Research Brief:

ARM Neoverse CSS N3 & CSS V3 Announcements

STEVE MCDOWELL, CHIEF ANALYST

FEBRUARY 2024

ARM NEOVERSE N3 & V3 ANNOUNCEMENTS

CONTEXT

Arm brings two new Neoverse compute subsystems to market, each based on their third-generation Neoverse IP, extending its N-Series and V-Series product lines. These new platforms, Neoverse CSS N3, and V3, aim to improve performance-per-watt and support the implementation of new technologies like chiplets.

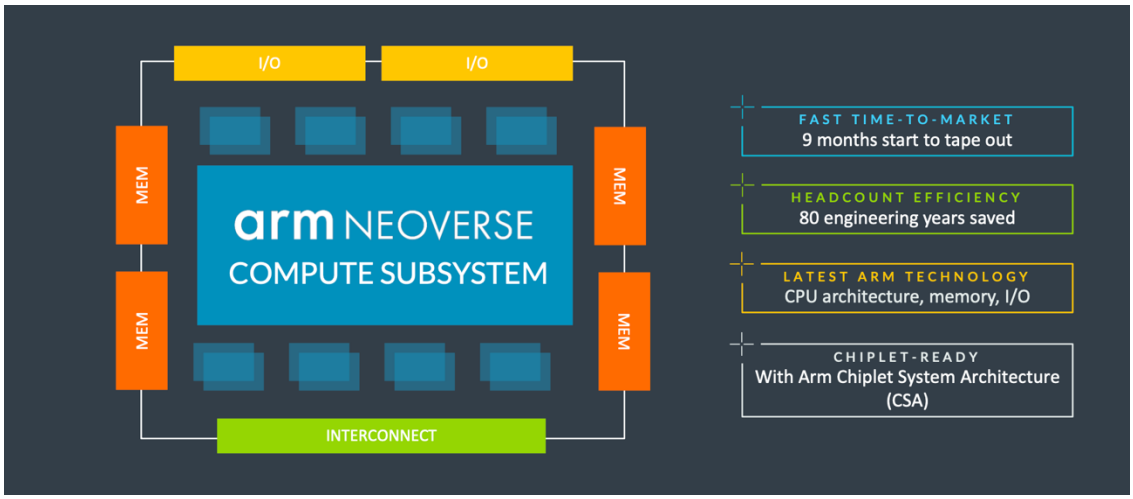
These new platforms mark a significant milestone in Arm's quest to redefine efficiency and performance in data centers and cloud environments.

In addition to its Neoverse announcements, the company has expanded its Arm Total Design initiative, which now includes a broader ecosystem of partners to accelerate and simplify the development of custom system-on-chip (SoC) designs based on Neoverse platforms.

BACKGROUND: WHAT IS NEOVERSE CSS?

The new Arm offerings extend its CSS portfolio. Before delving into the new N3 and V3 solutions, let's review what CSS is and its value to the Arm ecosystem.

Arm Neoverse Compute Subsystems are integrated and optimized computing platforms developed by Arm, specifically designed for high-performance and energy-efficient data centers and cloud workloads.



Source: Arm Holdings

Here's a detailed overview of what Arm Neoverse CSS entails:

1. **Optimized Compute Platforms**: Neoverse CSS is a comprehensive system that combines various key technologies integral to the heart of a System on Chip (SoC). They are not just individual processors but entire subsystems optimized for specific workloads.

2. **Designed for Diverse Workloads**: These platforms are tailored to handle a wide range of applications, including cloud computing, networking, data center infrastructure, high-performance computing, and AI-driven tasks. They are engineered to deliver the necessary performance and efficiency for these demanding environments.

3. **Integration of Latest Technologies**: Arm Neoverse CSS integrates the latest processor architecture, software, and system design innovations. This integration ensures that the CSS platforms are at the cutting edge of technology and can support the evolving demands of modern computing.

4. **Performance and Efficiency**: Neoverse CSS platforms are known for their balance of high performance and energy efficiency. They provide the computational power needed for intensive tasks while maintaining energy efficiency, crucial in large-scale and dense computing environments like data centers.

