Software Requirements Specification
MTOBridge

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Table 1: Revision History

Date	**Developer(s)**	**Change**
...	...	...

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This document describes the requirements for MTOBridge. The template for the Software Requirements Specification (SRS) is a subset of the Volere template Robertson and Robertson (2012). If you make further modifications to the template, you should explicitly state what modifications were made.

1 Project Drivers

1.1 The Purpose of the Project

1.2 The Stakeholders

1.2.1 The Client

1.2.2 The Customers

1.2.3 Other Stakeholders

1.3 Mandated Constraints

1.4 Naming Conventions and Terminology

1.5 Relevant Facts and Assumptions

User characteristics should go under assumptions.

2 Functional Requirements

2.1 The Scope of the Work and the Product

2.1.1 The Context of the Work

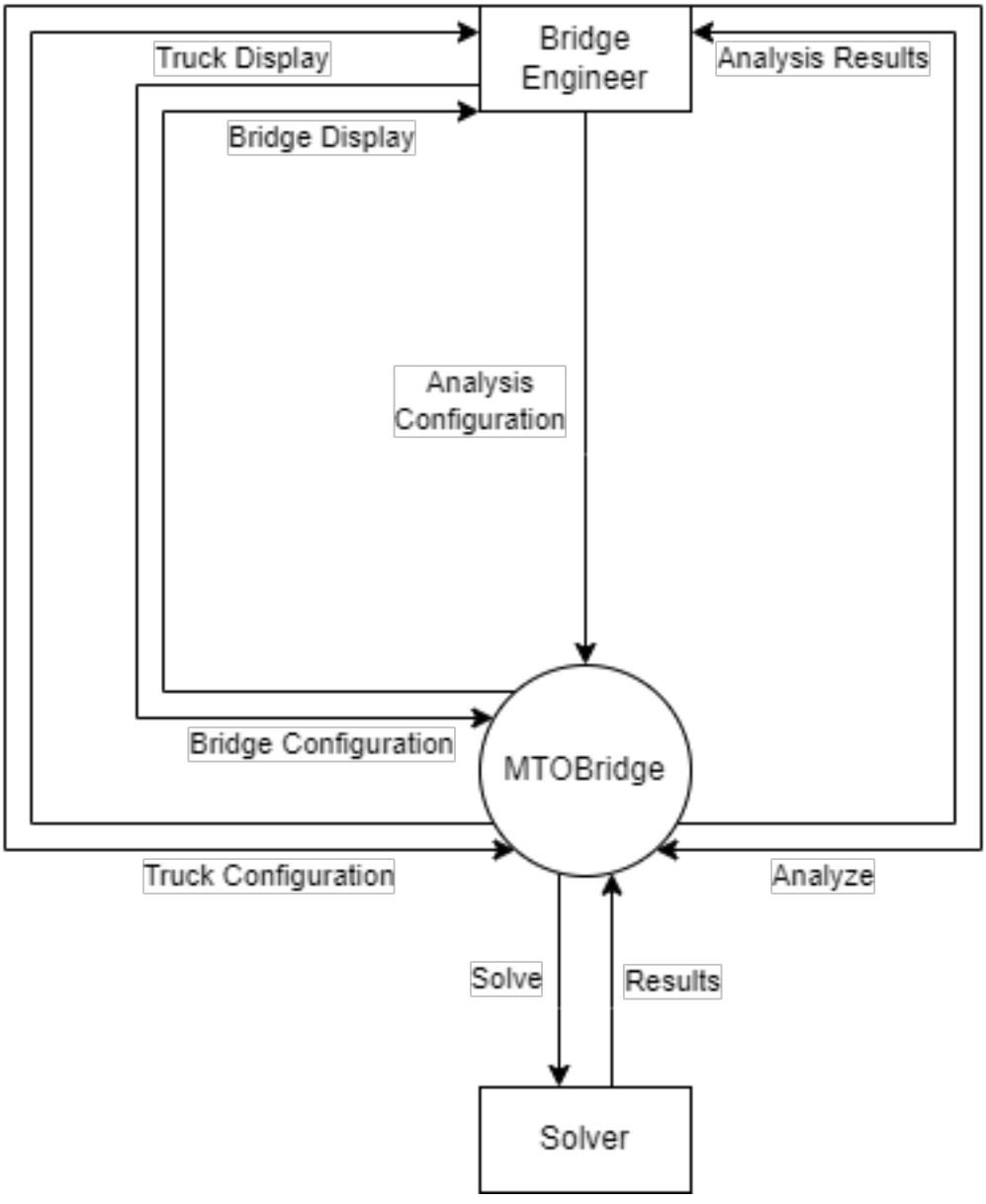

Figure 1: Context Diagram of MTOBridge

2.1.2 Work Partitioning

Table 2: Business Event List

Event Name	Input/Output	Summary
Engineer enters truck configuration	IN: Truck configuration, OUT: Truck display	Record truck configuration, show truck visualization
Engineer enters bridge configuration	IN: Bridge configuration, OUT: Bridge display	Record bridge configuration, show bridge visualization
Engineer enters analysis configuration	IN: Analysis configuration	Record analysis configuration
Engineer requests analysis	IN: Analyze request, OUT: Analysis results	Display analysis results
Time to solve forces	OUT: Solve request, IN: Solver results	Give configurations to solver to get results

2.1.3 Individual Product Use Cases

2.2 Functional Requirements

FR.1 The Program should be able to call the backend MATLAB functions.
Rationale: To visually display the outputs corresponding to user input, the UI needs to first figure out what those outputs are via the backend MATLAB.
Fit Criterion: Realtively Binary, analyze whether or not the program can successfully call the MATLAB functions.

FR.2 The Program should allow the user to define the characteristics of the truck platoon, including truck configuration, number of trucks, headway, and travel speed.
Rationale: The goal of the program is to determine the forces exerted by a

