

Advantages of Vector Supercomputer Maintained in Japanese Joint-Use for Academia



Cybermedia Center, Osaka University, Japan

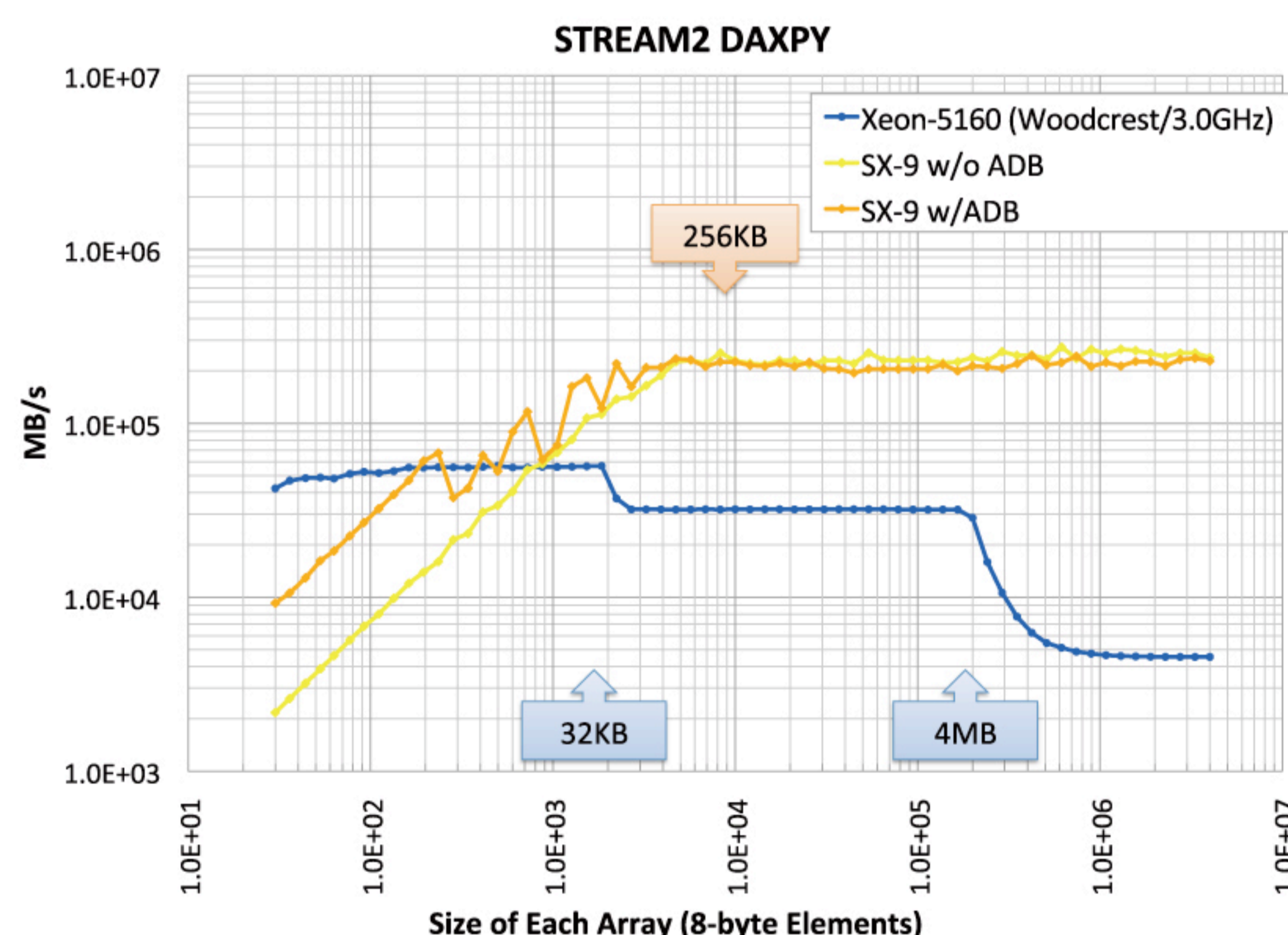
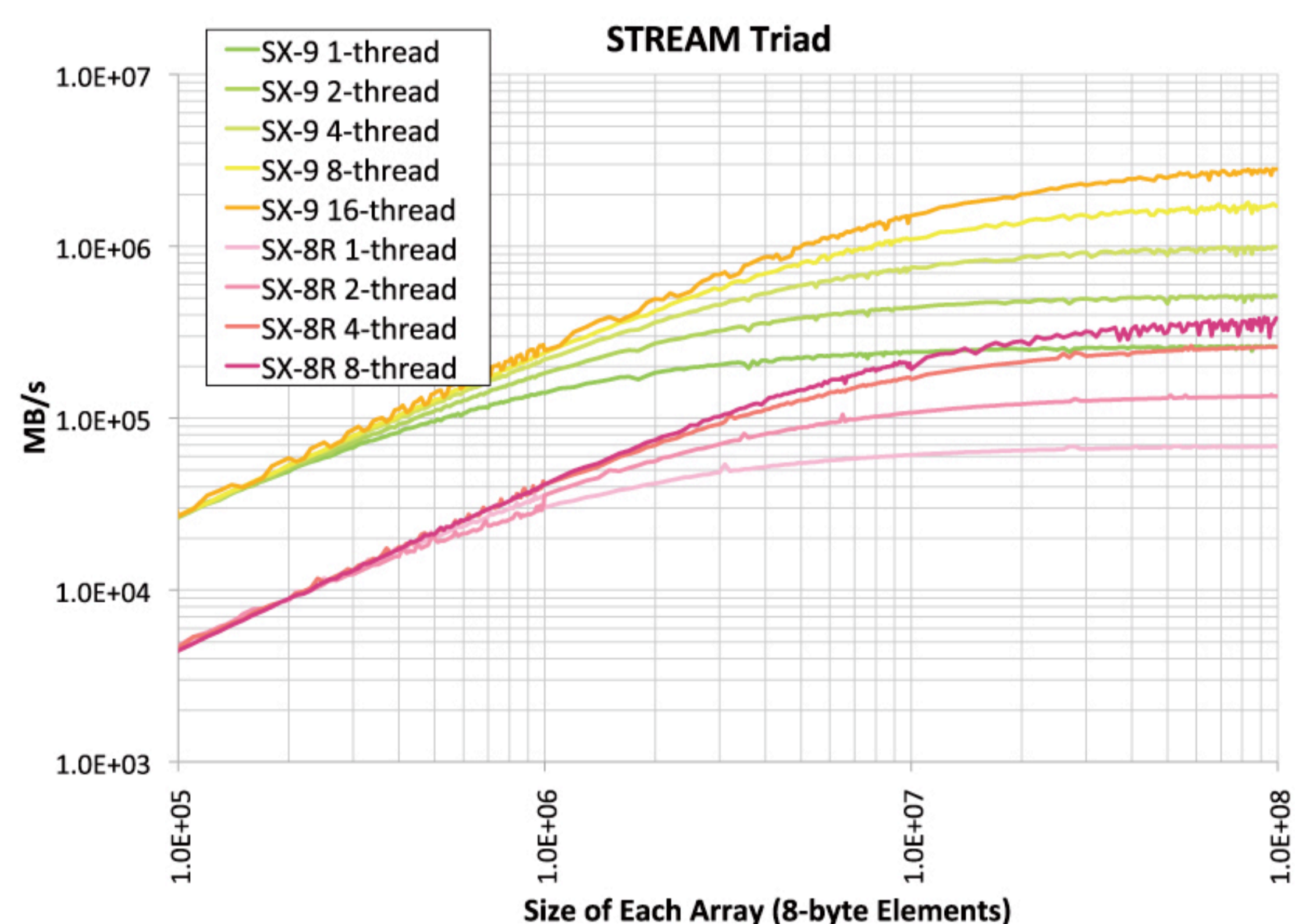
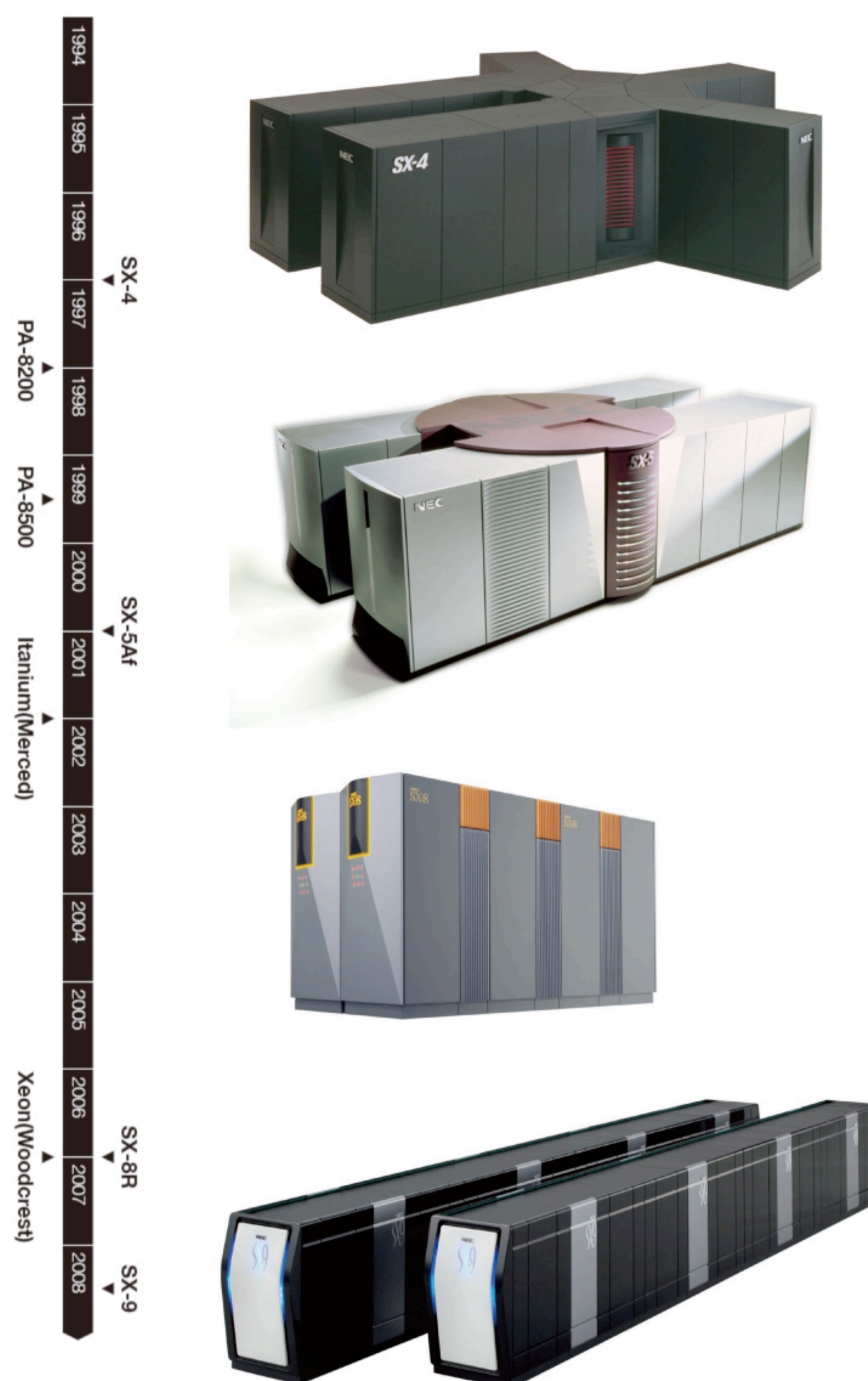
The Cybermedia Center at Osaka University was founded by merging the former Computation Center, the former Education Center for Information Processing and part of the university library in April 2000. Such reorganization was conducted in order to comprehensively promote educational study in view of rapid developments in the field of information technology.

