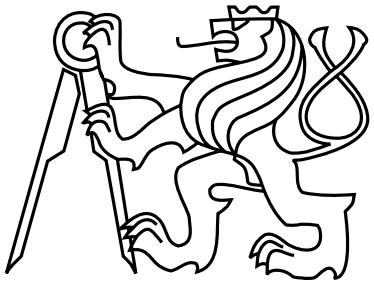
Czech Technical University in Prague
Faculty of Electrical Engineering
Department of Computer Science and Engineering



Bachelor's Project

Interactive visualization system for hybrid active pixel detectors within the ATLAS experiment at CERN

Petr Mánek

Supervisor: Ing. Stanislav Pospíšil, DrSc.

Study Programme: Open Informatics

Field of Study: Computer and Information Science

March 20, 2016

Aknowledgements

Zde můžete napsat své poděkování, pokud chcete a máte komu děkovat.

Declaration

I declare that I elaborated this thesis on my own and that I mentioned all the information sources and literature that have been used in accordance with the Guideline for adhering to ethical principles in the course of elaborating an academic final thesis.

In Prague on May 15, 2016 .....

Abstract

Translation of Czech abstract into English.

Abstrakt

Abstrakt práce by měl velmi stručně vystihovat její obsah. Tedy čím se práce zabývá a co je jejím výsledkem/přínosem.
Očekávají se cca 1 – 2 odstavce, maximálně půl stránky.

Contents

1 Introduction **1**
- 1.1 About the Timepix Detectors . . . 1
- 1.2 The Timepix Network at ATLAS . . . 1
- 1.3 The Problem of Efficient Data Manipulation . . . 1
- 1.4 Structure of This Document . . . 1

2 Data Structure and Storage **3**
- 2.1 Output Produced by Timepix . . . 3
- 2.2 Common Storage Formats . . . 3
  - 2.2.1 The Single-Frame and Multi-Frame Formats . . . 3
  - 2.2.2 The ROOT Format . . . 3
- 2.3 Expected Volume of Acquired Data . . . 3
- 2.4 Performance Optimizations . . . 3

3 Communication Protocol **5**
- 3.1 Requirements . . . 5
- 3.2 Underlying Standards . . . 5
- 3.3 Web Methods . . . 5

4 Data Server **7**
- 4.1 Role of the Application . . . 7
- 4.2 Decomposition . . . 7
- 4.3 Dependencies . . . 7
- 4.4 Object-Oriented Design . . . 7
- 4.5 A Note on Parallelism . . . 7
- 4.6 Performance Optimizations . . . 7

5 Web Visualization **9**
- 5.1 Naive Decomposition . . . 9
- 5.2 Final Decomposition . . . 9
- 5.3 Underlying Standards . . . 9
- 5.4 Dependencies . . . 9
- 5.5 Website Structure . . . 9

6 Conclusion **11**
6.1 System Deployment 11
6.2 Data Import 11
6.3 Automating Data Acquisition 11
6.4 Future of the Application 11

A Obsah přiloženého CD **13**

List of Figures

A.1 Seznam přiloženého CD — příklad 13

List of Tables

Chapter 1

Introduction

1.1 About the Timepix Detectors

1.2 The Timepix Network at ATLAS

1.3 The Problem of Efficient Data Manipulation

1.4 Structure of This Document

Chapter 2

Data Structure and Storage

2.1 Output Produced by Timepix

2.2 Common Storage Formats

2.2.1 The Single-Frame and Multi-Frame Formats

2.2.2 The ROOT Format

2.3 Expected Volume of Acquired Data

2.4 Performance Optimizations

Chapter 3

Communication Protocol

3.1 Requirements

3.2 Underlying Standards

3.3 Web Methods

Chapter 4

Data Server

4.1 Role of the Application

4.2 Decomposition

4.3 Dependencies

4.4 Object-Oriented Design

4.5 A Note on Parallelism

4.6 Performance Optimizations

Chapter 5

Web Visualization

5.1 Naive Decomposition

5.2 Final Decomposition

5.3 Underlying Standards

5.4 Dependencies

5.5 Website Structure

Chapter 6

Conclusion

6.1 System Deployment

6.2 Data Import

6.3 Automating Data Acquisition

6.4 Future of the Application

Appendix A

Obsah přiloženého CD

Tato příloha je povinná pro každou práci. Každá práce musí totiž obsahovat přiložené CD. Viz dále.

Může vypadat například takto. Váš seznam samozřejmě bude odpovídat typu vaší práce. (viz [**?**]):

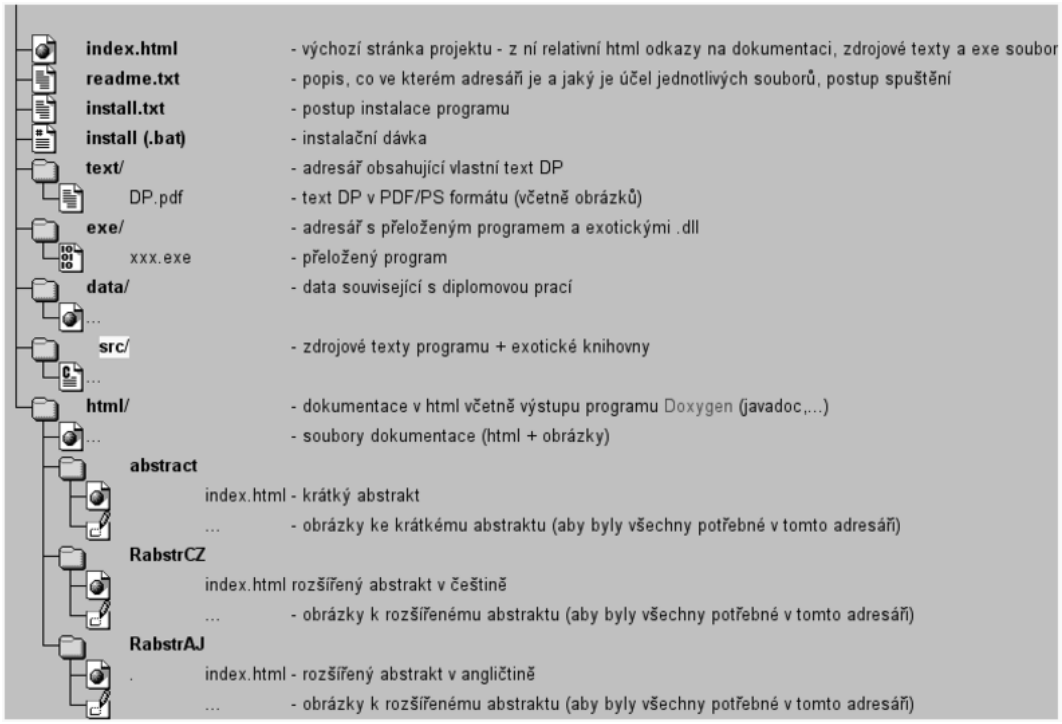


Figure A.1: Seznam přiloženého CD — příklad