

ABSTRACT:

This report presents detailed results of the tests done on two web servers: apache and nginx. The two servers are compared on the basis of the average and maximum response time for different number of concurrent and total requests. The response time for different number of threads and concurrent connections is also recorded. The comparison is done for dynamic as well as static pages.

Multi-processed (Prefork) or Multi-Threaded (Worker) apache: We have used Multi-Threaded (worker) apache as: In theory, creating/removing a process is costly.

The benchmarking tools used were ab for studying response time with varying number of requests, weighttp for recording performance with different number of concurrent threads and connections.

Nginx came out to be fairly better than Apache in terms of performance (under stress and in normal conditions) as well as CPU utilization, as shown by the results of the tests.

HARDWARE SPECIFICATION: On a virtual machine allotted 1GB RAM, 10GB Hard Disk Space, and 1 processor with 2 cores. (of a core i 7 Laptop)

SOFTWARE SPECIFICATION: Ubuntu 12.10 on VMWare Workstation Version 9.0, apache 2.2, nginx 1.2.1, AB tool, weighttp tool (for benchmarking)

STATIC PAGES:

Response time as a function of number of requests:

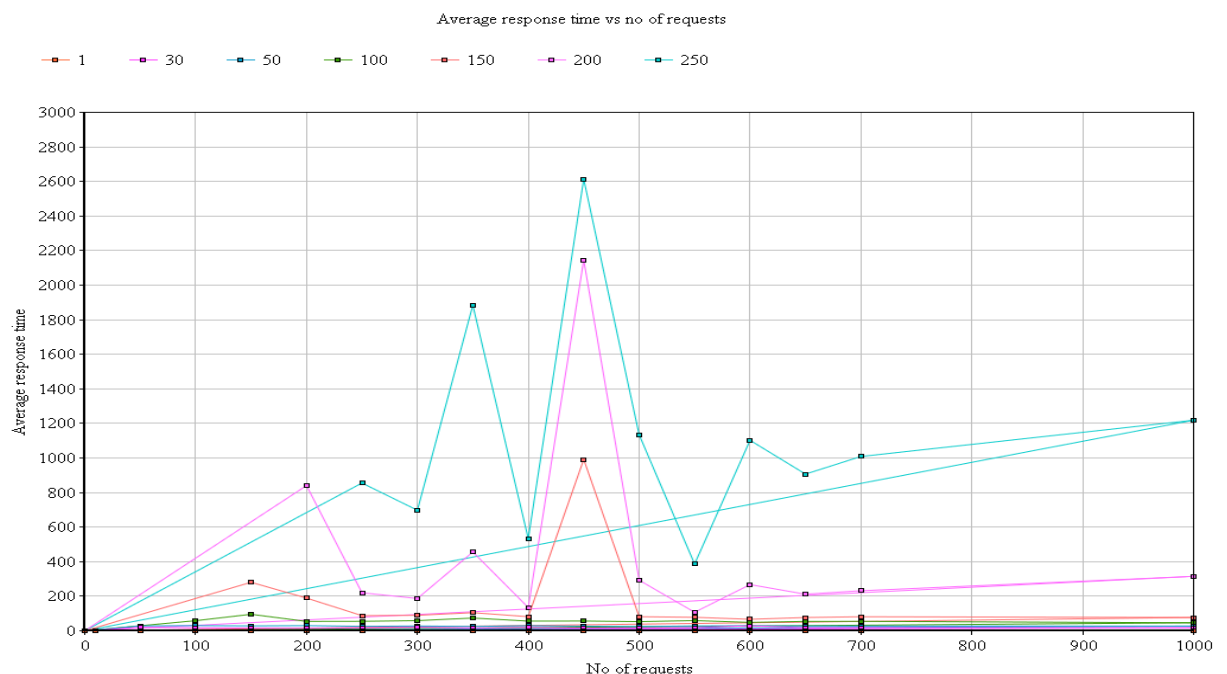


Fig 1: Response time v/s number of requests (for different concurrency levels) for Apache server

