

Overview of Reedbush-U

How to Login

Information Technology Center
The University of Tokyo

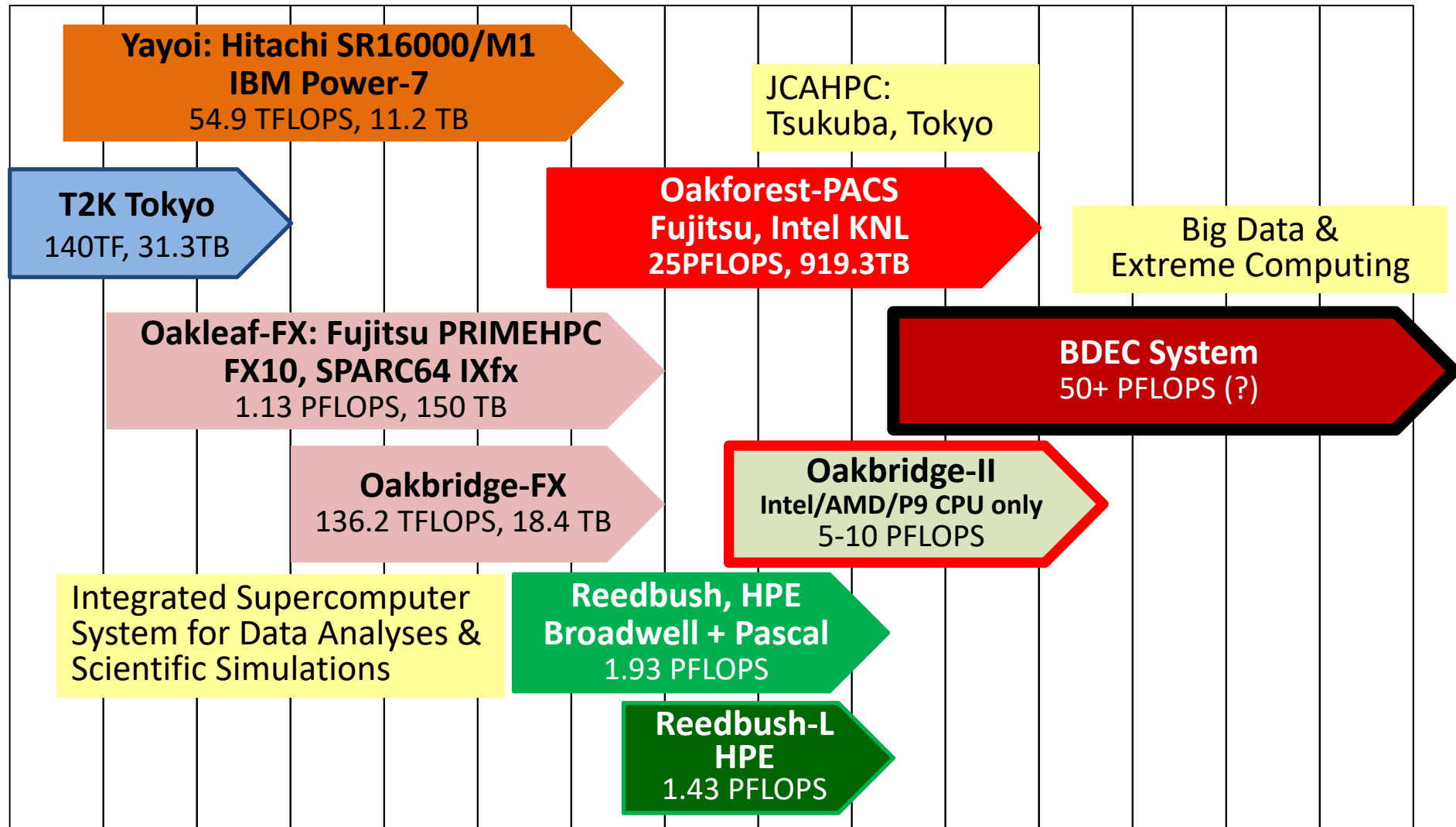
<http://www.cc.u-tokyo.ac.jp/>

Supercomputers in ITC/U.Tokyo

2 big systems, 6 yr. cycle

FY

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25



Now operating 4 (or 6) systems !!

- Oakleaf-FX (Fujitsu PRIMEHPC FX10)
 - 1.135 PF, Commercial Version of K, Apr.2012 – Mar.2018
- Oakbridge-FX (Fujitsu PRIMEHPC FX10)
 - 136.2 TF, for long-time use (up to 168 hr), Apr.2014 – Mar.2018
- **Reedbush (HPE, Intel BDW + NVIDIA P100 (Pascal))**
 - Integrated Supercomputer System for Data Analyses & Scientific Simulations
 - Jul.2016-Jun.2020
 - **Our first GPU System**, DDN IME (Burst Buffer)
 - **Reedbush-U: CPU only, 420 nodes, 508 TF (Jul.2016)**
 - **Reedbush-H: 120 nodes, 2 GPUs/node: 1.42 PF (Mar.2017)**
 - **Reedbush-L: 64 nodes, 4 GPUs/node: 1.43 PF (Oct.2017)**
- **Oakforest-PACS (OFP) (Fujitsu, Intel Xeon Phi (KNL))**
 - JCAHPC (U.Tsukuba & U.Tokyo)
 - 25 PF, #7 in 49th TOP 500 (June.2017) (#1 in Japan)
 - Omni-Path Architecture, DDN IME (Burst Buffer)

