IEEE COMPSAC2021 Panel "Career Pointers from Computer Society Leadership: What is the Most Important Advice that Your Carrier Ponters have Taugh You? "

Hironori Kasahara, Ph.D., IEEE Fellow, IPSJ Fellow
Senior Executive Vice President, Waseda University
IEEE Computer Society President 2018
URL: http://www.kasahara.cs.waseda.ac.jp/

1980 BS, 82 MS, 85 Ph.D. , Dept. EE, Waseda Univ.
1985 Visiting Scholar: U. of California, Berkeley,
1986 Assistant Prof., 1988 Associate Prof., 1989-90
Research Scholar: U. of Illinois, Urbana-Champaign,
Center for Supercomputing R&D, 1997 Prof.,
2004 Director, Advanced Multicore Research Institute,
2017member: the Engineering Academy of Japan (2020
Board Mem) and the Science Council of Japan
2018 IEEE Computer Society President
    Nov. Senior Vice President, Waseda Univ.

AWARD: 1987 IFAC World Congress Young Author Prize
1997 IPSJ Sakai Special Research Award,
2005 STARC Academia-Industry Research Award,
2008 LSI of the Year Second Prize,
2008 Intel Asia Academic Forum Best Research Award,
2010 IEEE CS Golden Core Member Award
2014 Minister of Edu., Sci. & Tech. Research Prize
2015 IPSJ Fellow, 2017 IEEE Fellow, Eta Kappa Nu
2019 Spirit of IEEE Computer Society Award,
2020 IPSJ Contribution Award,

Reviewed Papers: 223, Invited Talks: 215,
Granted Patents: 62 (Japan, US, GB, China),
Articles in News Papers, Web News, TV etc.: 660

Committees in Societies and Government 263
IEEE Computer Society： President 2018, Executive
Committee(2017-2019), BoG(2009-14), Strategic
Planning Committee Chair 2018, Multicore STC Chair
(2012-), Japan Chair(2005-07),
IPSJ Chair: HG for Magazine. & J. Edit, Sig. on ARC.
【METI/NEDO】 Project Leaders: Multicore for
Consumer Electronics, Advanced Parallelizing
Compiler, Chair: Computer Strategy Committee
【Cabinet Office】 CSTP Supercomputer Strategic ICT
PT, Japan Prize Selection Committees, etc.
【MEXT】Info. Sci. & Tech. Committee,
Supercomputers (Earth Simulator, HPCI Promo., Next
Gen. Supercomputer K) Committees
JST Moonshot Project G3 Robot & AI Vice Chair,
【COCN】Board Member in Council of
Competitiveness Nippon, etc.

Some of papers in and just after Ph.D. Course in Waseda U.

IEEE TRANSACTIONS ON COMPUTERS, VOL. C-33, NO. 11, NOVEMBER 1984   1023

Practical Multiprocessor Scheduling Algorithms for Efficient Parallel Processing

HIRONORI KASAHARA, MEMBER, IEEE, AND SEINOSUKE NARITA, SENIOR MEMBER, IEEE

Courtesy of dexchao - Fotolia.com

104   IEEE JOURNAL OF ROBOTICS AND AUTOMATION, VOL. RA-1, NO. 2, JUNE 1985

Parallel Processing of Robot-Arm Control Computation on a Multimicroprocessor System

HIRONORI KASAHARA MEMBER, IEEE, AND SEINOSUKE NARITA, SENIOR MEMBER, IEEE

1 of 10

2nd International Conference on Superecomputing
Santa Clara, CA, USA   May 3-8, 1987

A PARALLEL PROCESSING SCHEME FOR THE SOLUTION OF SPARSE LINEAR EQUATIONS USING STATIC OPTIMAL-MULTIPROCESSOR-SCHEDULING ALGORITHMS

H.Kasahara*, T.Fujii*, H.Nakayama*, S.Narita*, and Leon O.Chua**

*   Dept. of Electrical Eng., Waseda University, Tokyo, 160, Japan
**   Dept. of Electrical Eng. and Computer Sciences,
     University of California, Berkeley, CA 94720, U.S.A.

Copyright © IFAC 10th Triennial World Congress.
Munich, FRG, 1987

PARALLEL PROCESSING OF ROBOT MOTION SIMULATION

H. Kasahara, H. Fujii and M. Iwata

Department of Electrical Engineering, Waseda University, 3-4-1 Ohkubo
Shinjuku-ku, Tokyo 160, Japan

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1987 OSCAR(Optimally Scheduled Advanced Multiprocessor)
Co-design of Compiler and Architecture

Looking at various applications, design a parallelizing compiler and design a multiprocessor/multicore-processor to support compiler optimization

