

POZNAŃ SUPERCOMPUTING AND NETWORKING CENTER



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CAPACITIES

COOPERATION

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IDEAS

INFORMATION SOCIETY

MILESTONES

POZNAŃ SUPERCOMPUTING AND NETWORKING CENTER



Cloud for HPC – case study

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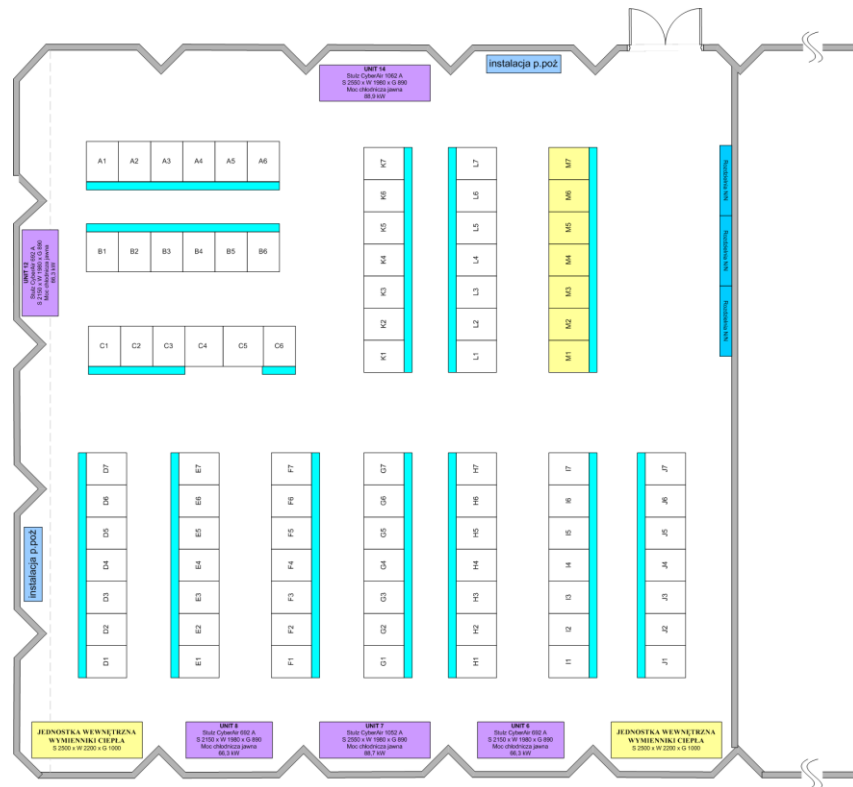
National Research and Education Network - PIONIER (transmission)



- HPC infrastructure
 - PC clusters
 - GPGPU clusters
 - Prototypes on future promising technologies
-
- Hierarchical data infrastructure
 - Fast external source of data (computing)
 - Part of National Data Storage
 - Part of European Data Infrastructure



PSNC server room



PSNC server room

- ~300 m²
- 88 racks, more than 50 racks for HPC
- 0,6 MW of power

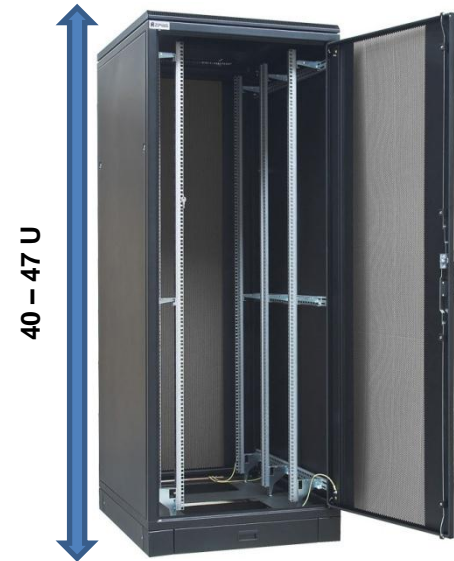
The problem:

Over 90% of the racks are full

The alternatives:

- **Colocation of the servers**
- Commercial cloud services
- New data center

Server room basics

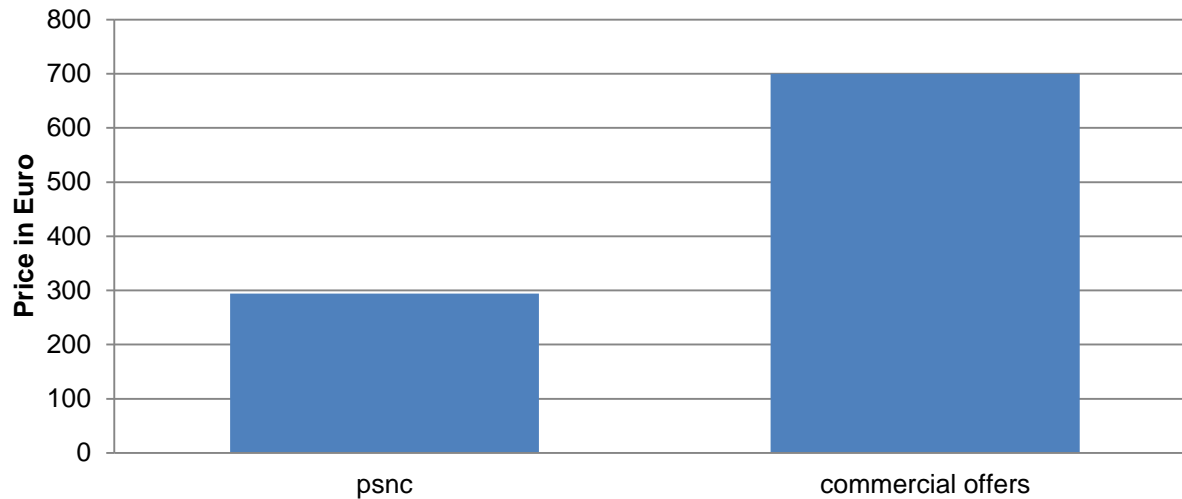


Monthly cost of collocation of 1U (2



