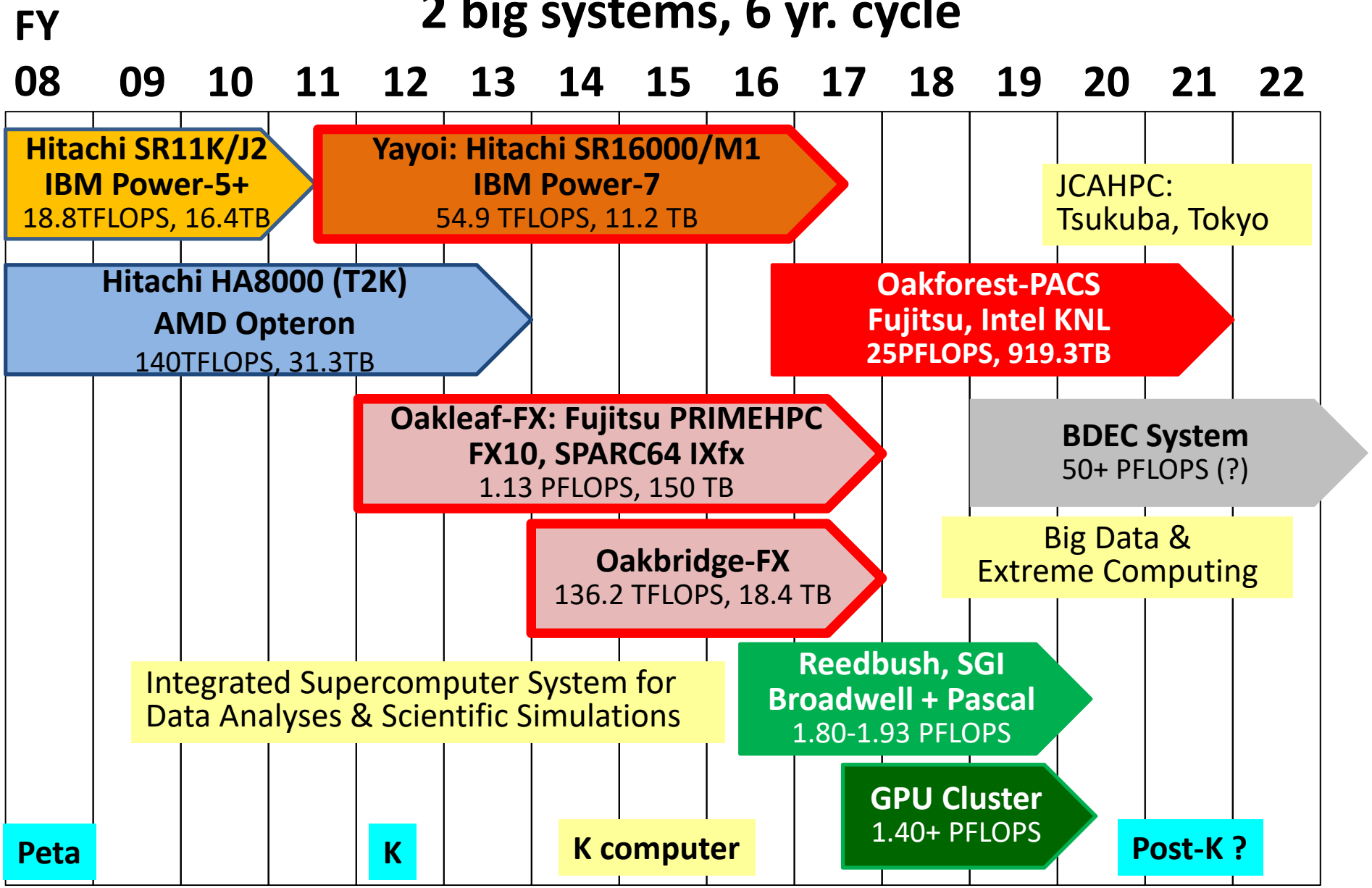
東京大学
THE UNIVERSITY OF TOKYO

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



We are now operating 5 systems !!

