

OCTOPUS: a new supercomputing service of Osaka University

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Cybermedia Center, Osaka University

Cybermedia Center,
Osaka University

Cybermedia Center

- a computing center at Osaka University
 - <http://www.cmc.osaka-u.ac.jp/>
- has a responsibility of providing a powerful high-performance computing environment for university researchers across Japan as a national joint-use facilities.
- Is in charge of the campus IT infrastructure and for promoting its effective use.



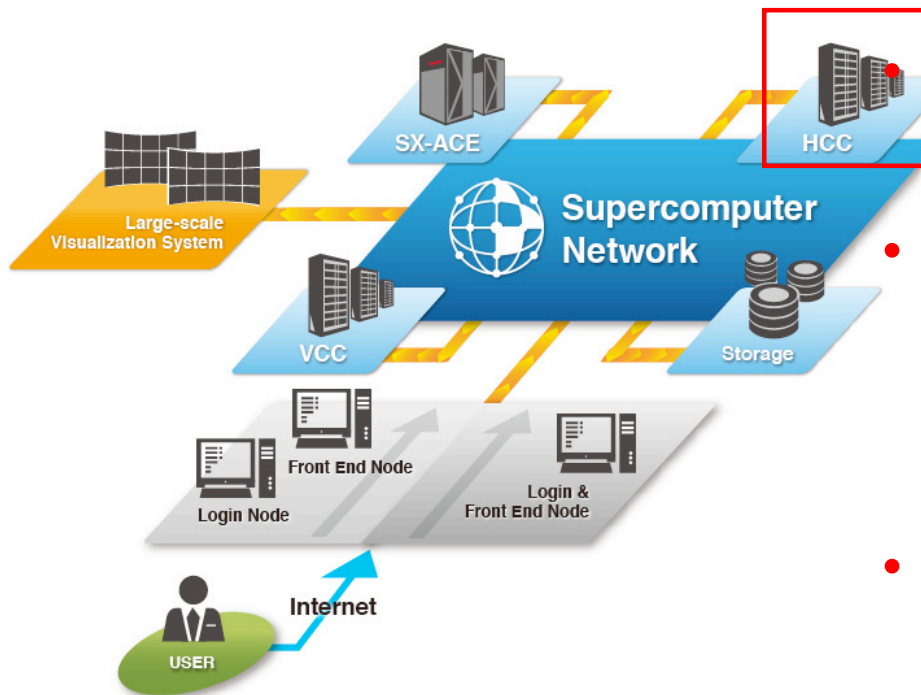
CMC's Suita main building



IT Core Annex: new datacenter building



Overview and Feature of Cybermedia Center's Computing Infrastructure



- **Vector-typed Supercomputer**

- SX-ACE

- **Scalar-typed Supercomputer**

- PC cluster system for large-scale visualization (VCC)
- General-purpose Computer System "Hanyou" Computer Cluster" (HCC)

- **Large-scale Visualization System**

- 24-screen Flat Stereo Visualization System
- 15-screen Cylindrical Stereo Visualization System

SX-ACE of Osaka University



Type: Vector

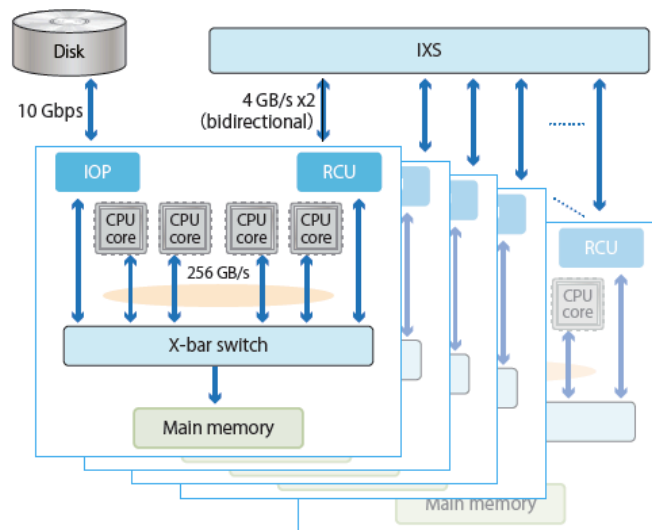
OS: Super-UX

of nodes: 1,536

of cores: 6,144

Total memory: 96 TB

Peak performance: 423 Tflops (inc. scalar processor)



Each node has

- 4-core multi-core vector CPU (256 GFlops)
- 64 GB memory

IXS (Internode crossbar switch) connects 512 nodes and allows 4GB x 2 communication

VCC(PC cluster system for large-scale visualization)



Type: Scalar

OS: Linux

of nodes: 66+3

of cores: 1320 + 84

Total memory: 4.224 + 0.192 TB

Peak performance: 26.4 + 4.5 TFlops

Accelerator: NIVIDA Tesla K20 x 59

- As of 2017.11

66 comptuing nodes (Intel Xeon E5-2670v2 processor, 64GB main memory)

