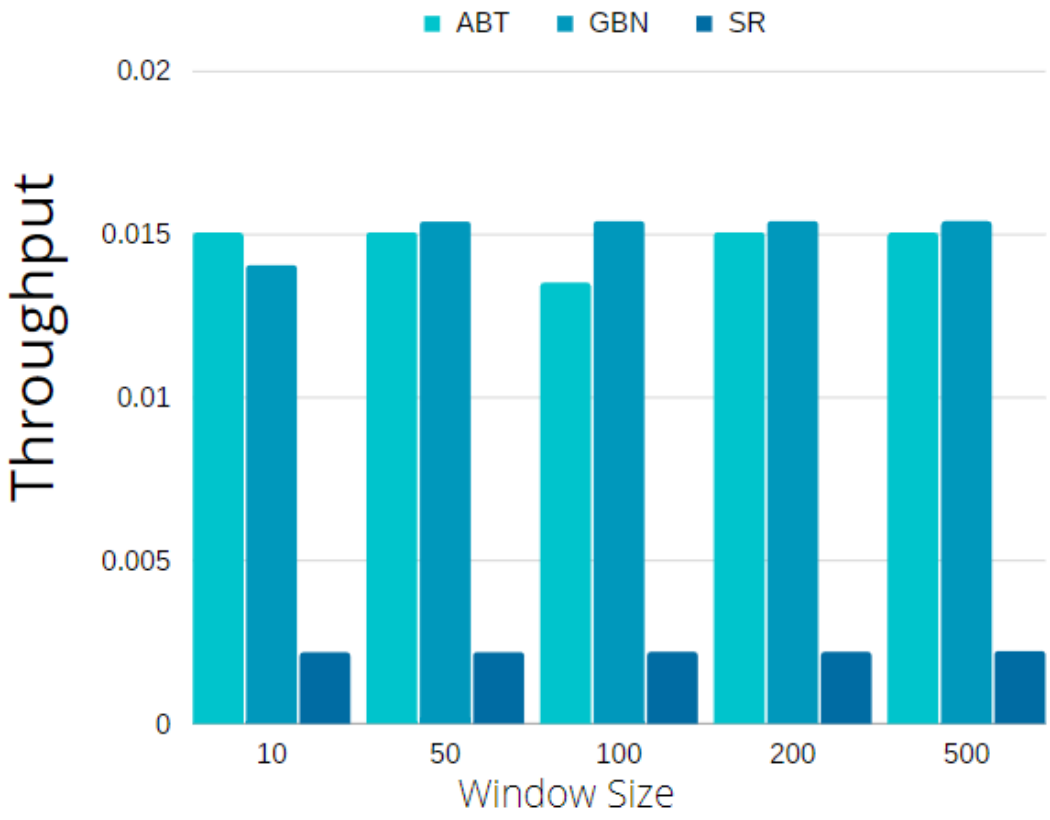

ABT
GBN
SR
0.02
0.015
0.01
0.005
0
Throughput
0.1
0.2
0.4
0.6
0.8
Loss

EXPERIMENT-2

1. With window sizes: {10, 50, 100, 200, 500} for GBN and SR, compare the 3 protocols' throughputs at the application layer of receiver B. Use 3 loss probabilities: {0.2, 0.5, 0.8} for all 3 protocols.

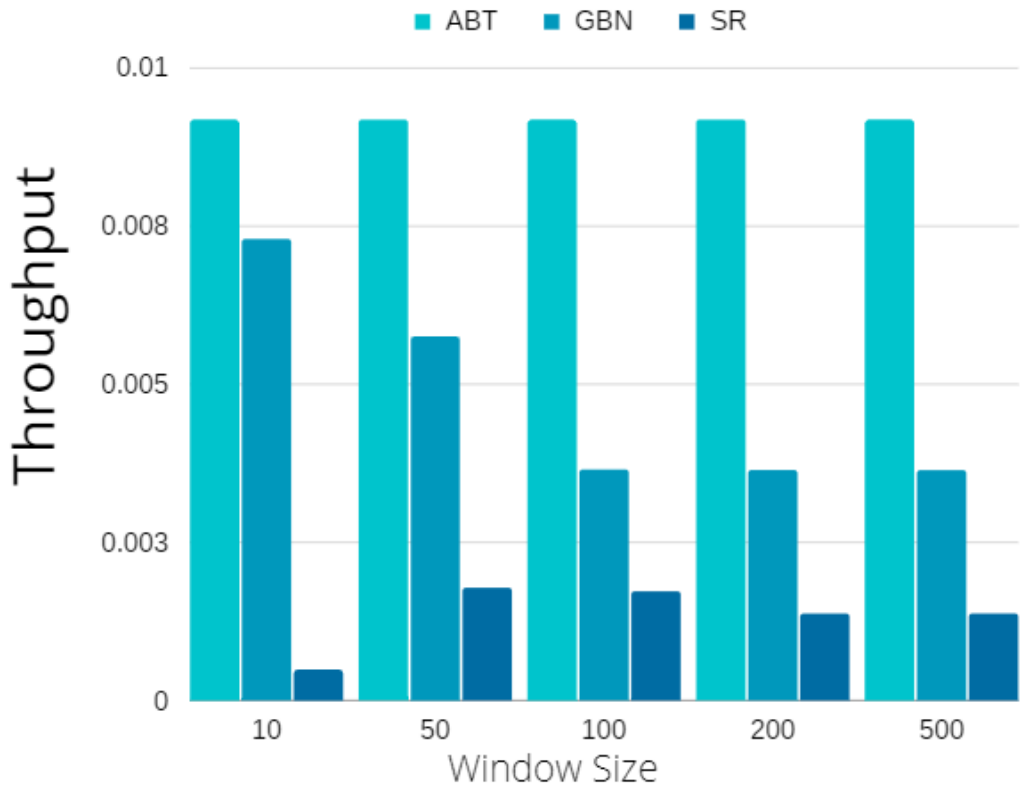
   Loss= 0.2

| Window size | ABT | GBN | SR |
|---|---|---|---|
| 10 | 0.0150473 | 0.0140403 | 0.0002189 |
| 50 | 0.0150473 | 0.0153779 | 0.0002187 |
| 100 | 0.0135143 | 0.0153905 | 0.0002201 |
| 200 | 0.0150473 | 0.0153904 | 0.000220 |
| 500 | 0.0150473 | 0.0153901 | 0.000222 |



Loss= 0.5

| Window size | ABT | GBN | SR |
|---|---|---|---|
| 10 | 0.0091748 | 0.0072897 | 0.0004867 |
| 50 | 0.0091748 | 0.0057544 | 0.0017799 |
| 100 | 0.0091748 | 0.003648 | 0.0017239 |
| 200 | 0.0091748 | 0.003640 | 0.0013729 |
| 500 | 0.0091748 | 0.003638 | 0.0013735 |



Loss= 0.8

| Window size | ABT | GBN | SR |
|---|---|---|---|
| 10 | 0.0022802 | 0.0010888 | 0.0001107 |
| 50 | 0.0022802 | 0.00058944 | 0.0001586 |
| 100 | 0.0022802 | 0.00043112 | 0.0001497 |
| 200 | 0.0022802 | 0.00043105 | 0.0022428 |
| 500 | 0.0022802 | 0.00043099 | 0.0006055 |