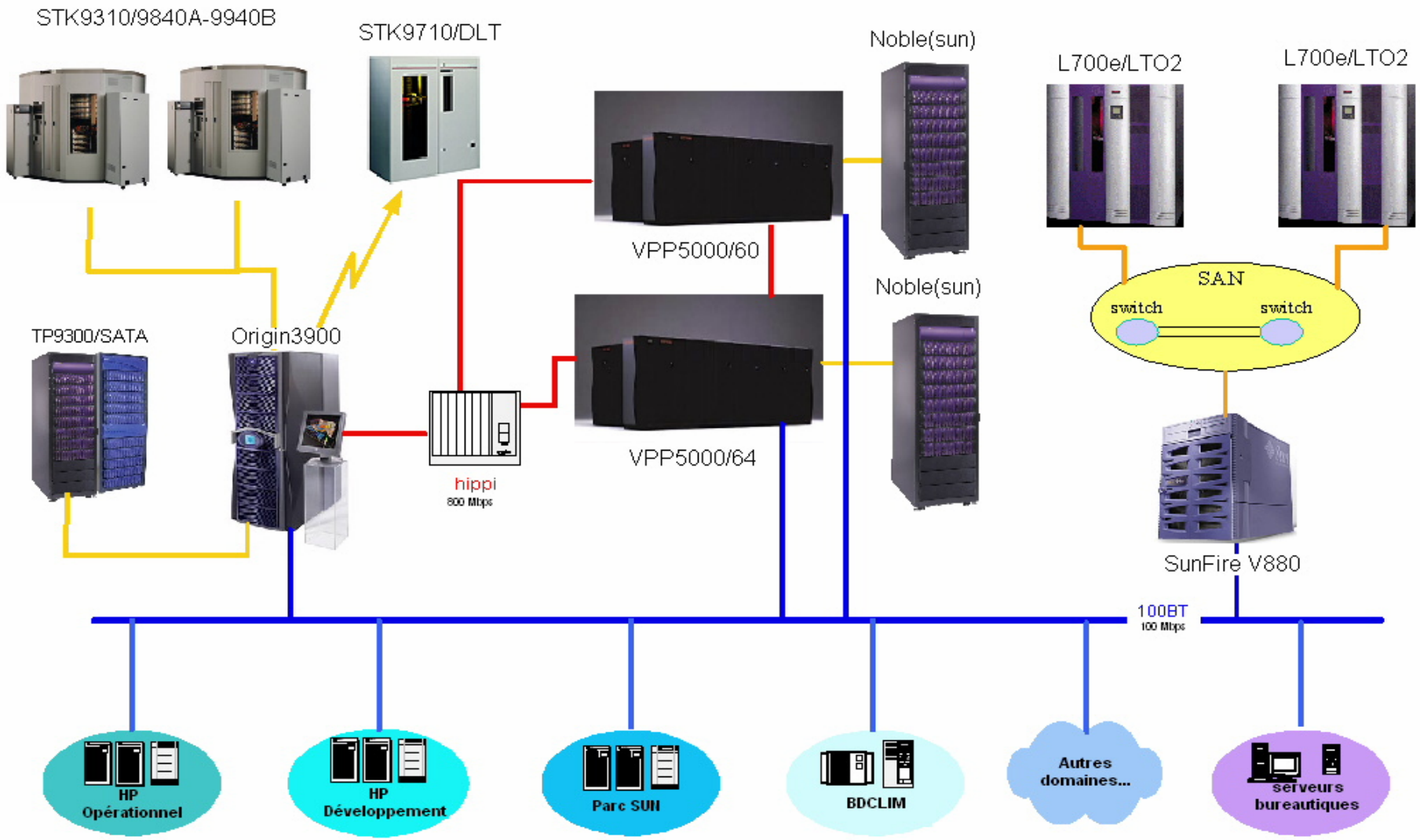
Supercomputing at Météo-France : trend and perspective

