

COMPUTATIONAL RESOURCES OF THE REGIONAL SOUTH-EAST EUROPE HIGH PERFORMANCE COMPUTING INFRASTRUCTURE



HP-SEE

High-Performance Computing Infrastructure
for South-East Europe's Research Community



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South Eastern
Europe (SEE)

Athens, Greece

www.hp-see.eu



In september 2010 new project started:
**High-Performance Computing Infrastructure
for South East Europe's Research Communities**

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HP-SEE project brings together 14 partners from the South-East European region, more than 10 institutions involved in the project as third parties...

1. **Greece** Greek Research & Technology Network
2. **Bulgaria** Institute for Parallel Processing, Bulgarian Academy of Sciences
3. **Romania** "Horia Hulubei" National Institute of Research and Development for Physics and Nuclear Engineering
4. **Turkey**
5. **Hungary** National Information Infrastructure Development Office
6. **Serbia** Institute of Physics Belgrade
7. **Albania**
8. **Bosnia and Herzegovina**
9. **Former Yugoslav Republic of Macedonia** SS. Cyril & Methodius University of Skopje
10. **Montenegro**
11. **Moldova (Republic of)**
12. **Armenia**
13. **Georgia**
14. **Azerbaijan**

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HP-SEE Infrastructure current status and plans of development

Country	TFlops			
	2010	2011	2012	2013
Greece	0	0	40	80
Bulgaria	25	31+8GPU	31+20GPU	40+20GPU
Romania	10	26+4GPU	30+20GPU	30+20GPU
Hungary	1	48	48+12GPU	48+12GPU
Serbia	6	6	20	20
OVERALL	42	111 + 12 GPU	169 + 52 GPU	218 + 52 GPU

	Max proces ses	CPU type	Nodes	TfI ops	Batch system	OS	Total storage
Blue Gene, BG	8192	IBM Power PC	2048	23.4 2	Load leveler	Compute Node Linux (CNL)	12 TB
HPCG cluster, BG	576	Intel Xeon X5560	36	3	Torque + maui	SC Linux 5.3	30 TB
Pécs SC, HUN	1152	Intel Xeon X7542	1	10	SGE 6.2u5	SuSELinux ES 11 SP1	160 TB
Debrecen SC, HUN	3072	Intel Xeon X5680	128	18	SGE 6.2u5	SuSELinux ES 11 SP1	152 TB
Szeged SC, HUN	2112	AMD Opteron 6174	44	14	SGE 6.2u5	Red Hat ELS 5.4	230 TB
InfraGrid, RO	400	Intel Xeon E5504	50	2,15	Condor 7.4.4	CentOS 5.5	10 TB
IFIN_Bio, RO	256	Intel Xeon E5430	32	1,2	PBS Torque	CenOS 5.5	180 GB
IFIN_BC, RO	368	IBM PowerXCell 8i, AMD Opteron 2376	26	2.05 0.39	PBS Torque	Fedora 9	120 GB
NCIT cluster, RO	562	Xeon E5504, Opteron 2435, PowerXCell 8i, Xeon E5630		1,04	SGE 6.2u5, PBS Torque	SC Linux 5.5	13,1 TB
ISS_GPU, RO	4x480	Nvidia		4	PBS	Ubuntu 10.10	
PARADOX, RS	672	Intel Xeon E5345	84	5,25	Torque 2.3.6 + Maui 3.2.6	SC Linux 5.5	53.1 TB



HPC Resources, available for MD application deploying

HPCG cluster located at IICT of Bulgarian Academy of Sciences.
576 computing cores. The storage and management nodes have 128 cores.

Number of nodes	36
CPU	Intel Xeon X5560 @2.8Ghz
RAM	24GB per node
Max number of parallel processes	576
Interconnect type	DDR Infiniband
Interconnect latency	2.5 μ s
Interconnect bandwidth	20Gbps
Peak performance (Tflops, double precision)	3.23
Achieved performance (Tflops, double precision)	3
Operating system	Scientific Linux 5.3 64 bit
Batch system	torque + maui



HPC Resources, available for MD application deploying

SGI UltraViolet 1000 supercomputer at NIIFI,
located in Pecs, Hungary. 1152 cores, 6057 GByte of memory

