

Parallel computing tests

- Home-made cluster vs Ixbst2001..2040 -



Home-made cluster

- Four HP Z800 workstations: pcendcz8001..8004;
- 8 CPUs per machine;
- Non-homogeneous hardware: Xeon E5540, 2.53 GHz / Xeon X5570, 2.93 GHz;
- 24 GB RAM each (tests never uses all of it);
- NFS share (tests never write to disk);
- Interconnection: NETGEAR GS108 switch 10/100/1000 Mbps (~50 CHF) + common patch cables;
- Internal network just for parallel computing.



IT 'engineering cluster'

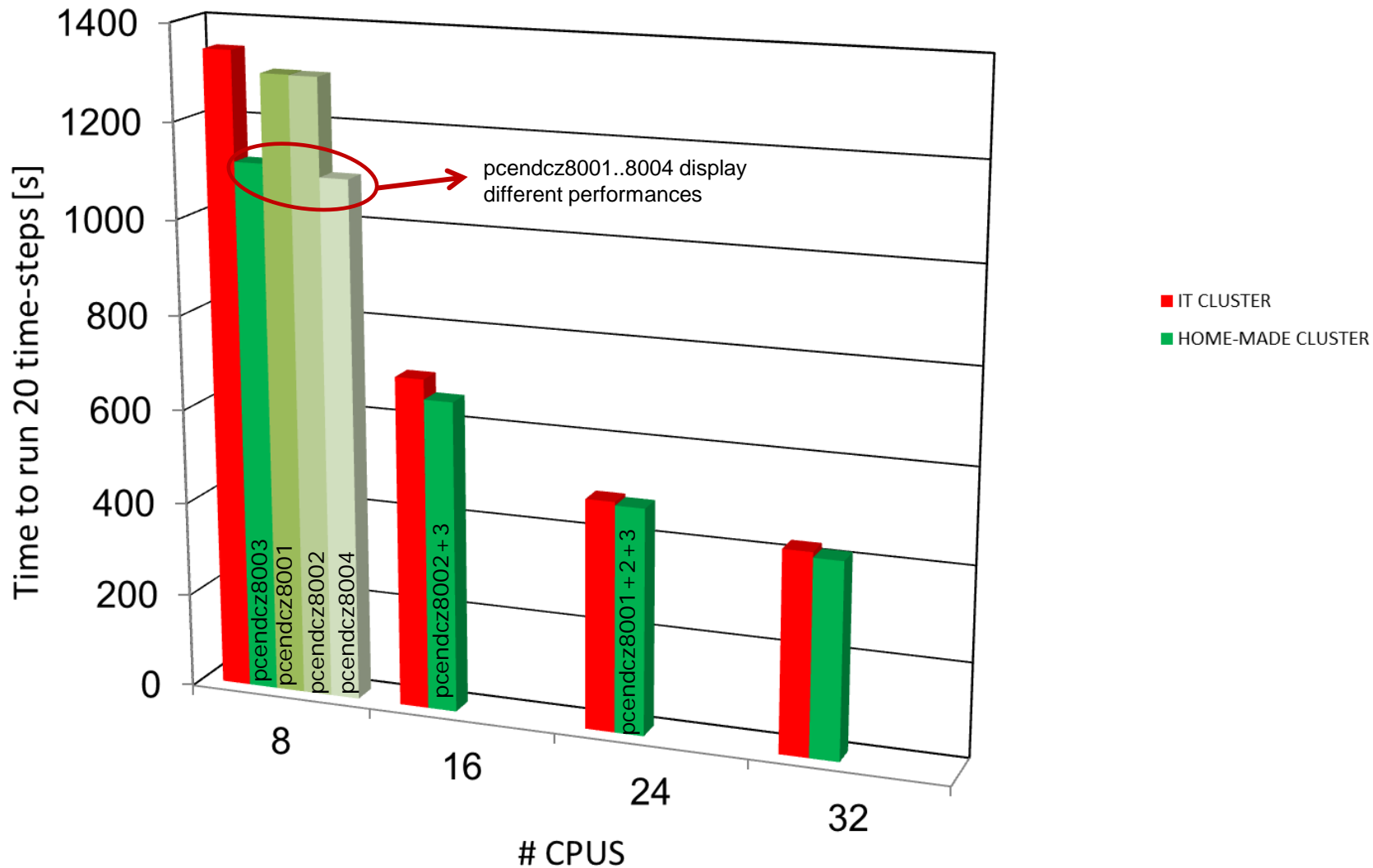
- 40 machines: lxbst2001..lxbst2040;
- 8 CPUs per machine;
- Xeon L5520, 2.27 GHz;
- 48 GB RAM each;
- AFS (tests never write to disk);
- Low-latency 10Gb Ethernet.

