

Test and Analysis

Output and result under packet losses (say 20%) and delays (say 100 msec)

<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.169 seconds PING 127.0.0.1 4 LOST PING 127.0.0.1 8 0.083 seconds PING 127.0.0.1 12 0.092 seconds PING 127.0.0.1 16 0.025 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=16, Lost=1 (20% Loss) The Minimum RTT is: 0.025 seconds The Maximum RTT is: 0.169 seconds The Average RTT is: 0.092 seconds</pre>	<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.179 seconds PING 127.0.0.1 8 0.152 seconds PING 127.0.0.1 8 LOST PING 127.0.0.1 12 0.182 seconds PING 127.0.0.1 16 0.173 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=16, Lost=1 (20% Loss) The Minimum RTT is: 0.152 seconds The Maximum RTT is: 0.182 seconds The Average RTT is: 0.172 seconds</pre>
<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.139 seconds PING 127.0.0.1 8 0.004 seconds PING 127.0.0.1 12 0.050 seconds PING 127.0.0.1 12 LOST PING 127.0.0.1 16 0.145 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=16, Lost=1 (20% Loss) The Minimum RTT is: 0.004 seconds The Maximum RTT is: 0.145 seconds The Average RTT is: 0.084 seconds</pre>	<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.045 seconds PING 127.0.0.1 8 0.035 seconds PING 127.0.0.1 8 LOST PING 127.0.0.1 8 LOST PING 127.0.0.1 12 0.131 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=12, Lost=2 (40% Loss) The Minimum RTT is: 0.035 seconds The Maximum RTT is: 0.131 seconds The Average RTT is: 0.071 seconds</pre>
<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.019 seconds PING 127.0.0.1 8 0.177 seconds PING 127.0.0.1 12 0.025 seconds PING 127.0.0.1 16 0.071 seconds PING 127.0.0.1 16 LOST Ping statistics for 127.0.0.1 Packets: Sent=5, Received=16, Lost=1 (20% Loss) The Minimum RTT is: 0.019 seconds The Maximum RTT is: 0.177 seconds The Average RTT is: 0.073 seconds</pre>	<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.020 seconds PING 127.0.0.1 8 0.089 seconds PING 127.0.0.1 12 0.032 seconds PING 127.0.0.1 16 0.124 seconds PING 127.0.0.1 20 0.108 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.020 seconds The Maximum RTT is: 0.124 seconds The Average RTT is: 0.075 seconds</pre>
<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.053 seconds PING 127.0.0.1 8 0.127 seconds PING 127.0.0.1 12 0.157 seconds PING 127.0.0.1 16 0.164 seconds PING 127.0.0.1 16 LOST Ping statistics for 127.0.0.1 Packets: Sent=5, Received=16, Lost=1 (20% Loss) The Minimum RTT is: 0.053 seconds The Maximum RTT is: 0.164 seconds The Average RTT is: 0.125 seconds</pre>	<pre>PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.188 seconds PING 127.0.0.1 8 0.006 seconds PING 127.0.0.1 12 0.201 seconds PING 127.0.0.1 16 0.062 seconds PING 127.0.0.1 20 0.171 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.006 seconds The Maximum RTT is: 0.201 seconds The Average RTT is: 0.126 seconds</pre>

PING 127.0.0.1, 1500	PING 127.0.0.1, 1500
PING 127.0.0.1 0 LOST	PING 127.0.0.1 4 0.192 seconds
PING 127.0.0.1 4 0.025 seconds	PING 127.0.0.1 8 0.067 seconds
PING 127.0.0.1 8 0.160 seconds	PING 127.0.0.1 12 0.047 seconds
PING 127.0.0.1 12 0.158 seconds	PING 127.0.0.1 16 0.087 seconds
PING 127.0.0.1 16 0.008 seconds	PING 127.0.0.1 20 0.195 seconds
Ping statistics for 127.0.0.1	Ping statistics for 127.0.0.1
Packets: Sent=5, Received=16, Lost=1 (20% Loss)	Packets: Sent=5, Received=20, Lost=0 (0% Loss)
The Minimum RTT is: 0.008 seconds	The Minimum RTT is: 0.047 seconds
The Maximum RTT is: 0.160 seconds	The Maximum RTT is: 0.195 seconds
The Average RTT is: 0.088 seconds	The Average RTT is: 0.118 seconds

Real lost rate = $(0.2+0.2+0.2+0.4+0.2+0.0+0.2+0.0+0.2+0.0)/10 \times 100\% = 14\%$