Number of nodes	1
CPU	Intel Xeon X7542 (Nehalem EX), @ 2.67GHz
RAM	6 TByte
Max number of parallel processes	1152 cores
Interconnect type	NUMALink 5, paired node 2D torus
Interconnect latency	<1 μ s
Interconnect bandwidth	15 GByte/sec
Peak performance (Tflops, double precision)	10
Achieved performance (Tflops, double precision)	10
Operating system	SUSE Linux Enterprise Server 11 SP1 (x86_64)
Batch system	Sun Grid Engine 6.2u5

Available HP-SEE training resources



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Country	Partner	Number of Nodes	Number of Cores	CPU Architecture	Interconnection	Batch System
BG	IICT	4	1920	GPU/NVIDIA	2xGigabit Ethernet	Torque
RO	UVT	50	400	x86_64	QDR 4xInfiniband	SLURM
RO	UPB	48	544	X86_64/Cell	4xGigabit Ethernet QDR 4xInfiniband	Sun Grid Engine
RO	ISS	4	2100	GPU/Fermi NVIDIA	2xGigabit Ethernet	Rocks Clusters
RS	IPB	2	16	x86_64 2.0GHz	Gigabit Ethernet Infiniband	Torque
RS	IPB	2	16	POWER6 4.0GHz	Gigabit Ethernet Infiniband	Torque
RS	IPB	2	16	PowerXCell 8i	Gigabit Ethernet Infiniband	Torque
RS	IPB	1	16	Nehalem	Gigabit Ethernet Infiniband	Torque
BA	UOBL ETF	2	16	x86_64	Gigabit Ethernet	Torque
MD	RENAM	1-6	8-20	x86_64	2xGigabit Ethernet	CCS2003
AM	IIAP NAS RA	6	48	x86_64	Gigabit Ethernet	Torque
AM	IIAP NAS RA	24	48	x86_64	Gigabit Ethernet	Torque
AM	IIAP NAS RA	1	240	Tesla 1060	GPU	

HP-SEE project. Moldavian application deploying in regional HPC-infrastructure



AMR_PAR application (Parallel algorithm and program for the solving of continuum mechanics equations using Adaptive Mesh Refinement), being developed in the Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova.

AMR_PAR 64-bit application was developed in MS Visual Studio 2010.