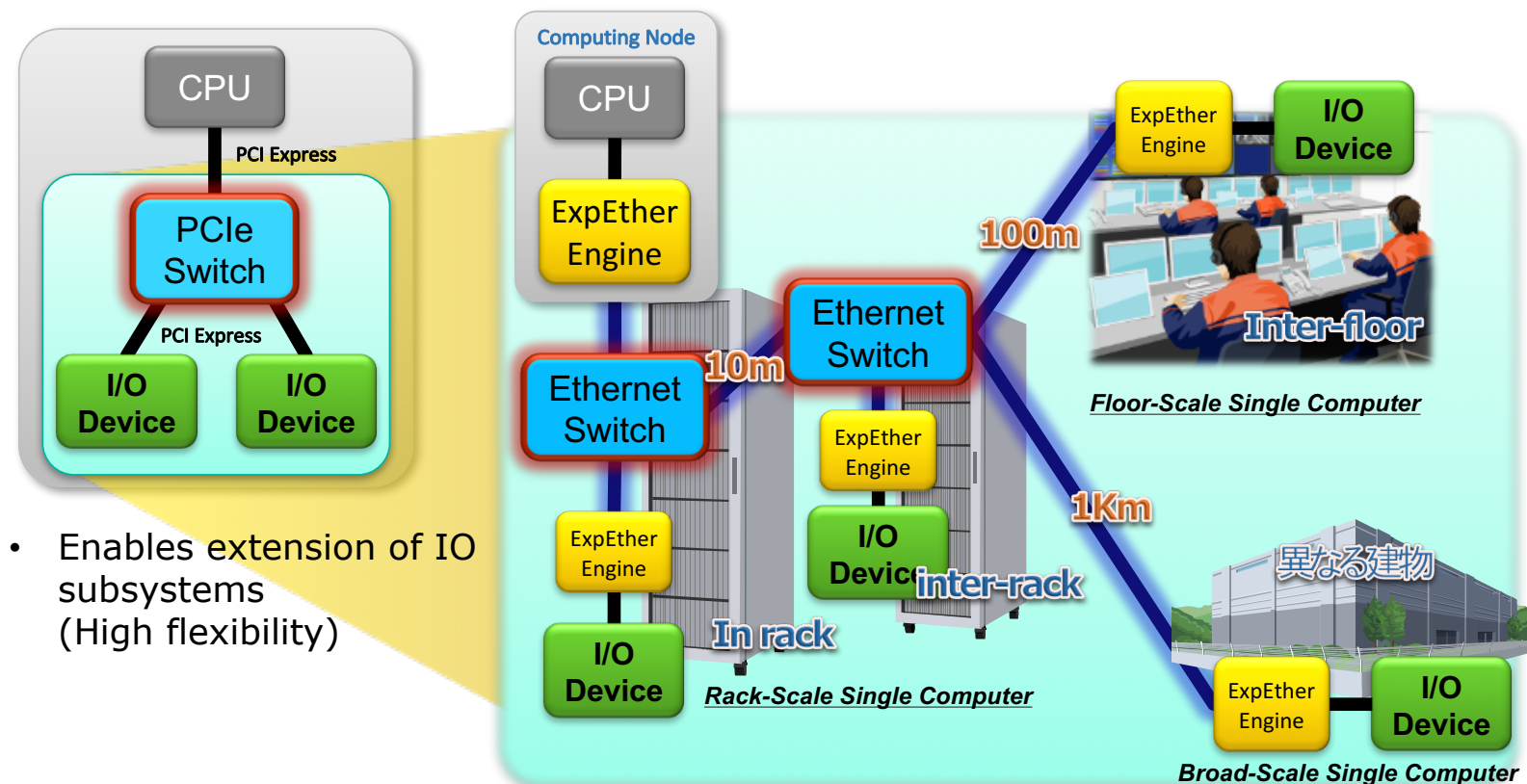
+

3 computing nodes (Xeon E5-2690v4, 64GB)

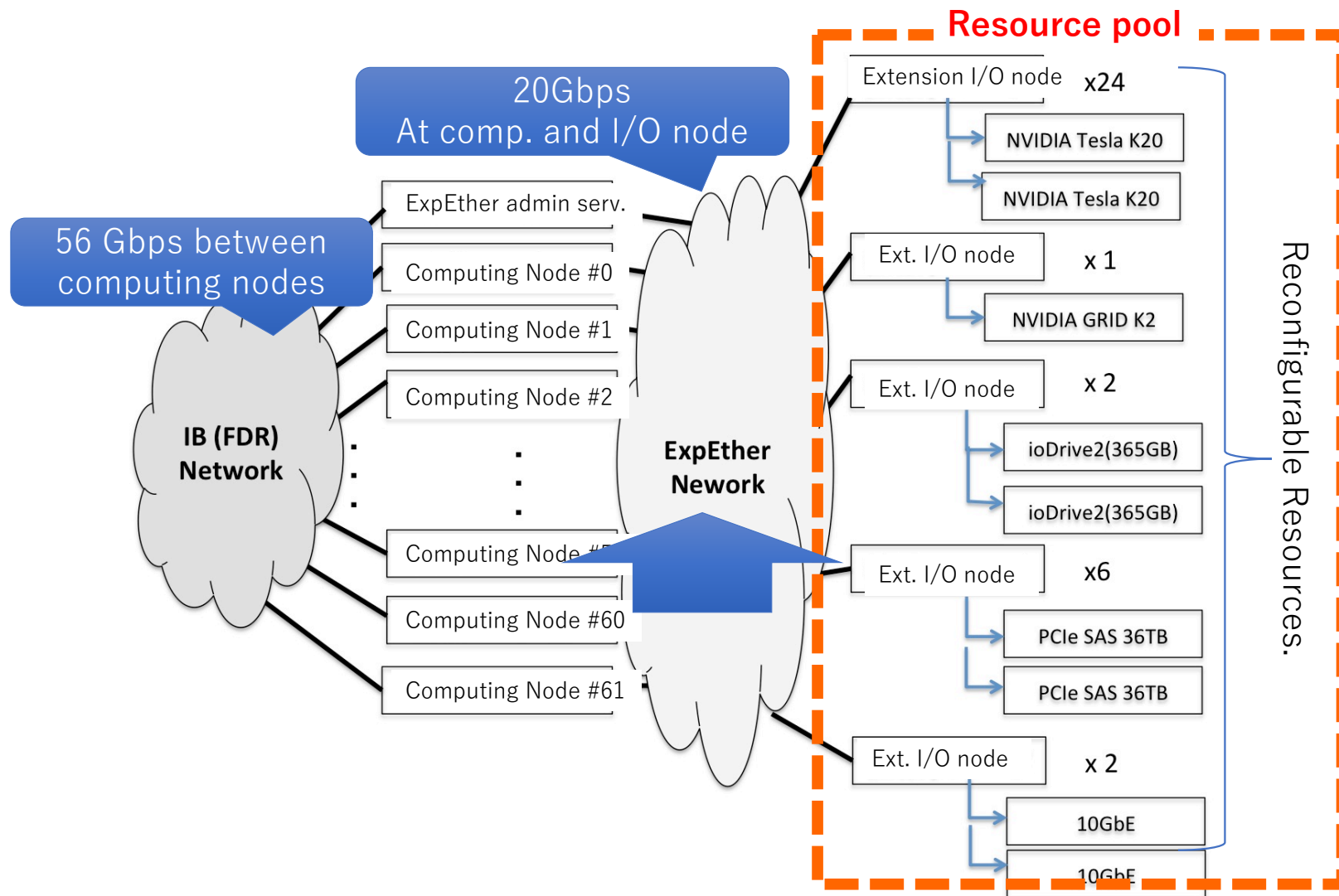
- **Dynamically Reconfigurable Cluster System**
using ExpEther, system virtualization technology from NEC

ExpEther ?

