Course Project

Project 1 - Architecture Visualization

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Abstract

The software provided aims to provide a visualization that is meaningful for various members in a team comprising of stakeholders, developers, architects and users. The visualization tools currently in use do not provide an abstract architecture with levels. Our team proposes to build a visualization tool that would provide a hierarchy/levels to the system's architecture. Each level has a different purpose and would suit different team members. The tool also highlights areas of vulnerabilities in the software to help the architect better understand the core components of the system.

Links to Software

Github repo: https://github.com/mukeshkdangi/softarch
AWS hosted site: visual.us-east-2.elasticbeanstalk.com/lv1/index.html

Tools Used

- Visualization Purposes: D3.js - v4.0
- Project management and building purpose: Apache Maven
- Language: Java(String Framework)
- Server: Python
- Framework: Java Spring
- Hosted on AWS
- Server Script: Node/Express Framework

Implementation

Data Crunching and Analysis

Input:

- RELAX: deps.rsf and relax_clusters_fn.rsf
- Source Code

A web service was created in Java using the Spring framework. A dependency map is being created along with a cluster map using the aws hosted files. A Java program then crunches the data to create an output JSON which is accessed from the front-end using an HTTP GET request. The format of the JSON had been predefined. Vulnerable files have been as the top 30 files in the system with the largest number of outgoing dependencies. The outgoing dependencies have been considered as the failure of that node could lead to the collapse of the system.