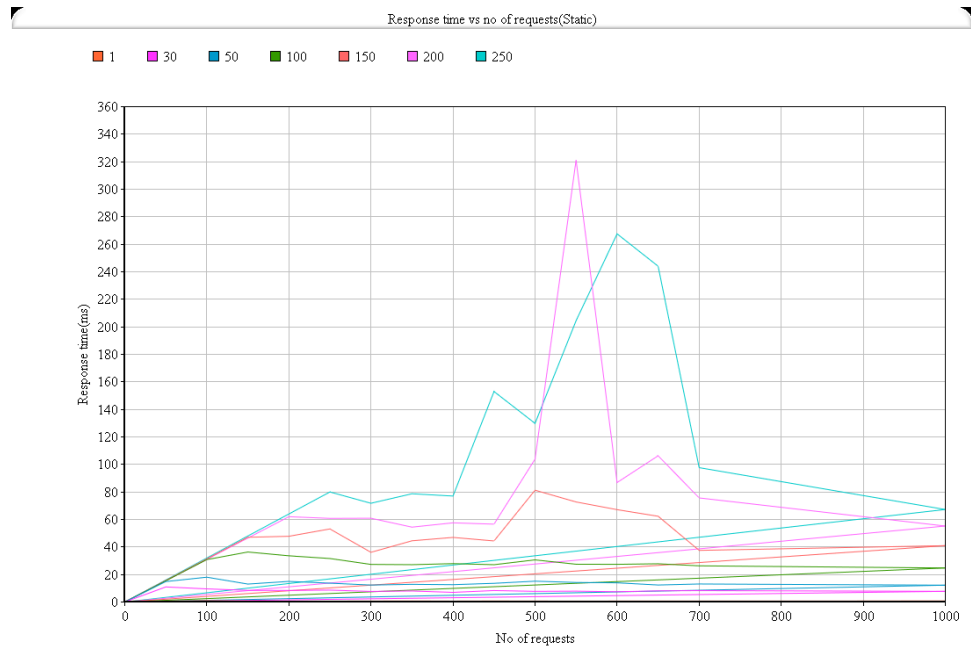


Fig 2: Response time v/s number of requests (for different concurrency levels) for Nginx server

As is clear from the graphs, while the response time for Nginx server stays in the range of 0-80 ms, that of Apache stays in the 0-200 ms range and sharply increases with greater concurrency levels. The maximum response time taken by Nginx is ~320 ms, much less than the ~2600ms of Apache.

Response time for different number of threads and concurrent requests:

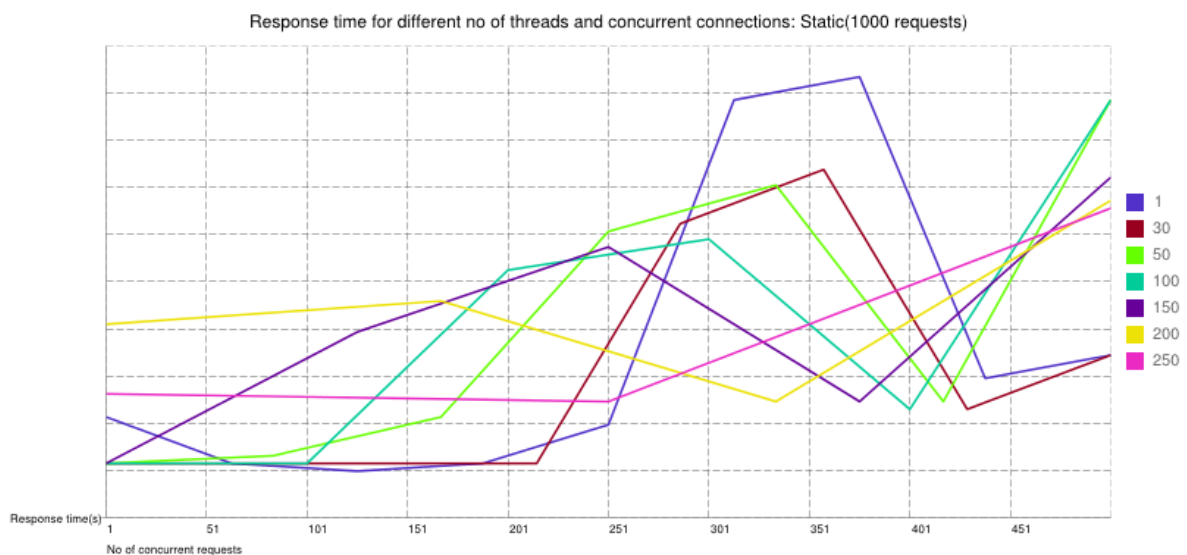


Fig 3: Response time v/s Diff num. of Conc. Requests(for diff number of threads) for Apache server

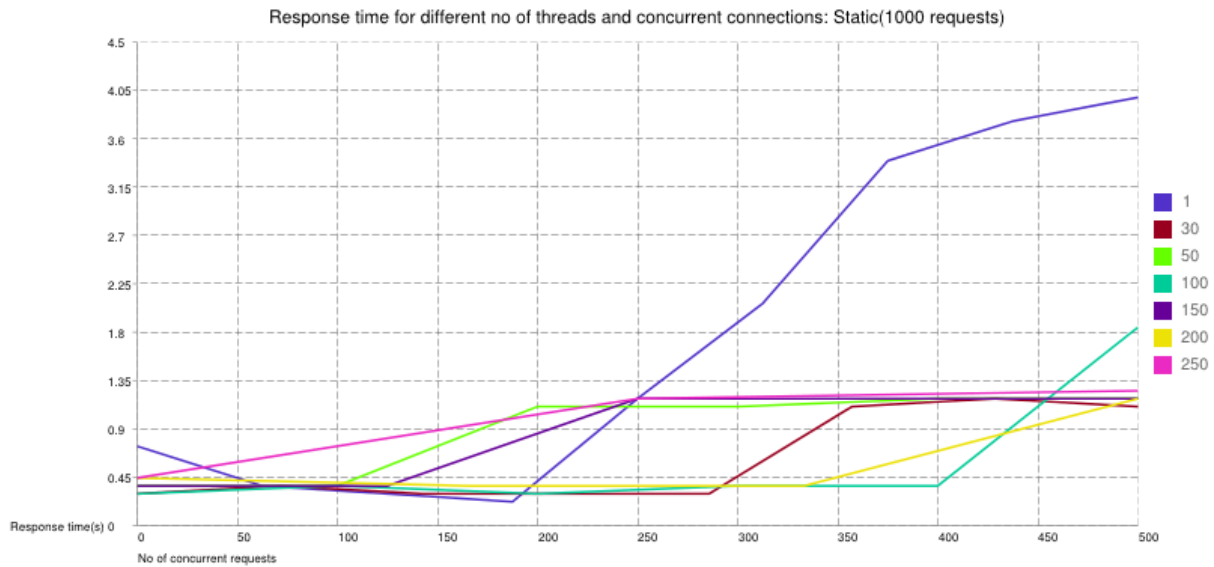


Fig 4: Response time v/s Diff num. of Conc. Requests(for diff number of threads) for Nginx server