given platoon on a bridge, they can come in many different forms, so flexibility in the characteristics of the platoon are necessary for the relevance of the simulation.
Fit Criterion: At least one method of input(text based, dropdown list, etc) exists that allows users to specify those 4 characteristics of the platoon.

FR.3 The Program should allow the user to visualize the effects of their truck platoon characteristic definitions on the final platoon.
Rationale: This is mainly to help the user verify that the inputs they put into the program correspond to the platoon they had in mind. As we are making a GUI, visual feedback is paramount to functionality.
Fit Criterion: There exists some visual representation of the truck platoon that changes to reflect the impact of changes in user input.

FR.4 The Program should allow the user to define the characteristics of the bridge, inclduing what type of bridge it is and its length.
Rationale: Different bridges will react to the same truck platoon differently, therefore specifiying the relevant characteristics of the bridge is necessary for the relevance of the simulation.
Fit Criterion At least one method of input(text based, dropdown list, etc) exists that allows users to specify those 2 characteristics of the bridge.

FR.5 The Program should allow the user to visualize the effects of their bridge characteristic definitions on the final bridge.
Rationale: This is mainly to help the user verify that the inputs they put into the program correspond to the bridge they had in mind. As we are making a GUI, visual feedback is paramount to functionality.
Fit Criterion: There exists some visual representation of the bridge that changes to reflect the impact of changes in user input.

FR.6 The Program should allow the user to define which of the two solvers they are interested in using.
Rationale: as the MATLAB backend can solve for both the demand on a concerned section as the platoon drives along, as well as for which section has

the highest maximum demand over the course of the whole trip, and these are very different pieces of info, allowing the user to determine which they are currently interested in is important.
Fit Criterion: At least one method of input(text based, dropdown list, etc) exists that allows the user to choose which solver they are would like to use.