- The world's first technology that extends PCI Express onto Ethernet (L2 layer)
 - Enables “spacious single computer” using networks”



Key feature: Reconfigurability



General-Purpose Computing Cluster “Hanyou” computing Cluster" (HCC)



Type: Scalar (VM)

OS: Linux

of nodes: 575

of cores: 1150

Total memory: 2.6TB

Peak performance: 16.6 TFlops

Expectation to a new scalar system
(Background behind system procurement)

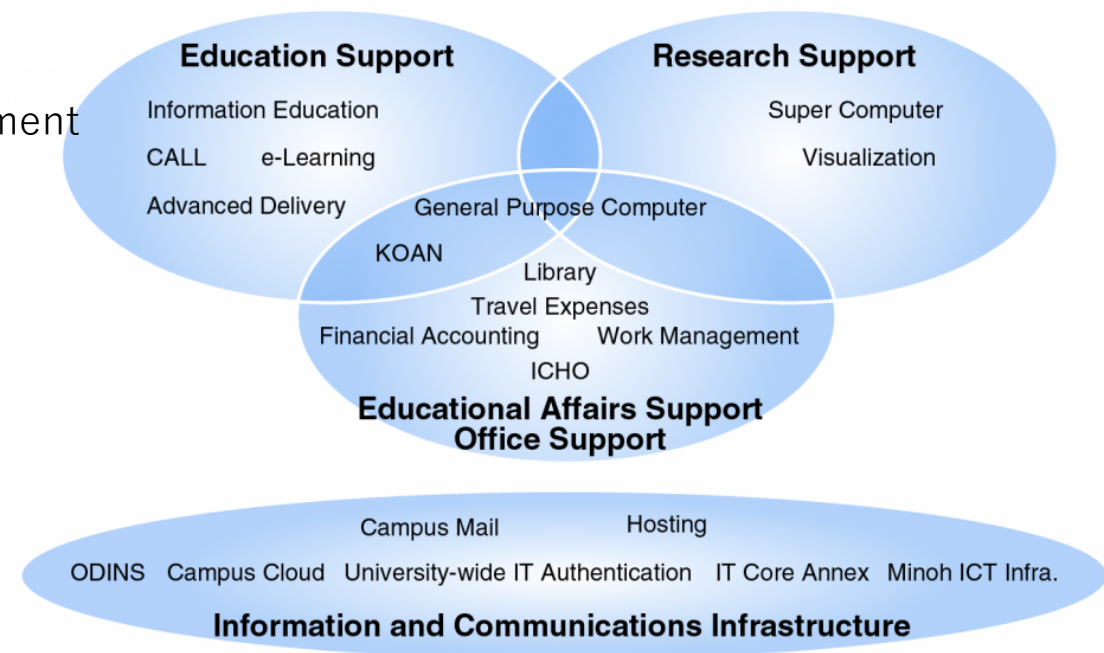
Problem of our scalar-typed computing resources keeping users away from the CMC

- Our scalar-typed computing resources are not sufficient enough to satisfy users requirements and needs.
- The problems of each system is caused from:
 - HCC was procured to be not a high-performance computing resource but "general-purpose" for university-wide .
 - VCC was procured under the supplementary budget from the government, which results in higher service charge.
 - The supplementary budget is expected to use up within the fiscal year and so the future maintenance and support fee cannot be covered.

Problem of HCC system

- In the last procurement, HCC was procured as a part of “general-purpose computer” composed of Educational Computer system, CALL system, High-Performance Computer system, Library system.

- Other education-related systems compresses HPC system.
 - The budget was integrated for the procurement
- Education, Library >> HPC
 - University is Education!!
 - Online Journals are more important..



CMC's university-wide services.

Problem of HCC system

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- HCC is no longer a system for high-performance computing but education system.

- Unstable due to virtualization. (Parallels stop support.. Unknown behaviour)
 - Not high-performance.



Users “hope” has become “hopeless” ...



**Education system froze..
when I moved mouse.**

Windows+ parallels

HW (CPU) IB + network

HCC's software stack.

**Why virtualization for
HPC system?**





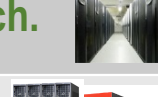



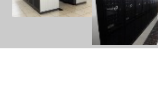
**Why does MPI
communication error take
place?**



Towards OCTOPUS procurement

- Happy “divorce” from education system, CALL system and Library system
 - “property division” based on original budget for each system
(no compensation, no child support : becomes others!)
- re-review users’ requests to next supercomputer & recover users for scalar-typed systems.
 - Towards hybrid type of cluster system that can accommodate a diversity of user requirements.
 - No vector for this procurement. Procurement timing is off. New vector arch. Is too late for our procurement.
 - Dig the potential users’ needs to large-scale memory machine
 - Rescue users who used to enjoy SX-9 with large-memory
 - Life scientists are eager to use.
- Towards large-scale system that satisfies computing needs to scalar-typed computing.
 - Number of nodes > number of cores, number of GPUs
 - Storage 3PB : ScateFS did not support 100Gbps interconnect.
 - Over 1 Peta Flops
 - CMC’s total peak performance of all systems is less than 0.5 PFlops although HPC people say post-peta, exa..
(efficiency is important though)
- Stable performance supply!
 - Water cooling due to higher CPU, GPU TDP
 - Our datacenter building has enough water cooling facility.
- Open “procurement”, of course !
 - Is NEC only looking to JAMSTEC and Tohoku University?

System planning of 9 computing centers (As of May 2016)

Fiscal Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hokkaido	 HITACHI SR16000/M1 (172TF, 22TB) Cloud System BS2000 (44TF, 14TB) Data Science Cloud / Storage HA8000 / WOS7000 (10TF, 1.96PB)				3.2 PF (UCC + CFL/M) 0.96MW				30 PF (UCC + CFL-M) 2MW			
Tohoku	 NEC SX-9 他 (60TF)				SX-ACE(707TF,160TB, 655TB/s) LX406e(31TF), Storage(4PB), 3D Vis, 2MW				~30PF, ~30PB/s Mem BW (CFL-D/CFL-M) ~3MW			
Tsukuba	 HA-PACS (1166 TF) COMA (PACS-IX) (1001 TF)				PACS-X 10PF (TPF) 2MW							
Tokyo	 Fujitsu FX10 (1PFlops, 150TiB, 408 TB/s), Hitachi SR16K/M1 (54.9 TF, 10.9 TiB, 28.7 TB/s)				Reedbush: 1.80-1.93 PF (FAC) 0.6 MW Post T2K: Oakforest-PACS 25 PF (UCC + TPF) up to 4.5MW				100+ PF 4.5MW (UCC + TPF) 50+ PF (FAC) 3.5MW			
Tokyo Tech.	 TSUBAME 2.5 (5.7 PF, 110+ TB, 1160 TB/s), 1.4MW				TSUBAME 2.5 延長運転 3~4 PF TSUBAME 3.0 (20 PF, 4~6PB/s) 2.0MW (3.5アップグレード可能なら2018に40PF)				TSUBAME 4.0 (100+ PF, >10PB/s, ~2.0MW)			
Nagoya	 FX10(90TF) Fujitsu FX100 (2.9PF, 81 TiB) CX400(470TF) Fujitsu CX400 (774TF, 71TiB) SGI UV2000 (24TF, 20TiB)				2MW in total				50+ PF (FAC/UCC + CFL-M) up to 4MW 100+ PF (FAC/UCC+CFL-M) up to 4MW			
Kyoto	 Cray: XE6 + GB8K + XC30 (983TF) Cray XC30 (584TF)				Cray XC40(5.5PF) + CS400(1.0PF) 1.3 MW				50-100+ PF (FAC/TPF + UCC) 1.8-2.4 MW			
Osaka	 NEC SX-ACE NEC Express5800 (423TF) (22.4TF)				3.2PB/s,10~20Pflop/s, 1.0-1.5MW (CFL-M) 0.7-1PF (UCC)				25.6 PB/s, 50-100Pflop/s,1.5-2.0MW			
Kyushu	 HA8000 (712TF, 242 TB) SR16000 (6.2TF, 6TB) FX10 (272.4TF, 36 TB) CX400 (966.2 TF, 183TB)				2.0MW 15-20 PF (UCC/TPF) 2.6MW FX10 (90.8TFLOPS)				100-150 PF (FAC/TPF + UCC/TPF) 3MW			

電力は最大供給量（空調システム含む）

Real Voice from Users(1)

I hope next system have **more computing nodes** because waiting time is long due to higher utilization.



