Chapter 2
Comprehensive Performance Tracking with Vampir 7

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Abstract Vampir 7 is a performance visualization tool that provides a comprehensive view on the runtime behavior of parallel programs. It is a new member of the Vampir tool family. This new generation of performance visualizer combines state-of-the-art parallel data processing techniques with an all-new graphical user interface experience. This includes fast local and remote event data browsing, searching, filtering, clustering, and summarization. The software is ported to Unix, Windows, and Apple platforms. This article gives an overview of the novel techniques and features of Vampir 7.

2.1 Introduction

Performance tracking is about understanding and improving the inner workings of software for complex computer infrastructure. The presented software microscope Vampir addresses the visualization of concurrent software processes at user definable levels of detail. The main motivation for our activities is scientific curiosity, efficient usage of in-house compute resources, and satisfied customers at our compute center. Certainly, we also support the common argumentation line that stresses the strategic role of Supercomputing and HPC, complex system architectures, painful programming techniques, and the resulting need for supportive tools. Then again, it is probably best to discuss this subject with HPC center managers and parallel application developers rather than tool developers like we are.

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This article gives an overview of the new Vampir 7 performance data browser and summarizes accomplishments of the Vampir team during the past two years, focusing on the enhanced visualization of time-dependent behavior of accelerated hybrid applications and new performance data sources like the energy consumption of system components.

2.2 Overview

The Vampir 7 performance visualization tool combines modern event processing techniques with a fully redesigned graphical user interface. It is portable and available for many HPC systems. Previously available only for Unix-based systems, Vampir 7 is a complete re-design that is based on a 15 years-plus product history [9].

Vampir provides an easy-to-use analysis framework (see Fig. 2.1), which enables developers to quickly display sequential and parallel program behavior, at customizable levels of detail. This helps developers to analyze their programs, find and identify performance problems, and supports them in producing optimized, more efficient applications:

• It converts performance data obtained from a program into different performance views.
• It supports navigation and zooming within these displays.
• It helps to identify inefficient parts of code.
• It leads to more efficient programs.

Vampir’s multi-document GUI offers support for common performance chart types, including timeline and profile. Timeline charts allow studying, debugging, and tuning of the control flow of a parallel application. Adaptive profile charts enable load balancing and subroutine optimization. The communication performance can be analyzed for either individual communication partners or for an entire communication network. In addition to performance tuning, the tool also helps to analyze consistency problems, including communication mismatches, deadlocks, race conditions, and false sharing.

2.3 Recent Developments in the Graphical User Interface

2.3.1 Custom Side by Side Chart Arrangement

The value of individual performance charts can be increased by connecting and correlating them with other charts. Vampir 7 supports a mode of operation, which allows to display multiple time correlated charts side by side. Charts that display a