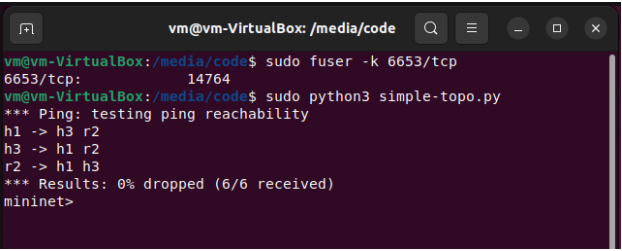


SETUP

(Only for Virtual Box Config when using a shared directory where .py files are located)

```
$ sudo mkdir /media/shared
$ sudo mount -t vboxsf shared /media/shared
```

```
$ sudo apt install python3-pip
$ pip install mininet
$ sudo apt-get install mininet
$ sudo apt-get install xterm
$ sudo apt-get install -y openvswitch-testcontroller
$ sudo mn -c
$ sudo fuser -k 6653/tcp
$ sudo python3 simple-topo.py
```

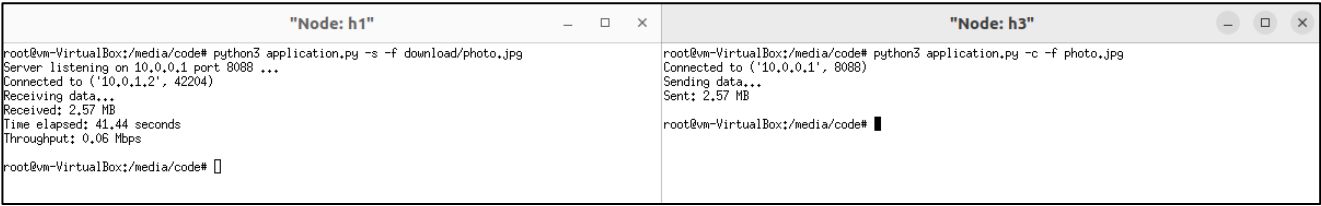


TEST Case 1: Run the file transfer application

Stop and Wait (timeout: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

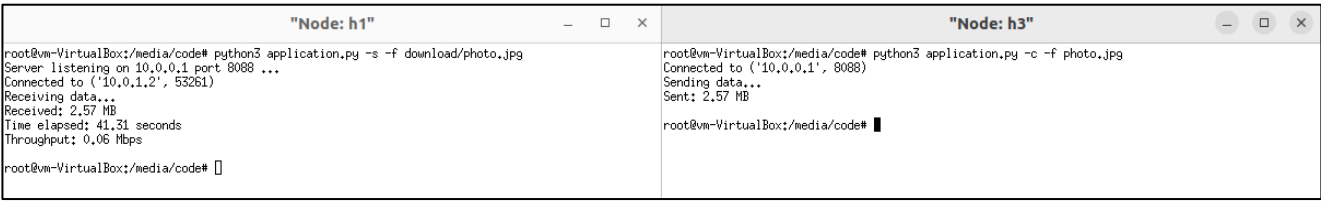
```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```



Stop and Wait (timeout: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

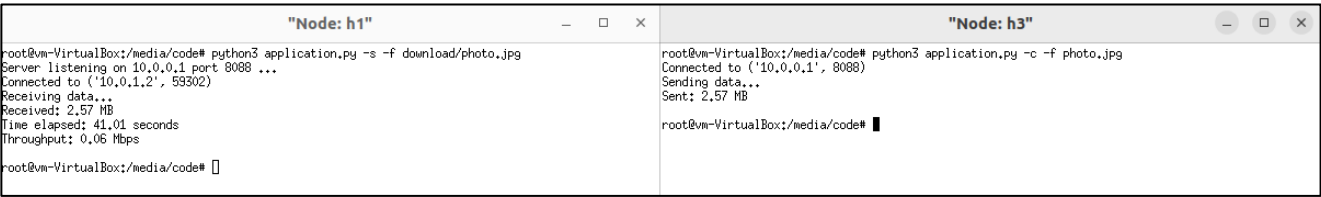
```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```