- Yayoi (Hitachi SR16000, IBM Power7)
  - 54.9 TF, Nov. 2011 – Oct. 2017

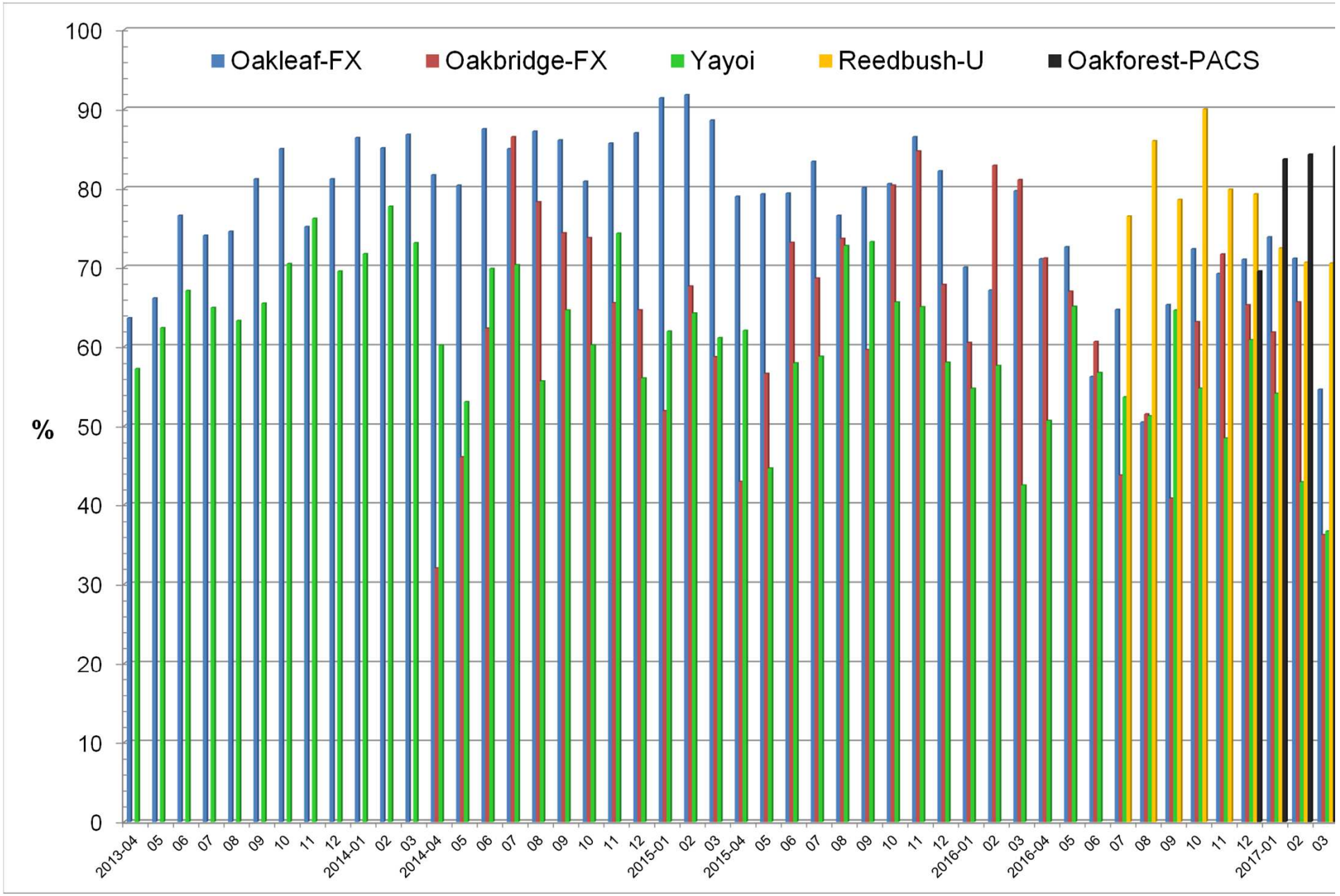
- Oakleaf-FX (Fujitsu PRIMEHPC FX10)
  - 1.135 PF, Commercial Version of K, Apr.2012 – Mar.2018
- Oakbridge-FX (Fujitsu PRIMEHPC FX10)
  - 136.2 TF, for long-time use (up to 168 hr), Apr.2014 – Mar.2018
- Reedbush (SGI, Intel BDW + NVIDIA P100 (Pascal))
  - Integrated Supercomputer System for Data Analyses & Scientif Simulations
  - 1.93 PF, Jul.2016-Jun.2020
  - Our first GPU System (Mar.2017), DDN IME (Burst Buffer)
    - Additional GPU Cluter (Oct.2017): 4x64+ GPU's, 1.40+PF

- 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)

