# SX-Aurora TSUBASA

# SX-Aurora TSUBASA specifications

	Tower		Rack Mount		Supercomputer			
Models								
Model name	A101-1	A111-1	A311-4	A311-8	A511-64			
# of Vector Hosts (VHs)	1	1	1	1	8			
Form factor	Tower	Tower	1U rack mount	4U rack mount	Proprietary rack			
Vector Engine (VE)								
# of VEs	1	1	2, 4	8	64			
VE type	Type 10B	Type 10CE	Type 10BE	Type 10BE	Type 10AE/10BE			
Vector Host (VH)								
CPU/VH	1	1	2	2	2			
CPU	Intel® Xeon® Scalable Processors							
Memory configuration	DDR4 DIMM x 6 / CPU							
Max. memory capacity /VH	96GB	96GB	192GB	192GB	192GB			
Max. disk capacity/VH	SATA HDD 4TB	SATA HDD 4TB	SATA SSD 1.92TB	SATA SSD1.92TB +NVMe SSD 3.2TB	SATA SSD 1.92TB			
OS	Red Hat Enterprise Linux 7.6 or higher/ CentOS 7.6 or higher							
Interconnect								
InfiniBand	-	-	HDR100/EDR					
# of HCA	-	-	2	2	16			
Bandwidth /HCA	-	-	100Gbps					
Power and cooling								
Rated power	1.2kW	1.2kW	2.0kW	4.0kW	Under 40kW			
Cooling	Air	Air	Air	Air	Water+Air			
Software								
Bundled software	VE controlling software, VE driver							
Software development kit	NEC Software Development Kit for Vector Engine, NEC MPI							

# Vector Engine(VE) Specifications

		Type 10AE	Type 10BE	Type 10B	Type 10CE		
Core Specifications							
Clock speed (GHz)		1.584	1.408	1.400	1.400		
Peak performance (GFLOPS)	DP	304	270	268	268		
	SP	608	540	537	537		
Processor Specifications							
# of cores / processor		8	8	8	8		
Peak performance (TFLOPS)	DP	2.43	2.16	2.15	2.15		
	SP	4.86	4.32	4.30	4.30		
Memory bandwidth (TB/s)		1.35	1.35	1.22	1.00		
Cache capacity (MB)		16	16	16	16		
Memory capacity (GB)		48	48	48	24		

\* For more informantion, please access Aurora Forum Website<https://www.hpc.nec/>

A Safety Notice

Mail: Info@hpc.jp.nec.com

Please visit SX-Aurora TSUBASA website for all the lastest updates:

SX-Aurora TSUBASA website

https://www.nec.com/en/global/solutions/hpc



Before using this product, please read carefully and comply with the cautions and warnings in manuals such as the Installation Guide



For further information, please contact:

Mail: info@nec.de

NEC Corporation (Headquarters) NEC Deutschland GmbH (HPC Europe)

and Safety Precautions. Incorrect use may cause a fire, electrical shock, or injury.

NEC Technologies India Private Limited (AIPF) Mail: HPC@India.nec.com

Vector Supercomputer SX Series SX-Aurora TSUBASA



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The new NEC supercomputer system "SX-Aurora TSUBASA" creates the future of HPC with a newly developed vector processor. Built as a PCIe card in a standard x86 environment, It combines "sustained performance" with ease of use.



## SX-Aurora TSUBASA architecture

#### •Vector processor + x86/Linux architecture

The SX architecture contains the Vector Engine (VE) and Vector Host (VH). The VE executes complete applications while the VH mainly provides OS functions for connected VEs. The VE consists of one vector processor with eight vector cores, using "high bandwidth memory" modules (HBM2) for utmost memory bandwidth. The world's first implementation of one CPU LSI with six HBM2 memory modules using a "chip-on-wafer-on-substrate" technology (CoWoS) leads to the world-record memory bandwidth of 1.35 TB/s.\*1

It is connected to the VH, a standard x86/Linux node, through PCIe.

SX architecture executes an entire application on the VE and the OS on the VH, combines highest sustained performance, for which vector processors are famous, in a well-known x86/Linux environment.



# Newly developed vector processor

•Extremely high capability core and processor with extremely high memory bandwidth

The vector core on the VE processor is one of the most powerful single core in HPC as of today, thus keeping the design philosophy from the previous SX series. It will achieve industry leading calculation performance per core (304 GFLOPS) and highest memory bandwidth per core (168 GB/s)\*<sup>1</sup>.

With eight cores the vector processor will execute applications with extremely high sustained performance. It features 2.43 TF peak performance and the world's highest memory bandwidth per processor, 1.35 TB/s. Different from standard processors a vector architecture is known to achieve a significant fraction of the peak performance on real applications.

#### •State of the art technology for high sustained performance

The vector processor employs 16nm FinFET process technology for extremely high performance and low power consumption.







# From entry model to supercomputer model

VE cards with one vector-processor and high memory bandwidth HBM are used in a wide range of models. The product portfolio features a tower model that can be used on a user's desk to a supercomputer model for a large-scale supercomputer center. The product can be flexibly configured to meet the most demanding computational needs.

## Inherited ease of use as a research and development tool

A supercomputer is a tool to increase the productivity of researchers and developers. For users to achieve the optimal vector-processor performance, the SX-Aurora TSUBASA offers the following major software features:

#### •Compiler with automatic vectorization and parallelization

Supporting a GNU environment, the SX-Aurora TSUBASA offers Fortran/C/C++ compilers with advanced automatic vectorization and parallelization for industry leading sustained performance and MPI libraries optimized for system configurations of the SX-Aurora TSUBASA.

### •Rich scientific computing library

Scientific computing libraries optimized for SX-Aurora TSUBASA are available. These libraries include the industry standard BLAS, FFTW,LAPACK, and ScaLAPACK.

# Application to new fields such as big data analysis

With the advent of the big data era, vector computing technology that can process large amounts of data at high speed is significantly required in various application fields. For example, it can deliver higher accuracy in security field through higher resolution image analysis. In the advanced medical care field, it can contribute to increase diagnostic accuracy by inspecting more data in a shorter time. And its real-time analysis capability will help bring new business and services for a richer society.

SX-Aurora TSUBASA contributes to realize a safe, secure and highly efficient society, and enable people to live brighter lives.

\*1: as of September, 2019 (according to NEC's research)