

CONFIGURATION GUI

Google Summer of Code Program 2015 Project Proposal

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Project Abstract.

The project is to build a cross platform GUI to configure RTEMS, which will provide the frontend support to the already existing backend libraries. The values entered in the GUI would be checked for the right type and ensured to be within the bounds for that type. It also aims at developing new types and limits for the configuration values.

Project Description.

- Goals:
 - Build a cross platform GUI to configure RTEMS for users to generate config file using wxPython for waf build.
 - Bounds checking and option type verification for configuration parameters entered in the GUI.
 - Provide more option types to support further unique options within RTEMS and set limits for the same
- Existing Scenario:
 - Only the backend background libraries have been written to handle these configuration options.
 - String, StringList, Integer and Boolean are the only acceptable option-types for each configuration parameter.
- Benefits to RTEMS Community:
 - Easier to build config file.
 - No erroneous values would be entered.
 - More support and choices for values allowed for each parameter
- Why Configuration GUI?
 - Would be a useful contribution to RTEMS, especially for the waf build version.
 - A portal to learn more and familiarize with RTEMS and to become a better contributor to the community.

- Comfortable with Python.

Project Deliverables

- May 25 (coding begins):
 - Familiarize myself better with the RTEMS development environment, the source code.
 - Work more on wxPython too and make myself fluent with it.
 - Build a full understanding of how the backend "RTEMS Config" works.
 - List possible use cases for the GUI.
 - Contribute to the RTEMS community
- June 26 (Midterm Evaluation):
 - Built a GUI that sets the configuration parameters for RTEMS.
- August 21 (Final Evaluation):
 - Incorporate more option types (long/hex) for the options during configuration.
 - Verify the values entered via GUI are within allowable bounds and are of acceptable types.
 - Ensure that all the use cases decided are being satisfied by the GUI and it works properly across all platforms.
- August 28 (Final Results Announced):
 - Make sure the code is properly documented.
 - Ready-To-Deploy code.
 - Ensure that my code is in terms with RTEMS coding convention.
- Post GSOC:
 - Help in maintaining and upgrading the GUI built, if necessary.
 - Work with RTEMS, as a user and developer.
 - Contribute to more RTEMS projects, like those that provide support for some specific Boards, obtaining runtime statistics.

Proposed Schedule

March 6 - March 27 (Application Period)

- Finding a mentoring organization - Go through the open and past projects.
- Fixed on RTEMS and joined the mailing lists of RTEMS and IRC and followed the activity.
- Built a tool-set for SPARC following the RTEMS Source Builder documentation and with help from mentors and installed RTEMS. Ran the hello world program and modified it.
- After discussing about my project with my mentor, I wrote up a proposal to be submitted.

March 28 - April 27 (Fluency Period)

- Build a strong RTEMS background by studying the source code and running it.
- Work with wxPython, which is what we would be using in the project.
- Try building necessary patches and contribute further to RTEMS.
- Comprehend RTEMS coding conventions and provide necessary documentation as I write the code for my project.

April 27 - May 24 (Design Period)

- Prepare a design of the project and the flow of the final deliverable, taking into consideration the dependencies involved and the files which the GUI affect.
- The bounds for the existing options type can be calibrated further and new option types and its bounds can be decided.
- Prepare all the possible use-cases to ensure the GUI handles all of these cases.
- The code would be written in github and it can be reviewed at any phase.

May 25 - June 26 (Building GUI Period)

- Start to build the GUI for configuring the RTEMS- parameters in https://git.rtems.org/amar/waf.git/tree/rtems_waf/defaults/options.py.
- Ensure the GUI deals satisfactorily with any value whose types are defined in: https://git.rtems.org/amar/waf.git/tree/rtems_waf/config/options.py
- Any future types will also be accommodated by the GUI.
- Deliverable:
 - The GUI for configuring the currently existing options by the end of this period, but it cannot be submitted for inclusion to RTEMS.

June 27 - August 21 (Bounds Checking Period)

- Verify the values entered in the GUI are within the bounds for that particular parameter type.
- Include more option types for RTEMS configuration and set bounds for them.
- Deliverable:
 - A GUI to configure the RTEMS that ensures bound checking for the entered values with more types of values present.
 - The GUI would run across multiple platforms smoothly and the code written is in lines with RTEMS coding convention with proper documentation.
 - The GUI built would handle the use cases defined in the Design period and it can be integrated into RTEMS at the end of my project.

Future Improvements

- Include more values in the configuration file.
- Re-tune the bounds for all the existing option types if the bounds were set for parameters and features that are no longer supported by RTEMS.