FR.7 The Program should allow the user to define a section of concern on the bridge.
Rationale: The first solver revolves around calculating the demand on a certain point along the bridge as the truck platoon drives over, specifying what point it is that we care about is necessray for this function.
Fit Criterion: At least one method of input(text based, dropdown list, etc) exists that allows the user to determine a section of concern on the bridge.

FR.8 The Program should allow the user to define a discretization length for their bridge.
Rationale: The second solver finds which section has the maximum demand placed on it over the course of the platoon's trip. The discretization length determines how many sections the bridge is split up into, which is necessary for the functioning of the second solver.
Fit Criterion: At least one method of input(text based, dropdown list, etc) exists that allows the user to define a discretization length for their bridge.

FR.9 The Program should allow the user to define which type of demand placed on the bridge they are interested in, between shear forces and positive/negative moment.
Rationale: There are a variety of different demands placed on the bridge as the platoon drives over, and the MATLAB backend contains calculations for all 3 of the above mentioned demands. Allowing the user to define which of the 3 they are interested in seeing is necessary for the functionality of the simulation.
Fit Criterion: At least one method of input(text based, dropdown list, etc) exists that allows the user to define which of the 3 demands they are interested in simulating.

FR.10 The Program should be capable of visualizing the results of the concerned section calculation for the user.
Rationale: This is essentially the main purpose of the GUI. Displaying the results of the MATLAB backend calculations visually to the user. This is one of the two main caluclations to be represented, so this functionality is very necessary.
Fit Criterion: There exists some visualization of the mathematical results of the concerned section calculation.

3 Non-functional Requirements

3.1 Look and Feel Requirements

graphics (ui, animations, graphic element choice e.g. bridge mockup triangle/circle) will be informative, unobtrusive, and not distracting rationale: no shit fit criteria: reviewed by client contacts (civil engineers)?

3.2 Usability and Humanity Requirements

program will be intuitive to use rationale: no shit fit criteria: reviewed by civil engineers (our client contacts) to eliminate unintuitive controls?

program will have a user manual and (user-based) documentation provided rationale: so that new people can actually use it quickly fit criteria: they exist, idfk. review??

3.3 Performance Requirements

speed will be not unreasonably slow rationale: no shit fit criteria: ...program will not cause more than 1 second delay to any valid user input (independent of matlab component)?

precision reqs(!), program will be precise rationale: no shit a bridge simulator should be precise fit criteria: calculations are accurate to within (???)% relative error of (other bridge simulation engine)

reliability and availability reqs? capacity reqs? probably N/A

3.4 Operational and Environmental Requirements

system/enviro constraints? if not a portability req
partner applications? if matlab integration not already mentioned

3.5 Maintainability and Support Requirements

portable for windows 10, distributable for standalone(!) use on windows 10 rationale: expected users dont all have matlab but will use windows 10 fit criteria: test it

3.6 Security Requirements

protect private mtobridge assets rationale: why DO they not want their code uploaded anyway? ...confidentiality? why...? fit criteria: don't upload them to the git my dude

3.7 Cultural Requirements

3.8 Legal Requirements

3.9 Health and Safety Requirements

This section is not in the original Volere template, but health and safety are issues that should be considered for every engineering project.

4 Project Issues

4.1 Open Issues

4.2 Off-the-Shelf Solutions

4.3 New Problems

4.4 Tasks

4.5 Migration to the New Product

4.6 Risks

4.7 Costs

4.8 User Documentation and Training

4.9 Waiting Room

4.10 Ideas for Solutions

References

James Robertson and Suzanne Robertson. *Volere Requirements Specification Template*. Atlantic Systems Guild Limited, 16 edition, 2012.

5 Appendix

This section has been added to the Volere template. This is where you can place additional information.

5.1 Symbolic Parameters

The definition of the requirements will likely call for SYMBOLIC_CONSTANTS. Their values are defined in this section for easy maintenance.

5.2 Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1. What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain specific knowledge from the domain of your application, or software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, or writing, or presentation, or team management, etc. You should look to identify at least one item for each team member.

2. For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?