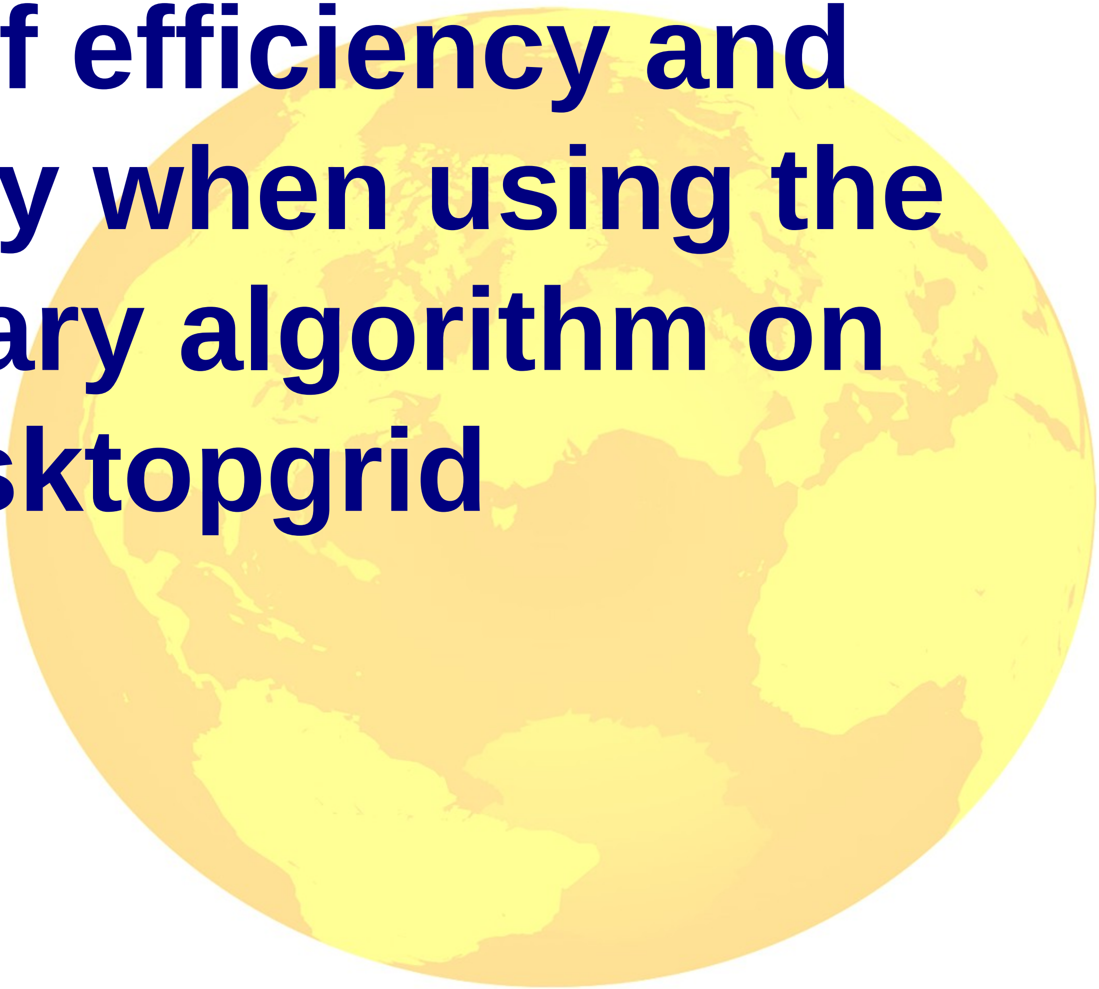
Metrics of efficiency and productivity when using the evolutionary algorithm on desktopgrid