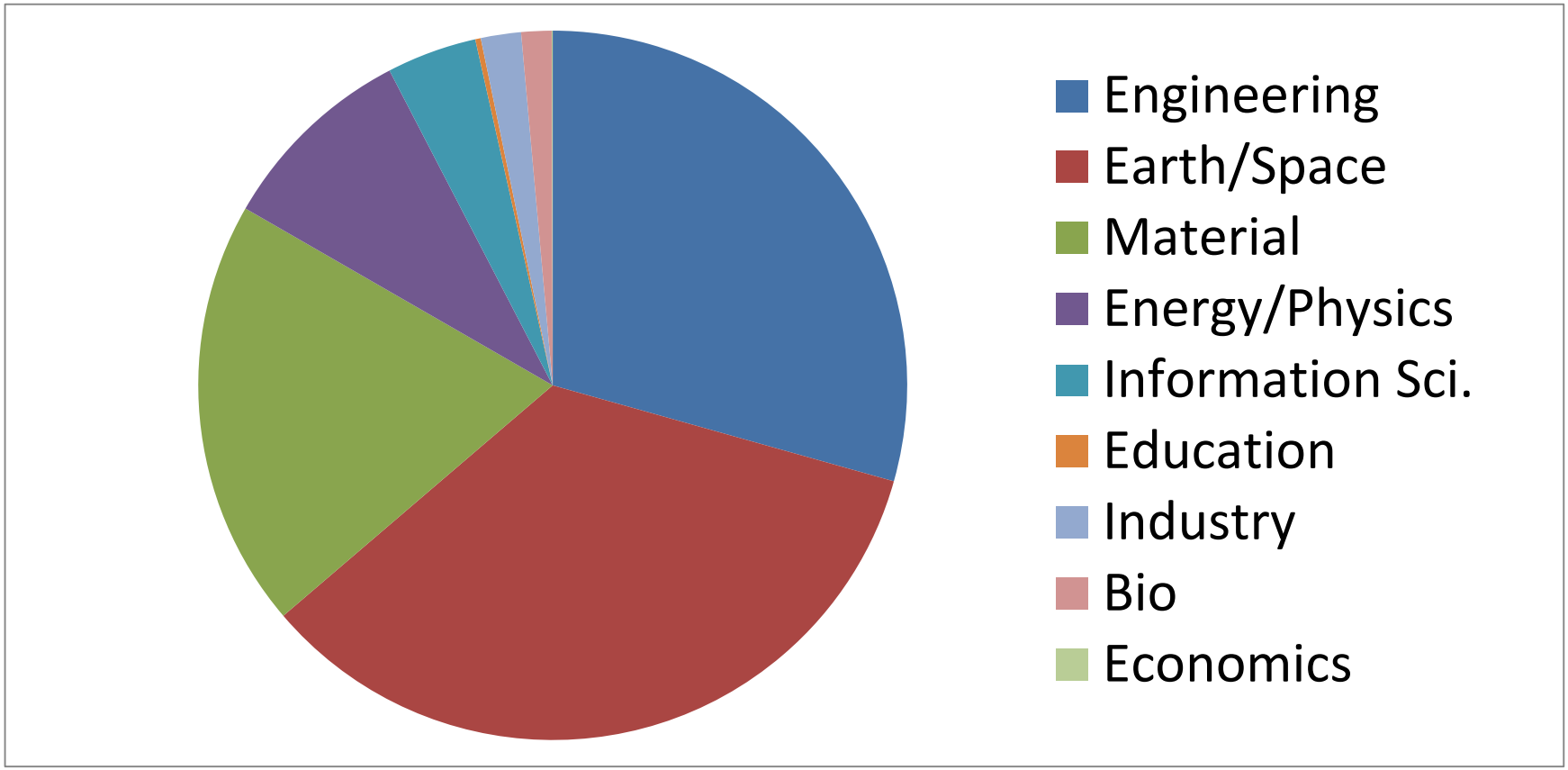
JPY (=Watt)/GFLOPS Rate
Smaller is better (efficient)