7€

Price for 42U rack

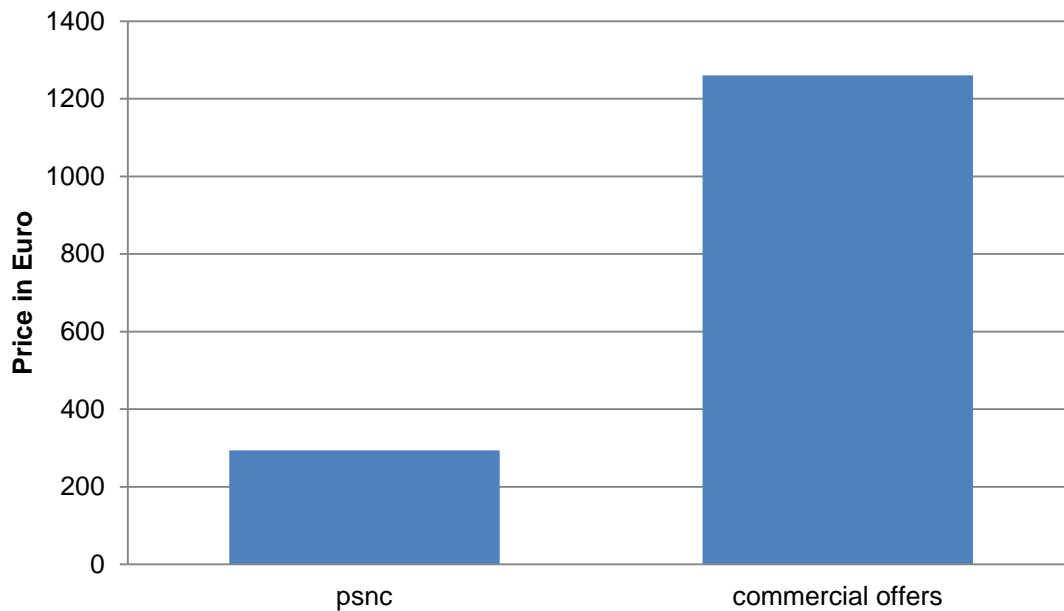


Problem

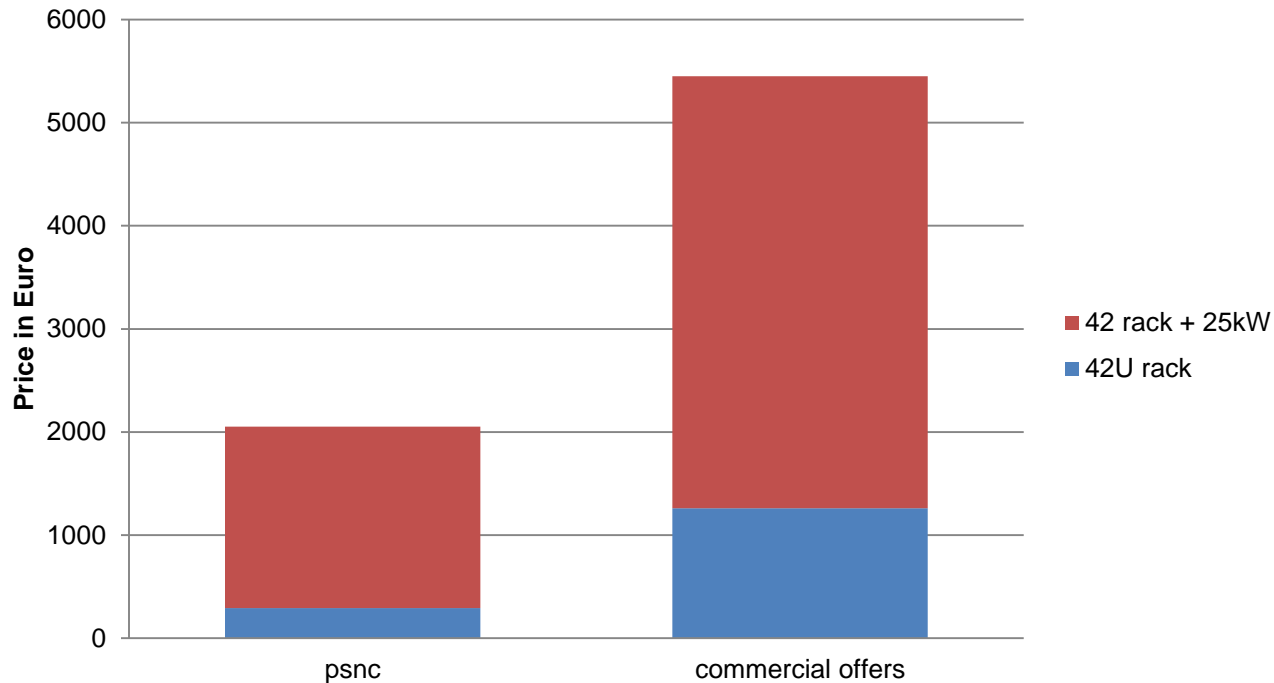
In the commercial DC power limit per rack is usually **8-12 kW**

At PSNC HPC servers consume **20-30kW** per rack.