HIE-ISOLDE HELIUM LEAK TEST CASE (4 millions cells, 8 equations)

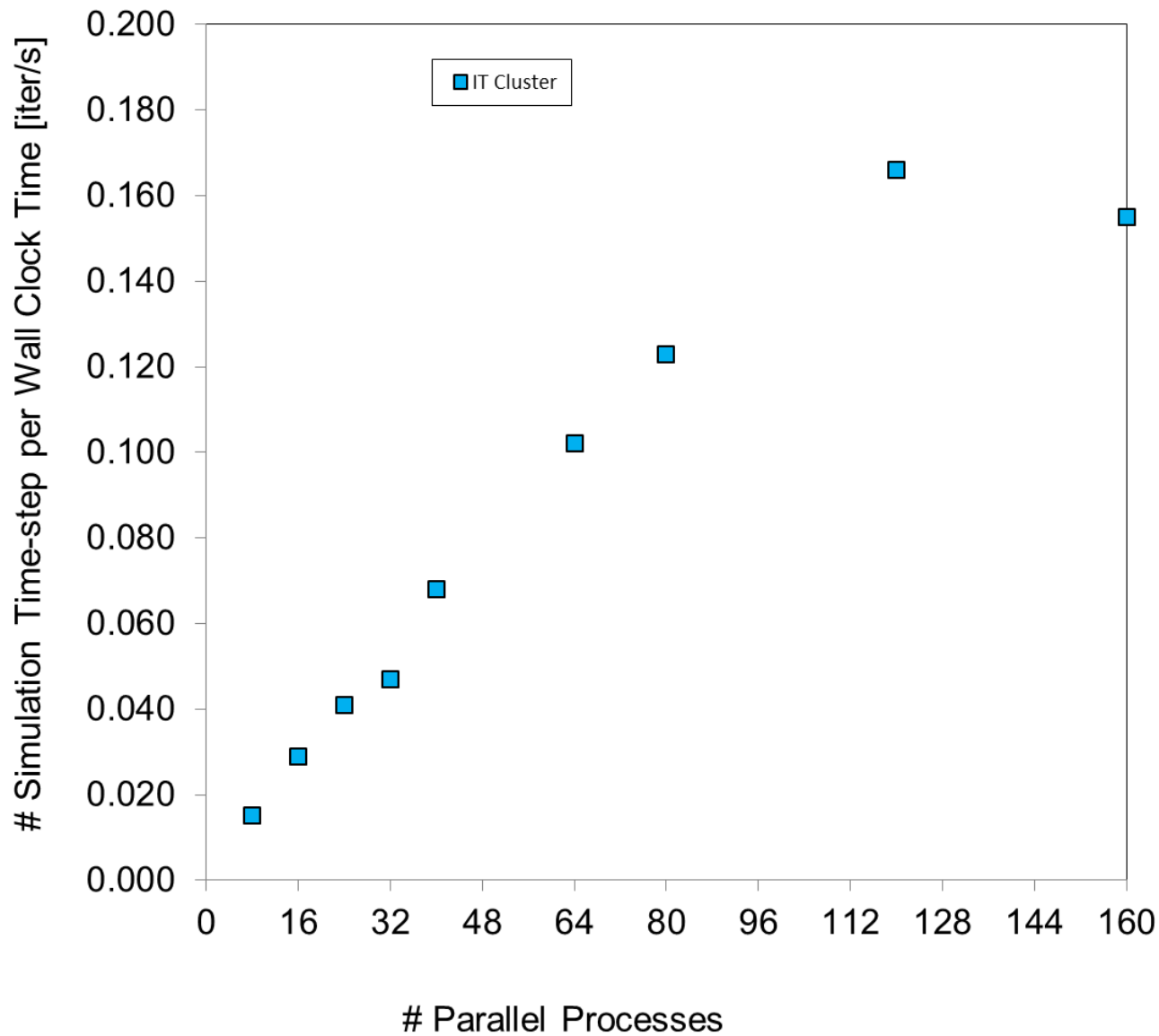
ANSYS FLUENT 14.5.7 available in AFS

