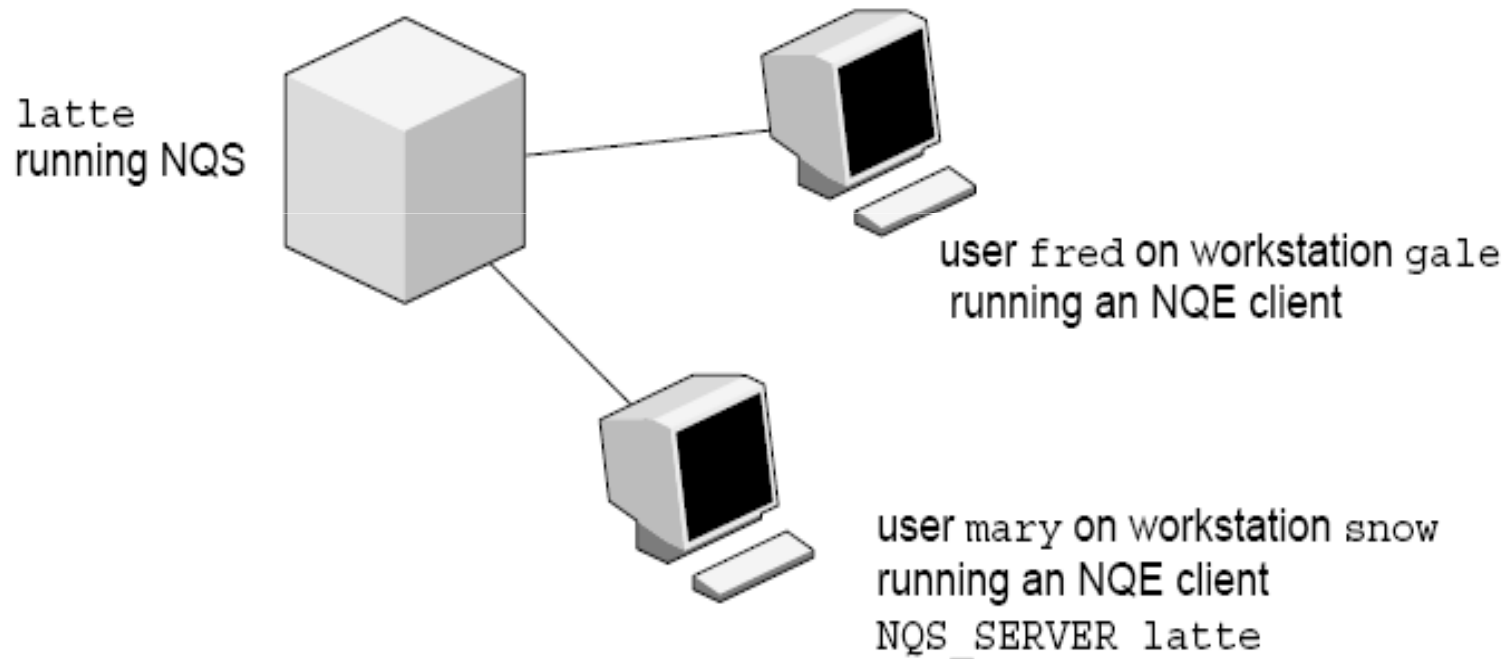


Resource Management Systems

Sistemas DRM

<i>Independent Suppliers</i>	<i>Open Source</i>	<i>OEM Proprietary</i>
<i>Platform Computing</i> LSF	<i>Altair</i> Open PBS	<i>IBM</i> Load Leveler
<i>Altair</i> PBS Pro	<i>University of Wisconsin</i> Condor	<i>Cray</i> NQE
	<i>Sun Microsystems</i> SGE	

NQE (Network Queue Environment)