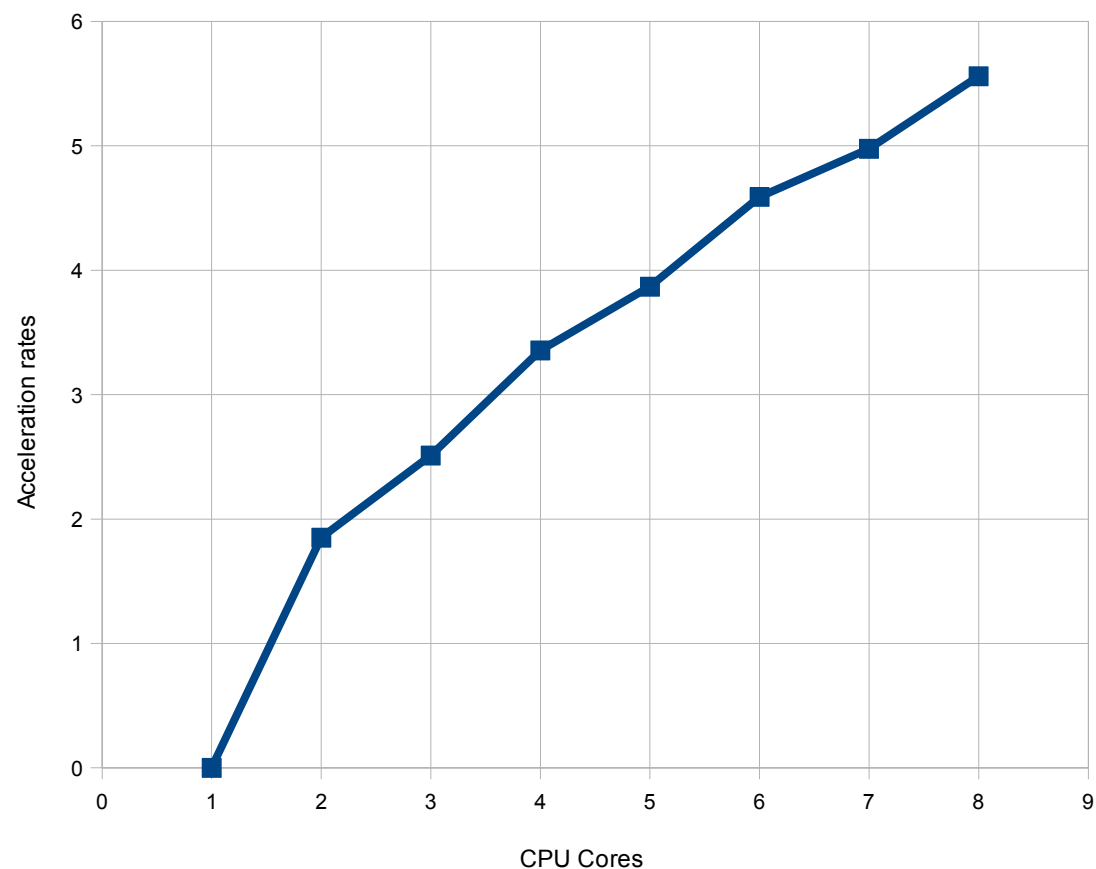
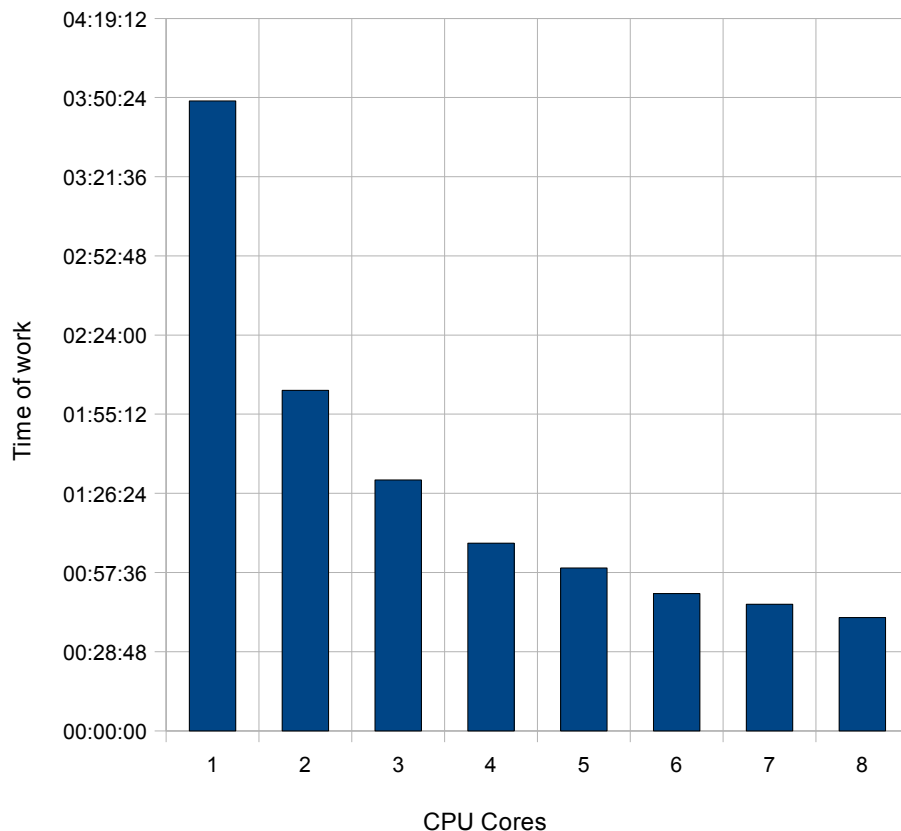
Now AMR_PAR application is ready in OpenMP mode and was locally tested on small AMR grids (128x128x128 cells, 5 layers) on MS Windows Compute Cluster 2003.

Application was ported to Linux, compiled and tested on front-end computers ***HPCG cluster located at IICT of Bulgarian Academy of Sciences*** and ***SGI UltraViolet 1000 supercomputer at NIFI, located in Pecs, Hungary.***

HP-SEE project. Moldavian application deploying in regional HPC-infrastructure

Parallel computing of AMR_PAR application on the WCC2003 cluster of IMI

AMR_PAR Acceleration — results of testing on 1-8 cores





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Questions ?