



Performance Testing

Practicalities testing web applications

Here are the main topics:

- Intro
 - Why performance testing
 - Performance testing types
- Web page performance analysis
 - ^{Good}~~Best~~ practices
 - Tools & Demo
- Load testing
 - Requirements gathering
 - What and how to script
 - Configure for execution (and run)
 - Load testing demo
 - Interpret and report results
- Q&A anytime

Intro

- *“Performance testing is a testing practice performed to determine how a system performs in terms of **responsiveness** and **stability** under a particular **workload**.”* – Wikipedia.

NFR - Performance Testing

- **Functional vs. Non Functional Requirements**
 - **Functional** requirements describe **what** the system should do
 - **Non-functional** requirements describe **how** the system should behave
- **Why?**
 - Demonstrate that system meets performance criteria
 - Find which parts perform badly – find bottlenecks
 - Improve overall performance of the system
- **What?**
 - Performance specifications
 - Concurrency/throughput
 - Server response time
 - Other ...

Performance Testing Types

❑ Load

- ❑ under expected specific load
- ❑ find bottlenecks

❑ Stress

- ❑ above expected load
- ❑ upper limits of capacity
- ❑ determine the breaking point

❑ Spike

- ❑ short period of time
- ❑ extreme load
- ❑ recovery of the system

❑ Volume

- ❑ large volume/amount of data
- ❑ check performance with large data

❑ Endurance/Soak

- ❑ long periods of time
- ❑ memory leaks
- ❑ performance degradation
- ❑ reliability of the system

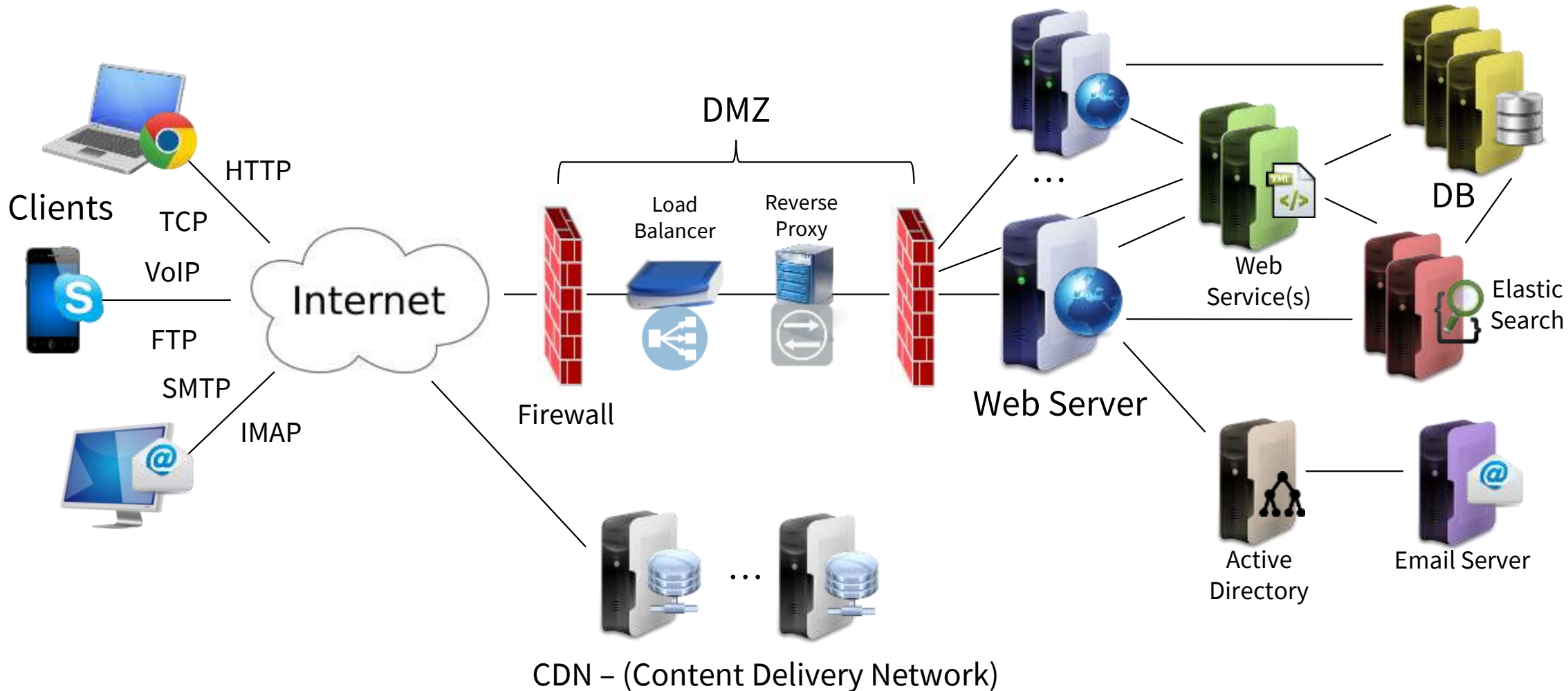
❑ Scalability

- ❑ ability to handle a growing amount
- ❑ scale up, scale out

Application Network Architecture

- The architecture of the application plays an important role in the load testing approach.

