Virtual workspace as basis of supercomputer center

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Agenda

2

- Introduction
- Cluster configuration
- Virtual workspace approach
- Virtual machines
- Benefits
- Examples
- Conclusion

Resource Center Computational Center

3

- was founded in 1996
- provides university members with HPC services
- offers distributed computing software licenses
- develops new ways of provisioning computational resources

Cluster configuration

4

	T-Platfrom cluster T-EDGE96 HPC-0011828-001	**SMP cluster, HP Proliant DL980**	**Hybrid cluster, HP SL390s G7**
CPU	2x Intel E5335 2.0 GHz	8x Intel X7560 2.2 GHz	2x Intel X5650 2.67 GHz
Commutator	Infiniband 20 Gb/s		
HDD	160 GB	2 TB	120 GB
GPU	-	-	3x (8x) NVIDIA Tesla M2050
RAM	16 GB	0.5-2 TB	96 GB
Total RAM	768 TB	3 TB	2.3 TB
Total characteristics	48 nodes, 384 cores	3 nodes, 192 cores	24 nodes, 288 cores, 112 GPUs
Peak performance	**3.07 TFLOPS**	**1.7 TFLOPS**	**59.6 TFLOPS**

Conventional clusters

5

- managed by CentOS
- utilized by issuing PBS command or running user-friendly script to submit job
- have user's home directory mounted on each node prior to running a job

Virtual workspace approach

6

Users need a way to access cluster resources:

- they want it to be easy
- they want it to be secure
- they want to store experiment's data safely and have universal access to it
- they want to customize their working environments

Virtual workspace approach

7

Each user is provided with private virtual machine which enables

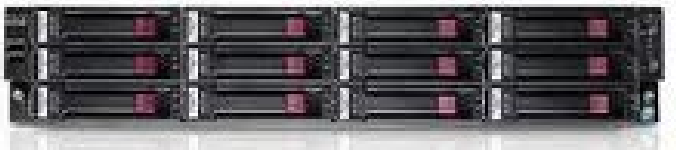
- access to clusters via PBS
- access to licensed software repository
- storage for user's data

Virtual workspace approach

8

There is a separate cluster of virtual machines managed by VMWare.

Cluster specifications:



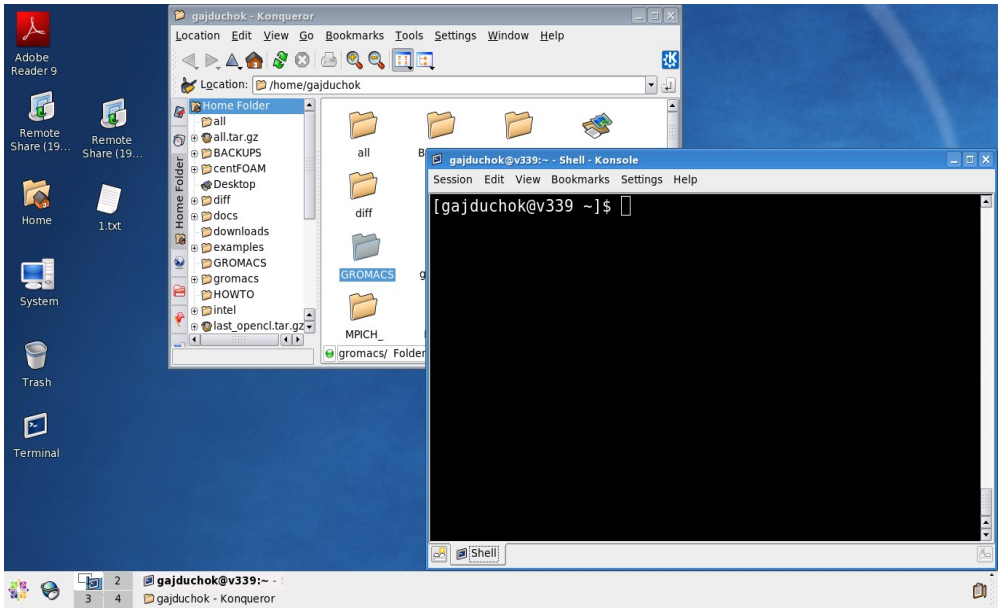
- 60 Blade servers HP BL460G7
  - 2x Intel Xeon X5670
  - 96GB RAM
  - 2x 10GbE, 2x QDR IB
- Storage system: StorageWorks P4500 G2 (240 TB)
- Commutators: 48x 1GbE и 4x 10GbE
- Peak performance: 8.6 TFLOPS