a10261

Figure 1. Sample NQE Configuration



NQE

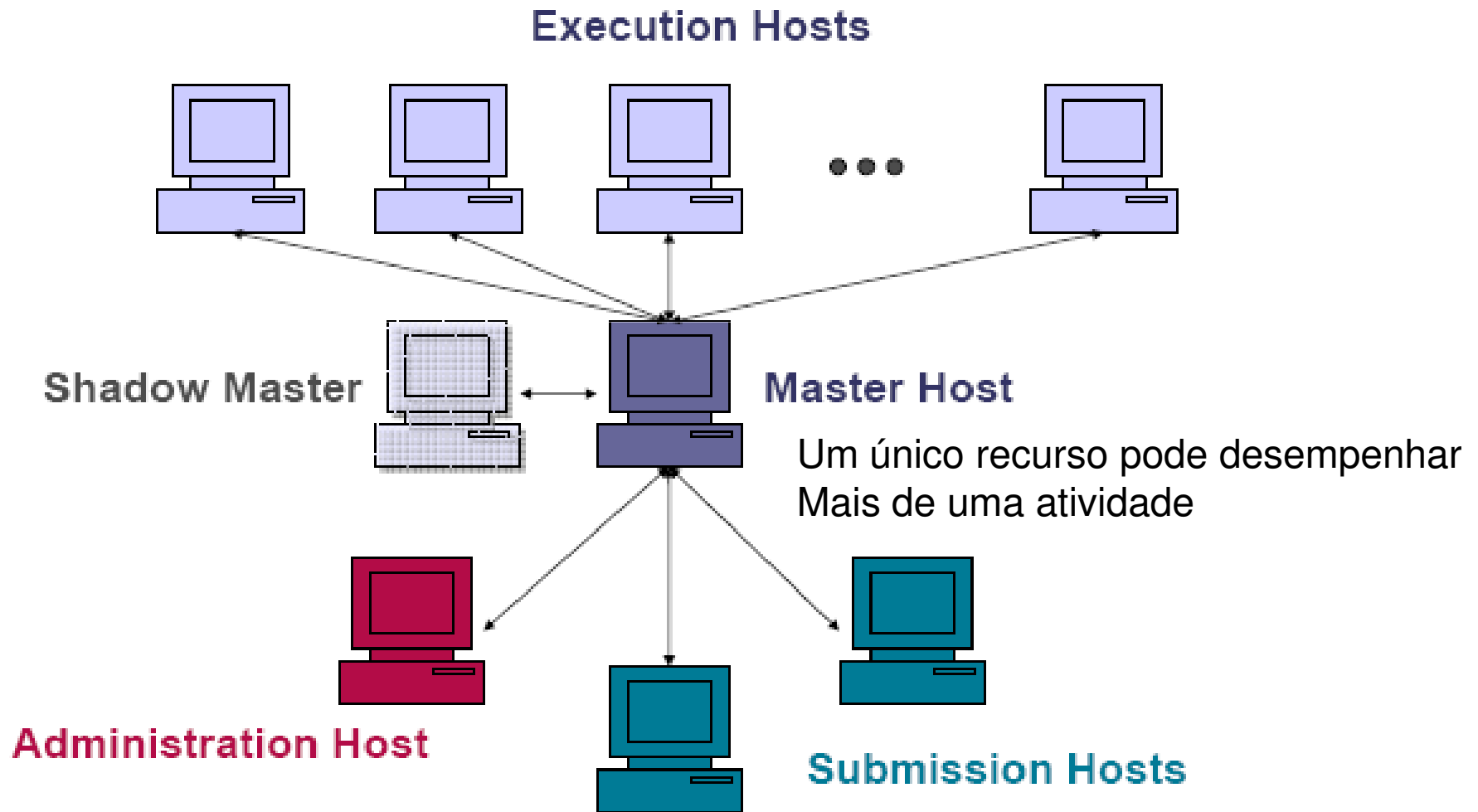
```
#QSUB -eo          #merge stdout and stderr
#QSUB -J m    #append NQS job log to stdout
#QSUB -o "%fred@gale/nppa_latte:/home/gale/fred/mary.jjob.output"
    #returns stdout to fred@gale
#QSUB -me    #sends mail to submitter at completion
#QSUB    #optional qsub delimiter
date    #prints date
rft -user mary -host snow -domain nppa_latte -nopassword -function get jan.data nqs.data
    #use FTA to transfer jan.data from latte to snow
cc loop.c -o prog.out    #compile loop.
./prog.out
rm -f loop.c prog.out jan.data nqs.data    #delete files
echo job complete
```



NQE user commands

cevent	Posts, reads, and deletes job-dependency event information.
cqdel	Deletes or signals to a specified batch request.
cqstatl	Provides a line-mode display of requests and queues on a specified host
cqsub	Submits a batch request to NQE.
ftua	Transfers a file interactively (this command is issued on an NQE server only).
ilb	Executes a load-balanced interactive command.
nqe	Provides a graphical user interface (GUI) to NQE functionality.
Commands issued on an NQE server only:	
qalter	Alters the attributes of one or more NQS requests
qchkpnt	Checkpoints an NQS request on a UNICOS, UNICOS/mk, or IRIX system
qdel	Deletes or signals NQS requests
qlimit	Displays NQS batch limits for the local host
qmsg	Writes messages to stderr, stdout, or the job log file of an NQS batch request
qping	Determines whether the local NQS daemon is running and responding to requests
qstat	Displays the status of NQS queues, requests, and queue complexes
qsub	Submits a batch request to NQS
rft	Transfers a file in a batch request

