Market Forecast

Worldwide HPC Market Forecast for Arm-Based HPC Servers

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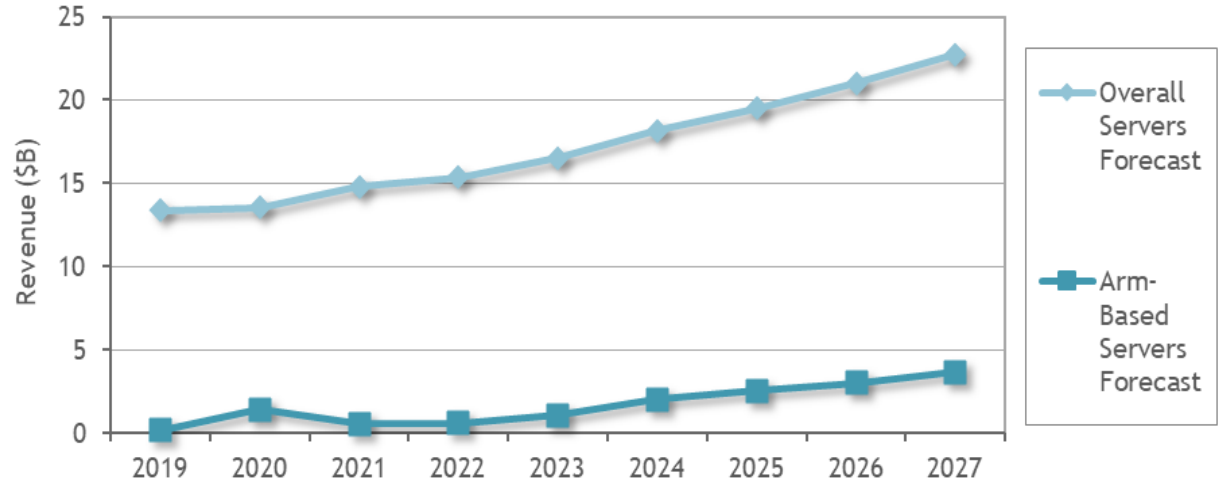
HYPERION RESEARCH OPINION

While there has been interest in Arm as a primary CPU for HPC architectures for quite some time, Riken's adoption of it in 2020 in its Fugaku machine and its subsequent claim to the top spot in the Top500 for several consecutive updates proved its maturity. NVIDIA's adoption of Arm in its Grace CPU and Grace Hopper CPU+GPU superchip solidify it as a viable option for HPC CPUs.

Arm-based HPC servers are forecasted to become approximately 16% of the overall HPC server revenues in 2027. x86-based servers dominate the HPC market and are expected to continue to represent the majority of systems over the forecast period and beyond. However, careful tracking from several years of Hyperion Research forecasts has shown a consistent rise in the adoption of Arm-based HPC systems. The latest forecast projects Arm-based HPC server revenues to grow at a 45.2% 5-year CAGR to reach $3.6 billion by 2027, far outpacing the HPC market growth rate writ large (see Figure 1). This growth is anticipated to be supported by an increasing number of new adopters driven primarily by growing AI workloads, as well as some exceptionally large/exascale-class systems.

FIGURE 1

On-Premises HPC Server Revenue Forecast -- Arm-Based vs. All Servers



Note: See assumptions.

Source: Hyperion Research, December 2023

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Overall, the HPC server market is expected to grow at around an 8% CAGR to reach $22.7 billion in 2027 as the market recovery continues and exascale systems continue to ramp up (see Figure 1, above). Although the timing of some of these exceptionally large systems remains uncertain, especially at the farthest end of the forecast period, the total dollar amount over the period is more predictable. The countries and geographies that anticipate installing the most exascale and pre-exascale systems are Europe, China, and the United States.

The Arm HPC Server Market Forecast

Table 1, below, shows the forecast for HPC Arm server systems by revenues of accepted systems and by processor counts. Arm servers are expected to be a high growth area, far outpacing the HPC server market writ large. However, Arm systems are expected to remain a minority of systems throughout the forecast and are expected to account for about 16% of all HPC server revenues by 2027.

