ID2205 Project Plan for 'A Development Environment for DMDL'

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Abstract

This document is the project plan for the project course ID2205 Individual Advanced Studies in Software Systems at KTH Royal Institute of Technology in Stockholm. The project will consist of developing a web-based Development Environment (DE) for the graphical programming language Decomposite MAC Description Language (DMDL).

Contents

List of Acronyms and Abbreviations

This document requires readers to be familiar with terms and concepts described in [1]. For clarity some basic terms are here summarized for ease of reference.

MAC	Medium Access Control, a sublayer of the second layer of the OSI model[2]
DMDL	Decomposite MAC Description Language, a graphical programming language for describing MAC protocols

1 Background

Increasing demands on wireless communication systems means increasing demands on wireless system development. Several tools and technologies are used to to speed up the development cycle, most notably the Software Defined Radio (SDR) [3]. The SDR is a core concept in many tools that support digital radio development, such as GNU Radio and LabVIEW. However, most of these tools are either platform-dependent or focused on the development of Physical (PHY) layer protocols. New development tools for MAC layer protocols are needed in order to fully utilize the flexibility provided by SDRs.

DMDL [1] is a graphical programming language aimed at achieving a swift prototyping and development workflow for MAC protocols. DMDL decomposes standard MAC layer operations such as carrier sensing and address lookup into functional blocks that can be connected together and modeled acording to the Synchronous Data Flow (SDF) model of computation.

2 Goals

2.1 Learning Outcome

The expected learning outcome of the project is a deeper understanding of SDRs and MAC protocol simulation and prototyping in preparation for a possible thesis collaboration in the future.

2.2 Deliverables

The project is expected to deliver a lightweight, web-based DE for DMDL. The DE need not be able to interface with actual SDR hardware at the end of the project. It shall, however, be able to perform a syntax check of a program to determine whether that program describes a nonsensical MAC protocol or not.

3 Organization

The project serves as the content in the course ID2205 Individual Advanced Studies in Software Systems at KTH Royal Institute of Technology in Stockholm. Table 1 lists all people involved in the project.

Table 1: The people involved in the project

Name	Contact	Role
Leon Fernandez	leonfe@kth.se	Student, Main Developer
Peng Wang	pengwang@kth.se	Project Owner
Marina Petrova	petrovam@kth.se	Supervisor
Christian Schulte	cschulte@kth.se	Course Examiner

4 Project Overview

The project will constist of three main phases for development, listed in the subsections below. Time plan details can be found in Section 5 and Appendix A.

4.1 Phase 1: Block Design

The focus of the first phase will be on the development of the functional blocks that make up the language and the setup of the DEs GUI. The project owner offers a set of template icons that can be used when

designing the blocks. The developed blocks should have a panel which can be opened via double click or right click so that the properties of the block can be set. A property might for instance be the duration if the block is a timer block. The blocks and their proprties can be found in the DMDL documentation [*INSERT REFERENCE HERE*].

4.1.1 Completion Criteria

- ✓ A set of blocks that immplement the MAC operations defined by the DMDL language
- ✓ A canvas where the blocks can be placed
- ✓ A panel from which the user can select a block to place

4.2 Phase 2: Connection Design

The second phase will consist of developing the mechanisms needed to connect the blocks together. This means assigning ports to the blocks which can then be connected using the mouse. Ports should be divided into two categories, namely input ports and output ports. Port lists for all blocks in the DMDL language can be found in the DMDL documentation [*INSERT REFERENCE HERE*]. Depending on how the properties of a certain block are set, its port might change. The DE should be able to handle this by being able to hide unused ports. Illegal port connections, such as connecting and output port to an output port, shall be marked with an error.

4.2.1 Completion Criteria

- ✓ The user can use the mouse to connect the ports of the blocks into a SDF graph
- ✓ Illegal port connections are highlighted as an error

4.3 Phase 3: Syntax Check

The aim of the third phase is to implement a mechanism for performing a simple syntax check of the user's program. Unlike traditional languages, DMDL was specifically designed to describe and handle MAC layer protocols. Therefore, the DE should be able to perform a check to verify that the user's program does indeed describe a sensible MAC protocol. Non-sensible MAC protocol behavior might for instance be having a ”Send”-block but no ”Generate Frame”-block. The DE should provide the user with helpful feedback for such errors.

4.3.1 Completion Criteria

- ✓ A button for performing a syntax check
- ✓ A panel for displaying error feedback

4.4 Additional Completion Criteria

In addition to the criteria mentioned above the project is also expected to deliver:

- ✓ A well-structured project report that adheres to the course guidelines
- ✓ A well-documented repository containing all self-written code
- ✓ A 20 minute oral presentation and demonstration of the project and the DE

5 Timeplan Commentary

To be written

6 Project Documentation

The project will be documented in the form of a git repository. All project documentation will be written in LaTeX and the corresponding source code will be version handled using git. The source code for the DE will be version handled in the same way and in the same repository. Documentation for the DE source code will be generated using Doxygen. The project owner and the student will meet on a weekly basis and the contents of the meeting will be breifly summarized in a short report that will be available on the git repository as well.

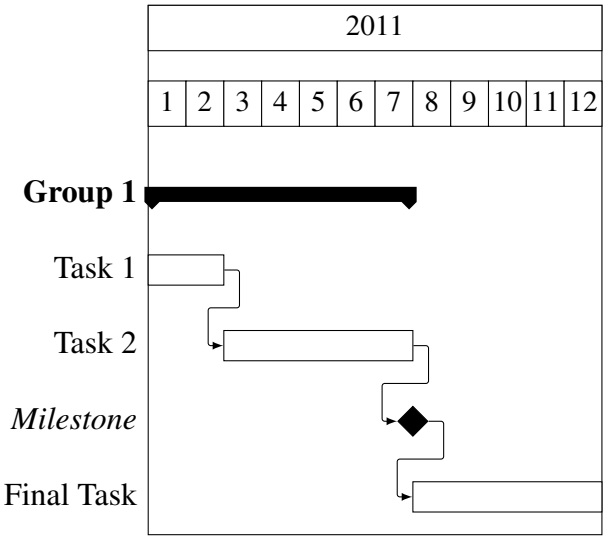
References

[1] P. Wang, M. Petrova, and P. Mähönen, "Dmdl: A hierarchical approach to design, visualize, and implement mac protocols," in *2018 IEEE Wireless Communications and Networking Conference (WCNC)*, April 2018, pp. 1–6.

[2] J. D. Day and H. Zimmermann, "The osi reference model," *Proceedings of the IEEE*, vol. 71, no. 12, pp. 1334–1340, Dec 1983.

[3] J. Mitola, "The software radio architecture," *IEEE Communications Magazine*, vol. 33, no. 5, pp. 26–38, May 1995.

A Timeplan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Group 1
Task 1
Task 2
Milestone
Final Task