High Level Issue:

Microsoft Azure Kubernetes Cluster is limiting outbound TCP connections per external domain and Node.

We are only able to make a total of approximately 1200 outbound connections from any one AKS node. We also appear to be throttled by the number of total concurrent TCP connections we can make to an outbound domain (outbound outside the cluster but within the same data center) to several hundred per domain name up to the maximum number of connections per node.

Tests:

Microsoft AKS cluster test – Pointing at VM in same data center: (Multi-Threaded)

The connections are limited to a total number of several hundred.

```
root@db-proxy-test-jeremy:/# python3 client_threaded.py 20.59.112.73 12345 1000 500
Running test on 20.59.112.73:12345
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
Current statistics: Successful=564, Failed=0, Delayed=0
^CTraceback (most recent call last):
  File "//client_threaded.py", line 64, in <module>
    run_test(args.ips, args.port, args.num_connections, args.delay_threshold)
  File "//client_threaded.py", line 39, in run_test
    time.sleep(1) # Delay to allow results to be processed
    ^^^^^^^^^^^^^
KeyboardInterrupt
^CException ignored in: <module 'threading' from '/usr/local/lib/python3.11/threading.py'>
Traceback (most recent call last):
  File "/usr/local/lib/python3.11/threading.py", line 1583, in _shutdown
    lock.acquire()
KeyboardInterrupt:

root@db-proxy-test-jeremy:/# python3 client_threaded.py 20.59.112.73 12345 1000 500
Running test on 20.59.112.73:12345
Current statistics: Successful=31, Failed=402, Delayed=0
Current statistics: Successful=31, Failed=405, Delayed=0
Current statistics: Successful=31, Failed=405, Delayed=0
Current statistics: Successful=31, Failed=405, Delayed=0
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
Current statistics: Successful=529, Failed=405, Delayed=498
^CTraceback (most recent call last):
  File "//client_threaded.py", line 64, in <module>
    run_test(args.ips, args.port, args.num_connections, args.delay_threshold)
  File "//client_threaded.py", line 39, in run_test
    time.sleep(1) # Delay to allow results to be processed
    ^^^^^^^^^^^^^
KeyboardInterrupt
```

Single Threaded Run:

Results in the same types of issues.

```
root@db-proxy-test-jeremy:/# python3 client_singlethreaded.py 20.59.112.73 12345 5000 500 120
Running test on 20.59.112.73:12345
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=273, Failed=0, Delayed=0
Current statistics: Successful=526, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
Current statistics: Successful=687, Failed=0, Delayed=0
```

again

```
root@db-proxy-test-jeremy:/# python3 client_singlethreaded.py 20.59.112.73 12345 5000 500 120
Running test on 20.59.112.73:12345
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=114, Failed=0, Delayed=1
Current statistics: Successful=402, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
Current statistics: Successful=606, Failed=0, Delayed=1
```

again

```
root@db-proxy-test-jeremy:/# python3 client_singlethreaded.py 20.59.112.73 12345 5000 500 120
Running test on 20.59.112.73:12345
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=225, Failed=0, Delayed=1
Current statistics: Successful=575, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
Current statistics: Successful=589, Failed=0, Delayed=1
```

AKS Test using one node as server and one node as client:

Test succeeds no problem.

5000 connections (No problem):

```
Delayed connections: 0 (more than 500.0 milliseconds)
root@db-proxy-test-jeremy:/# python3 client_threaded.py 10.244.1.212 12346 5000 500
Running test on 10.244.1.212:12346
Current statistics: Successful=4999, Failed=0, Delayed=0
Total connections: 5000
Successful connections: 5000
Delayed connections: 0 (more than 500.0 milliseconds)
root@db-proxy-test-jeremy:/#
```

Google Kubernetes cluster test – Pointing at same VM in AZURE data center: (Single Threaded)