For 250 threads the maximum response time for apache was ~3.3 seconds where as for Nginx was ~1.2 seconds. For the 1000 requests as the concurrency increases the response time increases too in both cases but for Nginx the slopes are more stable indicating stability in the increment or decrement of the response time. (hence making assumptions will be easier in the latter)

Maximum Response time for different number of requests and concurrent requests:

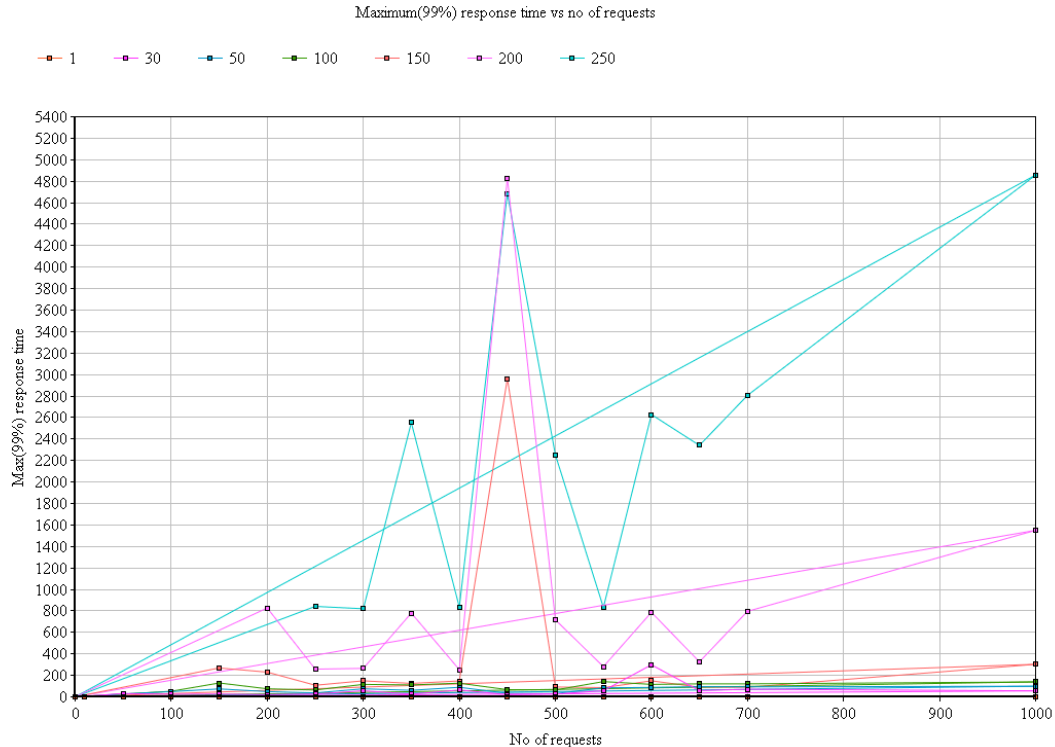


Fig 5: Max. Response time v/s Diff num. of Requests(for diff num of conc requests)for Apache server