Virtual machines

9

Virtual machine can be used for:

- data pre- and post-processing
- application development
- data storage
- other routine tasks



Virtual machine default characteristics

10

- CentOS 5.6
- 2 core CPU
- 4 Gb RAM
- 50 Gb HDD

VM characteristics can be customized to suit user's needs (CPUs, RAM, storage, operating system)

Access to virtual machine

11

- LDAP single sign on
- Logging via SSH (Linux) or RDP (Windows)
- Optional VPN
- User is free to install additional software for remote access (VNC, FreeNX, etc.)

User's benefits

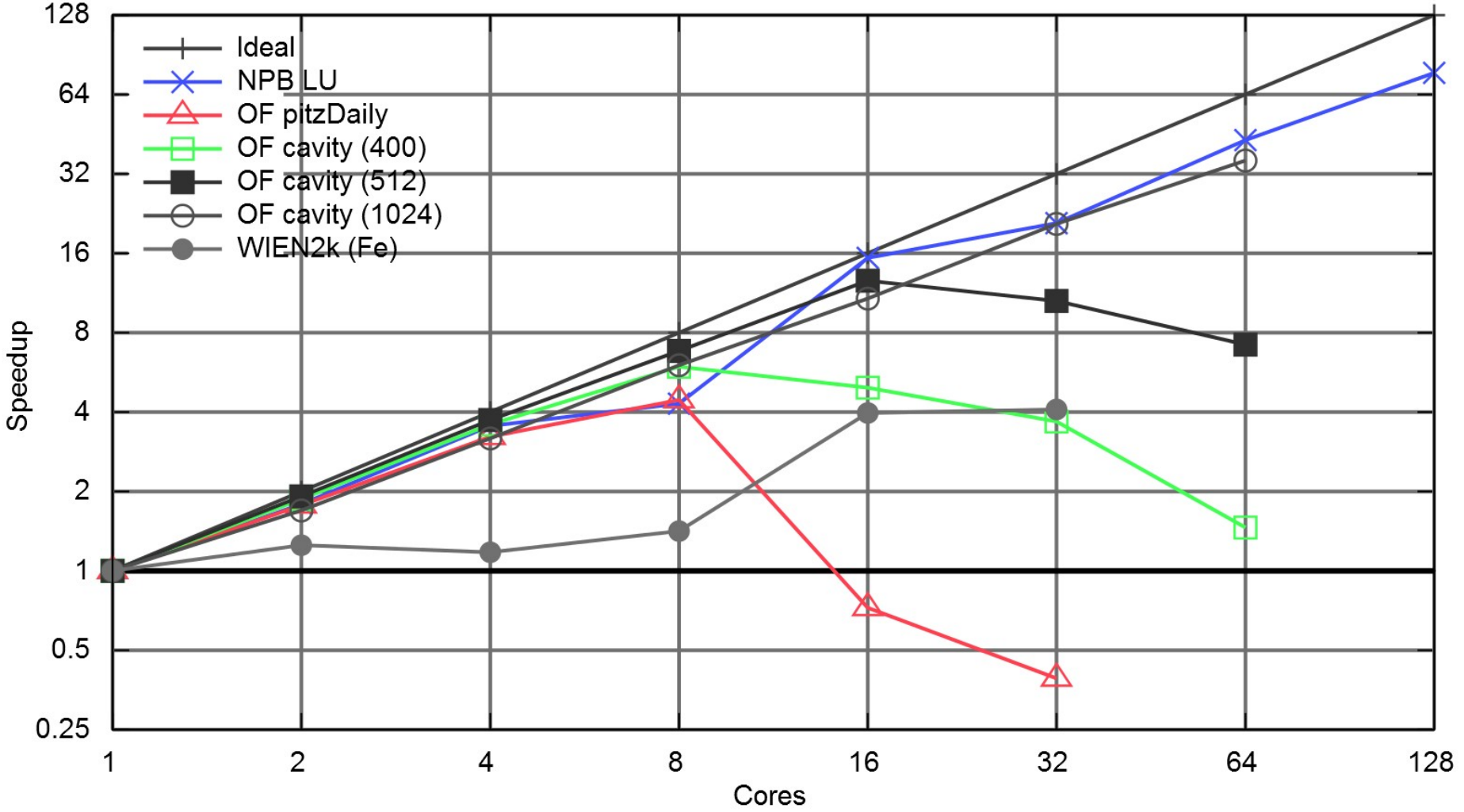
12

- Customized environment
- Root privileges in virtual machine (sudo)
- Universal access to computational and storage resources
- Virtual machine backup (regular snapshots)
- Possibility to create virtual private clusters

