Performance of ARPEGE-NEMO Coupled Model on NEC SX9 and IBM Blue Gene L

ARPEGE -NEMO Petascale

Migration from vector to massively parallel machine
A few results with ARPEGE-NEMO climate model

- Performance on massively parallel machine (IBM BG/L)
- Perfomance on new Meteo-France vector NEC SX9
- Can we compare vector/MPP machine performances using our present-day climate models ?

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-- Atmosphere: ARPEGE-IFS
Derived from the spectral weather forecasting model, hydrostatic, MPI, global

-- Ocean: NEMO
Primitive equations, MPI, global

-- Coupler: OASIS3
pseudo-parallel mode, MPI

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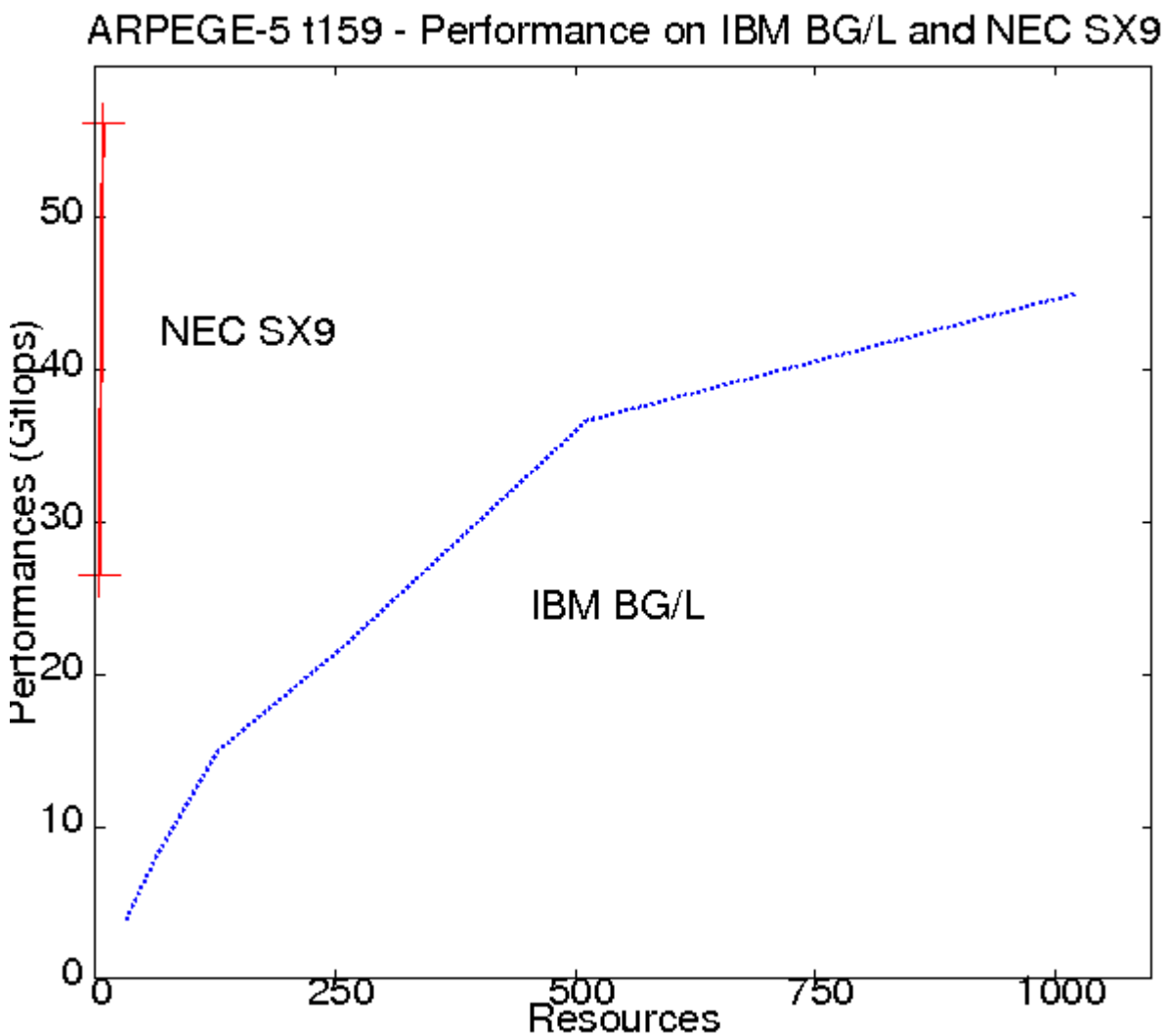
Meteo France NEC SX9

