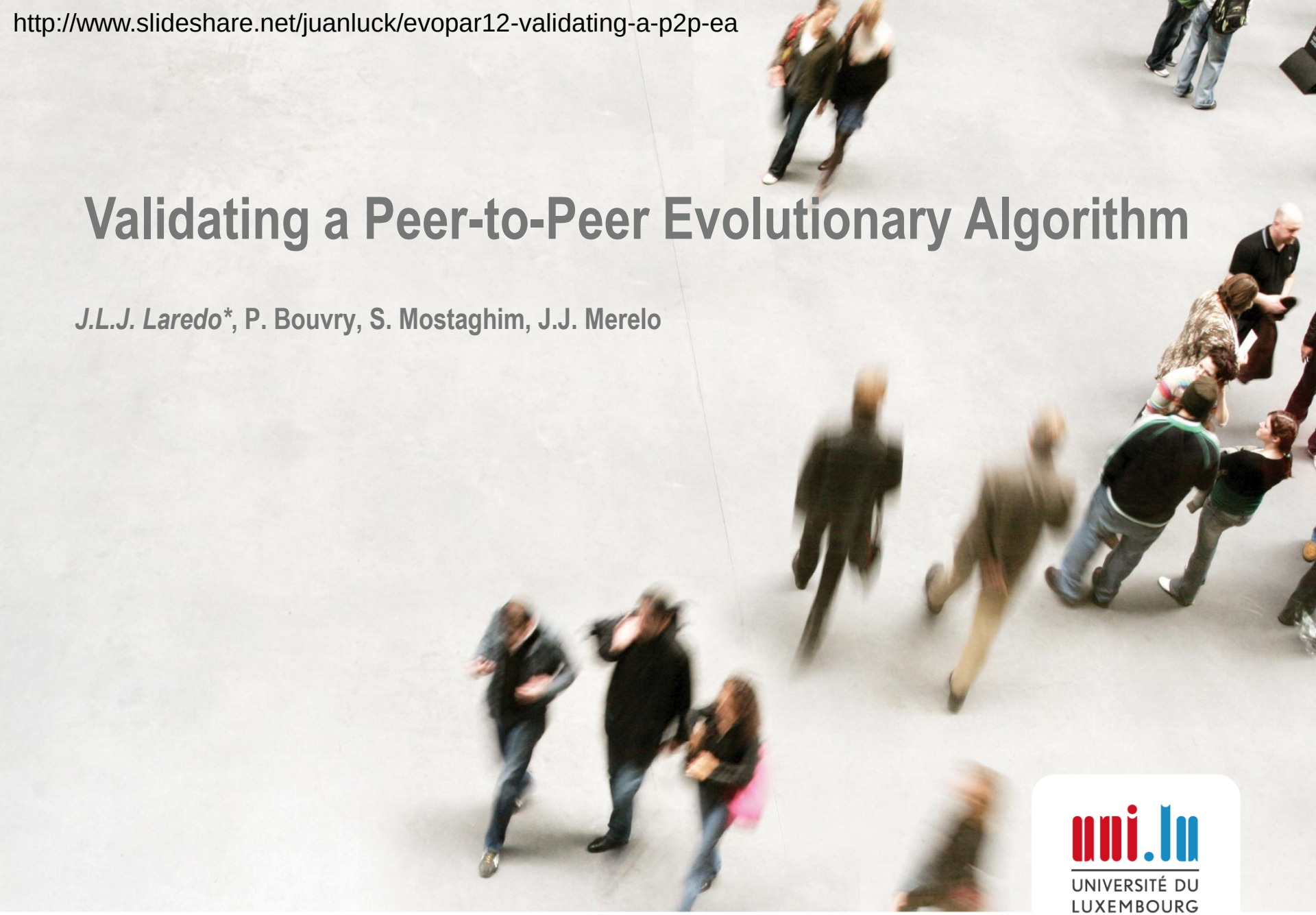
http://www.slideshare.net/juanluck/evopar12-validating-a-p2p-ea

Validating a Peer-to-Peer Evolutionary Algorithm

*J.L.J. Laredo**, P. Bouvry, S. Mostaghim, J.J. Merelo



UNIVERSITÉ DU LUXEMBOURG

evo* 2012

EvoPAR 2012,
Wednesday 11th April, 2012
Malaga, Spain

P2P Optimization

What?

Parallelization of time-consuming meta-heuristics in P2P systems:

- Branch&Bound
- PSO
- EA
- …

Why?

