A Study of Grid Applications: Scheduling Perspective

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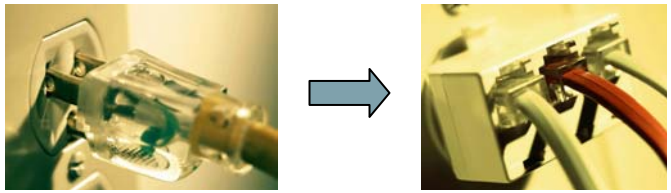
Outline

- Introduction to Grid Computing
- Study of Grid Applications
- Implications for Grid Scheduling

Grid Computing

- Utility platform
- Computational Service



- Range of Hardware

- Range of Uses/Applications

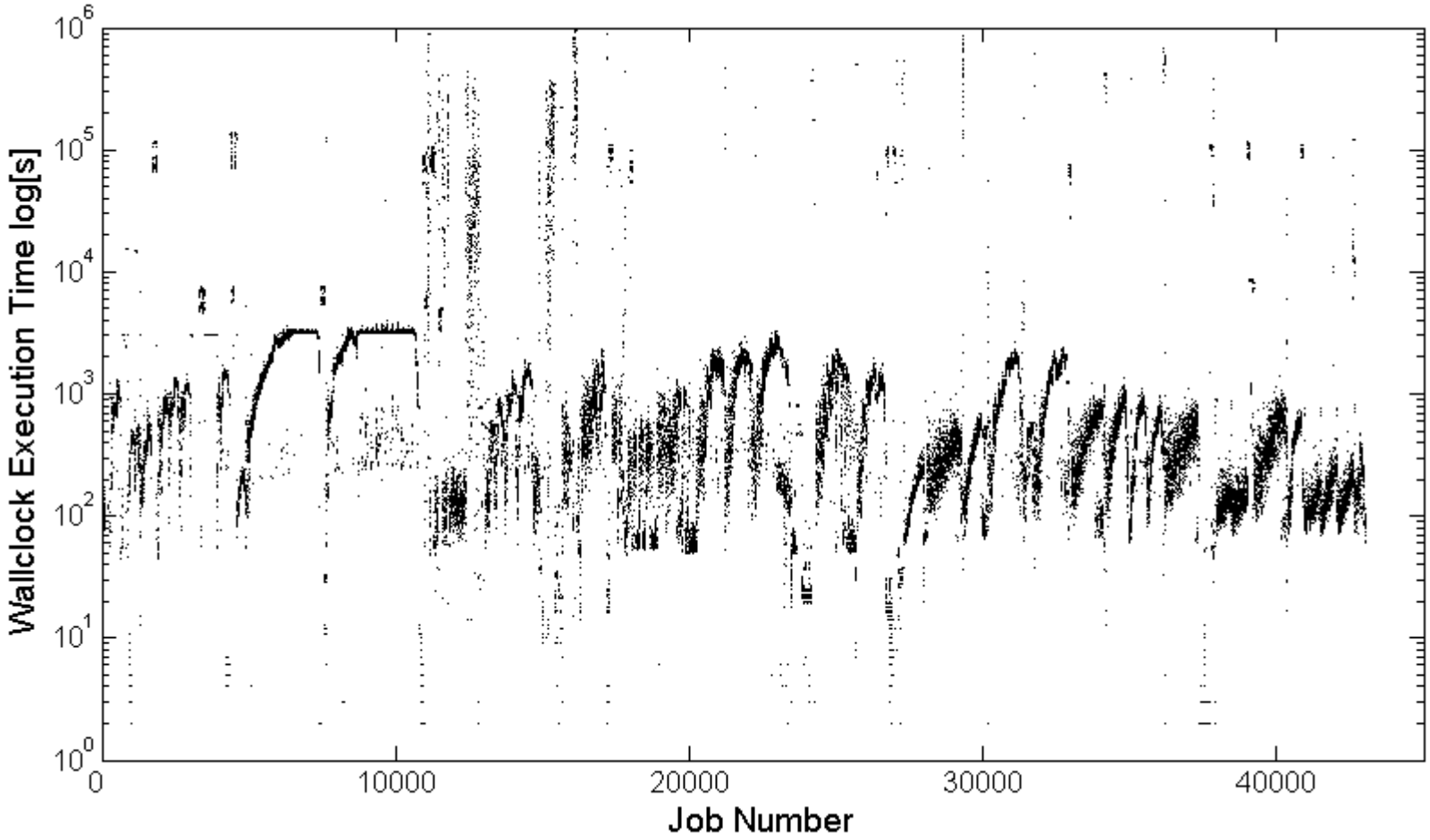
Mission Statement

- Study Grid Usage/Applications
  - Explore job & resource utilisation statistics
  - Patterns of user behaviour and workflows
