Ruby on Rails Issue Tracker

J. Jared Rodriguez-Rivera
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Author Note

J. Jared Rodriguez-Rivera
A.A, A.S Computer Programming and Analysis, Valencia College
B.A.S Software Development, University of Central Florida (In Progress)
Contact: jaredrodr2@gmail.com
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Nomenclature

**AccuRev** - software configuration management application; a centralized version control system which uses a client/server model

**Bootstrap (CSS)** - a free collection of tools for creating websites and web applications. It contains *HTML* and *CSS*-based design templates for typography, forms, buttons, navigation and other interface components, as well as optional *JavaScript* extensions.

**CSCI** - Computer Software Configuration Item

**CSS** - *Cascading Style Sheets* is a style sheet language used for describing the look and formatting of a document written in a markup language.

**DA** - development activity is a high level task that get approved by a panel and worked by developers

**Gem** - *Ruby on Rails* software package/library

**HTML** - *HyperText Markup Language* is the main markup language for creating web pages and other information that can be displayed in a web browser.

**JavaScript** - a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed

**jQuery** - a cross-platform *JavaScript* library designed to simplify the client-side scripting of *HTML*

**LCS** - Launch Control System

**NC** - Non-conformances are software issues that require immediate assessment

**PostgreSQL** - often simply "Postgres", is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards-compliance. As a database server, its primary function is to store data, securely and supporting best practices, and retrieve it later, as requested by other software applications

**Ruby** - a dynamic, reflective, object-oriented, general-purpose programming language; designed and developed in the mid-1990s by Yukihiro Matsumoto in Japan.

**Ruby on Rails** - often simply referred to as Rails, is an open source web application framework which runs via the *Ruby* programming language.

**SCCS** - Spaceport Command and Control System

**WAF** - more commonly referred to as *web application framework* or *web framework*; is a software framework that is designed to support the development of dynamic websites, web applications, web services and web resources. The framework aims to alleviate the overhead associated with common activities performed in web development.
Abstract

The purpose of this report is to detail the tasks accomplished as a NASA NIFS intern for the summer 2014 session. This internship opportunity is to develop an issue tracker Ruby on Rails web application to improve the communication of developmental anomalies between the Support Software Computer Software Configuration Item (CSCI) teams, System Build and Information Architecture. As many may know software development is an arduous, time consuming, collaborative effort. It involves nearly as much work designing, planning, collaborating, discussing, and resolving issues as effort expended in actual development. This internship opportunity was put in place to help alleviate the amount of time spent discussing issues such as bugs, missing tests, new requirements, and usability concerns that arise during development and throughout the life cycle of software applications once in production.

Introduction

The task assigned to me during my internship at NASA’s Kennedy Space Center was to develop a Ruby on Rails web application to track development issues for web applications produced by Information Architecture and System Build. Up to this point in my education, my focal point has revolved around mobile applications for a variety of mobile platforms/operating systems, website development and web application frameworks (WAF). For the development of this application I began by using an existing Excel spreadsheet, LCS IAS Issue Tracker, which details the content of an issue, as a starting point. With the guidance of my mentor, I was able to apply the knowledge acquired throughout my education and create a dynamic, database driven, multi-layered web application to replace the LCS IAS Issue Tracker spreadsheet. Having little experience developing web applications using Rails¹, the first two weeks were dedicated to becoming familiar with the framework, making the publication Rails 4 in Action (Bigg, Katz, & Klabbink, 2014) and the website www.railscasts.com (Bates) tools imperative to my success.

The following five weeks were dedicated to planning, constantly communicating ideas and actively developing the application until reaching the point when we were able to deploy a stable, pre-beta release to Launch Control System (LCS) development servers. Deployment of the application allowed Information Architecture and System Build to begin creating issues for their respective projects and to provide valuable user feedback for the Issue Tracker application itself by posting issues against the application. This phase of development is where all of the hands on learning took place and where I worked closest with my mentor. The Issue Tracker application was designed to look like a corkboard with each issue displayed as pinned up index cards. The design involved using the Bootstrap CSS library and a combination of images, CSS, jQuery and JavaScript functionality to not only style the application but to also add some unique animations; making this application one of the most detailed, in depth applications I have ever had the pleasure to design and develop.

The issues posted against my Issue Tracker application became the final task for me to complete during the last few weeks of the internship. During this phase of development, users found bugs and usability issues and provided feedback to me via issue cards allowing me to further enhance the application before the end of term.

¹ A commonly used alias for Ruby on Rails
Planning and Design

The main objective of the project assigned to me was to use the LCS IAS Issue Tracker spreadsheet, shown in Figure A, as a point of reference and develop an interactive, dynamic and modern Ruby on Rails web application that would allow users to post, assign, view, comment and search for issues within the IA and Build Architect applications.