Price for 42U rack



Price for 42U rack including power bill



The alternatives:

- ~~Colocation of the servers~~
- **Commercial cloud services**
- New data center

Two pillars of cloud business

- Typically servers are **under loaded**
- Overbooking makes cloud **cheap**

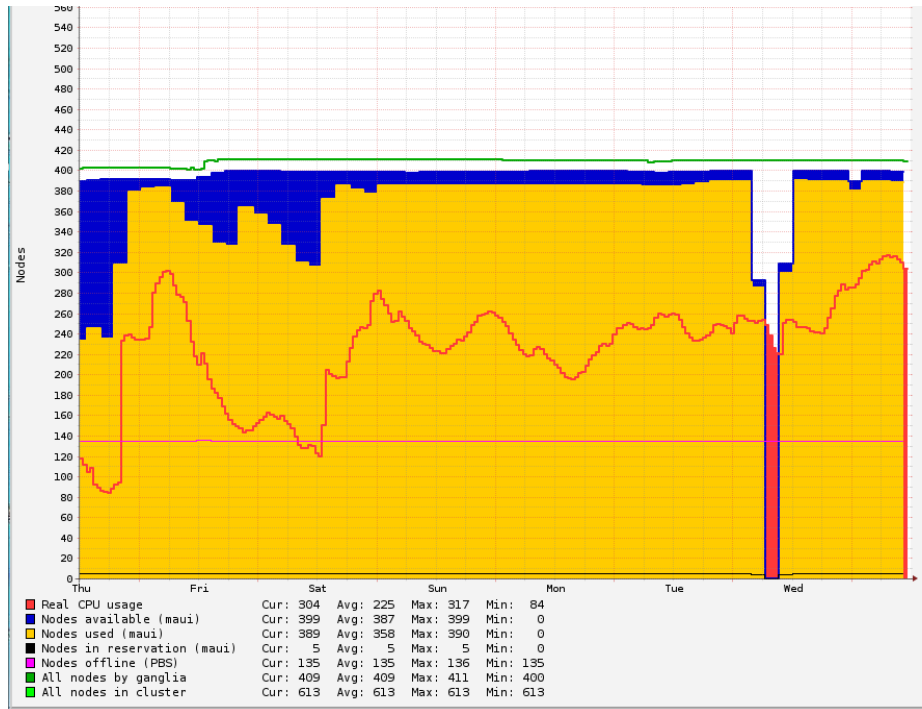
HPC computing: basics



Program requirements:

- CPU
- RAM
- HDD
- GPU

Overbooking in HPC



Our servers

Typically

- **16-64 GB memory (2GB/Core)**

8-24 physical cores

Hundreds of TB shared storage

64-bit platform

I/O Performance: InfiniBand DDR/QDR, several 1Gbit ethernet links



Virtual machines?

Extra Large Instance (EC2)

- **15 GB memory**
8 EC2 Compute Units (4 virtual cores with 2 EC2 Compute Units each)
1,690 GB instance storage
64-bit platform
I/O Performance: High



Virtual machines?

Cluster Compute Eight Extra Large Instance (EC2)

- **60.5 GB of memory**
88 EC2 Compute Units (2 x Intel Xeon E5-2670, eight-core "Sandy Bridge" architecture)
3370 GB of instance storage
64-bit platform
I/O Performance: Very High (10 Gigabit Ethernet)