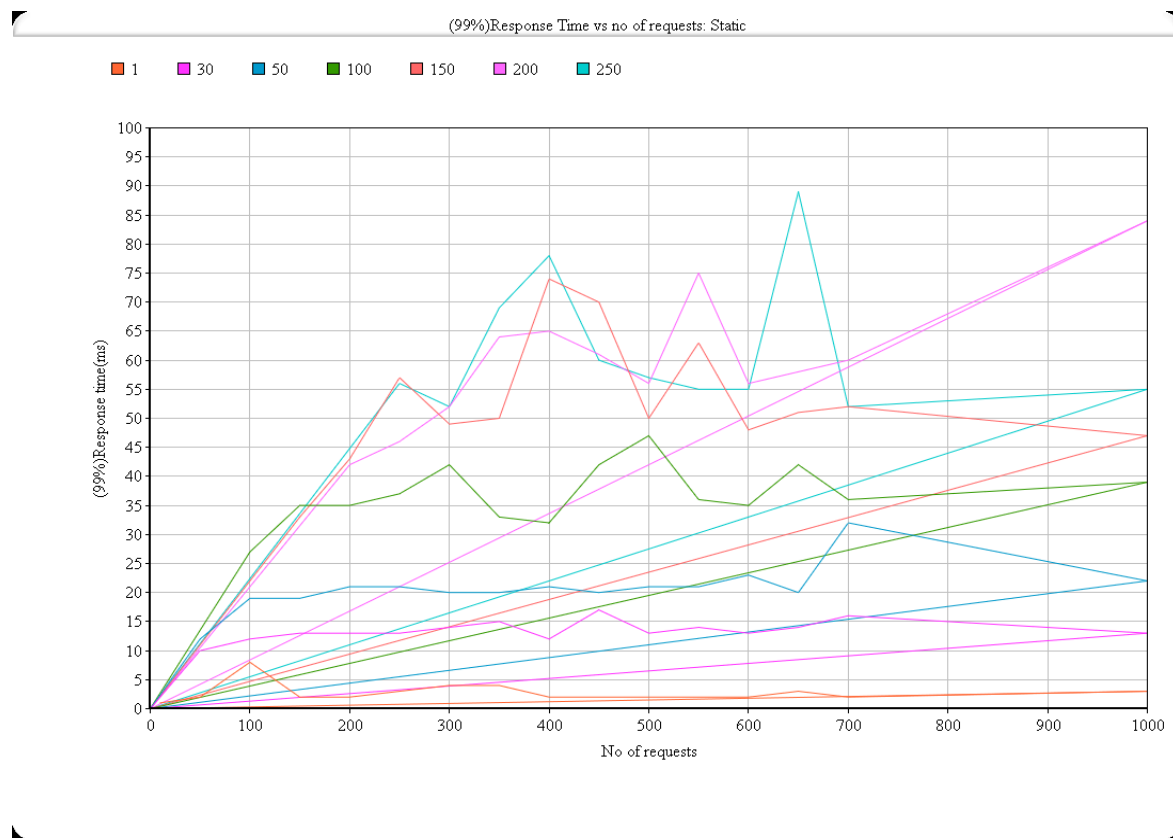


Fig 6: Max. Response time v/s Diff num. of Requests(for diff num of conc requests)for Nginx server

We can see here that the response time for 99 % of the requests in Nginx doesn't cross 90 ms , and for Apache it crosses 4800 ms (for about 450 requests). Even then Nginx has a much lesser response time compared to Apache.

Response time for different no. of requests (for different num. of concurrent requests):

(Performance under stress)

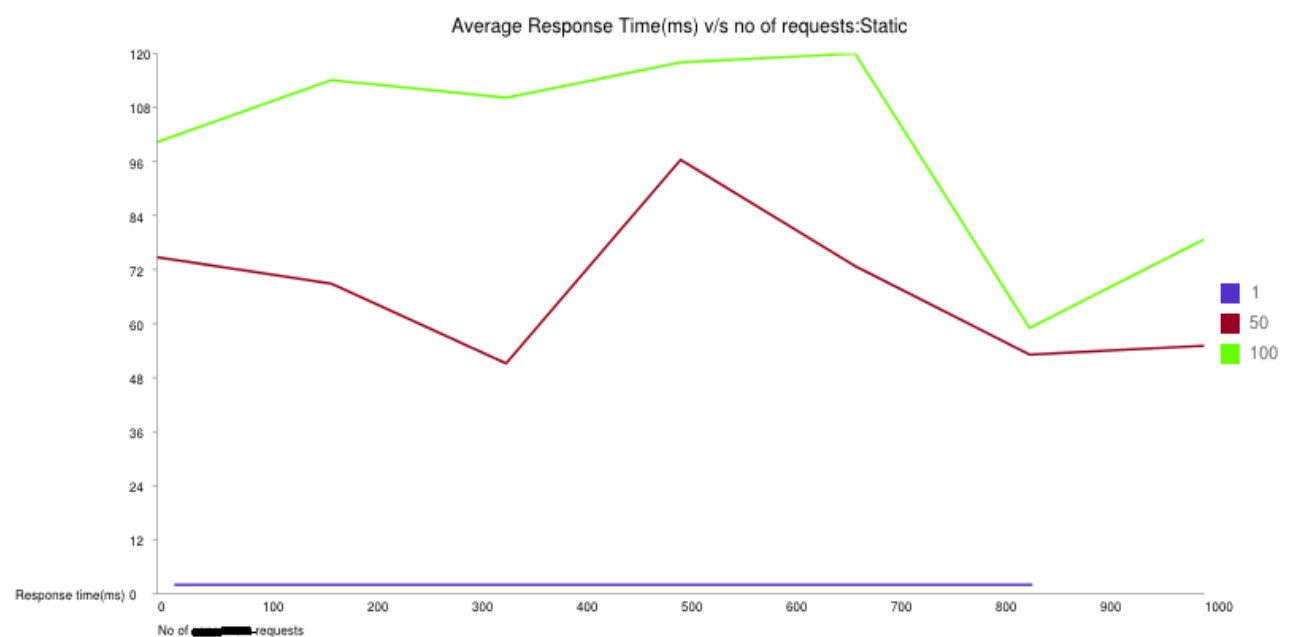


Fig 7: Response Time v/s Diff num. of Requests(for diff num of concurrent requests)for Apache server(Under a stressed machine with 4 while loops running concurrently)



Fig 8: Response Time v/s Diff num. of Requests(for diff num of concurrent requests)for Nginx server(Under a stressed machine with 4 while loops running concurrently)

The above is the performance under stress with 4 while loops running concurrently...

Here we see that Apache stays in a range of 95 – 120ms whereas Nginx stays near 24 - 75ms for 100 concurrent connections.