Application Network Architecture



Web Page Performance Analysis

- Analyze the content of a web page
- Generate suggestions to make that page faster

Web Page Performance Analysis

Good practices

- Minify HTML / CSS / JavaScript
- Prioritize visible content
- Avoid landing page redirects
- Leverage browser caching
- Optimize images
- Enable compression
- Remove Render-Blocking JavaScript

Google



PageSpeed Insights

Online / Free

Web Page Performance Analysis

DEMO



PageSpeed Insights

<https://developers.google.com/speed/pagespeed/insights/>

Load Testing

- To understand the behavior of the system under a **specific expected load** (e.g. multiple users).

Load Testing – Tools



- Open source Java application
- Designed to load test functional behavior and measure performance



- Open-source load and performance testing framework
- Based on Scala, Akka and Netty



- Open source load testing tool
- Uses Python to define user behavior

Steps for performance (load) testing

- ❑ Gather requirements
- ❑ Define scenario(s) – user journey
- ❑ Implement scenario – write JMeter script
- ❑ Configure script for execution
- ❑ Configure environment
- ❑ Run (on different configurations – if needed)
- ❑ Interpret and analyze results
- ❑ Report findings and possible improvements

Requirements gathering

Discovery questions:

- ▣ What is the type of the application? (web, mobile, desktop)
- ▣ What is the scope of performance testing? (benchmarking, bottlenecks ...)
- ▣ Is the application live? Can we access analytics data?
- ▣ Is the environment hardware and software configuration equivalent with Live?
 - Is the environment fully scaled?
 - Is the DB loaded with similar or live-like data type and data size?
- ▣ What is the number of expected concurrent users? (analytics or estimate)
- ▣ Are there any specific metrics or specific scenarios/tests to be targeted?

Define scenario(s) – user journey

Based on:

- ▣ What the client is looking for (response times, bottlenecks, ...)
- ▣ Web analytics – as close as possible to real usage
- ▣ Requests distribution
- ▣ Scenarios distribution
- ▣ Dynamic and randomized
- ▣ Environment – servers and server types
- ▣ With or without authentication, multiple users, user types, user roles
- ▣ User behavior (pause between actions as real users would)
- ▣ New vs. returning users (cache and cookies)

Load testing – CONFIG & RUN

Configure for execution and run

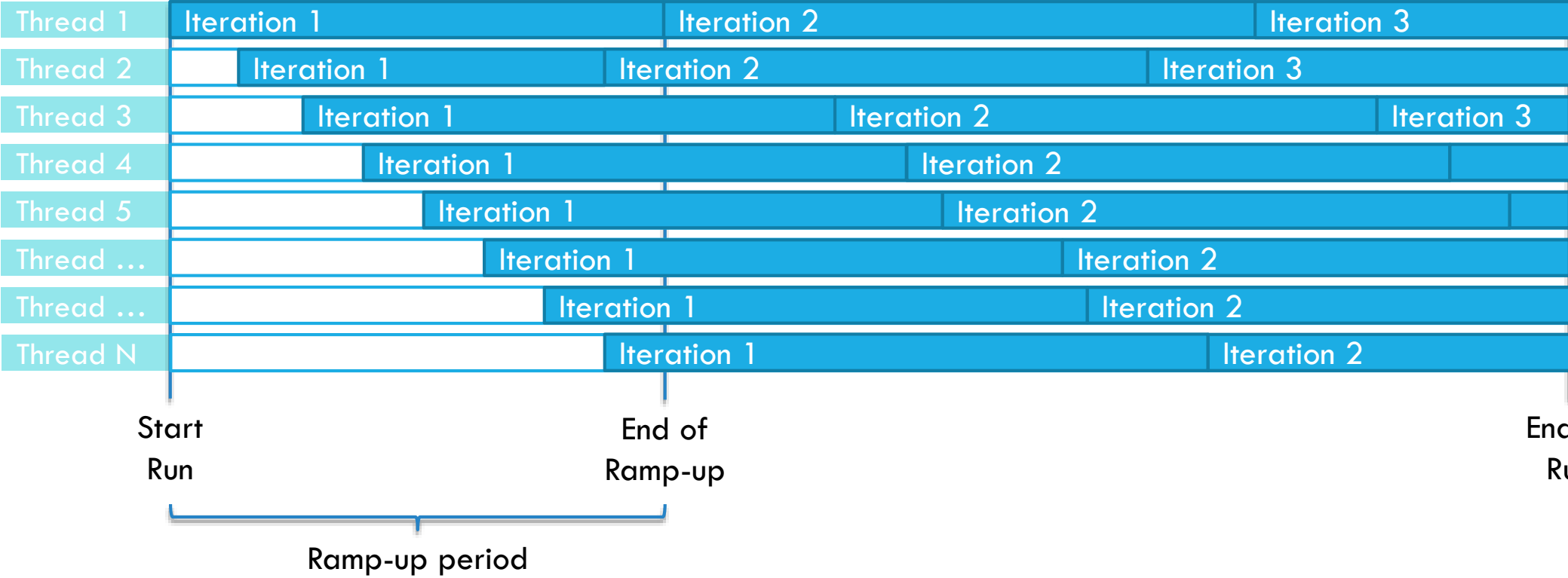
- ▣ Controlled and monitored environment (server and client)
- ▣ Dedicated environment (reduce noise/load from other users)
- ▣ Live-like configuration (hardware and software)
- ▣ Application data setup consistent (DB data, users)
- ▣ Simulate real users usage (pause between actions)
- ▣ Comparable results (use a baseline)
- ▣ For high loads use:
 - Lightweight tool configuration (e.g. CLI)
 - Distributed execution

