

Example Trace with GBN, using simulator output

```
-bash-3.2$ ./project2 20 0.05 0.05 0.05 10 1 1 0 -1
```

```
----- Network Simulator Version 2.3 -----
```

Input parameters:

```
Number of Messages = 20  Lost Packet Prob. = 0.050
Corrupt Packet Prob. = 0.050  Out Of Order Prob. = 0.050
Ave. time between messages = 10.00  Trace level = 1
Randomize = 1  Bi-directional = 0
```

SEED: 1480378929

```
A: 9.6820, Layer 5 to 4 Message = !fEVhy->Pbs'2J3m~2DU
A: 14.6508, Layer 5 to 4 Message = ##i.Qt9]!Eh-Ps8[~Dg,
B: 29.1652, Layer 4 to 5 Message = !fEVhy->Pbs'2J3m~2DU
A: 34.5821, Layer 5 to 4 Message = $X$d:oFzQ([3h>sJ~U,a
B: 34.8730, Layer 4 to 5 Message = ##i.Qt9]!Eh-Ps8[~Dg,
A: 36.9937, Layer 5 to 4 Message = %kS%$jR:#iQ9!hP8~gO7
B: 38.3344, Layer 4 to 5 Message = $X$d:oFzQ([3h>sJ~U,a
A: 42.1340, Layer 5 to 4 Message = &}wq&e_XRLF?93-'~xr1
B: 44.5428, Layer 4 to 5 Message = %kS%$jR:#iQ9!hP8~gO7
A: 58.0599, Layer 5 to 4 Message = '2=IT'kv$x:FQ]hs~,7C
B: 60.4479, Layer 4 to 5 Message = &}wq&e_XRLF?93-'~xr1
```

Printing the contents of the Simulation Event Q

```
Event Time = 76.761 A: LAYER 3 Seq/Ack/Check = 9002/2/-274305514:
Event Time = 77.486 A: LAYER 5
Event Time = 86.180 B: LAYER 3 Seq/Ack/Check = 5/1005/-1197427177: '2=IT'kv$x:FQ]hs~,7C
Event Time = 94.630 A: LAYER 3 Seq/Ack/Check = 9003/3/533304993:
Event Time = 95.696 A: LAYER 3 Seq/Ack/Check = 9004/4/-1554679961:
Event Time = 148.551 A: Timer
```

Printing the contents of the Simulation Event Q

```
Event Time = 77.486 A: LAYER 5
Event Time = 86.180 B: LAYER 3 Seq/Ack/Check = 5/1005/-1197427177: '2=IT'kv$x:FQ]hs~,7C
Event Time = 94.630 A: LAYER 3 Seq/Ack/Check = 9003/3/533304993:
Event Time = 95.696 A: LAYER 3 Seq/Ack/Check = 9004/4/-1554679961:
Event Time = 161.341 A: Timer
```

Printing the contents of the Simulation Event Q

```
Event Time = 86.180 B: LAYER 3 Seq/Ack/Check = 5/1005/-1197427177: '2=IT'kv$x:FQ]hs~,7C
Event Time = 94.630 A: LAYER 3 Seq/Ack/Check = 9003/3/533304993:
Event Time = 95.696 A: LAYER 3 Seq/Ack/Check = 9004/4/-1554679961:
Event Time = 176.761 A: Timer
```

```
A: 77.4860, Layer 5 to 4 Message = (Eb~=Z(6SpxLi(Eb~=Zw
```

Printing the contents of the Simulation Event Q

```
Event Time = 89.896 B: LAYER 3 Seq/Ack/Check = 6/1006/-541378612: (Eb~=Z(6SpxLi(Eb~=Zw
Event Time = 94.630 A: LAYER 3 Seq/Ack/Check = 9003/3/533304993:
Event Time = 95.539 A: LAYER 5
Event Time = 95.696 A: LAYER 3 Seq/Ack/Check = 9004/4/-1554679961:
Event Time = 176.761 A: Timer
```

```
B: 86.1798, Layer 4 to 5 Message = '2=IT'kv$x:FQ]hs~,7C
B: 89.8964, Layer 4 to 5 Message = (Eb~=Z(6SpxLi(Eb~=Zw
```

