SC@UNAM

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Supercomputing Department
UNAM

Outline

- Supercomputing Department
- Miztli
- Users / projects / human resources
- More efforts in Mexico

Supercomputing Department

- Founded in 1991
- UNAM invested 10 MUSD for:
  - A Cray supercomputer (80%)
  - Funding supercomputing-based research projects (20%)
  - Visualization laboratory

Supercomputing Department

ICT Office

- Global computing/comm services to UNAM's community
  - Networking, mail, web-based services
- Specific services for research
  - SC, Vis, VR, NREN

Supercomputing department

- HPC resources to UNAM research community
- Academic services
  - Training
  - advice

	1991 Sirio	1997 Berenice	2003 Bakliz	2007 KanBalam	2013 Miztli
marca	CRAY	SGI	HP	HP	HP
procesador	Vectorial	R10000	Alpha EV67	Opteron Dual Core	Intel E2670 8 cores
número de procesadores	4	40	32	1,368	5,312
rendimiento numérico (GFlops)	1.02	15.6	80	7,113	118,000
memoria (Gigabytes)	0.512	10	32	3,016	15,000
almacenamiento (Gigabytes)	19	170	1,000	160,000	750,000

Miztli

- 314 ‘regular’ nodes
  - 2 Intel E5-2670 (2.6 GHz)
  - 16 cores
  - 64 GB RAM
  - Infiniband 40 Gbps

- 20.8 GFlop/s per core
- 332.8 GFlop/s per node
- 104.5 TFlop/s

Miztli

- 8 ‘gpu’ nodes
  - regular nodes + 2 Tesla M2090
- 665 GFlop/s per GPU
- 10.6 TFlop/s (no CPU)

Miztli

- 10 ‘special’ nodes
  - 2 Intel E5-2670 (2.6 GHz)
  - 16 cores
  - 256 GB RAM
  - Infiniband 40 Gbps
- 20.8 GFlop/s per core
- 332.8 GFlop/s per node
- 3.3 TFlop/s

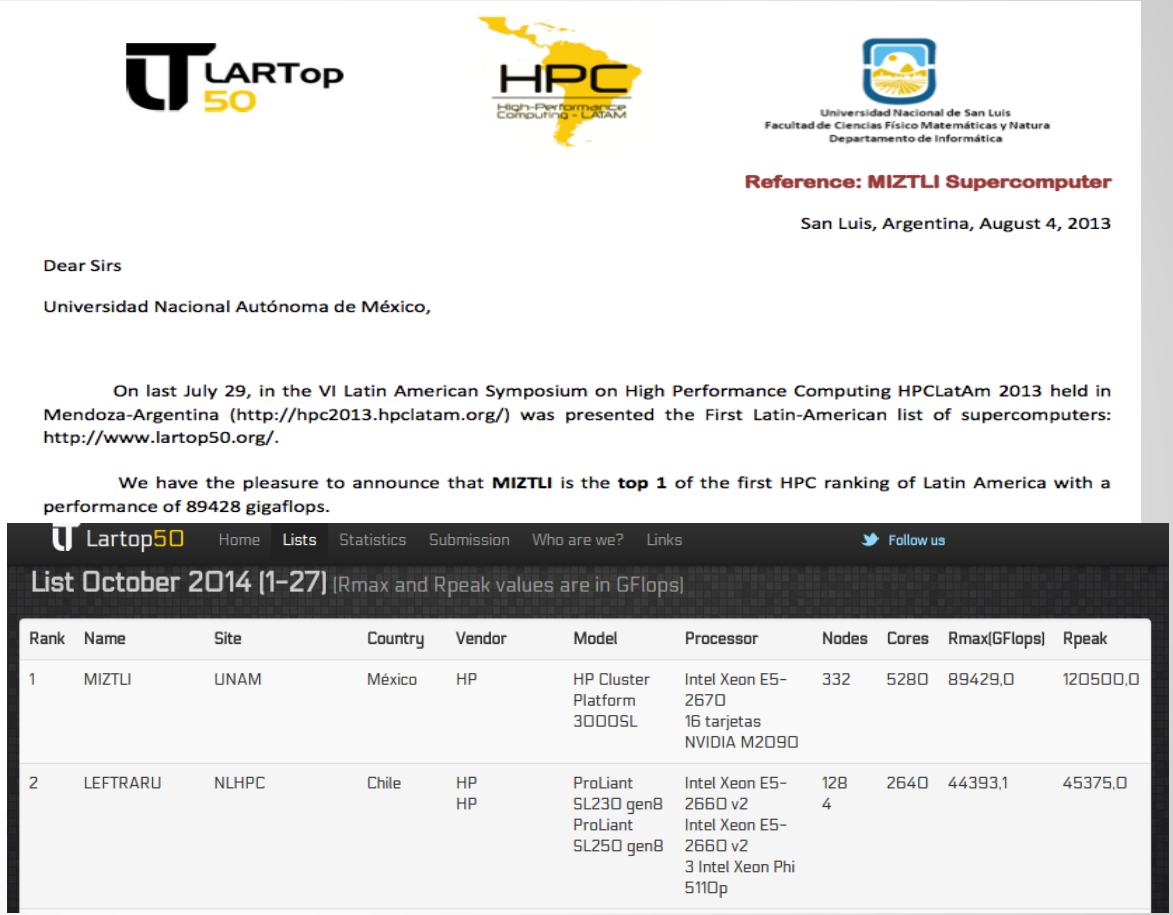
Miztli

- 324-ports IB 40 Gbps
  - + 3 “leaf” switches
- 2 DDN Lustre filesystems
  - 220 TB (scratch)
  - 500 TB (repository)