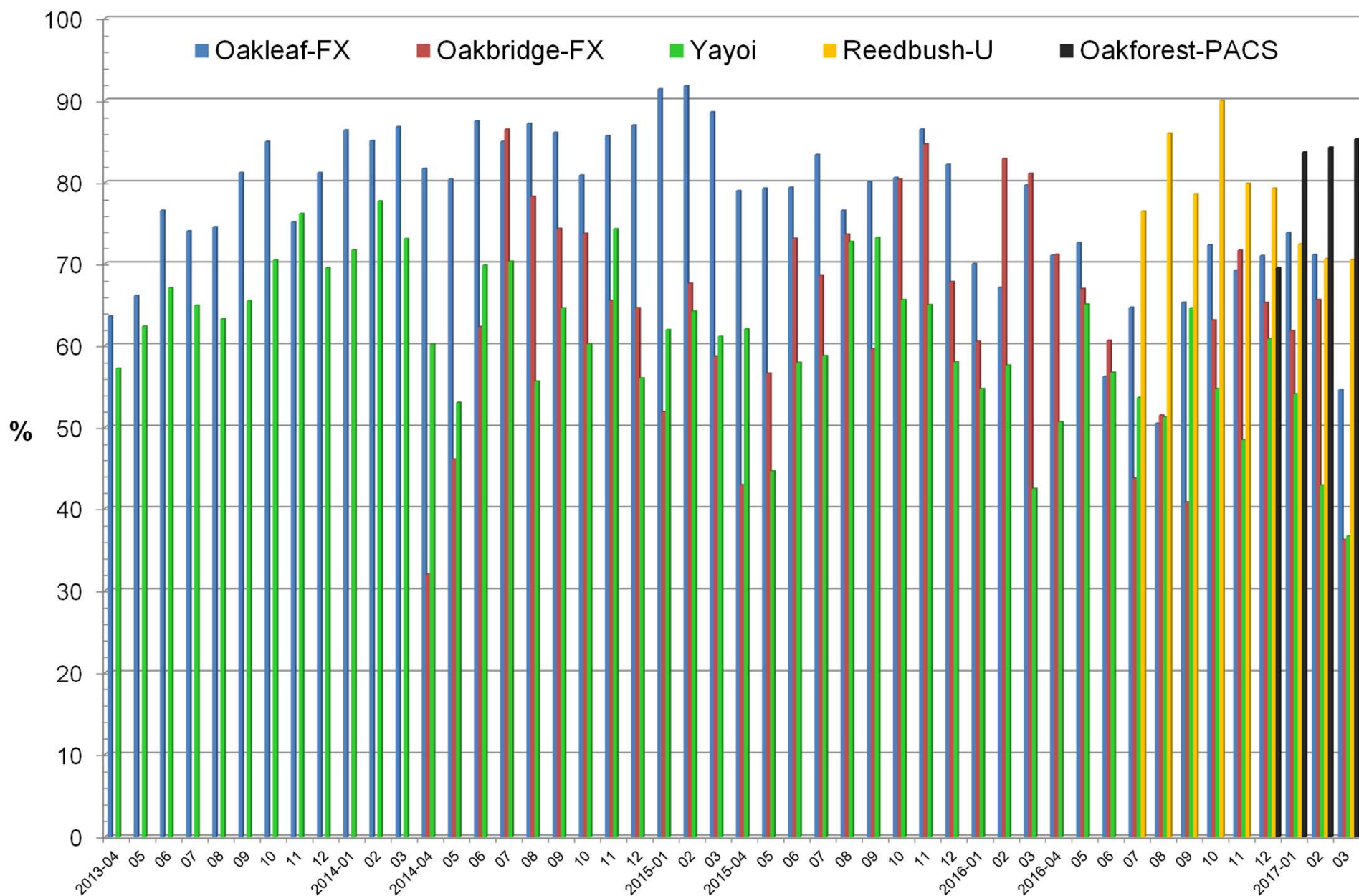


JPY (=Watt)/GFLOPS Rate

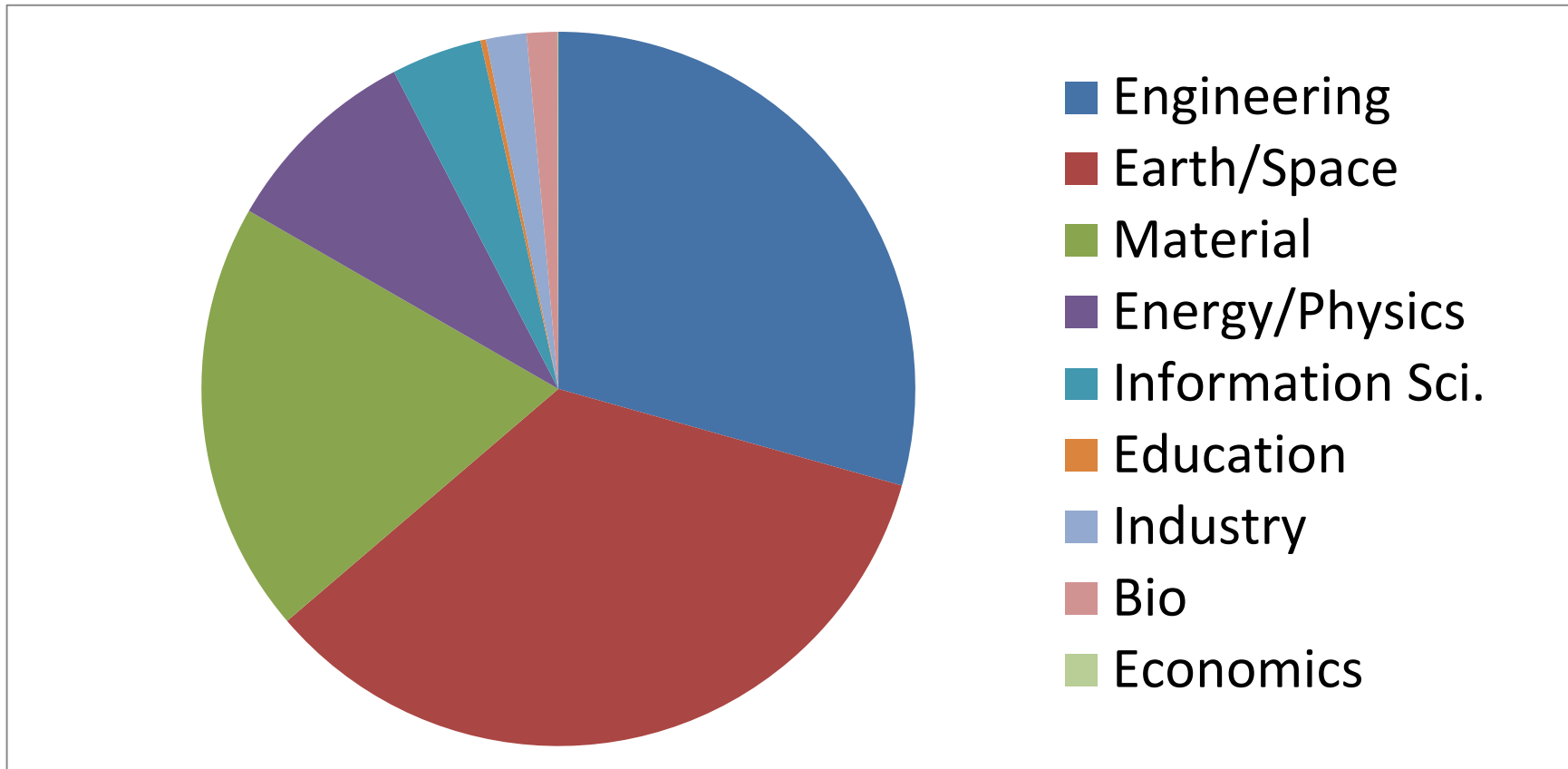
Smaller is better (efficient)

System	JPY/GFLOPS
Oakleaf/Oakbridge-FX (Fujitsu) (Fujitsu PRIMEHPC FX10)	125
Reedbush-U (SGI) (Intel BDW)	62.0
Reedbush-H (SGI) (Intel BDW+NVIDIA P100)	17.1
Oakforest-PACS (Fujitsu) (Intel Xeon Phi/Knights Landing)	16.5