5. **Versatile and Scalable Solutions**: Arm's Neoverse CSS offer scalable solutions that can be tailored to a variety of market segments and use cases. This flexibility allows for a range of applications, from small-scale IoT devices to large-scale cloud infrastructure.

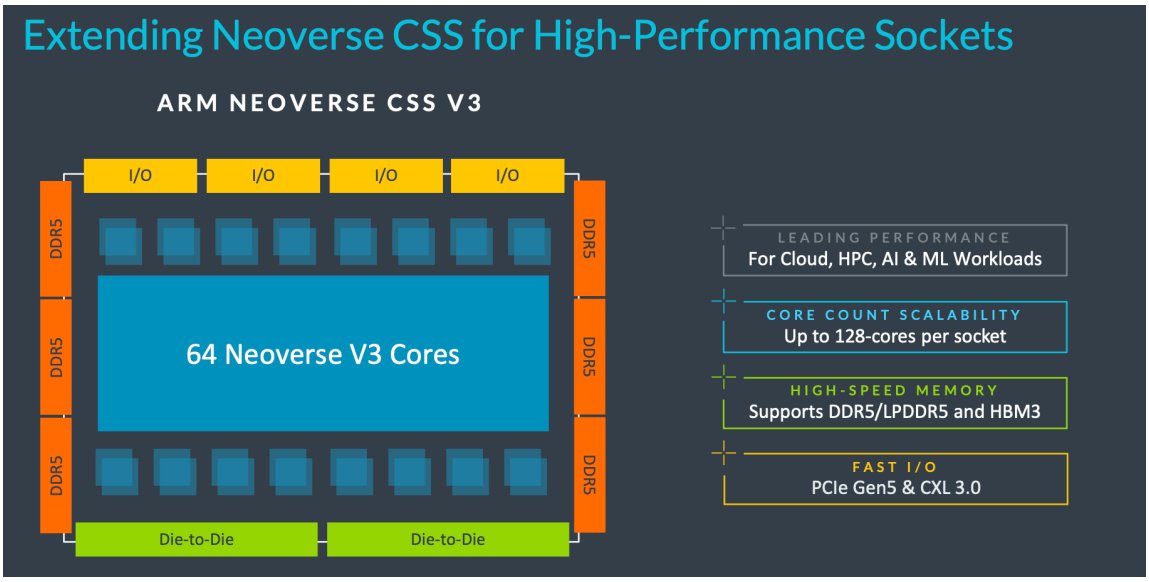
6. **Ecosystem Support**: Arm Neoverse CSS benefits from the robust Arm ecosystem, which includes a wide array of partners and collaborators. This ecosystem provides additional support and resources for companies building SoCs based on Arm Neoverse CSS, from design to deployment.

7. **Foundation for Customized SoC Development**: With Neoverse CSS, Arm provides a solid foundation for partners to develop customized SoCs. It enables them to prioritize differentiation, SoC optimization, and accelerated time to market for their products.

Arm Neoverse CSS represents a suite of optimized, integrated computing platforms crucial for powering the next generation of infrastructure and cloud-based services. They provide the foundation for high-performance, efficient, and scalable computing solutions across various applications.

NEOVERSE CSS V3

The new Arm Neoverse CSS V3 is a new offering tailored for high-performance applications, a growing market for Arm-based processors.



Source: Arm Holdings

The key features and aspects of the CSS V3 include:

1. **High-Performance V-Series Portfolio**: The CSS V3 is the first product in Arm's high-performance V-series portfolio. This positions it as a solution aimed at compute-intensive applications, setting a new benchmark in performance within Arm's range.

2. **Significant Performance Improvement**: One of the standout features of the CSS V3 is its 50% improvement in performance-per-socket over the previous Neoverse CSS N2. This substantial increase indicates a significant leap forward in processing capability, making it well-suited for demanding applications that require high computational power.

3. **Targeted for AI and Intensive Workloads**: Given its high performance, the CSS V3 is particularly suited for AI-driven applications and other compute-intensive tasks. Its enhanced capabilities make it ideal for environments where processing speed and efficiency are crucial.

4. **Integration with 3rd Generation Neoverse IP**: The CSS V3 is built on the brand-new 3rd generation Neoverse IP, incorporating the latest innovations and improvements in processor architecture from Arm.

