GridSim:
"Java-based Modelling and Simulation of Deadline and Budget-based Scheduling for Grid Computing"

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Simulation Parameters

- **Resources**
  - Speed: 0.5 to 1.5 (1, standard machine. normal distribution for speed).

- **Users:**
  - Users job contains 20 tasks with variation of +/-2 with random submission.
  - Users submitted jobs only after completion of previous job.

- **Jobs = 20 tasks**
  - Each task takes 50 units.
  - Heterogeneous tasks (future)

- **Simulation Time = 7*60*60 units (approx. 7 hours).**

- As the number of users grows, the probability of getting at least one resource per user, throughout the deadline, decreases.

- This low probability demands high (>> 1) $D_{Factor}$ and $B_{Factor}$ in order to achieve very high job completion rate.
**D-Factor**

\[ Job\_Time\_{\text{MAX}} = \text{Time to process all the tasks, serially, using the slowest resource} \]

\[ Job\_Time\_{\text{MIN}} = \text{Time to process all the tasks, in parallel, giving the fastest resource the highest priority} \]

\[ D\_\text{Factor} = \frac{\text{Deadline} - Job\_Time\_{\text{MIN}}}{Job\_Time\_{\text{MAX}} - Job\_Time\_{\text{MIN}}} \]

- Any job with \( D\_\text{Factor} < 0 \) would never be completed
- As long as some resources are available throughout the deadline, any job with \( D\_\text{Factor} \geq 1 \) would always be completed
B-Factor

\[ Job_{Cost}^{MAX} = \text{Cost to process all the tasks, in parallel within deadline, giving the costliest resource the highest priority} \]

\[ Job_{Cost}^{MIN} = \text{Cost to process all the tasks, in parallel within deadline, giving the cheapest resource the highest priority} \]

\[
B\_Factor = \frac{Budget - Job_{Cost}^{MIN}}{Job_{Cost}^{MAX} - Job_{Cost}^{MIN}}
\]

- Any job with \( B\_Factor < 0 \) would never be completed.
- As long as some resources are available throughout the deadline, any job with \( B\_Factor \geq 1 \) would always be completed.
Users=21, Resources=25, Optimization: TIME

Job completion rate (%)
Users=21, Resources=25, Optimization: TIME
Budget Utilisation & Time Optimise

Users = 21, Resources = 25, Optimization: TIME

Budget Utilization (%) vs. B-factor (%) and D-factor (%)
Job Completion & Cost Optimise

Users=21, Resources=25, Optimization: COST

Job completion rate (%)
Time Utilisation & Cost Optimise

Users=21, Resources=25, Optimization: COST
Budget Utilisation & Cost Optimise

Users=21, Resources=25, Optimization: COST
Job Completion for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME

Job completion rate (%)
Time Utilisation for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME
Budget Utilisation for Optimise Time

B-factor = D-factor = 110%, Optimization: TIME
Job Completion for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST

Job completion rate (%)
Time Utilisation for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST
Budget Utilisation for Optimise Cost

B-factor = D-factor = 110%, Optimization: COST