Stop and Wait (timeout: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```



Window Size: 5

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.0.1', 55978) Receiving data... Received: 2.57 MB Time elapsed: 9.94 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.0.1', 48968) Receiving data... Received: 2.57 MB Time elapsed: 9.75 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.0.1', 52964) Receiving data... Received: 2.57 MB Time elapsed: 9.57 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.0.1', 43137) Receiving data... Received: 2.57 MB Time elapsed: 9.76 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 40326) Receiving data... Received: 2,57 MB Time elapsed: 9,82 seconds Throughput: 0,26 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 35861) Receiving data... Received: 2,57 MB Time elapsed: 9,52 seconds Throughput: 0,27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Window Size: 10

### Go-Back-N (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51364) Receiving data... Received: 2,57 MB Time elapsed: 5,84 seconds Throughput: 0,44 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 53716) Receiving data... Received: 2,57 MB Time elapsed: 5,67 seconds Throughput: 0,45 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 42984) Receiving data... Received: 2,57 MB Time elapsed: 5,87 seconds Throughput: 0,44 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 54533) Receiving data... Received: 2.57 MB Time elapsed: 5.76 seconds Throughput: 0.45 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 37527) Receiving data... Received: 2.57 MB Time elapsed: 5.77 seconds Throughput: 0.44 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 50596) Receiving data... Received: 2.57 MB Time elapsed: 5.59 seconds Throughput: 0.46 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Window Size: 15

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55950) Receiving data... Received: 2.57 MB Time elapsed: 4.46 seconds Throughput: 0.58 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 45671) Receiving data... Received: 2,57 MB Time elapsed: 4,36 seconds Throughput: 0,59 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 46946) Receiving data... Received: 2,57 MB Time elapsed: 4,67 seconds Throughput: 0,55 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 58430) Receiving data... Received: 2,57 MB Time elapsed: 4,49 seconds Throughput: 0,57 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 48154) Receiving data... Received: 2,57 MB Time elapsed: 4,64 seconds Throughput: 0,55 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51848) Receiving data... Received: 2,57 MB Time elapsed: 4,58 seconds Throughput: 0,56 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

**TEST Case 2: Skip an ack packet**

**Stop and Wait (timeout: 25 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 48307) Receiving data... Received: 2.57 MB Time elapsed: 40.86 seconds Throughput: 0.06 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Stop and Wait (timeout: 50 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 52257) Receiving data... Received: 2.57 MB Time elapsed: 40.6 seconds Throughput: 0.06 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Stop and Wait (timeout: 100 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 33185) Receiving data... Received: 2.57 MB Time elapsed: 40.81 seconds Throughput: 0.06 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Window Size: 5**

**Go-Back-N (RTT: 25 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 34709) Receiving data... Received: 2.57 MB Time elapsed: 9.63 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Selective - Repeat (RTT: 25 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 44257) Receiving data... Received: 2,57 MB Time elapsed: 9,46 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

mininet> xterm h1

# ifconfig

# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack

mininet> xterm h3

# python3 application.py -c -f photo.jpg -r gbn

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 49638) Receiving data... Received: 2,57 MB Time elapsed: 9,72 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 50 ms)

mininet> xterm h1

# ifconfig

# python3 application.py -s -f /download/photo.jpg -m sr -t skipack

mininet> xterm h3

# python3 application.py -c -f photo.jpg -r sr

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 52440) Receiving data... Received: 2,57 MB Time elapsed: 9,53 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 100 ms)

mininet> xterm h1

# ifconfig

# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack

mininet> xterm h3

# python3 application.py -c -f photo.jpg -r gbn

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 43213) Receiving data... Received: 2,57 MB Time elapsed: 10,95 seconds Throughput: 0.23 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

mininet> xterm h1

# ifconfig

# python3 application.py -s -f /download/photo.jpg -m sr -t skipack

mininet> xterm h3

# python3 application.py -c -f photo.jpg -r sr

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 44359) Receiving data... Received: 2,57 MB Time elapsed: 9,69 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

Window Size: 10

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t
skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 38651) Receiving data... Received: 2,57 MB Time elapsed: 5,63 seconds Throughput: 0,46 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 43593) Receiving data... Received: 2,57 MB Time elapsed: 5,52 seconds Throughput: 0,46 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t
skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 36840) Receiving data... Received: 2,57 MB Time elapsed: 5,89 seconds Throughput: 0,44 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 34436) Receiving data... Received: 2,57 MB Time elapsed: 5,63 seconds Throughput: 0,46 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t
skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```