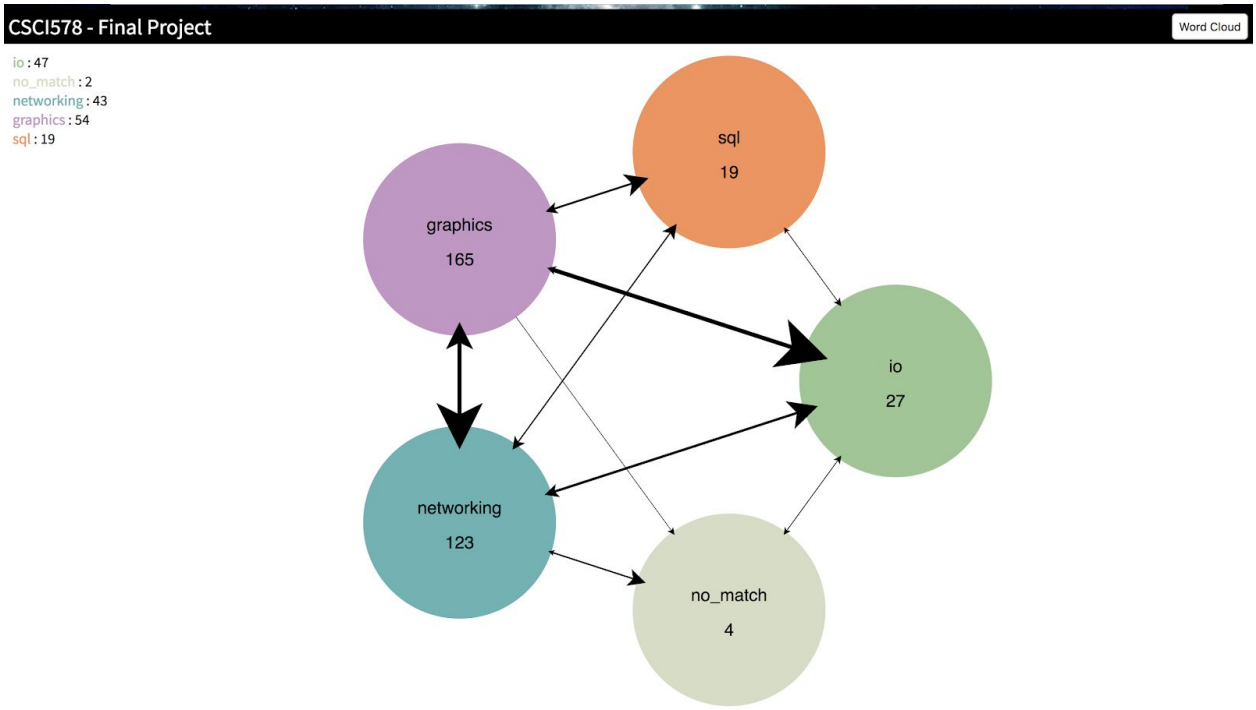
Data Visualization

Using a combination of HTML, CSS and Javascript, a visualization for each level was created using D3.js. The widths of the circles in level 2 are relative to the file size of the java class. Along with that, all files have been categorized by their category and by sub-directory. The files are hosted on AWS with the server script written using Node.

