

# Rohde & Schwarz

## Software Internship Portfolio

### 1 Description

Work alongside software developers to increase understanding of how an engineering environment functions and to identify the skills that are required to be a successful contributor to an engineering team. Primarily deal with programming and software tools focused on application development for the R&S FSW Signal and Spectrum Analyzer. Report, track, and attend to bugs and defects in both new and existing applications. Use and develop tools to fit test requirements for evolving software and hardware designs.

### 2 Spurious Measurement Application

The team I was on was developing an application to perform spurious emission measurements on a transmitting device under test. This project was unique because this application is an improvement to an existing function on the FSW Spectrum Analyzer. The goal was to provide faster results through optimization of the measurements that the instrument performs.

### 3 Projects

Throughout my internship I worked on a variety of projects and tasks. I was exposed to different tools, languages, and overall topics in software engineering. Since the project I was working on was still under development, I also encountered several instances where tools or tests that were already in place for testing our application needed to be updated as the functionality of our application grew.

#### 3.1 SCPI Coverage Consistency

One form of interaction with the FSW is through remote commands - SCPI commands - that allow users to interact with the applications remotely instead of through keypresses or the touch screen. One aspect for testing the functionality of the application is to send a series of scripts to the instrument to ensure all of the commands are working. Since these scripts were written at many different times during the development of the application and by a variety of programmers, they weren't always consistent in their formatting of the SCPI commands. I was tasked with going through our project's SCPI command scripts to ensure that all the commands were consistently formatted. This allowed our team to see which SCPI commands were untested or not functioning properly.

## 3.2 Weekly Testing

One of the occasional tasks the programmers complete is testing of that week's finished change requests and problem reports from other teams. When the rotation came to me I was able to test a variety of improvements that were made to several different applications. This allowed me to see the applications that other teams were working on and gave me hands on experience working with the instrument.

## 3.3 Rabanito Reduction

One of the standards for our applications is being able to handle one million randomized remote commands and still retain functionality. Typically this goal isn't accomplished during the early stages of application development, and the team has to determine what set of commands put the instrument into an inoperable state and why. One of the tools we use to reduce a randomized "crash script" down to the offending command is called Rabanito. It runs an algorithm to remove blocks of code from the crash script, and then it re-runs the script until it has reduced the script to a limited number of commands that may have caused that crash. (This is a lengthy process). My task was to add support so Rabanito could run with a simulation of the instrument. This allowed the physical instrument to be utilized for other tasks. This assignment exposed me to visual basic and became my first main programming task where I had to go through and understand a very large program with many contributors and changes.

I also configured a Jenkins job server such that several auto hot key files would configure Rabanito for a completely automated test run. This was my first time working with auto hot key and provided a unique learning experience. The Jenkins job server automatically sends the SCPI commands from a test script to the instrument simulation, and when a crash is detected it copies the entire environment to a new virtual machine. Then it starts the Rabanito reduction algorithm to identify the offending commands. The goal is for this process to run in an automated fashion during the night, presenting the developers with the results each morning.

## 3.4 VSE Bug Tracking

One of my early tasks was to use the VSE application as a new user to test for bugs and usability. While going through some of the user menus I found a bug. I was then given the task of replicating the bug and determining under what conditions it could be replicated. After replicating the bug, I demonstrated it to the project lead for the VSE application so that it could be tracked and fixed in a future release.

## 3.5 Jenkins

A big portion of my internship this summer was learning, improving, and maintaining a set of automated tests for my team's application. The Jenkins server is used to run automated tests overnight so any unexpected errors or bugs can be caught before changes are implemented. The main test I worked with was dealing with randomized commands being sent to our application. The goal was to catch any set of commands that may put the application into an unresponsive state. Our project's specific randomized command test had the issue that some of our commands taking longer to complete than the specified timeout. Since this was known to cause an unnecessary alarm my task was to set up the automation of a rerun that would allow for a longer timeout and therefore weed out any false errors. This task familiarized me with the Jenkins server, and I was able to demonstrate my understanding by also maintaining all our project's automated tests throughout the summer.

### 3.6 Matlab

The main goal for our project's application was to improve the speed and accuracy of our application's functions. Due to this unique setup one of our benchmarks was comparing our new application to the existing function. In order to do this a Matlab script was written to send commands and receive results from both applications on the instrument. I took over for a co-worker once the main portion of the code was complete. The main task I was faced with was tweaking the script as different changes and functionality was added to our application.

## 4 Events and Experiences

One of the big differences between working on projects and tasks for this internship and working on projects and assignments for school were the extra events and experiences I was able to encounter. I was exposed to many different aspects of a real world job. A unique feature of Rohde and Schwarz is that it is a German based company. Due to this I was also exposed to a variety of events and procedures I wouldn't have seen in a U.S. based company.

### 4.1 File Management

One of the biggest differences of working for a company was the use of file management tools including Rational Clearcase and Code Collaborator. Since development was happening in both the U.S. and Germany I was exposed to a unique process of file management and source control. Since this was my first engineering internship, this was my first time working with a file management system. It was interesting to see how each team adapted the process of integrating changes to work best for their specific projects.

### 4.2 Working with a Team

A big part of engineering is working with different teams to finish a project or task. I've experienced different types of teams before due to school projects that simulated a "real-world working environment". However nothing really compares to a real work environment. Since my project lead was based in Germany, we would have weekly phone calls to give an update on our progress and to hear any feedback from other programmers in Germany. Besides our weekly call our team here would meet daily to go over any issues or questions we had with things that came up while we were working. It was also beneficial to see how project management and planning was handled in a work environment because that aspect is always hardest for college classes to enforce.

### 4.3 Capstone poster session.

The "Local" campus for the office in Beaverton is Portland State University. Due to its proximity Rohde & Schwarz sometimes pairs up with a group of students in order to mentor them through a Capstone project. This task is one of the last major projects the students complete before receiving their degrees. It is high intensity and expectations as a way for students to test their classroom knowledge to tackle a proposed problem. I was able to go to the poster session for these projects which was a great opportunity. This idea is also captured by Purdue's Senior Design project and it was interesting to view some of the finished projects and compare them to those I've seen at Purdue.