"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 35824) Receiving data... Received: 2.57 MB Time elapsed: 5.85 seconds Throughput: 0.44 Mbps root@vm-VirtualBox:/media/code# </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# </pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55209) Receiving data... Received: 2.57 MB Time elapsed: 5.7 seconds Throughput: 0.45 Mbps root@vm-VirtualBox:/media/code# </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# </pre>

### Window Size: 15

### Go-Back-N (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 49909) Receiving data... Received: 2.57 MB Time elapsed: 4.32 seconds Throughput: 0.53 Mbps root@vm-VirtualBox:/media/code# </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# </pre>

### Selective - Repeat (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 39442) Receiving data... Received: 2.57 MB Time elapsed: 4.21 seconds Throughput: 0.61 Mbps root@vm-VirtualBox:/media/code# </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# </pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 49559) Receiving data... Received: 2.57 MB Time elapsed: 4.4 seconds Throughput: 0.58 Mbps root@vm-VirtualBox:/media/code# </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# </pre>

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 58691) Receiving data... Received: 2.57 MB Time elapsed: 4.27 seconds Throughput: 0.6 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 39454) Receiving data... Received: 2.57 MB Time elapsed: 4.52 seconds Throughput: 0.57 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 45188) Receiving data... Received: 2.57 MB Time elapsed: 4.33 seconds Throughput: 0.59 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

TEST Case 3: Skip a sequence number

Stop and Wait (timeout: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 43120) Receiving data... Received: 2.57 MB Time elapsed: 40.43 seconds Throughput: 0.06 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Stop and Wait (timeout: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 52657) Receiving data... Received: 2,57 MB Time elapsed: 40,51 seconds Throughput: 0,06 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Stop and Wait (timeout: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51389) Receiving data... Received: 2,57 MB Time elapsed: 40,54 seconds Throughput: 0,06 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Window Size: 5

#### Go-Back-N (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 35859) Receiving data... Received: 2,57 MB Time elapsed: 9,56 seconds Throughput: 0,27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

#### Selective - Repeat (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51888) Receiving data... Received: 2,57 MB Time elapsed: 9,46 seconds Throughput: 0,27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

#### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55908) Receiving data... Received: 2,57 MB Time elapsed: 9,59 seconds Throughput: 0,27 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 38197) Receiving data... Received: 2.57 MB Time elapsed: 9.49 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 42268) Receiving data... Received: 2.57 MB Time elapsed: 9.69 seconds Throughput: 0.26 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 38062) Receiving data... Received: 2.57 MB Time elapsed: 9.51 seconds Throughput: 0.27 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Window Size: 10

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 46814) Receiving data... Received: 2.57 MB Time elapsed: 5.54 seconds Throughput: 0.46 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 41279) Receiving data... Received: 2,57 MB Time elapsed: 5,48 seconds Throughput: 0,47 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51425) Receiving data... Received: 2,57 MB Time elapsed: 5,65 seconds Throughput: 0,45 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 53550) Receiving data... Received: 2,57 MB Time elapsed: 5,52 seconds Throughput: 0,46 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 50534) Receiving data... Received: 2,57 MB Time elapsed: 5,95 seconds Throughput: 0,43 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 40763) Receiving data... Received: 2,57 MB Time elapsed: 5,57 seconds Throughput: 0,46 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

Window Size: 15

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 40943) Receiving data... Received: 2,57 MB Time elapsed: 4,39 seconds Throughput: 0,59 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 48920) Receiving data... Received: 2,57 MB Time elapsed: 4,25 seconds Throughput: 0,6 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 43288) Receiving data... Received: 2,57 MB Time elapsed: 4,42 seconds Throughput: 0,58 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 50713) Receiving data... Received: 2,57 MB Time elapsed: 4,29 seconds Throughput: 0,6 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 35025) Receiving data... Received: 2.57 MB Time elapsed: 4.46 seconds Throughput: 0.58 Mbps root@vm-VirtualBox:/media/code# █ </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# █ </pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 43463) Receiving data... Received: 2.57 MB Time elapsed: 4.32 seconds Throughput: 0.59 Mbps root@vm-VirtualBox:/media/code# █ </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# █ </pre>

### TEST Case 5: Skip ack packets (5) and sequence numbers (5)

#### Stop and Wait (timeout: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 56662) Receiving data... Received: 2.57 MB Time elapsed: 40.73 seconds Throughput: 0.06 Mbps root@vm-VirtualBox:/media/code# █ </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# █ </pre>