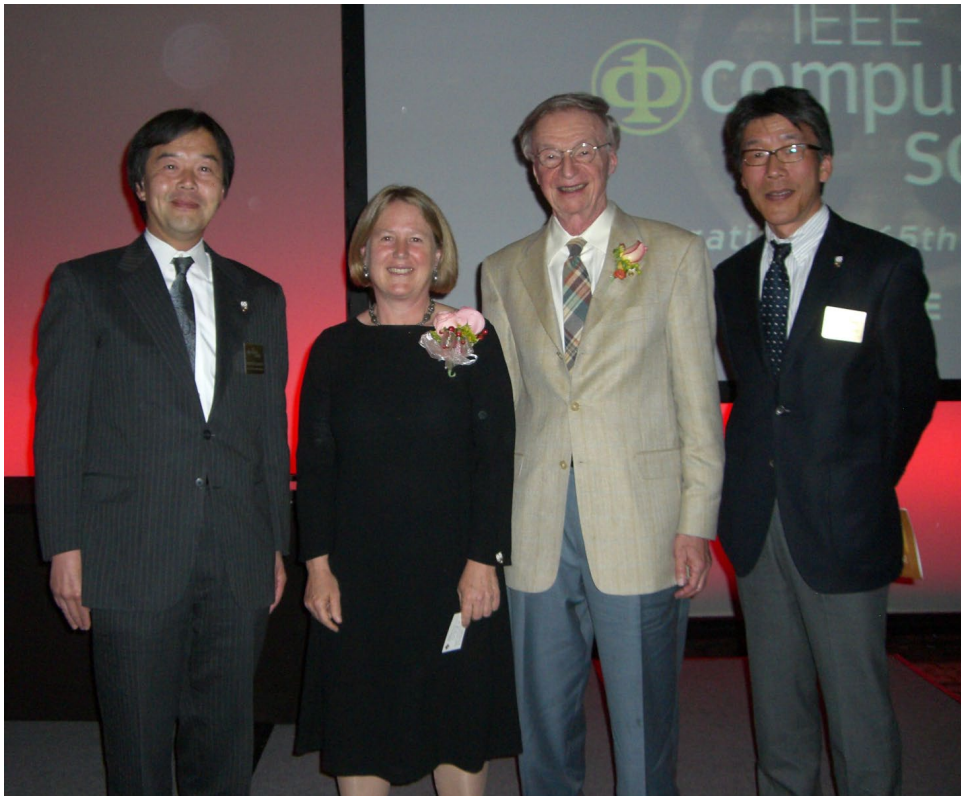**Easy to Use, Collaboration of Software and Hardware, Useful for World People**

Prof. David J Kuck (Univ. Illinois, Intel)
IEEE Computer Pioneer Award 2011

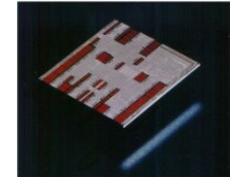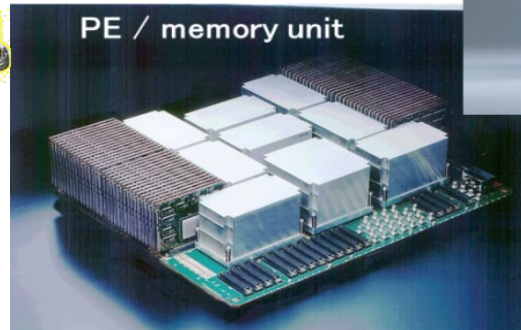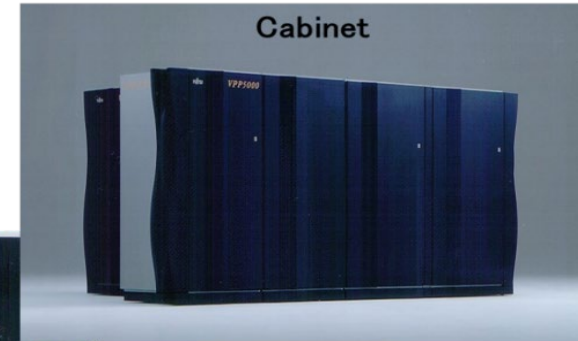## Ms. Diane B. Greene (VMware Cofounder & CEO)
IEEE Computer Society Computer Entrepreneur Award 2011

2018.03.08 WasedaUniv. Symposium on Future of High Performance Green Computing 2018 (HPGC2018)

Dr. Peter Braam | Prof. Vladimir Getov | Dr. David Kuck | Prof. David Padua | Prof. Jaejin Lee | Prof. Hironori Kasahara

