2013 HPC Challenge Awards BOF

9th Edition

Jack Dongarra	UTK, ORNL
Jeremy Kepner	MIT Lincoln Lab
Robert Lucas	ISI/USC
Piotr Łuszczek	UTK

Plan for BoF

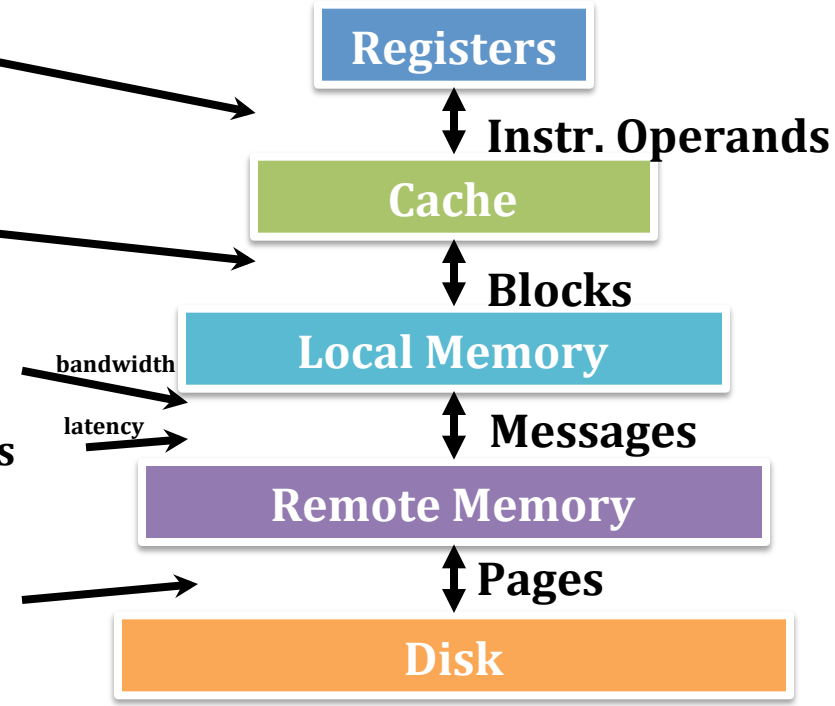
- HPC Challenge Overview
- Presentations by the Class 2 Finalists
- Presentation of Class 1 Awards
- Presentation of Class 2 Awards

HPC Challenge Benchmark

HPC Challenge Benchmark

- Top500: solves a system
  Ax = b
- STREAM: vector operations
  A = B + s * C
- FFT: 1D Fast Fourier Transform
  Z = FFT(X)
- RandomAccess: random updates
  T(i) = XOR(T(i), r)
- Iozone: Read and write to disk
  (Not part of HPC Challenge)

Corresponding Memory Hierarchy



HPC Challenge Awards Rules

- Class 1: Best Performance (4 awards)
  - Best performance on a run submitted to the website
    - HPL
    - RandomAccess
    - STREAM
    - FFT
  - The prize will be $750 plus a certificate for each benchmark
  - Judging criterion: objective
- Class 2: Most Productivity
  - Most elegant implementation of at least two benchmarks
  - 50% on performance
  - 50% on code elegance, clarity, and size
  - The prize will be $2000 plus a certificate for this award
  - Judging criterion: subjective
- Co-chairs
  - Jack Dongarra (UTK/ORNL/U.Manchester) and Jeremy Kepner (MIT LL)

All prizes sponsored by IDC (Earl Joseph)

Class 2 Award Schedule

- October 1
  - Early bird entry to get feedback on the submission is by October 1st
- October 7
  - We provide feedback by so the submission could be improved
  - This is to help for compliance of the rules
  - Only get one shot at an early bird submission (the process is not iterative)
- October 24
  - The final deadline for the submission
- November 7
  - Awards Committee chooses 3 finalists
- SC conference
  - Each finalist makes a presentation at the winners are chosen at the session and the prize is given there.
- Not to early to start preparing your submission for 2014

HPC Challenge Judges and Sponsors

- HPC Challenge Evaluation Committee
  - David Bailey, NERSC/LBL
  - Jack Dongarra, UTK/ORNL/U. of Manchester
  - Jeremy Kepner, MIT Lincoln Lab
  - Bob Lucas, ISI/USC
  - Rusty Lusk, ANL
  - Piotr Łuszczek, University of Tennessee
  - John McCalpin, TACC
  - Rolf Rabenseifner, HLRS Stuttgart
  - Daisuke Takahashi, Tsukuba, Japan
  - Jeff Vetter, ORNL/Goergia Tech
- Sponsors

2012 HPCC Awards Class 2 Highlights

Award	Recipient	Affiliation	Language
Best performance	Olivier Tardieu	IBM	X10
Most elegant languange	Bradford L. Chamberlain	Cray	Chapel
Finalist	Laxmikant V. Kale	University of Illinois at Urbana-Champaign	Charm++
Finalist	Masahiro Nakao	University of Tsukuba, RIKEN	XcalableMP