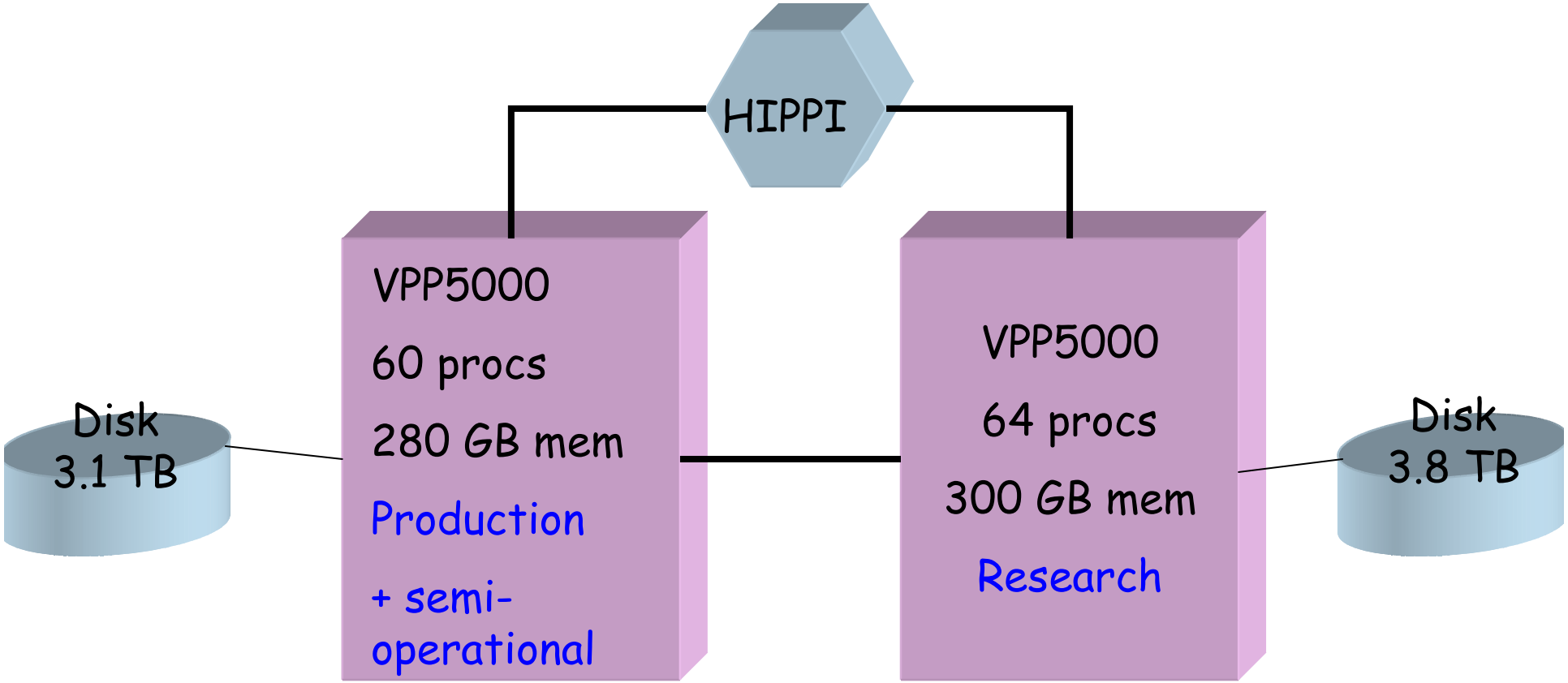
1. Main computer facilities at Météo-France
2. The users application
3. Evolution
4. AROME
5. Some performances
6. Procurement
7. Main issues with new supercomputers

With the collaboration of Yann Seity(CNRM), Michel Pottier, Marion Pithon (DSI)