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

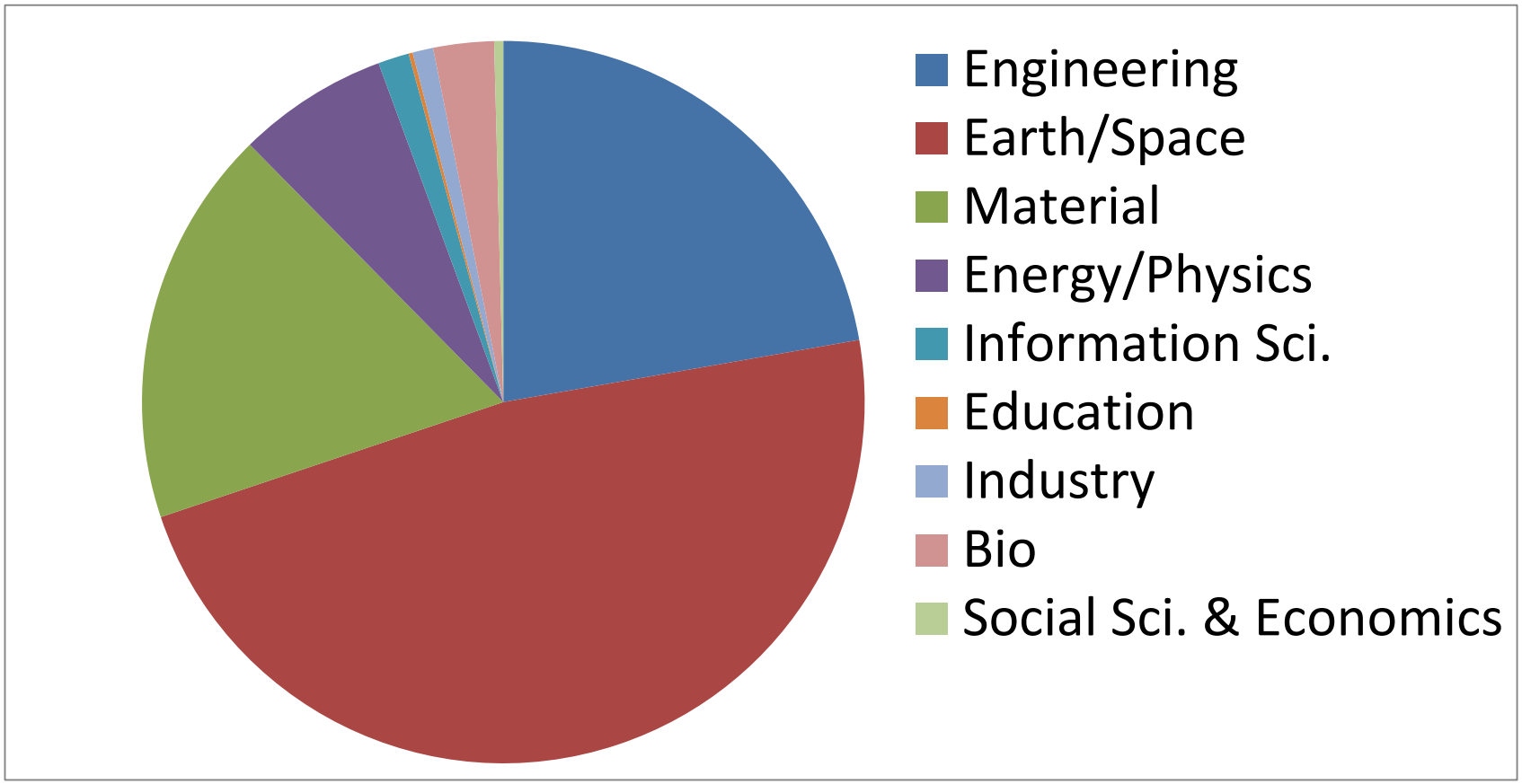

Oakleaf-FX
Oakbridge-FX
Yayoi
Reedbush-U
Oakforest-PACS
%
100
90
80
70
60
50
40
30
20
10
0
2013-04
05
06
07
08
09
10
11
12
2014-01
02
03
2014-04
05
06
07
08
09
10
11
12
2015-01
02
03
2015-04
05
06
07
08
09
10
11
12
2016-01
02
03
2016-04
05
06
07
08
09
10
11
12
2017-01
02
03