2013 Submissions for Class 2

- Vijay Saraswat
  - IBM
  - X10
  - FFT, HPL, STREAM
  - Unbalanced Tree Search, Betweenness Centrality

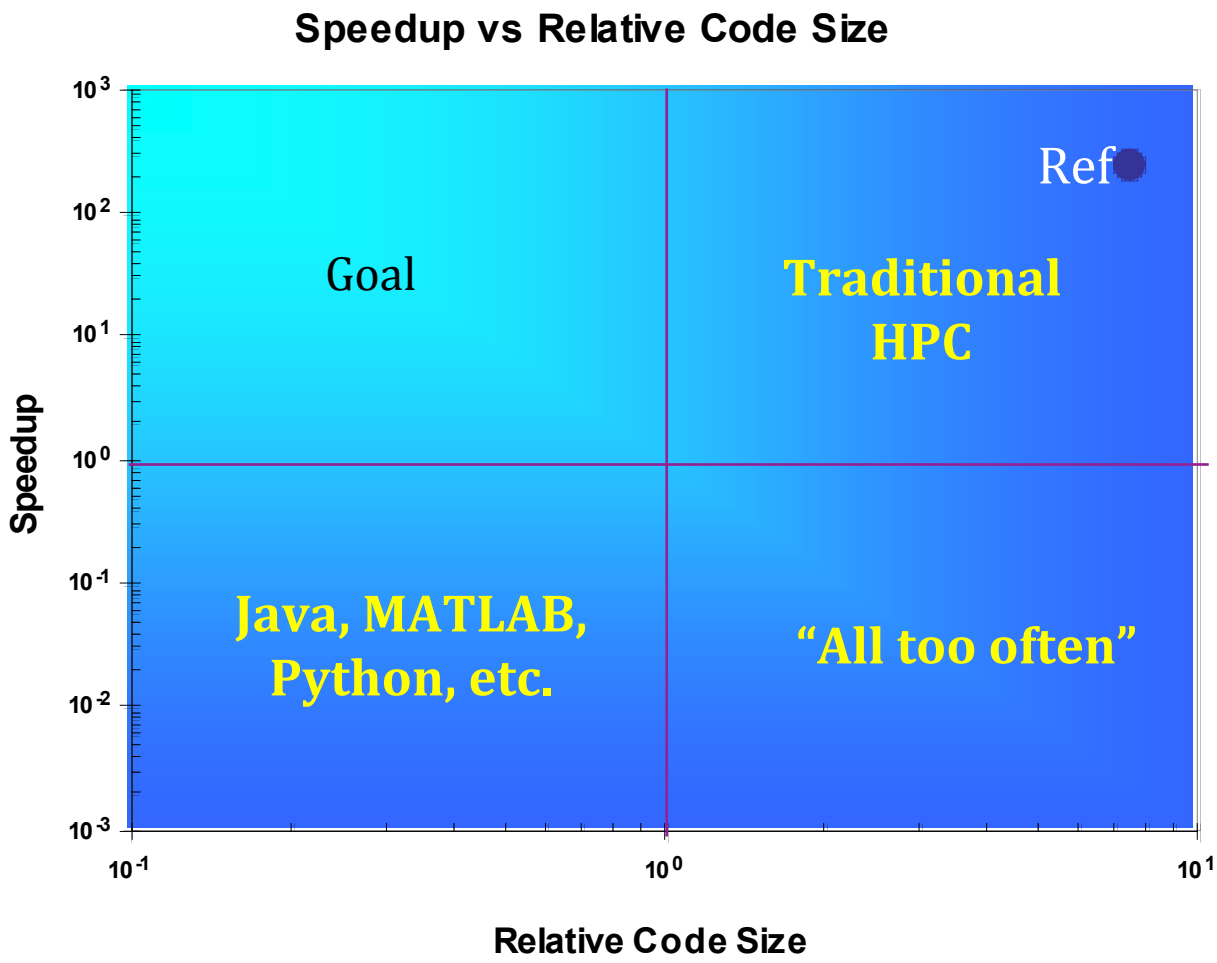
• POWER7	256 cores
• Blue Gene/Q	16K cores
• K computer	32K cores

- Masahiro Nakao
  - University of Tsukuba, RIKEN
  - XcalableMP
  - FFT, HPL, STREAM
  - Himeno (stencil calculation)

