

## Citation

For pioneering and significant contributions to the development of the high performance computers, including the world's fastest supercomputers, "Earth Simulator" and "K computer"



## Dr. Tadashi Watanabe

Position and Organization : Honorary Scientist, RIKEN

Date of Birth : March 19, 1944

Degree : Ph.D. (Information Science) (2005, Tohoku University)

## Brief Biography :

1962 Department of Electronic Engineering, Faculty of Engineering, The University of Tokyo  
 1968 Department of Electrical Engineering, Graduate School of Engineering, The University of Tokyo  
 1968 Joined NEC Corporation  
 1982 Engineering Manager, Computer Engineering Division, NEC Corporation  
 1986 Manager, 4th Engineering Dept., Computer Engineering Division, NEC Corporation  
 1988 Associate General Manager, Computer Engineering Division, NEC Corporation  
 1990 General Manager, Supercomputers Marketing Promotion Division, NEC Corporation  
 1999 Senior General Manager, NEC Solutions, NEC Corporation  
 1999-2005 Board of Directors, Research Organization for Information Science and Technology  
 2006 Director for Research Promotion, Research Promotion Bureau, Ministry of Education, Culture, Sports, Science and Technology (MEXT)  
 2006 Project Leader, RIKEN Next-Generation Supercomputer R&D Center  
 2012 Senior Advisor, RIKEN  
 2013 Honorary Scientist, RIKEN

## Honors :

1998 ACM/IEEE Eckert-Mauchly Award  
 2006 IEEE Seymour Cray Computer Engineering Award  
 2006 IEEE Fellow  
 2006 The Japan Society for Computational Engineering and Science (JSCES) Achievement Award  
 2008 Foreign member of the National Academy of Engineering (NAE)  
 2009 Japan Academy Prize (jointly with Dr. Genki Yagawa)

## Main Achievements :

Dr. Tadashi Watanabe joined NEC Corporation in 1968, where he was actively involved in the architecture design of the ACOS-6 general-purpose mainframe computer, as well as in the development of a fingerprint matching processor (FMP) used in criminal investigations and a LISP processor for artificial intelligence (AI) applications. From April 1982, he was responsible for project management, system design, and architecture design in NEC's supercomputer development project, culminating in the successful commercialization of the SX-1 and SX-2 systems in 1985, the first supercomputers to surpass the one gigaflops (GFLOPS) performance barrier. From 1989, Dr. Watanabe oversaw product planning and sales support for NEC supercomputers, while also managing NEC's supercomputer business overseas. He deepened engagement with research institutions and university computing centers worldwide and led the development of supercomputers that fulfilled the needs and expectations of users.

This NEC SX series was widely used as a core infrastructure for scientific and technological research at the computing centers and research institutes of Japanese and overseas universities, meteorological centers and aerospace research institutes worldwide, and in vehicle development by automotive manufacturers, contributing significantly to advances in basic scientific research, industrial technology development in areas such as automobiles and aircraft, and improvements in

daily life through weather forecasting and other applications. In recognition of the development and global contributions of the SX supercomputer series, Dr. Watanabe was awarded the ACM/IEEE Eckert-Mauchly Award (named for the developers of ENIAC) in 1998, presented by two leading global computer science organizations, the Association for Computing Machinery (ACM) and the IEEE Computer Society.

In 1997, the Earth Simulator development project was launched jointly by the National Space Development Agency of Japan and the Power Reactor and Nuclear Fuel Development Corporation, under the leadership of the late Hajime Miyoshi. Dr. Watanabe took the lead in NEC's system design and manufacturing involvement in this project. Completed in February 2002, the Earth Simulator far exceeded its target performance of 5 TFLOPS for atmosphere-ocean general circulation models used in global warming simulations, achieving 16 TFLOPS along with a peak performance of 40 TFLOPS. In June 2002, it was ranked top in the TOP500 List for supercomputers, and in November at SC2002 (a supercomputer international conference hosted by ACM and IEEE), it again claimed the world's top position with a LINPACK performance of 35.86 TFLOPS, an astounding performance value that significantly surpassed the second-ranked U.S. system, ASCI-Q. This achievement was described by The New York Times as a "Computenik," on par with the shockwaves caused by the Sputnik launch. The Earth Simulator's system maintained its top global ranking for a long time until June 2004 and was later recognized, at the General Chair panel discussion for the 30th anniversary of SC in 2018, as one of the most memorable machines of the past thirty years. Primarily used for large-scale environmental predictions such as climate change projections and crustal movements, it made significant contributions to the Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize in 2007. For these achievements, Dr. Watanabe was presented the IEEE Seymour Cray Computer Engineering Award, the highest honor for supercomputer architects, at SC2006.

In 2006, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the "K" computer development project, which aimed to achieve 10 PFLOPS (10 petaFLOPS, or 10 quadrillion floating-point operations per second) performance by FY2012. Dr. Watanabe transferred to RIKEN as the project leader for this development project.

The extraordinary efforts of the development team brought the development ahead of schedule, and in June 2011 the K computer ranked top in the TOP500 List with a LINPACK performance of 8.16 PFLOPS. Full system installation was completed by August 2011, and at SC11 in November the same year, it reached its target performance of 10.51 PFLOPS ( $1.051 \times 10^{16}$  floating-point operations per second), retaining its top rank. Following the start of its operation in 2012, the K computer has been utilized across a wide range of fields including disaster prevention, space, meteorology, drug discovery and healthcare, and materials science, contributing to the advancement of science and technology.

Since joining NEC, Dr. Watanabe has consistently dedicated himself to computer development work. Most notably in the field of supercomputers, he has been involved in the development of the homegrown SX supercomputer series and of the world's fastest supercomputers such as the Earth Simulator and the K computer. Through these efforts, he produced invaluable results in the advancement of computational science, the development of cutting-edge technologies including automobiles, aircraft, and semiconductors, and contributions toward the Sustainable Development Goals (SDG) including global warming projections. In recognition of these exceptional achievements, Dr. Tadashi Watanabe is hereby awarded the Okawa Prize.