



Project Definition

Bilkent University | CS443 | 2020, Spring | Dr. Orçun Dayıbaş

Definition

● URL Shortener Application

- Design and implement a system to take user-provided URLs and transform them to a shortened URLs.
 - Ex: <https://bitly.com/> , <https://tinyurl.com/> , <https://demo.polr.me/>
- Users will use the system to share their links with other parties (No need to be an authenticated user).
 - For instance, you are a unauthenticated/3rd-party user of goo.gl when you click on <http://goo.gl/I6MS> (it redirect you to long link → you are a user)
- Shortened URLs will be used to access to original ones.
 - System redirects the incoming request to long (original) URLs.
- Short links has to be short enough to be easily shared at mobile platforms (copy+paste, etc.).

Definition

● Functional Requirements

- The system should generate unique and short links.
- The system should redirect the request to original URL when a short link of that URL is accessed.
- The system should have an option that the user can pick a custom short link for their URL.
- The system should expire short links according to user-provided rules (specific exp. time, duration, etc.).
- The system should provide “link analytics” for the user.
- The system should provide “system-wide analytics” for the system administrator.

Definition

- **Non-functional Requirements**

- The system should be highly available.
- Redirection should happen with minimal latency.
- Short links should not be easy to predict.
- Link management UX should be designed for mobile.
- The system should have REST endpoints as an API.
- API should be designed to be used by other parties.

Constraints

- **Cloud-nativeness**

- Design and implement your system according to “5 essentials” (see Chapter 1 for details) of cloud:



Constraints

- **Mobile Application & API**

- The system will include an mobile application (B2C) and external facing API (B2B).
- Analytics part is optional in the mobile application.

- **Monitoring & Testing**

- Testing your system is a part of the project (important one).
- Try to produce comparable results (e.g. user/core, user/disk).
- At minimum, you have to validate your SLAs.
 - Remember “SLA → SLO → SLI”

Constraints

- **Tech stack**

- You are free to use any service/framework/component for mobile & web application development.
- Backend services (API) must be implemented in Java.



Do not use any external solution for the core business logic (e.g. do not use source code of any other link shortener project).

Deliverables & Demo

● Design Report

- Includes system design (components, connections, etc.).
- Includes all details of the system like which models will be used, what external services/APIs will be used, which metrics will be monitored, etc.
- Includes SLAs for the system (you are required to convert functional/non-functional requirements into structural SLAs).
- Includes tech. stack decisions (please elaborate these decisions) and trade-off analysis, assumptions (e.g. new URL reg.s are on 1M/day, redirects are on 1B/day).
 - If you assume anything, be sure you are doing this explicitly (read as “include this in the design report”)

Deliverables & Demo

● Design Report

- Includes capacity estimations (followings but not limited to)
 - Bandwidth, Storage, Memory, CPU, etc.
- Includes cost estimations (followings but not limited to)
 - Total cost of operation, cost of single user (you may assume it is an on-prem. solution to calculate these).

You can use ballpark figures to calculate estimations. We will use these estimations just to compare with final results (but it is important to freeze estimations prior to implementation).

- Includes testing strategies (performance test, etc.)
 - At least, you should test your system according to SLAs.

Deliverables & Demo

- **Final Report**

- Evaluation of the process (decision updates, tasks of each team members, blocker events, solutions, etc.)
- Use design report as a base and compare your final outcomes (Estimations vs. final findings, etc.)
- API documentation
- Details of codebase

- **Presentation & Demo**

- Presentation (derived from “Final Report”)
- Mobile UX, Feature tour, analytics dashboard, etc.
- Test & Monitoring

Scheduling & Coordination

- **Hands-on labs**
 - Docker, Kubernetes, etc.
- **Deadlines, exam dates, team formations, etc.**
 - Expect an announcement from TA
- **Follow the course web page**
 - <http://odayibas.github.io/CS443>
 - Use “watch” function of github and/or follow [commits](#)
- **Have fun...**



Q/A

Questions & Answers

● Q&A-1

- In the project description, it says "The system should provide “link analytics” for the user". Can we show this part of the analytics on the user's mobile phone? This way, we plan to only show the “system-wide analytics” from a web application to the sys.adm.
- Yes, you can do this (as per that design, sys. admin will use web app only). User experience design details such as that will be included in your design report. You are free to design your own solution as long as it satisfies the requirements (functional, non-functional, cloud-nativeness, ease of use, etc.).

Questions & Answers

● Q&A-2

- How will the B2B and B2C endpoints differ? Aren't they supposed to provide the same functionality, i.e, creating a short link and redirecting users to the long link?
- B2B users (hypothetical) will consume the API from their own applications. Therefore, we will have two consumer points: our mobile application (B2C clients) and 3rd parties (B2B clients). A good solution is expected to be able to differentiate these different consumers (e.g. being able to define different SLA's for these different points or being able throttle/migrate one or another in such a lack of resource cases. Introducing these kind of trade-off points and mechanisms (first in you design and then in your implementation) is the part of the project.

Questions & Answers

● Q&A-3

- Do we need to include database tables, columns?
- No, you don't need to... However, you can include if you think the database design have an significant impact on reaching goals of the project definition. The idea is very simple; include your objectives and design points in the design report and compare/discuss with your final implementation in the final report (pivoting from the originally designed solution is perfectly fine as long as you show that you are know what you are doing and the updated version is justifiable)

Questions & Answers

● Q&A-4

- What measures should be taken in terms of application security?
- It is part of your design (read as “that question is implicitly asked to you in this assignment”). As an engineer it's your responsibility to design/include "enough" measures to secure your solution. For instance -I think- it is not that hard to tell; that kind of open system has to handle DoS attacks to provide high availability, right?... Please do not be biased with my example, it is your responsibility to elaborate the general requirements stated in the project description.

Questions & Answers

● Q&A-5

- Are we expected to come up with new functionality that could affect our grades?
- You need to be more into increasing/implementing/enhancing "5 essentials of cloud computing". Frankly, all content and deadlines are aligned to give you enough resource (read as "man-hour") to implement these non-functional requirements (that's why the functional requirements are a kind of light in this assignment).

Questions & Answers

● Q&A-6

- As per the definition, testing is also part of the project workload. What platform/inputs&outputs will be used to test our system?
- Yes, validation is very important of the project and you need to “at least but not limited to” cover your SLAs (define SLAs and validation methods in the design report and evaluate your results in the final report).
 - Since load test will be your bare minimum, below platforms are very first tools to consider (not an exhaustive list, others are also fine)
 - <https://www.invisionapp.com/blog/open-source-load-testing-tools-which-on>

Questions & Answers

- **Q&A-7**

- Could you prepare a short report guideline to state how long should the different parts of the report be?
- I can't see any value on that. Project description includes all the details to decide the content of the report. Furthermore, the format is not part of evaluation (but it has to be readable). You can't get any extra point by generating redundant pages...

