SINAPAD:

Role, services and roadmap of the Brazilian HPC System

Antônio Tadeu Azevedo Gomes
LNCC – Researcher
SINAPAD – Executive Secretariat

sinapad@lncc.br
http://www.lncc.br/sinapad

SINAPAD Role

- Provide on demand HPC services to Brazilian academy **and** industry
  - "Open Science" support
- Give support to the development of HPC applications
- Foster education in HPC
- Transfer knowledge in HPC

Operation

- General coordination: Ministry of Science, Technology & Innovation (MCTI)
  - Representation through LNCC
- Integration of running HPC centers (CENAPADs) funded by MCTI
  - Creation of new CENAPADs since the formal establishment of SINAPAD (2004)

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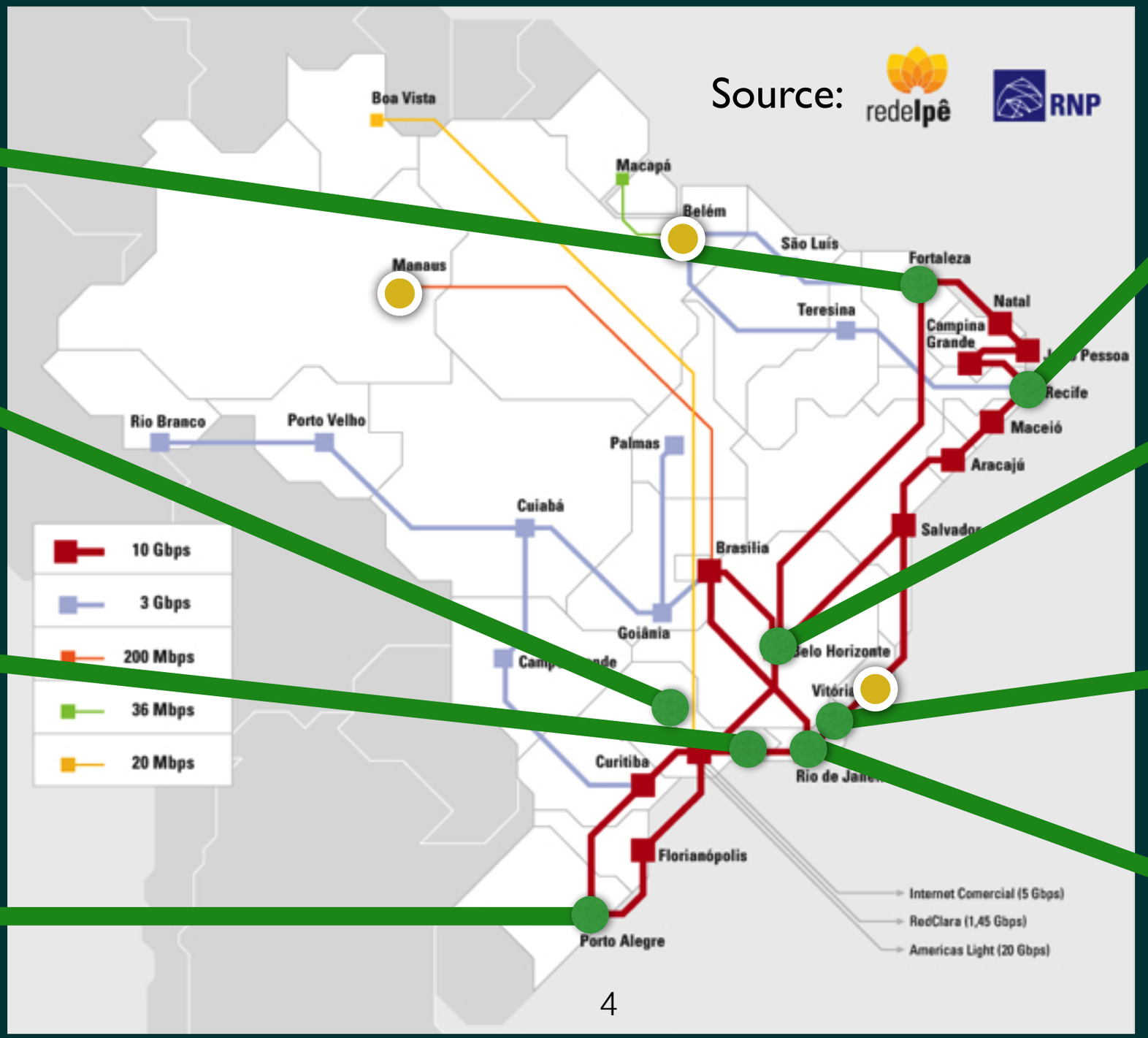
Sistema Nacional de Processamento de Alto Desempenho