Monthly cost of 1 server



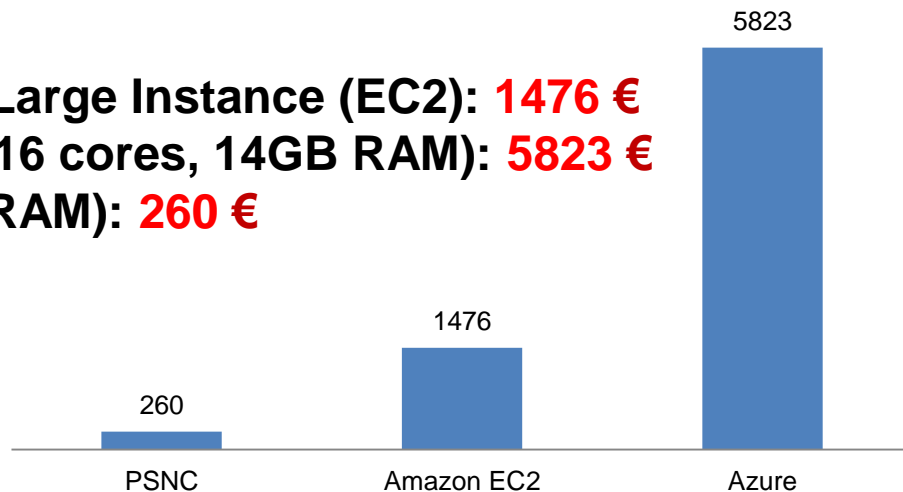
260€

Price comparison – server / month

Cluster Compute Eight Extra Large Instance (EC2): **1476 €**

Microsoft Azure XL machine (16 cores, 14GB RAM): **5823 €**

SGI 1U server (2xCPU 48 GB RAM): **260 €**



What about other machines?



SGI UV server

- 2048 cores
- 16 TB of shared memory

What about other costs?

- **Storage**
- **Network**



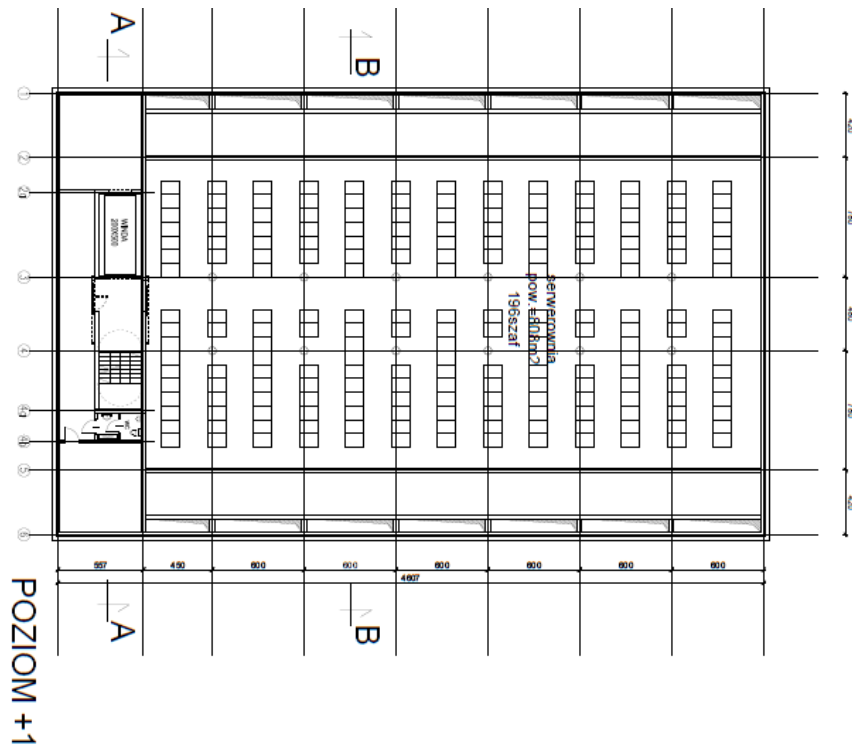
The alternatives:

- ~~Colocation of the servers~~
- ~~Commercial cloud services~~
- **New data center**

Design phase

Estimation of the building cost: 20ME

- 400+ racks
- Up to 16 MW



ROI

Overhead on renting **currently used servers** in the cloud:

- Amazon EC2: 12,7 M € / year
- Microsoft Azure: 58 M € / year

Lessons learned

- **From the tax-payers point of view**
 - It is still cheaper to have national data centers
- **From the user point of view**
 - Don't care about the costs as long as the budget can support it
 - Willing to pay more for more flexibility/simplicity
- **From the HPC DC point of view**
 - Some techniques may be adapted to increase user satisfaction and better resource management (**ENERGY!**)

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MOŻLIWOŚCI
I ZASOBY

MISJA

WSPÓLPRACA

LUDZIE

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