**http2-app-flood**

Part A:

| Metric/Property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | Unresponsive | Unresponsive  \* varies with attack parameters |
| CPU consumption | docker stats | 400-500% | Attacker: 5%< |
| Victim:90-100% |
| Mem usage | docker stats | 50.08MiB / 554.9MiB (9.03%) | Attacker: 100+ MB |
| Victim: 50+ MB |
| Network I/O | docker stats | 11.6MB / 992kB | Attacker: 1-1000 KB |
| Victim: 1-10 MB |
| Number of established connections | docker exec \*-victim-server sh -c "awk 'NR>1 && \$4==\"01\" {count++} END {print count+0}' /proc/net/tcp" | Fully established | - Fully established  - Match the attacker script |

Part B:

| Metric/Property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | Basic attacker:  Unsresponsive  Advanced attacker:  Unresponsive | Basic attacker: Unresponsive  \* varies with attack parameters |
| CPU consumption | docker stats | 806.59% | Basic attacker: 50%< |
| Victim:100-400% |
| Mem usage | docker stats | 170.2MiB / 554.9MiB 30.68% | Basic attacker: 250+- MB |
| Victim: 300+- MB |
| Network I/O | docker stats | 4.8MB / 288kB | Basic attacker: 1-2MB / 4-5MB |
| Victim: 3-4MB / 1-2MB |
| Number of established connections | docker exec \*-victim-server sh -c "awk 'NR>1 && \$4==\"01\" {count++} END {print count+0}' /proc/net/tcp" | Fully established | - Fully established  - Match the attacker script |

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**Flow-control**

Zero Window:

| metric/property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | Unresponsive | Unresponsive |
| CPU consumption | Via docker –stats | 0.2% - 1.2% | Attacker: 1-5% |
| Victim: 0-1% (does not handle requests) |
| Mem usage | Via docker –stats | 108.9MiB | Attacker: 52.88MiB |
| Victim: 137.6MiB |
| Network I/O | Via docker –stats | 1.2MB / 747kB | Attacker: 1.09MB / 1.53MB |
| Victim: 2.76MB / 2.47MB |
| Number of established connections | docker exec \*-victim-server sh -c "netstat -an | grep :8080 | grep ESTABLISHED | wc -l" | Up to ~325 | - Fully established  - Will match attacker script |

Slow Incremental:

| metric/property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | unresponsive | Unresponsive |
| CPU consumption | Via docker –stats | ~5% | Attacker: 20% |
| Victim: Around 5% |
| Mem usage | Via docker –stats | ~112 MB | Attacker: ~50 MB |
| Victim: ~180MB |
| Network I/O | Via docker –stats | ~22MB | Attacker: 31.4MB / 56.7MB |
| Victim: 54.9MB / 30.8MB |
| Number of established connections | docker exec \*-victim-server sh -c "netstat -an | grep :8080 | grep ESTABLISHED | wc -l" | - Fully established, not maintained.  ~290 has been observed to be sufficient to choke the server | - Fully established and maintained  ~400 has been observed to be sufficient to choke the server |

Adaptive Slow:

* Attack designed for cloud deployment

| metric/property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | unresponsive | NAN |
| CPU consumption | Via docker –stats | ~ 5% | NAN |
| Mem usage | Via docker –stats | ~108MB | NAN |
| Network I/O | Via docker –stats | ~24MB | NAN |
| Number of established connections | docker exec \*-victim-server sh -c "netstat -an | grep :8080 | grep ESTABLISHED | wc -l" | - Fully established and maintained.  ~290 has been observed to be sufficient to choke the server | NAN |

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**Slowloris**

Old Apache Server (httpd:2.2.34)

Release data: July 11, 2017

* We launch this part only locally

| metric/property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | NAN | Unresponsive (quickly) |
| CPU consumption | Via docker –stats | NAN | Attacker:0.00% |
| Victim:0.01% |
| Mem usage | Via docker –stats | NAN | Attacker:9 MiB |
| Victim: 192.8MiB |
| Network I/O | Via docker –stats | NAN | Attacker: 290kB / 389kB |
| Victim: 354kB / 259kB |
| Number of established connections | docker exec \*-victim-server sh -c "netstat -an | grep :8080 | grep ESTABLISHED | wc -l" | NAN | - Exhausted  - ~250 connections |

Latest Apache Image:

| metric/property | CLI | Cloud | Local |
| --- | --- | --- | --- |
| Response time | "curl -o /dev/null -s -w "Time: %{time\_total}\n" $TARGET\_URL" | Advanced attacker: unresponsive | Unresponsive |
| Cloud attacker: unresponsive |
| CPU consumption | Via docker –stats | Advanced Attacker: 10-20% | Advanced attacker: 10-20% |
| Cloud Attacker: 10-20% |
| Victim: ~1-5% | Victim:0-5% |
| Mem usage | Via docker –stats | Advanced attacker: ~70MB | Advanced attacker: 120MB |
| Cloud Attacker: ~70 MB |
| Victim ~100MB | Victim: 70MB |
| Network I/O | Via docker –stats | Advanced attacker:1.2MB/1.57MB | Advanced attacker: 5.91MB / 18.3MB |
| Cloud Attacker ~2MB/3MB: |
| Victim: 19MB | Victim: 78.1MB / 37.1MB |
| Number of established connections | docker exec \*-victim-server sh -c "netstat -an | grep :8080 | grep ESTABLISHED | wc -l" | - choked with 907 connections (both attacks). The server drops connections and the attack keeps increasing it. Cloud attack preserve connections for more time, and thus chocks the server for longer. | - choked with maximized 910 connections maintained during the attack |