A: 95.5387, Layer 5 to 4 Message = dW(V'U&)%S\$R2Q!P~O}N
B: 97.9565, Layer 4 to 5 Message = dW(V'U&)%S\$R2Q!P~O}N
A: 107.4903, Layer 5 to 4 Message = *jL.nP2r*6vX:z]>~aC%
A: 126.9651, Layer 5 to 4 Message = +fpdWK>2&+k_RF3~rFY
B: 130.4948, Layer 4 to 5 Message = *jL.nP2r*6vX:z]>~aC%
A: 131.6565, Layer 5 to 4 Message = ,16;AFKPUZ,ejoty~&+0
A: 133.7364, Layer 5 to 4 Message = -DZq*AWn'=T-\$:Qh~7Ne
B: 139.1719, Layer 4 to 5 Message = +fpdWK>2&+k_RF3~rFY
A: 148.2634, Layer 5 to 4 Message = .V~Iq;d.V~Iq.d.V~Iq;
B: 157.6121, Layer 4 to 5 Message = ,16;AFKPUZ,ejoty~&+0

Printing the contents of the Simulation Event Q

Event Time = 167.485 A: LAYER 3 Seq/Ack/Check = 9009/9/-679095333:
Event Time = 174.758 B: LAYER 3 Seq/Ack/Check = 11/1011/-112287508: -DZq*AWn'=T-\$:Qh~7Ne
Event Time = 193.314 A: LAYER 3 Seq/Ack/Check = 9010/10/474274883:
Event Time = 197.696 B: LAYER 3 Seq/Ack/Check = 12/1012/-1489756008: .V~Iq;d.V~Iq.d.V~Iq;
Event Time = 257.346 A: Timer

A: 164.5821, Layer 5 to 4 Message = xiE~Z6pL(b=wSxiE~Z6p

Printing the contents of the Simulation Event Q

Event Time = 167.485 A: LAYER 3 Seq/Ack/Check = 9009/9/-679095333:
Event Time = 174.758 B: LAYER 3 Seq/Ack/Check = 11/1011/-112287508: -DZq*AWn'=T-\$:Qh~7Ne
Event Time = 193.314 A: LAYER 3 Seq/Ack/Check = 9010/10/474274883:
Event Time = 197.696 B: LAYER 3 Seq/Ack/Check = 12/1012/-1489756008: .V~Iq;d.V~Iq.d.V~Iq;
Event Time = 198.911 B: LAYER 3 Seq/Ack/Check = 13/1013/1079609917: xiE~Z6pL(b=wSxiE~Z6p
Event Time = 257.346 A: Timer

A: 164.6677, Layer 5 to 4 Message = d{iVD1|jWE2}2X03~1YG

Printing the contents of the Simulation Event Q

Event Time = 170.131 A: LAYER 5
Event Time = 174.758 B: LAYER 3 Seq/Ack/Check = 11/1011/-112287508: -DZq*AWn'=T-\$:Qh~7Ne
Event Time = 193.314 A: LAYER 3 Seq/Ack/Check = 9010/10/474274883:
Event Time = 197.696 B: LAYER 3 Seq/Ack/Check = 12/1012/-1489756008: .V~Iq;d.V~Iq.d.V~Iq;
Event Time = 198.911 B: LAYER 3 Seq/Ack/Check = 13/1013/1079609917: xiE~Z6pL(b=wSxiE~Z6p
Event Time = 213.288 B: LAYER 3 Seq/Ack/Check = 14/1014/1540725642: d{iVD1|jWE2}2X03~1YG
Event Time = 257.346 A: Timer

Printing the contents of the Simulation Event Q

Event Time = 174.758 B: LAYER 3 Seq/Ack/Check = 11/1011/-112287508: -DZq*AWn'=T-\$:Qh~7Ne
Event Time = 193.314 A: LAYER 3 Seq/Ack/Check = 9010/10/474274883:
Event Time = 197.696 B: LAYER 3 Seq/Ack/Check = 12/1012/-1489756008: .V~Iq;d.V~Iq.d.V~Iq;
Event Time = 198.911 B: LAYER 3 Seq/Ack/Check = 13/1013/1079609917: xiE~Z6pL(b=wSxiE~Z6p
Event Time = 213.288 B: LAYER 3 Seq/Ack/Check = 14/1014/1540725642: d{iVD1|jWE2}2X03~1YG
Event Time = 267.485 A: Timer

