

How to use PsPing to test ping, latency & bandwidth between Blue Prism components

Introduction

When you are experiencing slow performance across your Blue Prism environment it may be caused by network factors such as high latency and low bandwidth. This slow performance may manifest as slowing loading or saving of processes and objects, slow updates in Control Room or slower running of processes. It may even be a combination of all these.

It is useful if you can determine various performance metrics such as latency times and bandwidth performance between two different Blue Prism component machines. This can help you identify possible network faults or understand the load put on your network by Blue Prism client interactions or by running a particular process.

In addition, by measuring these statistics when your system is performing normally you will be able to form a baseline using these metrics. This will give you a good understanding of your network performance under normal conditions and use this for comparison when your system is experiencing abnormal performance.

The **PsPing** tool from Microsoft (<https://docs.microsoft.com/en-us/sysinternals/downloads/psping>) can be used to measure bandwidth and latency between Windows machines over TCP connections as well as provide more information than the standard ping tool. This can help diagnose network connectivity & performance issues you may be experiencing on your Blue Prism environment.

You can download **PsPing** as a part of the SysInternals toolset by visiting <https://docs.microsoft.com/en-us/sysinternals/> or as a separate download [here](#).

PsPing is a self-contained executable file, so simply copy it to a directory that is already in your path (or add your chosen directory to your path) so that you can run it without having to specify the filesystem location. E.g. entering the following command in a Windows command prompt will bring up information messages about the tool:

psping

```
C:\tools\SysinternalsSuite>psping

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PsPing implements Ping functionality, TCP ping, UDP/TCP latency, and UDP / TCP
bandwidth measurement.

Help usage: psping -? [i|t|l|b]
  -? i  Usage for ICMP ping.
  -? t  Usage for TCP ping.
  -? l  Usage for latency test.
  -? b  Usage for bandwidth test.
  -nobanner  Do not display the startup banner and copyright message.

C:\tools\SysinternalsSuite>
```

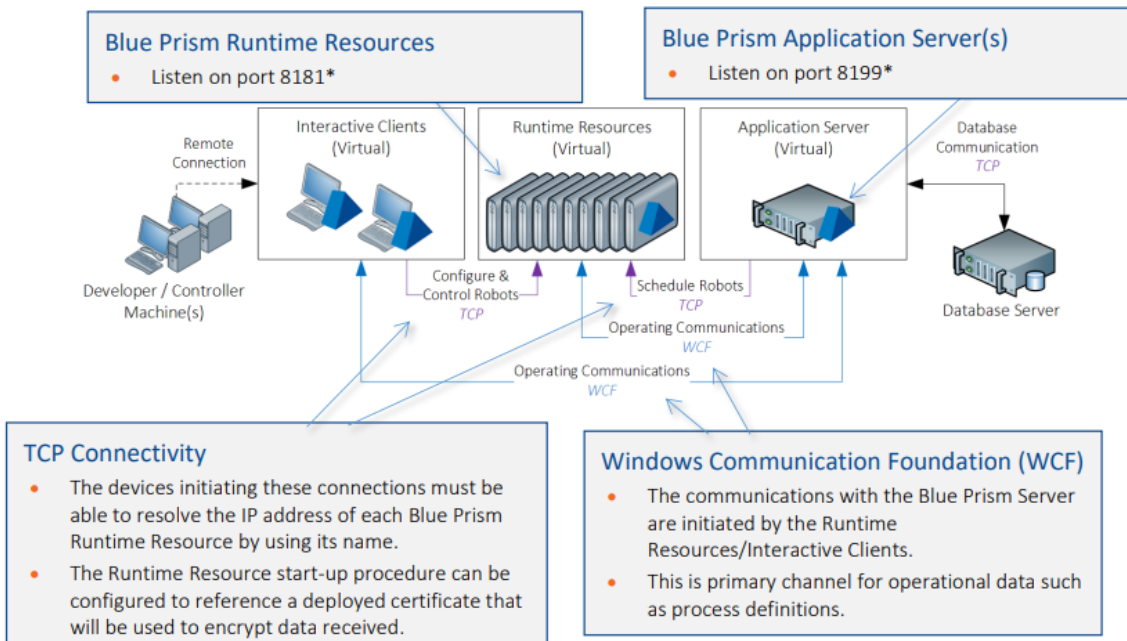
PsPing can perform ICMP pings as well as TCP pings. TCP pings are useful if ICMP pings have been blocked by your Network Team and you can also target a service running on a specific port on a machine. This allows you to test the same ports that are being used by your Blue Prism components, for example the Runtime Resource default port of 8181 and the Application Server (App Server) default port of 8199.

You and your infrastructure teams can gain valuable insight into your network performance by running these tests during times when your Blue Prism systems are both busy and quiet. This will give you a good reference point when diagnosing and troubleshooting network issues when they arise.

Below is a communication summary diagram showing the different Blue Prism components. **PsPing** can be installed on any of these machines for the tests, including the SQL Server database server.

Blue Prism Communication Summary

The following information highlights the Blue Prism inter-component communication and the security that can be configured for each channel.