Work Ratio

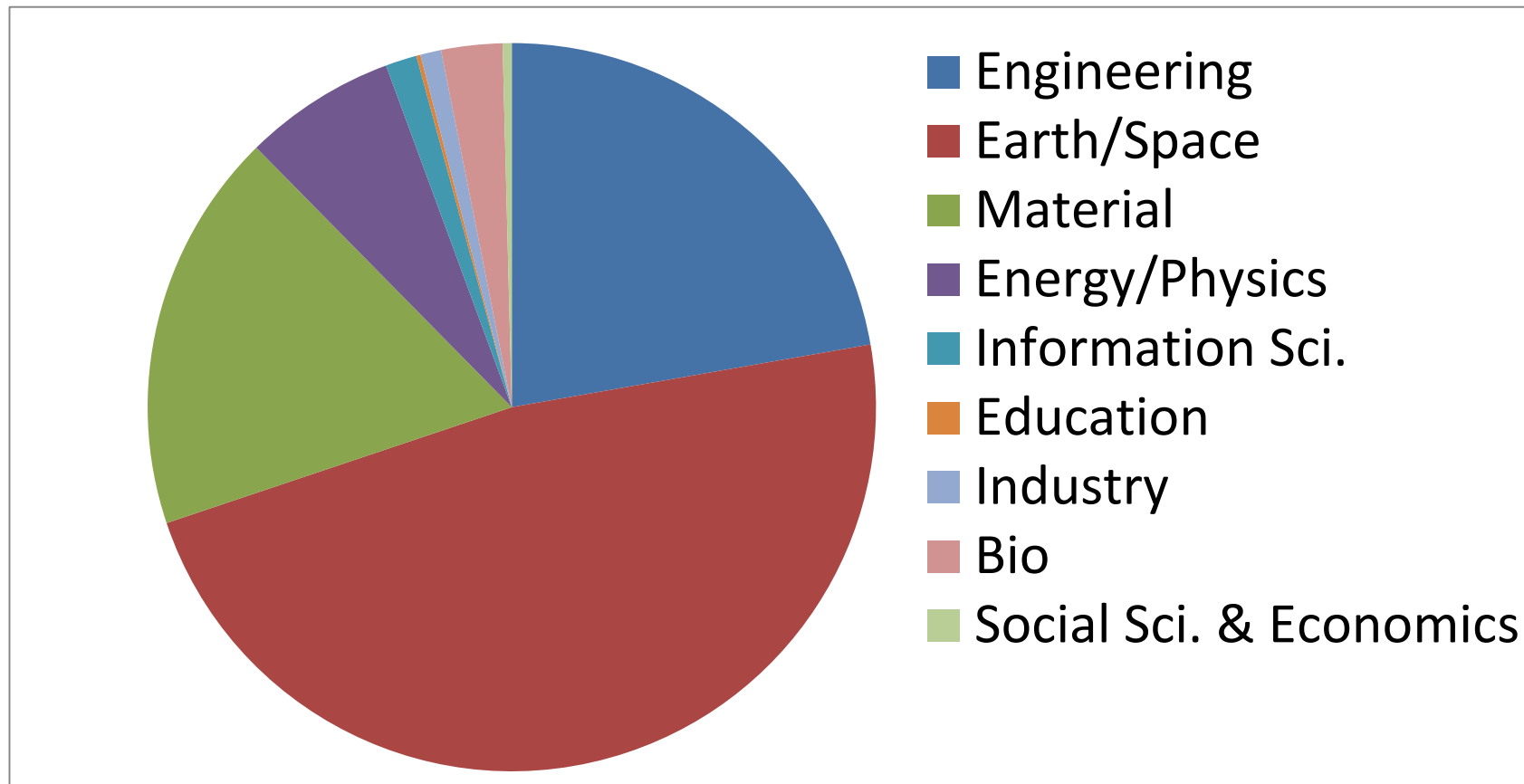


Research Area based on CPU Hours FX10 in FY.2015 (2015.4~2016.3E)



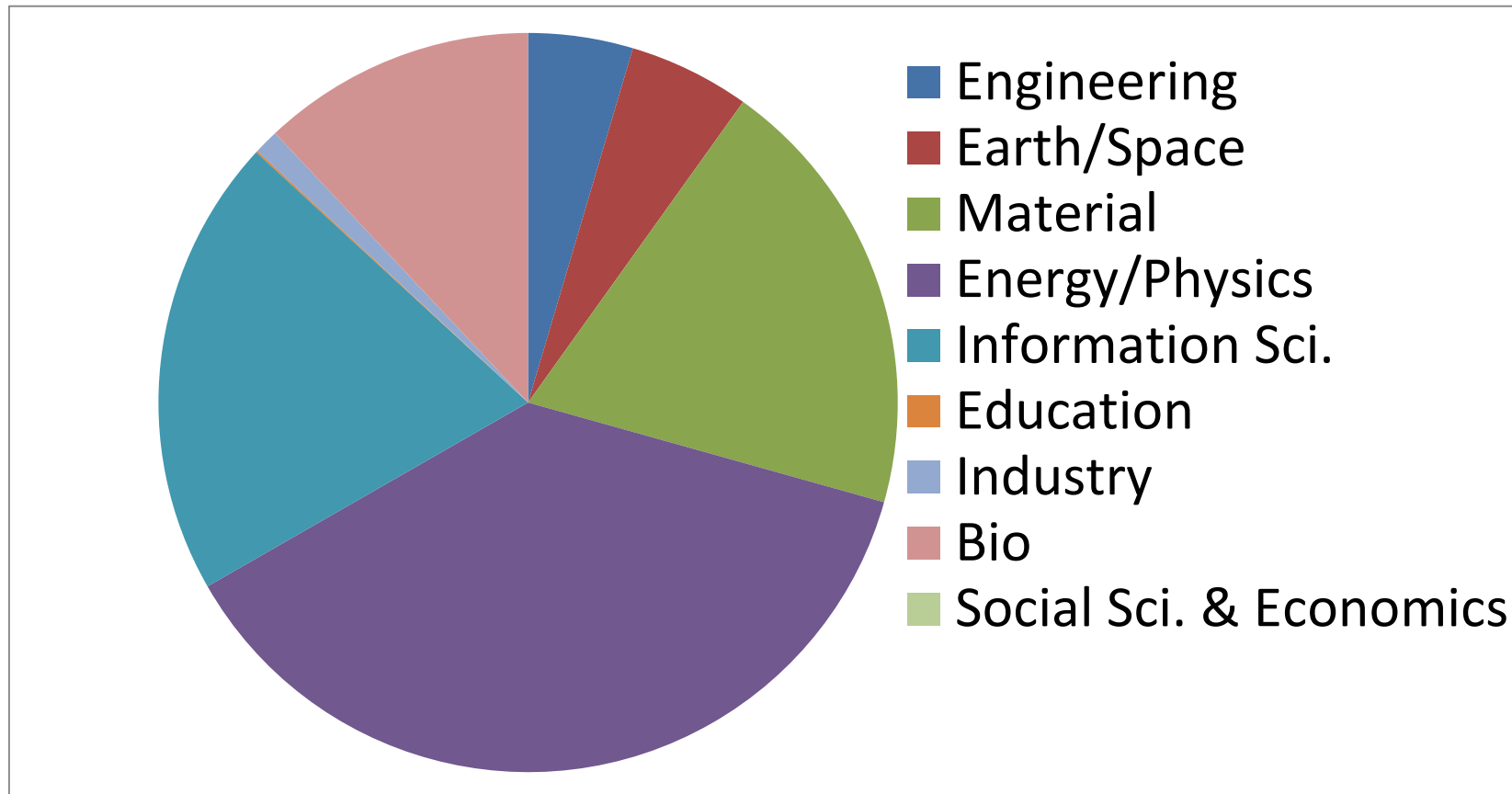
Oakleaf-FX + Oakbridge-FX

Research Area based on CPU Hours FX10 in FY.2016 (2016.4~2017.3E)



Oakleaf-FX + Oakbridge-FX

Research Area based on CPU Hours Reedbush-U in FY.2016 (2016.7~2017.3E)



Oakforest-PACS (OFP)