A system that allows us **to perform middle-class parallel computing (nonetheless, parallelism should be around thousands)** towards the future use of K computer.



Vector typed system is preferable.



As I am planning to use my own code (■ ■ simulation), I don't have any requests to application installation. My first choice is a cluster system where MPI and OpenMP are available. In near future, I would like to consider the use of GPU and FPGA. **I do not recommend any vector-typed machine due to lack of generality.**



I prefer **x86 server with large amount of memory.**
Pascal-GPGPU is also preferable.



I am strongly hoping that the CMC should **have more application software installed.** In comparison with other computing centers in the former imperial universities, application software is too weak.



Real Voice from Users(2)



It is preferable that memory capacity is **more than 64GB (the same size of SX-ACE), 128GB** if possible. Size of recent ■ ■ is becoming large and so I hope next system has enough memory. Memory access performance is also important.



Please **put higher priority to communication performance**. (I hear the story of ○X university. Because they squeezed a penny for communication performance, efficiency of ■ ■ code had dropped to 0.1 %.) I hear other similar stories of taking communication lighter to raise peak performance. Again, **do not squeeze a penny for communication**.



I personally **prefer NVIDIA GPU** because it offers higher performance. (*snip*) In the case of introducing GPU to the next system, please provide user training sessions about CUDA and OpenACC.



XeonPhi. I hear bad stories about Knights Corner, the first generation available now (○○university ….) I would like to expect next-generation Knights Landing.. For ■ ■ user, **XeonPhi may be better than NVIDIA GPU because users can use it without a lot of knowledge and expertise.**

Real Voice from Users(3)



I hope that next system should have **more computing nodes**, because waiting time is too long and it seems that many users are waiting.

At "tensorflow", a python module must have glibc v.2.15 later and so, for example, **newer version CentOS 7 later** would come in handy



I am doing the research of utilizing plasma simulator at ○X science research institute. I would like to use a cluster system **with more tens of thousands cores.**

My specialty area is fluid engineering. Recently, it is natural to perform parallel computing using multiple cores. I feel like "consuming computing resources as infrastructure" the same way as water and electricity, rather than "using computing resources in a trial-and-error manner so far. Although I misunderstand because I am directly not using the computer systems at the CMC, **I often hear (a) MPI job is not executed, (b) system often stops, (c) data staging is always required all the time.** These situations are bad and inconvenient as computing infrastructure. I would like to request the improvement of these situations.



Roadmap to OCTOPUS

仕様書

全国共同利用大規模並列計算システム

Large-scale Parallel Computing System for Nation-wide Shared Use

- Feb.17, 2016 Explanatory meeting of system introduction
- Jul.28, 2016 Explanatory meeting of specification draft
- Feb. 6 ,2017 Bid announcement
- Feb. 13, 2017 Pre-bid meeting
- Apr. 3, 2017 Deadline for bid
- May 31, 2017 Bid Opening
- Dec. 1, 2017 Service starts

大阪大学サイバーメディアセンター

平成29年2月

OCTOPUS Overview

OCTOPUS

- is short for **Osaka university Cybermedia cenTer's Over-Petascale Universal Supercomputer**.
- We are really eager to obtain a Peta-Flops system.
- The CMC' system is difficult to remember. Not fun!
 - Vcc, ace, hcc.. PCC.
- Many Japanese people associate TAKOYAKI with Osaka.

Takoyaki (たこ焼き or 蛸焼) is a ball-shaped Japanese snack made of a [wheat flour](#)-based [batter](#) and cooked in a special molded pan. It is typically filled with minced or diced [octopus](#) (*tako*), [tempura](#) scraps (*tenkasu*), [pickled ginger](#), and [green onion](#).^{[1][2]} Takoyaki are brushed with takoyaki sauce (similar to [Worcestershire sauce](#)) and [mayonnaise](#), and then sprinkled with green laver (*aonori*) and [shavings](#) of dried [bonito](#). There are many variations to the takoyaki recipe, for example, [ponzu](#) (soy sauce with [dashi](#) and citrus vinegar), goma-dare (sesame-and-vinegar sauce) or vinegared dashi.

Yaki is derived from "*yaku*" (焼く) which is one of the cooking methods in Japanese cuisine, meaning "to fry or grill", and can be found in the names of other [Japanese cuisine](#) items such as [okonomiyaki](#) and [ikayaki](#) (other famous Osakan dishes)

from wikipedia



CPU nodes



NEC LX 2U Twin2 Server 406 Rh-2 (59: 236nodes)

Many-core nodes



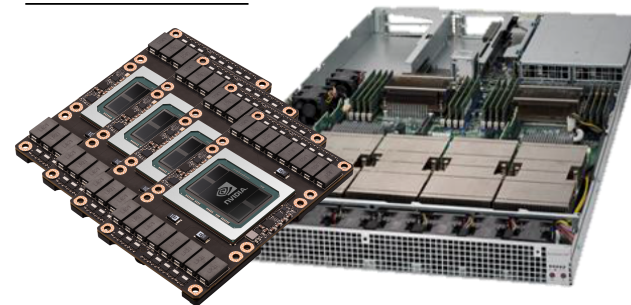
NEC Express5800/HR110c-M (11: 44nodes)

Storage



DDN EXAScaler (3.1PB)

GPU nodes



NEC LX 1U 4GPU Server 102Rh-1G (37: 37 nodes)

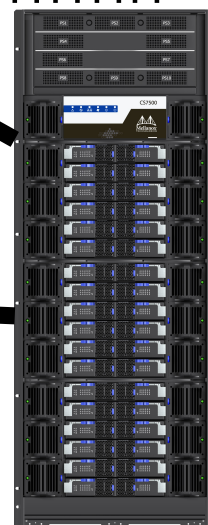
Large-scale shared memory nodes



NEC LX 116Rg-7 (2: 2nodes)



NEC LX 4U-GPU server 108Th-4G (4)



Mellanox CS7500
648 port EDR InfiniBand Director
Switch

1.46 PFlops

NEW ARRIVAL SUPERCOMPUTER "OCTOPUS"

全国共同利用大規模並列計算システム、12月新規導入。



CYBERMEDIA CENTER, OSAKA UNIVERSITY



ベタフロップス級ハイブリッド型
スーパーコンピュータ 2017年度お試し利用開放!

