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Panmnesia Revolutionizes Custom CXL Development: Showcasing CXL 3.0 All-in-One Framework at SC'23

- ■ Innovative Spectrum: Panmnesia's CXL 3.0 All-in-One Framework – Comprehensive Solution Spanning CXL Hardware and Software for Tailored CXL Development.
- ■ Groundbreaking Showcase: Industry-First Demonstration of CXL 3.0 Memory Sharing in a Full-System Context, Featuring Real-World CXL Switches
- ■ Performance Milestone: Panmnesia's CXL 3.0 Framework – Significantly Enhancing HPC and Datacenter Application Performance.

November 16, 2023 - - At the Supercomputing Conference 2023 (SC23), Panmnesia, a leader in CXL Intellectual Property, unveiled the pioneering CXL 3.0 All-in-One Framework. SC23, a pivotal event in the HPC industry, was hosted at the Colorado Convention Center from November 14-16, drawing key players like Meta, Google, and Microsoft.

CXL Technology and Panmnesia. Compute eXpress Link (CXL), a cornerstone of Panmnesia's expertise, is an interface technology that connects an array of system devices, enabling on-demand memory utilization and cost-efficient memory management for HPC and data center environments.

Panmnesia, a South Korean fabless enterprise, has positioned itself at the forefront of this innovation. Known for its extensive CXL IP offerings, the company's recent $12.5 million seed funding underscores its growing influence. Panmnesia's distinction in the industry was further highlighted by its exclusive showcase of CXL 3.0 technologies at the Flash Memory Summit, marking a significant milestone in CXL development.

Panmnesia's CXL 3.0 All-in-One Framework. Panmnesia's latest endeavor, the CXL 3.0 All-in-One Framework, was a highlight at SC23, showcasing their ongoing dedication to CXL technology innovation. Dr. Myoungsoo Jung, the CEO and founder of Panmnesia, expressed his enthusiasm for the framework's launch. "We're thrilled to introduce our renewed framework," he said, highlighting the framework's enhanced internal architecture and advanced CXL 3.0 IPs. This development aims to provide an efficient and comprehensive environment for customers to develop custom CXL software and hardware solutions.

This framework features a full array of both hardware and software components, meticulously designed for robust development processes. The hardware suite boasts state-of-the-art CXL 3.0 devices, including a CXL-enabled CPU, a CXL switch, and various CXL endpoints. These devices are intricately constructed using Panmnesia's proprietary CXL 3.0 IPs and are fully compatible with all CXL protocols, such as CXL.io, CXL.cache, and CXL.mem. Panmnesia underscores the significance of these devices, particularly their ability to leverage unique CXL 3.0 features, including memory sharing capabilities.

A pivotal component of the framework is the CXL switch, tasked with the crucial function of connecting devices according to user specifications. To enable configurable connectivity, Panmnesia has meticulously designed their CXL switch to incorporate a sophisticated software known as the fabric manager. This software is adept at managing internal routing rules within the switches. Moreover, the switch's design is not limited to interconnecting devices within the framework; it can also extend its connectivity to include external devices or even another switch. This versatile feature allows users to effortlessly scale their framework, facilitating the construction of systems that closely resemble actual production environments.

Panmnesia's CXL 3.0 All-in-One Framework not only provides advanced hardware but also delivers a comprehensive software stack crucial for executing user-level applications with CXL enhancements. This includes a specialized OS based on Linux, complete with CXL device drivers and a CXL-aware virtual memory subsystem, enabling applications in AI and computational science to fully utilize CXL without requiring code changes.

The framework garnered significant attention at SC23, appealing to those looking to incorporate CXL into their solutions. It received positive feedback for its holistic approach, offering both hardware and software capabilities. Software developers were particularly impressed with its readiness for user-level applications, while hardware developers valued its support for interoperability testing, a key aspect in CXL hardware development and testing. This dual appeal underscores Panmnesia's success in providing a comprehensive, ready-to-use solution for CXL technology integration.