- Full Operation started on December 1, 2016
- 8,208 Intel Xeon/Phi (KNL), 25 PF Peak Performance
 - Fujitsu
- **TOP 500 #7 (#1 in Japan), HPCG #5 (#2) (June 2017)**
- **JCAHPC: Joint Center for Advanced High Performance Computing)**
 - University of Tsukuba
 - University of Tokyo
 - New system will installed in Kashiwa-no-Ha (Leaf of Oak) Campus/U.Tokyo, which is between Tokyo and Tsukuba
 - <http://jcahpc.jp>



東京大学
THE UNIVERSITY OF TOKYO



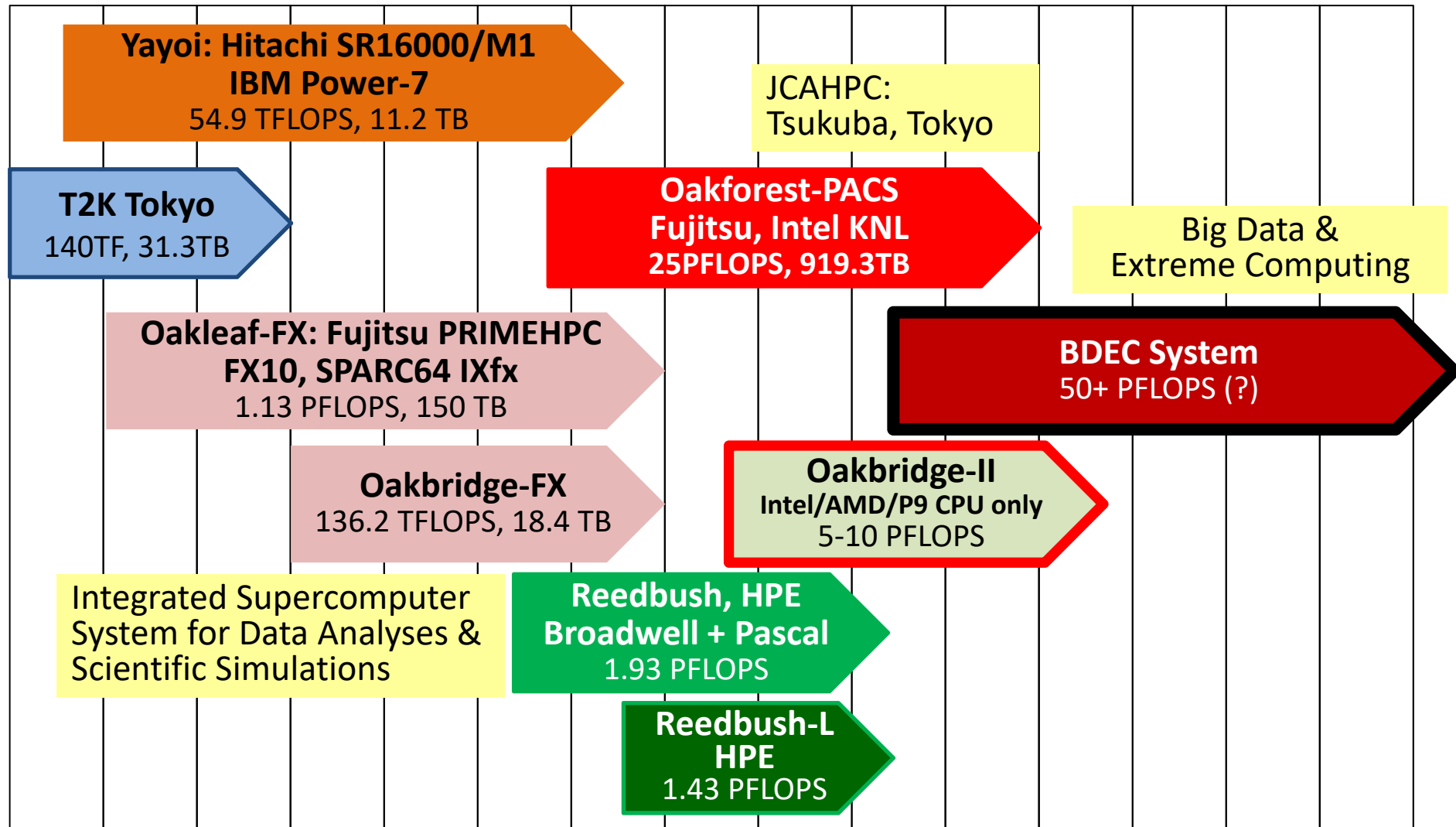
筑波大学
University of Tsukuba

Supercomputers in ITC/U.Tokyo

2 big systems, 6 yr. cycle

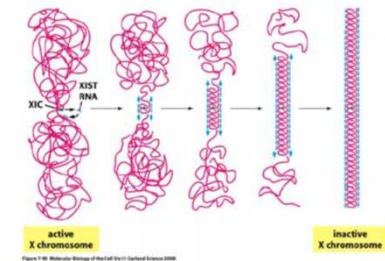
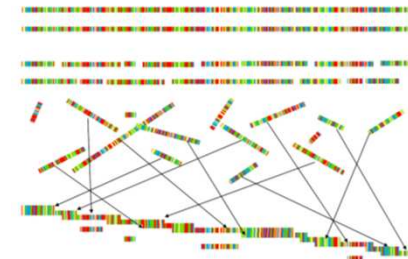
FY

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25



Reedbush: Our First System with GPU's

- Before 2015
 - CUDA
 - We have 2,000+ users
- Reasons of Changing Policy
 - Recent Improvement of OpenACC
 - Similar Interface as OpenMP
 - Research Collaboration with NVIDIA Engineers
 - Data Science, Deep Learning
 - New types of users other than traditional CSE (Computational Science & Engineering) are needed
 - Research Organization for Genome Medical Science, U. Tokyo
 - U. Tokyo Hospital: Processing of Medical Images by Deep Learning