Load testing – CONFIG & RUN

RUN Configuration

- ▣ Number of threads / users
- ▣ Ramp-up time
- ▣ Execution duration
- ▣ Timer(s)
- ▣ Cookies
- ▣ Cache
- ▣ Headers
- ▣ Request defaults

Threads, Iterations, Users & Ramp-up



N – Number of Threads (users)

Load Testing

DEMO



Load testing – RESULTS

Interpret results, suggest improvements

- ▣ Gather results and monitoring data
- ▣ Track script and execution notes (environment, configuration info)
- ▣ Plot results (e.g. average response time / # of threads)
- ▣ Historical comparison (previous builds)
- ▣ Summarize findings on each result type (load times, bottlenecks, errors, improvements, performance degradation)
- ▣ Include an executive summary

Some cool statistics



53% of visits are abandoned if a mobile site takes 3+ secs to load (Google)

(KISSMetrics)

Every 1 sec delay or 3 secs of waiting decreases satisfaction

16%



79% of shoppers dissatisfied with site performance will not buy again (KISSMetrics)



95% of customers share bad experiences with others (Zendesk)



SALES

79% of customers who report dissatisfaction with website performance are less likely to buy from that same site again.



MOBILE USERS

64% of smartphone users expect pages to load in less than 4 seconds.



CUSTOMER EXPERIENCE

47% of customers expect a webpage to load in 2 seconds or less.



SPEED AFFECTS REVENUE

If your site makes \$100,000/day, 1 second improvement in page speed brings \$7,000 daily.



SEO

1 second delay in page load time means 11% loss of page views.



CONVERSION

1 second delay means a 7% reduction in conversions.

Some cool statistics

Most marketers' landing pages don't hit acceptable speeds



Visitors won't wait long for a page to load

How long will you wait for a website to load on your phone?



Questions & Answers Session



Takeaways

- Cannot cover everything, therefore, a subset of journeys/pages can be used and balanced based on the real/estimated usage.
- Configure and adjust the testing based on the real usage of the application and the behavior of the end-users.

References

PageSpeed Insights - <https://developers.google.com/speed/pagespeed/insights/>

JMeter - https://jmeter.apache.org/download_jmeter.cgi

JMeter Plugins - <https://jmeter-plugins.org/>

Blaze Demo: <http://www.blazedemo.com/>

Thanks!

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Summer Internships

JS

In the **JS Department** you will learn and then code, code, code.

Technologies used: Vanilla JavaScript & ES6+, React, Material-UI, NodeJS and others.

Duration:
4-6 weeks



Testing

In the **Testing Department** you'll learn about manual testing & test automation.

Technologies used: Selenium Webdriver, JAVA/C#.

Duration:
4 weeks

Microsoft .NET

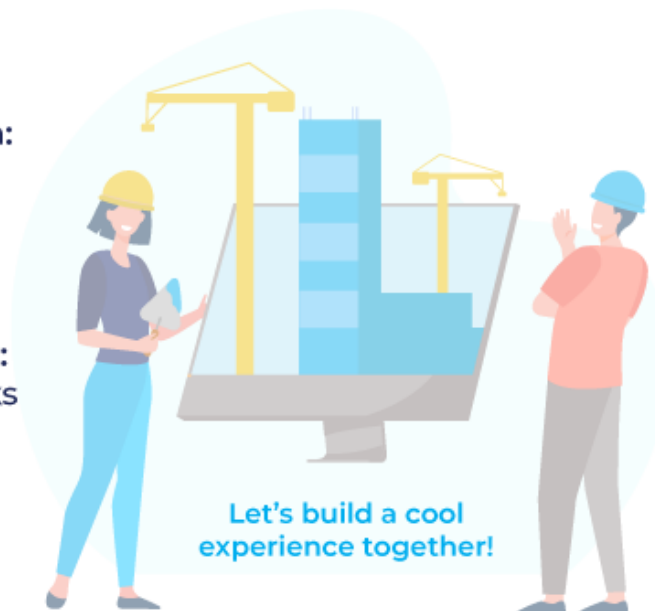
In the **.NET Department** we'll build an app together.

You'll be part of: - The Front-End Team & you need to know:
Vanilla JS, jquery, CSS, HTML.

or

- The Back-End Team & you need to know:
Relational Databases, C#/.NET, OOP/Design.

Duration:
6-8 weeks



You can either choose **the development side** (JS or/and .NET internship) or **the testing side**. Find our internships at evozon.recruitee.com and apply to the one of your liking.

Application deadline:
April 26, 2021

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