Analysis

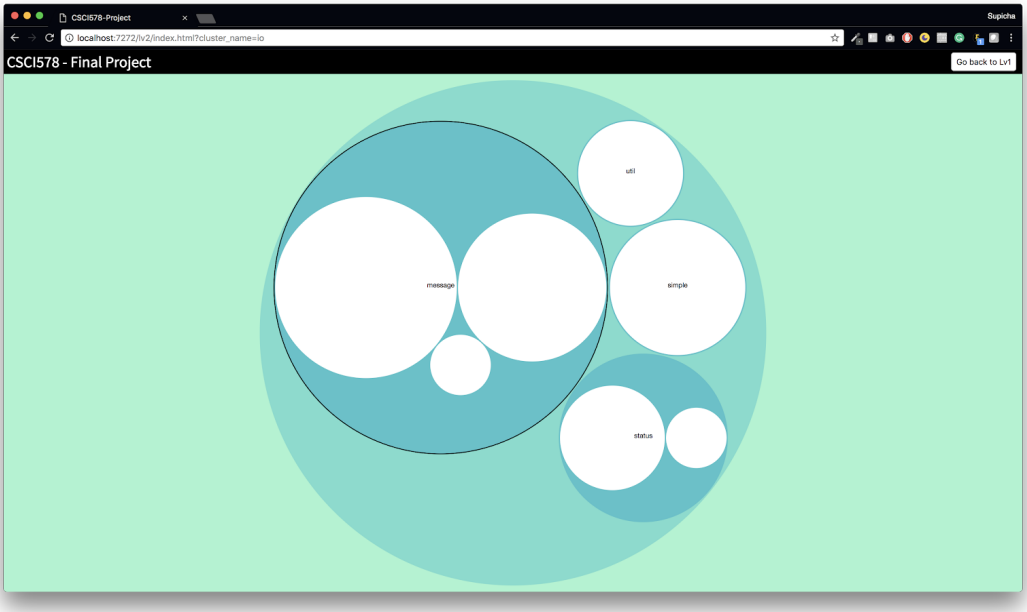
Level 1

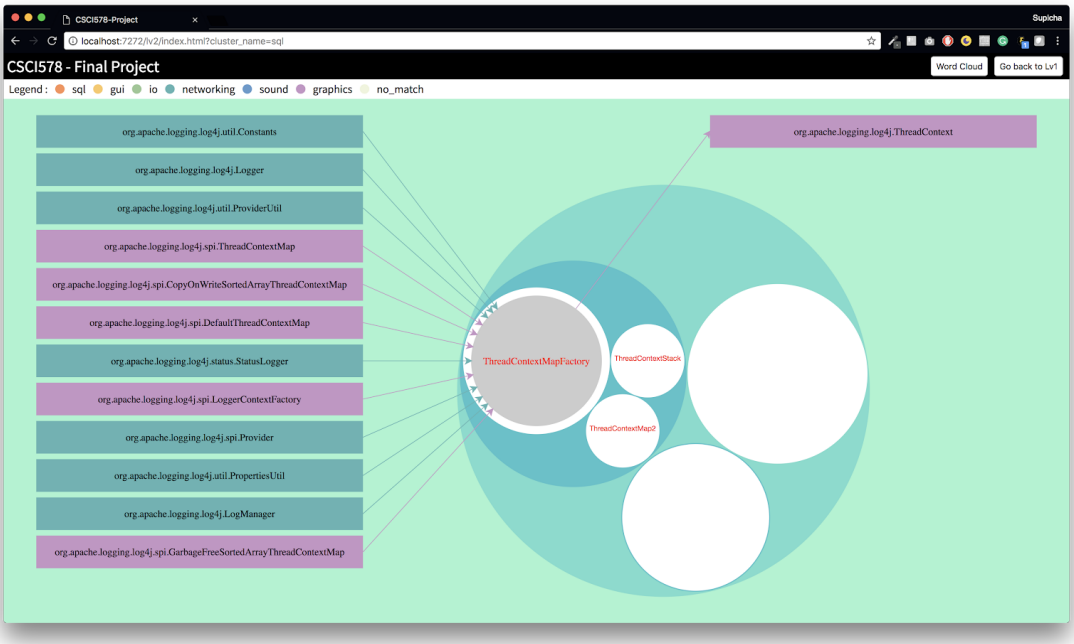
This level assists the stakeholders, users and non-technical folks understand what kind of a system the software is. The visualization shows bubbles for each category as defined by RELAX and the number of files in each. This helps the users/stakeholders comprehend where a majority of the functionality of the system lies. For example, if the system is database-centric, SQL would have a large number of files as compared to the other categories. Along with this, the thickness of arrows varies according to the number of dependencies. A thicker arrow would signify that more files under category A are dependent on category B.



Level 2

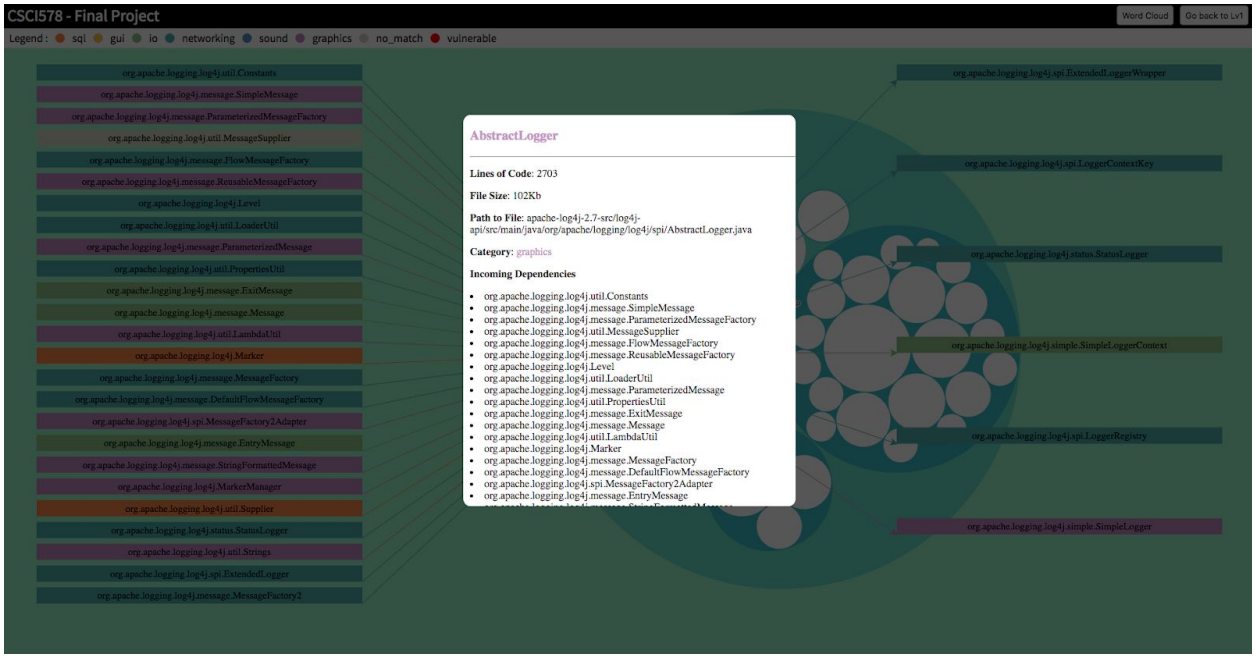
The architect is responsible for designing, planning and (sometimes) developing the system. Files are grouped according to their categories and are sub-grouped by directories/paths to the file. On clicking each file, a list of incoming and outgoing dependency can be seen which would help identify erosion and decay in the system. The type of file can also be identified using the legend.





