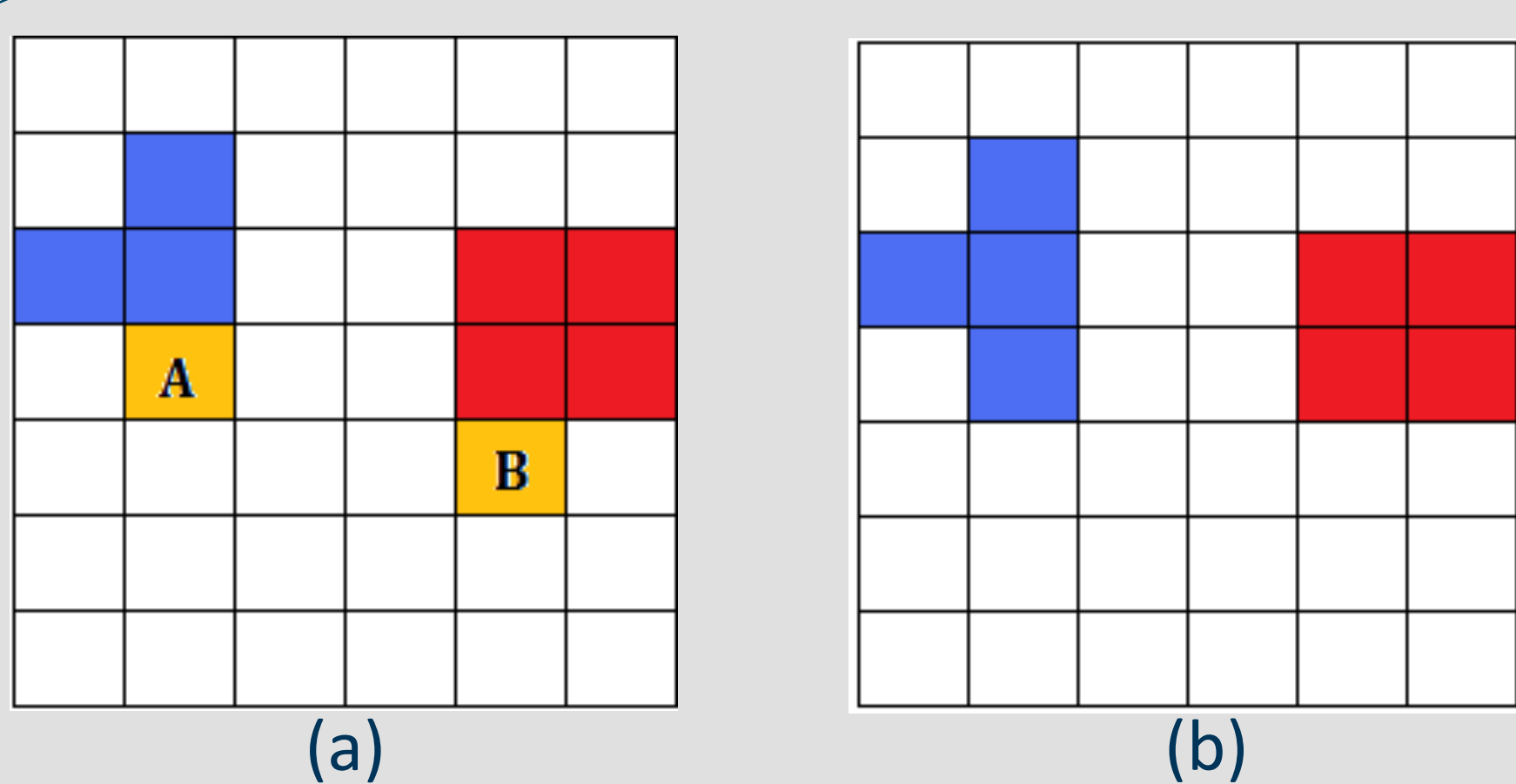


Research Description

We have performed site percolation on square lattices based on *Achlioptas Processes* [1]. In contrast to the well-known random percolation which produces continuous transitions, this model is related to “explosive” transitions

Model Description



Consider an instant of the procedure where we have two clusters (blue and red colors – a). A and B are candidate sites. According to Achlioptas Process, there remains the site that leads to the formation of the smaller cluster, i.e. site A (b).

