Software testing methods

Performance testing

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Performance testing

- Performance testing is a practise to determine system perfomance in terms of sensitivity, reactivity and stability under a particular workload
- The goal is to **identify** (and eventually **eliminate**) performance bottlenecks
- Testing is carried out to ensure that software meets the expected service level and delivers positive user experience
- Improvements that should be done before going to the market
- Especially important for mission-critical software or software, that requires excellent reliability (no downtime)
- Can be executed on lab/development environment or in production

Performance engineering

- Proactive, continuous, and end-to-end application perfomance testing and monitoring
- Goal is to deliver a system/software that meets its nonfunctional performance-related requirements
- Holistic view on the system, not just hardware and software, but includes also business processes
- Performance testing can be seen as a subset of perfomance engineering

Performance testing

- Perfomance testing is about examining software's
  - speed
  - latency
  - scalability
  - stability
  - response time
  - reliability
  - capacity
  - robustness
  - use of resources (memory, disk, …)
  - …

Load, stress and performance testing

- **Load testing** is a type of software resting which determines the perfomance of software under load conditions based on real-life/expected conditions
- **Stress testing** is the check upper limits of software (breaking point) under extreme load and examine, how system recoveres when load returns to normal
- **Performance testing** can be understood ad a superset or umbrella term for load and stress testing
- Sometimes these terms are used interchangeably, or some resources argue that these terms have different meanings

Load testing

- Monitor system behaviour under specific loads of users/expected/real-life load
- Helps developers to understand how system/software works under different loads
- Find and fix bottlenecks before they occur on production
- Testing tools that generate users/traffic are often used
- Load testing can be automated to support CI/CD

Stress testing

- Extreme load testing, users/traffic higher than expected
- Push system beyond the limits that it can take
- Find the breaking point
- Test also power and network failures etc. circumstances
- See how system recovers
- Make sure that after failure system is operational and no data is lost

Types of performance testing

- Load testing
- Stress testing
- Spike testing
- Soak/endurace testing
- Scalability testing
- Capacity/volume testing
- Isolation/unit testing
- …

Performance testing metrics/key indicators

- Number of users
- Hits per second
- Errors per second
- Response time
- Latency
- Connect time
- Throughput
- CPU interrupts per second
- …

How to conduct performance testing

- Indentify the testing environment
- Identify and define acceptable perfomance criteria
- Plan the testing
- Run tests
- Analyze
- Tune the system
- Re-test

Common performance problems

- Long loading time
- Poor response time
- Poor scalability
- Bottlenecks
  - CPU utilization
  - Memory consumption
  - Disk space and usage
  - Network problems
  - Operating system
  - Database

Tools

- Jmeter, Load Runner, Open STA, Web Load,…
- Tools help to perform testing by generating/simulating required load or other circumstances for testing
- Provide key metrics easily to analyze perfomance
- Can be used to automate testing process

Performance testing challenges

- Some tools only support specific environments
- It might be difficult to test complex software
- Some problems might occur only on production and cannot be reproduced
- Alltogether might be quite complex and expensive
- …

Resources

- Neotys. Performance testing, best practices, metrics & more. https://www.neotys.com/insights/performance-testing
- SoapUI. The Difference Between Load Testing, Stress Testing, and Performance Testing. https://www.soapui.org/learn/load-testing/load-testing-vs-stress-testing-vs-performance-testing/
- TechTarget. Performance testing. https://searchsoftwarequality.techtarget.com/definition/performance-testing
- TutorialsPoint. Performance testing. https://www.tutorialspoint.com/software_testing_dictionary/performance_testing.htm

Resources

- Guru99. Load Testing vs Stress Testing vs Performance Testing. Difference Discussed. https://www.guru99.com/performance-vs-load-vs-stress-testing.html
- Guru99. Performance Testing Tutorial. What is, Types, Metrics & Example. https://www.guru99.com/performance-testing.html
- BlazeMeter. Understanding Your Reports: Part 1 – What are KPI's. https://www.blazemeter.com/blog/load-testing-kpis-part-1-what-are-kpis?utm_source=Blog&utm_medium=BM_Blog&utm_campaign=performance-testing-load-testing-stress-testing-spike-testing-soak-testing