1993 World No.1 Supercomputer NWT (Numerical Window Tunnel) VPP500

Mr. Hajime Miyoshi

Memory

PE / memory unit

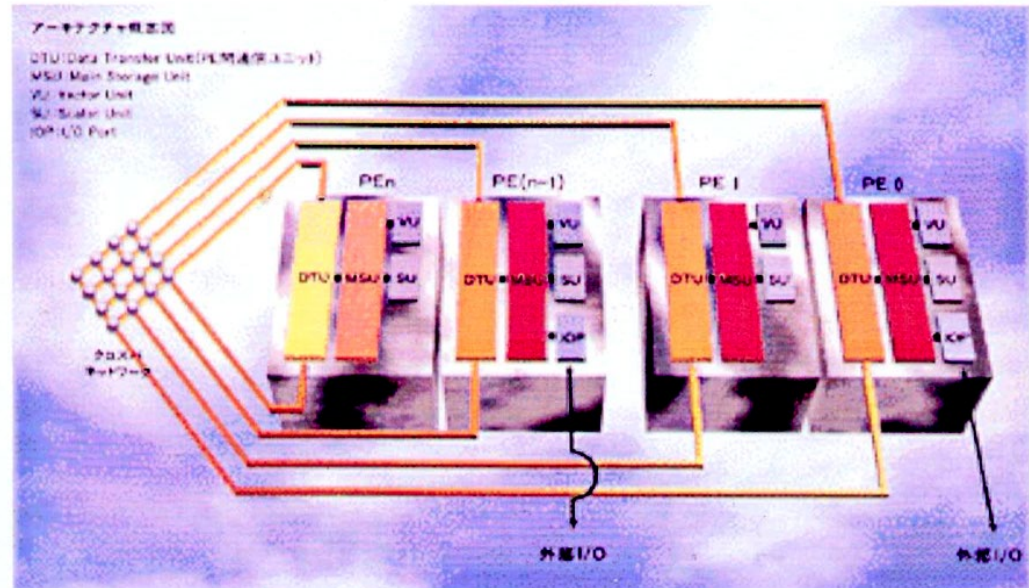Cabinet
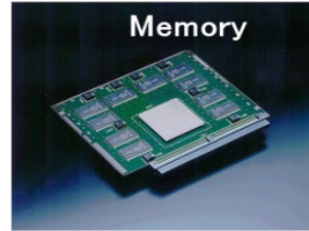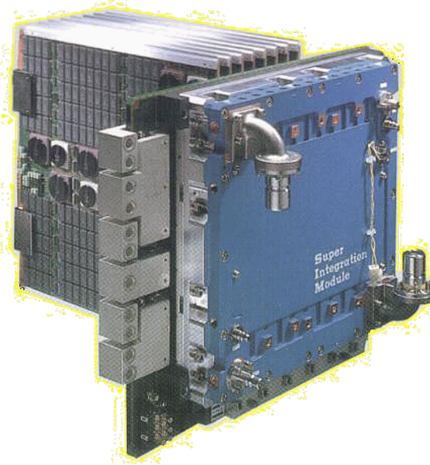
CMOS LSI
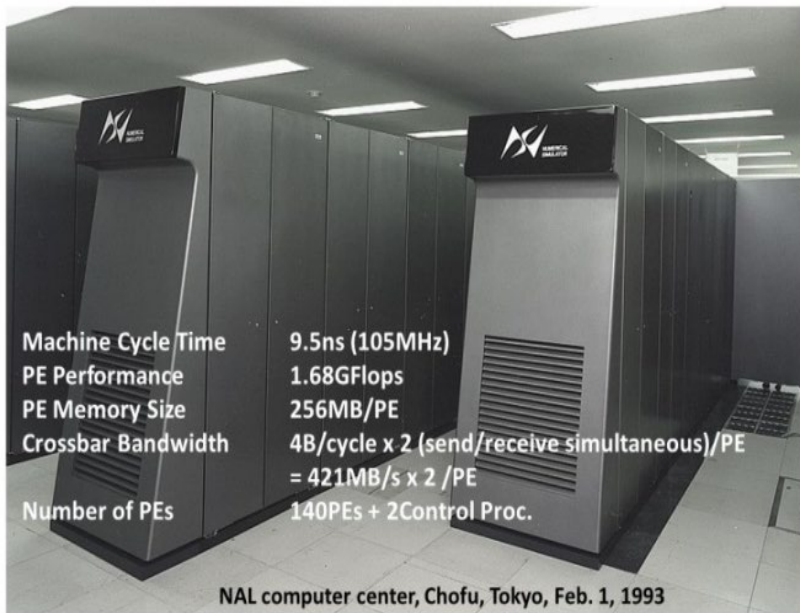
Machine Cycle Time	9.5ns (105MHz)
PE Performance	1.68GFlops
PE Memory Size	256MB/PE
Crossbar Bandwidth	4B/cycle x 2 (send/receive simultaneous)/PE
	= 421MB/s x 2 /PE
Number of PEs	140PEs + 2Control Proc.

NAL computer center, Chofu, Tokyo, Feb. 1, 1993

Patents related with OSCAR Parallelizing Compiler & Hardware

58 international patents in USA, UK, China, Japan to improve effective performance, cost-performance and software productivity and reduce power

High Performance & Low Power

### 1) Multigrain Parallelization for Embedded and Heterogeneous Multicores & Hardware Supports (Synchronization)

coarse-grain parallelism among loops, subroutines & **basic blocks** among statements in addition to **loop parallelism**

2) Data Localization: Cache & Local Memory Optimization

- **Automatic data management for distributed shared memory, cache and local memory**
- **Software Cache Coherent Control**
- **Data Transfer Controller**
- Data transfer overlapping using **DMA hardware & its compiler**

### 3) Automatic Power Reduction HW&SW

- **Reduction of consumed power by compiler control DVFS and Power gating with hardware supports.**
- **Accelerator** See right figure

