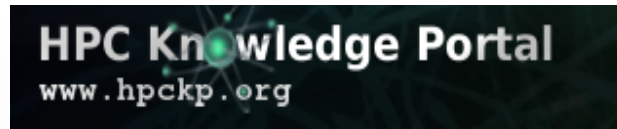


# HPCKP'14

## HPC Future trends: *My 2 cents*

Gabriel Verdejo Álvarez - RDlab



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# Who & Why

- **Who?**

Gabriel Verdejo Álvarez, Computer Science Engineer (PhD in progress :)  
Research and Development Lab (RDlab) IT Manager at UPC  
Working in HPC environments since 2004

- **Why?**

Share my experience in Supercomputing (HPCKP)  
I want to know & learn from you  
I want to tease you about HPC new tendencies

*I want to use my superpowers for Supercomputing future prediction*

# What is Supercomputing?

- ***Some definitions about HPC/Supercomputing***

“**noun.** a particularly powerful mainframe computer.”

Oxford Dictionaries [www1]

“A supercomputer is a computer at the frontline of contemporary processing capacity – particularly speed of calculation.”

Wikipedia [www2]

“HPC clusters can be composed of large numbers of servers, where the total physical size, energy use or heat output of the computing cluster might become a serious issue. Furthermore, there are requirements for dedicated communications among the servers that are somewhat unique to clusters. Because small design differences amount to large benefits when multiplied by the number of servers in the clusters, we are seeing the emergence of server designs that are optimized for HPC.....”

Gartner [www3]

# What is Supercomputing? II

- **More definitions about HPC/Supercomputing**

“Very simply, a supercomputer is a very fast computer. Usually the term is reserved for the 500 fastest computers in the world.”

San Diego SCC [www4]

## Googling for

## Results

Supercomputing	definition	873,000
HPC	definition	1,210,000

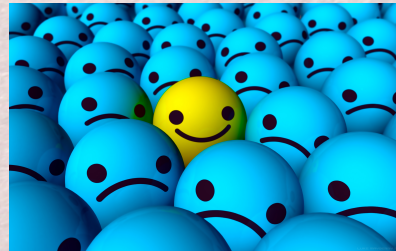
There are different "kinds" of supercomputing. Not an absolute truth.

# My 2 cents

**Big Data**



**GPU Computing**



**Quality of service**

**Virtualization and  
Cloud Computing**



**Green Computing**





# BIG DATA

- ***Big or small change?***

## Main features

## Typical HPC system

We need a lot of space

OK

Disk Arrays

We need a lot of processing power

OK

Thousands Cores

We need new file system paradigm

?

(GPFS/Lustre vs Hadoop/Ceph)

# BIG DATA II

- We need to offer extra support for our users and their applications.
- Does it fit? **Not at first sight** [www6][www7][www8]

- ***A new model vs Coexistence***

- |  |                                    |
|--|------------------------------------|
| 1. We can avoid this?                            | No problem, It's just a fad.       |
| 2. We can split resources!                       | Divide and be conquered.           |
| 3. We can think and evaluate (iterative process) | Embrace or reject, it's up to you. |



# GPU Computing

- ***Not for everybody... today***

- Stream processing problems [www9]
- Small amount of memory
- Very expensive
- High power consumption
- Too many incompatible “standards” (*Nvidia, Intel Phi...*)

- ***But... After midnight...***

- Faster than any bunch of CPU
- CPU+GPU = Integrated Graphics [www11]
- Overload\*/versatile execution nodes

\* We will talk about it later.

# Virtualization and cloud computing

- ***First things first.... Virtualization on a HPC?***
  - It hurts performance!
  - It hurts performance!
  - It hurts performance!
- ***When performance is not enough...***
  - CPU VT support
  - Not really a question of time: More CPUs and Moore's law
  - Flexibility: 1 host, N guests [www12][www13][www15]
  - More Flexibility: user images, reproducible experiments...
  - Security : Independent environments
  - Yes, but It hurts performance!

# Virtualization and cloud computing II

- ***For your eyes only?***

- Your own infrastructure, your own VT management method
- Only some nodes/queues can run vm... under some circumstances
- My HPC system can run vm... but is not compliant

C'mon grow up and be standard [www17][www18][www19]

- ***From cloud to cloud***

- Less is better (few good are better than many bad)
- More resources if needed but not on demand
- Possibilities: move executions “easily”, lower maintenance downtimes
- More Possibilities: temporary queues, shared executions

# Green computing

- ***I love recycling and ecology, am I green?***

- You have thousands of powerful CPU/GPU cores and RAM memory modules
- You have hundreds of 24x7 spinning hard disks and power supplies
- You have dozens of network equipment
- You have several cooler machinery
- You may have a backup power generator

Face it, if you own/run a HPC system **today**, you are dark!  
(and I don't mean dark green) [www22][www23][www24]

# Green computing II

- ***Yes, I would like to... but in a “near” future***

- Performance vs efficiency
- Green computing is a “whole”, not just a hardware question
- Using the same HPC models leads to the same results

$\infty$  - something =  $\infty$  [www25][www26][www27]

- ***Tell me more, tell me more...***

- FLOP/watt ratio [www29]
- The Montblanc project [www30]
- Cloud computing and market segmentation

# Quality of service

- ***Last but not least***

- Forgiven but not forgotten
- I am a real BOFH (Google and Amazon loves you)
- I have “nice” user satisfaction surveys results (“Everybody lies” House, M.D.)
- Nobody wants you when you're down and out [www38][www39]  
(...but I am ISO 9XXX compliant / My service is 99.9%)
- Quality of service is a whole, a day-to-day process for **everybody**

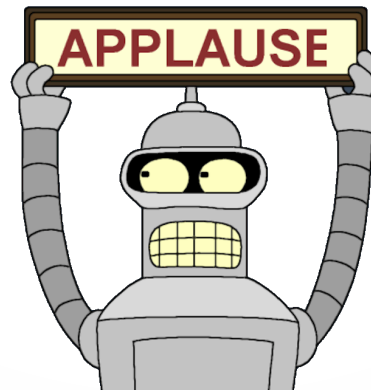
Etch in mind: Quality of service is not for users, is for you!  
[www32][www33][www34][www35][www36]

# Thank You!

- *I would like you to think/ask about*

- Big Data
- Virtualization and cloud computing
- Quality of service
- GPU Computing
- **Green** computing

## *Any Questions ¿?*





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