Centre de Calcul: Mars 2004



VPP5000 Configuration



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

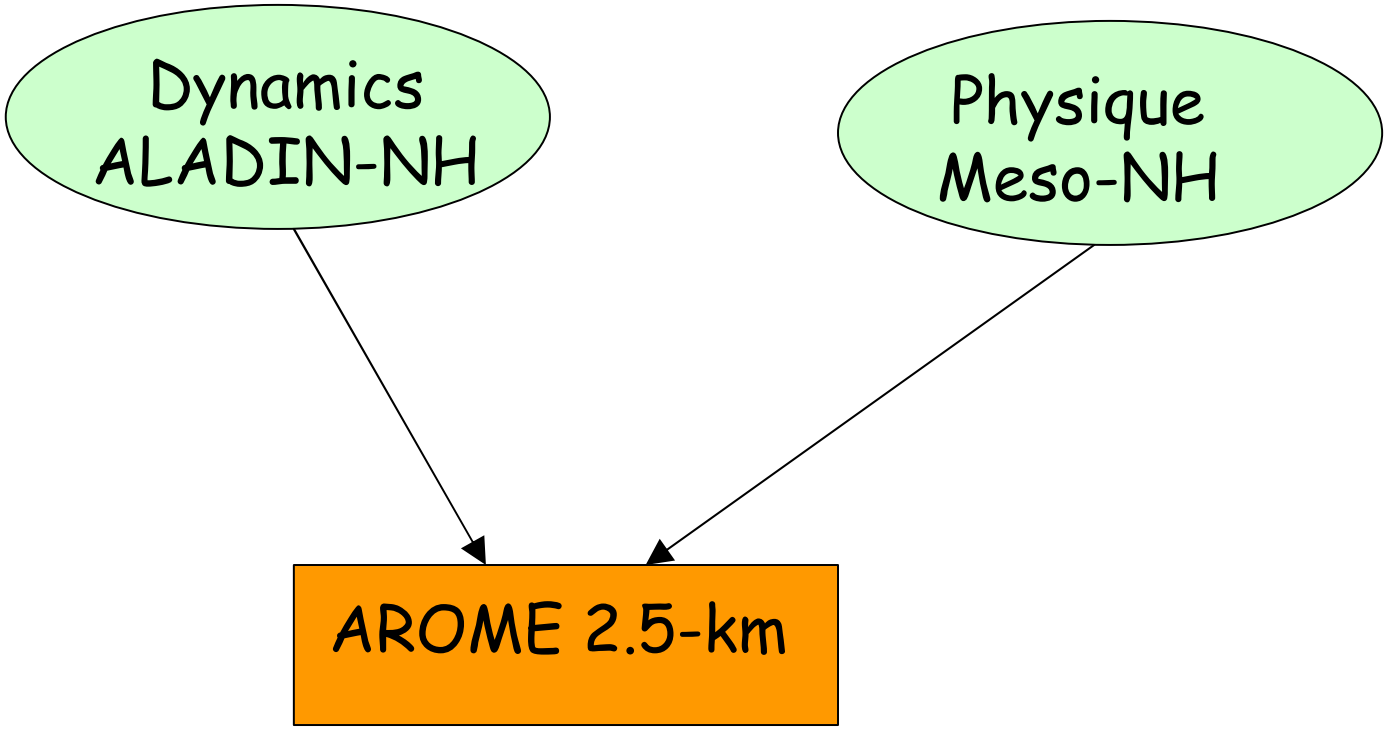
Semi-operational :
+ MERCATOR : once /week
+ Pollution Model on demand
+ EPS

Main Trend for the applications(oper)

2004		2008
ALADIN Grid 10km Timestep = 7 min 3000*3000 grid size	*30 →	Arome Grid 2.5 km Timestep 1 min 1000*1000 grid size
ARPEGE T358	*10 →	ARPEGE T800 + physics
4DVAR	*3 →	# of obs : ↗

New applications
Pollution, coupling ???

