# THE COMPETITIVE ADVANTAGE OF AN HPC-OPTIMIZED SOFTWARE STACK FOR MAXIMIZING SYSTEM PERFORMANCE

## Introduction

High-performance computing (HPC) is used in many different industries as a vital technology for guiding business strategies. Commercial enterprises across the board are readily employing HPC in combination with data-intensive analytics to discover key decision-making insights for helping them become more competitive, improve their cost efficiency, and innovate faster.

But while increasingly necessary for competing in a data-driven world, adopting, scaling, and getting value from HPC technology is challenging. Companies can overcome this challenge with HPC solutions that offer ease of use and a software programming environment optimized to support HPC workloads.

## Industry HPC Needs

In today's fast-paced environment, organizations attempting to leverage HPC face mounting pressure to swiftly integrate tools with existing workloads, achieve quick results, and get the most from their investments. For these reasons, companies need options that are agile, customizable, and easy to manage. By reducing the learning curve and driving computing performance, organizations can be more efficient in tackling their workload-specific challenges — allowing them to accelerate time-to-insight and enhance ROI.

Companies can also better compete with HPC solutions that lower the total cost of ownership by providing upgradability, ISV compatibility, and the best possible performance with minimal effort. They need programmability and consistency. As they look to scale performance and capacity, they need an HPC system that can easily scale with them.

# Addressing Memory Bandwidth Constraints

Next-generation computing demands are driving an ever-expanding need for systems to quickly process greater and greater quantities of data. But as workloads and processing requirements continue to scale higher, memory bandwidth is the critical limitation to maintaining performance and keeping pace.

> "
> ...as workloads and processing requirements continue to scale higher, memory bandwidth is the critical limitation.
> "

To address memory-bandwidth constraints in markets and high-performance applications such as automotive, wireline networking, and AI, end-users need solutions that offer high-bandwidth memory with flexible computing performance.

The AMP EPYC™ 7000 processors feature high memory bandwidth, high IO, and are expressly designed to provide highly scalable, energy- and cost-efficient performance in large and midrange clusters. The memory bandwidth of the EPYC 7000 is well suited for workflows in computational fluid dynamics, finite element analysis, oil and gas, and the types of ISV codes that already have been optimized for x86 platforms.

By integrating the AMD line with an optimized programming environment, end-users would benefit from an agile solution that maximizes HPC cluster performance.

# A Customized Programming Approach to Overcome HPC Complexity

AMD's EPYC processors have been added to Cray's CS500™ product line to provide customers with a flexible, high-density system tuned for their demanding environments.

> **The mission of an optimized programming environment is to drive maximum computing performance while focusing on programming and portability. Specifically, a programming environment:**
>
> - **Provides the best environment to develop, debug, analyze, and optimize applications for production supercomputing with tightly coupled compilers, libraries, and tools.**
>
> - **Addresses issues of scale and complexity of HPC systems.**
>
> - **Features an intuitive behavior and best performance with the least amount of effort.**
>
> - **Targets ease of use with extended functionality and increased automation.**
>
> - **Enables close interaction with users.**

Boosting the competitiveness of an AMD solution requires integrating and optimizing the programming environment and libraries to enhance AMD EPYC processor performance. The scientific libraries should be uniquely designed to provide maximum possible performance with minimum effort through node and network performance, highly-adaptive software, and productivity features.

This brings simplicity to complex HPC problems by supplying customers with the tools to tackle a broad range of HPC workloads without the need to rebuild and recompile x86 applications.

# Collaborative-Based Problem Solving

As a dedicated collaborator who helps companies better compete in fast-evolving industries, Cray is the first system vendor to offer an optimized programming environment for AMD EPYC processors. The Cray-AMD offering reflects Cray's commitment to supporting end-to-end development as well as Cray's unique way of addressing highly-complex problems.

The most popular and important HPC codes – especially in segments like scientific computing and weather – are characterized by being built with programming models and languages that are not commonly supported by open source and commercial compilers. This software support ensures all the hardware advantages of the EPYC processor are maximized.

Cray looks at systems holistically for what they are: a complex process that requires a wide view to truly optimize. Cray's programming environment counters complexity with customization — offering scalable tools, compliers and libraries for customers that need optimized performance, programmability and portability. This reduces the need for troubleshooting and allowing companies to focus on their business operations.

Cray's culture is shaped by a boundless enthusiasm for aligning with visionaries and technology leaders. As a partner, Cray provides companies with both access to the most powerful computers in the world and the expertise for the most tactical application.