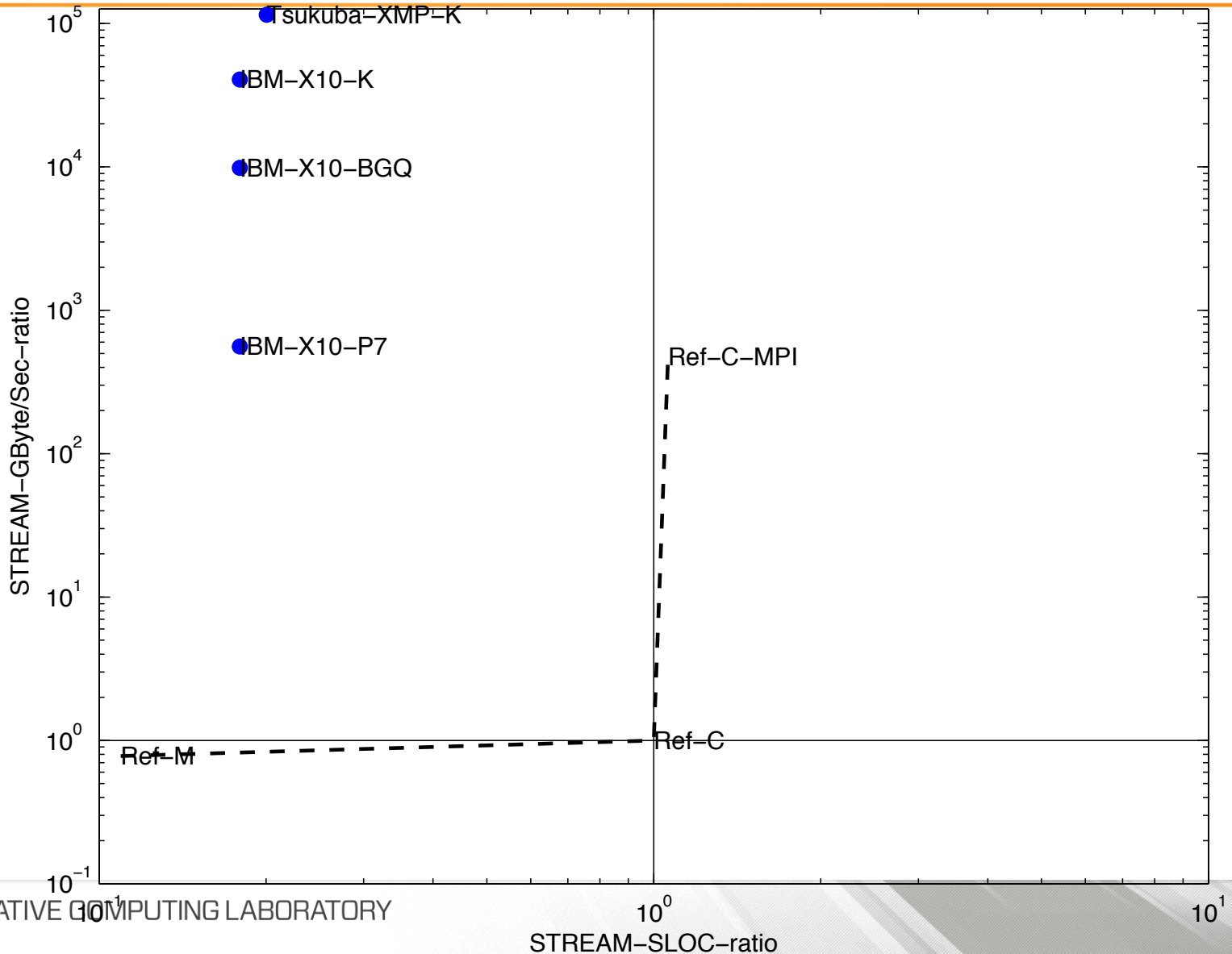
• K computer	8K, 32K, 64K cores

Each speaker gets ~20 minutes

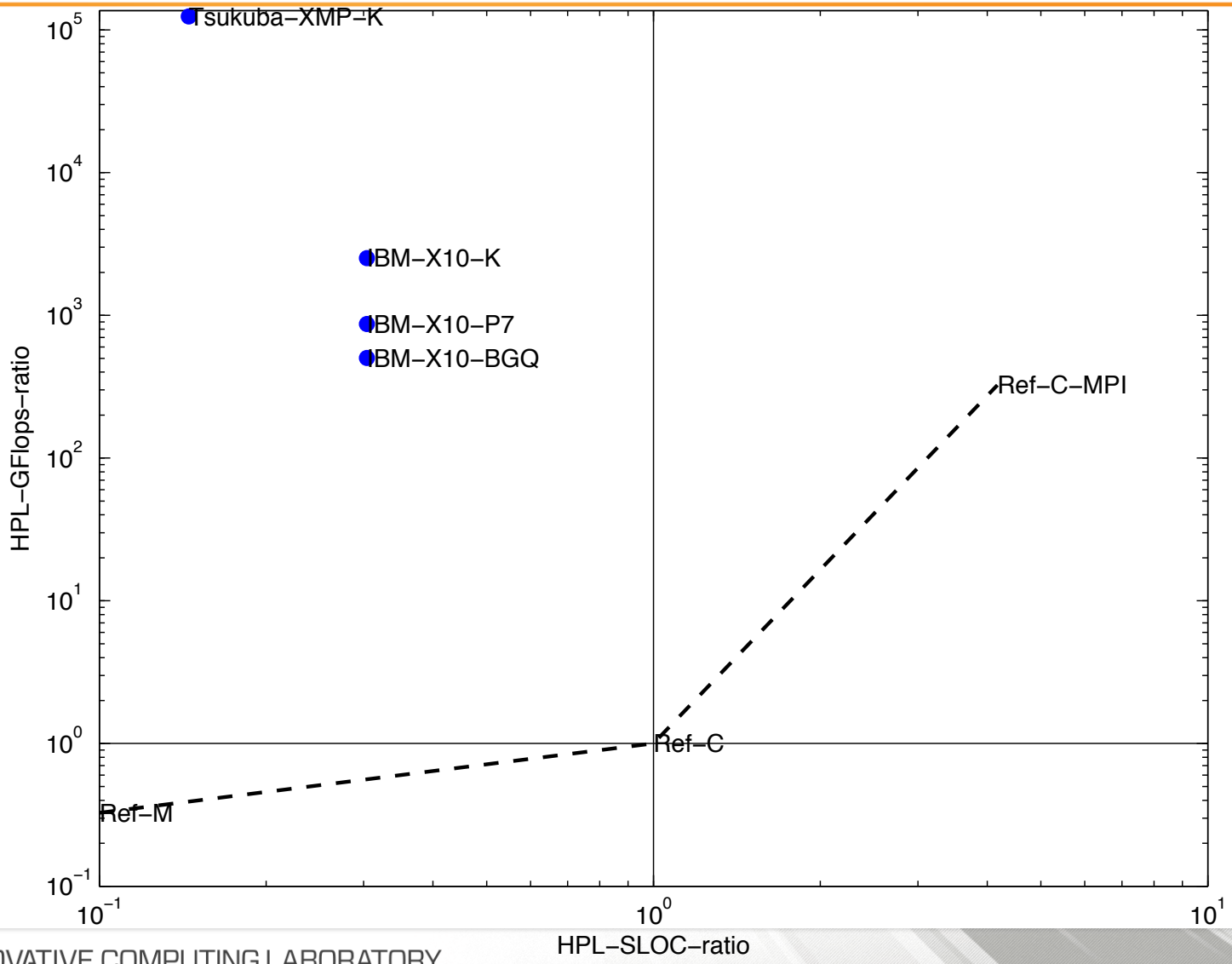
Productivity Challenge



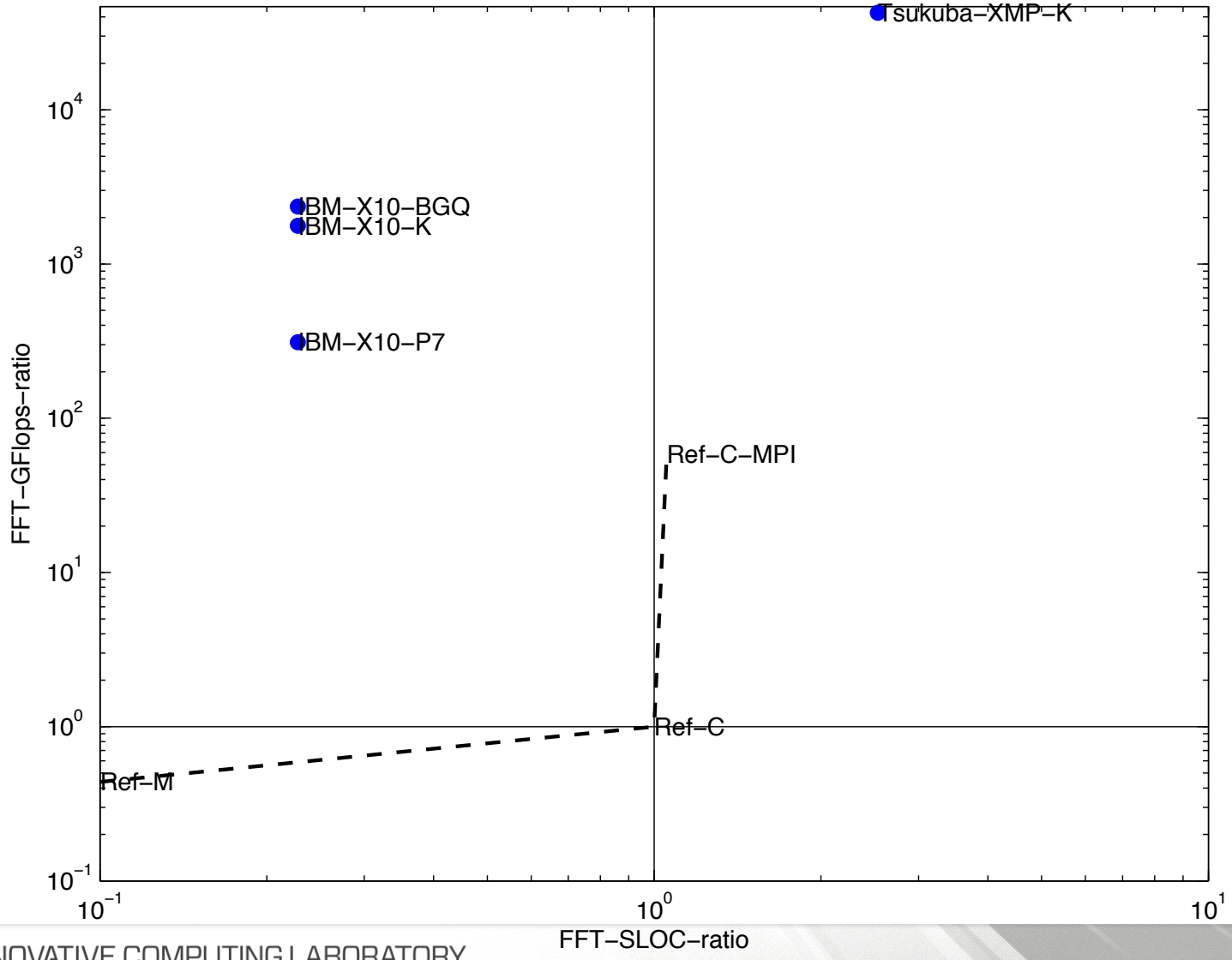