#### Stop and Wait (timeout: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 38646) Receiving data... Received: 2.57 MB Time elapsed: 41.01 seconds Throughput: 0.06 Mbps root@vm-VirtualBox:/media/code# █ </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# █ </pre>

#### Stop and Wait (timeout: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -t skipack

```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -t loss

```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 47166) Receiving data... Received: 2.57 MB Time elapsed: 41.45 seconds Throughput: 0.06 Mbps root@vm-VirtualBox:/media/code# █ </pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB root@vm-VirtualBox:/media/code# █ </pre>

Window Size: 5

Go-Back-N (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 44394) Receiving data... Received: 2,57 MB Time elapsed: 9,82 seconds Throughput: 0,26 Mbps root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 25 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 54919) Receiving data... Received: 2,57 MB Time elapsed: 9,71 seconds Throughput: 0,26 Mbps root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 46005) Receiving data... Received: 2,57 MB Time elapsed: 10,08 seconds Throughput: 0,25 Mbps root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB root@vm-VirtualBox:/media/code#

Selective - Repeat (RTT: 50 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 35767) Receiving data... Received: 2,57 MB Time elapsed: 10,0 seconds Throughput: 0,26 Mbps root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB root@vm-VirtualBox:/media/code#

Go-Back-N (RTT: 100 ms)

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```



"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55161) Receiving data... Received: 2.57 MB Time elapsed: 10.79 seconds Throughput: 0.24 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55960) Receiving data... Received: 2.57 MB Time elapsed: 10.26 seconds Throughput: 0.25 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#</pre>

### Window Size: 10

### Go-Back-N (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55589) Receiving data... Received: 2.57 MB Time elapsed: 5.9 seconds Throughput: 0.43 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 25 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 53768) Receiving data... Received: 2.57 MB Time elapsed: 5.75 seconds Throughput: 0.45 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 48473) Receiving data... Received: 2.57 MB Time elapsed: 6.03 seconds Throughput: 0.43 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#</pre>

**Selective - Repeat (RTT: 50 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 48310) Receiving data... Received: 2.57 MB Time elapsed: 5.88 seconds Throughput: 0.44 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Go-Back-N (RTT: 100 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 45502) Receiving data... Received: 2.57 MB Time elapsed: 6.15 seconds Throughput: 0.42 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Selective - Repeat (RTT: 100 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 52283) Receiving data... Received: 2.57 MB Time elapsed: 6.06 seconds Throughput: 0.42 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Window Size: 15**

**Go-Back-N (RTT: 25 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 58514) Receiving data... Received: 2.57 MB Time elapsed: 4.84 seconds Throughput: 0.53 Mbps  root@vm-VirtualBox:/media/code#	root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2.57 MB  root@vm-VirtualBox:/media/code#

**Selective - Repeat (RTT: 25 ms)**

```
mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```
mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 37526) Receiving data... Received: 2,57 MB Time elapsed: 4,34 seconds Throughput: 0,59 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t
skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 41810) Receiving data... Received: 2,57 MB Time elapsed: 4,91 seconds Throughput: 0,52 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 50 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 51495) Receiving data... Received: 2,57 MB Time elapsed: 4,64 seconds Throughput: 0,55 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Go-Back-N (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m gbn -t
skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r gbn -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m gbn -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 34462) Receiving data... Received: 2,57 MB Time elapsed: 5,37 seconds Throughput: 0,48 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r gbn -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>

### Selective - Repeat (RTT: 100 ms)

```

mininet> xterm h1
# ifconfig
# python3 application.py -s -f /download/photo.jpg -m sr -t skipack
```

```

mininet> xterm h3
# python3 application.py -c -f photo.jpg -r sr -t loss
```

"Node: h1"	"Node: h3"
<pre> root@vm-VirtualBox:/media/code# python3 application.py -s -f download/photo.jpg -m sr -t skipack Server listening on 10.0.0.1 port 8088 ... Connected to ('10.0.1.2', 55016) Receiving data... Received: 2,57 MB Time elapsed: 4,79 seconds Throughput: 0,54 Mbps  root@vm-VirtualBox:/media/code#</pre>	<pre> root@vm-VirtualBox:/media/code# python3 application.py -c -f photo.jpg -r sr -t loss Connected to ('10.0.0.1', 8088) Sending data... Sent: 2,57 MB  root@vm-VirtualBox:/media/code#</pre>