CXL 3.0 memory sharing demonstration. At the booth, Panmnesia showcased a demonstration of memory sharing using CXL 3.0. This was conducted using their CXL 3.0 All-in-One Framework. The demonstration focused on a plasma simulation, an HPC application, to illustrate the benefits of CXL memory sharing. This simulation involves modeling the movement of charged particles by calculating the forces between them. For efficiency, the simulation is typically parallelized by dividing the space into smaller sections and assigning these to different hosts.

In order to accurately compute the forces on a particle, the host responsible for that particle must gather information like charge and velocity from neighboring particles. These neighboring particles might be located on different hosts, necessitating data exchange among hosts. Traditional methods for this exchange rely on network communication, which can be slow due to network latency, a known issue in HPC scientific applications.

During SC23, Panmnesia introduced a solution based on CXL 3.0 that reduces the overhead of inter-host data exchange. This solution utilizes the memory sharing feature of CXL 3.0 to facilitate data exchange. It enables multiple hosts to access data stored in CXL-attached memory. Panmnesia's approach, which automates key memory sharing functions, enhances performance significantly. They also shared details of their software implementation, which is built on a popular data exchange library.

Panmnesia highlighted the superiority of their CXL 3.0-based solution over traditional network-based methods by demonstrating a notable 1.8x speed increase. They pointed out that the utility of their solution extends beyond plasma simulation, encompassing a broad spectrum of applications such as molecular dynamics, bioinformatics, and computational fluid dynamics, making it broadly applicable in various scientific domains within HPC environments.

Conclusion. Panmnesia's introduction of this framework marks a pivotal moment for the CXL ecosystem, facilitating accelerated development for both software and hardware enterprises. Furthermore, Panmnesia has solidified its position as a leader in CXL technology with this industry-first public demonstration of CXL 3.0 memory sharing in a complete system, inclusive of a CXL switch.

For those interested in exploring Panmnesia's All-in-One framework and related demonstrations further, videos are available on Youtube (https://www.youtube.com/watch?v=zLhYn19EQCM). Detailed information about the All-in-One framework and CXL IPs is accessible on Panmnesia's website (https://panmnesia.com/).