5. **Optimized Compute Subsystems**: As with other Neoverse offerings, the CSS V3 is an optimized, integrated, and verified platform. It brings together key

technologies essential for the heart of an SoC (System on Chip), offering a comprehensive solution for high-performance computing needs.

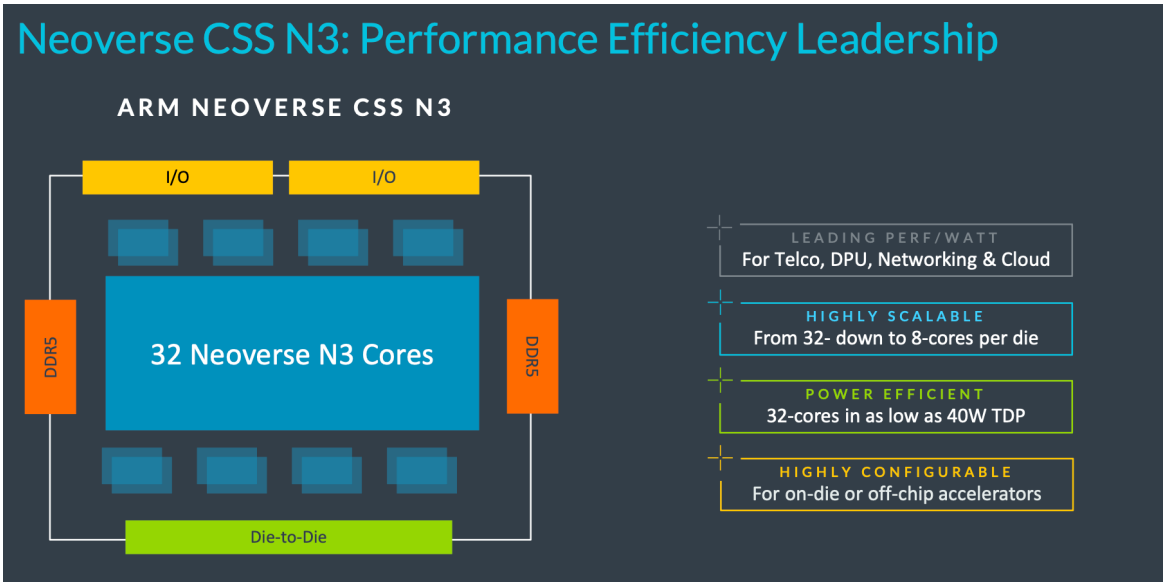
6. **Foundation for AI Aspirations**: Arm's positioning of the CSS V3 indicates its role as a foundational technology for the world's AI aspirations, underlining its capability to handle advanced AI algorithms and data processing tasks efficiently.

7. **Industry Adaptation and Use Cases**: The CSS V3's enhanced performance makes it a suitable choice for technology giants and various industries looking to redesign and optimize their entire stack – from silicon to software and systems – especially for AI and other demanding workloads.

The Arm Neoverse CSS V3 is a groundbreaking addition to the Arm Neoverse portfolio, offering unprecedented performance improvements. It's designed to meet the needs of the most demanding computational tasks, particularly in the AI domain, solidifying Arm's position as a leader in high-performance compute solutions.

ARM NEOVERSE N3

The Arm Neoverse N3 is specifically designed for enhanced performance efficiency.



Source: Arm Holdings

The key features and attributes of the Neoverse N3 include:

1. **Enhanced Performance Efficiency**: The Neoverse N3 stands out for its 20% increase in performance-per-watt compared to its predecessor, the Neoverse N2. This improvement signifies a substantial step forward in energy-efficient

computing, making it highly suitable for environments where power efficiency is as crucial as computational power.

2. **Part of the N-Series Roadmap**: The N3 extends Arm's successful N-series Compute Subsystems (CSS) roadmap. The N-series is known for delivering a balance of high performance and efficiency, and the N3 continues this tradition with its enhanced capabilities.

3. **Optimized for Diverse Applications**: The N3's improved performance efficiency makes it versatile for various applications, especially where energy efficiency is crucial. This includes cloud computing, networking, data center infrastructure, and AI-driven applications.