Miztli

Overall peak performance is 118.4 TFlop/s

HPL clocks at 89 TFlop/s



LARTop 50

HPC High-Performance Computing - LATAM

Universidad Nacional de San Luis
Facultad de Ciencias Físico Matemáticas y Natura
Departamento de Informática

Reference: MIZTLI Supercomputer

San Luis, Argentina, August 4, 2013

Dear Sirs

Universidad Nacional Autónoma de México,

On last July 29, in the VI Latin American Symposium on High Performance Computing HPCLatAm 2013 held in Mendoza-Argentina (http://hpc2013.hpclatam.org/) was presented the First Latin-American list of supercomputers: http://www.lartop50.org/.

We have the pleasure to announce that **MIZTLI** is the **top 1** of the first HPC ranking of Latin America with a performance of 89428 gigaflops.

Lartop50 Home Lists Statistics Submission Who are we? Links Follow us

List October 2014 (1-27) (Rmax and Rpeak values are in GFlops)

Rank	Name	Site	Country	Vendor	Model	Processor	Nodes	Cores	Rmax(GFlops)	Rpeak
1	MIZTLI	UNAM	México	HP	HP Cluster Platform 3000SL	Intel Xeon E5-2670 16 tarjetas NVIDIA M2090	332	5280	89429,0	120500,0
2	LEFTRARU	NLHPC	Chile	HP HP	ProLiant SL230 gen8 ProLiant SL250 gen8	Intel Xeon E5-2660 v2 Intel Xeon E5-2660 v2 3 Intel Xeon Phi 5110p	128 4	2640	44393,1	45375,0

1st Call for projects (apr'14)

Research projects

- Experienced groups
- Well established requirements
- Well established goals
- 64 projects, 102 Mcpu-hours

1st Call for projects (apr'14)

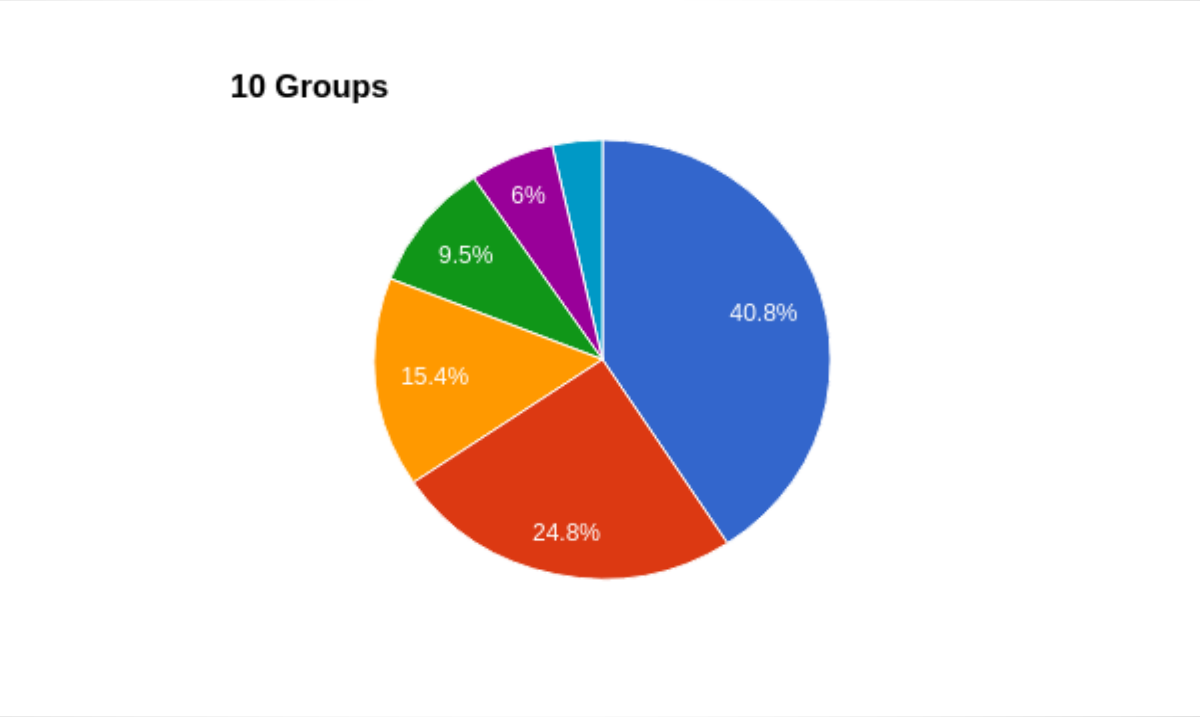
Seed projects

- Gain knowledge
- Test software/methodologies
- Occasional runs
  - 16 projects, 6.6 Mcpu-hours