AROME



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
scheme. Prognostic TKE, Bougeault-Lacarrère (1989)
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

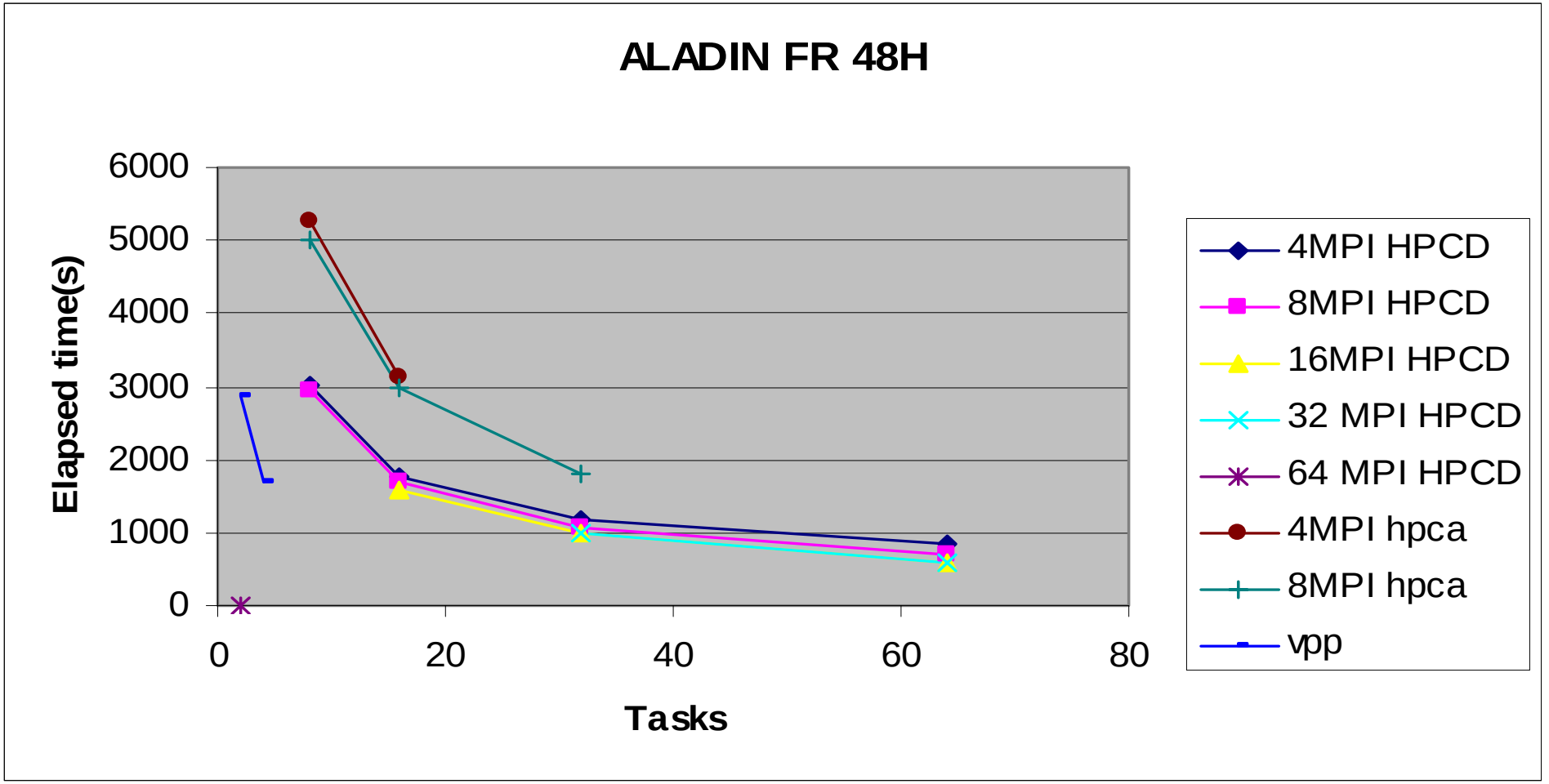