CENAPADs

Being set up



CENAPADUFC

CENAPAD-PE

CENAPAD SP

CENAPAD MG/CO

CPTEC

NACAD

CESUP

CENAPAD RJ

SINAPAD services

- HPC network, with few centers:
  - Geographically spread (technology dissemination)
  - Medium capacity (and cost)
  - Heterogeneous (shared & distributed memory architectures, GPUs)
- Mass storage network:
  - High capacity
  - Under deployment

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CENAPAD	Equipamento (#cores)	Desempenho teórico (TFlops)	Memória RAM (TBytes)	Capacidade de disco (TBytes)	Instalação / Última atualização
COPPE	Sun Fire V20Z (4 CPUs) * SGI Altix 450 (64 CPU Cores) SGI Altix ICE 8200/8400LX/UV100 (672 CPU Cores + 896 GPU Cores)	0,017 0,384 8,33	0,004 0,128 1,3	0,072 3 32	2005 2006 / 2007 2008 / 2011
CPTEC	Sun Fire V20Z (4 CPUs) *	0,017	0,004	0,072	2005
LNCC	Sun Fire V20Z (4 CPUs) * Sun Blade X6250 (576 CPU Cores) SGI Altix ICE 8400 (108 CPU Cores) SGI Altix XE340 (336 CPU Cores + 2688 GPU Cores) Bull bullx (1112 CPU Cores + 2688 GPU Cores)	0,017 5 1,1 23 30	0,004 1,2 0,4 1,36 3,0	0,072 30 1 129 35	2005 2010 2012 2011 / 2012 2011 / 2012
UFC	Sun Fire V20Z (8 CPUs) * Bull bullx (576 CPU Cores)	0,034 6,128	0,008 1,152	0,072 27	2005 2011
UFMG	Sun Fire V20Z (4 CPUs) * Bull NovaScale (878 CPU Cores)	0,017 9	0,004 1,7	0,072 45	2005 2010
UFPE	Bull NovaScale (576 CPU Cores)	6	1,1	11	2010
UFRGS	Sun Fire V20Z (4 CPUs) * Sun Fire X2200M2/X4240/X4600M2 (516 CPU Cores + 1920 GPU Cores) SGI Altix ICE 8400LX (1536 CPU cores)	0,017 12,94 15,97	0,004 1,2 4	0,072 60 174	2005 2008 2011 / 2012
UNICAMP	Sun Fire V20Z (4 CPUs) * SGI Altix 1350 (70 CPUs) SGI Altix 450/ICE 8400LX (560 CPU cores) IBM P750 (1280 CPU cores + 5376 GPU cores)	0,017 0,42 5,96 43,18	0,004 0,274 1,496 5,120	0,072 7 36 224	2005 2005 / 2007 2008 / 2011 2011
SINAPAD (storage)	NetApp - NFS distribuído – FAS3160 (1 unidade central) – FAS3140 (1 unidade de backup) – FAS2050C (8 unidades remotas)			720 302 832	em instalação em instalação 2011