The goal of our center is twofold: 1) to continue providing stable infrastructure services as well as technical knowledge about supercomputers, information education systems and networks used around the world, and 2) to pursue research that enables the most advanced infrastructure services.

Advantages of Historical Vector Computing Maintained

At our center, we introduced 20-nodes of SX-8R in January, 2007. It replaced SX-5/128M8 which had stunned the HPC community with its peak performance of more than 1TFLOPS for the first time ever as a vector-type supercomputer and the 8th rank on the TOP500 list in 2001. While we have witnessed a phenomenal increase in the computational performance on the TOP500 list after this SX-5, we now give first priority to the users' benefits gained through the continuous improvement in performance rather than mere performance index. In line with such a policy, we decided to upgrade this system in a phased manner with an additional 10-node SX-9 system for July, 2008.

The performance in running real application programs has been improved by the sophisticated compiler technology. While the recent microprocessors can realize the improved performance as long as their caches are effective, the supremacy of vector machines is still remarkable. Especially, multi-threaded performance with automatic parallelization of the SX-9 is outstanding.



In these ten years, the technology of past high-end microprocessors has been inherited to budget-price products, and the low power consumption technology has been spread simultaneously. Although the large-scale cluster system based on PC is getting popular, it has also left the issues surrounding operation and maintenance. We built a cluster system that can closely be co-operated with the vector machine in order to gain benefits from both architectures. It became a good example which demonstrates a synergistic effect by different architectures.

In terms of the STREAM2 benchmark, the performance of vector computers is rather excellent even for very short loop lengths partly due to the automatic loop collapse by the compiler. For the SX-9, 256KB of ADB (Assignable Data Buffer) acts like a secondary cache to increase the bandwidth for short loop lengths. The efficiency of the cache of a microprocessor can now be grasped. In fact, it became clear that the vector machine is superior to conventional scalar processors also for the case with short loop lengths that was thought to be tailored to microprocessors: vector operations can be effective even for the range of very short array lengths where the L1 cache of the microprocessor is effective.

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