4. **3rd Generation Neoverse IP Integration**: Built on the latest 3rd generation Neoverse IP, the N3 benefits from the newest innovations in processor architecture from Arm, ensuring it is equipped with the latest technology.

5. **Tailored for Next-Gen Workloads**: The Neoverse N3 caters to next-generation workloads, which often demand high computational performance and greater energy efficiency. This makes it well-suited for the evolving needs of modern data centers and cloud environments.

6. **Support for Advanced Technologies**: Like other Neoverse offerings, the N3 is expected to support critical new technologies, including those related to AI and machine learning, further enhancing its utility in cutting-edge applications.

7. **Ecosystem and Industry Adoption**: The N3, through its balance of performance and efficiency, is likely to see adoption across various industries and applications, continuing the trend of Arm's technology being central to various technology solutions.

The Arm Neoverse N3 is a critical development in Arm's portfolio, offering improved performance efficiency, which is increasingly essential in today's energy-conscious technology landscape. Its design and capabilities make it a suitable choice for a variety of applications, especially those requiring a balance of high performance and energy efficiency

ARM TOTAL DESIGN INITIATIVE

In addition to the new CSS offerings, Arm is expanding its Arm Total Design Initiative, a program that helps accelerate the adoption of Arm IP into its customer's processor designs.

Here's what's new and notable in the Arm Total Design initiative:

1. **Expansion of the Ecosystem**: One of the key developments in the Arm Total Design initiative is its rapid expansion, now encompassing over 20 partners.

This growth has occurred in just a few months, reflecting the initiative's appeal and importance to the broader technology sector.

2. **Collaborative Design and Development**: The initiative brings together a diverse range of partners across the technology landscape. These partners collaborate on various aspects of SoC development, from verifying IP and customizing firmware to building chiplets using the world's most advanced process nodes.

3. **Focus on Customized SoC Solutions**: Arm Total Design is specifically geared towards enabling partners to deliver customized SoC solutions more efficiently and effectively. This is particularly significant for companies looking to develop tailored solutions for specific applications or market needs.

4. **Frictionless Delivery of Custom SoCs**: A major goal of the initiative is to streamline and simplify the process of developing custom SoCs. By leveraging the collective expertise and resources of the ecosystem, Arm aims to reduce the barriers and complexities traditionally associated with custom SoC design and production.

5. **Support for Advanced Technologies**: The initiative facilitates the incorporation of cutting-edge technologies into custom SoCs. This includes support for new developments like chiplets and advanced process nodes, ensuring that SoCs developed under the Arm Total Design umbrella are at the forefront of technology.

6. **Guidance and Expertise**: Arm Total Design also provides access to expert professional services. These services guide partners through every step of the SoC development process, from initial concept to final production, ensuring successful outcomes.

7. **Responding to Industry Feedback**: Arm is leveraging feedback from the Total Design ecosystem to shape its recently announced Chiplet System Architecture (CSA). This approach ensures that the initiative remains responsive to the needs and insights of industry partners.

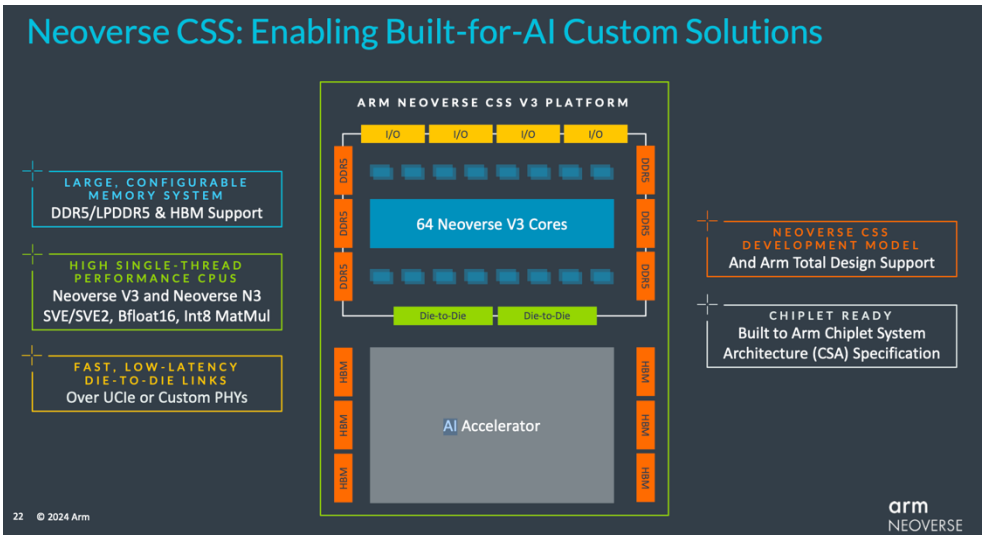
The new developments in the Arm Total Design show Arm's continuing commitment to fostering a collaborative and innovative ecosystem for the development of customized, high-performance SoCs. By expanding its partner base and focusing on streamlined, cutting-edge SoC design, Arm is positioning itself and its partners to meet the computing demands of an AI-accelerated future.