8860 CPU Cores + 13568 GPU Cores
~168 TFlops / ~24 TBytes RAM / ~ 3 PBytes Storage

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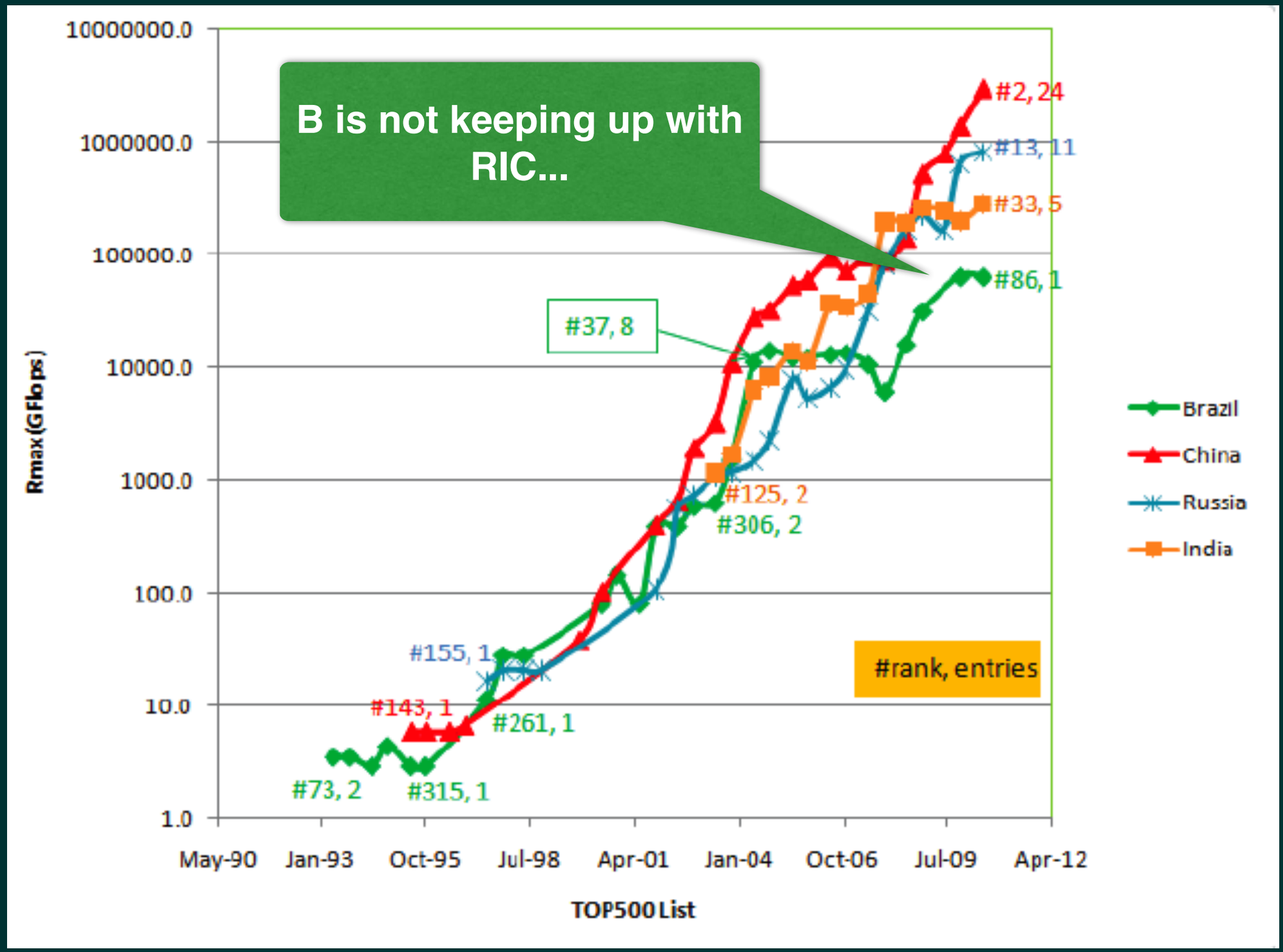