The LCS IAS Issue Tracker spreadsheet was put in place so that there was a standardized method of reporting issues. The user reporting the issue fills in the date the issue was found/reported, the Issue Type (bug, missing tests, new requirement or usability), what repository the issue is located in, an issue and test description (in the format depicted in Figures B and C), additional notes (if any), the name of the engineer who reported/requested the change, if the issue is associated with a DA or an NC, who worked the issue, the AccuRev (AccuRev, 2002) stream it was found in, and finally the Status Change Date.

After several weeks of familiarizing myself with the Rails framework and a general knowledge of how to initialize a Rails project, we began by defining the Issue Tracker’s database structure and what aspects of the application would be constants. As you can see below in Figure D, we defined the tables/models necessary for the application, these included tables for individual Projects, Users, Issues, and Comments with the corresponding associations defined for each table. The associations help in defining each layer of the application and thus are creating these associations was imperative to the design. Starting from bottom of the hierarchy, Comments belong to an Issue and a User, and Issues belongs to a User and a Project.

Also illustrated in Figure D are the definitions of the constants we deemed necessary for our application, those of which included Issue Types, Status, Streams, and Repositories. These are the only elements of the application whose definitions went unchanged throughout the course of development.
Further along the planning phase, we came up with the idea that in order to bring an element of nostalgia into our application, our design should be modeled after Information Architecture/System Build’s previous method of reporting issues: color coded index cards pinned to a corkboard with thumb tacks. Where each index card color represents an issue type, Bugs are red, Missing Tests are yellow, New Requirements are green, and Usability issues white. We decided at this point, all of our styling for this application was to follow a common theme: office supplies, and include a variety of elements ranging from clipboards, to sticky notes, and ripped pieces of papers to accompany the corkboard, index cards and thumb tacks that would give the application a unique user interface.
Development

As the Issue Tracker application started to take shape and having already decided the theme, it was my responsibility to style the interface and, consequently, I was allowed to let my creativity take control. I began by designing the front and back of the New Issue form, as shown in Figures E and F. This form is actually what Rails defines as a partial. A partial is an object in Rails that the ActionController, for the respective model (in this case the issues_controller), handles a particular request and produces the appropriate output. In other words, the controller is designed to render an issue form partial if a user elects to create a new issue, but it will render the same partial when a user initiates an edit action as well.

On this form, the user enters all of the data they would fill out on the LCS IAS Issue Tracker. Entering the issue description on the front, then flipping to the back of the card input the test description and select from the options to define the issue type, status, stream, repository, and selecting whether or not it is an NC.

Styling this action was a particularly entertaining task. In order to give the users a unique interface we incorporated some CSS animation driven by jQuery. When the user clicks on the blue arrow on the bottom right hand corner, the card flips to the back displaying the contents shown in Figure F. The user can flip back and forth, entering and selecting all of the information necessary to post an issue and not until the Create Issue (or Update Issue during an edit action) button is clicked will the information be saved to the database. There are other minor details on the form that give the user interface a very natural feel, like the added effect of a shadow around the index cards to give the application and element of depth, illustrating that the issue is on top of the corkboard as opposed to giving the impression that the index card is a part of the corkboard. I also added some styling that allows the text to stay within the lines of the index card when a user is inputting issue and test descriptions and automatically changing index card colors when the user changes the Issue Type option.

Furthermore, take note of the drop down options on the back of the card in Figure F. These selections are all populated using the constants we defined in our application, allowing the user to select from these predefined collections.

The Issue Form worked like a template for the Issue Tracker application, having devoted so much time ironing out all of the minor details, translating this into the Issue partial allowed me to reuse a lot of the styling methods, simply adjusting some of the sizes in order to adapt to the smaller sized issue index cards for this show action.

The Issue partial, like the form, is a partial designed to display individual issues on the Project show action. However, unlike the form, this partial is static, used solely for display purposes. Though most of the styling
techniques are reused for this partial from the form, there is one significant effect that makes the Issue partial stand out.

When a new issue is created, the application routes you to the Project show action and a thumb tack is placed on the top of the card as it is illustrated in Figure G. Note that on the top right of the header, the user’s name and date the issue was created. Figure H. represents the back of the Issue partial. When a user clicks on the arrow to flip to the back of the card, the thumbtack moves, once again driven by CSS and jQuery, off the card and the card proceeds to turn to the back. When the arrow to turn back to the front is clicked, the card flips back over and the thumbtack moves back into place. This bit of animation was one of the most unique elements of this project, though simple, it added a distinctive natural effect: You cannot flip a card without first unpinning it. This component seems simple, yet, likely one of my favorites of the application.

In addition to animating the thumbtack, I also decided to use it as a link to the Issue show action. This action includes logic to verify whether or not the current user created the issue, if this condition is true this action displays the Issue form partial, granting the user access to edit the issue, otherwise this action displays a static Issue partial allowing the user to only view the contents of the issue.

Figure I. clarifies how the Issue show action looks to users. It includes a trashcan glyph to link the user to the Comment destroy action and a pen glyph to link the user to the Comment edit action if the current user owns the comment, otherwise it just displays the content of the comment without allowing the user to make any changes or destroy the comment.