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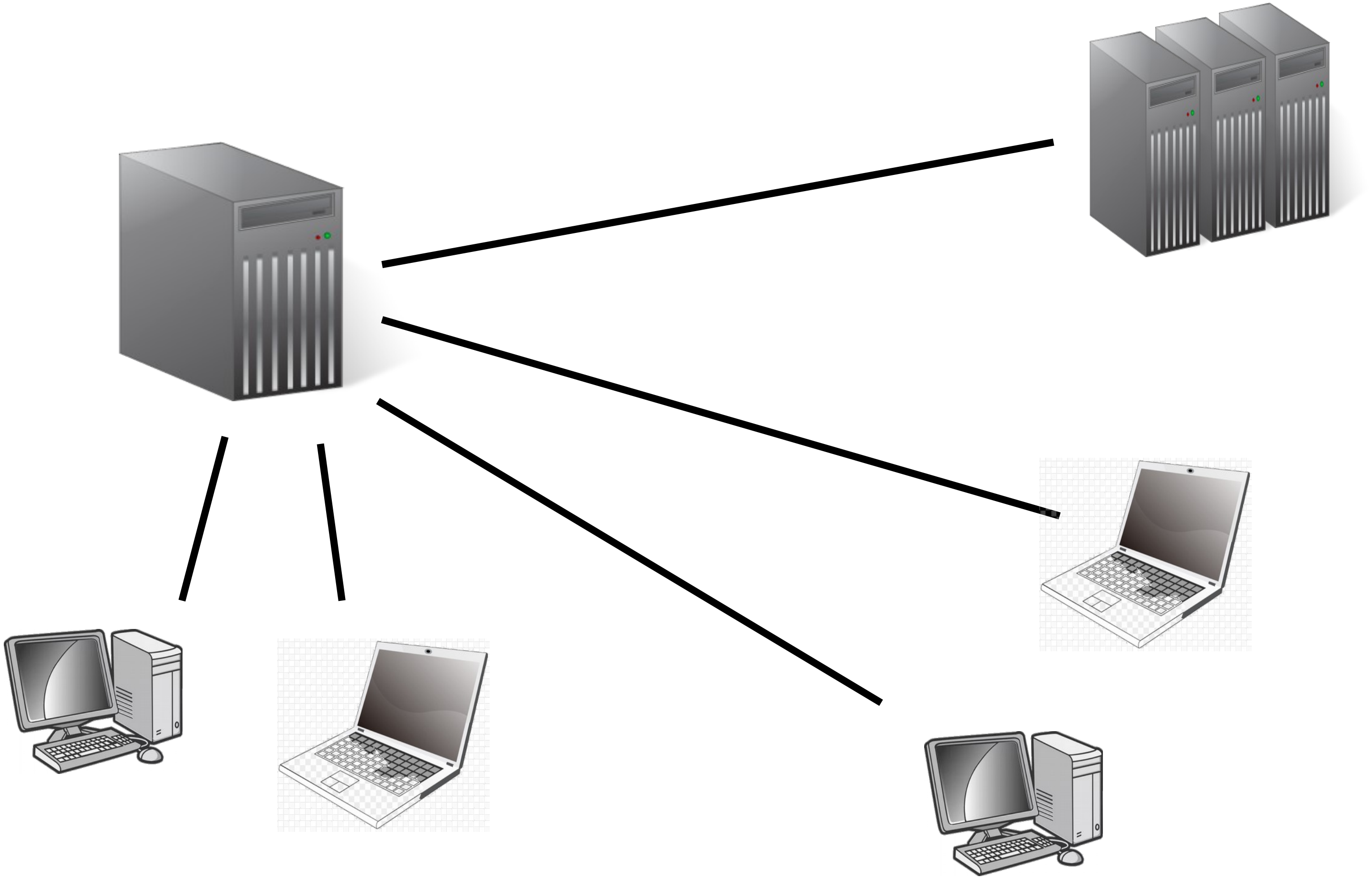
DesktopGrid

- BOINC
- OurGrid
- HTCondor



Makespan

$$Ms = t_{stop} - t_{start}$$

Portable Batch System (PBS)	Desktopgrid
• The waiting time depends on the state of the queue. • Computation time depends on the characteristics of the computing system.	• The waiting time depends on both the state of the queue and the availability of resources. • The computation time depends on both the state of the queue and the availability of resources.
t_{start} — queue end time.	t_{start} — time of placing the first task in the queue.