Allocations

- Resources for all requestors
  - Global reduction factor
  - Merit factor (reduce or increase)
- Research projects: 28 Mcpu-hours
- Seed projects: 1.3 Mcpu-hours

Resource distribution



Top 5 Projects

Intercalación de complejos metálicos en ADN	1,250,000
Topología atómica y propiedades de materiales complejos (no cristalinos)	1,250,000
Supercómputo para problemas de N cuerpos y matrices aleatorias	1,150,000
Nanoestructuras metálicas quirales	1,150,000
Estudio de propiedades estáticas, dinámicas y ópticas de sistemas anispotropos utilizando simulaciones moleculares.	1,150,000

Some highlights

propiedades conformacionales de la región modular tipo ankirina en la interacción con regiones proteicas de membrana	250K átomos, 256 cores, 15 TB en datos de trayectorias
Modelado a gran escala de la propagación de ondas en la Zona Centro de México con aplicaciones a la obtención de parámetros de la fuente sísmica y la generación en tiempo real de mapas de de movimiento del terreno.	software escalable a 4K procesadores

Plan de Becarios SC/RV

- Undergraduate students
  - Compute, Physics, Chemistry, Maths
- Develop skills
  - Advance unix usage
  - Programming tools
    - Development, compiling, debugging

Plan de Becarios SC/RV

- Parallel programming
  - Concepts, models, tools, performance
- Virtual Reality
  - 3D, interactive, multiple interfaces
- Scientific Visualization
  - Visual representation, tools
- HPC sysadmin
  - admin, networking, security

Plan de Becarios SC/RV

2013-2014:

- 9 students
- 8 projects
- 1,220 course-hours

Alice T1@UNAM

- Alice is one of the HLC experiments
- Generates >1 Petabyte/year
- Deployed a world grid to storage, distribution and analysis

Alice T1@UNAM

- 32-node processing cluster
- 500-Tbytes storage cluster
- 1 Gbps link to Europe *

LANCAD

- Supercomputing consortium
- 3 major research institutions
  - CINVESTAV, UAM, UNAM
- 3 big SC centers
  - CINVESTAV-Z, UAM-I, UNAM-DGTIC
- 1 big network
  - metropolitan FO network owned by LANCAD

Capacity in México (incomplete list)

100s nodes

UNAM-DGTIC	332
UAM-I	188
CINVESTAV-Z	170
IPICYT/CNS	140

10s nodes

UNAM-IIMAS	74	UNAM-IGf	20	UNISON	71
UNAM-CGC	38	UNAM-C3	18	CIO*	36
UNAM-ICN	40	UNAM-CCA	15	UAMx	14
UNAM-IBt	48	UNAM-IA	20	LANGEBIO*	36
UNAM T1	32	CIMAT*	80	CINVESTAV-M	30

Projected centers, machines

ABACUS	LLNS	CNS/IPICYT	RED SUPERCOMPUTO
CINVESTAV - EDOMEX 100’s nodes Focus in app developing	BUAP - INAOE - UDLA 100’s nodes Focus in research	1.5 PetaFLOP/s	Guanajuato 10’s nodes HPC consolidation

Founding and organization

CONACYT funded ‘national laboratories’

- LANCAD
- CNS/IPICYT
- Promote and fund ‘red temática SC’

REMEXSU

- Join HPC efforts / interests
  - Resource providers, grade programs, users
- Promote politics, policies and strategies
  - Suitable infrastructure
  - Long term strategies
  - HR development
- Invest optimization

Where we are? (HW)

Brown	Buffalo
Clemson	Utah
Mississippi State	Georgia Tech
Arizona	Ohio

Where we are? (HW)

Brown	538	Buffalo	710
Clemson	1978	Utah	444
Mississippi State	960	Georgia Tech	1207
Arizona	391	Ohio	1130

Year	TFlop/s systems	PFlop/s systems
(1997, 2008)	1	2
(1998, 2009)	1	2
(1999, 2010)	3	7
(2000, 2011)	7	10
(2001, 2012)	17	20
(2002, 2013)	47	31
(2003, 2014)	131	37*
(2004, 2015)	397	
(2005, 2016)	500	

- When PF will be the minimal level of SC?
- How many 100s TF apps are already there?

PFlop/s system (current technology)

- ~64K cores
- 5400 - 4000 procs
- 1000 - 2700 nodes (IB ports)
- 400 - 600 KW
- 30 MUSD

- ⅓ with accelerators
  - How many groups can benefit from 1K accelerators?
- Would be useful to invest 15 MUSD in developing?

Where we are? (SW)

- How many 10’s TF apps?
- When 100’s TF apps?
- Invest in HW (30K USD/project)
- Invest in app development (?)

Thank You!