Figure 1. Panmnesia's exhibit 1

Figure 2. Panmnesia's exhibit 2

Figure 3. Panmnesia's exhibit 3
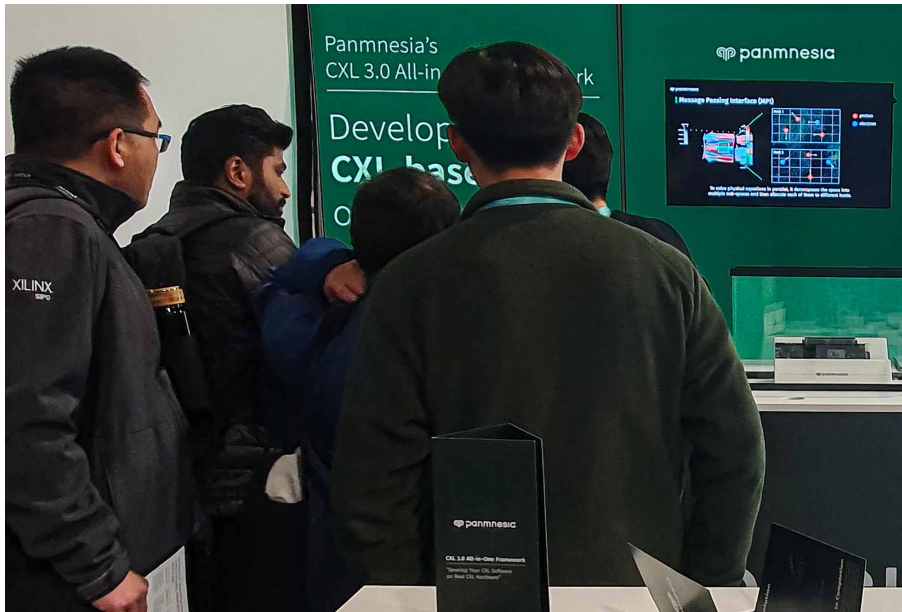

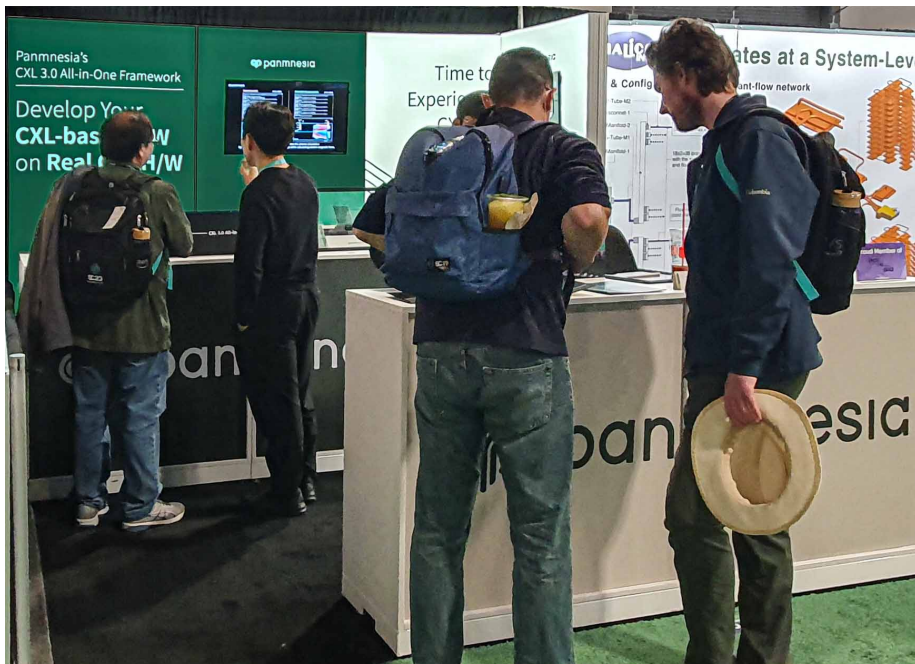Figure 4. Panmnesia's exhibit 4

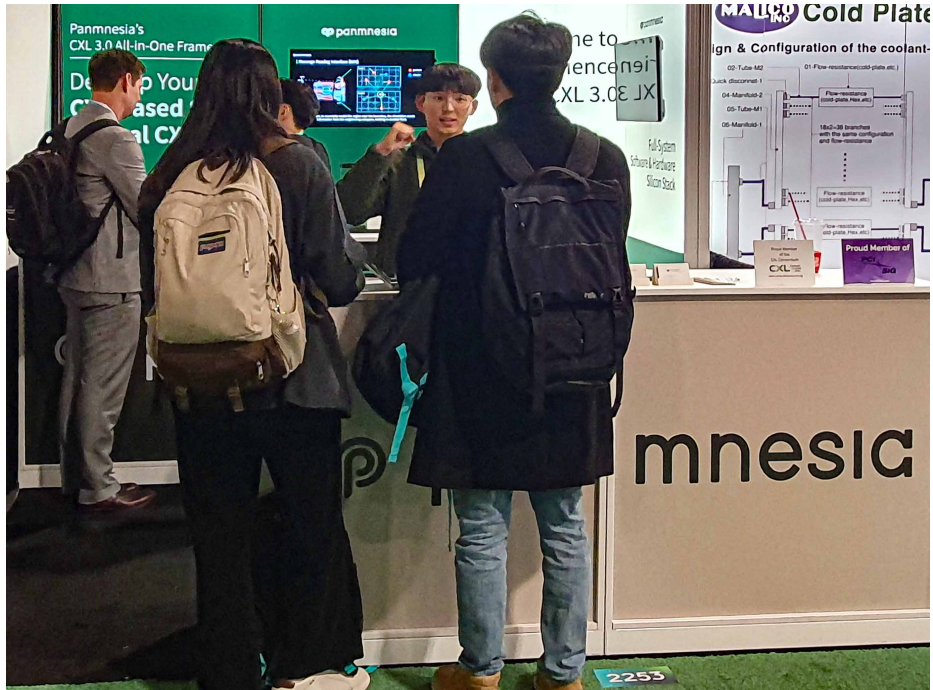Figure 5. Panmnesia's booth 1

Figure 6. Panmnesia's booth 2

Figure 7. Panmnesia's booth 3