The test was able to make 900 single threaded connections and hold them open without failure.

```
Delayed connections: 0 (more than 500.0 milliseconds)
root@my-python-pod-1-1-5979fd9f95-mgm8r:/# python3 client.py 20.59.112.73 12345 900 500 120
Running test on 20.59.112.73:12345
Current statistics: Successful=0, Failed=0, Delayed=0
Current statistics: Successful=22, Failed=0, Delayed=0
Current statistics: Successful=45, Failed=0, Delayed=0
Current statistics: Successful=67, Failed=0, Delayed=0
Current statistics: Successful=90, Failed=0, Delayed=0
Current statistics: Successful=112, Failed=0, Delayed=0
Current statistics: Successful=135, Failed=0, Delayed=0
Current statistics: Successful=157, Failed=0, Delayed=0
Current statistics: Successful=180, Failed=0, Delayed=0
Current statistics: Successful=203, Failed=0, Delayed=0
Current statistics: Successful=225, Failed=0, Delayed=0
Current statistics: Successful=248, Failed=0, Delayed=0
Current statistics: Successful=271, Failed=0, Delayed=0
Current statistics: Successful=293, Failed=0, Delayed=0
Current statistics: Successful=316, Failed=0, Delayed=0
Current statistics: Successful=339, Failed=0, Delayed=0
Current statistics: Successful=361, Failed=0, Delayed=0
Current statistics: Successful=384, Failed=0, Delayed=0
Current statistics: Successful=407, Failed=0, Delayed=0
Current statistics: Successful=429, Failed=0, Delayed=0
Current statistics: Successful=452, Failed=0, Delayed=0
Current statistics: Successful=475, Failed=0, Delayed=0
Current statistics: Successful=497, Failed=0, Delayed=0
Current statistics: Successful=520, Failed=0, Delayed=0
Current statistics: Successful=542, Failed=0, Delayed=0
Current statistics: Successful=565, Failed=0, Delayed=0
Current statistics: Successful=588, Failed=0, Delayed=0
Current statistics: Successful=610, Failed=0, Delayed=0
Current statistics: Successful=633, Failed=0, Delayed=0
Current statistics: Successful=656, Failed=0, Delayed=0
Current statistics: Successful=678, Failed=0, Delayed=0
Current statistics: Successful=701, Failed=0, Delayed=0
Current statistics: Successful=723, Failed=0, Delayed=0
Current statistics: Successful=746, Failed=0, Delayed=0
Current statistics: Successful=769, Failed=0, Delayed=0
Current statistics: Successful=791, Failed=0, Delayed=0
Current statistics: Successful=814, Failed=0, Delayed=0
Current statistics: Successful=837, Failed=0, Delayed=0
Current statistics: Successful=859, Failed=0, Delayed=0
Current statistics: Successful=882, Failed=0, Delayed=0
Total connections: 900
Successful connections: 900
Delayed connections: 0 (more than 500.0 milliseconds)
root@my-python-pod-1-1-5979fd9f95-mgm8r:/#
```

Same thing with 5000 connections:

```
Current statistics: Successful=2159, Failed=0, Delayed=0
Current statistics: Successful=2181, Failed=0, Delayed=0
Current statistics: Successful=2204, Failed=0, Delayed=0
Current statistics: Successful=2227, Failed=0, Delayed=0
Current statistics: Successful=2250, Failed=0, Delayed=0
Current statistics: Successful=2272, Failed=0, Delayed=0
Current statistics: Successful=2295, Failed=0, Delayed=0
Current statistics: Successful=2318, Failed=0, Delayed=0
Current statistics: Successful=2340, Failed=0, Delayed=0
Current statistics: Successful=2363, Failed=0, Delayed=0
Current statistics: Successful=2386, Failed=0, Delayed=0
Current statistics: Successful=2408, Failed=0, Delayed=0
Current statistics: Successful=2431, Failed=0, Delayed=0
Current statistics: Successful=2454, Failed=0, Delayed=0
Current statistics: Successful=2477, Failed=0, Delayed=0
Current statistics: Successful=2499, Failed=0, Delayed=0
Current statistics: Successful=2522, Failed=0, Delayed=0
Current statistics: Successful=2545, Failed=0, Delayed=0
Current statistics: Successful=2568, Failed=0, Delayed=0
Current statistics: Successful=2590, Failed=0, Delayed=0
Current statistics: Successful=2613, Failed=0, Delayed=0
Current statistics: Successful=2636, Failed=0, Delayed=0
Current statistics: Successful=2658, Failed=0, Delayed=0
Current statistics: Successful=2681, Failed=0, Delayed=0
Current statistics: Successful=2704, Failed=0, Delayed=0
Test timed out!
Total connections: 5000
Successful connections: 5000
Delayed connections: 0 (more than 500.0 milliseconds)
root@my-python-pod-1-1-5979fd9f95-mgm8r:/#
```

Google Kubernetes cluster test: (Multi-Threaded)

The test was able to make 5000 concurrent connections with 5000 threads no problem.

```
root@my-python-pod-1-1-5979fd9f95-mgm8r:/# nano client_threaded.py
root@my-python-pod-1-1-5979fd9f95-mgm8r:/# python3 client_threaded.py 20.59.112.73 12345 5000 500
Running test on 20.59.112.73:12345
Current statistics: Successful=4979, Failed=0, Delayed=0
Total connections: 5000
Successful connections: 5000
Delayed connections: 0 (more than 500.0 milliseconds)
root@my-python-pod-1-1-5979fd9f95-mgm8r:/#
```