Reedbush (1/2)

Integrated Supercomputer System for Data Analyses & Scientific Simulations

- SGI was awarded (Mar. 22, 2016)
- Compute Nodes (CPU only): Reedbush-U
 - Intel Xeon E5-2695v4 (Broadwell-EP, 2.1GHz 18core) x 2socket (1.210 TF), 256 GiB (153.6GB/sec)
 - InfiniBand EDR, Full bisection Fat-tree
 - Total System: 420 nodes, 508.0 TF
- Compute Nodes (with Accelerators): Reedbush-H
 - Intel Xeon E5-2695v4 (Broadwell-EP, 2.1GHz 18core) x 2socket, 256 GiB (153.6GB/sec)
 - NVIDIA Pascal GPU (Tesla P100)
 - (5.3TF, 720GB/sec, 16GiB) x 2 / node
 - InfiniBand FDR x 2ch (for ea. GPU), Full bisection Fat-tree
 - 120 nodes, 145.2 TF(CPU)+ 1.27 PF(GPU)= 1.42 PF

Why “Reedbush” ?



Blaise Pascal
(1623-1662)

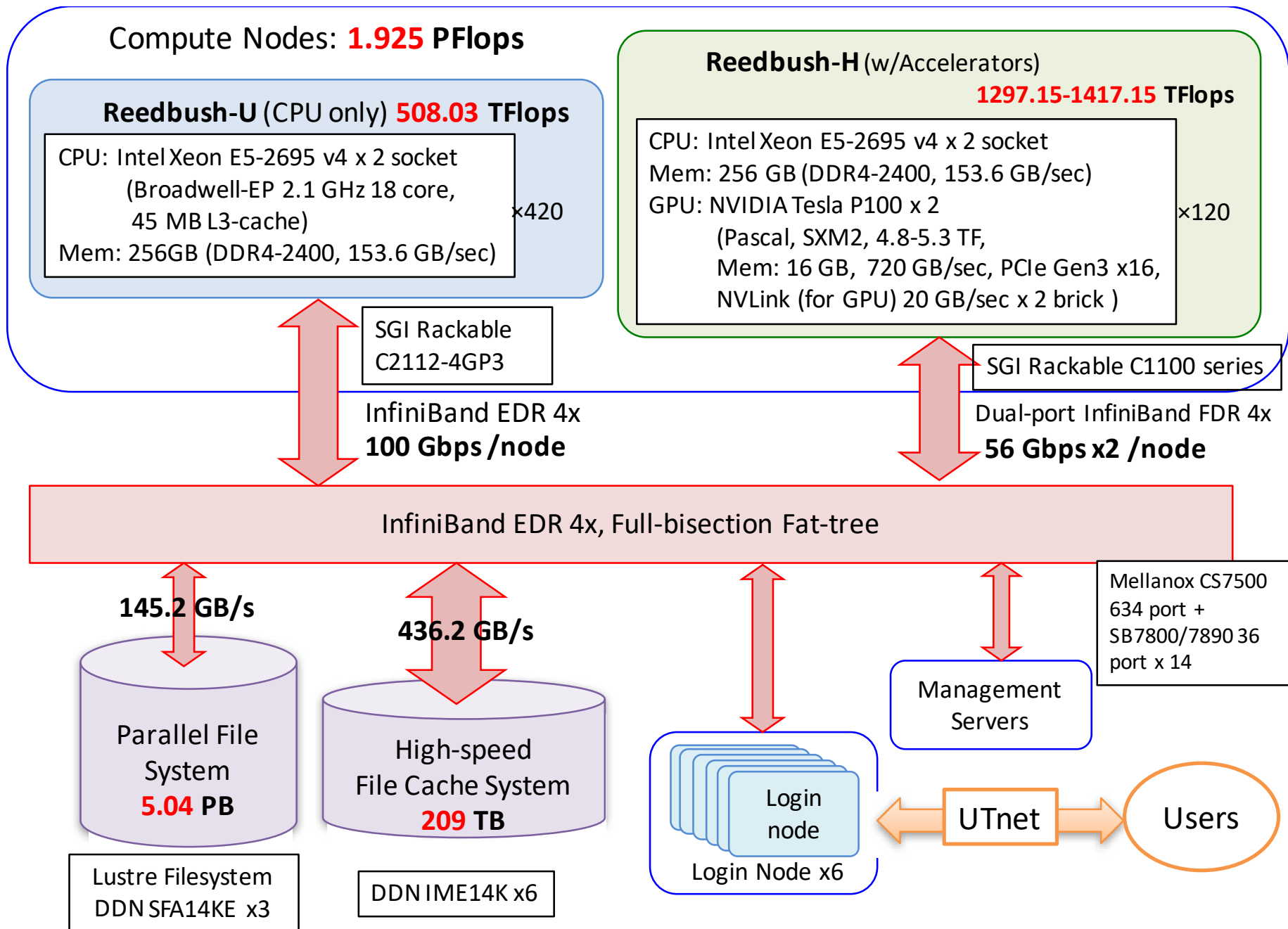
- L'homme est un roseau pensant.
 - Man is a thinking reed.
 - 人間は考える葦である
- Pensées (Blaise Pascal)



