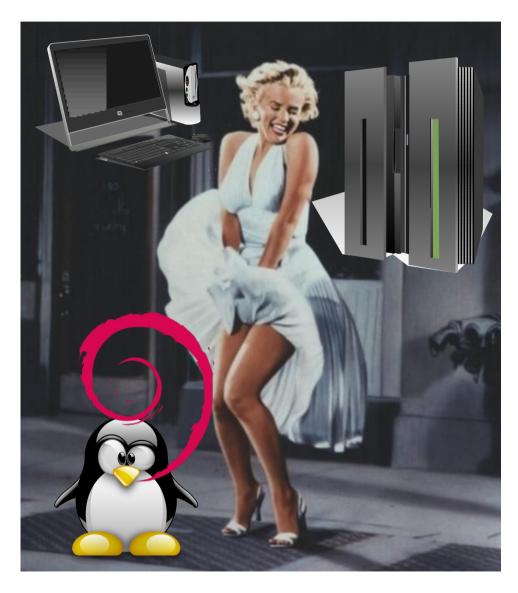# Starting with a tiny joke !

- How do you call people speak 3 languages ?
  - Trilingual people !
- How do you call people speak 2 languages ?
  - Bilingual people !
- How do you call people speak 1 language ?
  - French people !

I'm french :

if I twist your eardrums, I apologize...

Debian for Scientific Facilities Days

ÉCOLE **NORMALE**
SUPÉRIEURE
DE **LYON**

From Workstations
to HPC
with Debian weapons
7 years to twitch
to convince scientists

Film : « 7 year itch »

16 years ago Debian, in 1996...

Everything started in 1996, I got married (2x ...)

- On 10th of August with Noëlle

- On 17th of June with Debian (most important?)

Sixteen years later in 2012 :

- 3 wonderful children and separated...

- Several hundred on Debian systems installed !

    - As Workstations on PC and Laptops

    - As servers, routers (ATM un 2001 and GE in 2002)

    - As nodes of scientific computing...

2005: back to scientific computing Debian : ideologic & pragmatic

- In 2005 : Mesocenter in ENS-Cachan
  - Nec TX7 with « Itanic » processors
  - System Red Hat Enterprise Linux 2.1
    - You can find your vomit bag under your seat !
- For the Laboratory of Mecanic Technology
  - Ask for modern compiler, and LA libraries
  - Try to compile compiler (in 2005, not in 1995)
  - Impossible to install on native distribution
- Idea : Use Debootstrap from Debian !

2005 : (hidden) distribution
The choice of reason (& heart)

- The process :
  - Get Itanium version of DebootStrap of Woody
  - Unwrap executables
  - Import to RHEL distribution
  - Start installation
  - Copy & upgrade installation (Woody to Sarge & to Sid)
  - Bind Home directory
  - Start SSH on different ports : 22022, 22021, 22020

Virtualisation : several systems on one machine !

- And the most important : User satisfied !

2007 : My Own System on Cluster Grid'5000 & Kadeploy

- Working on Lego project with Diet software :
  - Gridification of 2 applications : cosmology & meteo
- Need to deploy my own environment
- Use Kadeploy software :
  - Reserve on OAR batch scheluler software
  - Boot on PXE and untar my own system
- Results :
  - In march 2007, 1 year in 1 day
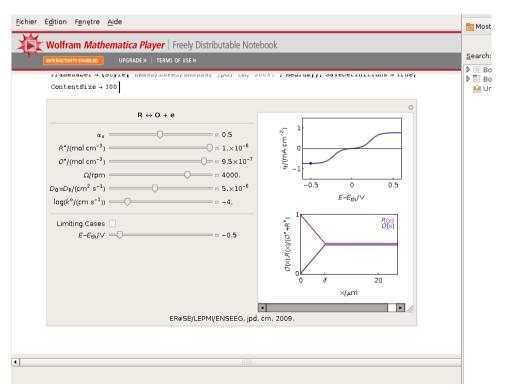 - New paradigm : Scientific software & system intrication