DOALL Sequential LOOP SB BB



88.3% Power Reduction
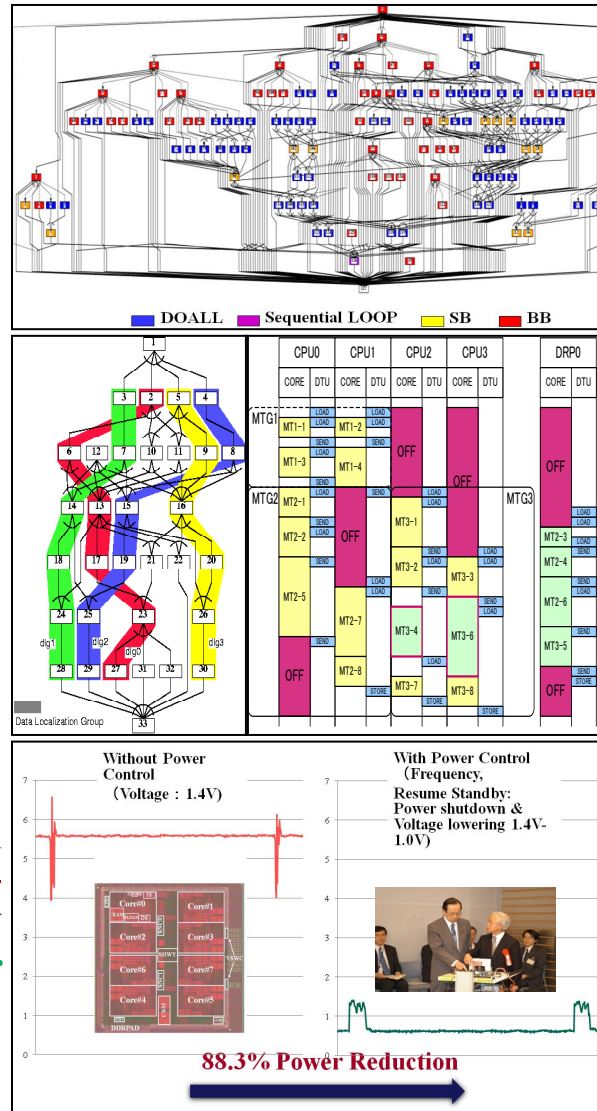
Green Accelerator

can be attached to any processor cores, RISCV, arm, Infineon Renesas, AMD, Intel, etc, without instruction extensions.

➤It works **with automatic local memory management** and **power reduction control** by OSCAR Automatic vectorizing & parallelizing compiler
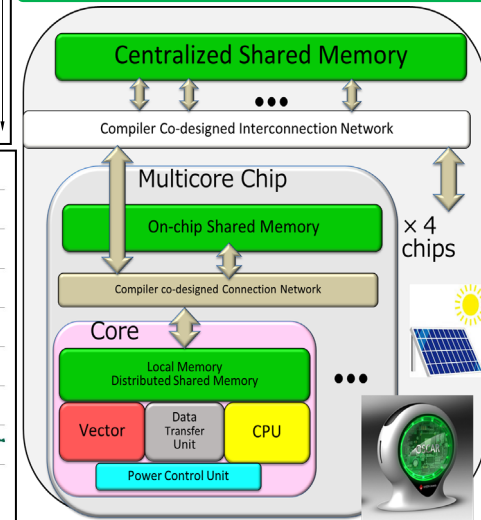
110 Times Speedup against the Sequential Processing for GMS Earthquake Wave Propagation Simulation on Hitachi SR16000

（Power7 Based 128 Core Linux SMP） (LCPC2015)

Proposed method — **Proposed method（Speed Up Ratio）**
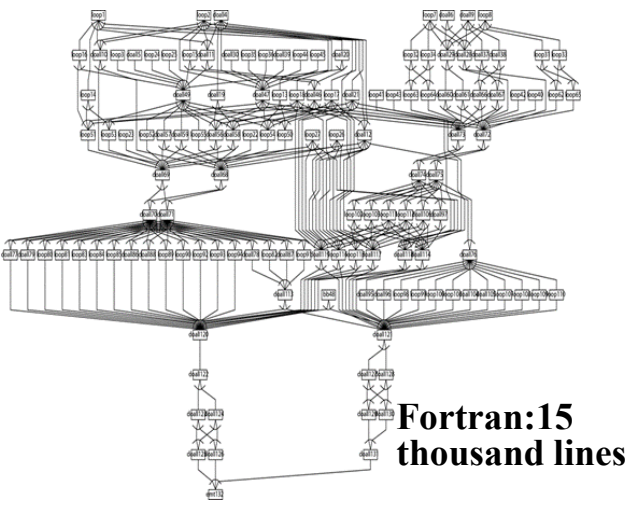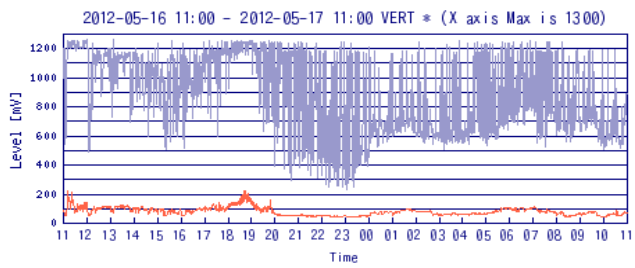
Fortran:15 thousand lines