STREAM Analysis



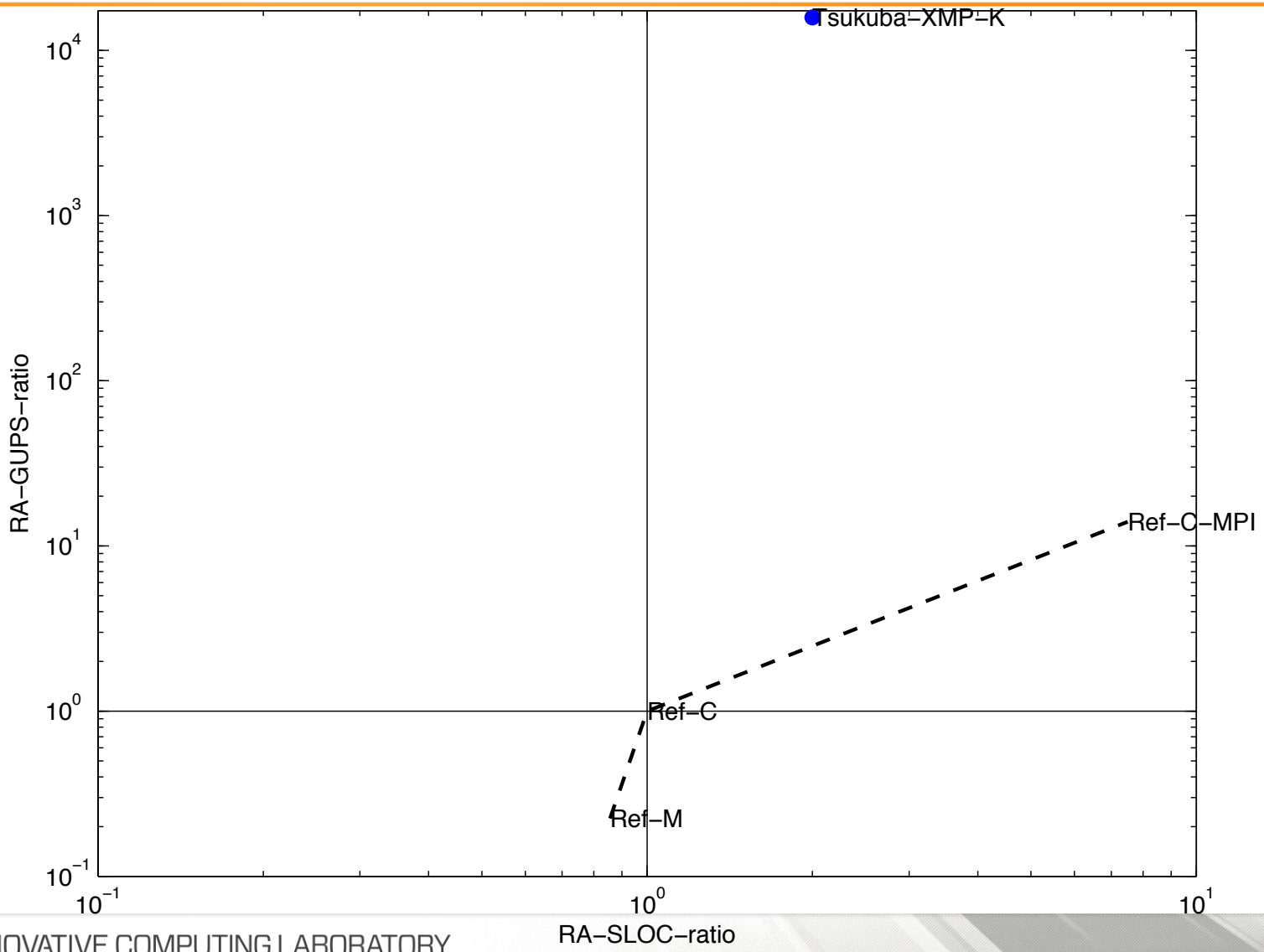
HPL Analysis



FFT Analysis



RandomAccess Analysis



Class 2 Presentations

1. Olivier Tardieu from IBM
   presenting X10