- 1 全国の研究者が利用可能
- 2 多様な計算ニーズへの対応
- 3 ベタフロップス級大規模計算能力
- 4 安定した動作環境の提供

全国の研究者の多様な計算ニーズの収容を目的とする全国共同利用大規模並列計算システム (OCTOPUS) は、汎用CPU計算ノード群、メニーコア型計算ノード群、GPU計算ノード群、大容量主記憶計算ノード群、大容量ストレージから構成されるハイブリッド型スーパーコンピュータです。本システムに搭載するプロセッサ、GPUアクセラレータは水冷方式により定常的に冷却され、総理論演算性能1.463PFlopsを安定的に提供します。稼働開始後から2018年3月末までの試験運用期間中、本センターの利用資格を満たす皆様には無料でお試し利用いただけます。

お問い合わせ・お申込み
2017年度無料利用は右記URLよりお申し込み下さい。
大阪大学 サイバーメディアセンター 応用情報システム研究部門
大阪大学 情報基盤研究推進部 研究システム課
system@cmc.osaka-u.ac.jp, 06-6879-5813
<http://osku.jp/b0815>

FREE TRIAL
新スーパーコンピュータOCTOPUS、2017年度、お試し利用受付中！
稼働開始後から2018年3月末までの試験運用期間中、大阪大学サイバーメディアセンターの利用資格を満たす皆様には無料でお試し利用いただけます。研究室の計算機性能では足りない方、最新プロセッサあるいはアクセラレータを使ってみたい方をはじめ、スーパーコンピュータを使ったことのない方も是非この機会にご利用をご検討ください。
無料開放スケジュール
2017年 12月開始 サイバーメディアセンター 一部開放 (各利用機関 随時)
2018年 1月中旬 サイバーメディアセンター 一部開放開始

Procurement results

• NEC fielding awarded.

• A hybrid cluster system composed of

- General CPU nodes: 236 (471.24TFlops)
 - Intel Xeon Gold 6126 (Skylake/ 2.6Ghz, 12 cores) x 2
 - 192GB memory
- GPU nodes: 37 (858.28TFlops)
 - Intel Xeon Gold 6126 (Skylake/ 2.6Ghz, 12 cores) x 2
 - 192GB memory
 - NVIDIA Tesla P100 (NVLINK) x 4
- Many-core nodes: 44 (117.14TFlops)
 - Intel Xeon Phi 7210 (KNL/ 1.3Ghz, 64 cores) x 1
 - 192GB memory
- Large-scale shared-memory nodes : 2 (16.38 Tflops)
 - Intel Xeon Platinum 8153 (Skylake/ 2.0Ghz, 16 cores) x 8
 - 6TB memory
- Storage (Lustre 3.1 PB)

However, current situation is...

- **Delayed!!!!** Waiting for the arrival of CPU/GPU/many-core/large-memory nodes....
 - Right before leaving Japan, I hear the first server is scheduled to arrive on Oct. 28.



DDN Storage and Mellanox was installed on Sep.11.



Water cooling facility has been already expanded in our data center building.

Cybermedia Center Osaka University

Basic policy/strategy for supercomputing system planning

- Targeting high-memory bandwidth and so aims to improve 8-10 times larger in memory BW every procurement
- Promotion of cluster architecture that can allows users to use vector and scalar computing depending on applications.
- Streamlining the entire scientific workflow from data collection to visualization

Fiscal Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Current	NEC SX-ACE (type: CFL-M) (memory BW 393.2TB/s, peak perf. 393.2TFlops, power consumption 0.74MW) + VCC (type: UCC) (peak perf. 84.8TFlops)											
next					CFL-M	(memory BW 3.2PB/s? , peak perf. 10-20Pflops, power 1.0-1.5MW)						
				UCC	(peak perf. 0.7 – 1PFlops)							
Next next											TPF	
											(memory BW 25.6 PB/s, peak perf. 50-100Pflop, power consumption 1.5-2.0MW) + UCC	

Expansion of industrial use and collaboration

- From social contribution and regional contribution, we would like to actively conduct collaboration and industrial use
- Seeking for New computing needs

Human resource development

- Nurturing of human resources who can solve e-scientific problems leveraging HPC and VIS
- Development of human resources who can lead to new architecture based on integrated vector and scalar

Towards a new computing service through OCTOPUS

- **R&D of new technology that accommodate a diversity of computing needs w/ NEC collaboration research division of CMC**
 - Secure Stage-in mechanism that allows scientists to treat security-sensitive data on supercomputers (last year: wssp by me)
 - Flexible supercomputing that allows reconfiguration of hardware and software based on users's computing requirements (two years ago: wssp by Prof. Shinji Shimojo)
- **More seminar and training opportunities to users.**
 - GPU challenge w/ NVIDIA
 - Tuning support w/ NEC
- **Outreach and advertisement to new users**
 - Octopus rack design
 - More explanatory opportunities to industry users.

Research and Development

Severity Measurement

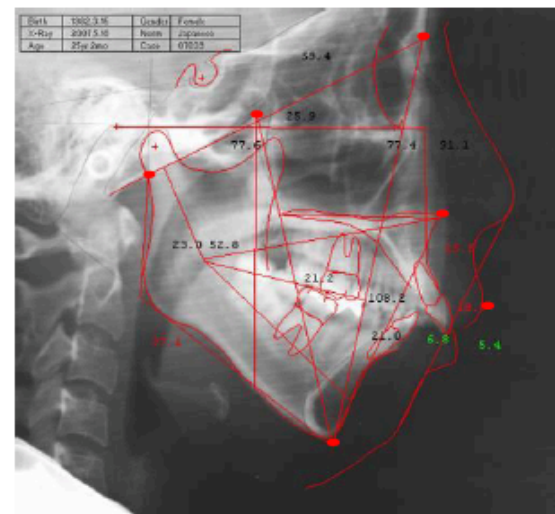
Index of Orthodontic Treatment Priority (IOTN)

one of the severity measures for malocclusion and jaw abnormality, which determines whether orthodontic treatment is necessary