VPP5000 : 9.6 Glops/Pes 60 Pes

HPCA : IBM SP4 P690
colony switch
960 Pes – 1.3 GHz

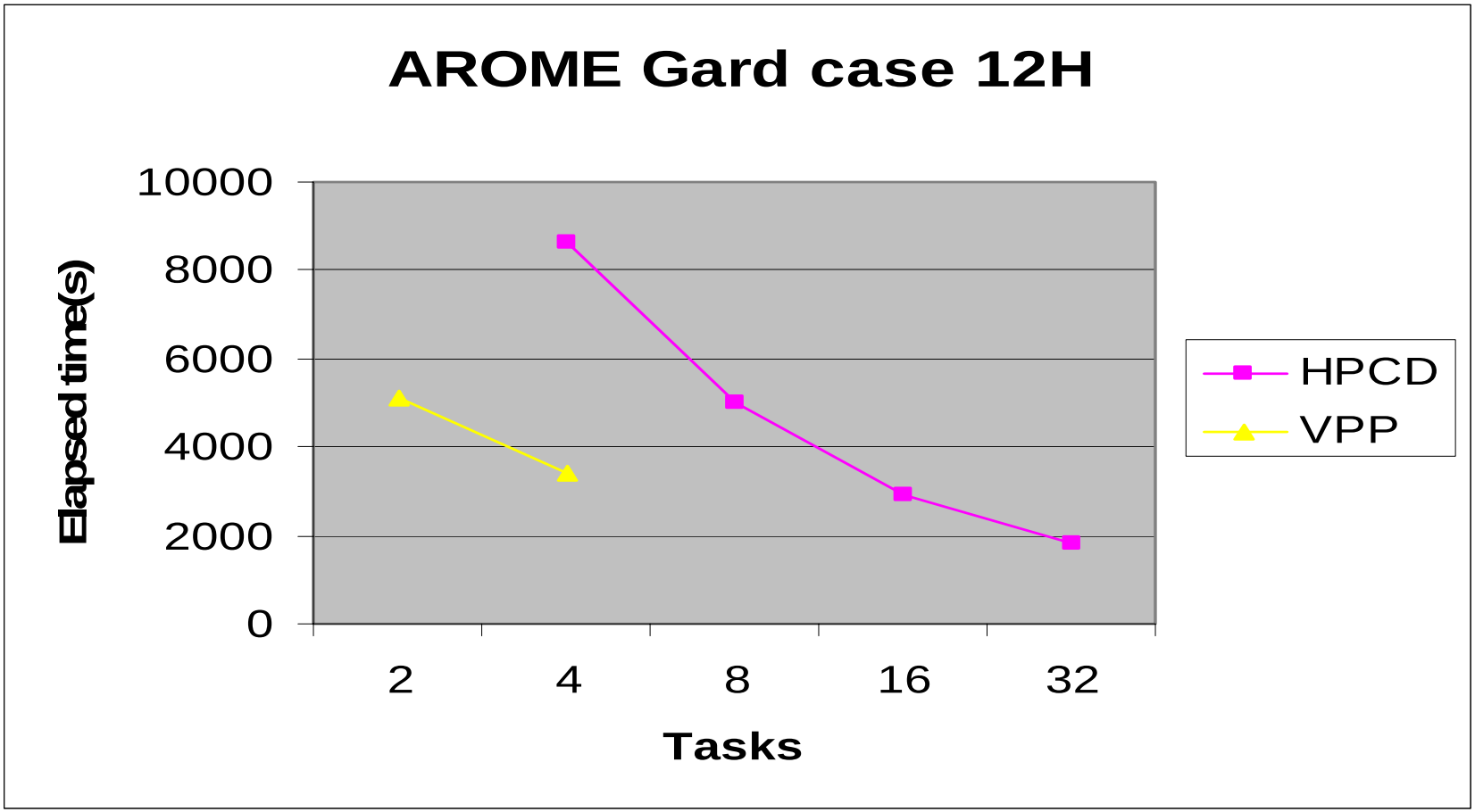
HPCD : IBM SP4 P690+
Federation switch
2176 Pes –1.9 GHz

On CYCLE :