DYNAMIC PAGES:

Response time as a function of number of requests:

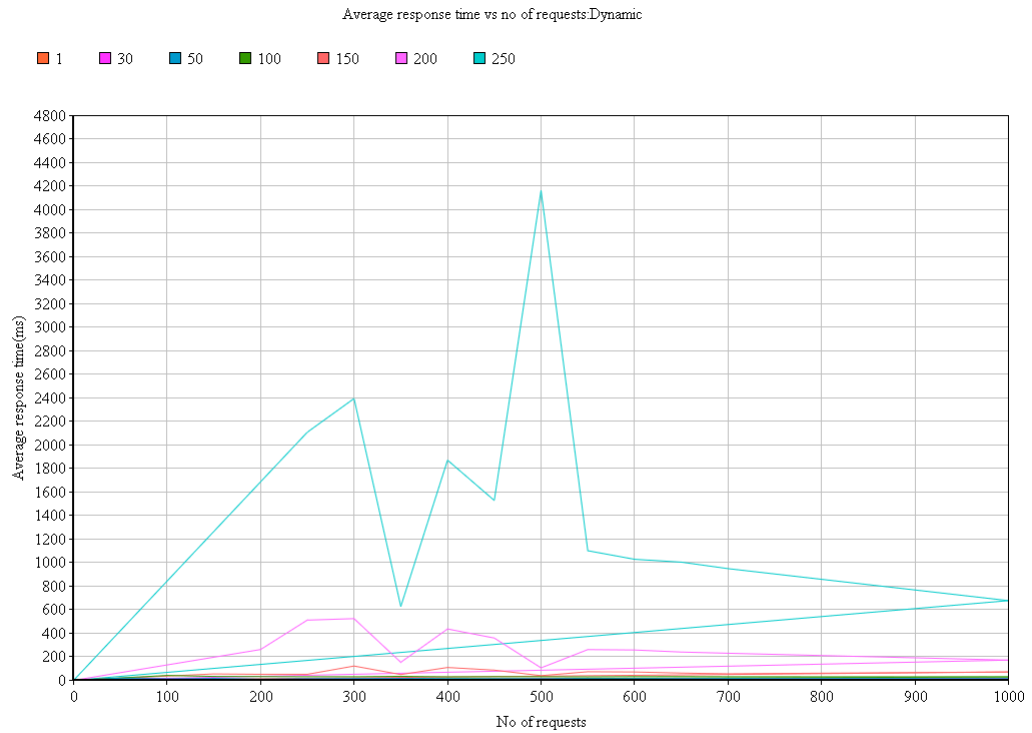


Fig 9: Response time v/s number of requests (for different concurrency levels) for Apache server

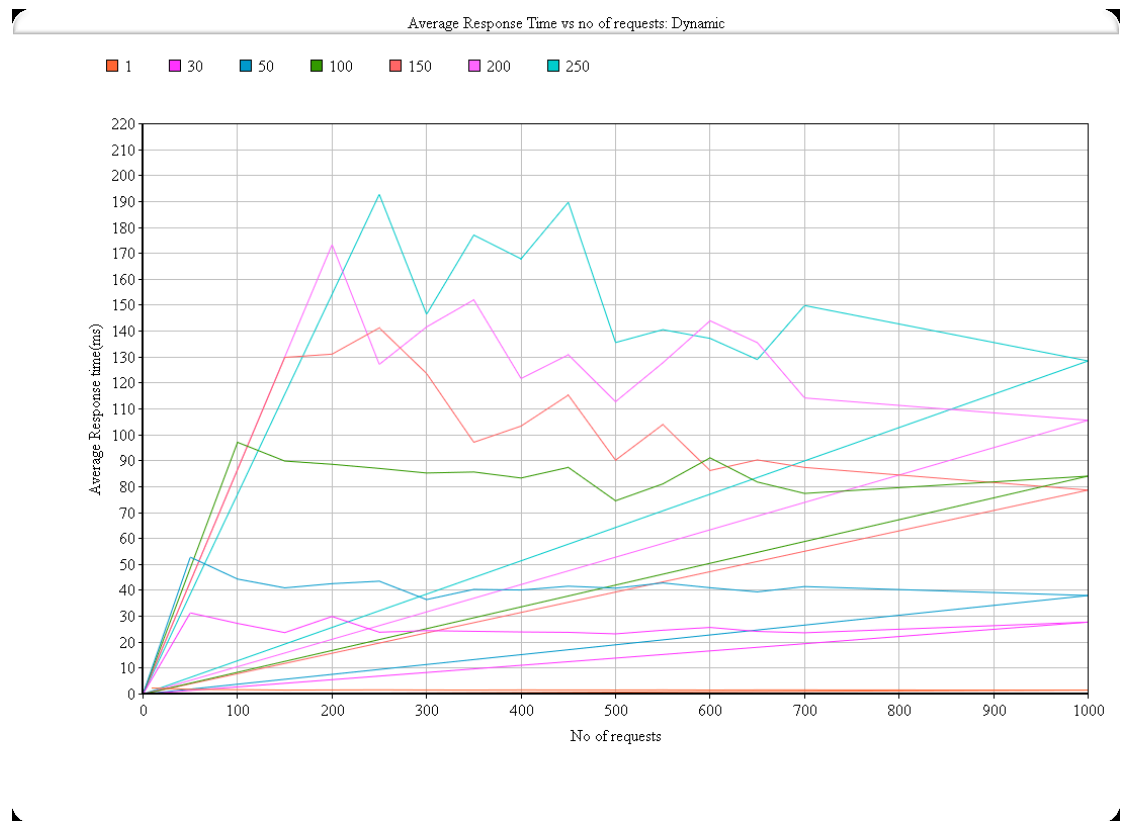


Fig 10: Response time v/s number of requests (for different concurrency levels) for Nginx server

While the response time for Apache server varies greatly with concurrency levels, that of Nginx doesn't vary much. The performance is similar for concurrency levels below 200, but for levels greater than that, the Apache Server gives a response time around 10 times greater than that of Nginx. Also response time of Apache is influenced highly by the total number of requests.