SGE (Sun Grid Engine)





SGE

- Comandos similares aos do NQE
- Exemplo: g.job

```
#!/bin/csh
```

```
gaussian < testDFT.in
```

- To run:

```
qsub -pe smp 4 -M ines@dcc.c.up.pt -m ae -r n g.job
```

Ou...



SGE

- Arquivo g.job

```
#!/bin/csh
```

```
#$ -pe smp 4    # parallel environment
```

```
#$ -M ines@dcc.c.up.pt
```

```
#$ -m ae       # mail sent at end/abort
```

```
#$ -r n        # no rerun
```

```
gaussian < testDFT.in
```

- To run: qsub g.job



SGE

- Utilizador pode especificar requisitos (tipo de cpu, qtde de disco, memória etc)
- SGE registra a tarefa, requisitos e informação de controle (usuário, grupo, depto, data/hora de submissão etc)
- Possui um planejador de execução de tarefas
- Assim que uma fila fique disponível, SGE lança a execução de uma das tarefas que estão aguardando
 - A tarefa com > prioridade ou > tempo de espera, segundo a configuração do planejador de tarefas
 - Se houver várias filas disponíveis escolhe a menos carregada
 - Podem haver várias filas por cluster



SGE

- Políticas de planejamento:
 - Baseada em tickets (Usuário)
 - Qto + tickets um usuário tiver, > a sua prioridade
 - Tickets são atribuídos de forma estática de acordo com a política de filas e prioridades atribuídos a cada usuário
 - Baseada em urgência (tarefas)
 - Hora limite para terminar a tarefa (que pode ser estipulada pelo usuário)
 - Tempo de fila da tarefa
 - Recursos requisitados
 - Personalizada: permite a atribuição arbitrária de prioridade às tarefas (similar ao nice)



SGE

- Ciclo de vida de uma tarefa:
 - Submissão
 - Master armazena tarefa e informa planejador
 - Planejador insere a tarefa na fila apropriada
 - Master envia tarefa ao host correspondente
 - Antes de executar, o daemon de execução:
 - Troca para o diretório da tarefa
 - Inicializa o ambiente (variáveis)
 - Inicializa o conjunto de processadores
 - Muda o uid para o uid do dono da tarefa
 - Inicializa limites de recursos do processo
 - Coleta info de contabilidade
 - Ao terminar estes passos, armazena a tarefa à sua base de dados e espera que a tarefa termine
 - Uma vez que a tarefa esteja terminada, avisa ao master e elimina a entrada da base de dados.



SGE

■ Alguns comandos:

- qconf: config do cluster
- qsub: submissão de tarefas
- qdel: eliminar tarefas
- qacct: estatísticas de utilização
- qhost: inspeciona estado dos hosts
- qstat: inspeciona estado das filas

SGE

- GUI





 n01.q n01 Slots: 1 (4) ████████	 n02.q n02 Slots: 1 (4) ████████	 n03.q n03 Slots: 1 (4) ████████	 n04.q n04 Slots: 1 (4) ████████	 n05.q n05 Slots: 1 (4) ████████	 n06.q n06 Slots: 1 (4) ████████	 n07.q n07 Slots: 1 (4) ████████
 n08.q n08 Slots: 1 (4) ████████	 n09.q n09 Slots: 1 (4) ████████	 n10.q n10 Slots: 1 (4) ████████	 n11.q n11 Slots: 1 (4) ████████	 n12.q n12 Slots: 1 (4) ████████	 n13.q n13 Slots: 1 (4) ████████	 n14.q n14 Slots: 1 (4) ████████
 n15.q n15 Slots: 1 (4) ████████	 n16.q n16 Slots: 1 (4) ████████	 n17.q n17 Slots: 0 (4) ████████	 n18.q n18 Slots: 1 (4) ████████	 n19.q n19 Slots: 1 (4) ████████	 n20.q n20 Slots: 1 (4) ████████	 n21.q n21 Slots: 1 (4) ████████
 n22.q n22 Slots: 1 (4) ████████	 n23.q n23 Slots: 1 (4) ████████	 n24.q n24 Slots: 1 (4) ████████	 n25.q n25 Slots: 1 (4) ████████	 n26.q n26 Slots: 1 (4) ████████	 n27.q n27 Slots: 0 (4) ████████	 n28.q n28 Slots: 1 (4) ████████
 n29.q n29 Slots: 1 (4) ████████	 n30.q n30 Slots: 1 (4) ████████	 n31.q n31 Slots: 1 (4) ████████	 n32.q n32 Slots: 1 (4) ████████	 n33.q n33 Slots: 1 (4) ████████	 n35.q n35 Slots: 1 (4) ████████	 n36.q n36 Slots: 1 (4) ████████
 n37.q n37 Slots: 1 (4) ████████	 n38.q n38 Slots: 1 (4) ████████	 n39.q n39 Slots: 1 (4) ████████	 n40.q n40 Slots: 1 (4) ████████	 n41.q n41 Slots: 1 (4) ████████	 n42.q n42 Slots: 1 (4) ████████	 n43.q n43 Slots: 1 (4) ████████
 n44.q n44 Slots: 1 (4) ████████						

