

TORA Implementation in ns3

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Throughput Calculation

- ▶ Calculated at Transport Layer
- ▶ $\text{startTime} = \min \{ \text{first time of packet transmit for each flow} \}$
- ▶ $\text{endTime} = \max \{ \text{last time of packet Receive for each flow} \}$
- ▶ $\text{throughput} = \text{total received packets size in bits} / (\text{endTime} - \text{startTime}) \text{ in secs} / 10^6$



Pacet Delivery/Drop Ratio

- ▶ Calculated at Network Layer
- ▶ *Ipv4L3Protocol* has trace source $T_x, R_x, Drop$



TODO: End to End Delay

- ▶ Calculated at Network Layer
- ▶ formula = Time of packet received at destination - Time of packet sent from source
- ▶ *Ipv4L3Protocol* has trace source *SendOutgoing*, *LocalDeliver*
- ▶ Make new PacketTag that contains TimeStamp
- ▶ Attach tag inside trace sink of *SendOutgoing*
- ▶ Retrieve tag at trace sink of *LocalDeliver*

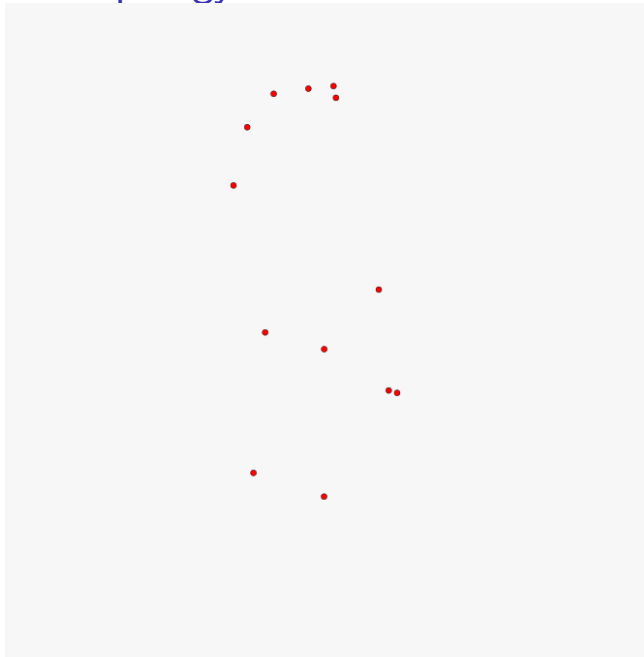


Parameters

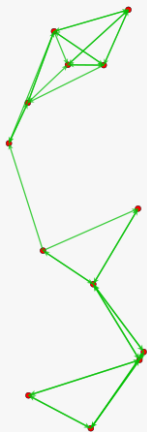
```
./waf -j8 --run "scratch/manet.cc \  
--n=13 \  
--nFlows=10\  
--nodeSpeed=100 \  
--xRange=200 --yRange=600\  
--packetRate=4 --maxPacketCount=10\  
--simulationTime=100 " --vis
```