2. Masahiro Nakao from University of Tsukuba
   presenting XcalableMP

Class 1 Awards

- Categories
  - HPL
  - STREAM
  - RandomAccess
  - FFT
- Each category winner will receive $750
  - Sponsored by IDC

HPL Ranking

3.

2.

1.

HPL Ranking

3. Power 775 IBM Dev. Eng. 1344 Tflop/s

2.

1.

HPL Ranking

3. Power 775, IBM Dev. Eng. 1344 Tflop/s

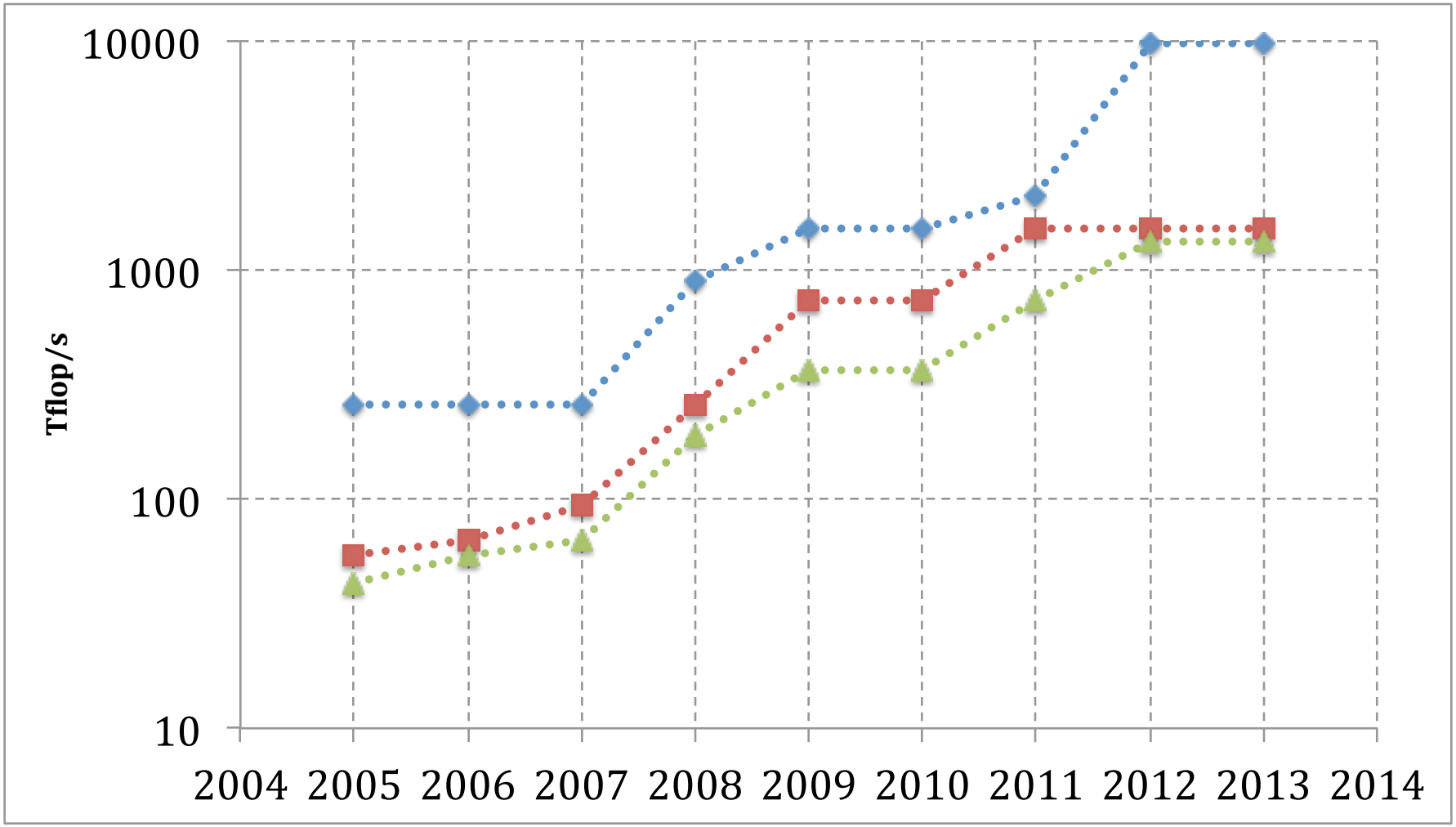
2. Cray XT5 Oak Ridge 1534 Tflop/s

1.