First touch for distributed shared memory and cache optimization over loops are important for scalable speedup

21,704

110.7

58.7

21.7

1.0   1,000   370   196

1pe   32pe   64pe   128pe
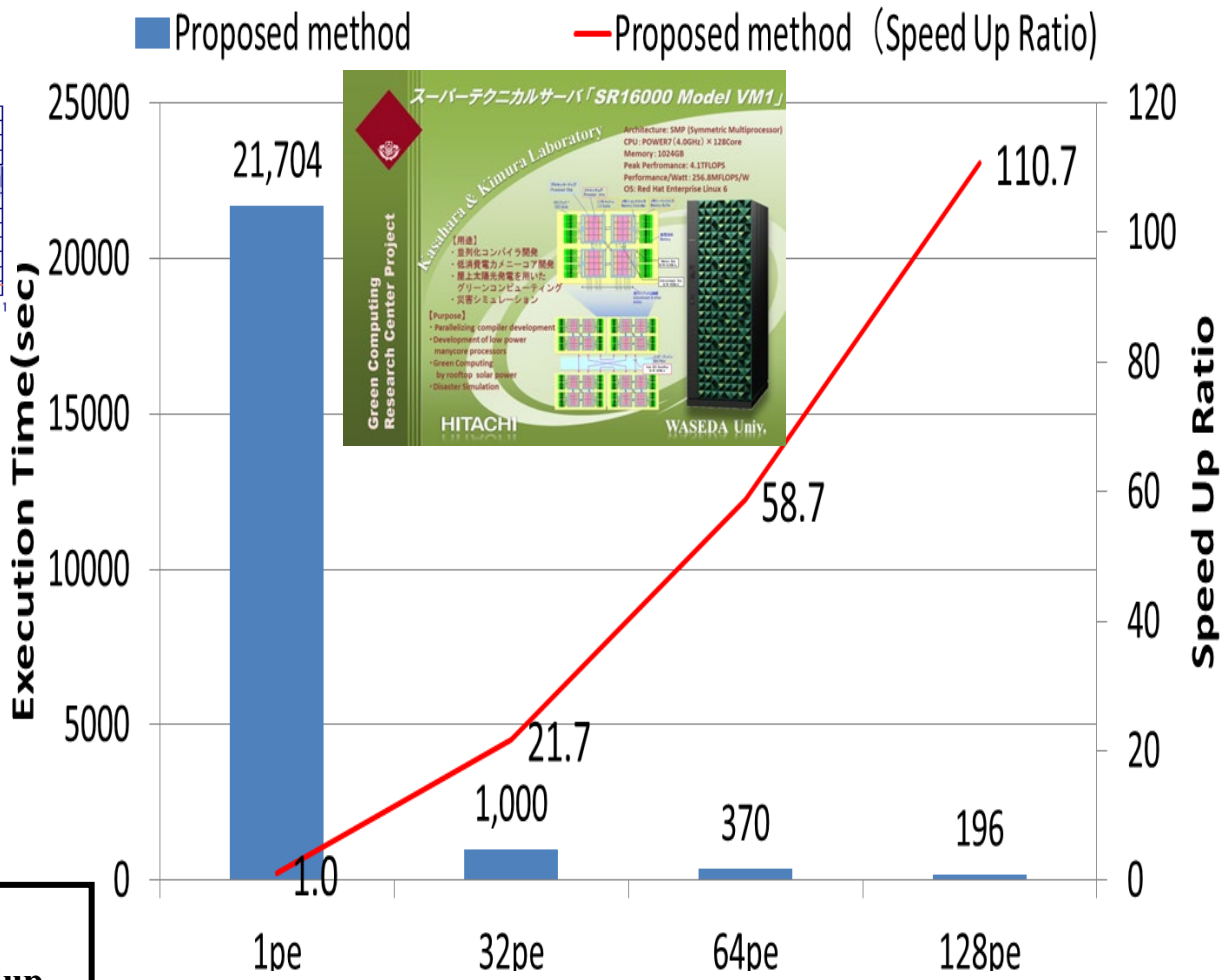
Demo of NEDO Green Multicore Processor for Real Time Consumer Electronics at Council of Science and Engineering Policy on April 10, 2008

http://www8.cao.go.jp/cstp/gaiyo/honkaigi/74index.html

Codesign of Compiler and Multiprocessor Architecture since 1985

第74回総合科学技術会議 【平成20年4月10日】

マルチコア

標準半導体

2.52 37.21

2012/12/10

第74回総合科学技術会議の様子(1)

第74回総合科学技術会議の様子(2)

第74回総合科学技術会議の様子(3)

第74回総合科学技術会議の様子(4)