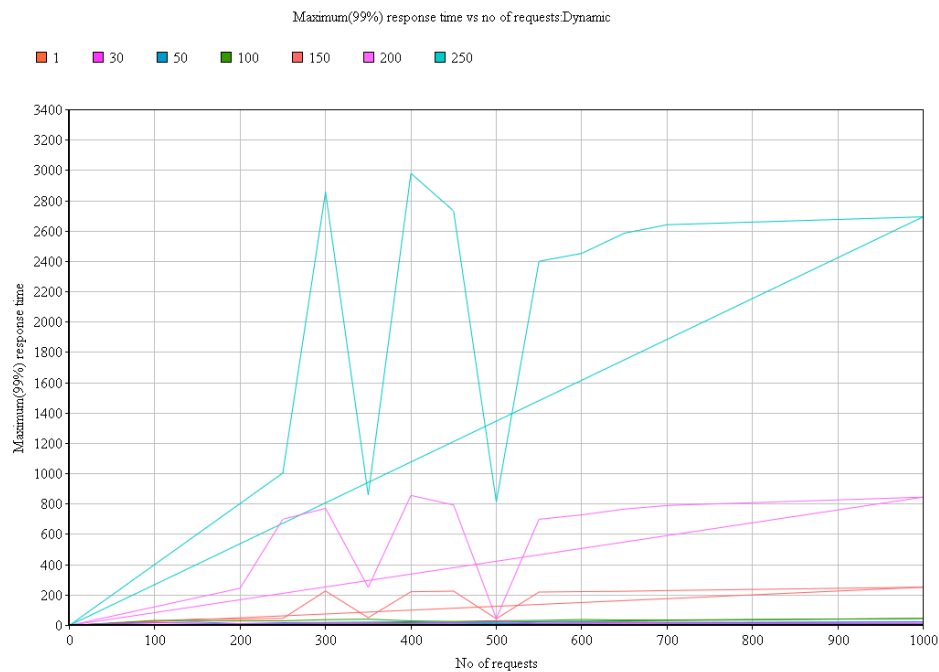


Fig 11: Maximum(99%) time v/s number of requests (for different concurrency levels) for Apache server

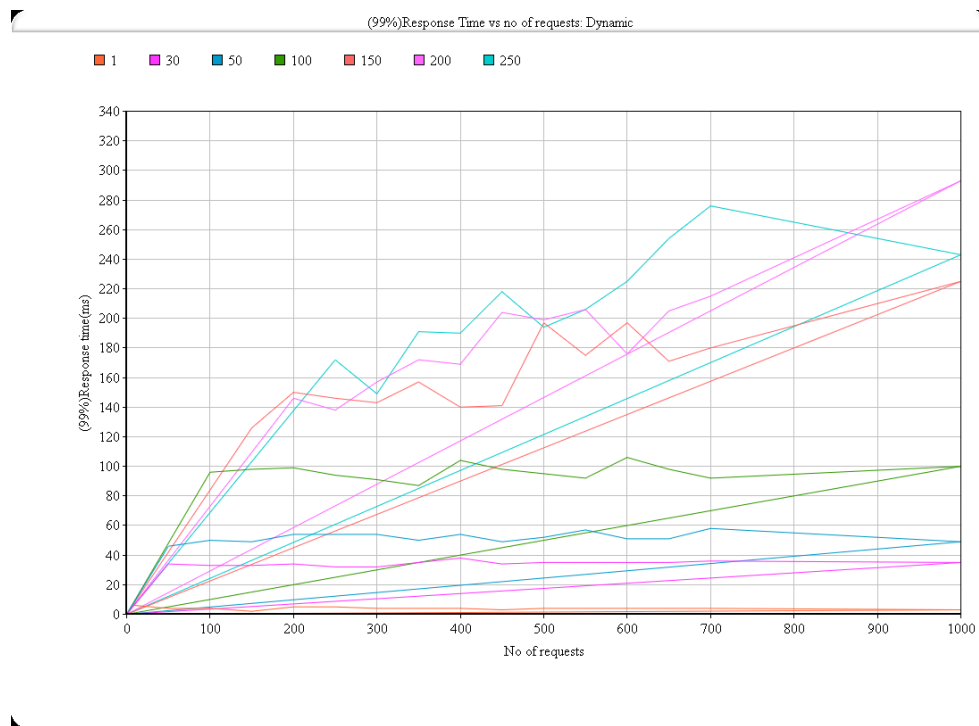


Fig 12: Maximum(99%) time v/s number of requests (for different concurrency levels) for Nginx server

As discussed earlier, the response time here refers to the time that 99% of the requests complete in. Similar trends can be observed here: apache takes more time for greater concurrency levels, and varies greatly with the number of requests.