2009 : Back to science !
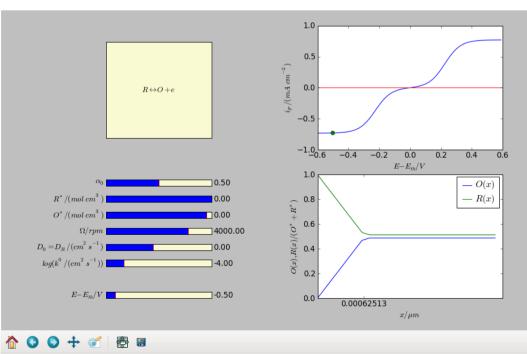# In Blaise Pascal Center

- Hotel for projects, courses, workshops

- Main activities : « catalyse » scientific projects

  - Provide ressources : « brain available », SC resources

  - What ? Simulation, processing, visualization

  - Who ? Chemistry, Physics, Digital Humanities, ...

  - How ?

    – Provide compleye scientific environments for specific software

    – Integrate Scientific Software on plat-form

    – Evaluate new hardware & integration

    – Anticipate : distributed storage, GPU, middleware, ...

    – « Librification » of code

Librification of code
Sample « learn & produce »

- From Mathematica runtime to Python

- Used for two years by chemistry teachers

Blaise Pascal Center :
Like « Dryden » in NASA !

Dryden Flight Research Center EC87 0182-14 Photographed 1987
X-29

Nasa X-29

- Cell of F-5

- Engine of F-18

- Gear of F-16

- Studies

  - Fwd swept wing

  - Incidence >50°

  - *« Fly-By-Wire »*

Green Attitude !

Recycle, Re-use and explore new domains

ÉCOLE **NORMALE** **SUP**ÉRIEURE DE **LYON**

2009: How to migrate ? (and make them work better!)

- From IT supervisor to Research Engineer

- In Blaise Pascal Center (originally Cecam)

- Lots of old (or very very old) hardware

- Transform tiny Neoware terminal X

  - Extend memory with cluster memory

  - Switch to PXE boot

  - Overclock processor

- Process

  - Boot by PXE

  - Load all system by NFSROOT
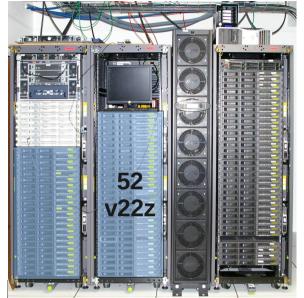
2010 : up to a cluster

- PSMN released 24 nodes Sunfire v20z

  - Two AMD processors

  - Embedded system on hard drive

  - Two hard drives

- Apply process of Thin clients

  - Boot PXE

  - Load system

  - Start exploring distributed storage

  - Providing cluster for experiment and integration

2011 : scaling process and exploring new domains...

- PSMN released 52 nodes v22z

  - Two 2-cores AMD processors

  - From 8 to 16 GB or RAM

  - IB network interconnect

- Use exacly same infrastructure

- Persistence needed : from TMPFS to AUFS/iSCSI

  - Origin : R/O NFSROOT & R/W with TMPFS on folders

  - First : RO NFSROOT & R/W with NFS on / with AUFS

  - Last: RO NFSROOT & R/W with iSCSI on / with AUFS

- Improving support on IB with old material

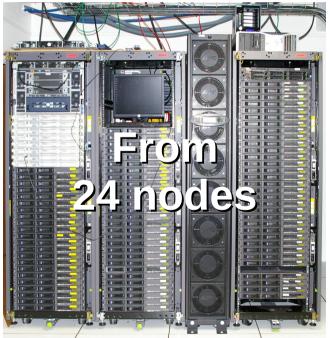# 2012 : qualification of hardware and software

- Infiniband support of Mellanox 4
  - Create paquet from OpenFabrics to replace native ones
- GPUs
  - Dell C6100 & C410x
  - HP SL250
  - Machines delivered without Hard Drive : network boot !
- ZFS on Linux as replacement of MDADM/LVM
- iSCSI boot machines
- GlusterFS on IB for scratch High Bandwitdh folders

Success story of portability
From 10 thin clients to clusters...