A: 170.1312, Layer 5 to 4 Message = 10x.-,+*)('&%\$#1~}|{

Printing the contents of the Simulation Event Q

Event Time = 186.863 A: LAYER 5
Event Time = 193.314 A: LAYER 3 Seq/Ack/Check = 9010/10/474274883:
Event Time = 197.696 B: LAYER 3 Seq/Ack/Check = 12/1012/-1489756008: .V~Iq;d.V~Iq.d.V~Iq;
Event Time = 198.911 B: LAYER 3 Seq/Ack/Check = 13/1013/1079609917: xiE~Z6pL(b=wSxiE~Z6p
Event Time = 213.288 B: LAYER 3 Seq/Ack/Check = 14/1014/1540725642: d{iVD1|jWE2}2X03~1YG
Event Time = 241.015 B: LAYER 3 Seq/Ack/Check = 15/1015/1297015328: 10x.-,+*)('&%\$#1~}|{

Event Time = 267.485 A: Timer

```
B: 174.7577, Layer 4 to 5 Message = -DZq*AWn'=T-$.Qh~7Ne
A: 186.8627, Layer 5 to 4 Message = 2CSdt'7HXiy,<M^n21BR
B: 197.6959, Layer 4 to 5 Message = .V~Iq;d.V~Iq.d.V~Iq;
B: 198.9108, Layer 4 to 5 Message = xiE~Z6pL(b=wSxiE~Z6p
A: 201.9276, Layer 5 to 4 Message = 3Uw;^!Df*Ln2Tv:]~3e)
B: 213.2879, Layer 4 to 5 Message = d{iVD1|jWE2}2X03~1YG
A: 213.9120, Layer 5 to 4 Message = 4f=qGzP&Yxc8lB3K~T4^
A: 215.8376, Layer 5 to 4 Message = 5zbI0u]D+pW>&kR9~fM5
B: 241.0147, Layer 4 to 5 Message = 10x.-,+)(&%$#1~}|{
B: 252.0440, Layer 4 to 5 Message = 2CSdt'7HXiy,<M^n21BR
```

Printing the contents of the Simulation Event Q

```
Event Time = 261.166 A: LAYER 3 Seq/Ack/Check = 9015/15/-1686713686:
Event Time = 274.529 A: LAYER 3 Seq/Ack/Check = 9016/16/-770824704:
Event Time = 279.896 B: LAYER 3 Seq/Ack/Check = 18/1018/-662440335: 4f=qGzP&Yxc8lB3K~T4^
Event Time = 303.018 B: LAYER 3 Seq/Ack/Check = 19/1020/1777874245: 5zbI0u]D+pW>&kR9~fM5
Event Time = 342.021 A: Timer
```

```
B: 253.2801, Layer 4 to 5 Message = 3Uw;^!Df*Ln2Tv:]~3e)
B: 279.8957, Layer 4 to 5 Message = 4f=qGzP&Yxc8lB3K~T4^
B: 303.0182, Layer 4 to 5 Message = 5zbI0u]D+pW>&kR9~fM5
```

Simulator terminated at time 326.205759
after receiving 20 msgs at layer5

Simulator Analysis:

```
Number of messages sent from 5 to 4: 20
Number of messages received at Layer 5, side A: 0
Number of messages received at Layer 5, side B: 20
Number of messages incorrectly received at layer 5: 0
Number of packets entering the network: 40
Average number of packets already in network: 1.700
Number of packets that the network lost: 0
Number of packets that the network corrupted: 0
Number of packets that the network put out of order: 0
```

Example Trace with GBN, using my output

```
-bash-3.2$ ./project2 20 0.05 0.05 0.05 10 -1 1 0 -1
----- Network Simulator Version 2.3 -----
```

Input parameters:

```
Number of Messages = 20 Lost Packet Prob. = 0.050
Corrupt Packet Prob. = 0.050 Out Of Order Prob. = 0.050
Ave. time between messages = 10.00 Trace level = -1
Randomize = 1 Bi-directional = 0
```

```
SEED: 1480378880
(0 , 0 ) Original Send      0      1000      !fEVhy->Pbs'2J3m~2DU
(0 , 0 ) Original Send      1      1001      ##i.Qt9]!Eh-Ps8[~Dg,
(0 , 0 ) Original Send      2      1002      $X$d:oFzQ([3h>sJ~U,a
(0 , 0 ) Received           0      1000      !fEVhy->Pbs'2J3m~2DU
(0 , 0 ) Sending Ack        9000      0
(0 , 0 ) Got Ok NAK/ACK     9000      0
```