Source: A. Coutinho

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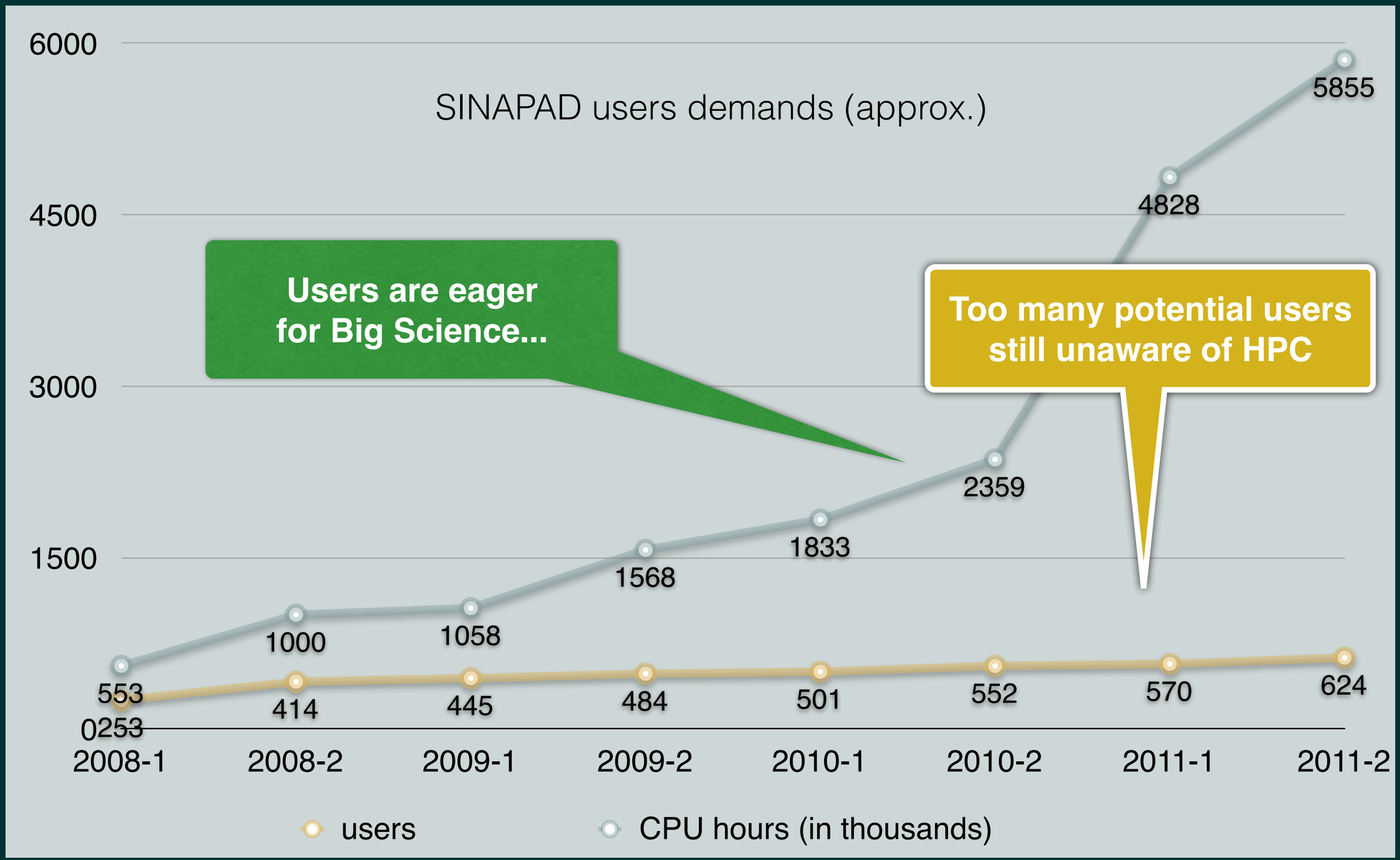

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Período:	JAN - JUN 2008	JUL - DEZ 2008	JAN - JUN 2009	JUL - DEZ 2009	JAN - JUN 2010	JUL - DEZ 2010	JAN - JUN 2011	JUL - DEZ 2011
Área de aplicação	%	%	%	%	%	%	%	%
Astronomia	-	0,36	0,54	0,18	1,77	0,98	2,02	3,31
Biologia	0,73	0,47	0,03	1,95	4,29	6,23	4,50	4,89
Bioquímica	-	-	-	0,19	-	-	0,42	0,79
Computação	0,48	0,61	0,37	2,28	3,34	8,04	1,50	0,10
Economia	-	-	-	-	-	-	-	-
Engenharia	1,89	3,10	3,46	3,81	15,68	0,21	5,33	6,53
Estatística	-	-	-	-	-	0,13	-	0,08
Física	89,43	83,30	80,97	78,04	62,67	34,11	62,11	69,14
Genética	-	0,01	0,01	-	-	-	-	-
Geociências	0,01	-	0,97	-	3,53	-	-	-
Matemática	0,40	2,50	-	0,15	0,31	2,64	0,58	0,11
Medicina	-	-	-	-	-	0,04	0,32	0,17
Meteorologia	-	-	-	-	-	-	-	-
Oceanografia	-	0,10	-	0,02	-	0,01	0,00	-
Química	7,06	9,55	1,32	12,15	8,24	5,68	22,66	14,64
Sistema	-	-	12,33	1,23	0,17	-	-	-

Usage share per discipline (approx.)

BoT applications abound...