*ports are configurable

ICMP ping tests

An ICMP test is similar to standard Windows ping and produces the same statistics but with more precision. It also offers histograms, control of interval, payload and iterations and the ability to use IPv4 or IPv6.

The following example performs an ICMP ping to display a histogram with 10 buckets, ping as quickly as possible, use a 1500-byte payload, send 10 pings (with the default of 1 for warmup) and using IPv4:

```
psping -h 10 -i 0 -l 1500 -n 10 -4 10.44.1.12
```

```

C:\SysinternalsSuite>psping -h 10 -i 0 -l 1500 -n 10 -4 10.44.1.12

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Pinging 10.44.1.12 with 1500 bytes of data:
11 iterations (warmup 1) ping test:
Reply from 10.44.1.12: 0.96ms
Reply from 10.44.1.12: 2.19ms
Reply from 10.44.1.12: 1.90ms
Reply from 10.44.1.12: 1.87ms
Reply from 10.44.1.12: 1.90ms
Reply from 10.44.1.12: 0.82ms
Reply from 10.44.1.12: 1.85ms
Reply from 10.44.1.12: 1.75ms
Reply from 10.44.1.12: 2.06ms
Reply from 10.44.1.12: 1.43ms
Reply from 10.44.1.12: 0.96ms

Ping statistics for 10.44.1.12:
    Sent = 10, Received = 10, Lost = 0 (0% loss),
    Minimum = 0.82ms, Maximum = 2.19ms, Average = 1.67ms

Latency Count
0.82      2
0.97      0
1.12      0
1.27      0
1.43      1
1.58      0
1.73      3
1.88      2
2.04      1
2.19      1

C:\SysinternalsSuite>
    
```

Command switch usage:

Parameter	Description
-h	Print histogram (default bucket count is 20).
	If you specify a single argument, it's interpreted as a bucket count and the histogram will contain that number of buckets covering the entire time range of values. Specify a comma-separated list of times to create a custom histogram (e.g. "0.01,0.05,1,5,10").
-i	Interval in seconds. Specify 0 for fast ping.
-l	Request size. Append 'k' for kilobytes and 'm' for megabytes.
-n	Number of pings or append 's' to specify seconds e.g. '10s'.
-4	Force using IPv4.

TCP ping tests

ICMP ping tests can be used just to check that a target machine is “up” and contactable, but TCP ping can be used to check whether a service on a port can be communicated with, such as the default Runtime Resource port of 8181.

To execute a TCP connect test, specify the port number. The following example executes connect attempts against the target IP address and port 8181 as quickly as possible, only printing a summary after 100 iterations and 1 warmup:

```
psping -n 100 -i 0 -q 10.44.1.12:8181
```

```
C:\SysinternalsSuite>psping -n 100 -i 0 -q 10.44.1.12:8181

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TCP connect to 10.44.1.12:8181:
101 iterations (warmup 1) ping test: 100%

TCP connect statistics for 10.44.1.12:8181:
  Sent = 100, Received = 98, Lost = 2 (2% loss),
  Minimum = 0.15ms, Maximum = 513.78ms, Average = 6.43ms

C:\SysinternalsSuite>
```

Command switch usage:

Parameter	Description
-i	Interval in seconds. Specify 0 for fast ping.
-n	Number of pings or append 's' to specify seconds e.g. '10s'.
-q	Don't output during pings.

Latency Testing

Network latency is a measurement of the time it takes for some data to get to its destination across the network. It is usually measured as the time taken for information to get to its destination and back again. This round-trip delay has a key impact on the performance of the network.

You can test the latency between two Blue Prism component machines (e.g. an App Server and a Runtime Resource) by having **PsPing** running on each of the components. One machine will listen on a specific port and the other machine will then be used to target that port.

Please see the example below:

We first start a **PsPing** ‘listener session’ on the machine and port we want to target from the Runtime Resource machine:

```
psping -4 -s 10.44.1.12:8181
```

```
C:\Windows\System32\cmd.exe - psping -4 -s 10.44.1.12:8181
```

```
C:\SysinternalsSuite>psping -4 -s 10.44.1.12:8181

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Type Control-C to exit.
Waiting for TCP connection on 10.44.1.12:8181: _
```

This starts up a listener using the specified IP address on TCP port 8181. If the Windows firewall needs opening use the '-f' switch to do this. Open the 'CMD' prompt with Administrator permissions if this is required.

Please note this is **not** a Blue Prism Runtime Resource listener, it is the **PsPing** 'target' session.

The latency is then tested from another Blue Prism component machine (e.g. the App Server) using the following command:

```
psping -4 -h 10 -n 10 -l 1000 10.44.1.12:8181
```

```
C:\SysinternalsSuite>psping -4 -h 10 -n 10 -l 1000 10.44.1.12:8181

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TCP latency test connecting to 10.44.1.12:8181: Connected
15 iterations (warmup 5) sending 1000 bytes TCP latency test: 100%

TCP roundtrip latency statistics (post warmup):
  Sent = 10, Size = 1000, Total Bytes: 10000,
  Minimum = 0.84ms, Maximum = 3.03ms, Average = 1.50ms

Latency Count
0.84      4
1.08      2
1.33      0
1.57      0
1.82      2
2.06      1
2.30      0
2.55      0
2.79      0
3.03      1

C:\SysinternalsSuite>
```

This uses IPv4, creates a histogram, uses 1000 bytes of payload and targets TCP port 8181 on address 10.44.1.12.