Home-made cluster: pcendcz8001..4, NETGEAR GS108 switch

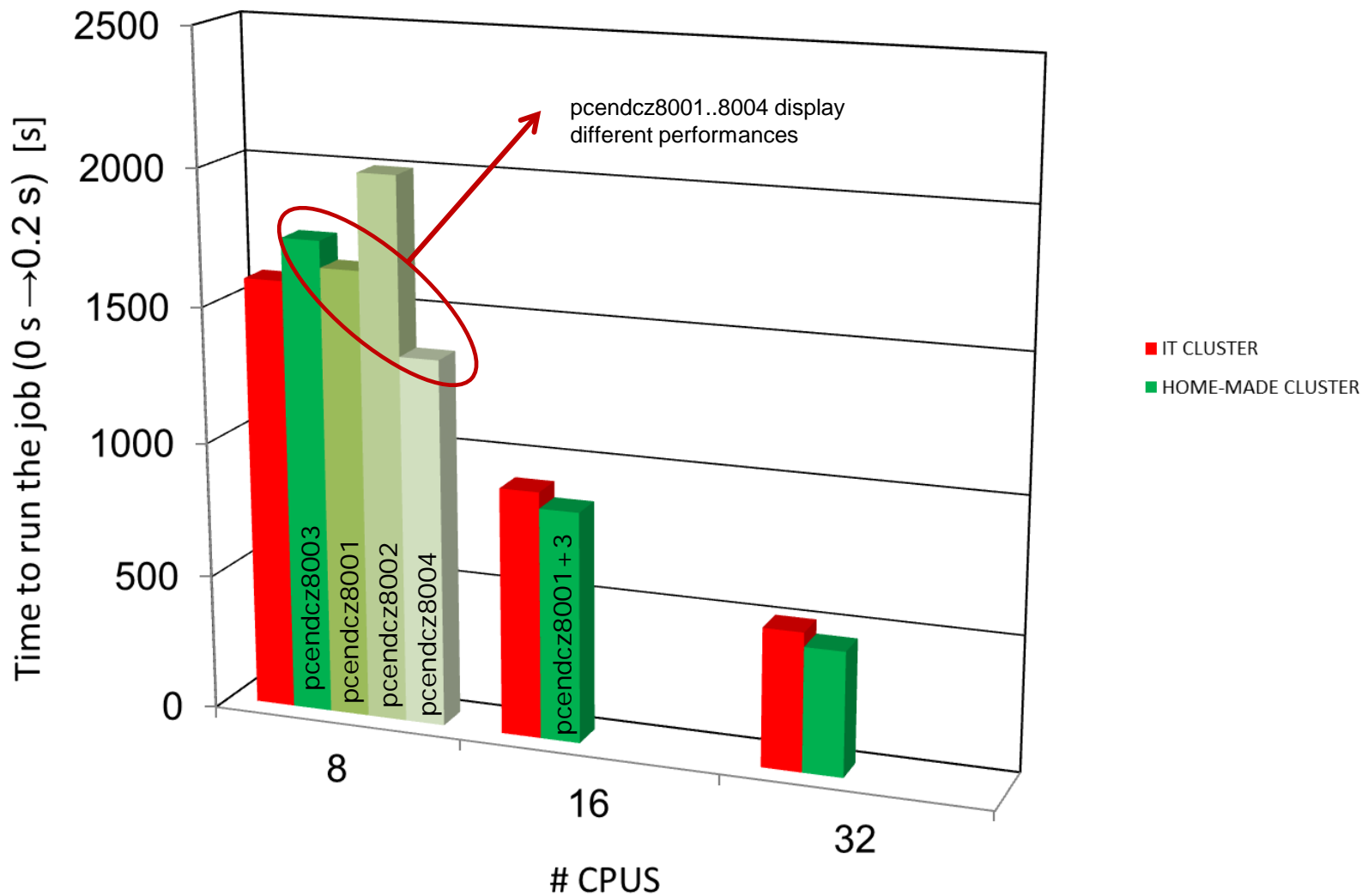
IT-CLUSTER: lxbst2001..lxbst2040, low-latency 10Gb Ethernet