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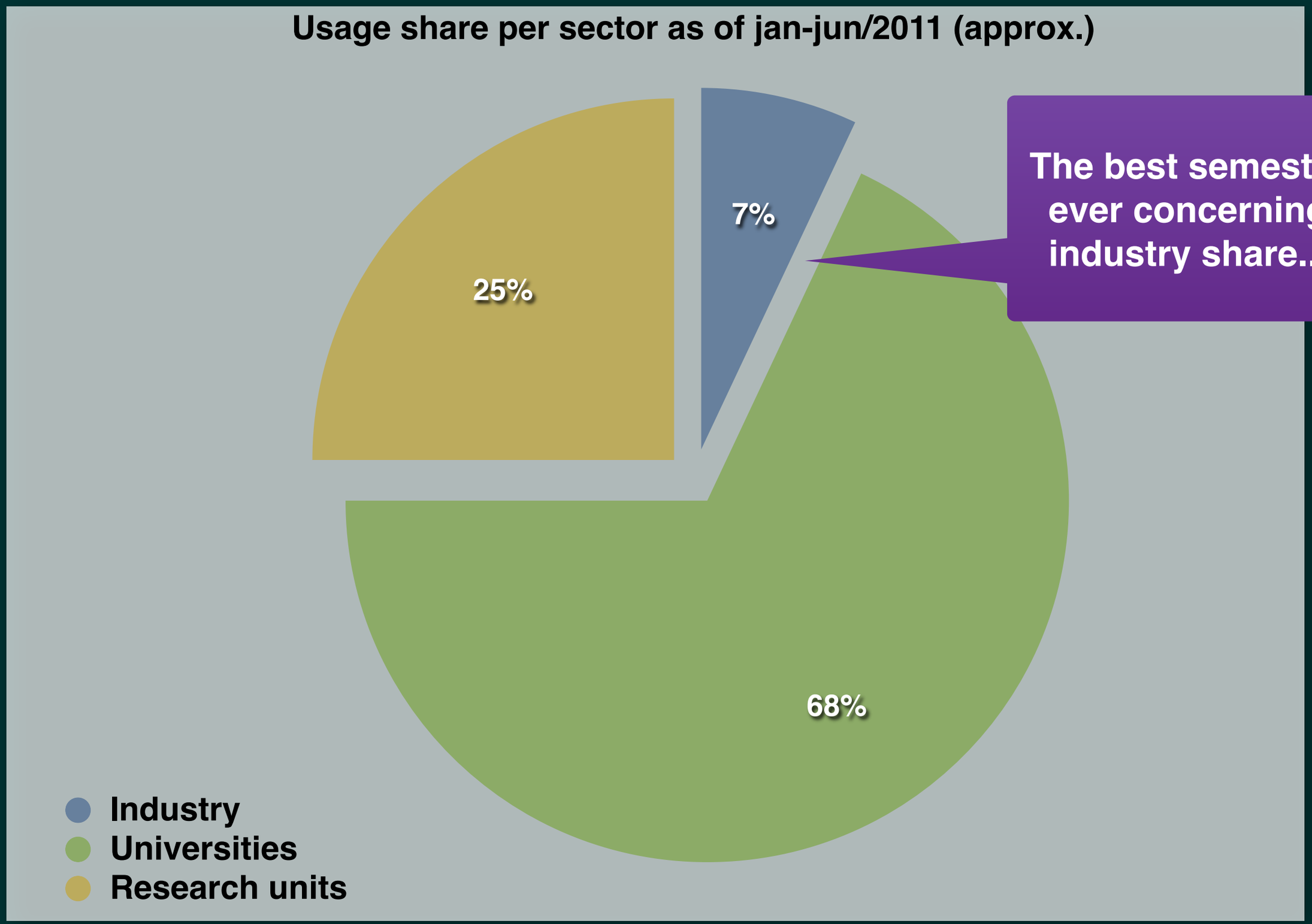


SINAPAD roadmap:
short term

- Data and appl bus for seamless centers integration
- Partnership with other initiatives (OurGrid, "Ciência em sua casa"...)
- Narrow user interfaces (Clouds!)
- Support to scientific workflows (Galaxy, Taverna...)