  - Correlation with historical data
- Explore Resource Management implications
  - On higher level: planning, provisioning and SLA
  - On lower level: admission control and **scheduling**

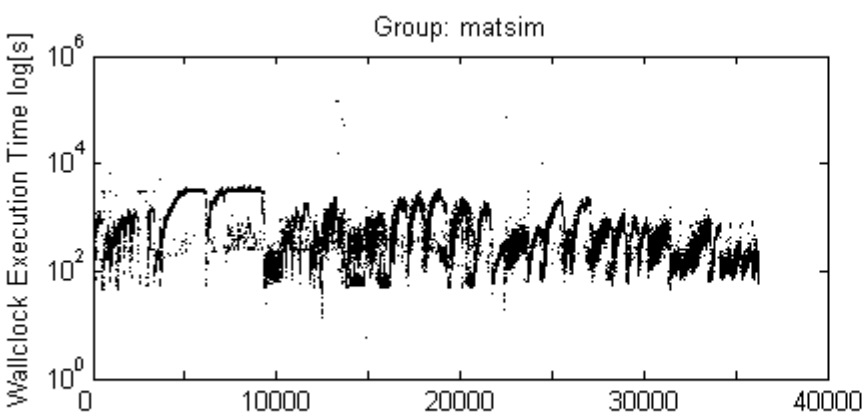
UCL Grid Cluster

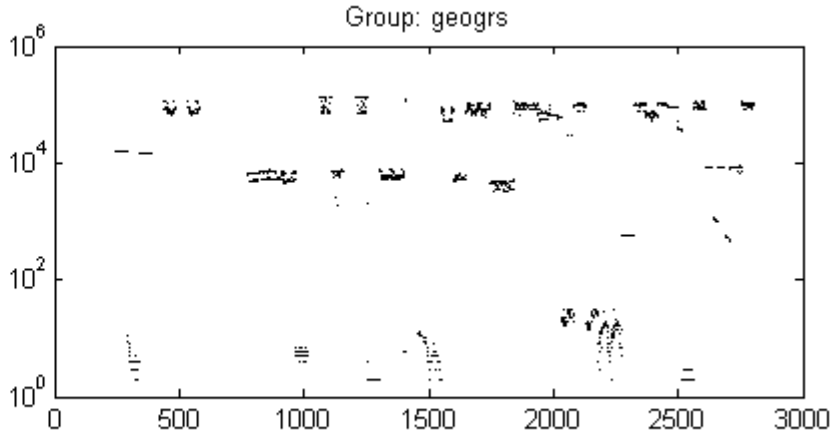
- 6 months of job accounting data from UCL's Central Computing Cluster
- 25 eScience projects, ~ 50,000 jobs
- Collect meta-data on job submitter, submit time and node, scheduling delay, real CPU time, **wallclock execution time** etc.