Slowly but steadily, the application began to take life. All of these individual components started to give the application its shape. Thus, the daunting task of developing the Project show action was upon us. This action incorporated some new elements and functionality. Figure J. displays the contents of the Project show action, beginning with the navigation bar; this was styled to look like the wooden border of a corkboard, again incorporating the shadow effect to give the user interface a sense of depth. On the navigation bar, I also incorporated a variety of links, the first being the application title, Issue Tracker, this link took the user to the Project show action from any other action. Next to the title link, I added a dropdown menu,
containing the link to the *New Issue* action and the sign out link. Following the dropdown menu, we incorporated a Postgres full-text search box, using the Ruby gem pg-search, allowing the user to enter content and the *Project* show action refreshes to show all of the issues that contain any part of that text, finding both the singular and pluralized instances of the words entered into the search field.

![Figure J. Project Show Action](image)

The next component of the *Project* show action is the page header. The header for this show action is exclusive to this action alone and it includes six filters displayed on sticky notes, and the title of the current project in between the six sticky notes on a ripped piece of paper all of which are seemingly taped to the corkboard. From left to right, the filters are *Sort*, *Status*, *Type*, *Repository*, *Requested by*, and *Stream*. Each of these selections filter the issues displayed on the *Project* show action and each filter can be used in tandem with one another. By default, the *Project* show action displays the issues with the newest first. The *Sort* sticky note filter allows the user to toggle the order in which the issues are displayed, allowing the user to view the issues in either ascending or descending order. The *Status*, *Type*, *Repository*, and *Stream* filters, when clicked display the filter options in a *modal*\(^2\). The *Status*, *Type*, *Repository*, and *Stream* filter options are populated by the application constants we defined early on in the development while the *Requested by* filter is populated by the users that have created issues for the corresponding project.

In order to reduce the duplication of code for the filter modals, we created a *helper class*\(^3\) to dynamically populate the content of each modal based on the parameters passed into the helper class functions. These parameters include the modal title, the filter object (which by default is ‘All’), the color of the sticky note, and the lean direction. Furthermore, inside the modal we have another function that populates the content of the modal using the constants or the collection of users. Figures K. and L. are examples of how the *Project* show page looks when the filter modals are initiated.

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\(^2\) In user interface design, a modal window is a graphical control element subordinate to an application's main window which creates a mode where the main window can't be used.

\(^3\) is a programming technique in object-oriented programming. Helper classes are a term given to classes that are used to assist in providing some functionality, though that functionality isn't the main goal of the application.
Figure K. Status Modal

Figure L. Type Modal
The remaining actions of the Issue Tracker application were almost an afterthought, having focused so much time and energy into the partials and even more time on the Project show action, yet absolutely vital to the functionality of the application. Primarily, the User sign in and the Project select action pages.

First and foremost, for the User sign-in page, we decided we would let users utilize existing LCS Development logins to sign-in to the application. In order to accomplish this, we used a Ruby gem called devise which allows us to configure the details of the server we are going to use for verification and consequently refrain from forcing the user to create and remember another username and password for yet another service. Maintaining the office supplies theme, Figure M. illustrates what the Issue Tracker sign-in action looks like to the end user.

![Figure M. User Sign in Action](image)

Last, but certainly not least, was the Project select action. This was quite a simple action to create, using the same ripped paper image as the Project title on the Project show action page to display the names of the projects available for a user to pick from and submit issues against. Figure N. is the Project select action. Note: each of the images work as links to the respective Project show action page.

![Figure N. Project Select Action](image)
Once the application was functional and in near-beta status, we officially deployed the application to the LCS Development servers and allowed users to begin by posting issues against the Issue Tracker itself. Allowing my mentor and me to focus on some of the more specific details of the application provided to us by the feedback from the users. Some of the issues posted against the Issue Tracker found small bugs we weren’t aware of, or put on the backburner and forgot about them. For example, the search field searches through all issues not just the issues for that particular project. Concerns about the font, font colors and font sizes were also brought up. While other issues were details we never considered, for example, how the application would respond to a vertical monitor set up.

Nevertheless, I’ve always been of the mindset that no piece of software or application is ever perfect. Software can always be improved and can always become more efficient and thus, the feedback we receive from the user simply allows me to further enhance the application, with the end goal of it being a beneficial application and my small contribution to the larger picture at NASA.

**Conclusion**

To sum up, this internship opportunity was an incredible experience. I was faced with a wide variety of tasks and encountered computer programming aspects I had virtually no skill with, while also working with website development tools that expanded my knowledge base. My assignment was to create a Ruby on Rails web application to improve the communication of developmental anomalies between the Support Software Computer Software Configuration Item (CSCI) teams, System Build and Information Architecture. As many may know software development is a laborious, time consuming, concerted effort, involving nearly as much work designing, planning, collaborating, discussing, and resolving issues as effort expended in actual development. This internship opportunity allowed me to help alleviate the amount of time spent discussing issues such as bugs, missing tests, new requirements, and usability concerns that arise during development and during the life cycle of software applications once in production.

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Works Cited