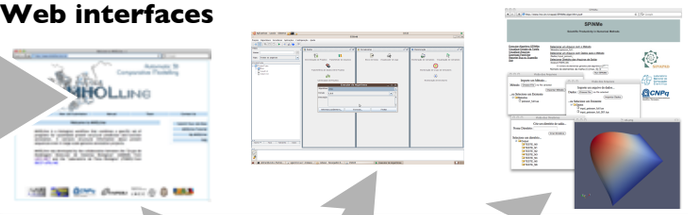
Release HPC resources from BoT applications

Increase awareness of HPC capabilities

The PADBR grid and the *mc*^{2} platform

Researcher (user of e-science applications empowered by mc²)

Web interfaces



mc² engine

configurator

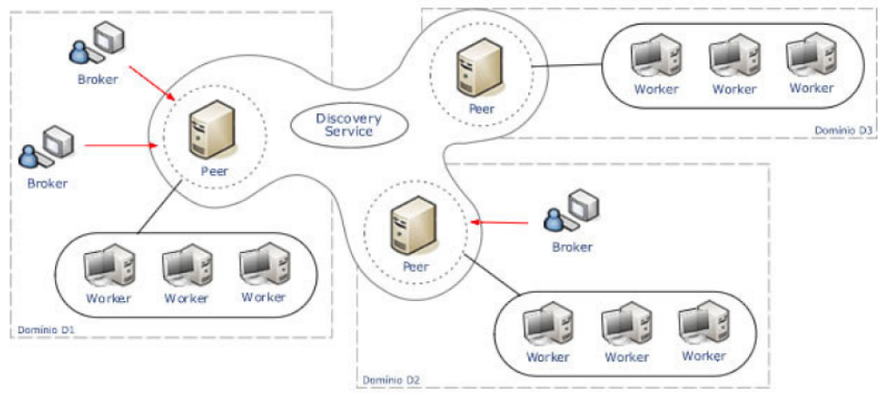
Configuration repository

Developer of e-science applications (typical user of mc²)

Data & appls bus

CENAPADs (dedicated resources)

OurGrid & BOINC (opportunistic resources)



mc² Minha Cloud Científica

Laboratório Nacional de Computação Científica

Universidade Federal de Campina Grande

PUC RIO

RNP

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Web portals

SINAPAD roadmap:
mid and long terms

- Support to Big Science
  - Deployment of a Petascale facility in Brazil
- Collaboration with industry (service consumer/ provider perspectives)
- Collaboration with players at the Southern Cone, US, Europe (France), ...

Increase industry share

Provide users with "Big HPC"

HPC as a Service (HPCaaS)

ebruary 14, 2011
The Cloud-Enabled Space Weather Platform
Everett Toews

February 15, 2011
CTO Panel: Are Public Clouds Ripe for Mission Critical Applications?
Nicole Hemsoth

April 06, 2011
Cloud Sparking Rapid Evolution of Life Sciences R&D
Bruce Maches

May 24, 2011
Univa Unifies Grid Engine and Eucalyptus Clouds

April 11, 2011
Boosting Biology with High Performance Clouds
Asoke K. Talukder, Ph.D

April 06, 2011
University of Texas to House Largest Cancer Research Cloud

ugust 26, 2012
HPC as a Service – Key to Mainstream HPC or Wishful Thinking?
Wolfgang Gentzsch, Executive HPC Consultant

At this year's SRII Global Conference 2012 organized b the Service Research and Innovation Institute [http://www.thesrii.org/], which aims at "Driving Researcl & Innovation for "IT Enabled Services" for a Better World", we organized a panel about High Performance Technical Computing as a Service (HPCaaS).

This panel was inspired by the perception that on one hand HPC provides huge benefits to the industry, and especially to small- and medium enterprises (SMEs) with a focus on digital manufacturing (sometimes called the 'missing middle'), but on the other hand includes a number of significant barriers preventing its wider adoption. The panel wanted to investigate how especially HPC as a Service (remote access to HPC resources, HPC in the Cloud) is able to remove these barriers. As the Council on Competitiveness [http://www.compete.org] and the National Center for Manufacturing Sciences [http://www.ncms.org] have found, 97% of manufacturers are still using workstations and PCs as their main workhorses for design and simulations, but 57% of them said that they have problems that they can't solve with their existing desktop computers today. Therefore, they have a real need for more computing power, but there are still some barriers for them to overcome.

Source: HPC In the Cloud

SINAPAD roadmap:
Crosscutting issues

- Multidisciplinary teams
- Human resources formation in:
  - parallel data structures and algorithms,
  - system software,
  - fault tolerance & recovery,
  - visualization,

...

Thank you!
Merci!
Obrigado!

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