



Vrije Universiteit Brussel

Computing infrastructures in Belgium

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Research and education policy in Belgium

- Research and education policy
 - Belgian Science Policy at the federal level
(space, energy, research network, national delegation to international organisations)
 - Research funding is at the regional level
(Flanders, Wallonia, Brussels)
 - Education is at the community level
(Flemish, French, German)



Community computing infrastructures in Belgium

- Flemish Supercomputer Centrum (VSC)



<https://vscentrum.be/>

- Consortium des Équipements de Calcul Intensif (CECI)



<http://www.cec-hpc.be/>



VSC infrastructure (1)

- Tier-1 located at the University of Ghent
- Interconnected Tier-2s at:
 - University of Antwerp
 - University of Brussels
 - University of Ghent
 - University of Leuven
- Contribution to the Belgian grid for research (BEgrid connected to EGI)
concentrated in one gridcluster at the Univ. of Brussels



VSC Infrastructure (2)

BEgrid cluster

2000 cores

several different CPU models

memory per node/core is going up

Infrastructure at University of Antwerp

a 768 core cluster (L5420 CPUs, 16 GB RAM/node) from HP extended with 768 cores (L5640 CPUs, 24 GB RAM/node)



VSC Infrastructure (3)

- **Infrastructure at KULeuven**

928 core cluster (L5420 CPUs, 8GB RAM/node) from SGI, extended with 640 cores (Xeon 5560 CPUs, 24GB RAM/node) followed by a small extension with 6 72 GB Ram-nodes was added. In February 2011, the cluster was extended once again with 96 nodes (Xeon 5650, 24GB RAM/node).



VSC Infrastructure (4)

- Infrastructure at University Gent

192 computing nodes

- dual-socket quad core Intel Xeon Harpertown (L5420)
- 16 GB RAM per node
- Infiniband connectX DDR

54 computing nodes, for single node jobs

- dual-socket quad-core Intel Xeon Nehalem (L5520)
- 12 GB RAM per node

167 computing nodes, for single node jobs

- dual-socket quad-core Intel Xeon Nehalem (L5520)
- 12 GB RAM per node



VSC Infrastructure (5)

- 34 computing Dell C6145 nodes
 - quad-socket octa-core AMD Magny-Cours (Opteron 6136)
 - 2 GB RAM per core
 - Infiniband Double QDR
- 16 computing nodes
 - dual-socket hexa-core Intel Westmere-EP (X5675)
 - 8 GB RAM per core
 - Symmetric Multi-Processing (SMP) machine based on vSMP Foundation from ScaleMP
- **Storage -Total storage space: 82 TB**
 - 52 TB fast temporary storage (scratch)
 - 30 TB long term storage
 - **no back up**



VSC Infrastructure (7)

- **Infrastructure at University of Brussels**

The latest Hydra upgrade is an HP cluster composed of 64 HP ProLiant BL465c G7 blades for a total of 1024 cores and 4096GB of RAM.

-Blades specifications:

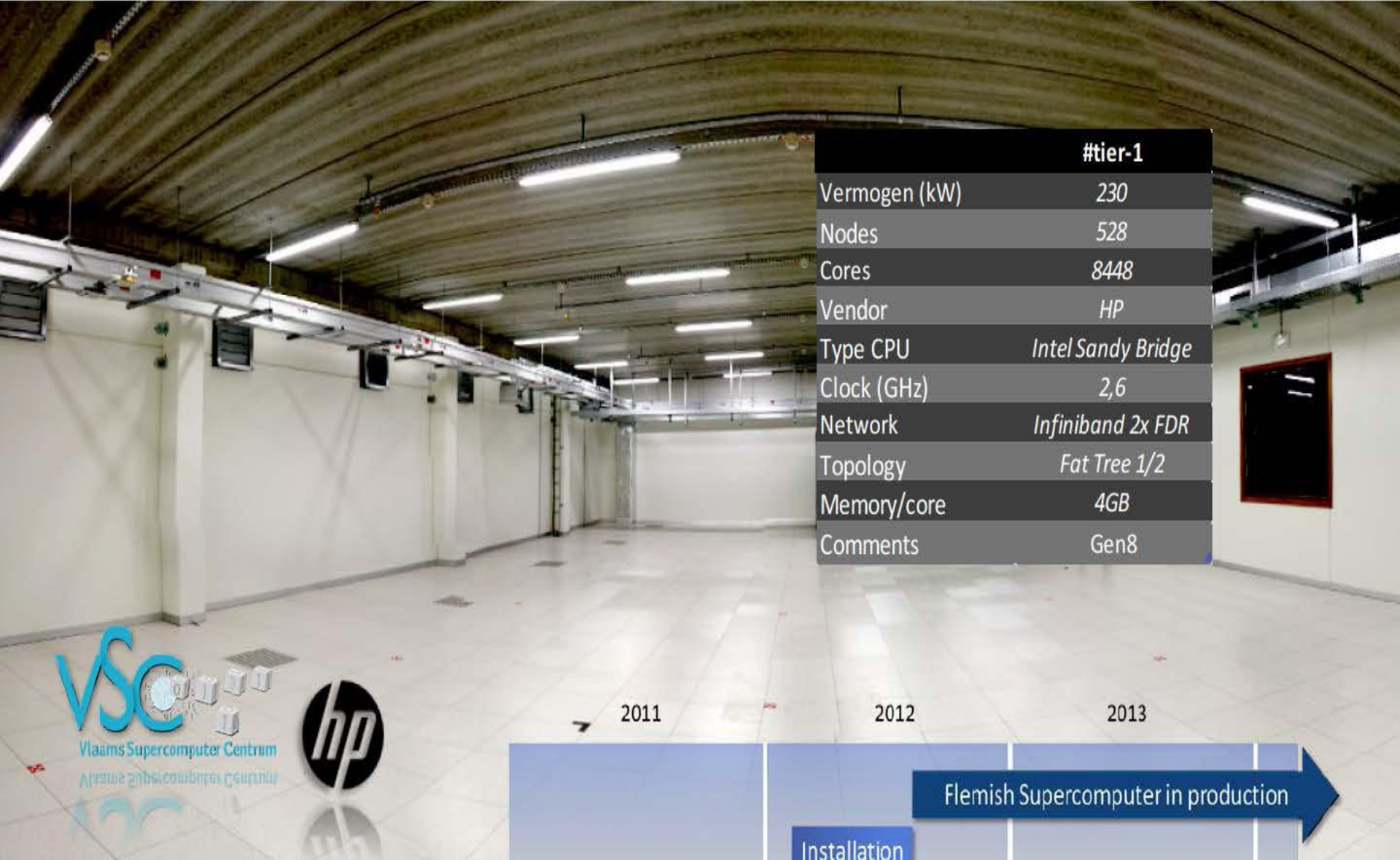
2x AMD Opteron 6100 2.3GHz with 8 cores each.

64GB DDR3 RAM 1.333GHz.

2 x 500GB SATA 7.2k in RAID0 with a 1GB RAM controller.1x Gb Ethernet connection.

1x HP 4X QDR Infiniband connection on a PCI express 2x card..

STORAGE 72 Tbyte.



	#tier-1
Vermogen (kW)	230
Nodes	528
Cores	8448
Vendor	HP
Type CPU	Intel Sandy Bridge
Clock (GHz)	2,6
Network	Infiniband 2x FDR
Topology	Fat Tree 1/2
Memory/core	4GB
Comments	Gen8