Technical Aspects (I)

Parametric job framework

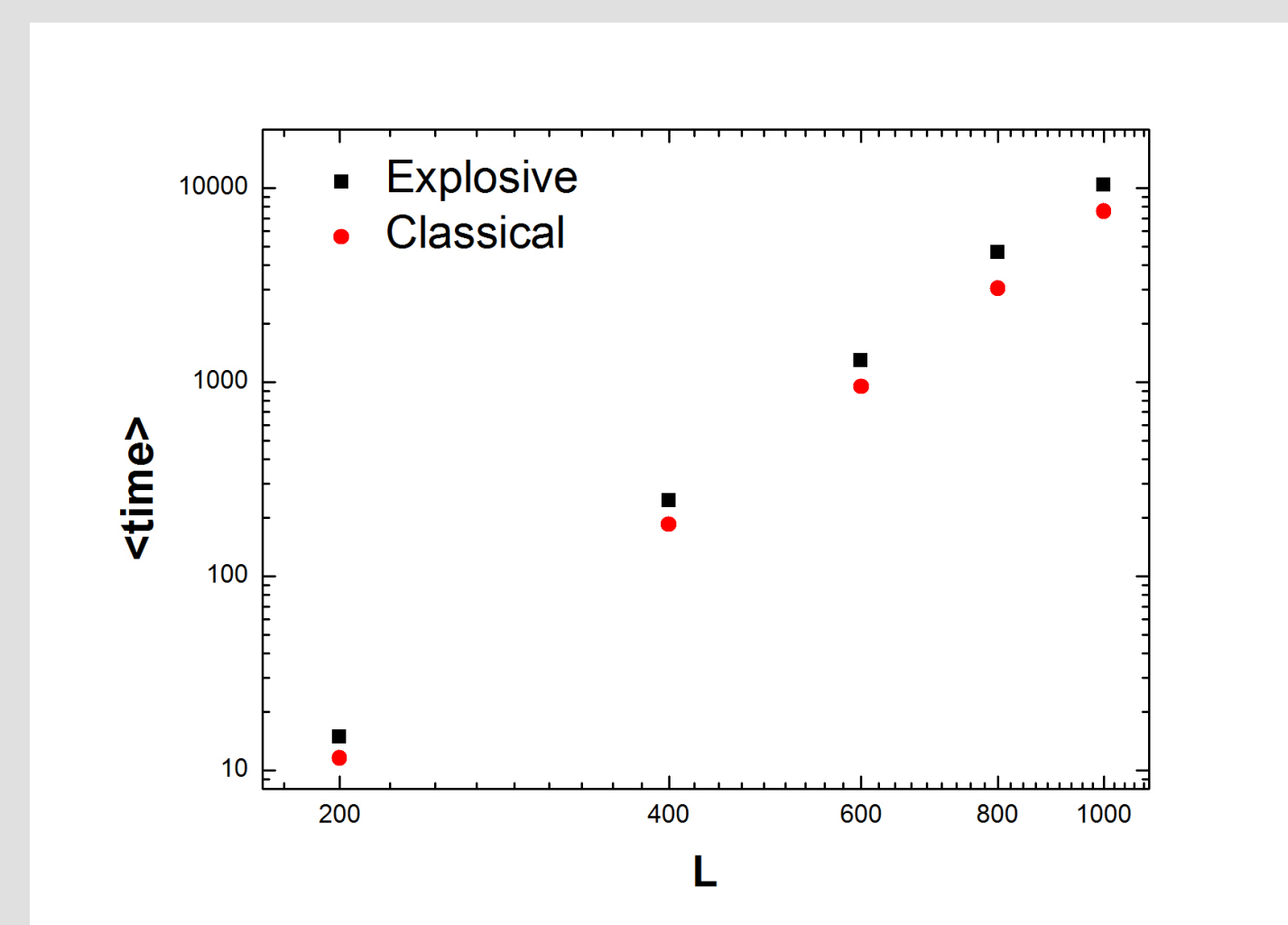
```
jobType = "Parametric";
Executable = "Achlioptas1000.sh";
Arguments = "_PARAM_";
Requirements = (other.GlueHostArchitecturePlatformType == "x86_64");
InputSandbox = { Achlioptas1000.sh , Achlioptas };
ParameterStep = 1;
ParameterStart = 0;
Parameters = 1000;
StdOutput = "std.out";
StdError = "std.err";
OutputSandbox = {"std.out", "std.err", "folder.tar.gz"};
```

Avoiding the selection of a worker node that has not the specified architecture

Time consumption

For a typical 1000x1000 system: average time consumption 10314.9 sec
Considering 1000 runs