(0 , 0)	Original Send	3	1003	%kS%\$jR:#iQ9!hP8~gO7
(0 , 0)	Original Send	4	1004	&}wq&e_XRLF?93- '~xr1
(0 , 0)	Received	1	1001	##i.Qt9]!Eh-Ps8[~Dg,
(0 , 0)	Sending Ack	9001	1	
(0 , 0)	Original Send	5	1005	'2=IT'kv\$x:FQ]hs~,7C
(0 , 0)	Got Ok NAK/ACK	9001	1	
(0 , 0)	Received	2	1002	\$X\$d:oFzQ(]3h>sJ~U,a
(0 , 0)	Sending Ack	9002	2	
(0 , 0)	Original Send	6	1006	(Eb~=Z(6SpLi(Eb~=Zw
(0 , 0)	Received	3	1003	%kS%\$jR:#iQ9!hP8~gO7
(0 , 0)	Sending Ack	9003	3	
(0 , 0)	Got Ok NAK/ACK	9002	2	
(0 , 0)	Original Send	7	1007	dW(V'U&)%S\$R2Q!P~O}N
(0 , 0)	Original Send	8	1008	*jL.nP2r*6vX:z]>~aC%
(0 , 0)	Received	4	1004	&}wq&e_XRLF?93- '~xr1
(0 , 0)	Sending Ack	9004	4	
(0 , 0)	Got Ok NAK/ACK	9003	3	
(0 , 0)	Original Send	9	1009	+fpdWK>2&+k_RF3~r~rfY
(0 , 0)	Original Send	10	1010	,16;AFKPUZ,ejoty~&+0
(0 , 0)	Original Send	11	1011	-DZq*AwN'=T-\$:Qh~7Ne
(0 , 0)	Queueing	12	1012	.V~Iq;d.V~Iq.d.V~Iq;
(0 , 0)	Received	5	1005	'2=IT'kv\$x:FQ]hs~,7C
(0 , 0)	Sending Ack	9005	5	
(0 , 0)	Queueing	13	1013	xiE~Z6pL(b=wSxiE~Z6p
(0 , 0)	Got Ok NAK/ACK	9004	4	
(0 , 0)	Sending	12	1014	.V~Iq;d.V~Iq.d.V~Iq;
(0 , 0)	Received	6	1006	(Eb~=Z(6SpLi(Eb~=Zw
(0 , 0)	Sending Ack	9006	6	
(0 , 0)	Queueing	14	1015	d{iVD1 jWE2}2X03~1YG
(0 , 0)	Queueing	15	1016	10x.-,+*)('&%\$#1~} {
(0 , 0)	Received	7	1007	dW(V'U&)%S\$R2Q!P~O}N
(0 , 0)	Sending Ack	9007	7	
(0 , 0)	Got Ok NAK/ACK	9005	5	
(0 , 0)	Sending	13	1017	xiE~Z6pL(b=wSxiE~Z6p
(0 , 0)	Queueing	16	1018	2CSdt'7HXiy,<M^n21BR
(0 , 0)	Received	8	1008	*jL.nP2r*6vX:z]>~aC%
(0 , 0)	Sending Ack	9008	8	
(0 , 0)	Queueing	17	1019	3Uw;^!Df*Ln2Tv:]~3e)
(0 , 0)	Received	9	1009	+fpdWK>2&+k_RF3~r~rfY
(0 , 0)	Sending Ack	9009	9	
(0 , 0)	Queueing	18	1020	4f=qGzP&Yxc8lB3K~T4^
(0 , 0)	Got Ok NAK/ACK	9006	6	
(0 , 0)	Sending	14	1021	d{iVD1 jWE2}2X03~1YG
(0 , 0)	Got Ok NAK/ACK	9007	7	
(0 , 0)	Sending	15	1022	10x.-,+*)('&%\$#1~} {
(0 , 0)	Got Ok NAK/ACK	9008	8	
(0 , 0)	Sending	16	1023	2CSdt'7HXiy,<M^n21BR
(0 , 0)	Got Ok NAK/ACK	9009	9	
(0 , 0)	Sending	17	1024	3Uw;^!Df*Ln2Tv:]~3e)
(0 , 0)	Queueing	19	1025	5zbI0u]D+pw>&kR9~fM5
(0 , 0)	Received	10	1010	,16;AFKPUZ,ejoty~&+0
(0 , 0)	Sending Ack	9010	10	
(0 , 0)	Got Ok NAK/ACK	9010	10	
(0 , 0)	Sending	18	1026	4f=qGzP&Yxc8lB3K~T4^
(0 , 0)	Received	11	1011	-DZq*AwN'=T-\$:Qh~7Ne
(0 , 0)	Sending Ack	9011	11	
(0 , 0)	Received	12	1014	.V~Iq;d.V~Iq.d.V~Iq;