4 core multicore RP1 (2007), 8 core multicore RP2 (2008) and 15 core Heterogeneous multicore RPX (2010) developed in NEDO Projects with Hitachi and Renesas

| RP-1 (ISSCC2007 #5.3)	RP-2 (ISSCC2008 #4.5)	RP-X (ISSCC2010 #5.3)
DAA Core 0 Core 1 SNC Core 2 Core 3 Peripherals GCPG→	CoreO Core1 Core2 Core3 Core6 Core7 Core4 Core5 GCPG→	PCIe S-ATA Media IPs MX-2 DDR3 Core 0-3 FE Bus Router Media IPs Core 4-7
90nm, 8-layer, triple-Vth, CMOS	90nm, 8-layer, triple-Vth, CMOS	45nm, 8-layer, triple-Vth, CMOS
97.6 mm^2 (9.88 x 9.88 mm)	104.8 mm^2 (10.61 x 9.88 mm)	153.8 mm^2 (12.4 x 12.4 mm)
1.0V (internal), 1.8/3.3V (I/O)	1.0-1.4V (internal), 1.8/3.3V (I/O)	1.0-1.2V (internal), 1.2-3.3V (I/O)
600MHz ,4.32 GIPS,16.8 GFLOPS	600MHz , 8.64 GIPS, 33.6 GFLOPS	648MHz, 13.7GIPS, 115GOPS, 36.2GFLOPS
11.4 GOPS/W (32b換算)	18.3 GOPS/W (32b換算)	37.3 GOPS/W (32b換算)

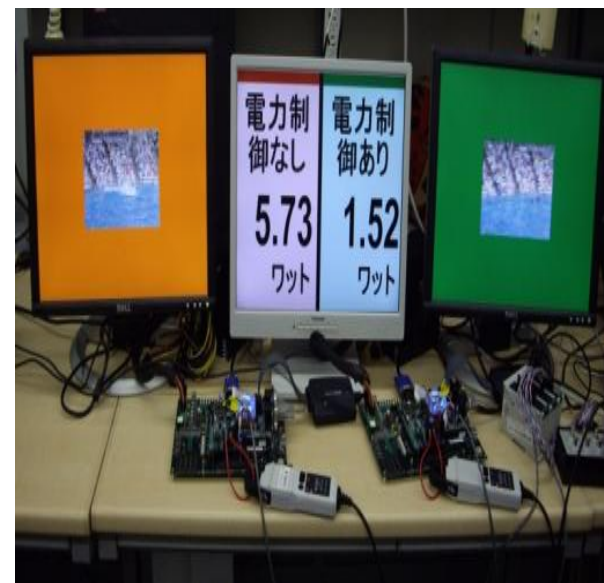**Prime Minister FUKUDA is touching our multicore chip during execution.**

太陽光電力で動作する情報機器

コンピュータの消費電力をHW&SW協調で低減。電源喪失時でも動作することが可能。

リアルタイムMPEG2デコードを、8コアホモジニアス
マルチコアRP2上で、消費電力1/4に削減

世界唯一の差別化技術

電力制御無し
平均電力
5.73 [W]

太陽電池で駆動可

電力制御無し

省電力分

電力制御有

電力を
ソフトで
1/4に
削減

電力制御有
平均電力
1.52 [W]

周波数/電圧・電源遮断制御
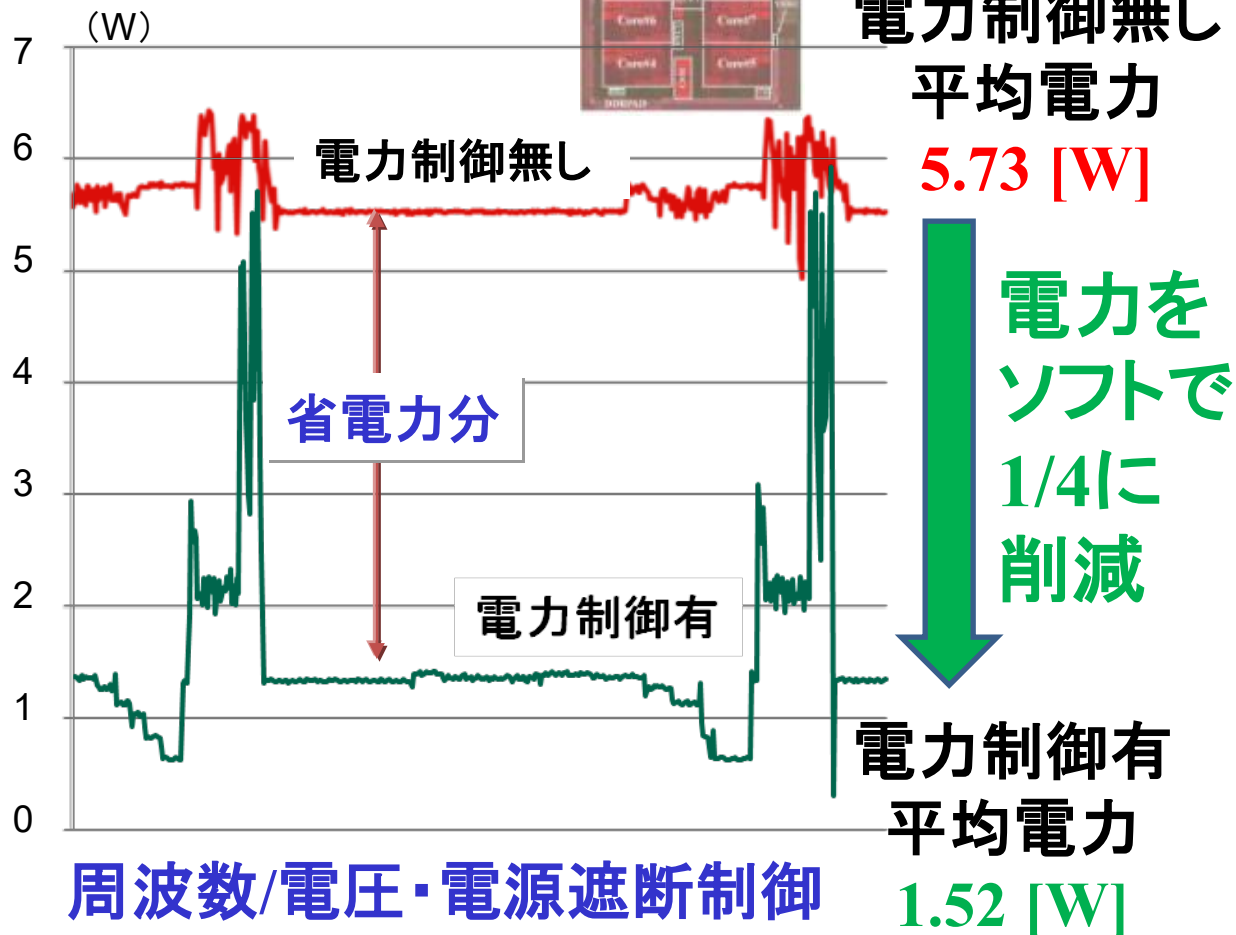
Green Computing Systems R&D Center
Waseda University