Real average RTT = $1.024 / 10 = 0.1024 \text{ sec} = 102.4 \text{ msec}$

Output and result under no packet losses and delays

PING 127.0.0.1, 1500	PING 127.0.0.1, 1500
PING 127.0.0.1 4 0.003 seconds	PING 127.0.0.1 4 0.024 seconds
PING 127.0.0.1 8 0.001 seconds	PING 127.0.0.1 8 0.003 seconds
PING 127.0.0.1 12 0.001 seconds	PING 127.0.0.1 12 0.004 seconds
PING 127.0.0.1 16 0.001 seconds	PING 127.0.0.1 16 0.004 seconds
PING 127.0.0.1 20 0.006 seconds	PING 127.0.0.1 20 0.004 seconds
Ping statistics for 127.0.0.1	Ping statistics for 127.0.0.1
Packets: Sent=5, Received=20, Lost=0 (0% Loss)	Packets: Sent=5, Received=20, Lost=0 (0% Loss)
The Minimum RTT is: 0.001 seconds	The Minimum RTT is: 0.003 seconds
The Maximum RTT is: 0.006 seconds	The Maximum RTT is: 0.024 seconds
The Average RTT is: 0.002 seconds	The Average RTT is: 0.008 seconds

PING 127.0.0.1, 1500	PING 127.0.0.1, 1500
PING 127.0.0.1 4 0.025 seconds	PING 127.0.0.1 4 0.007 seconds
PING 127.0.0.1 8 0.014 seconds	PING 127.0.0.1 8 0.006 seconds
PING 127.0.0.1 12 0.016 seconds	PING 127.0.0.1 12 0.009 seconds
PING 127.0.0.1 16 0.014 seconds	PING 127.0.0.1 16 0.016 seconds
PING 127.0.0.1 20 0.005 seconds	PING 127.0.0.1 20 0.016 seconds
Ping statistics for 127.0.0.1	Ping statistics for 127.0.0.1
Packets: Sent=5, Received=20, Lost=0 (0% Loss)	Packets: Sent=5, Received=20, Lost=0 (0% Loss)
The Minimum RTT is: 0.005 seconds	The Minimum RTT is: 0.006 seconds
The Maximum RTT is: 0.025 seconds	The Maximum RTT is: 0.016 seconds
The Average RTT is: 0.015 seconds	The Average RTT is: 0.011 seconds

PING 127.0.0.1, 1500	PING 127.0.0.1, 1500
PING 127.0.0.1 4 0.020 seconds	PING 127.0.0.1 4 0.025 seconds
PING 127.0.0.1 8 0.003 seconds	PING 127.0.0.1 8 0.003 seconds
PING 127.0.0.1 12 0.004 seconds	PING 127.0.0.1 12 0.005 seconds
PING 127.0.0.1 16 0.013 seconds	PING 127.0.0.1 16 0.016 seconds
PING 127.0.0.1 20 0.016 seconds	PING 127.0.0.1 20 0.016 seconds
Ping statistics for 127.0.0.1	Ping statistics for 127.0.0.1
Packets: Sent=5, Received=20, Lost=0 (0% Loss)	Packets: Sent=5, Received=20, Lost=0 (0% Loss)
The Minimum RTT is: 0.003 seconds	The Minimum RTT is: 0.003 seconds
The Maximum RTT is: 0.020 seconds	The Maximum RTT is: 0.025 seconds
The Average RTT is: 0.011 seconds	The Average RTT is: 0.013 seconds

<pre> PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.025 seconds PING 127.0.0.1 8 0.002 seconds PING 127.0.0.1 12 0.003 seconds PING 127.0.0.1 16 0.004 seconds PING 127.0.0.1 20 0.003 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.002 seconds The Maximum RTT is: 0.025 seconds The Average RTT is: 0.007 seconds </pre>	<pre> PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.025 seconds PING 127.0.0.1 8 0.008 seconds PING 127.0.0.1 12 0.004 seconds PING 127.0.0.1 16 0.007 seconds PING 127.0.0.1 20 0.006 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.004 seconds The Maximum RTT is: 0.025 seconds The Average RTT is: 0.010 seconds </pre>
<pre> PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.005 seconds PING 127.0.0.1 8 0.003 seconds PING 127.0.0.1 12 0.008 seconds PING 127.0.0.1 16 0.007 seconds PING 127.0.0.1 20 0.004 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.003 seconds The Maximum RTT is: 0.008 seconds The Average RTT is: 0.005 seconds </pre>	<pre> PING 127.0.0.1, 1500 PING 127.0.0.1 4 0.025 seconds PING 127.0.0.1 8 0.003 seconds PING 127.0.0.1 12 0.004 seconds PING 127.0.0.1 16 0.014 seconds PING 127.0.0.1 20 0.014 seconds Ping statistics for 127.0.0.1 Packets: Sent=5, Received=20, Lost=0 (0% Loss) The Minimum RTT is: 0.003 seconds The Maximum RTT is: 0.025 seconds The Average RTT is: 0.012 seconds </pre>

Real lost rate = 0%

Real average RTT = $0.094 / 10 = 0.0094 \text{ sec} = 9.4 \text{ msec}$

Discussion and Conclusion:

After testing, I found that packet lost would seldom happen if we did not artificially add

any lost rate, and data transmission is relatively stable under local system. The

Transmission delay and propagation delay of PING operation is very small. Obviously,

PING is a good tool to test the connectivity of the network.