HIE-ISOLDE HELIUM LEAK TEST CASE (4 millions cells, 8 equations)
 ANSYS FLUENT 14.5.7 available in AFS



CMS CAVERN FIRETEST CASE (8 millions cells, 10 equations)
 OpenFOAM-2.0.x 14.5.7 available in AFS
 Home-made cluster: pcendcz8001..4, NETGEAR GS108 switch
 IT-CLUSTER: lxbst2001..lxbst2040, low-latency 10Gb Ethernet



- ANSYS Fluent internal tool for interconnection diagnostic;
- Real-life test in the ‘engineering cluster’: several other jobs running at the same time.

Home-made cluster

Test run	Bandwidth (MB/s)		Latency (μs)	
	min	max	min	max
16 CPUs	104	104	46	46
24 CPUs	104	112	46	46
32 CPUs	103	111	46	46

- Stable bandwidth and latency;
- Measured bandwidth corresponds to declared 1 Gbps.

Home-made ‘engineering cluster’

Test run	Bandwidth (MB/s)		Latency (usec)	
	min	max	min	max
16 CPUs	358	361	<u>38</u>	<u>38</u>
24 CPUs	161	464	23	<u>39</u>
32 CPUs	428	478	22	25
40 CPUs	<u>46</u>	681	22	<u>38</u>
64 CPUs	<u>38</u>	576	22	<u>39</u>
80 CPUs	<u>38</u>	661	22	<u>39</u>
120 CPUs	<u>34</u>	682	21	<u>40</u>
160 CPUs	<u>30</u>	817	22	<u>39</u>

- In all the “real-life” tests in the IT ‘engineering cluster’, with at least 5 machines in parallel, at least one connection display a bandwidth lower than the one given by the NETGEAR GS108.

Bandwidth (MB/s) with 32 messages of size 4MB [10.6264 sec]

ID	n0	n8	n16	n24	n32
n0	\	289.7	475.1	*100	538.9
n8	291.6	\	308.7	*50	510.0
n16	474.2	308.1	\	*255	474.1
n24	100.8	*46	256.7	\	350.6
n32	540.1	502.4	473.4	*350	\

Min: 46.0581 [n24<-->n8]

Max: 540.132 [n32<-->n0]

Latency (usec) with 1000 samples [0.576905 sec]

ID	n0	n8	n16	n24	n32
n0	\	35.558	23.136	*36.80	21.576
n8	35.561	\	*38.28	27.458	37.330
n16	23.137	*38.28	\	37.162	25.001
n24	36.802	27.458	37.160	\	*38.06
n32	21.577	37.328	25.004	*38.06	\

Min: 21.5764 [n0<-->n32]

Max: 38.2785 [n16<-->n8]