Cyberonics

Proposal- Intern Project

Fall 2009

"Implement Unit Test Framework for Application running on a Pocket PC 2003 device"

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1. TITLE

Implement Unit Test framework for applications written in C++ targeted for Pocket PC 2003 Operating System.

2. NEED

Cyberonics designs and develops Class 3 medical devices for Epilepsy and Depression. As per the Medical Device Software standard (IEC 62304:2006) and Cyberonics internal software development procedure, software code must be unit tested. Currently unit testing is done via debugging and there is lack of unit testing framework.

Programmer device used to program and interrogate therapy parameters in the Cyberonics implanted device along with other information is part of the Cyberonics device system. Programmer Software (VNS 7.1.4) is developed in C++ for the Pocket PC 2003 platform for which not many commercial or open source unit test frameworks are available.

This project will provide a customized unit test infrastructure enabling developers to create and execute the unit tests with ease and get diagnostic information about the test execution and coverage.

3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

Class 3 Devices: Highly regulated high risk medical devices.

IDE: Integrated Development Environment

4. APPLICABLE AND REFERENCE DOCUMENTS

IEC 62304:2006: Medical Device Software – Software Life Cycle Processes

5. LEVEL OF CONCERN / SOFTWARE SAFETY CLASSIFICATION

The unit test framework created as an output of this project will be used for testing code for the class 3 medical devices and considered as a Software of Unknown Provenance (SOUP) as per IEC 62304:2006. Cyberonics will need this tool validated in order to use it for class 3 device unit testing.

6. SYSTEM REQUIRMENTS

Unit Test Framework

- Shall be created for writing and performing unit tests for the C++ code base targeted for Pocket PC 2003 operating system

- Shall provide the basic unit test constructs such as asserting equal, null (this list will be enhance as needed)

- Shall enable the developers to create and execute the unit tests and incorporate into existing code base easily

- Shall provide the capability of running unit tests in batches/group to enable automatic running of all/selected unit tests with a single click/command

- Shall provide summary of test result with details of failures

- Shall provide the code coverage report (which lines of the code is covered and which is not)

7. DEVELOPMENT METHODOLOGY, ACTIVITIES AND TOOLS

Cyberonics is open for any development methodology and tools. The only requirement is that the unit test framework shall enable developers at Cyberonics to create and perform unit tests for C++ code base targeted for Pocket PC 2003 operating system using Visual Studio 2008/C++ IDE

Tools:

Visual Studio 2008/C++ - To view Programmer Software (VNS 7.1.4) source code on an as-needed basis

8. SOFTWARE DEVELOPMENT DELIVERABLES

- Project Plan

- Requirements Document
- Software Architecture and Design Document
- Source Code
- Build documents explaining building and releasing the Unit Test framework
- Unit Test Framework Validation Protocol and Report
- Known anomalies and future enhancement Report
- User manual with the details of usage and capabilities of the Unit Test Framework with sample tests for Programmer software (VNS 7.1.4)

9. STAFF, RESOURCE AND TRAINING REQUIREMENTS

Expected duration for this project is 14 weeks (1 semester). Regular weekly meetings will be required for providing periodic feedback. Dr. Mathur and/or the appointed project leader will be the main contact points between Purdue and the Cyberonics engineer (s). All deliverables agreed upon will be due back to Cyberonics by the end of the semester before the team disbands.

Resources from Cyberonics:

Software Engineer -   Estimated 80 man-hours of effort over the course of the semester.

Resources from Purdue:

Undergraduate/
Graduate
CS Students -   Estimated 320 man-hours of effort over the course of the semester. This can be divided among the appropriate number of students comprising a project team as determined by the instructor.

Equipments:

Pocket PC 2003 Devices and power supplies-   Cyberonics will provide needed device running Pocket PC 2003 Operating systems

Ethernet Cable – Cyberonics will provide Ethernet cables needed to debug the code on Pocket PC 2003 devices

Workstations – Purdue will be responsible for providing workstations to develop the code along with any development tools.

Equipments given by Cyberonics shall be returned to Cyberonics at the end of the project

10. SOFTWARE CONFIGURATION MANAGEMENT PLANNING

The source code shall be controlled in the Software configuration management (SCM) tool and the defects/enhancements shall be tracked in the change request database. Cyberonics uses ClearCase SCM and ClearQuest bug tracking tool. The developers of the unit test framework can use there own SCM and bug tracking tool.

11. REFERENCES

- Unit Testing Framework for eVC++ Applications:
  http://www.codeproject.com/KB/mobile/WCEUnit.aspx
- Google C++ Testing Framwork
  http://code.google.com/p/googletest/wiki/GoogleTestDevGuide