Revenue growth (45.2% CAGR) is expected to exceed processor growth (24.5% CAGR) as the cost per Arm processor or board is expected to increase and the proportion of GPU-enabled Arm systems is expected to rise, each driving up average system prices.

TABLE 1

Arm-Based On-Premises HPC Server Forecast

	2019	2020	2021	2022	2023	2024	2025	2026	2027	CAGR '22-'27
Revenue ($M)	$128	$1,375	$533	$563	$1,035	$2,000	$2,504	$3,014	$3,640	45.2%
Processors	44,455	125,000	96,909	170,743	191,202	334,834	381,812	436,782	509,888	24.5%

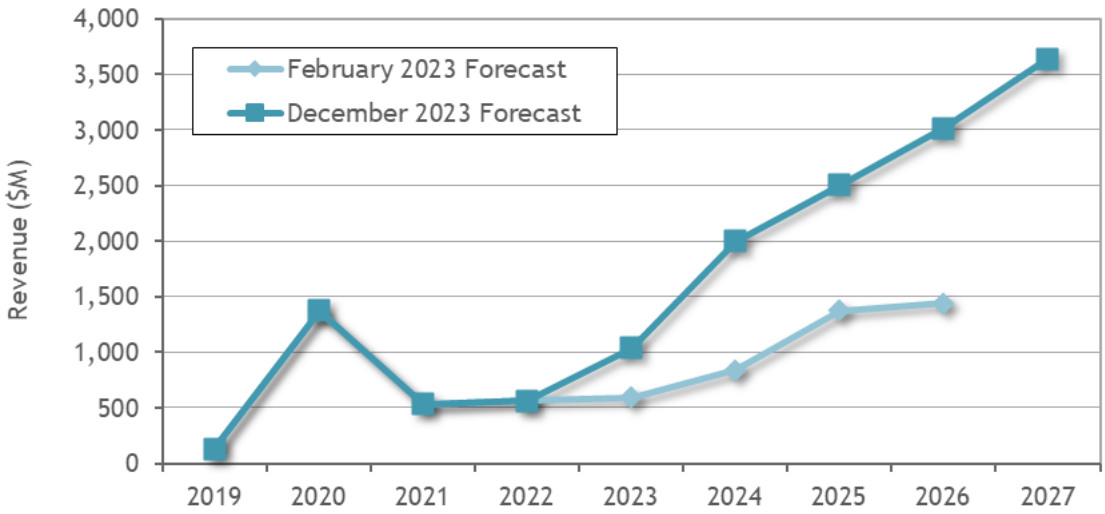
Note: See assumptions.

Source: Hyperion Research, October 2023

Compared to the previous version of this forecast, the expected Arm revenues have increased significantly. By 2026, revenues are expected to be about double what was previously predicted (see Figure 2, below).

FIGURE 2

Arm-Based On-Premises HPC Server Revenue Forecast -- New Forecast vs. Old



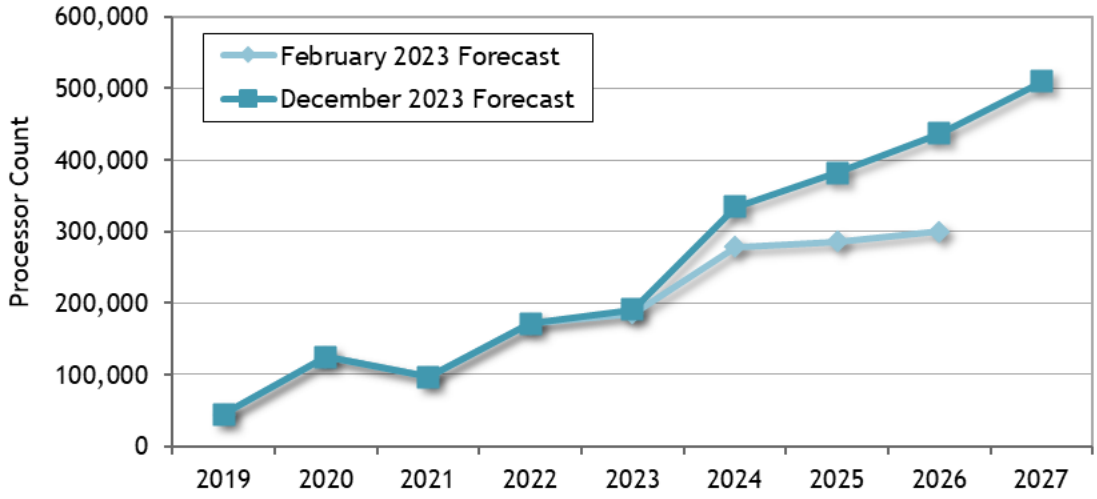
Note: See assumptions.