- Single CPU
- Total duration: 10314.9 x 1000 ≈ 119 days
- Parametric submission using EGI
- Total duration: 10314.9 sec

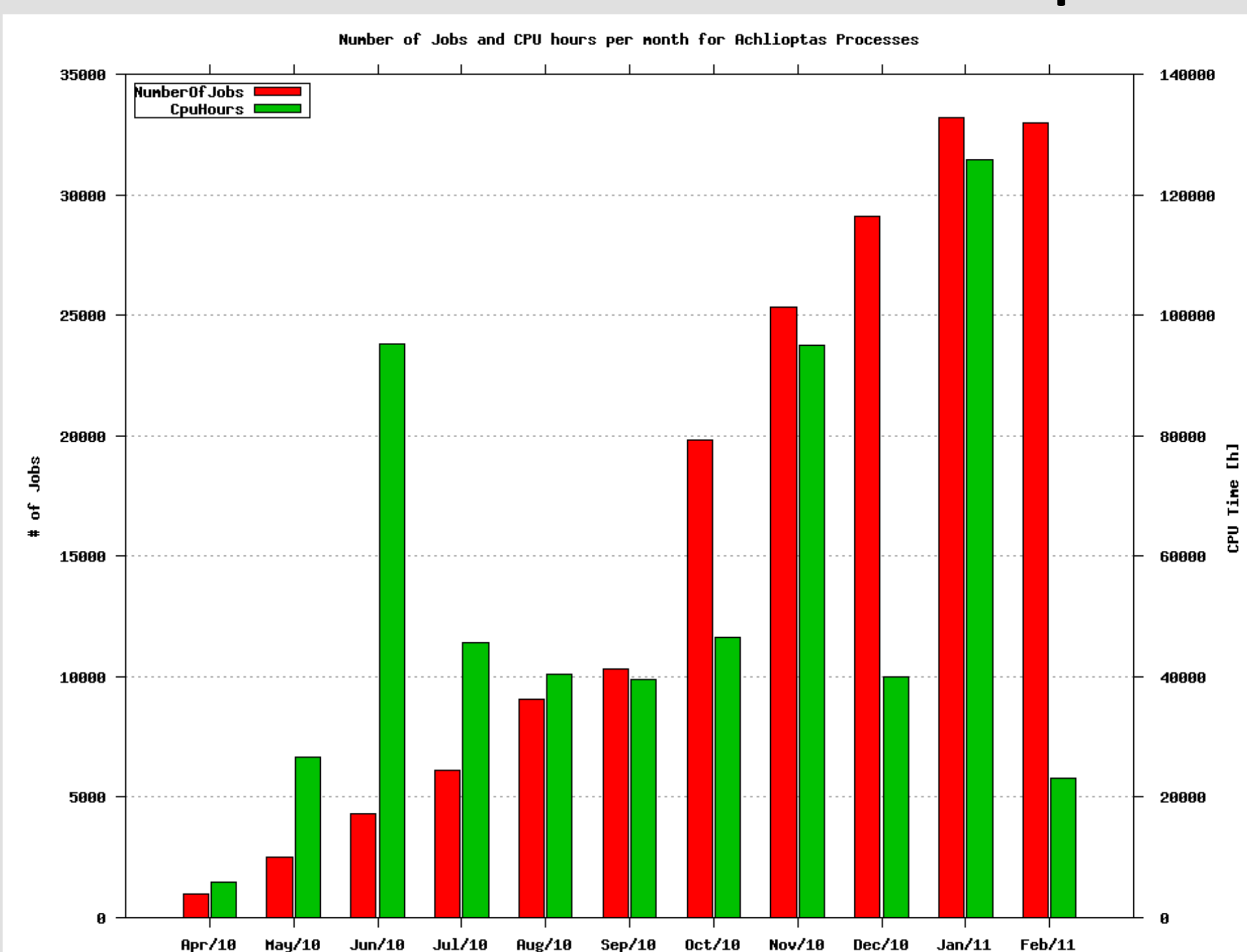


Average time scaling

- classical percolation
<time> ~ L^{4.09}
- achlioptas process
<time> ~ L^{3.78}

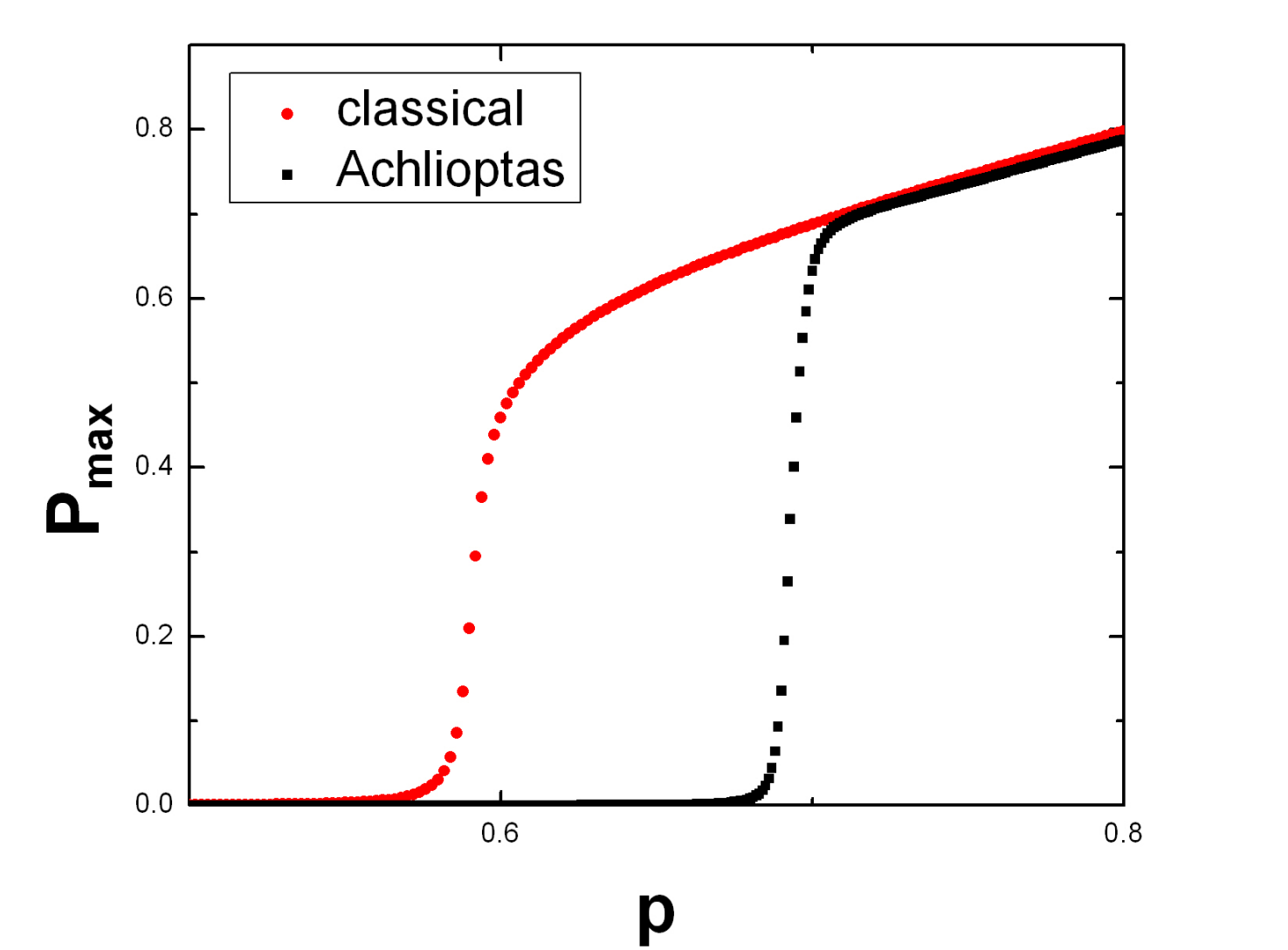
Technical Aspects (II)

Number of Jobs and CPU time consumption



Results

Achlioptas vs classical percolation



$$P_{max} = \frac{C_{max}}{pL^2}$$

C_{max} : size of the largest cluster

L : system size

p : fraction of occupied sites

More abrupt jump of the order parameter P_{max}

Different critical point

Impact - Conclusions

Define the actual nature of this phenomenon
CPU speed and memory availability is of great importance.

The EGI essential for the research on complex systems

Improvements

- Enabling higher wallclock limits on Grid resources
- Exploiting GPGPU cards for speeding up computation

1. D. Achlioptas, R. M. D'Souza, J. Spencer, "Explosive Percolation in Random Networks", Science, 323, p. 1453 (2009).

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