(0 , 0)	Sending Ack	9012	12	
(0 , 0)	Wrong seqnum	14	1021	d{iVD1 jWE2}2X03~LYG
(0 , 0)	Sending Old Ack	-9013	12	
(0 , 0)	Got Ok NAK/ACK	9011	11	
(0 , 0)	Sending	19	1027	5zbI0u]D+pw>&kR9~fM5
(0 , 0)	Wrong seqnum	15	1022	10x.-, +*)('&#\$1~} {
(0 , 0)	Sending Old Ack	-9014	12	
(0 , 0)	Got Ok NAK/ACK	9012	12	
(0 , 0)	Got Old Ack	-9014	12	
(0 , 0)	Wrong seqnum	16	1023	2CSdt'7HXiy, <M^n21BR
(0 , 0)	Sending Old Ack	-9015	12	
(0 , 0)	Got Old Ack	-9013	12	
(0 , 0)	Wrong seqnum	17	1024	3Uw;^!Df*Ln2Tv:]~3e)
(0 , 0)	Sending Old Ack	-9016	12	
(0 , 0)	Got Old Ack	-9015	12	
(0 , 0)	Wrong seqnum	18	1026	4f=qGzP&Yxc8lB3K~T4^
(0 , 0)	Sending Old Ack	-9017	12	
(0 , 0)	Got Old Ack	-9016	12	
(0 , 0)	Wrong seqnum	19	1027	5zbI0u]D+pw>&kR9~fM5
(0 , 0)	Sending Old Ack	-9018	12	
(0 , 1)	Got Old Ack	-9017	12	
Timeout!				
(0 , 1)	Resending	13	1028	xiE~Z6pL(b=wSxiE~Z6p
(0 , 1)	Resending	14	1029	d{iVD1 jWE2}2X03~LYG
(0 , 1)	Resending	15	1030	10x.-, +*)('&#\$1~} {
(0 , 1)	Resending	16	1031	2CSdt'7HXiy, <M^n21BR
(0 , 1)	Resending	17	1032	3Uw;^!Df*Ln2Tv:]~3e)
(0 , 1)	Resending	18	1033	4f=qGzP&Yxc8lB3K~T4^
(0 , 1)	Resending	19	1034	5zbI0u]D+pw>&kR9~fM5
(0 , 1)	Received	13	1028	xiE~Z6pL(b=wSxiE~Z6p
(0 , 1)	Sending Ack	9019	13	
(0 , 1)	Received	14	1029	d{iVD1 jWE2}2X03~LYG
(0 , 1)	Sending Ack	9020	14	
(1 , 1)	Correupt Ack/Nak	-9018	12	
Ignoring.				
(1 , 1)	Got Ok NAK/ACK	9019	13	
(1 , 1)	Got Ok NAK/ACK	9020	14	
(1 , 1)	Received	15	1030	10x.-, +*)('&#\$1~} {
(1 , 1)	Sending Ack	9021	15	
(1 , 1)	Received	16	1031	2CSdt'7HXiy, <M^n21BR
(1 , 1)	Sending Ack	9022	16	
(1 , 1)	Received	17	1032	3Uw;^!Df*Ln2Tv:]~3e)
(1 , 1)	Sending Ack	9023	17	
(1 , 1)	Got Ok NAK/ACK	9021	15	
(1 , 1)	Wrong seqnum	19	1034	5zbI0u]D+pw>&kR9~fM5
(1 , 1)	Sending Old Ack	-9024	17	
(1 , 1)	Got Ok NAK/ACK	9022	16	
(1 , 1)	Got Ok NAK/ACK	9023	17	
(1 , 1)	Got Old Ack	-9024	17	
Timeout!				
(1 , 1)	Resending	18	1035	4f=qGzP&Yxc8lB3K~T4^
(1 , 1)	Resending	19	1036	5zbI0u]D+pw>&kR9~fM5
(1 , 1)	Received	18	1035	4f=qGzP&Yxc8lB3K~T4^
(1 , 1)	Sending Ack	9025	18	
(1 , 1)	Received	19	1036	5zbI0u]D+pw>&kR9~fM5
(1 , 1)	Sending Ack	9026	19	

Simulator terminated at time 612.240853
after receiving 20 msgs at layer5

Simulator Analysis:

Number of messages sent from 5 to 4: 20
Number of messages received at Layer 5, side A: 0
Number of messages received at Layer 5, side B: 20
Number of messages incorrectly received at layer 5: 0
Number of packets entering the network: 56
Average number of packets already in network: 2.232
Number of packets that the network lost: 2
Number of packets that the network corrupted: 1
Number of packets that the network put out of order: 1