Speedup

$$Sp=\frac{\sum t_i}{Ms}$$

Portable Batch System (PBS)	Desktopgrid
• Does not use replication. • CPU time is roughly equal to the time of computaion for task for node.	• Replication is possible. • Computing may be suspended. So CPU time is not equal to the time of computaion for task for node.
	t_i — average time for several replics. Sp if t_i is time for computation. Sp_{cpu} if t_i is a CPU time.

Efficiency

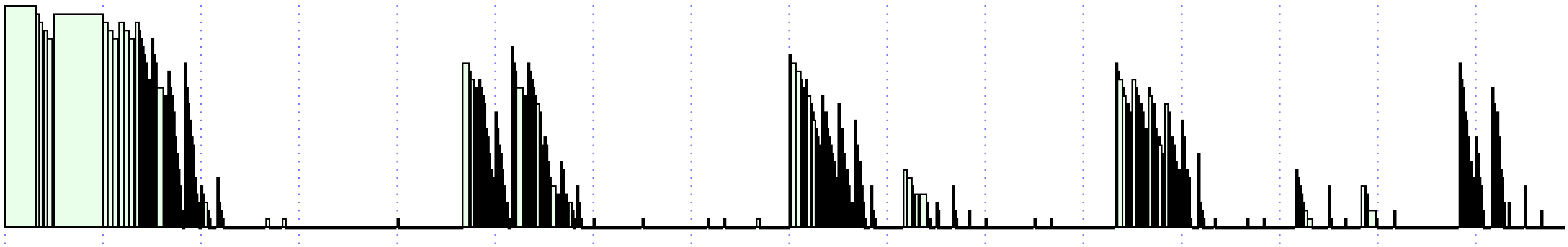
$$E_p = \frac{\sum t_i}{p \cdot M_s} = \frac{S_p}{p}$$

Desktopgrid features:

- P is indefined.
- Based on parameter Sp, parameters Ecpu and E can be determined.

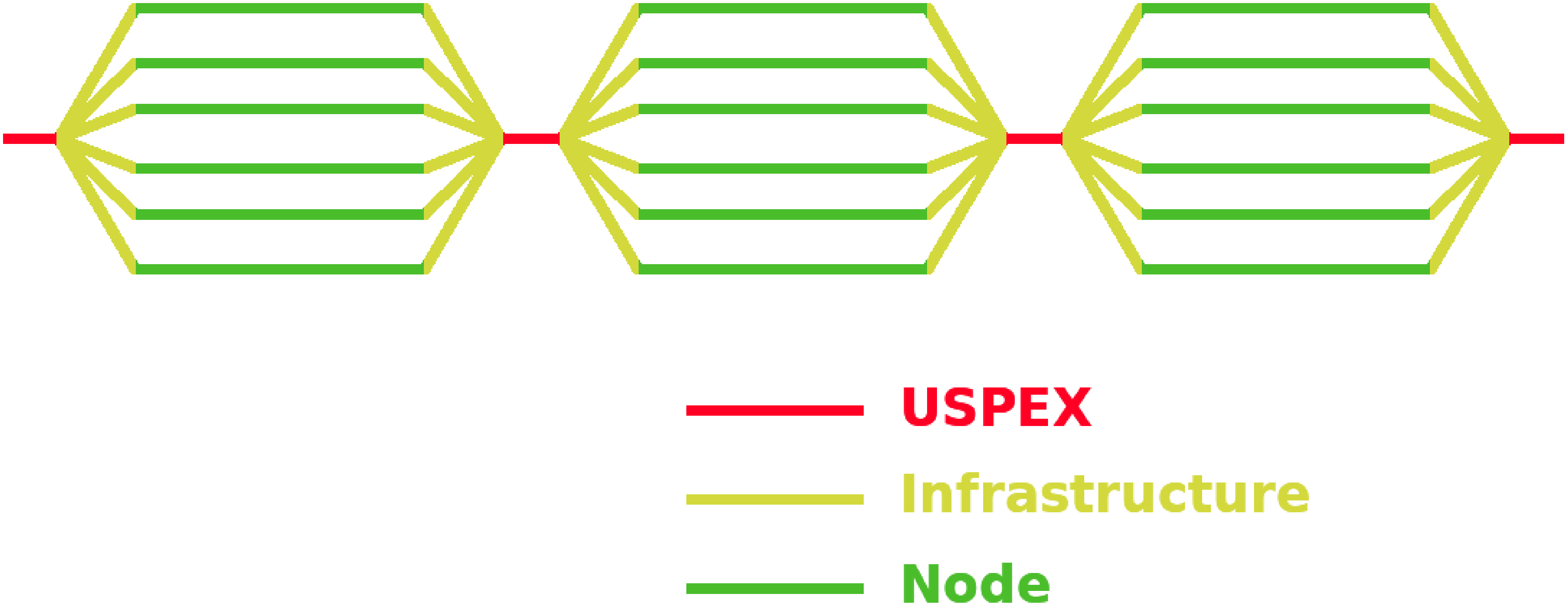
Efficiency
(special metric)