Key

- Running
- Suspended
- Disabled
- Alarm
- Error
- Calendar Suspend
- Calendar Disable

Refresh

Add

Modify

Force

Suspend

Resume

Disable

Enable

Reschedule

Clear Error

Delete

Customize

Done

Help

SGE GUI



Condor

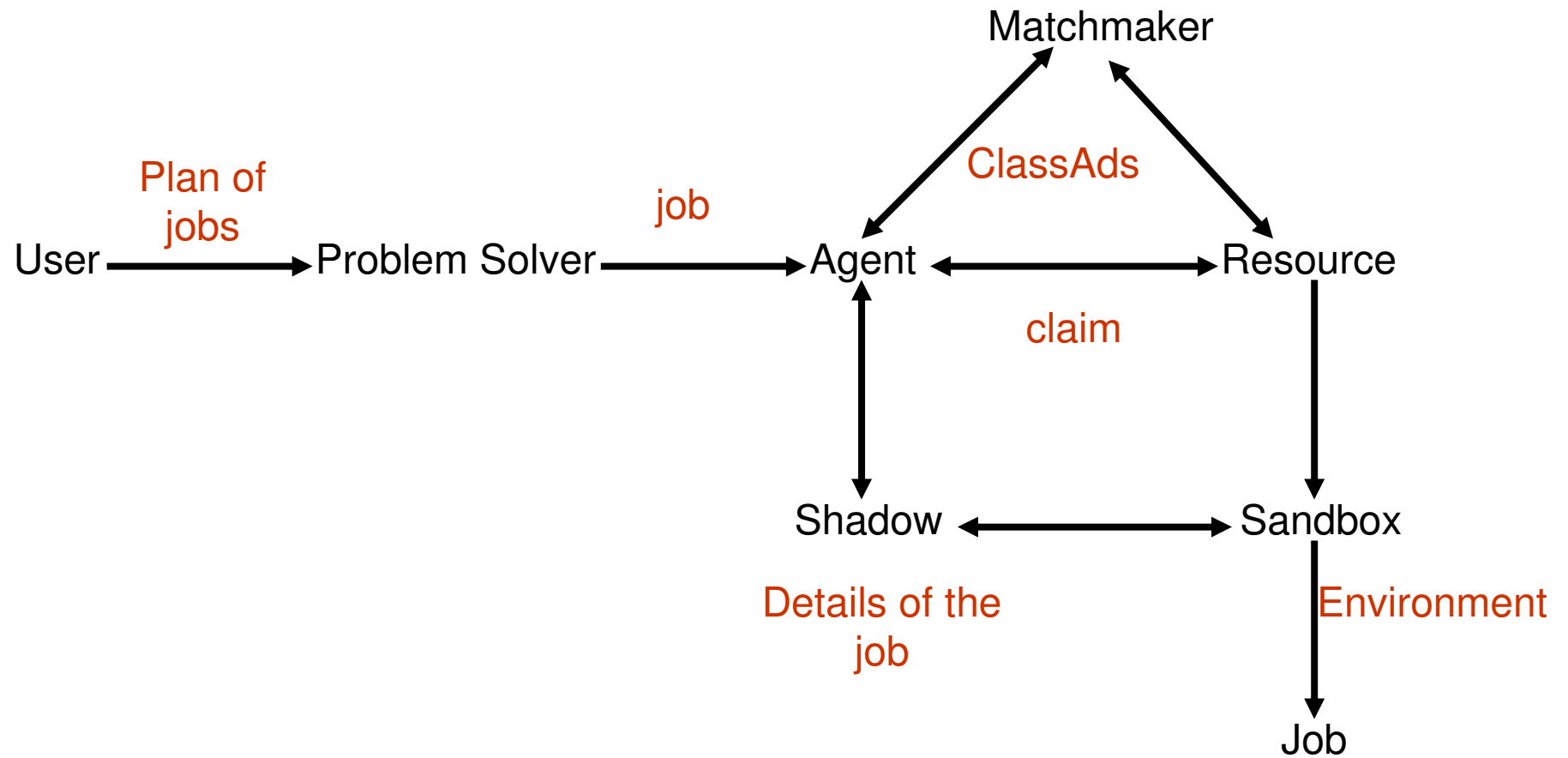
- It is a specialized job and resource management system. It provides:
 - Job management mechanism
 - Scheduling
 - Priority scheme
 - Resource monitoring
 - Resource management