CECI infrastructures

Université	Cluster	Noeuds	CPUs	Coeurs	GFLOPS/ Coeurs	Tera FLOPS	Type CPU
FUNDP+UMons	ISCF	58	116	464	12,67	5,88	Intel 5460 à 3,16GHz
		25	50	300	10,64	3,19	Intel 5650 à 2,66GHz
		1	4	24	8,4	0,2	Opteron 8425HE à 2,1GHz
FUNDP	NAXYS	14	28	112	11,32	1,27	Intel 5440 à 2,83GHz
UMons	SCMN	2	8	32	5,2	0,17	Power4
		20	40	40	11,2	0,45	Xeon 2,8GHz
	CRMM	80	80	80		0,46	AMD 1600 et 2600
	Physique	16		92		0,2	
	PoleTI	8	16	16	7,2	0,12	Opteron 244 à 1.8GHz
		10	20	80		10 0,8	Intel 5420 à 2.5GHz
		1		4		4,4	Nvidia tesla s1070
ULG	NIC3	208	416	1664		10 16,64	Intel 5420 à 2,5GHz
	NIC2	64	128	128	5,2	0,67	Opteron 252 à 2,6GHz
	GIGA			150		8 1,2	Divers
	Chimie/ Physique			62		1,02	Divers
UCL	Green	103	206	824		10 8,24	Intel 5420 à 2,5GHz
	Lemaitre	128	256	256	5,2	1,33	Opteron 252 à 2,6GHz
		12	24	96		10 0,96	Intel 5520 à 2,27GHz
		16	32	128		10 1,28	Intel 5420 à 2,5GHz
ULB	SMN	48	96	384		10 3,84	Intel 5420 à 2,5GHz
	HYDRA	10	40	80	4,8	0,38	Opteron à 2,4GHz
		80	160	640	9,6	6,14	Opteron 2353 à 2,4GHz
	SPP	80	80	80	6,4	0,51	Pentium 4 à 3,2GHz
		20	40	160		10 1,6	Intel 5420 à 2,5GHZ
		27	54	216	9,07	1,96	Intel 5520 à 2,26GHz
	IRIDA			336		8 2,69	Divers



Green IT (1)

The Tier-1 is hosted in an energy efficient, ecological new building

- Water cooling (cooling of hot air with cold water)
in this case more efficient than cooling with air
(cooling of hot air with cold air)
- Hot aisle containment: split the warm air off from the environment (inrow coolers take in “pure warm” air)
- use ASHRAE norms for the machines: temperatures up to 27° C, room temperature also 27° C



Green IT (2)

- hybrid drycoolers for the production of cooling water
(if outside temp. is under 17°C then water cooling happens by the outside air, in Belgium most of the year!!!)
- Use of modular UPS (UPS more efficient when fully loaded)
- (few) Offices heated with the warmth coming from the water that has to be cooled (warmth pump)
- rain water recuperation
- Part of the roof is a green garden



Sustainability (1)

Parameters important for defining a e-Infrastructure (OSIRIS project)

Governance

Sustainability

Access Policy

Operational principles

Sustainability (2)

Sustainability

Funding

Costs

Evolution

Governance



Sustainability (3)

Governance VSC and CECI

Both do not have a legal status

Collaboration between universities

→ Decision taking process is longer

→ No own policy for innovation

→ Has repercussion on distribution of funding

VSC Funding proposal

	2012	2013	2014	2015	2016	2017
Tier-2, FFEU 2010	4	1				
Tier-2 structureel		1.129	2.563	2.858	3.253	2.242
Tier-1		500	2.759	3.241	2.883	4.117
Personeel (vte)	12.5	17	17	22	22	22
Personeel (k€)	1.1	1.581	1.649	2.244	2.354	2.486
Energie tier-1	220	314	330	720	968	1.254
Netwerk en software	100	344	264	313	313	333
Werking (cursussen, ...)	30	110	120	120	130	130
Overige werking	50	522	815	844	749	408
Totaal structureel	1500	4500	8500	10340	10650	10970



Vrije Universiteit Brussel

CECI funding

1 M EUR in 2011

1 M EUR in 2012

2013 ... ?



Sustainability (6)

Lack of long-term funding policy (CAPEX and OPEX)



- Drawback for innovation
- Drawback for real collaboration
- Drawback for attracting a good staff and building up an expertise
- Impossibility to operate the infrastructure (energy, personnel, ...)