Command switch usage:

Parameter	Description
-n	Number of sends/receives. Append 's' to specify seconds e.g. '10s'
-r	Receive from the server instead of sending.
-s	Server listening address and port.
-4	Force using IPv4.
-h	Print histogram (default bucket count is 20).
-l	Request size. Append 'k' for kilobytes and 'm' for megabytes.

Bandwidth Testing

Bandwidth is a measure of how much data can be transferred between two devices in a given time. This is typically measured in megabytes per second. Networks with higher bandwidth are able to transfer a greater number of data packets than those with a low bandwidth. A common analogy is to think of data transfer as water flowing through a hosepipe - there's a limit to the amount of water that can fit inside the pipe at any given moment, with larger capacity pipes being able to carry more. The narrower it is, i.e. the smaller bandwidth, the less data is able to be pushed through it at once and vice-versa.

Like the previous test you should have one machine listening on a TCP port and the other machine can then 'ping' this machine with packets of data. After the test is complete the **PsPing** tool will give you bandwidth statistics showing how much data was able to be transferred between the two machines.

Please see below for an example of using both the server and client for the bandwidth test.

```
psping -b -4 -n 4000 -l 5000 10.44.1.12:8181
```

```
C:\SysinternalsSuite>psping -b -4 -n 4000 -l 5000 10.44.1.12:8181

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TCP bandwidth test connecting to 10.44.1.12:8181: Connected
4005 iterations (5 warmup) sending 5000 bytes TCP bandwidth test: 57344100%

TCP sender bandwidth statistics:
  Sent = 4000, Size = 5000, Total Bytes: 20005000,
  Minimum = 4.82 MB/s, Maximum = 7.59 MB/s, Average = 6.32 MB/s

C:\SysinternalsSuite>
```

This starts the bandwidth test using IPv4, with 4000 packets of 5000 bytes in size. Note the bandwidth results after the test completes.

On the client (target) machine that is 'listening' on port 8181 we see the following corresponding display when the test is ongoing and then completes:

```

Administrator: C:\Windows\System32\cmd.exe - psping -4 -s 10.44.1.12:8181

C:\SysinternalsSuite>psping -4 -s 10.44.1.12:8181

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Type Control-C to exit.
Waiting for TCP connection on 10.44.1.12:8181: Connected
4005 iterations (5 warmup) receiving 5000 bytes TCP bandwidth test: 2046630100%

TCP receiver bandwidth statistics:
  Received = 4000, Size = 5000, Total Bytes: 20005000,
  Minimum = 4.98 MB/s, Maximum = 7.55 MB/s, Average = 6.32 MB/s

Waiting for TCP connection on 10.44.1.12:8181:
    
```

Command switch usage:

Parameter	Description
-b	Bandwidth test.
-i	Number of outstanding I/Os (default is min of 16 and 2x CPU cores).
-l	Request size. Append 'k' for kilobytes and 'm' for megabytes.
-n	Number of sends/receives. Append 's' to specify seconds e.g. '10s'
-r	Receive from the server instead of sending.
-s	Server listening address and port.

Conclusion

By performing the tests described, it will give you performance metrics by which you and your Network Team can assess both the impact and help pinpoint possible causes of why your Blue Prism environment appears to be slower than normal. Having a baseline set of metrics allows you to compare performance when it is slow and when operating normally.

As an example, when you see 'ping' times of 50ms or greater and your baseline is 20ms then this may indicate some change in network infrastructure such as transmission errors (e.g. dropped packets), different routes taken for the traffic to get from point A to point B, changes to bridges or switches. Ping times of greater than 20ms can start to affect Interactive Client activity and slow down updates to the interface such as when in Control Room or when loading/saving processes and objects.

Latency can create bottlenecks within the network and reduces the amount of data which can be transferred over time. It can be temporary or persistent so testing should be done over a period of time to give a good sample of performance data.

The examples used in this document were produced in a Virtual Machine environment on one physical machine. Real world environments using LAN and WAN networks will produce different results. Again, performing your own tests will help you create a baseline for your own environment.

As an example, if you have a gigabit ethernet card on your Blue Prism machine, your router or switch is gigabit and the receiving device also has a gigabit ethernet card, your maximum transfer speed will be a theoretical maximum of 1000 Mbps (1000 megabits per second) or 125 MBps (125 megabytes per second). You are unlikely

to see this theoretical speed, but you will typically get anywhere from 70 to 115 MBps depending on the type of files you are transferring and your network setup. In the first instance you should work with your Network and Infrastructure Teams if your network is not performing as normal.

If you are experiencing slow performance across your Blue Prism network, check both the latency and bandwidth metrics between components and work with your Network Team to help identify the bottlenecks.