Response time for different number of concurrent threads and requests:

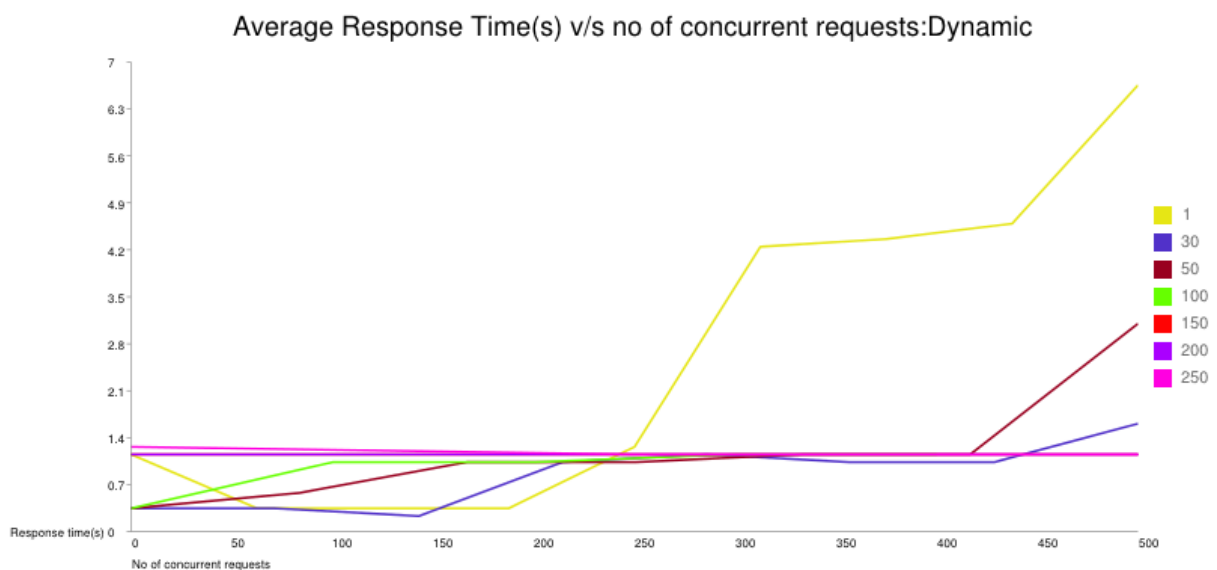


Fig 13: Response time for different number of threads and concurrent connections for Apache

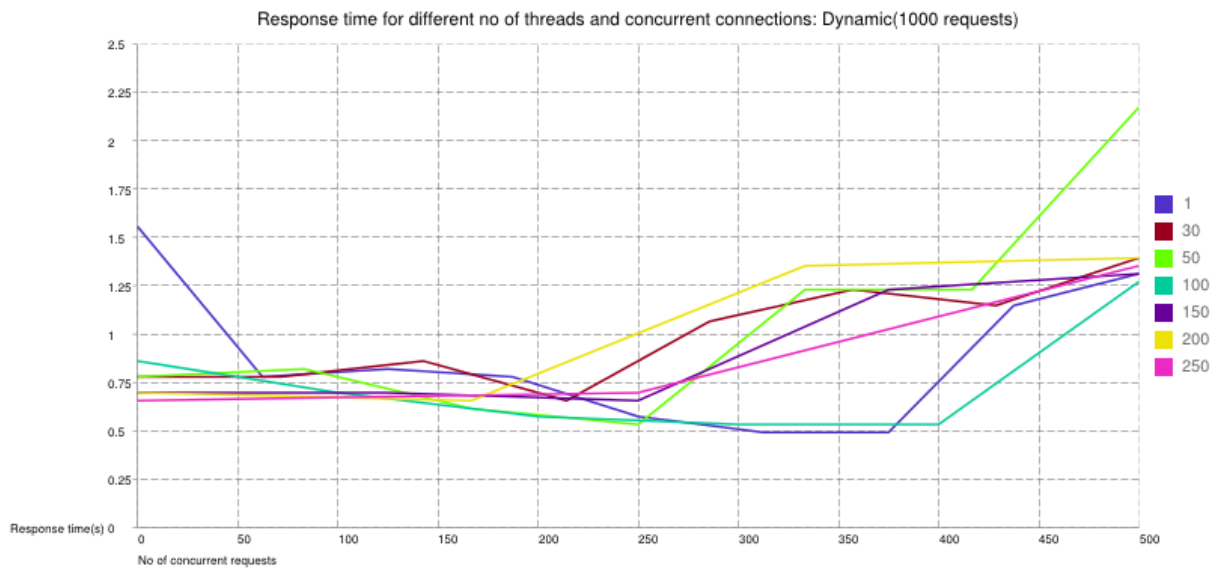


Fig 14: Response time for different number of threads and concurrent connections for Nginx

Apache is taking twice the time Nginx takes for higher threads and concurrency.