Source: Hyperion Research, December 2023

The processor forecast has also been upgraded significantly, although not as dramatically as revenues (see Figure 3, below).

FIGURE 3

Arm-Based On-Premises HPC Server Processors Forecast -- New Forecast vs. Old



Note: See assumptions.

Source: Hyperion Research, December 2023

KEY ASSUMPTIONS REGARDING MARKET GROWTH

The high growth predicted in this forecast is driven by the following key assumptions:

- The Arm-based EU processor in Germany is scheduled for 2024 at Jülich (approximately $300M).
- 2025 and 2026, includes 2 EU Arm systems at approximately $250M to 300M each.
- EU/Arm processor-based systems will be sold outside the EU in 2026 but in low volumes until after 2027.
- Grace and Grace Hopper work well, are successful, priced competitively, and roll out near the announced timetable.
- NVIDIA continues to develop high-performance Arm processors (i.e., Grace Hopper is the start of a continuing product line).
- Throughout the forecast, many will require GPUs and not just CPU-only systems.
- NVIDIA customers typically prefer GPU systems at an even higher rate than the HPC market writ large.
- Most buyers of CPU-only systems are traditional and will stay with their incumbent server processor (mostly x86).
- Boards/processors are counted when they are accepted by HPC customer, not when they are shipped to systems vendor.

ACCOUNTING EXAMPLES FOR ARM-BASED SYSTEMS

According to Hyperion Research accounting rules, each HPC system is categorized according to its primary processor. If a system is 100% GPU-based, the GPU can be considered the primary processor. Similarly, the primary processor might also be a combination CPU/GPU chip. See the following examples:

- A system that uses 100% Grace processors would be categorized as an Arm system.
- A system that uses 100% Grace Hopper processors would be categorized as an Arm system since Grace Hopper is the only processor.
- A system with numerous x86 processors and a smaller number of Grace Hopper would be categorized as an x86 system with a GPU. The Grace Hoppers would be accounted for in the GPU forecast.

METHODOLOGY

The forecasts in this study are based on multiple Hyperion Research information sources, including conducting many surveys of buyers and vendors, an in-house technical computing systems quarterly census database, vendor results for the historical years, discussions with vendors and users on future business directions and expectations, and in-depth interviews with users.

The forecasts were developed using Hyperion Research's technical computing systems forecast model, which targets compute servers by 13 verticals and by 26 countries/regions. This model considers competitive segments (supercomputers, technical divisional servers, technical departmental servers, and technical workgroup servers), forecasting system unit shipments, revenue, and average

sales price by industry/application segment. The forecasts include estimates for second-tier and new-entrant vendors to the HPC server market.

The forecasts provided in this study include only server systems used for technical computing applications. Systems sold into commercial (nontechnical) applications and desktop technical computers are not included in this study.

Note: Numbers in this document may not be exact due to rounding. Monetary values are given in USD.

About Hyperion Research, LLC

Hyperion Research provides data-driven research, analysis and recommendations for technologies, applications, and markets in high performance computing and emerging technology areas to help organizations worldwide make effective decisions and seize growth opportunities. Research includes market sizing and forecasting, share tracking, segmentation, technology and related trend analysis, and both user and vendor analysis for multi-user technical server technology used for HPC and HPDA (high performance data analysis). We provide thought leadership and practical guidance for users, vendors and other members of the HPC community by focusing on key market and technology trends across government, industry, commerce, and academia.

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