Continued Involvement

- Continue working with RTEMS in the maintenance of my project after its completion and as a developer.
- Contribute to building BSPs and real time and useful applications for embedded boards.
- Start with some currently open projects after successfully completing my GSOC project- like BSP or providing a network stack or device drivers for RTEMS.
- Build any patches if possible for RTEMS and be a solid contributor to this whole project.

After I complete my under-graduation, RTEMS is my best hope to remain involved with embedded systems and I will make sure that I remain involved.

Conflict of Interests or Commitment

My undergraduate course in CS gets completed by May 2015 and I graduate in August 2015. I've got placed in a software firm, but I do not join until the first week of August and from May to August, I have no other commitments and I hope and am fairly confident of contributing a lot to RTEMS. I am also sure that neither my university nor my future employer can claim the code I write for RTEMS. I have no other restrictions in coding for RTEMS.

Major Challenges foreseen

- Building system to package suitably on multiple operating systems.
- Finding appropriate bounds for the new option types for configuration parameters.

References

- <https://devel.rtems.org/wiki/waf/GUI> - a brief description of the project
- https://git.rtems.org/amar/waf.git/tree/rtems_waf/defaults/options.py - various configuration parameters
- https://git.rtems.org/amar/waf.git/tree/rtems_waf/config/options.py - definitions of various option types used in configuration
- http://docs.waf.googlecode.com/git/book_18/single.html - waf tutorial
- <http://www.wxpython.org/docs/api/wx-module.html> - wxPython reference

Relevant Background Experience

- I am comfortable with Python
- I have worked with embedded systems and on development boards like Raspberry Pi and controllers like Arduino before.

Personal

I am a final year (10th semester) student of BITS Pilani K K Birla Goa Campus, India pursuing a dual degree in MSc. Mathematics and B.E Computer Science. As my computer science curriculum began, I was more interested in courses like Microprocessors, Digital Design, Computer Architecture, Operating Systems than Databases or Web Development. In these courses we had hardware projects where we had to design and build circuits - like a frequency generator or a Decimal to HEX converter. My interests grew and I took my undergraduate thesis in embedded systems.

Embedded Systems are a part of everyday life for everyone in the world. But no matter what we build today, there would be a better and a smarter way tomorrow and the learning process is unending. This very fact motivates me to always be involved with embedded systems. No project in embedded systems is ever complete because the day we think we have fulfilled our requirements, a new smaller board that consumes less power and has higher computational abilities would be introduced. And now we'd want to port the whole project into this new board and the cycle goes on. I feel that in embedded systems that you get to learn a lot and that there is always a better way to do something.

I came to know about RTEMS through the GSOC 2015 organizations list. The projects available, the always active mailing lists presented a very active and committed group of people and I was attracted and fascinated by the quick replies to any matter of concern and the openness to allow anyone to contribute to RTEMS.

Adaptability is what I consider to be one of my strongest traits today. I become comfortable with a new environment easily and part of it is because when I learn something new, I'd like to get my hands dirty. I am intrigued by new ideas, I love to read and understand source codes and I'd always think of finding a better way to any problem. I am an active reader/listener - when I come across problems, I'd think how I would've approached it before moving on to the solution given and then understand the pros and cons of my method. My guide helped me build these traits and I am sure it will help me in contributing to RTEMS.

Experience

Language Skill Set

- C: Very Comfortable
- Python: Comfortable
- Java: Comfortable

Related Research and Work Experience:

- Currently doing my Bachelor's Thesis at Indian Institute of Technology - Bombay, India where I work with embedded systems and their applications in Smart Grids - Home Automation, Occupancy Identification etc.
- A publication "Fusing Sensors for Occupancy Sensing in Smart Buildings" in Distributed Computing and Internet Technology, LNCS 8956, Springer.

- Submitted a paper to ACM e-Energy Conference, 2015 which is currently under review.
- Internship at National Institute of Technology - Calicut, India on web development, where I designed and developed few websites for the research groups of CSE Department.

Reference Links and Web URLs:

- Website for Research Groups of Department of Computer Science and Engineering, NIT-C, India: http://cse.nitc.ac.in/project/bio_comp/home.php
- Link to my publication, "Fusing Sensors for Occupancy Sensing in Smart Buildings": http://link.springer.com/chapter/10.1007%2F978-3-319-14977-6_5
- Competitive coding on Hackerrank and Hackerearth. I've uploaded few solutions on github: https://github.com/anandkp92/competitive_coding
- Linkedin Profile: <https://in.linkedin.com/in/anandkp92>
- On #rtems IRC, I am: anandkp92