HPL Ranking

3.	Power 775	IBM Dev. Eng.	1344 Tflop/s
2.	Cray XT5	Oak Ridge	1534 Tflop/s
1.	K computer	RIKEN AICS	9796 Tflop/s

HPL Trends


10000
1000
100
10
Tflop/s
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

STREAM Ranking

3.

2.

1.

STREAM Ranking

3.	Cray XT5	Oak Ridge	398 TB/s
2.			
1.			

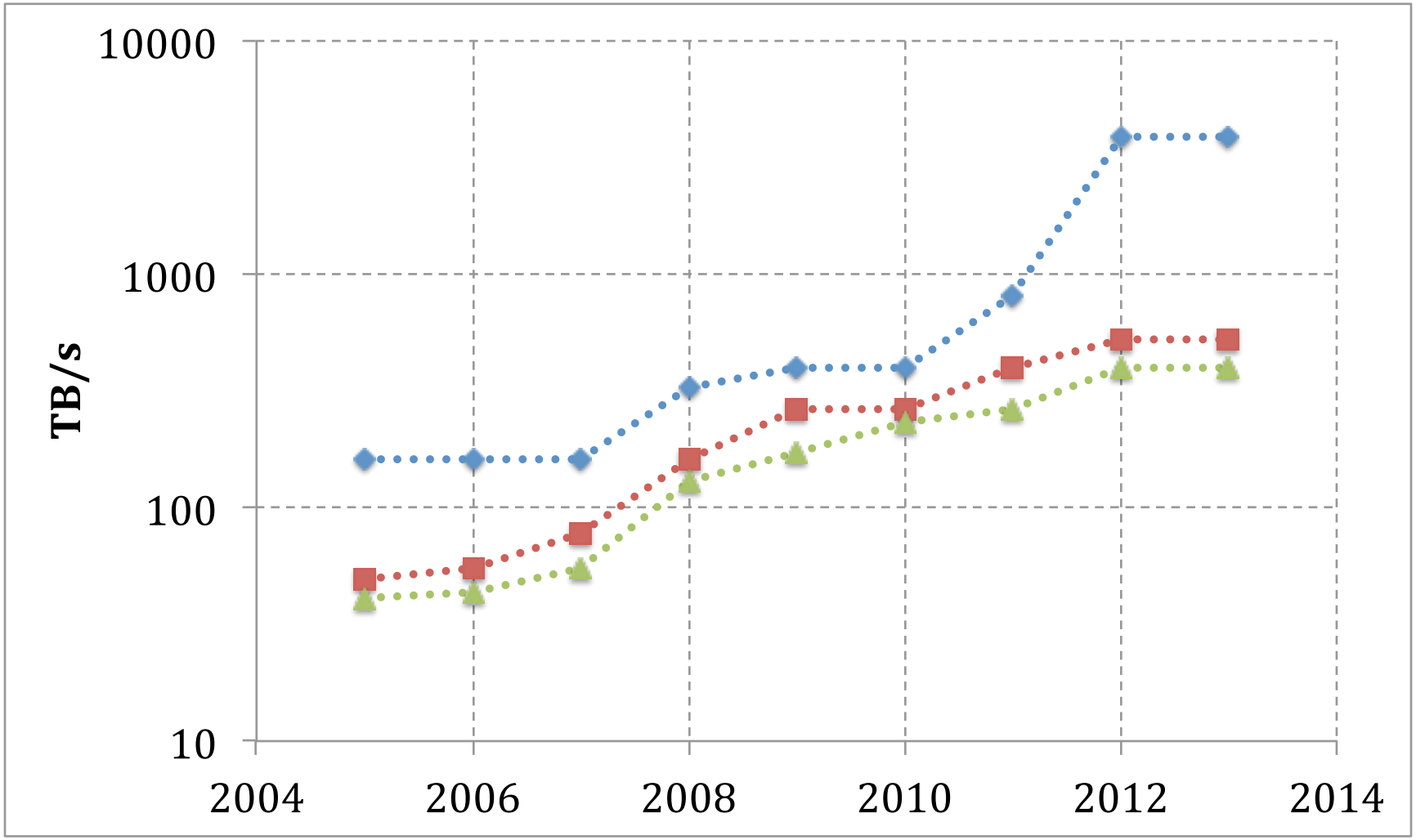
STREAM Ranking

3.	Cray XT5	Oak Ridge	398 TB/s
2.	Power 775	IBM Dev. Eng.	525 TB/s
1.			

STREAM Ranking

3.	Cray XT5	Oak Ridge	398 TB/s
2.	Power 775	IBM Dev. Eng.	525 TB/s
1.	K computer	RIKEN AICS	3857 TB/s

STREAM Trends



RandomAccess Ranking

3.

2.

1.

RandomAccess Ranking

3. Blue Gene/P Livermore 117 GUPS

2.

1.