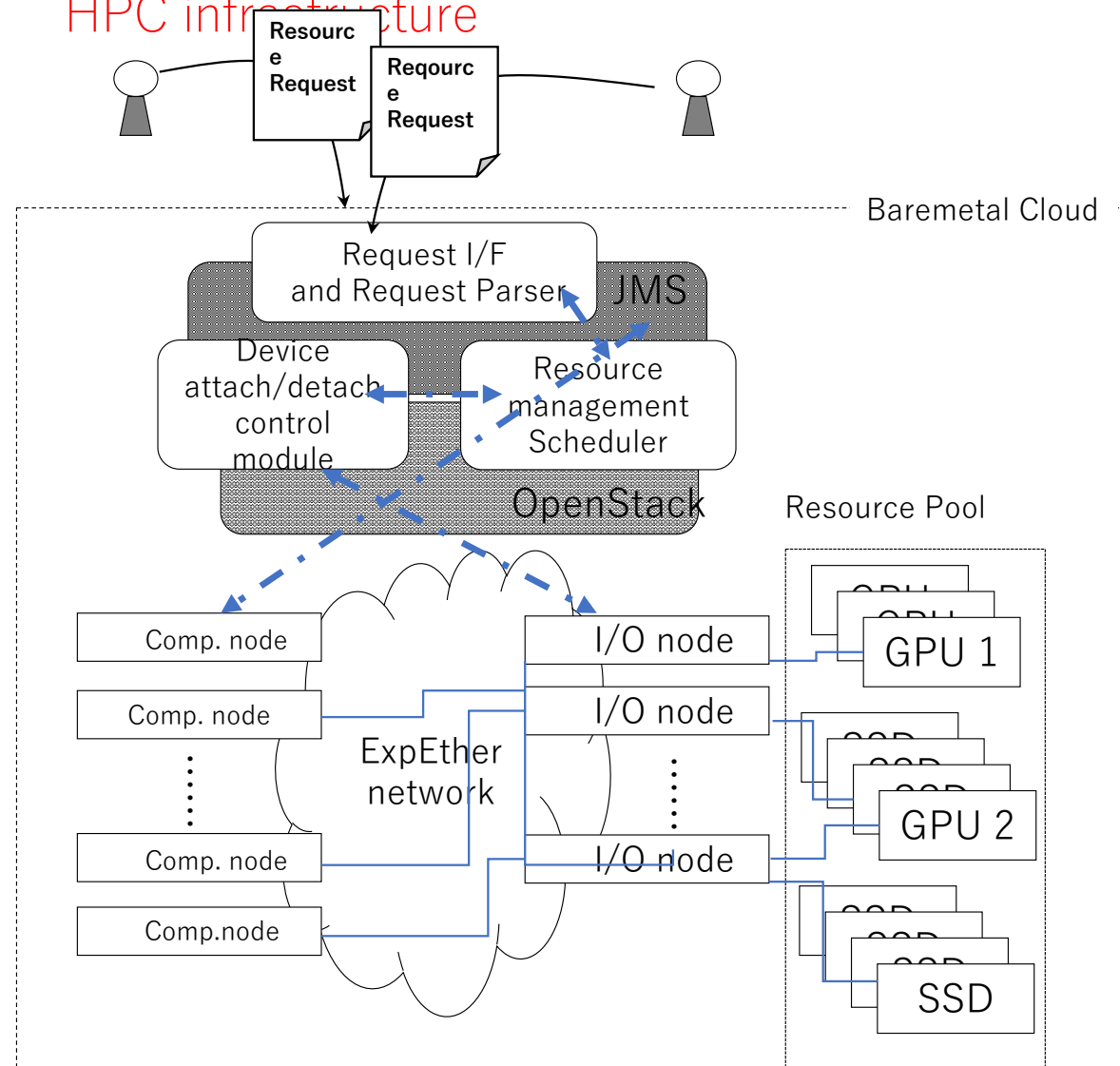
Morphological Landmarking

- Feature point detection
- measurement



Seiya Murata, Chonho Lee, Yujin Shimizu, Chihiro Tanikawa, Kazunori Nozaki, Susumu Date,
“Towards a Fully Automated Diagnostic System for Orthodontic Treatment in Dentistry”,
The thirteenth IEEE eScience Conference (e-science2017), Auckland, New Zealand, Oct. 2017.

Basic idea: dynamic reconfigurable
HPC infrastructure

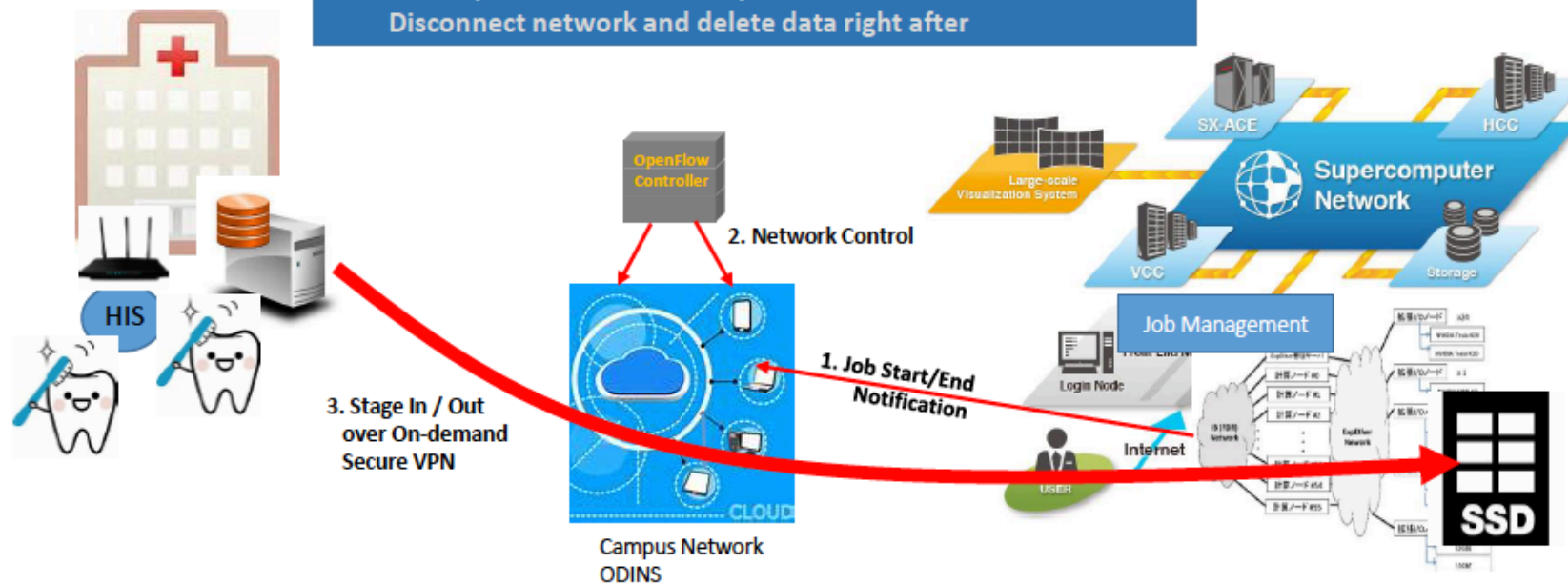


Secure VPN for Healthcare Data Analytics

- A Healthcare Infrastructure that supports secure, big data analytics using various data analytics services