Figure 8. Panmnesia's booth 4

Figure 9. Panmnesia's CXL 3.0 All-in-One Framework

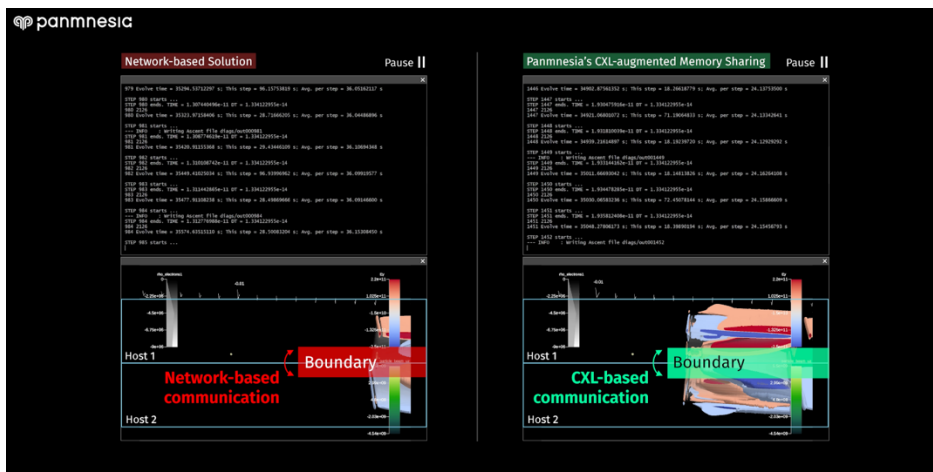Figure 10. Panmnesia's memory sharing demonstration

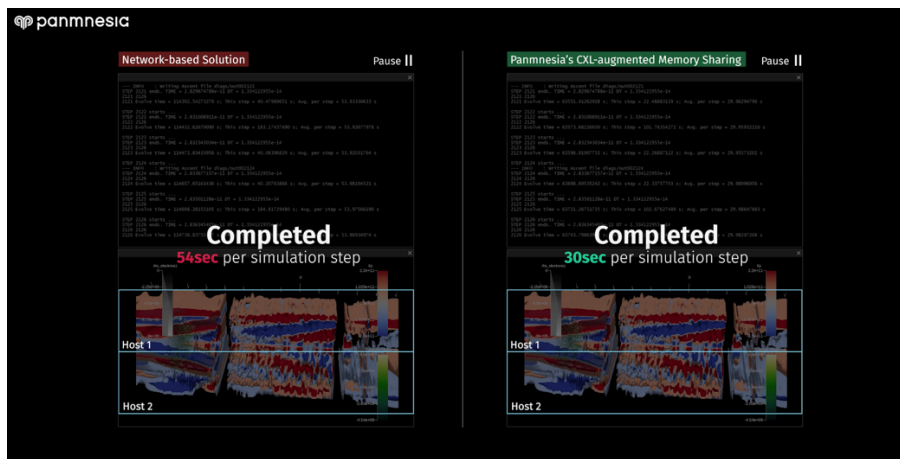Figure 11. Panmnesia's plasma simulation demonstration 1

Figure 12. Panmnesia's plasma simulation demonstration 2