Performance under stressed machine:

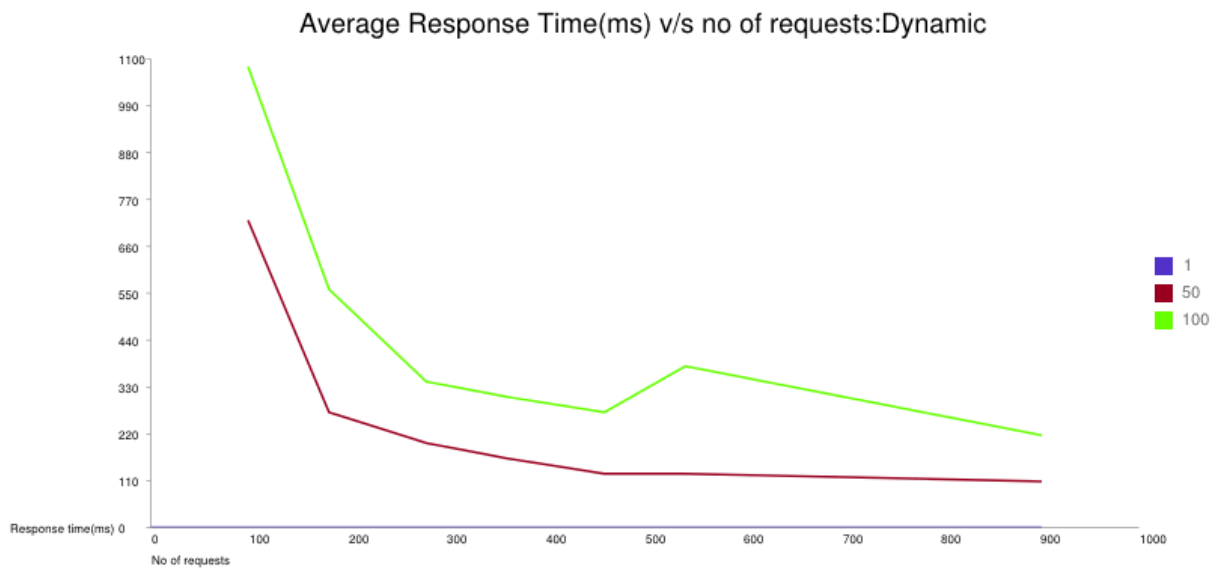


Fig 15: Average Response time v/s number of requests for different concurrency levels (Apache)

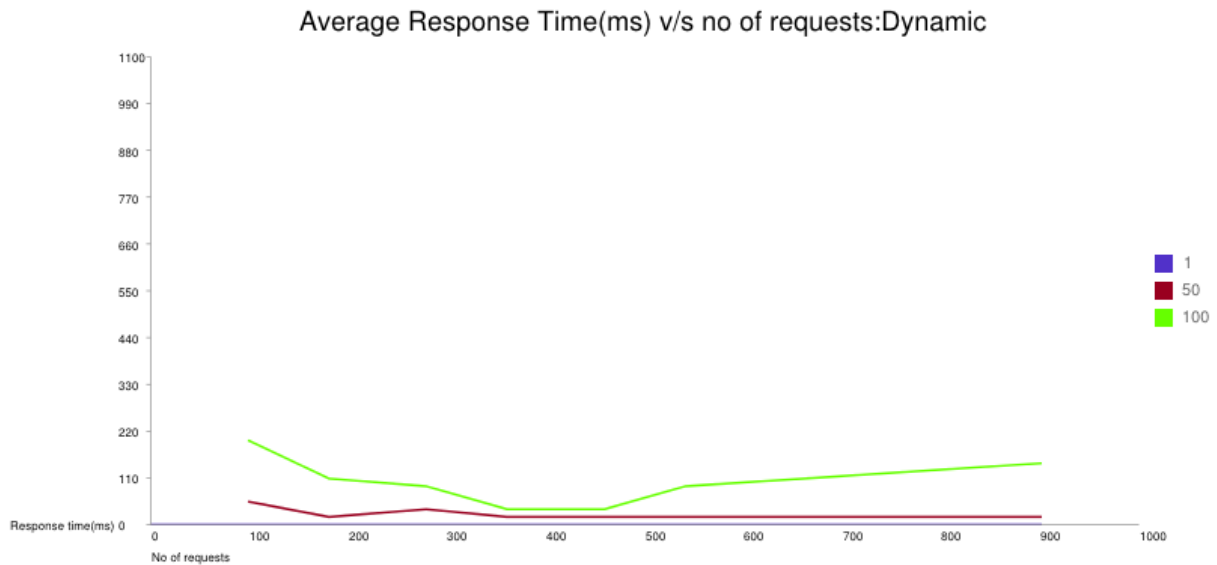


Fig 16: Average Response time v/s number of requests for different concurrency levels (Nginx)

The response time is perceptibly greater in the case of Apache as compared to nginx for lesser requests. But while the curve seems to be going downwards for 100 concurrent requests in apache, it has a rising edge in case of nginx. Still, the response time in apache is almost twice as that of nginx in most cases.

Conclusion:

Static:

- 1: As number of users increase Apache takes more time to respond and with the same setup Nginx is responding way faster.
- 2: As the number of threads increases, Nginx has lower response time and higher stability than Apache.
- 3: Nginx is faster at completing 99% of its requests concurrently than Apache.
- 4: Nginx takes almost half the time to process 100 concurrent connections.

Dynamic:

- 1: Response time of Apache varies greatly with increasing concurrent requests and Nginx remains stable. Response time of Apache is 10 times greater than Nginx.
- 2: Apache for high number of threads and high concurrency takes almost twice the time as nginx.
- 3: The response time in apache is almost twice as that of nginx in various concurrency levels

Thus we can conclude from our exhaustive benchmarking that nginx is faster in both static and dynamic content under various conditions