



D[6.1]– Collection of Course Material Version [1.0]

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Change Log

Version	Author	Description of Change
v0.1		Initial version of the POP L ^A T _E Xtemplate
v0.2	Dirk Schmidl(RWTH)	First draft for internal review.
v0.3	Dirk Schmidl(RWTH)	Included internal reviewer comments.
v1.0	Dirk Schmidl(RWTH)	Final version released to the European Commission.



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Executive Summary

This deliverable is about a collection of course material. Material has been collected from all partners and has been extended if needed. On the POP website the material can be found online and it can also be used in on-site tutorials given by POP. The material provides all necessary information to understand how performance analysis is performed in POP.



1 Introduction

Work package 6 "Training and Documentation" has two main objectives. First, tutorials and workshops are organized and held by POP members to teach customers about performance analysis and optimization. Second, online material is provided about tools and techniques used in POP. Deliverable 6.1 "Collection of Course Material" is about a collection of material for relevant topics which is provided to POP users. The material shall be based on existing material which has been developed by POP partners before and is extended by additional information if needed. The material can be used and extended on demand during the rest of the project.

2 Relevant Material

A first step in this work package was to investigate which areas in the field of performance optimization and productivity are of interest to POP users. We identified four such areas:

- **Parallel Programming:** Performance optimization requires deep understanding of the used parallel programming paradigm. Therefore, users should have access to tutorials of different parallel programming paradigms.
- **Performance Tools:** Performance analysis tools are the basis for all performance analysis activities in POP. For users which want to do some analysis on their own, material on the used tools is essential.
- **Performance Analysis:** Besides the tools, methods used in POP to generate a unified performance analysis report are essential. Methods include the general approach to do a performance audit and the structure how to present it.
- **Performance Issues:** The PoC activities in POP will implement performance optimizations for kernels or applications to demonstrate how a specific tuning action is used. Other users of POP with similar problems, should get access to this information to learn how to optimize their application as well in a similar way.

After identifying the areas of interest for the learning material, we collected which material is already available at partner sides. We did not want to replicate existing material, but provide an anchor page for POP users where all needed material can be found at one point. Material for parallel programming paradigms and performance tools, including tutorials and exercises were already present at partner sides. The reason not to replicate the training material on the POP website is to ensure, that partners only need to keep track of the documents on one place. Whenever tutorial slides or exercises are updated the latest version of the slides should be available for everyone. Therefore we used general links to the latest documents on the partner websites which are regularly updated. For the performance analysis section, material on the used performance metrics in POP was additionally created and also a document with further explanations to read the performance audits, like explanation of views in Paraver, was created. For the performance issues sections no material exists so far, since only the very first PoC activities have been finished. Material for this section will be created when more PoC's have been done.



Area	Topic	Material	Summary
Parallel Programming	MPI	MPI_Tutorial_1	concepts, point-to-point communication, non-blocking operations
		MPI_Tutorial_2	collective operations, communicators, user datatypes
		MPI_Tutorial_3	hybrid parallelisation, common parallel patterns
		Exercises	Exercises about these topics.
	OpenMP	IntroductionToOpenMP	parallel regions, worksharing, data scoping, basic tasking
		OpenMPTaskingInDepth	in depth tasking
		OpenMPSummary	summary of everything
	Exercises	exercises about these topics	
Performance Tools	Extrae	Tutorial	Extrae tutorial slides.
		UserManual	Extrae manual.
	Paraver	Tutorial	Paraver tutorial slides.
		UserManual	Paraver manual.
	Dimemas	Tutorial	Dimemas tutorial slides.
		UserManual	Dimemas manual.
	Score-P	Tutorial	Score-P tutorial slides.
		UserGuide	Score-P manual.
	Cube	Tutorial	Tutorial Slides about Cube.
		UserGuide	Cube manual.
		DerivedMetrics	Manual about usage of derived metrics in Cube.
	Scalasca	Tutorial	Scalasca tutorial slides.
UserGuide		Scalasca manual.	
PerformanceProperties		Online explanation of all Performance properties detected by Scalasca.	
Performance Analysis	Audits	Metrics	Explanation of efficiency Metrics used in audits.
		ParaverQuickGuide	Guide that explains the basic screenshots included in a report conducted with Paraver.

Table 1: Summary of learning material provided at the POP website.

3 Results and impact

On the POP website www.pop-coe.eu/further-information/learning-material a page for learning material has been created. On this webpage a collection of material with information on all tools used in POP can be found and further information on metrics used in POP performance audits. As the audit reports should be short and precise, they do not contain information on the used methods and tools, but concentrate on the actual investigated application. The additional material provided here for users of POP services is therefore very helpful to under-



stand performance audits in more detail for users which want to rerun some tests on their own or which want to understand how the presented metrics are computed. Additionally tutorial material for MPI and OpenMP programming can be found. This can be used if users need further background information on the parallel programming paradigm to implement certain proposed optimization. Additionally, of course all the material is used for tutorials done by POP at customer sites. Table 1 summarizes the material provided at the website.



Acronyms and Abbreviations

- POP: Performance Optimization and Productivity
- RWTH Aachen: Rheinisch-Westfaelische Technische Hochschule Aachen
- PoC Proof-of-concept