Supercomputing at Météo-France: trend and perspective

1. Main computer facilities at Météo-France
2. The users application
3. Evolution
4. AROME
5. Some performances
6. Procurement
7. Main issues with new supercomputers

With the collaboration of Yann Seity(CNRM), Michel Pottier, Marion Pithon (DSI)
Total 1.2 Tflops - 0.4 Tflops sustained
End: August 2007
Applications on the operational system

Operational : 4 times / day

ARPEGE : Global forecast : T358  41 vertical levels C=2.4
ALADIN : Local Forecast 10KM
4DVAR

Semi-operational :
+ MERCATOR : once /week
+ Pollution Model on demand
+ EPS
Main Trend for the applications (oper)

2004
- ALADIN
  - Grid 10km
  - Timestep = 7 min
  - 3000*3000 grid size
- ARPEGE T358
- 4DVAR

2008
- Arome
  - Grid 2.5 km
  - Timestep 1 min
  - 1000*1000 grid size
- ARPEGE T800 + physics

# of obs:

New applications
- Pollution
- Coupling ???
Prototype : 2004 => operational version 2008
The AROME Physics

Microphysics : ICE3 : sophisticated
vapour/cloud/rain/ice/graupel/snow scheme

Radiation : operational ECMWF
(SW Fouquart-Morcrette and LW RRTM)

Turbulence : at first step, 1D version of the 3D MesoNH
closure condition.

Surface : Externalized schemes (town, nature, sea, water)

Documentation : http://www.aero.obs-mip.fr/~mesonh/
Real Case

GARD flood 8-09-2002

Simulation parameters:
Size 192x192 points
Full Physique
Radiation called every 15'
Coupling every 3h with Aladin France
Begin at 12TU 8 September, end 00TU 9 Sept.
Time step 60s
Goal: As good as referenced mesoNH simulation
### Machines tested/ CYCLE

<table>
<thead>
<tr>
<th>Machine</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPP5000</td>
<td>9.6 Glops/Pes 60 Pes</td>
</tr>
<tr>
<td>HPCA</td>
<td>IBM SP4 P690</td>
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<td></td>
<td>colony switch</td>
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<tr>
<td></td>
<td>960 Pes – 1.3 GHz</td>
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<tr>
<td>HPCD</td>
<td>IBM SP4 P690+</td>
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<td></td>
<td>Federation switch</td>
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<tr>
<td></td>
<td>2176 Pes – 1.9 GHz</td>
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</tbody>
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**On CYCLE:**

* 28T0 for IFS/ARPEGE/ALADIN
* 26T1 for AROME
For each curve: MPI constant and threads change
Less scalability with more than 32 PEs
Good scalability MPI/Threads
Ratio IBM HPCD/HPCA between 1.7 and 1.8
Ratio VPP / IBM between 3 and 3.5
• Small problem of scalability
• Ratio VPP /HPCD between 2.5 and 3
For each curve: MPI constant, threads change
Scalability decrease after 64 MPI
Good scalability MPI/threads
Ratio HPCD/HPCA between 1.6 and 1.7
Ratio VPP/HPCD between 4.5 and 5
Call to tender: 01/12/04 (new regulation)

Benchmark tests: beginning February 2005

First set of results: May 2005

Second set of results: September 2005

Last offer: December 2005

Choice: February/March 2006

First installation: 4 T 2006

Operational acceptance: June 2007
Main issues about supercomputers

User support will be greatly appreciated
System administration quite complex!
Job scheduling – swap $\Rightarrow$ adapt for operational use!

Need big computer room!
Important Cooling (air or water)
Quite heavy

Even if:
From an application point of view:
Easy portable code with a rather good efficiency!
$=$ Market fully OPEN!