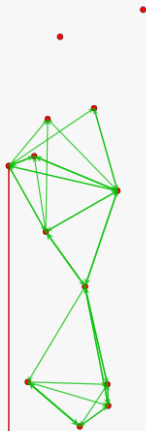
Initial Topology



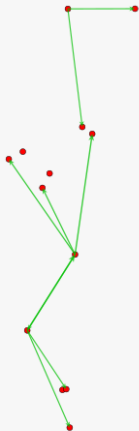
Topology At 2.3 Sec



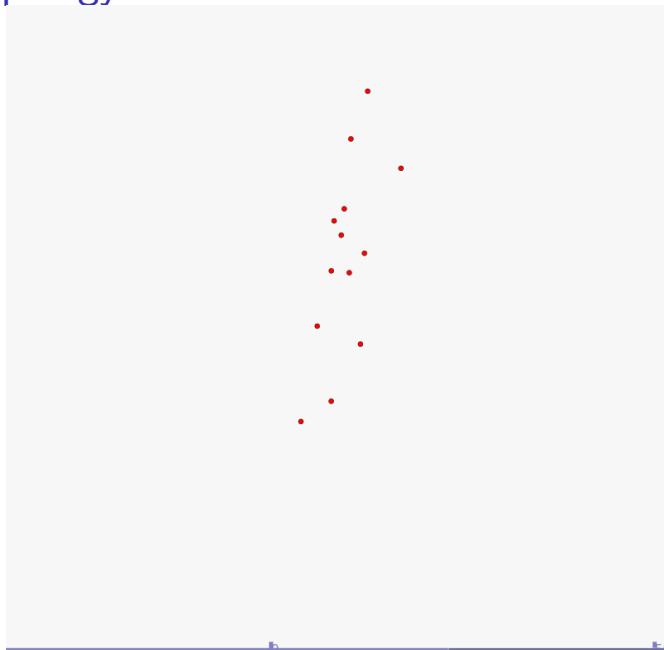
Topology At 5.2 Sec



Topology At 8.8 Sec



Topology At 28 Sec

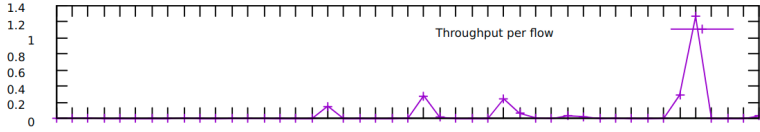


Statistics

```
Total Rx: 45128
Start time: +2e+09ns
End time: +1.86214e+10ns
Average Throughput: 0.0217204 Mbps
Total packets sent: 481
Total packets received: 765
Total packets dropped: 10
Packet Delivery Ratio (L3): 159.044%
Packet Drop Ratio (L3): 2.079%
```



Statistics



(10.0.0.2,49153)>(10.0.0.5,23807)
(10.0.0.3,49153)>(10.0.0.8,55211)
(10.0.0.4,49153)>(10.0.0.13,7977)
(10.0.0.5,49153)>(10.0.0.1,43491)
(10.0.0.10,49153)>(10.0.0.1,39017)
(10.0.0.13,654)>(10.0.0.4,654)
(10.0.0.5,654)>(10.0.0.3,654)
(10.0.0.3,654)>(10.0.0.2,654)
(10.0.0.13,7977)>(10.0.0.4,49153)
(10.0.0.1,654)>(10.0.0.3,654)
(10.0.0.3,654)>(10.0.0.5,654)
(10.0.0.8,654)>(10.0.0.11,654)
(10.0.0.11,654)>(10.0.0.12,654)
(10.0.0.3,654)>(10.0.0.12,654)
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(10.0.0.8,654)>(10.0.0.5,654)
(10.0.0.2,654)>(10.0.0.1,654)
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(10.0.0.5,654)>(10.0.0.8,654)
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(10.0.0.4,654)>(10.0.0.2,654)
(10.0.0.4,654)>(10.0.0.1,654)
(10.0.0.13,654)>(10.0.0.2,654)
(10.0.0.13,654)>(10.0.0.3,654)
(10.0.0.4,654)>(10.0.0.13,654)
(10.0.0.1,654)>(10.0.0.1,654)
(10.0.0.8,55211)>(10.0.0.3,49153)
(10.0.0.12,654)>(10.0.0.7,654)
(10.0.0.12,654)>(10.0.0.8,654)
(10.0.0.8,654)>(10.0.0.3,654)
(10.0.0.8,654)>(10.0.0.12,654)
(10.0.0.5,654)>(10.0.0.7,654)
(10.0.0.7,654)>(10.0.0.9,654)
(10.0.0.9,654)>(10.0.0.10,654)
(10.0.0.7,654)>(10.0.0.5,654)
(10.0.0.3,654)>(10.0.0.8,654)
(10.0.0.8,654)>(10.0.0.3,654)
(10.0.0.3,654)>(10.0.0.13,654)
(10.0.0.13,654)>(10.0.0.1,654)
(10.0.0.9,654)>(10.0.0.7,654)
(10.0.0.12,654)>(10.0.0.11,654)
(10.0.0.13,654)>(10.0.0.8,654)