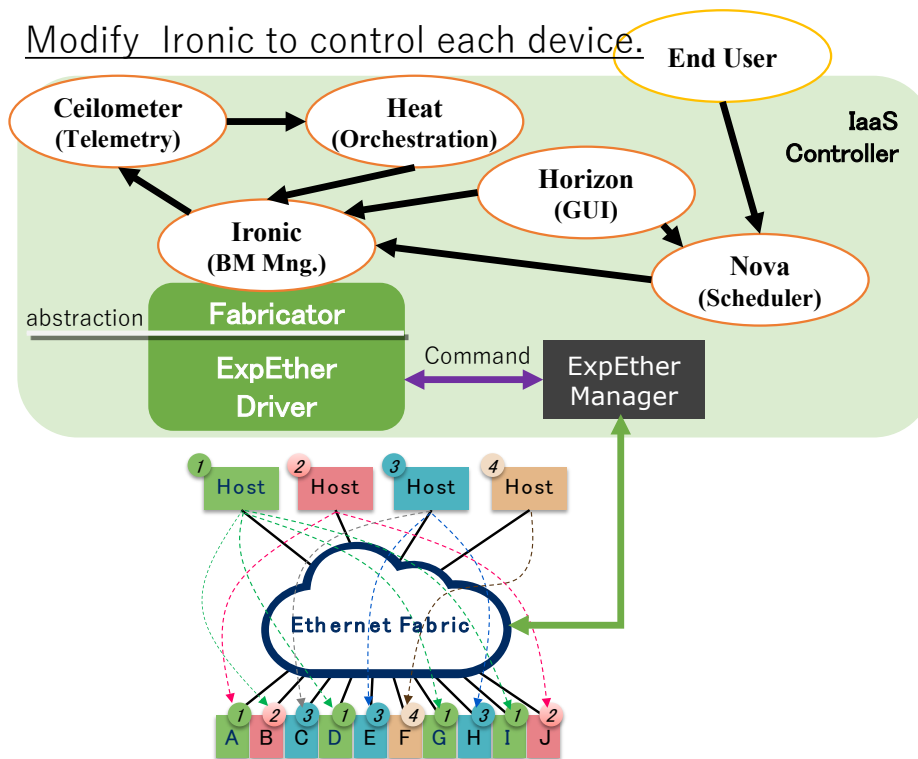
On-demand Secure Stage-in/out

Connect CMC-Group network and locate/transfer data to compute nodes when only needed.
Disconnect network and delete data right after

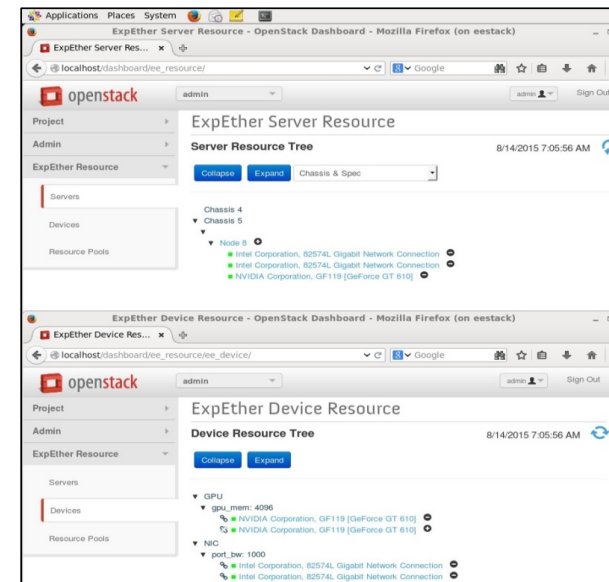


Hi-laaS: OpenStack Based Resource Management

- Modify Ironic (Bare metal control) to device level.



GUI on modified Horizon



Akihito Misawa, Susumu Date, Keichi Takahashi, Takashi Yoshikawa, Masahiko Takahashi, Masaki Kan, Yasuhiro Watashiba, Yoshiyuki Kido, Chonho Lee, Shinji Shimojo, "Highly Reconfigurable Computing Platform for High Performance Computing Infrastructure as a Service: Hi-laaS", The 7th International Conference on Cloud Computing and Services Science (CLOSER 2017), pp. 135-146, Apr. 2017. [DOI: [10.5220/0006302501630174](https://doi.org/10.5220/0006302501630174)]

More seminar and training
opportunities attracting users

OCTOPUS Celebration GPU Challenge

Cybermedia Center, Osaka University
Large-Scale Computer System

Access Sitemap 日本語 English

For the Future userFor the Userfor Research Proposal Based UseFor HPCIFor JHPCN

SystemService Guide / ApplicationSupportTraining/SeminarPublicationAchievement

Event/Explanatory meetingCybermedia Center, Osaka University > Training/Seminar > OCTOPUS Celebration GPU Challenge

OCTOPUS Celebration GPU Challenge

OCTOPUS Celebration GPU Challenge

Abstract

The Cybermedia Center, Osaka University will start the computing service by **OCTOPUS**, a hybrid-typed cluster system with 1.46 PFlops peak performance, composed of general CPU nodes, many-core nodes, GPU computing nodes, large-scale main memory nodes, and large-scale storage.

In this challenge, as a part of celebration of OCTOPUS introduction, we call for programs (non-commercial) that can be accelerated on the coming GPU computing nodes of OCTOPUS, so that GPU computing nodes are leveraged right after system introduction. The programs accepted in this challenge will be performance-tuned and optimized by the Cybermedia Center and NVIDIA experts.

GPU computing nodes of OCTOPUS has four NVIDIA GPU Tesla P100 equipped on NVLink high-speed interconnect network. This architecture provides a unified memory space of 64GB GPU memory(16GBx4) and CPU memory (192GB) for high parallelism.

This challenge aims to compare vector processing on SX-ACE and computing performance of Tesla P100. For the reason, this challenge targets programs currently executed on a single node of SX-ACE.

Please apply if you have any concern and interest to this challenge.

Applicant Guidelines

Application Period	Oct. 2 – Oct. 15, 2017
Application Qualification	Users of the Cybermedia Center
Target Program	Programs currently executed on a single node of SX-ACE
Number of Target Programs	a few
How to apply	Please apply from the following form.

Date : Oct 2 – Oct 15, 2017
Organizer: Cybermedia Center, Osaka University, NVIDIA
Venue: -
Type : Tuning support
Quota:
Application deadline: Oct. 15, 2017

• Motivation

- Many users are still stuck on a single SX-ACE node although they want to have more computational power.
 - Tuning support (migration to MPI) are available through NEC experts on the CMC though.
- Unified memory feature of P100 allows users to use 64GB GPU memory space (same as SX-ACE)
- Want to compare a single SX-ACE node a single GPU node using our user's actual code (for next procurement of supercomputer ?)
 - Performance, Programmability, Maintainability, Cost, etc..

• SX-ACE

- 4-core multi-core vector CPU 256GFlops (64GFlops x 4 cores)
- 64GB memory

• OCTOPUS GPU node.