$$E_{req} = \frac{N_{handle}}{N} \approx \frac{T_{queue}}{T}$$

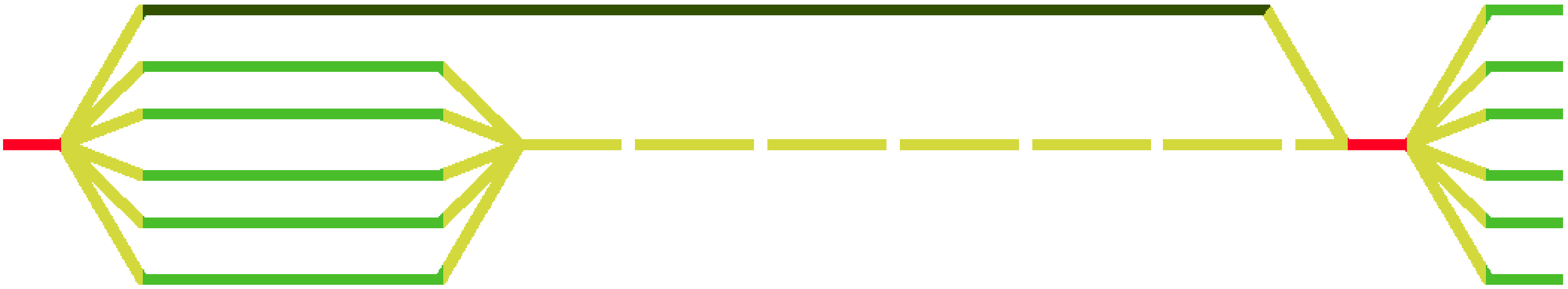


Evolutionary algorithm USPEX

(sequence of computations)



Waiting the last task



$$T_w = \sum_{i=1}^{n} \sum_{j=1}^{m} t_{ij}$$

$$K_w = \frac{T_w}{\sum_{i}^{n} m t_i}$$

Example

- Generation consists of 10 tasks.
- 1 task requires 1 hour of CPU time.
- Deadline is equal to 10 hours.
- 10 tasks was sent to 10 hosts. But 9 results was returned after 1 hour.
- After 10 hours new task was created. The task has been queued.
- After 12 hours the task passed the queue.
- After 1 hour the task has been finished.
- **Summary for generation**: 23 hours insted 1 hour.

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