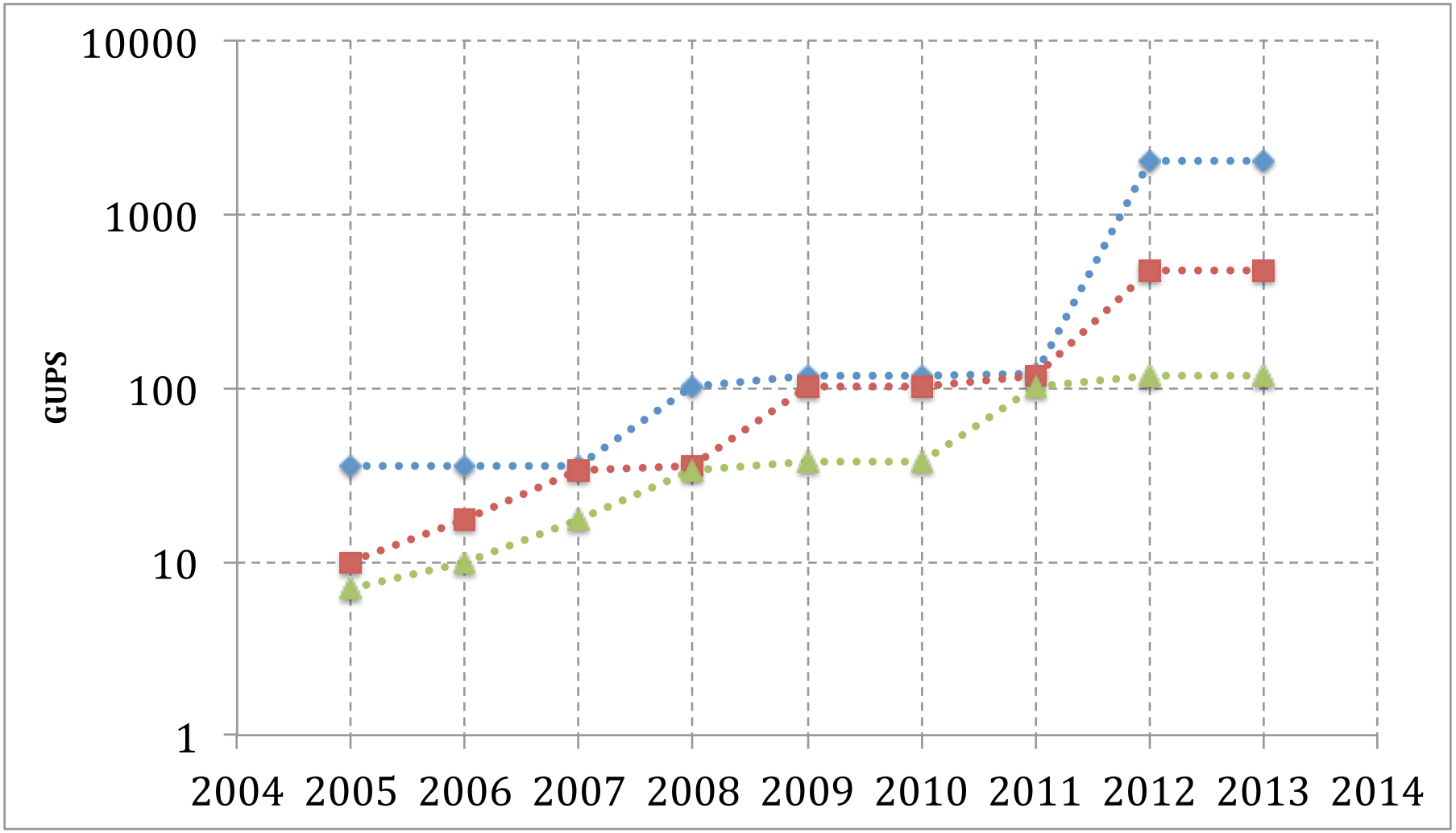
RandomAccess Ranking

3.	Blue Gene/P	Livermore	117 GUPS
2.	K computer	RIKEN AICS	472 GUPS
1.			

RandomAccess Ranking

3.	Blue Gene/P	Livermore	117 GUPS
2.	K computer	RIKEN AICS	472 GUPS
1.	Power 775	IBM Dev. Eng.	2021 GUPS

RandomAccess Trends



FFT Ranking

3.

2.

1.

FFT Ranking

3.	NEC SX-9	JAMSTEC	12 Tflop/s
2.			
1.			

FFT Ranking

3.	NEC SX-9	JAMSTEC	12 Tflop/s
2.	Power 775	IBM Dev. Eng.	133 Tflop/s
1.			

FFT Ranking

3. NEC SX-9	JAMSTEC	12 Tflop/s
2. Power 775	IBM Dev. Eng.	133 Tflop/s
1. K computer	RIKEN AICS	206 Tflop/s

FFT Trends

Class 2 Award

- Winner will receive $2000