- 21 peak Tflops - 13 Tb memory
- 6+7 nodes = 96+112 processors
- SX9 (3.2 Ghz)
- 1 Tb memory/node

CERFACS IBM Blue Gene /L (BG/L)

- 11.4 peak Tflops - 1.5 Tb memory
- 2048 nodes = 4096 cores
- PowerPC 440 (700Mhz)
- 1Gb memory/node (1024 nodes) + 500Mb memory/node (1024 nodes)

Vector vs Massively Parallel and ARPEGE scalability



For a present-day resolution model:

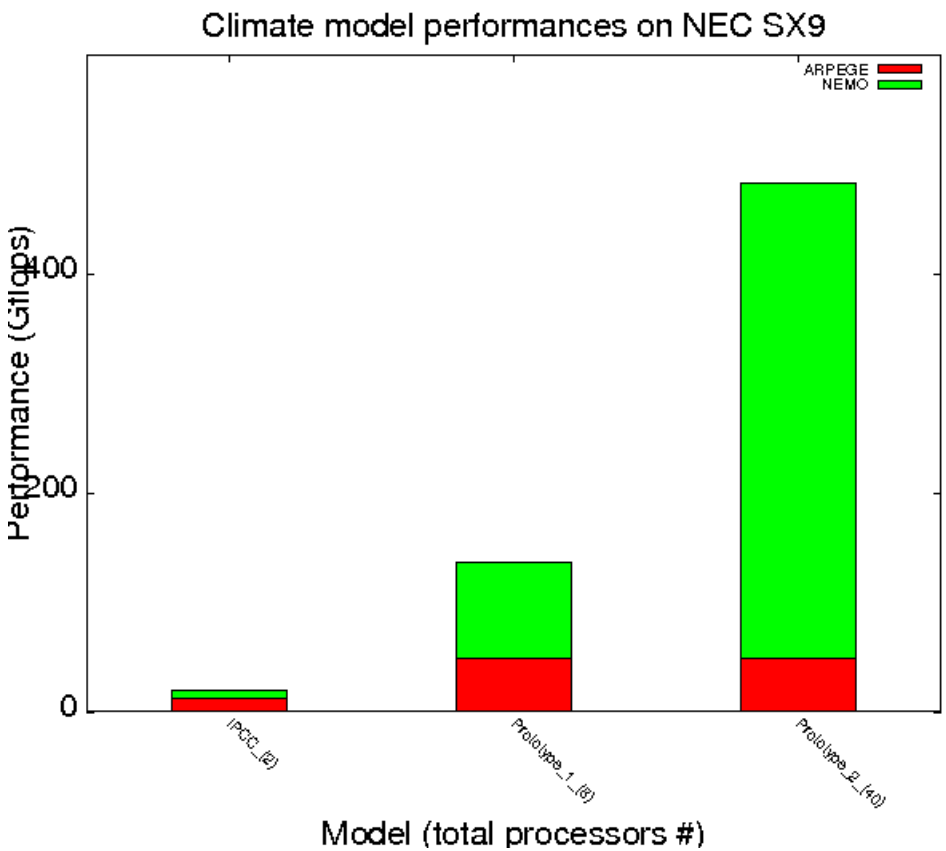
- Equal performance if NEC proc # < 4
- Bad speedup on BG/L if core # > 200
- NEMO less scalable
- OASIS-3 limits

Present-day climate model and prototypes

Grid size:

	Atmosphère	Océan
IPCC	75 000	868 000
SX9-1st prototype	5 600 000	73 000 000
SX9-2nd prototype	5 600 000	661 000 000

- IPCC: impossible to test scalability > 1000
- Necessary to create prototypes with biggest stand alone configuration: ARPEGE T359, ORCA ¼ and ORCA 1/12
- Possible to reach Teraflop



Conclusions/Questions

Petascale performance:

- Increase even more resolution is mandatory (or rewrite code ...)
- Such climate model prototype needed for PRACE platform

Scalability:

- Possibility to reach 100.000 cores with ARPEGE-NEMO
- Tests to be done within IS-ENES project: Oasis-4 scalability, MPI fault tolerance over 10.000 cores