



capacitas®

# Non-Functional Requirements Sample

---

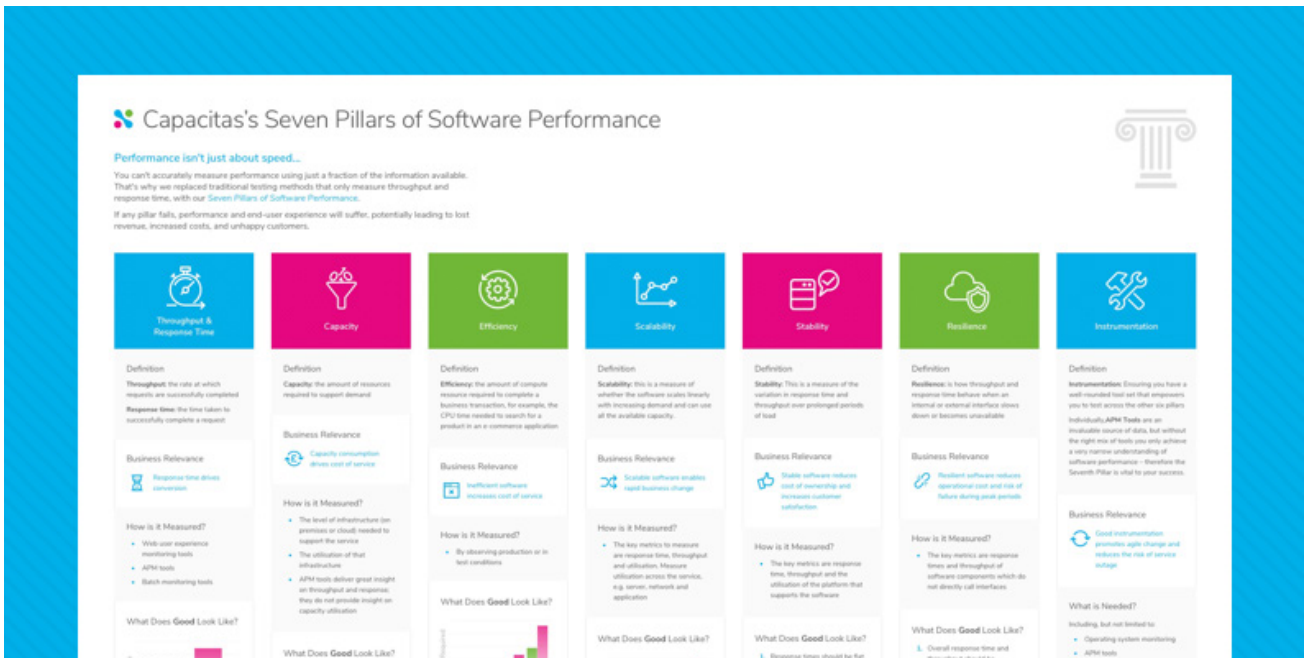
**DANNY QUILTON & THOMAS BARNES**

# Introduction

The purpose of this document is to define a template with which to document **Non-Functional Requirements (NFRs)** for a system.

## Non-Functional Requirements (NFRs)

NFRs should be aligned to the [Seven Pillars of Software Performance and Capacity](#).



The following table is a template example of a NFR definition. The list is not intended to be exhaustive, rather to provide an example from which the reader can build their own definition for their system.

Note there is a separate column for Production (live) and Test. We do this because we often have to performance test in environments which are of a lower scale compared to production. In this case, we use modelling techniques to transpose a production NFR to a test NFR.

NFR Type	NFR Category	NFR in Production	NFR in Test
Performance	Peak Business throughput	5 widgets per second	2.5 widgets per second <sup>[1]</sup>
Performance	Peak Business concurrency	10,000 users	5,000 users
Performance	Server-side Response Time	less than 1.5 seconds, 95% of the time <sup>[2]</sup>	less than 1.5 seconds, 95% of the time
Performance	Client-side Response Time	The Time to Interact should be less than 2.0 seconds, 95% of the time <sup>[3]</sup>	The Time to Interact should be less than 2.0 seconds, 95% of the time
Capacity	Database server CPU capacity	The server should be loaded up to 90% utilisation without any degradation in response time <sup>[4]</sup>	The server should be loaded up to 70% utilisation without any degradation in response time
Efficiency	System Capacity	Page size must be less than 1MB <sup>[5]</sup>	Page size must be less than 1MB
Efficiency	AWS Cloud Compute <sup>[6]</sup>	The time to process any web server request should consume no more than 100ms of CPU time on an AWS t2.medium instance	The time to process any web server request should consume no more than 100ms of CPU time on a AWS t2.medium instance
Scalability	Scalable Efficiency	Average web Service CPU time should not vary by more than 20%	Average web CPU service times <sup>[7]</sup> for different load stages should not vary by more than 20%
Scalability	Scalable Performance	Hourly average booking funnel response time should not vary by more than 20%	Average booking funnel response time at different load stages should not vary by more than 20%

[1] Detailed work required to understand scaling differences between Production and Test

[2] Data source APM tools or application log files

[3] Can be expanded to look at different client contexts, e.g. browser types or mobile vs. desktop

[4] Dependent on the server hardware architecture and number of CPU cores configured

[5] Consideration should be given to caching strategies in use, e.g. content delivery networks

[6] The reason for this NFR is ensure cost optimisation in the cloud

[7] The CPU time expended to process a single transaction

NFR Type	NFR Category	NFR in Production	NFR in Test
Stability	Stable Efficiency Inter-day	Average memory usage for the second day should be less than 10% higher than the first day	Average memory utilisation for the last hour of the soak test should be less than 10% higher than the first hour
Stability	Stable Performance Inter-day	Average response times for the second day should be less than 10% higher than the first day	Average response times for the last hour of the test should be less than 10% higher than the first hour
Stability	Stable Performance Intra-day	Within a working day, the coefficient of variation for response time should be no more than 15%	During a load test, the coefficient of variation for response time should be no more than 15%
Resilience	Return to stability	All servers should recover previous levels of load after a restart within 2 minutes	All servers should recover previous levels of load after a restart within 2 minutes
Resilience	Continue on fail	No user errors should occur on failure of a batch process	No user errors should occur on failure of a batch process
Resilience	Not affected by external system <sup>[8]</sup>	Performance NFRs hold when 3 <sup>rd</sup> party response times increase to 2 seconds	Performance NFRs hold when stub response times increase to 2 seconds
Resilience	Not affected by exceptions	Performance NFRs hold when 3 <sup>rd</sup> party fails	Performance NFRs hold when stub fails
Instrumentation	Measurement <sup>[9]</sup>	All measurements described above should be monitored and recorded in a database at collection intervals up to 1-minute	All measurements described above should be monitored and recorded in a database at collection intervals up to 1-minute
Instrumentation	Retention	Measurements recorded on the defined peak days should be retained for 5-years	Measurements recorded on valid test runs should be retained for 2-years

[8] This NFR is particularly important in loosely coupled systems, e.g. systems based on a microservices architectures

[9] Should be expanded out to include additional performance metrics from server operating system, network and application



## Bring us Your Capacity and Performance IT Challenges

If you want to see big boosts to performance, with risk managed and costs controlled, then talk to us now to see how our expertise gets you the most from your IT.

[www.capacitas.co.uk](http://www.capacitas.co.uk)

+44 (0) 20 7566 4869

[contact@capacitas.co.uk](mailto:contact@capacitas.co.uk)