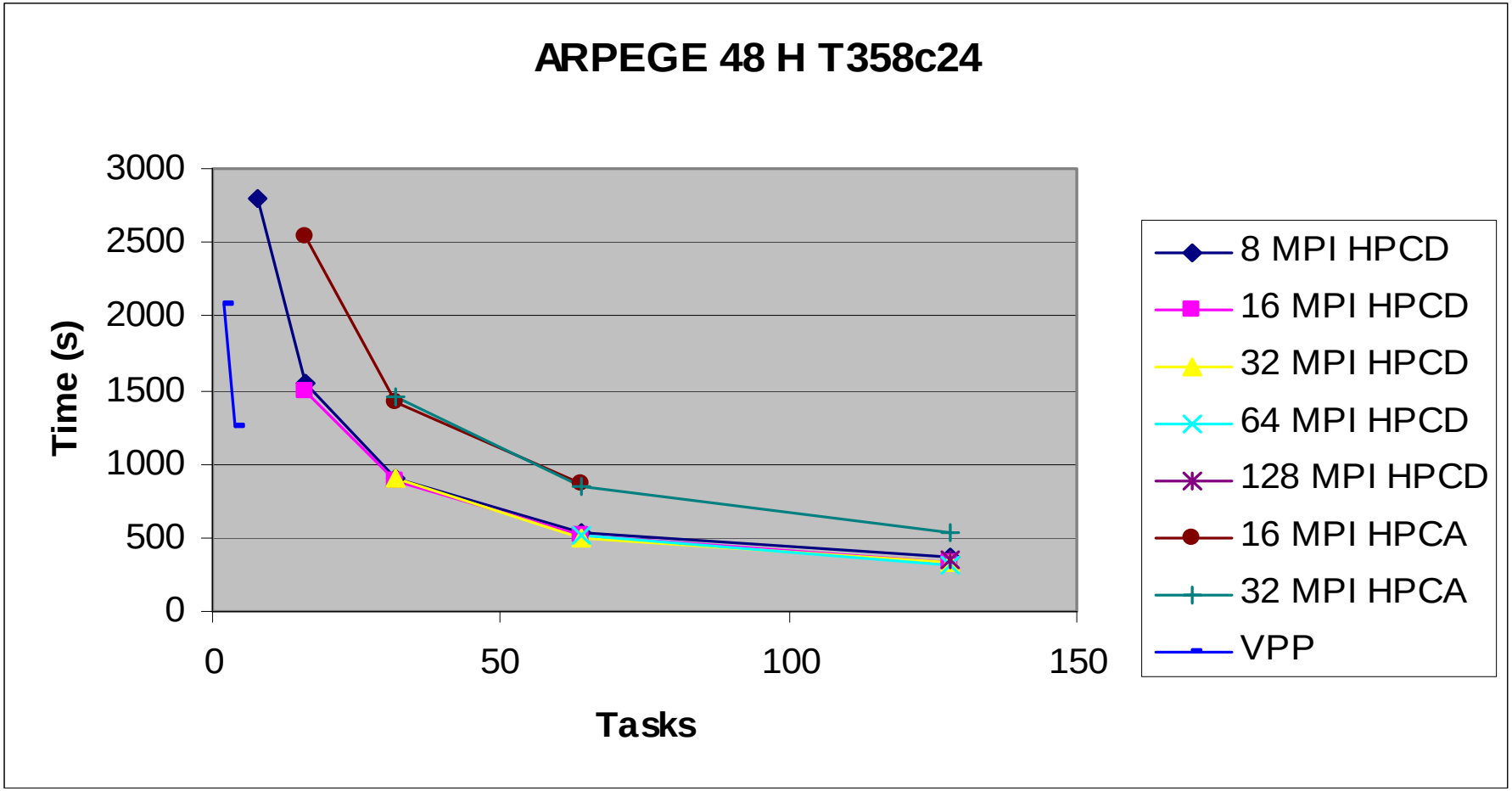
* 28T0 for IFS/ARPEGE/ALADIN
* 26T1 for AROME



- For each curve : MPI constant and threads change
- Less scalability with more than 32 Pes
- Good scalabilty 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
- Scalabitility 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

Procurement schedule

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 => 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!