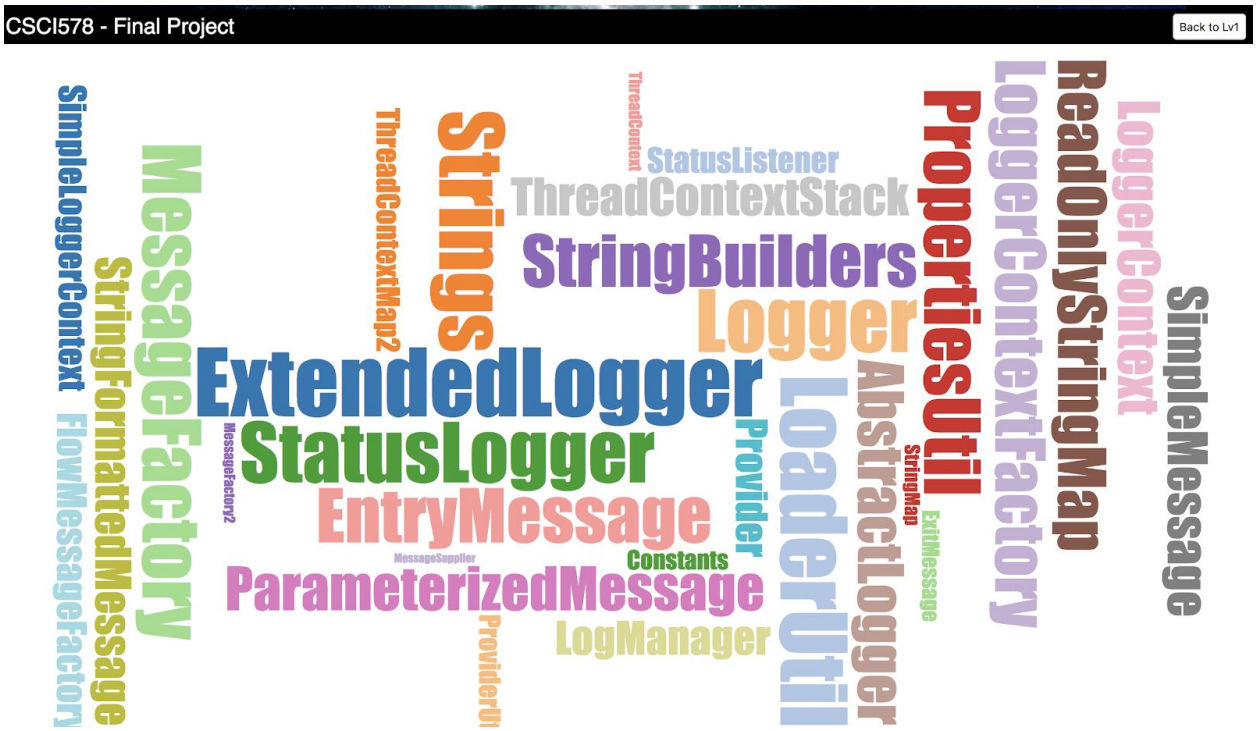
Level 3

This level serves an important purpose for the developer in particular. Implementation level detail for the file is provided in terms of lines of code, size of files, and dependencies.



Word Cloud

The word cloud serves as an additional piece of information for the architect and the developer. It lists the top 30 files that have the largest number of outgoing dependencies. For the architect, this could either reinforce the information he/she has about the prescriptive architecture or show architectural decay in the system. It also helps the architect identify critical files in the system that could lead to its failure. The larger the font size, the more vulnerable the file is.



Conclusion

The visualization tool developed caters to the various needs of a diverse team and successfully meets all the requirements stated in the project proposal.