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



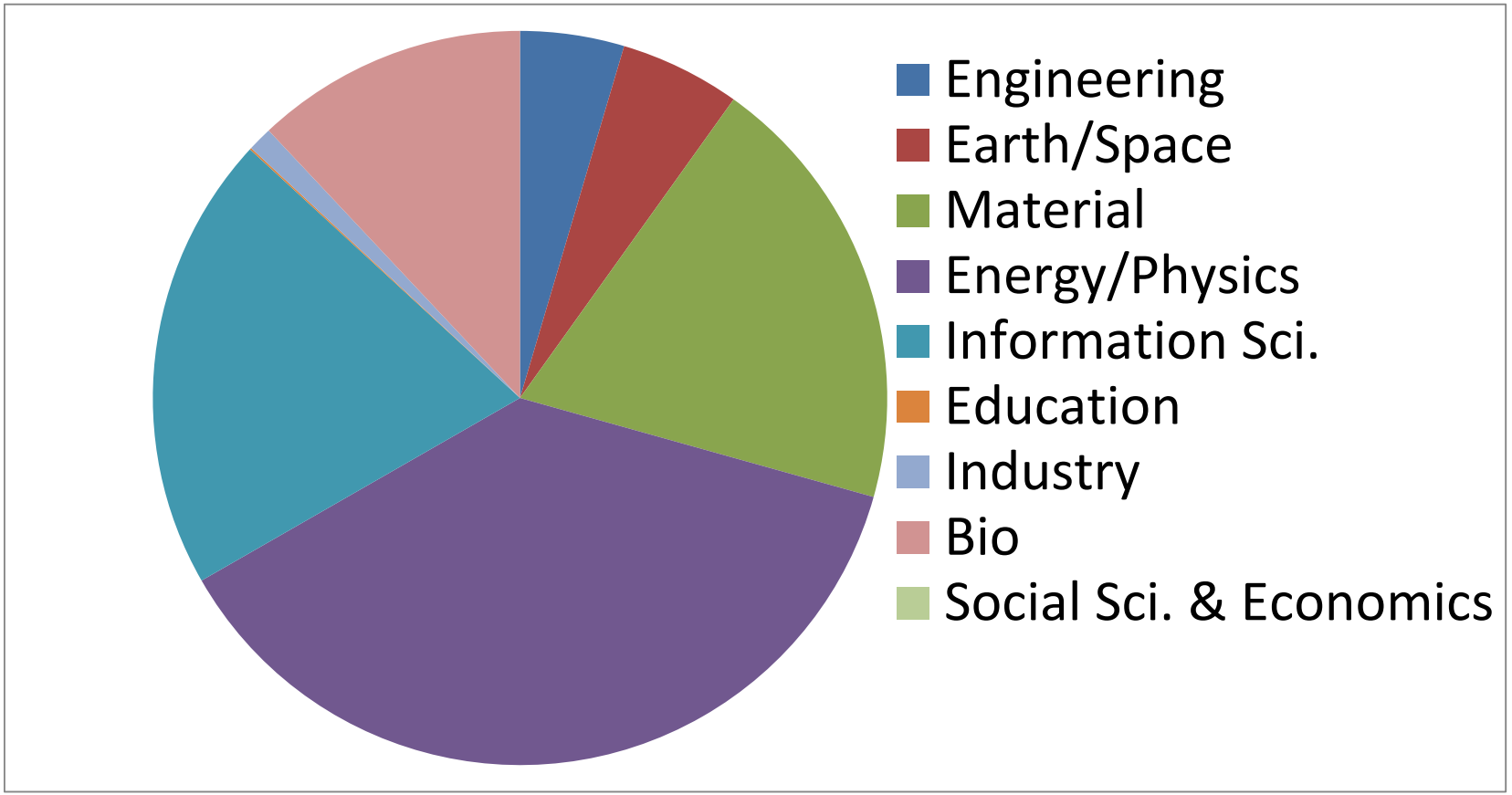
Oakleaf-FX + Oakbridge-FX

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

- 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

JCAHPC

東京大学 THE UNIVERSITY OF TOKYO

筑波大学 University of Tsukuba

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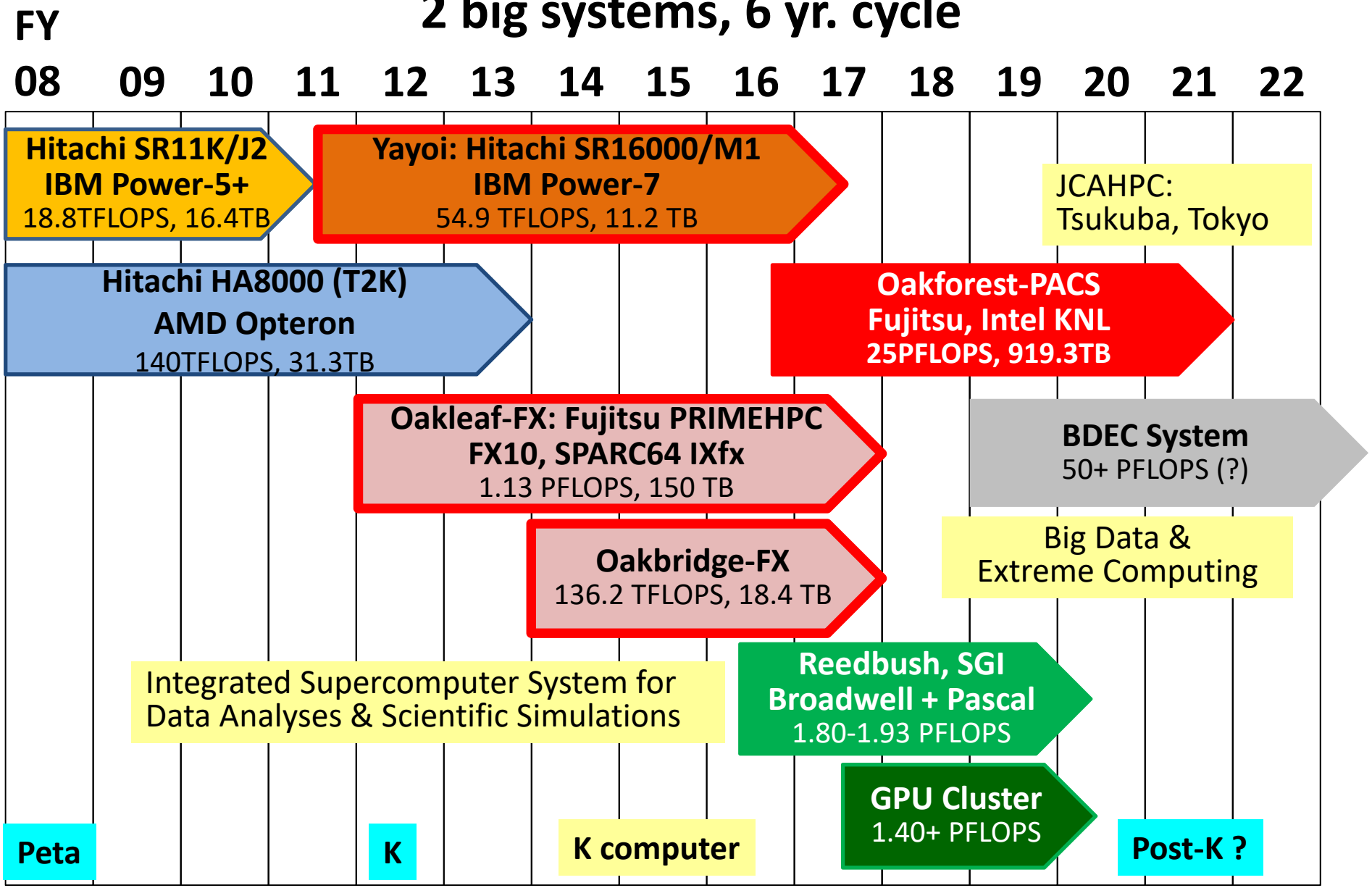
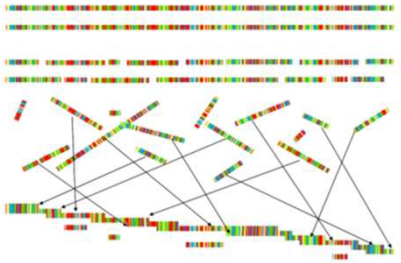


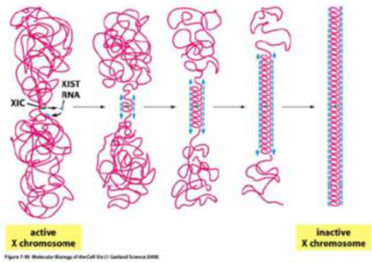
Reasons why we did not introduce systems with GPU's before …

- CUDA
- We have 2,000+ users
- Although we are proud that they are very smart and diligent …
- Therefore, we have decided to adopt Intel XXX for the Post T2K in Summer 2010.