- Intel Xeon Gold 6126 (Skylake/ 2.6Ghz, 12 cores) x2 (1.9968TFlops)
- NVIDIA Tesla P100 x 4 (21.2 TFlops)
- 192GB memory

OCTOPUS Rack Design Contest

- Publicly call for rack design of OCTOPUS for outreach and advertisement to the public.

スーパーコンピュータをキャンパスに絵を描いてみませんか？

大阪大学サイバーメディアセンターでは、2017年12月に日本全国の大学、研究所、企業の研究者が利用可能なスーパーコンピュータシステム「OCTOPUS (Osaka university Cybermedia cenTer Over-Petascale Universal Supercomputer)」の運用を開始いたします。スーパーコンピュータOCTOPUSの導入・運用開始を記念して、今後のOCTOPUSの“顔”となるデザインを募集いたします。採用されたデザインは、本センターのデータセンターであるITコア棟内の設置エリアに配置される計算ラック群(1940mm x 3500mm)に描画されます。また、本センターのウェブページ、広報資料等、幅広く利用されます。

締切

2017年9月20日 作品提出・応募締め切り、必着

賞

最優秀賞(1点) ノートパソコン、表彰状

募集内容

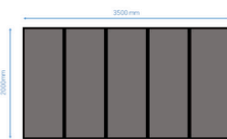
「OCTOPUS」のデザイン

下記のキーワードから想像されるデザイン

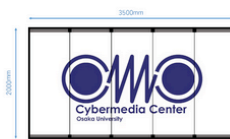
- 「大阪」
- 「皆に愛される」
- 「最先端の科学研究」
- 「スーパーコンピュータ」



「OCTOPUS」計算ラック群
白抜きの箇所にデザインを描画いたします



「OCTOPUS」計算ラック群
平面図



「OCTOPUS」計算ラック群
デザイン掲載イメージ

Why don't you draw your design on the canvas on our supercomputer system?

Cybermedia Center Osaka University will start the computing service of OCTOPUS (Osaka university Cybermedia cenTer Over-Petascale Universal Supercomputer) from Dec. 2017. The supercomputer system is expected to be utilized by researchers and engineers in academia and industry. As one of celebration events, we publicly call for the rack design of OCTOPUS to be "the face of OCTOPUS system". The adopted rack designed will be put into the series of computing racks (1940mm x 3500mm) on the IT core building, our data center facility. Also, it will be widely used for the advertisement of the system through our project web page, advertisement materials and so on.

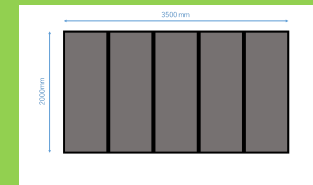
What we call for?

"OCTOPUS" rack design that can be associative with the following keywords.

- "Osaka"
- "Beloved From Everybody"
- "Cutting-edge Scientific Research"
- "Supercomputer"



OCTOPUS" Computing racks.
The awarded design is put onto the white region.



"OCTOPUS" Computing racks.
2D diagram

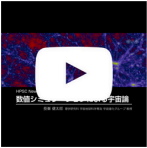



"OCTOPUS" Computing racks.
Image of computing racks whether
the design is put

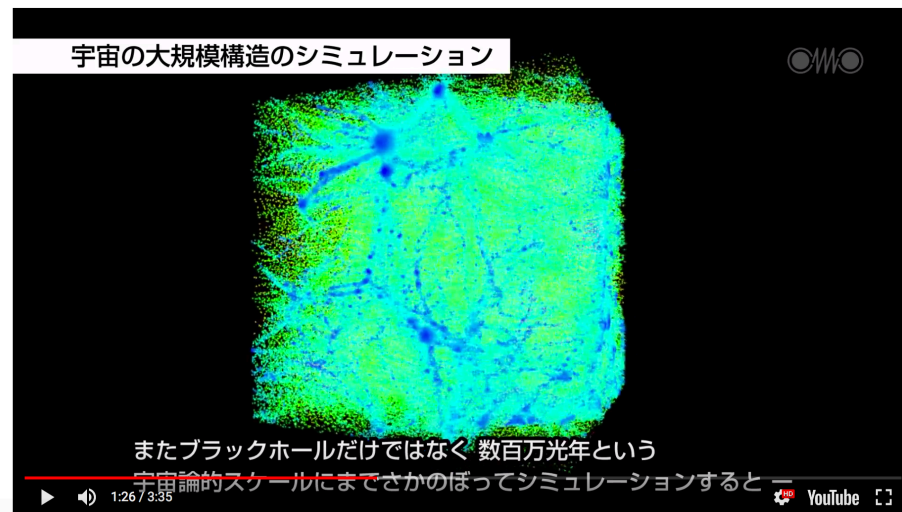
Outreach to the public
for getting the understanding of
supercomputing

HPSC news released on Youtube.

<http://www.hpc.cmc.osaka-u.ac.jp/en/hpsc-news/>

System	Service Guide / Application	Support	Training/Seminar	Publication	Achievement
HPSC (High Performance Scientific Computing News) Cybermedia Center, Osaka University > HPSC (High Performance Scientific Computing News)					
HPSC News picks up researchers who conduct their advanced scientific research leveraging large-scale computer in the Cybermedia Center.					
<div><div>vol.02 Cosmology with Numerical Simulations Researcher : Kentaro Nagamine Affiliation : Osaka University, Department of Earth and Space Science, Graduate School of Science, Professor Thanks to the explosive astronomical observations over the past two decades, humankind has obtained the expanding Big Bang Universe as a standard cosmological model. However, does such a model really reproduce the large-scale structure and galaxies that we see in the sky? Our goal is to reveal the secrets of cosmological structure formation using supercomputers in the Universe dominated by dark matter and dark energy. Our research is gradually revealing how large-scale structures, galaxies and supermassive black holes form in this Universe.</div></div> <div><div>vol.01 Air flow analysis on speech production Researcher : Kazunori Nozaki Affiliation : Osaka University Dental Hospital, Assistant Professor Speech is physically classified as aerodynamic acoustics, and the sound generated from the turbulence that is uttered in the oral cavity of the speaker propagates to the eardrum of the listener. This phenomenon can be visualized by using the supercomputer. In this research, as a first step, using the state-of-the-art medical imaging diagnostic apparatus, the airway shape at the time of utterance was measured and fluid simulation was carried out. In the future, by combining it with medical information, we plan to link speech information to medical information which is information</div></div>					

Pick up researchers who conduct their advanced scientific research leveraging large-scale computer in the Cybermedia Center.



Summary

- Background (dark-side story) behind the procurement of our new supercomputer "OCTOPUS" was presented.
- OCTOPUS system is a hybrid cluster system of SKL, KNL, GPU and large-scale shared memory nodes with 3.1 PB on IB EDR. Computing service will start at Dec. 1.
- Based on how OCTOPUS is used, we are preparing for the procurement (8- times larger than OCTOPS) of next supercomputer system.