UTDesign Fall 2019

Nokia:

Test Automation Suite for mmWave 5GNR Radios

Cody Hatfield

Sakari Hirvilampi

Joshua Obanor

Anthony Tang

Corporate Mentor: Joe Walker

Faculty Advisor: Dr. Nhut Nguyen

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I. INTRODUCTION

The project is to create a modular automated testing framework for development cycle of 5GNR radios. Our team will design and implement an easily extendable testing system for current and future 5G antenna testing, implement several existing 3GPP standardized tests, and create a modular front-end GUI system for streamlined test configuration, with back end SCPI scripts for 3GPP defined test cases. Software is intended as a simplified 5G alternate automation solution to T-Gate test automation software using object oriented extensible design and eliminating deprecated telecommunications dependencies.

II. DISCUSSION

An extensible automated test framework will be created for professional developers working at Nokia. To address the ever evolving needs to test new products as they are created, the test suite will not have hardcoded cases but rather will be capable of generating new code based on inputs/outputs defined within the GUI of the application.

This framework will extend beyond the currently existing technical solutions, which follow a painstaking process of defining and redefining test scripts from the ground up every time a new product must be tested. This will also help to standardize the testing process, thus ensuring that it is cheaper and faster to verify the functions of Nokia products.

III. RESOURCES

The resources available for the project include the following:

Team Members:

- Cody Hatfield
- Anthony Tang
- Joshua Obanor
- Sakari Hirvilampi

Sponsors:

- Joe Walker
- Tim Warriner
- William Thorp

Faculty Advisor:

- Nhut Nguyen

Software:

- Git
- Python
- Windows OS
- Linux OS
- Rohde & Schwarz Laboratory Instruments Software

Hardware:

- Personal development computer's of team members
- Nokia mmWave Radios to be tested
- Analyzer equipment
- Radio foam
- Server to handle remote communication with the equipment to be tested/analyzed.

Facilities:

- Nokia's facilities to house/store equipment
- A reserved space in the UT Dallas Design Center to hold the server and equipment to be tested to facilitate remote, any-time development.

IV. **KEY ROLES**:

Meeting Leader / Agenda:	Rotating on a weekly basis. Anthony - > Cody -> Josh -> Sakari
Note Taker / Minutes:	Rotating on a weekly meeting basis. Joshua -> Anthony -> Sakari -> Cody
Point of Contact:	Anthony Tang

V. COMMUNICATION PLAN

Sponsor Weekly Meeting: Monday 12:00 PM - 2:00 PM

Email Meeting Agenda: Leader's job before weekly sponsor meetings.

Email Meeting Minutes: Notetaker's job after sponsor meetings.

Team Weekly Technical Meeting: Friday 12:00 PM - 2:00PM

Team Messaging: Team has a running Discord voice and instant message chat for regular communication.

VI. RISK ANALYSIS

Absences: Due to the modular nature of the workflow process, should any team member be absent or become unavailable to work on the project for any reason, then their work can easily be transferred to another member of the team. While such an occurrence might impact deadlines, it is nonetheless a risk that must be undertaken while doing any kind of collaborative work.

Lack of Equipment: If the hardware or testing solution for the instruments does not arrive in time, we can shift production work over to the GUI elements and sequence. The SCPI has a default recording option that may be utilized in a script general framework to deliver a testing library without the need for hardware validation.

Missed Deadlines: For extra protection, the team is setting its own final deadline two weeks ahead of the project due date. This padding will allow for the team to miss initial deadlines by a few days each time, and would also give the team extra time to refine their solutions should no initial deadlines be missed.

VII. COSTS

The costs incurred by the project are minimal, as the team will be utilizing existing hardware for testing and analysis of Nokia equipment. There is a definite total cost of $28 to cover the costs of a private Github repository that will hold the code that the team develops. Testing environment with Nokia network may require the use of an on campus secure location.

VIII. TIMETABLE

#	Item	Start Date	End Date
1	Customizable Unit GUI	10/4/19	10/25/19
2	SCPI Scripts	10/18/19	12/9/19
3	Sequencer and DUT	10/25/19	11/22/19
4	Refinement Presentation	11/22/19	12/5/19
5	Poster and Slide Final	11/22/19	12/9/19
6	Senior Design Date	11/22/19	12/14/19

Milestone One: Customizable GUI

Begin: 10/4

Duration: Three weeks

First milestone is completing a modular graphical interface for the standard input and testing configuration. Graphical interface needs to support a flexible number of inputs and outputs. Software design for how the automation suite will operate will be built on individual test configuration.

Milestone Two: Test Scripts

Begin: 10/18

Duration: Eight weeks

When hardware testing capabilities become available, testing of SCPI test modules will begin developing the individual test scripts for each of the 3GPP defined tests. This has the potential to be the longest phase of testing and development of additional testing modules can run concurrent to automation framework development.

Milestone Three: Sequencer and DUT

Begin: 10/25

Duration: Four weeks

Develop GUI options for batching and sequencing lists of tests. Users should be able to customize lists of configured tests, and other quality of life changes to streamline reliability testing. GUI refinement. Phase can trigger when single test case GUI work is complete.

Milestone Four: Refinement and Presentation

Begin: 11/22

Duration: Two weeks

During this phase we will shift from adding additional functionality to refactoring the code for long term extensibility, generating user documentation, and continuing iterative user feedback development before the presentation.

IX. EVALUATION

Project will be evaluated based on its ability to meet the milestones of the required deliverables at the appropriate deadlines, how much each team member has contributed to the project, and how extensible the developed test suite is.

Extensibility in turn, will be determined by how quickly/easily new test processes can be developed for the suite, and the quality of the code generated as well.

X. CONTACT INFORMATION

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Joe Walker - joe.walker@nokia.com

Tim Warriner - tim.warriner@nokia.com

XI. APPENDIX

Rodhe and Schwarz FSW User Guide:

https://www.rohde-schwarz.com/us/manual/r-s-fsw-user-manual-manuals-gb1_78701-29088.html

5G Downlink User Manual : https://www.rohde-schwarz.com/us/manual/r-s-fsw-k144-nr-5g-downlink-measurements-user-manual-manuals-gb1_78701-539035.html

XII. SIGNATURES

Cody Hatfield	X _____
Joshua Obanor	X _____
Anthony Tang	X _____
Sakari Hirvilampi	X _____
Faculty Advisor: Nhut Nguyen	X _____
Company Mentor: Joe Walker, Tim Warriner, William Thorp	X _____