Reasons why we have decided to introduce a system with GPU's ...

- OpenACC
  - Recent Improvement of OpenACC
    - Similar Interface as OpenMP
  - An Expert of OpenACC joined ITC/U.Tokyo in Jan. 2016
- 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)

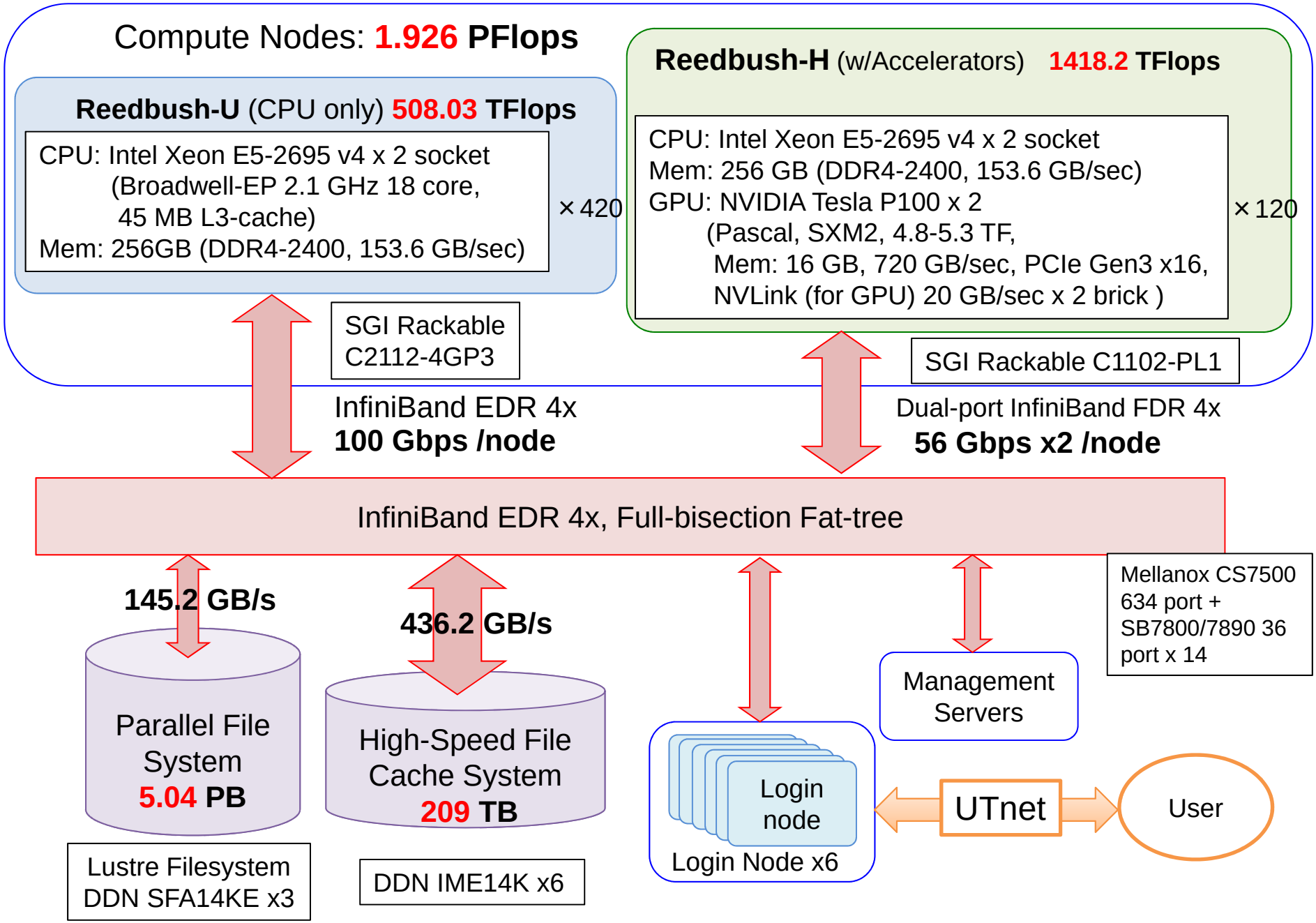
- L'homme est un roseau pensant.
- Man is a thinking reed.
- 人間は考える葦である

Pensées (Blaise Pascal)