ANALYSIS

The Neoverse N3 and V3 Compute Subsystems and Arm’s expansion of the Arm Total Design initiative signify a strategic acceleration in the company’s trajectory within the high-performance computing and AI spaces.

Here's a quick analysis of what Arm announced:

1. **Neoverse N3 and V3 – A Leap in Performance and Efficiency**:
    - The Neoverse N3 and V3 CSS significantly enhance Arm's portfolio, targeting high-efficiency and high-performance segments, respectively.
    - The N3's 20% increase in performance-per-watt over the Neoverse N2 caters to the growing demand for energy-efficient computing solutions, crucial in a world increasingly conscious of power consumption and sustainability.
    - The V3's impressive 50% improvement in performance-per-socket positions it as a powerhouse for compute-intensive applications, addressing the needs of industries like AI, cloud computing, and high-frequency trading where raw performance is critical.
2. **Strategic Implications in the Compute Market**:
    - These developments underscore Arm's strategic intent to diversify its offerings and solidify its presence in energy-sensitive and performance-hungry market segments.
    - Arm's move into high-performance computing challenges traditional industry players, positioning it as a more versatile competitor in the broader processor market.
3. **Expansion of Arm Total Design**:
    - The rapid expansion of the Arm Total Design ecosystem, now with over 20 partners, is a testament to Arm's collaborative approach and its appeal in the technology sector.
    - This initiative streamlines the SoC development process, reducing time-to-market for Arm's partners and fostering innovation by making cutting-edge technology more accessible.
4. **Implications for the AI and Cloud Computing Industries**:
    - The enhanced capabilities of the Neoverse platforms are particularly relevant for AI and cloud computing, which require both high-performance and energy-efficient compute solutions.



Source: Arm Holdings

- Arm's focus on these areas aligns with current technology trends, where AI and cloud services are becoming increasingly ubiquitous and demanding compute capabilities.

5. **Competitive Positioning in the Chip Market**:

    - These announcements reinforce Arm's position as a key player in the chip market, capable of catering to a wide range of needs – from mobile devices to data centers.

    - By offering a comprehensive range of solutions, Arm is solidifying its existing customer base and attracting new clients looking for specialized, high-performance, and efficient compute solutions.

Arm's new offerings demonstrate its strategic advancements in addressing the diverse and evolving demands of the high-performance computing market. Arm is expanding its technology portfolio and reinforcing its position as a key innovator and collaborator in the global compute architecture landscape.

The market is responding to Arm's efforts. In its most recent earnings call, Arm CEO Rene Haas highlighted the growing adoption of NVIDIA's Arm-based Grace Hopper products while pointing out that Microsoft's upcoming Arm-based server processor, Cobalt, is built using Neoverse CSS. High-performance and cloud computing is no longer the domain of just AMD and Intel. There's demand for Arm-based solutions.

As Arm lowers the barriers to integrating its technology while keeping its cores' capabilities current with evolving market needs, the company will continue to influence future compute architectures, especially with the increasing reliance on AI-driven technologies.

NAND Research is a technology-focused industry analyst firm providing research, customer content, market and competitive intelligence, and custom deliverables to technology vendors, investors, and end-customer IT organizations.

Contact NAND Research via email at info@nand-research.com or visit our website at nand-research.com.