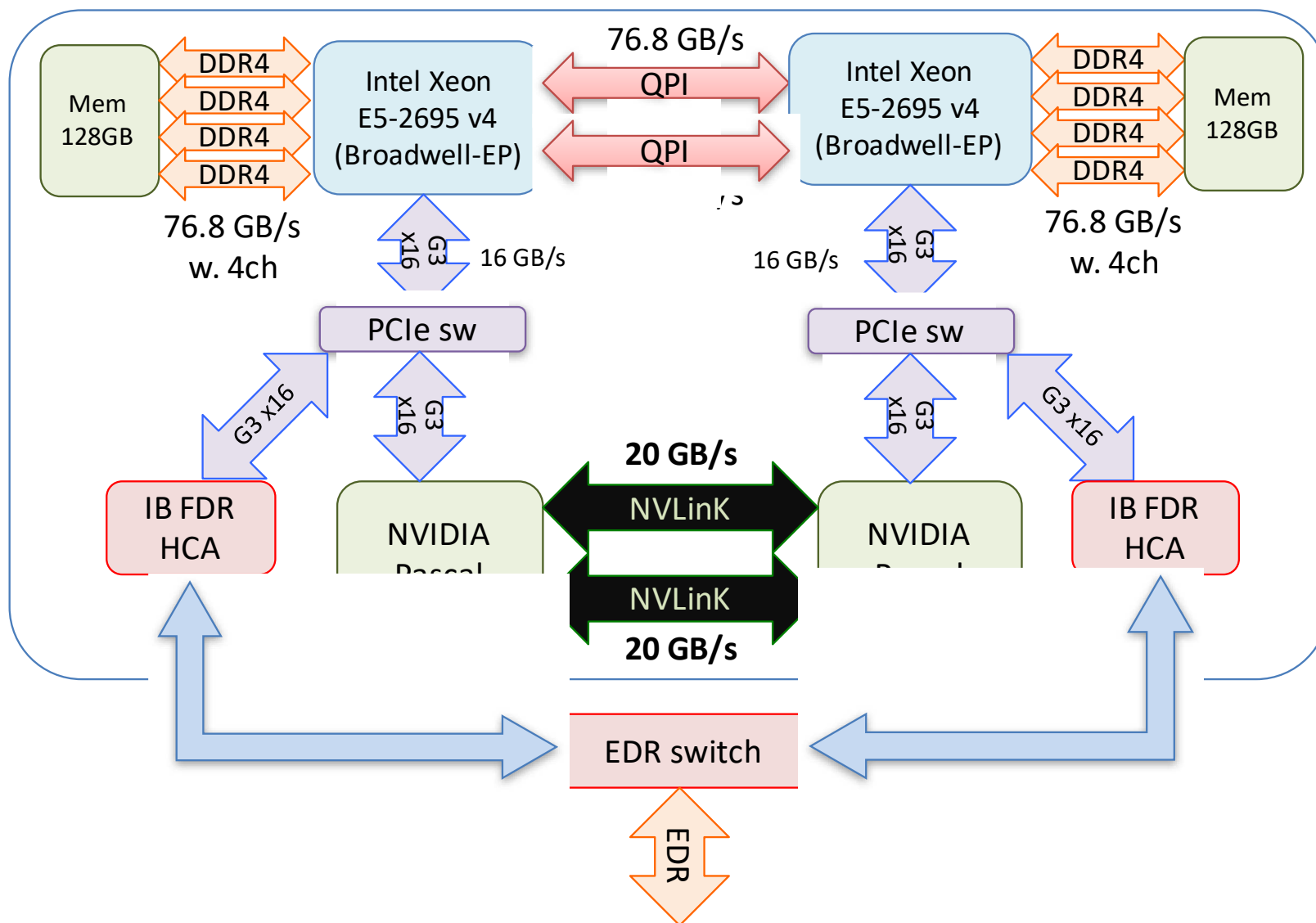
Reedbush (2/2)

Integrated Supercomputer System for Data Analyses & Scientific Simulations

- Storage/File Systems
 - Shared Parallel File-system (Lustre)
 - 5.04 PB, 145.2 GB/sec
 - Fast File Cache System: Burst Buffer (DDN IME (Infinite Memory Engine))
 - SSD: 209.5 TB, 450 GB/sec
- Power, Cooling, Space
 - Air cooling only, < 500 kVA (without A/C): 378 kVA
 - < 90 m²
- Software & Toolkit for Data Analysis, Deep Learning ...
 - OpenCV, Theano, Anaconda, ROOT, TensorFlow
 - Torch, Caffe, Cheiner, GEANT4



Configuration of Each Compute Node of Reedbush-H



How to Login (1 / 3)

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- Public Key Certificate

- Public Key Certificate

- Password provided by ITC
with 8 characters is not used
for “login”

How to Login (2/3)

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- Password with 8 characters by ITC
 - ▣ for registration of keys
 - ▣ browsing manuals
 - Only users can access manuals
 - SSH Port Forwarding is possible by keys

How to Login (3/3)

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- Procedures
 - ▣ Creating Keys
 - ▣ Registration of Public Key
 - ▣ Login

Creating Keys on Unix (1 / 2)

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- OpenSSH for UNIX/Mac/Cygwin
- Command for creating keys
\$ ssh-keygen -t rsa
- RETURN
- Passphrase
- Passphrase again

Creating Keys on Unix (2/2)

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```
>$ ssh-keygen -t rsa
```

Generating public/private rsa key pair.

Enter file in which to save the key (/home/guestx/.ssh/id_rsa):

Enter passphrase (empty for no passphrase): (your favorite passphrase)

Enter same passphrase again:

Your identification has been saved in /home/guestx/.ssh/id_rsa.

Your public key has been saved in /home/guestx/.ssh/id_rsa.pub.

The key fingerprint is:

```
>$ cd ~/.ssh
```

```
>$ ls -l
```

total 12

-rw-----	1	guestx	guestx	1743	Aug 23 15:14	id_rsa
-rw-r--r--	1	guestx	guestx	413	Aug 23 15:14	id_rsa.pub

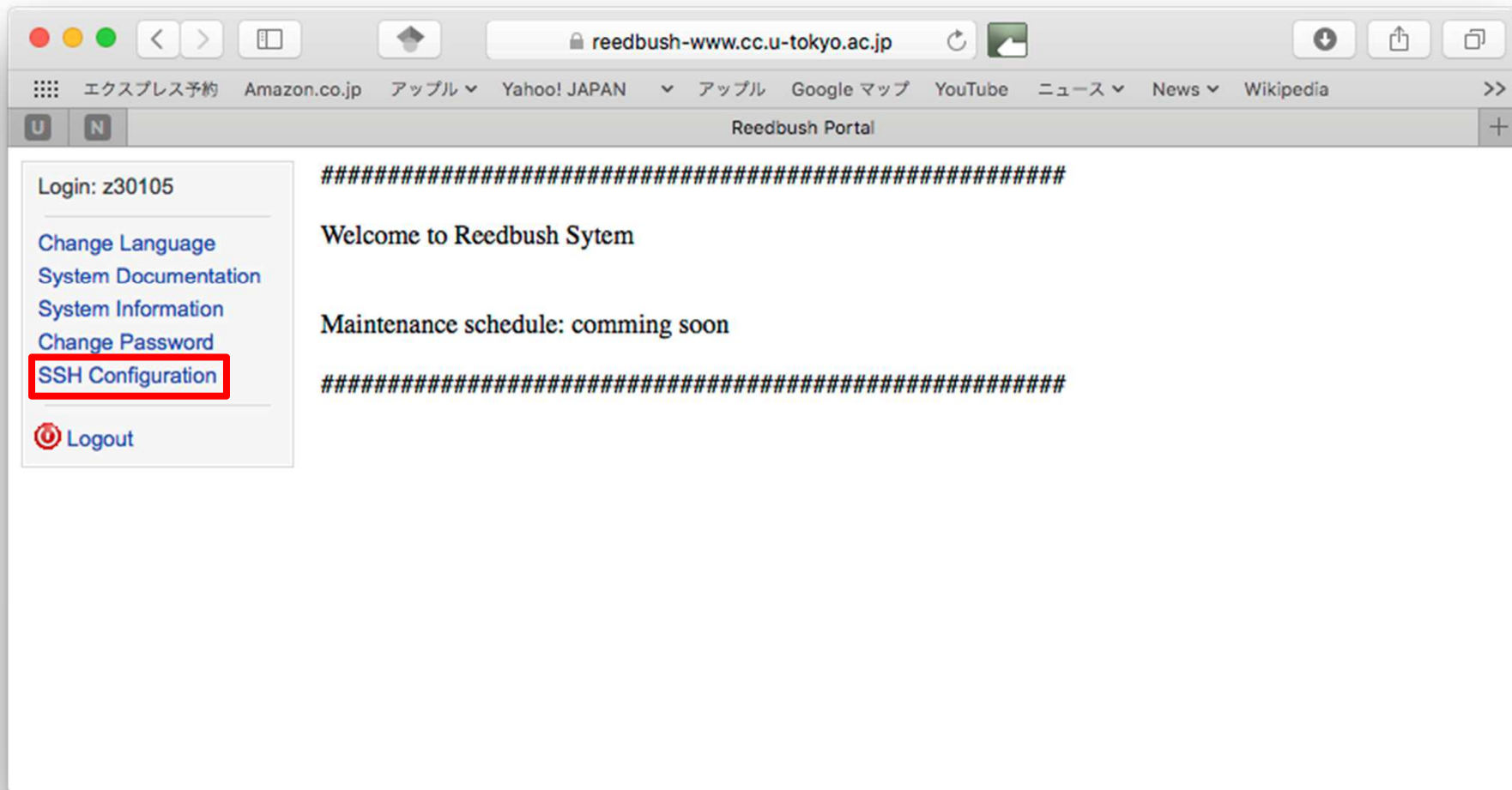
```
>$ cat id_rsa.pub
```

(cut & paste)

Registration of Public Key

- ▶ <https://reedbush-www.cc.u-tokyo.ac.jp/>
- ▶ User ID
- ▶ Password (8 characters)
- ▶ “SSH Configuration”
- ▶ Cut & Paste the Public Key





Login

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□ Login

```
$ ssh reedbush-u.cc.u-tokyo.ac.jp -l t290XX (or)
```

```
$ ssh t290XX@reedbush-u.cc.u-tokyo.ac.jp
```

□ Directory

```
$ /home/gt29/t290XX          login -> small
```

- ▣ Type “cd” for going back to /home/gt29/t290XX

```
$ cd /lustre/gt29/t290XX     please use this directory
```

- ▣ Type “cdw” for going to /lustre/gt29/t290XX

□ Copying Files

```
$ scp <file> t290**@reedbush.cc.u-tokyo.ac.jp:~/.
```

```
$ scp -r <dir> t290**@reedbush.cc.u-tokyo.ac.jp:~/.
```

□ Public/Private Keys are used

- ▣ “Passphrase”, not “Password”

Please check schedule of maintenance

- Last Friday of each month
 - other non-regular shutdown
- <http://www.cc.u-tokyo.ac.jp/>
- <http://www.cc.u-tokyo.ac.jp/system/reedbush/>

**If you have any questions,
please contact KN (Kengo
Nakajima)**

Do not contact ITC support directly.