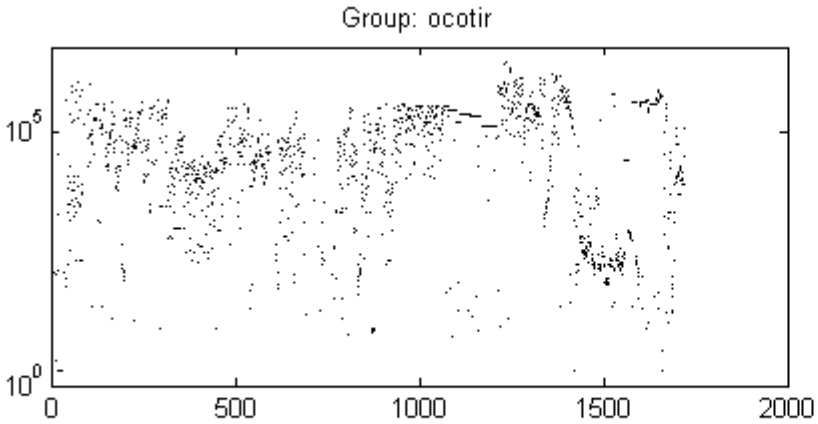
Overall Job Execution Times

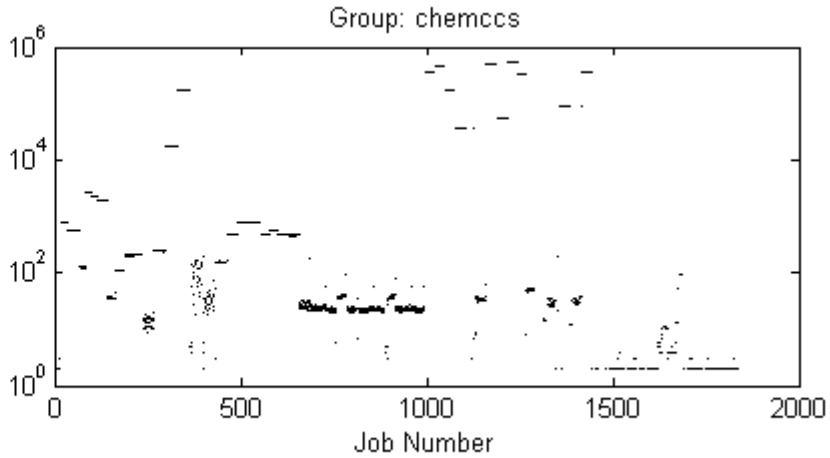


Group Execution Times

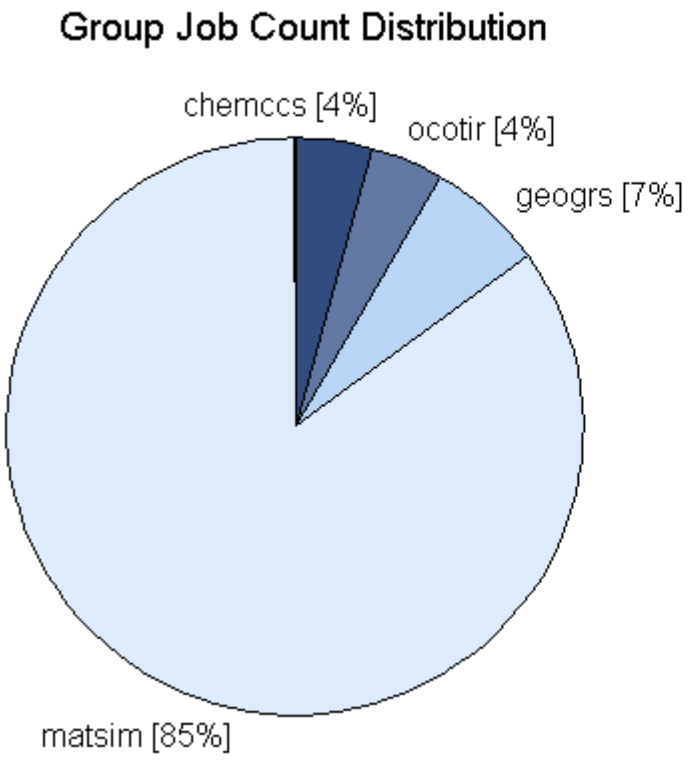


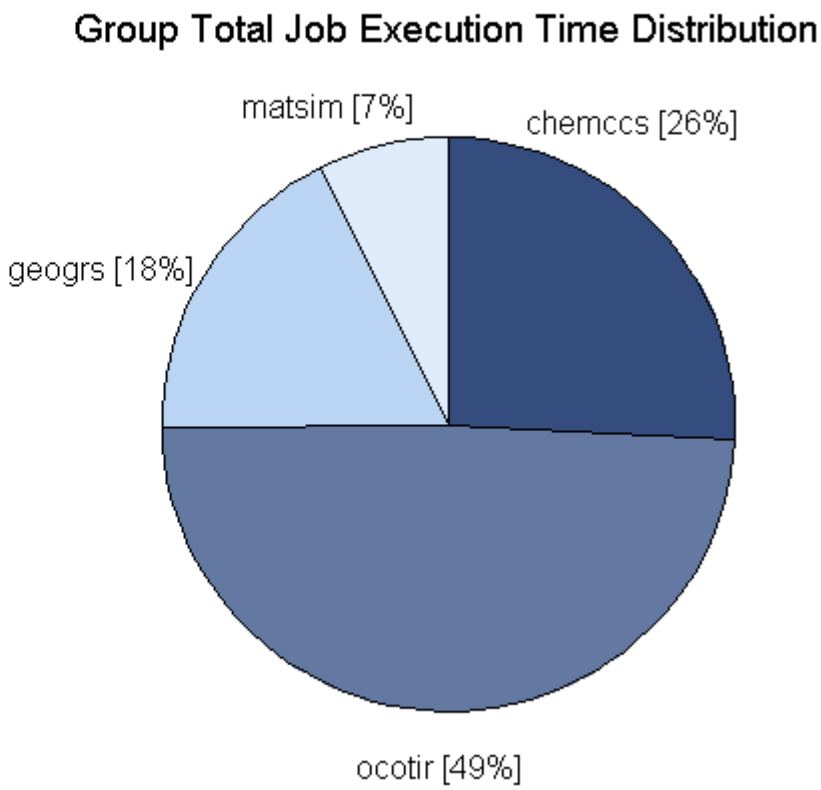




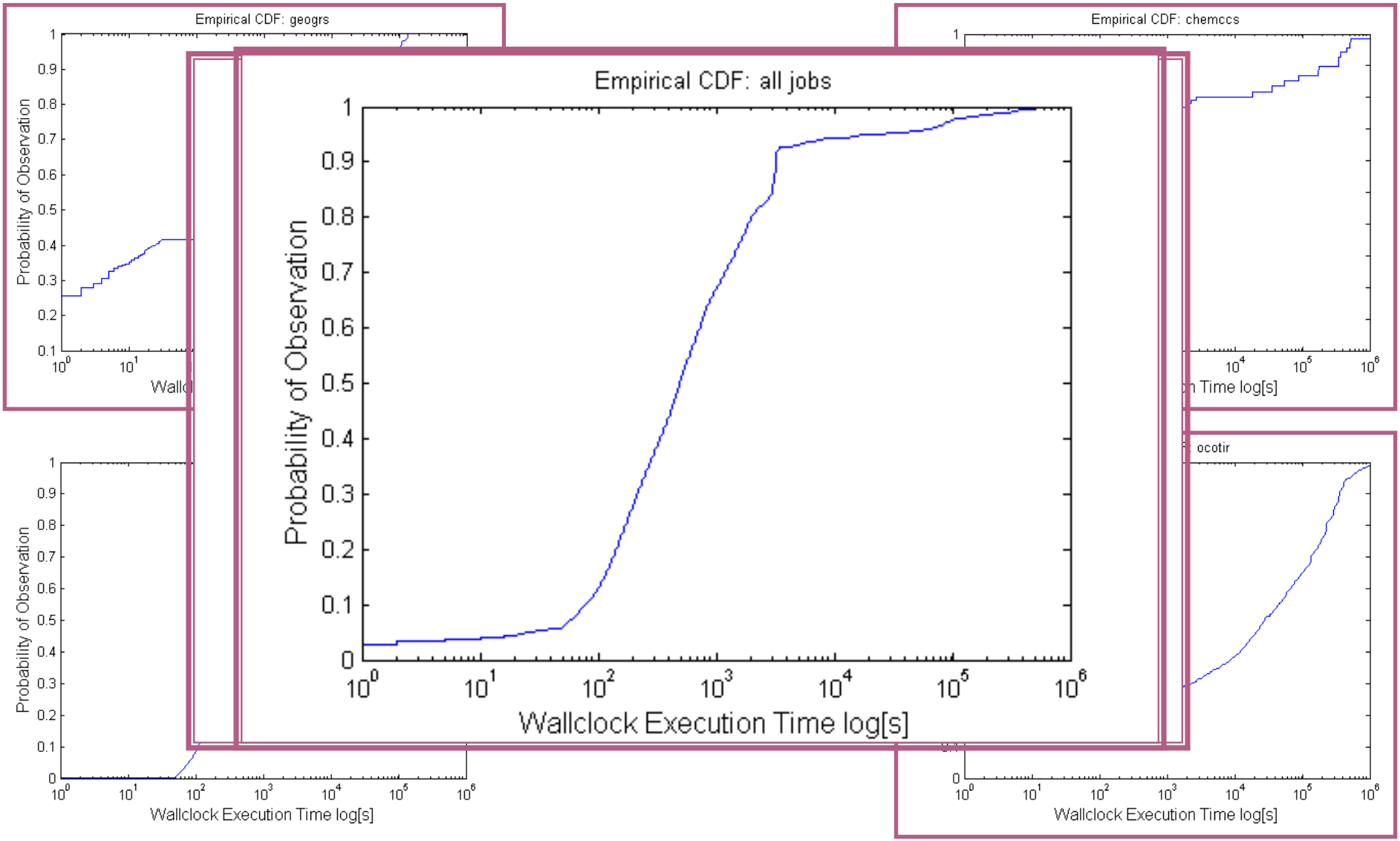


Group Job Distribution