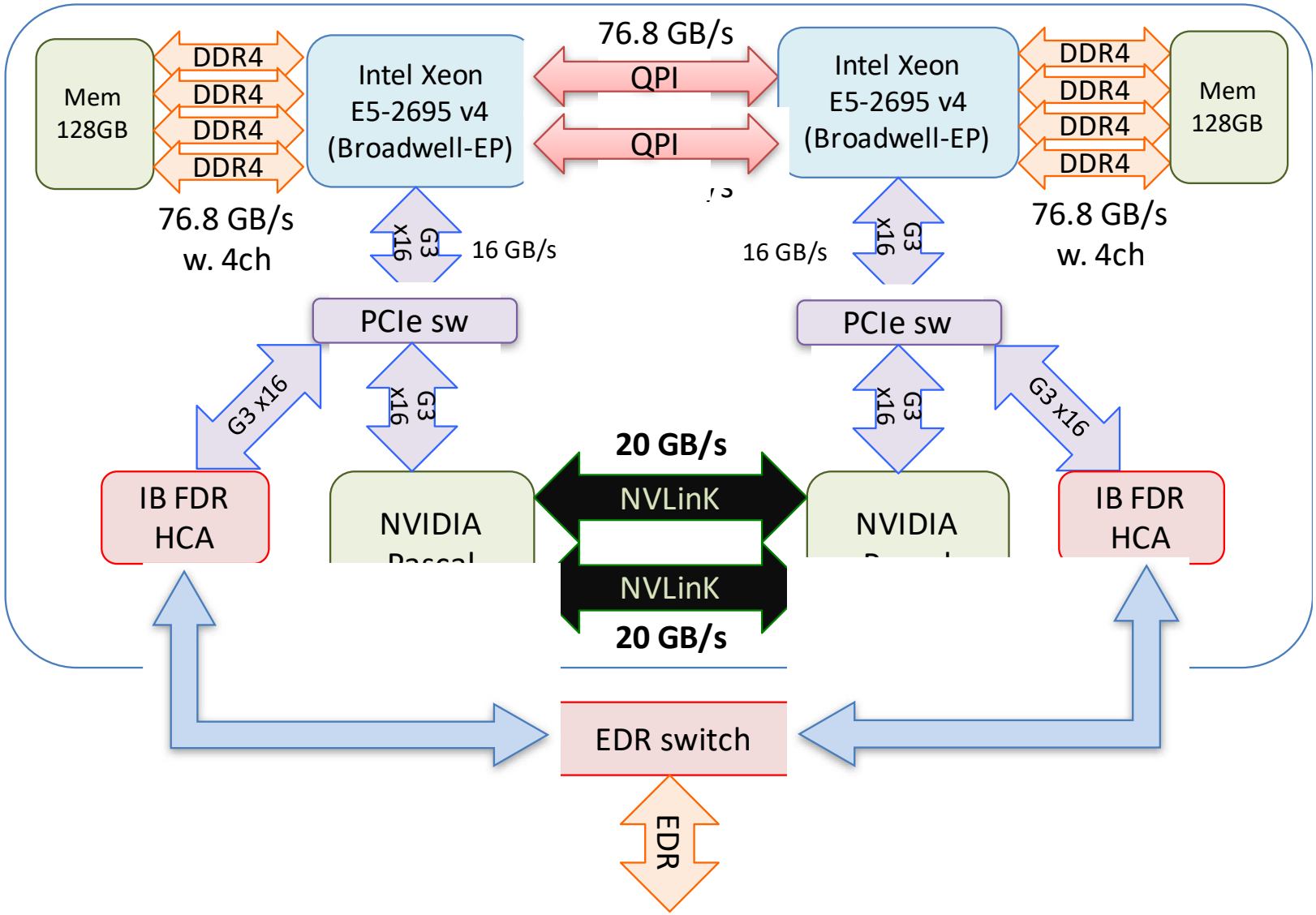
Reedbush (2/2)

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 m^2
- Software & Toolkit for Data Analysis, Deep Learning …
  - OpenCV, Theano, Anaconda, ROOT, TensorFlow
  - Torch, Caffe, Cheiner, GEANT4


Compute Nodes: 1.926 PFlops
Reedbush-U (CPU only) 508.03 TFlops
CPU: Intel Xeon E5-2695 v4 x 2 socket
(Broadwell-EP 2.1 GHz 18 core,
45 MB L3-cache)
Mem: 256GB (DDR4-2400, 153.6 GB/sec)
× 420
Reedbush-H (w/Accelerators) 1418.2 TFlops
CPU: Intel Xeon E5-2695 v4 x 2 socket
Mem: 256 GB (DDR4-2400, 153.6 GB/sec)
GPU: NVIDIA Tesla P100 x 2
(Pascal, SXM2, 4.8-5.3 TF,
Mem: 16 GB, 720 GB/sec, PCIe Gen3 x16,
NVLink (for GPU) 20 GB/sec x 2 brick)
× 120
SGI Rackable C2112-4GP3
SGI Rackable C1102-PL1
InfiniBand EDR 4x
100 Gbps /node
Dual-port InfiniBand FDR 4x
56 Gbps x2 /node
InfiniBand EDR 4x, Full-bisection Fat-tree
145.2 GB/s
436.2 GB/s
Mellanox CS7500
634 port +
SB7800/7890 36
port x 14
Parallel File
System
5.04 PB
High-Speed File
Cache System
209 TB
Management
Servers
Login
node
Login Node x6
UTnet
User
Lustre Filesystem
DDN SFA14KE x3
DDN IME14K x6

Configuration of Each Compute Node of Reedbush-H



How to Login (1/3)

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

How to Login (2/3)

- 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)