From
15 NeoWare
Under
NFS root

To
18 WS
Network
booted

Houches 2011
Local Cluster
12 laptops

From
24 nodes

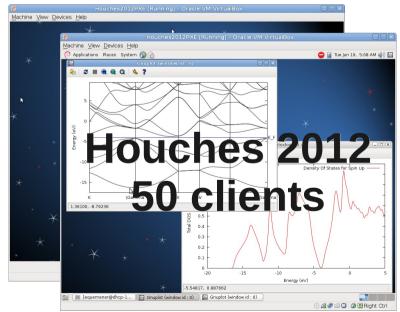To
100
nodes

Houches 2012
50 clients

Success story of virtualization

- Scientist : « I want to launched from my MacOSX »

- EQ : « OK, but as I want »

- Process :

  - Integration of (...) software on Debian in VirtualBox

  - Export Appliance

  - Import Appliance

- Scientist : « Great ! On my PhD, postdoc now ! »

- Scientist : « When on main HPC Center PSMN ? »

    EQ solution imported as default OS on PSMN

2012 : time to convergence
The revolution of virtualization

- What research engineers generally purpose ?

  - More and more (Processors, Memory, Disk space, ...)

- What scientific really want ?

  - The Smoothest transition from my workstation and HPC

  - Help for « engineering » scientific code (tricky...)

- Why Debian is THE solution ?

  - Large Software Covery : Complete

  - Large Hardware Covery : Multiplatform

  - Open Source : costs entrance/exploit/leave

  - Quality Assurance : reproducibility

What is « COTS » ?
Component on the Shelf

« Military & Aerospace Electronics »,

November 2011, COTS : 12 occurrences

Inside « **Robots in combat missions** » (page 26)

*« The DOD has mandated the use of **open standards** that **enable interoperability**, such as COM Express, VPX, and PC/104, because of the **cost savings** they deliver. »*

*« Commercial off-the-shelf (**COTS**) components also **allow** manufacturers to improve time-to-market, getting **new technologies deployed** in the field **faster**. »*

*« **Open-standard COTS** components offer even greater advantages, with their modularity **allowing designers** to **develop** more advanced systems **without increased project risk**. »*

From COTS in industry...
To SIDUS in HPC...

- SIDUS : « constellation » in Latin

  - Software Inside Debian Universal System

  - SIDUS approach, Integrative approach

- Debian, the best choice... Why ?

  - The Universal Operating System ?

  - Architectures : 9 supported (8 more non official)

    - amd64, armel, i386, ia64, mips, mipsel, PowerPC, s390, sparc

  - Kernel : Linux & FreeBSD (2 arch. supported)

  - Huge & Well integrated software (more 29000 packages)

  - Quality Assurance (any Debian Developer agree...)

  - Hardware... Software... Environment (as I've show it!)

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What's future ?

- Universal Operating System :
  - From Workstation to Cluster, Grid, Cloud...
  - Upload or use exaclty the same system
  - Universal Demonstrator in CBP for chemistry
- For me, Test Pilot in Scientific Computing
  - Integration of more and more software and hardware
  - Documentation of all complicated operation
  - Packaging more and more packages
  - Writing more and more tests
  - Administration of remote clusters (in Freelance 🙂)

As conclusion...
Back to Past

- Few decades before French Revolution (1789)
  - Corporatism : Hide knowledge to people
  - Two Scientists : Diderot & D'Alembert
  - *Encyclopédie du savoir, des sciences, des techniques*
- In 2012, in software environment
  - Corporatism : Close software to people
  - Few developpers (~1000)
  - Debian Distribution : Encyclopedy of working software

Ending with a tiny joke !

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- Yes, it's the same joke, but...

I'm aleady french (no change in 20 minutes) :

Questions ? Please speak slllloooowwwwly !