Condor

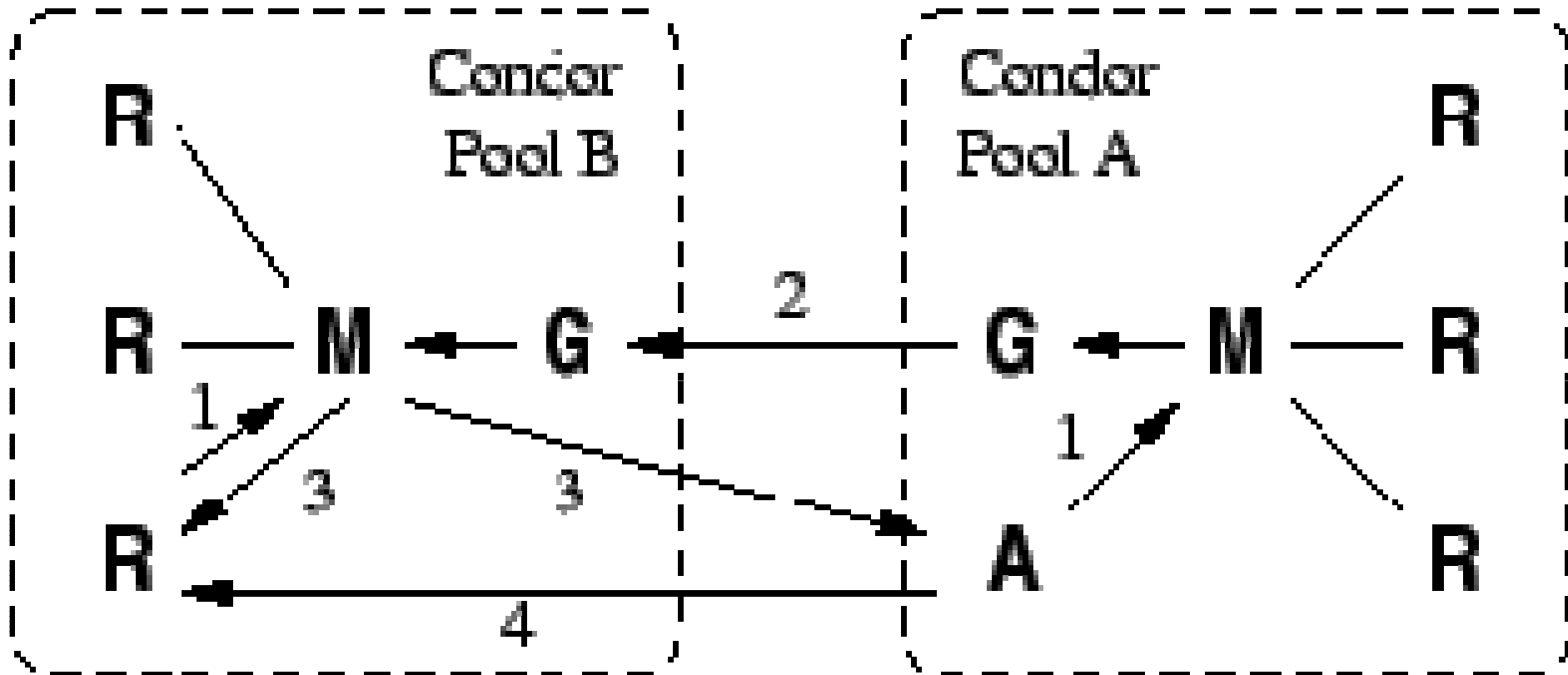
- The user submits a job to an agent.
- The agent is responsible for remembering jobs in persistent storage while finding resources willing to run them.
- Agents and resources advertise themselves to a matchmaker, which is responsible for introducing potentially compatible agents and resources.
- At the agent, a shadow is responsible for providing all the details necessary to execute a job.
- At the resource, a sandbox is responsible for creating a safe execution environment for the job and protecting the resource from any mischief.