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

Creating Keys on Unix (1/2)

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

Creating Keys on Unix (2/2)

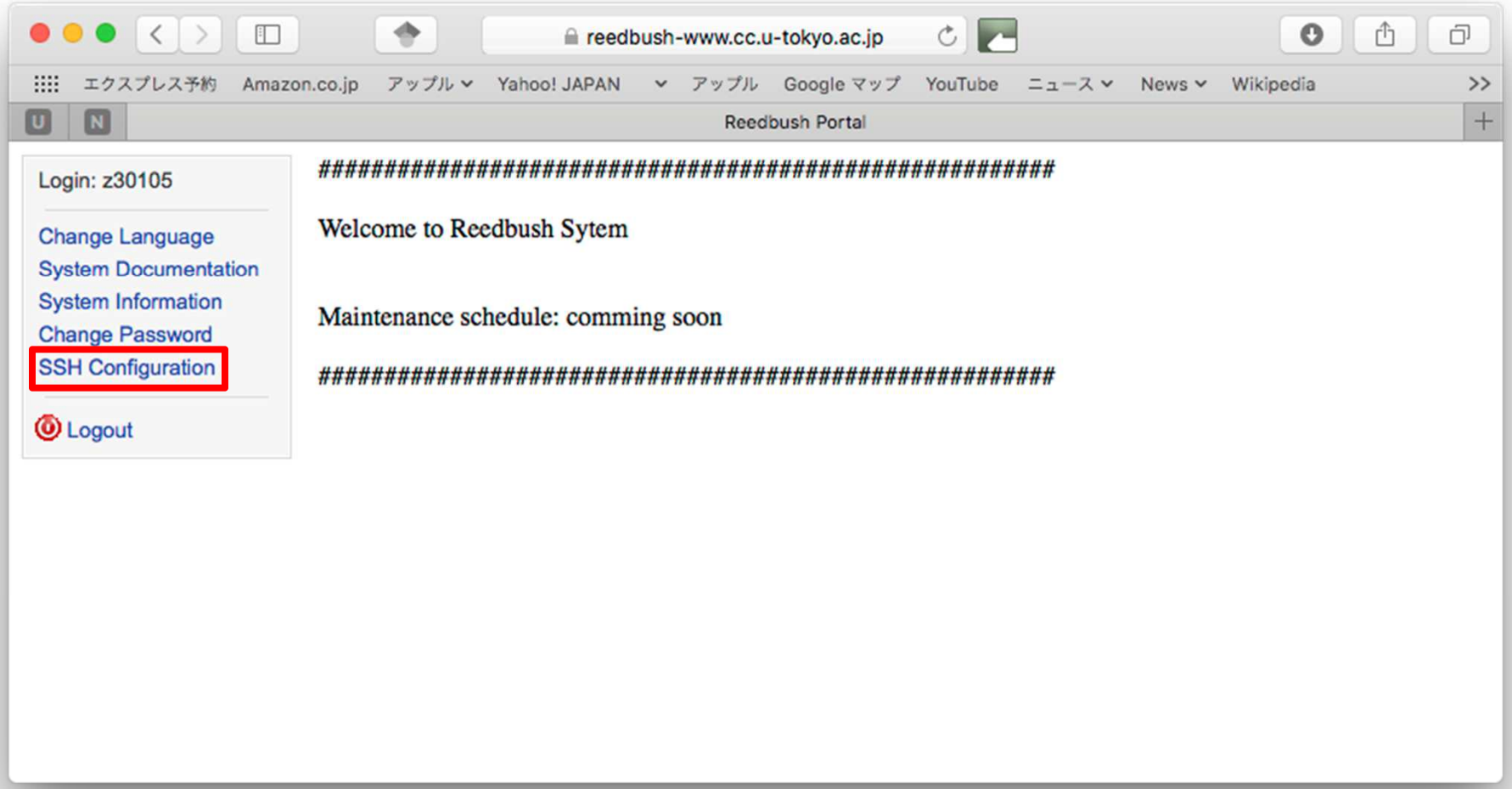

```
>$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/guestx/.ssh/id_rsa):
Enter passphrase (empty for no passphrase): (your favorite passphrase)
Enter same passphrase again:
Your identification has been saved in /home/guestx/.ssh/id_rsa.
Your public 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


reedbush-www.cc.u-tokyo.ac.jp
エクスプレス予約
Amazon.co.jp
アップル
Yahoo! JAPAN
アップル
Google マップ
YouTube
ニュース
News
Wikipedia
Reedbush Portal
Login: z30105
Change Language
System Documentation
System Information
Change Password
SSH Configuration
Logout
##########
Welcome to Reedbush Sytem
Maintenance schedule: comming soon
##########

Login

- Login

  $ ssh reedbush-u.cc.u-tokyo.ac.jp -l t260XX

(or)

  $ ssh t260XX@reedbush-u.cc.u-tokyo.ac.jp

- Directory

  $ /home/gt26/t260XX login -> small

  $ cd /lustre/gt26/t260XX please use this directory

- Copying Files

  $ scp <file> t260**@reedbush.cc.u-tokyo.ac.jp:~/.

  $ scp -r <dir> t260**@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.