Established by Prof. Kasahara supported by METI (Mar. 2011)

＜R & D Target＞

Hardware, Software, Application for Super Low-Power Manycore

- **More than 64 cores**
- **Natural air cooling (No fan) Cool, Compact, Clear, Quiet**
- **Operational by Solar Panel**

<Industry, Government, Academia>

Hitachi, Fujitsu, NEC, Renesas, Olympus, Toyota, Denso, Mitsubishi, Toshiba, OSCAR Technology, etc

＜Ripple Effect＞

- **Low CO_2 (Carbon Dioxide) Emissions**
- **Creation Value Added Products**
- **Automobiles, Medical, IoT, Servers**
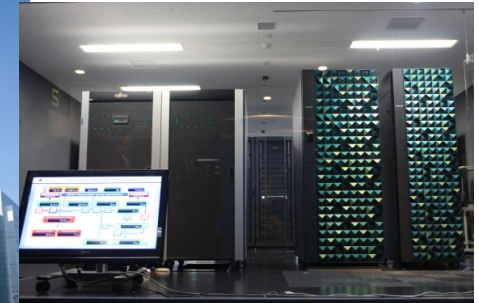
Hitachi SR16000:
  Power7 128coreSMP
Fujitsu M9000
  SPARC VII 256 core SMP

Beside Subway Waseda Station, Near Waseda Univ. Main Campus

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IEEE Computer Society

Bjarne Stroustrup: Morgan Stanley & Columbia Univ.
2018 IEEE Computer Society Computer Pioneer Award
IEEE COMPSAC2018 Keynote & Award Ceremony

MoU with UN ITU in AI for Good, May, Geneva

July 25, 2018 Award Ceremony
Rihga Royal Hotel Tokyo

THE SEYMOUR CRAY AWARD

2018 IEEE COMPUTER SOCIETY SEYMOUR CRAY COMPUTER ENGINEERING AWARD
DR. DAVID E. SHAW
FOR THE DESIGN OF SPECIAL-PURPOSE SUPERCOMPUTERS FOR BIOMOLECULAR SIMULATIONS

- **84,000+ members**
- **480 chapters**
- **168 countries**
- **31 technical committees & councils**

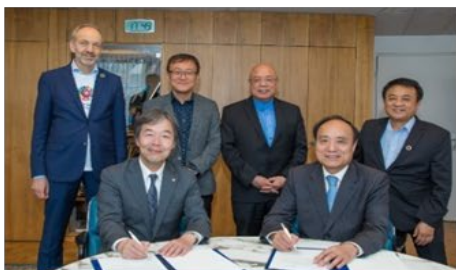**Cornel Univ. Prof. Steven Squyres: Mars Exploration, Caltech. Dr. Katie Bouman:Visualization of Blackhole**
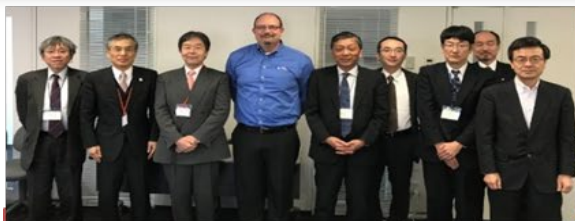
IPSJ Leaders, March, IPSJ Convention, Tokyo

Japan (IPSJ), China(CCF), Korea(KIISE) in March, Waseda U., Tokyo

Okawa Foundation, CS Japan Chapter, Multicore STC & Japanese Government Symp.