Examples

13

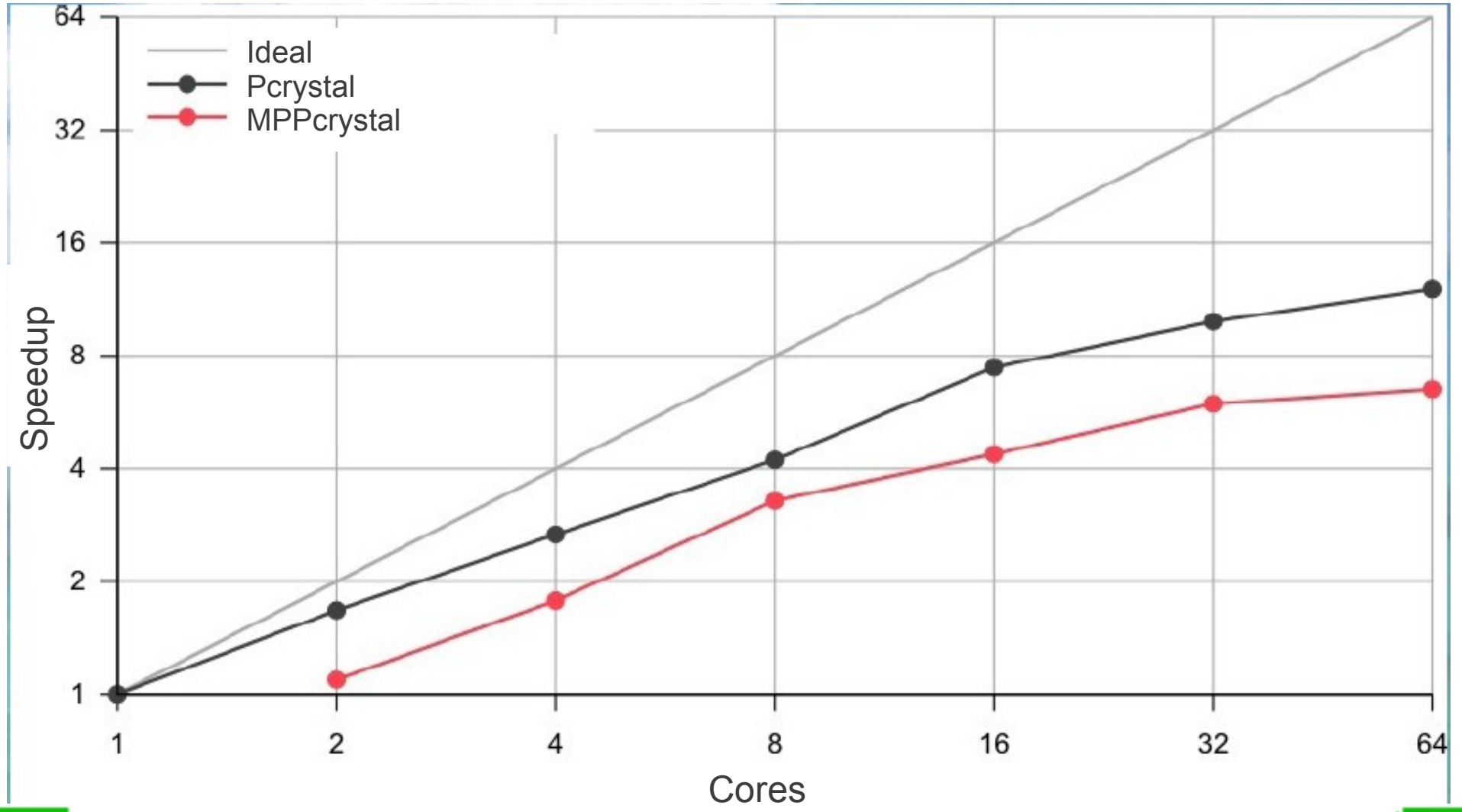
Hybrid cluster



Examples

14

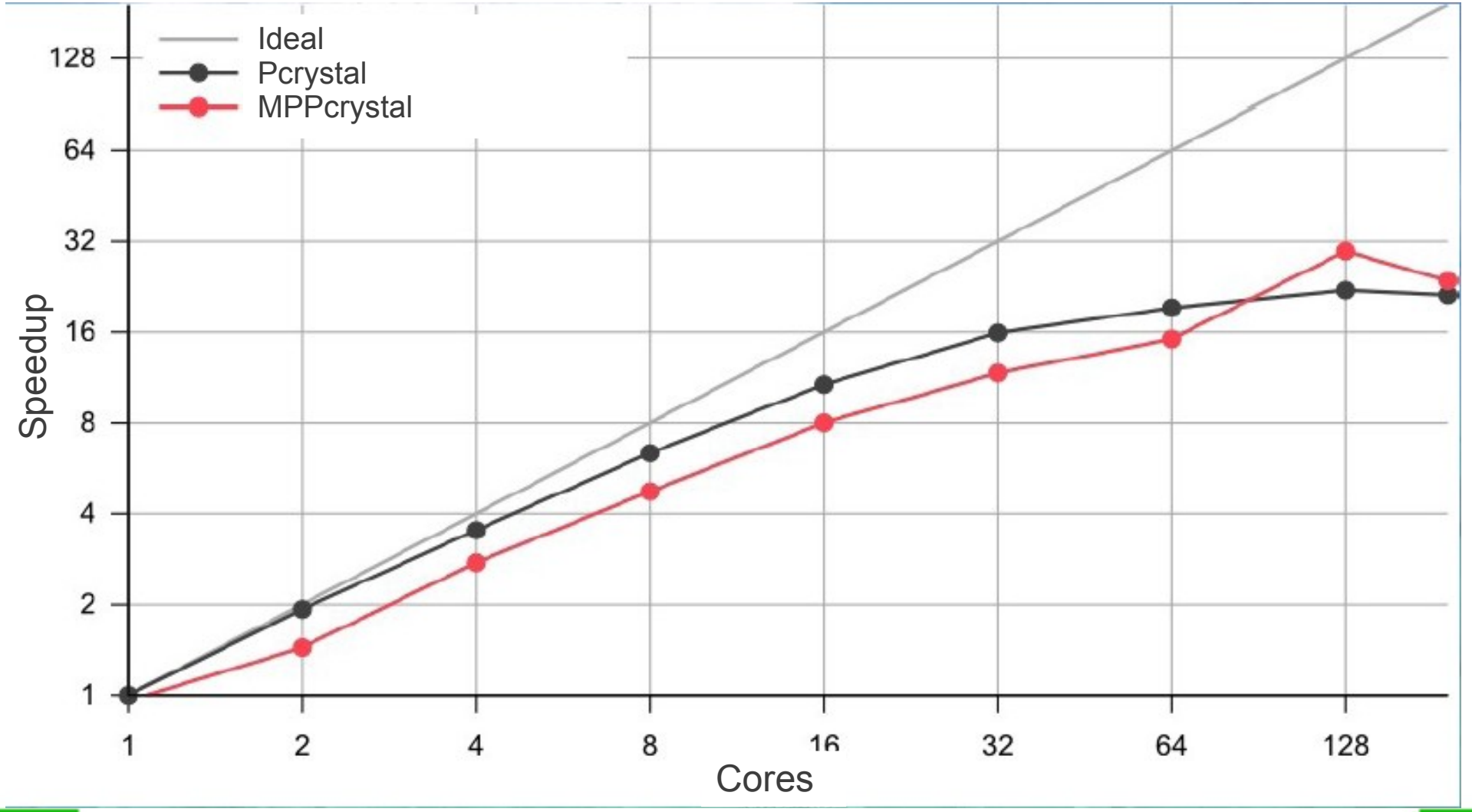
T-Platform cluster



Examples

15

SMP cluster



Conclusion

16

- Virtual workspace streamlines scientific research work flow
- Consolidates experiment's data
- Can be extended to virtual private cluster

Questions?

Thank you!