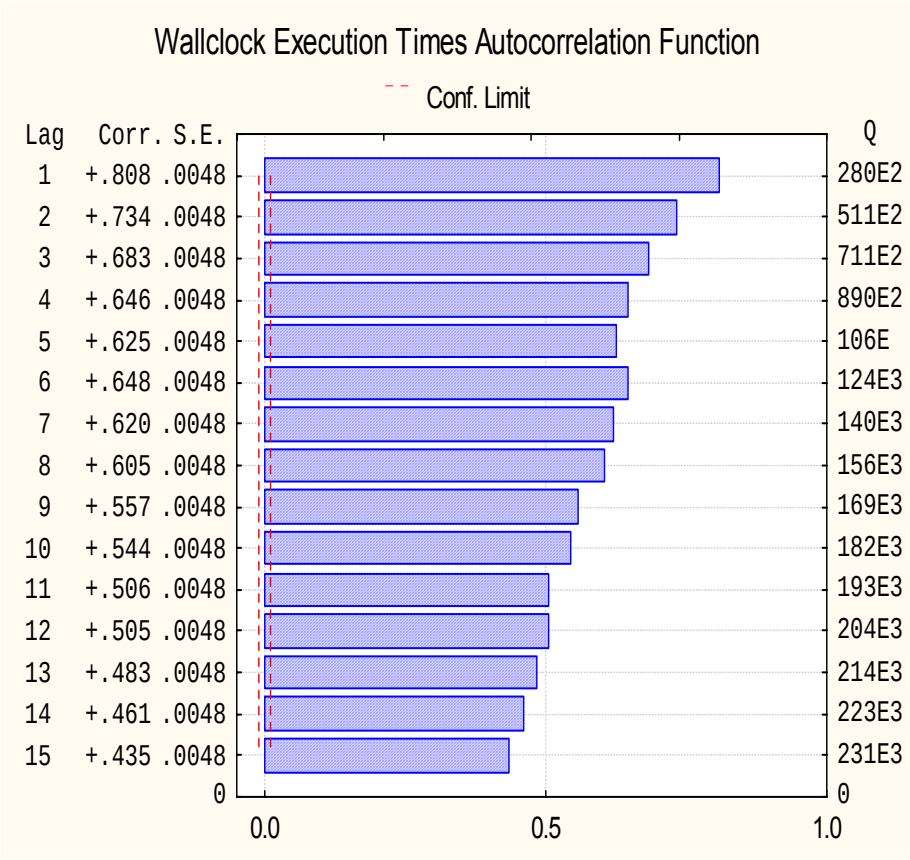


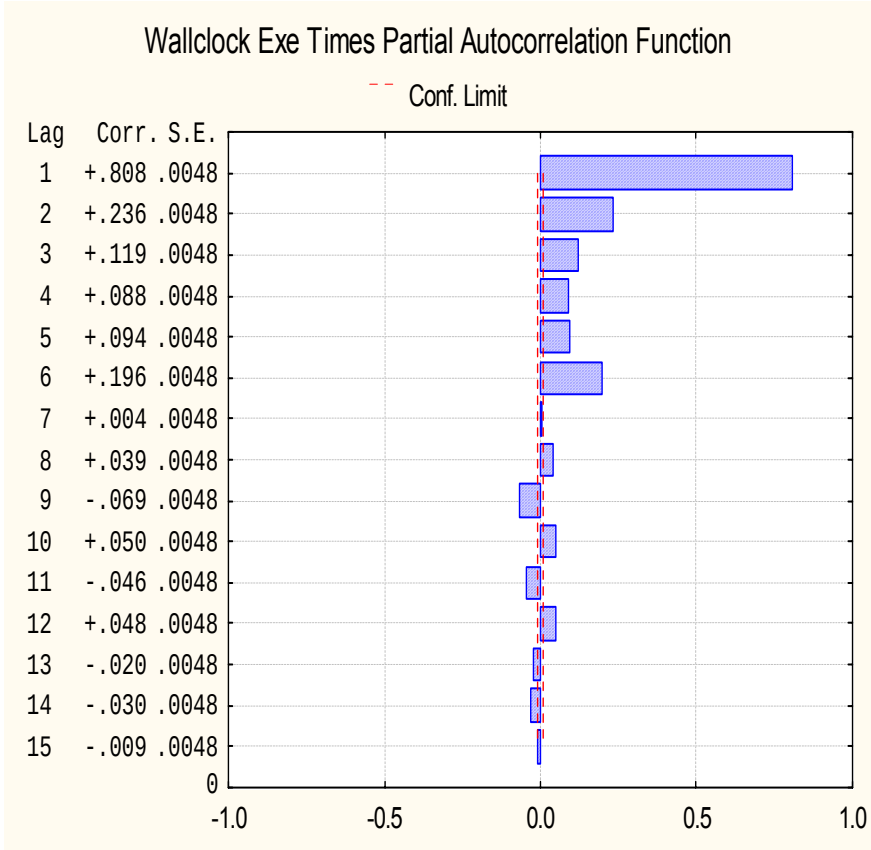


Cumulative Execution Time Distributions



Execution Time Autocorrelation





Scheduling Implications

- Could we anticipate job duration & resource requirements trends?
- Could we predict job duration of specific jobs in the queue?
- Could we offer an intuitive “deadline” scheduler with low administration cost?
- Could users live with probabilistic guarantees?

Conclusions

- Observed emergence of workflow patterns and their correlation with job meta-data
- Heterogeneous application set, size of jobs related to the resource size and expected performance
- High levels of autocorrelation could make statistical modelling feasible

Q & A

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- www.ee.ucl.ac.uk/~alazarev/
- Self-Organising Grid Resource Management (SO-GRM) Project: www.ee.ucl.ac.uk/acse/so-grm/index.htm