MoU with UN ITU in AI for Good, May, Geneva

CCF China National Computer Congress, Oct. , Hangzhou

MoU with Baidu, July, Green Comp. C., Tokyo

Russian Academy of Science: Russian Computer Science 70th Anniversary, Nov., Moscow

IEEE CS China Office moderated Tencent-Waseda Univ. Joint Symposium, Nov., Waseda U., Tokyo

Number of International Students

7,942* from **125*** countries and territories (Undergraduate and Graduate)

Graduate Employability **#1** in private university of Japan (#2 in Japan, #27 in the world) QS Graduate Employability Rankings 2019

ENROLLMENT [学生数]	ALUMNI [卒業生]
49,436	630,000
	FACULTY [教員]
World Business	5,468

PARTNER INSTITUTIONS [協定大学・機関]	NUMBER OF BOOKS [図書館蔵書]	GRADUATE STUDENTS [大学院生]	UNDERGRADUATE STUDENTS [学部生]
848 (93 countries)	5,800,000	8,385	41,051

Alumni CEOs in Japan **10,606**

8 Prime Ministers

Founder Shigenobu OKUMA

Masaru IBUKA   Tadashi YANAI

Hiroshi YAMAUCHI

Prime Ministers	Business Leaders	Business Leaders
	Founders of global companies	CEOs of global companies
8th Shigenobu Okuma		ANA (All Nippon Airways)
17th Shigenobu Okuma		HONDA
55th Tanzan Ishibashi	Sony	Nintendo
74th Noboru Takeshita	Samsung	UNIQLO
76th Toshiki Kaifu	Casio	Shiseido
84th Keizo Obuchi	LOTTE	Nomura Securities Co., Ltd.
85th Yoshiro Mori		Tokio Marine & Nichido Fire Insurance Co., Ltd.
91st Yasuo Fukuda		Olympus Corporation
95th Yoshihiko Noda		

Aiji TANAKA
President International Political Science Association (IPSA) President 2016

Hironori KASAHARA
Senior Executive Vice President IEEE Computer Society President 2018. The first president from outside USA and Canada in 72 years CS history. CS has 84,000 members from, 168 countries.

Toshio FUKUDA
The University Professor Waseda, Waseda Alumnus, Prof. Emeritus Nagoya Univ., Prof. Meijo Univ. IEEE President 2020. The first from Asia in 135 years history. IEEE has 420,000 members.
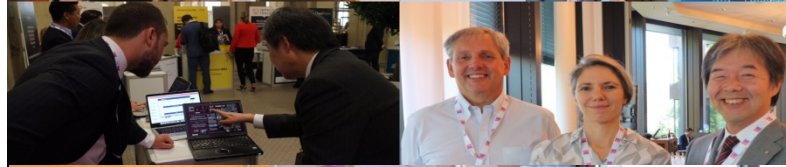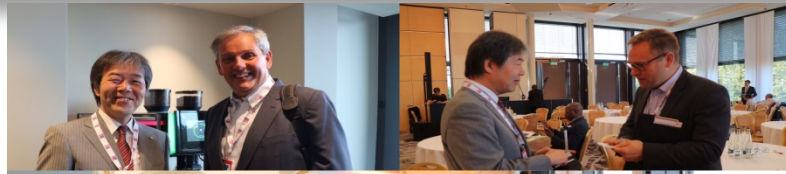
Haruki MURAKAMI

Hirokazu KOREEDA

Yuzuru HANYU

S. ARAKAWA

Daiya SETO

World Leading University Presidents Panel

Vice Chancellor Prof. Louise Richardson
 （WOI 2020で基調講演）
Head of Astrophysics：Prof. Rob Fender
Dept. of Physics: Prof. Ian Shipsey
Astrophysics: Prof. H.Falche, et. al.

Merton College
Warden: Prof. Irene Tracy （2020年1月に来学）
Fellow: Dr. Peter Braam
Sub Warden: Prof. Judy Armitage
CS: Prof. Jeremy Gibbons

Choral Evensong, 750th Anniversary Room

WOI'21
WASEDA OPEN INNOVATION FORUM 2021

Toward Realization of Waseda Open Innovation Ecosystem

International Collaboration	Industry-Academia Collaboration
Venture Startup & Acceleration	Development of Human Resource Understanding Social Needs
Social Sciences, Humanities, Science & Engineering Cooperation	Research Promotion (Including Patents Creation & Licensing)

Matching among people in Industry, Government, Academia, and Waseda

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Waseda Open Innovation Valley Project

> Research Innovation Center to be completed in March 2020
> Industry Academia Collaboration One Stop Desk, Research Support and Strategy, TLO, Contract Support, Venture Start-up Support

Waseda Main Campus

March 10, 2021 in Waseda Arena
Waseda Open Innovation Forum (WoI) 2021
(Matching among Leading Professors & Researchers, Industry, Ventures, Students)

New Research Innovation Center (Open: April 2020)

Toyama Campus

Waseda Arena with roof garden: Collaboration in Sport Science

Supported by METI

Green Computing Center for Industry Collaboration

Supported by MEXT

Research One Stop Desk: https://waseda-research-portal.jp/inquiry/

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