Condor



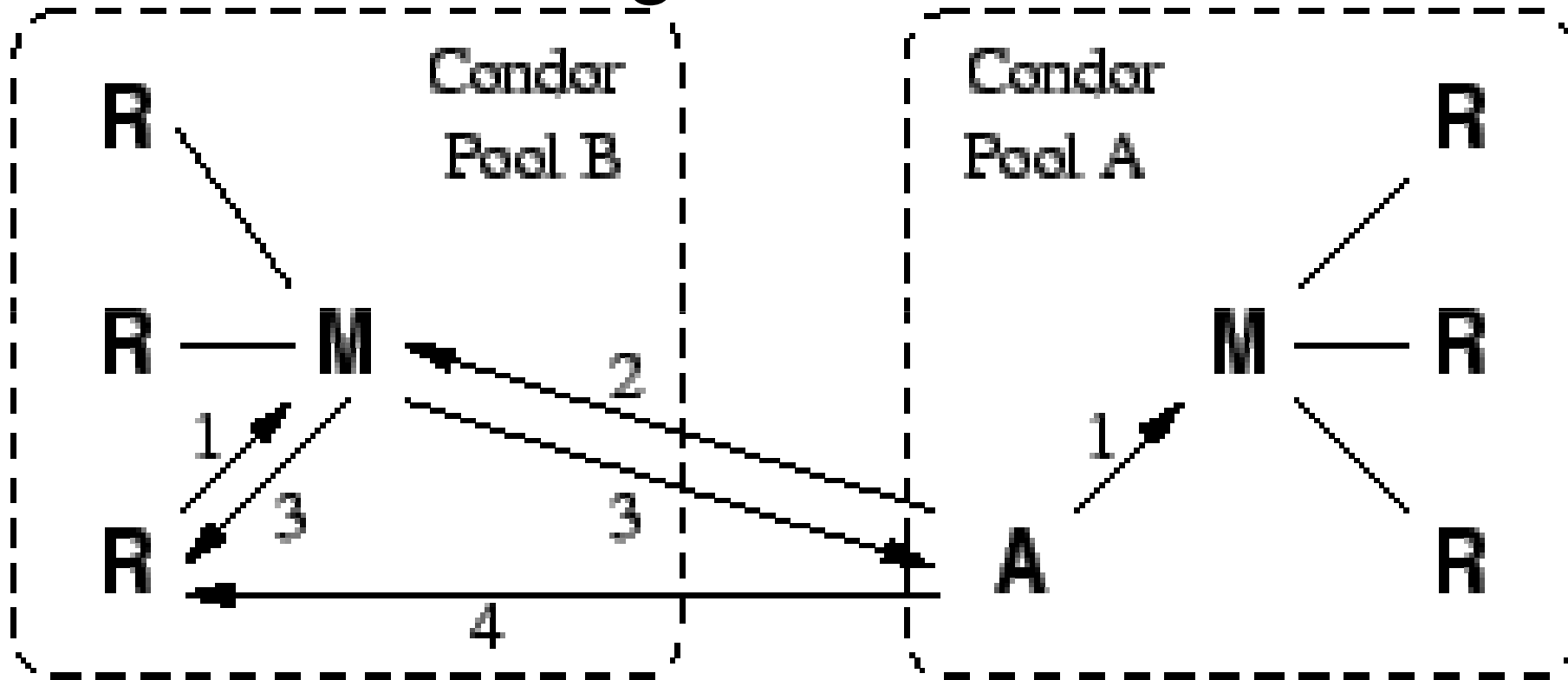
Condor

Gateway Flocking



Gateway pass information about participants between pools, M(A) sends request to M(B) through gateways, M(B) returns a match

Condor Direct Flocking



A also advertises to Condor Pool B



RMSs

- Cada um possui sua própria interface
- Não proporcionam integração
- Falta de interoperatividade
- Requerem habilidades específicas de administração
- Incrementam custos operacionais
- Geram sobre-provisionamento e desbalanceamento global de carga