✓ Massive Scalability

✓ Shorten convergence time

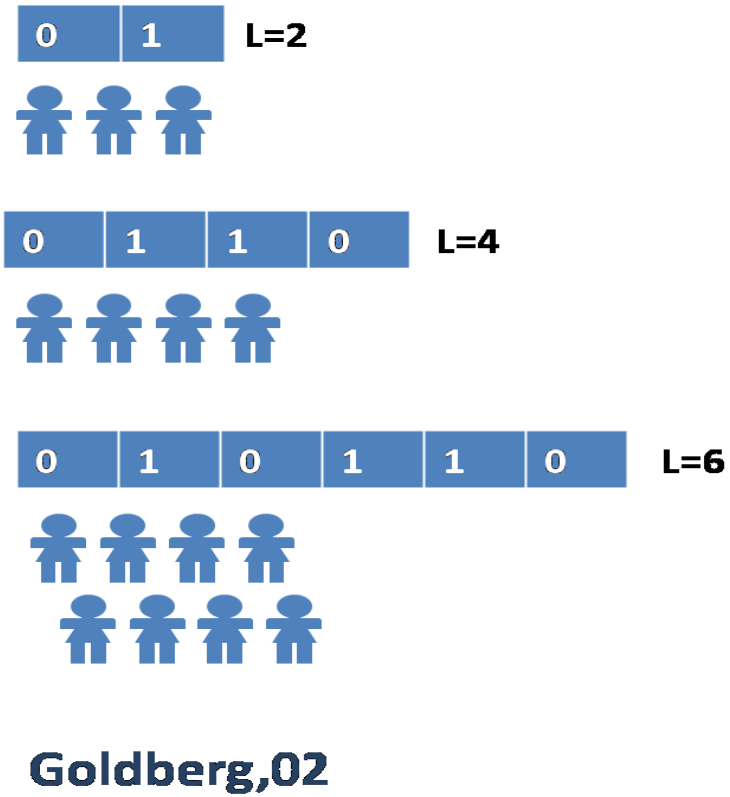
BUT!!

✗ So far… simulation based experimentation

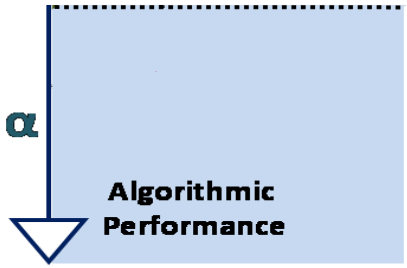
Outline

- Introduction
  - The Curse of Dimensionality
  - Parallel vs. Sequential
- P2P EC Model
  - Viability
- Validation in a real-environment
  - Simulations
  - Algorithmic results
  - Massive scalability
- Conclusions

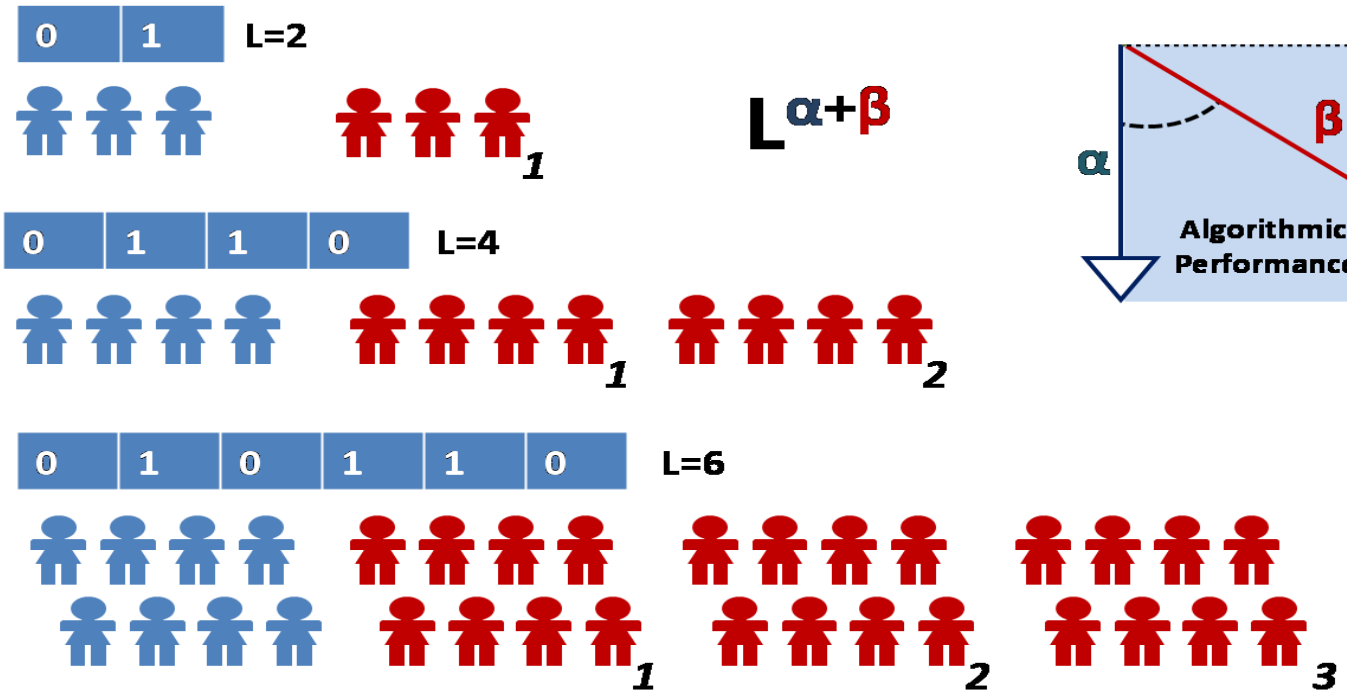
The Curse of Dimensionality



L^{α}



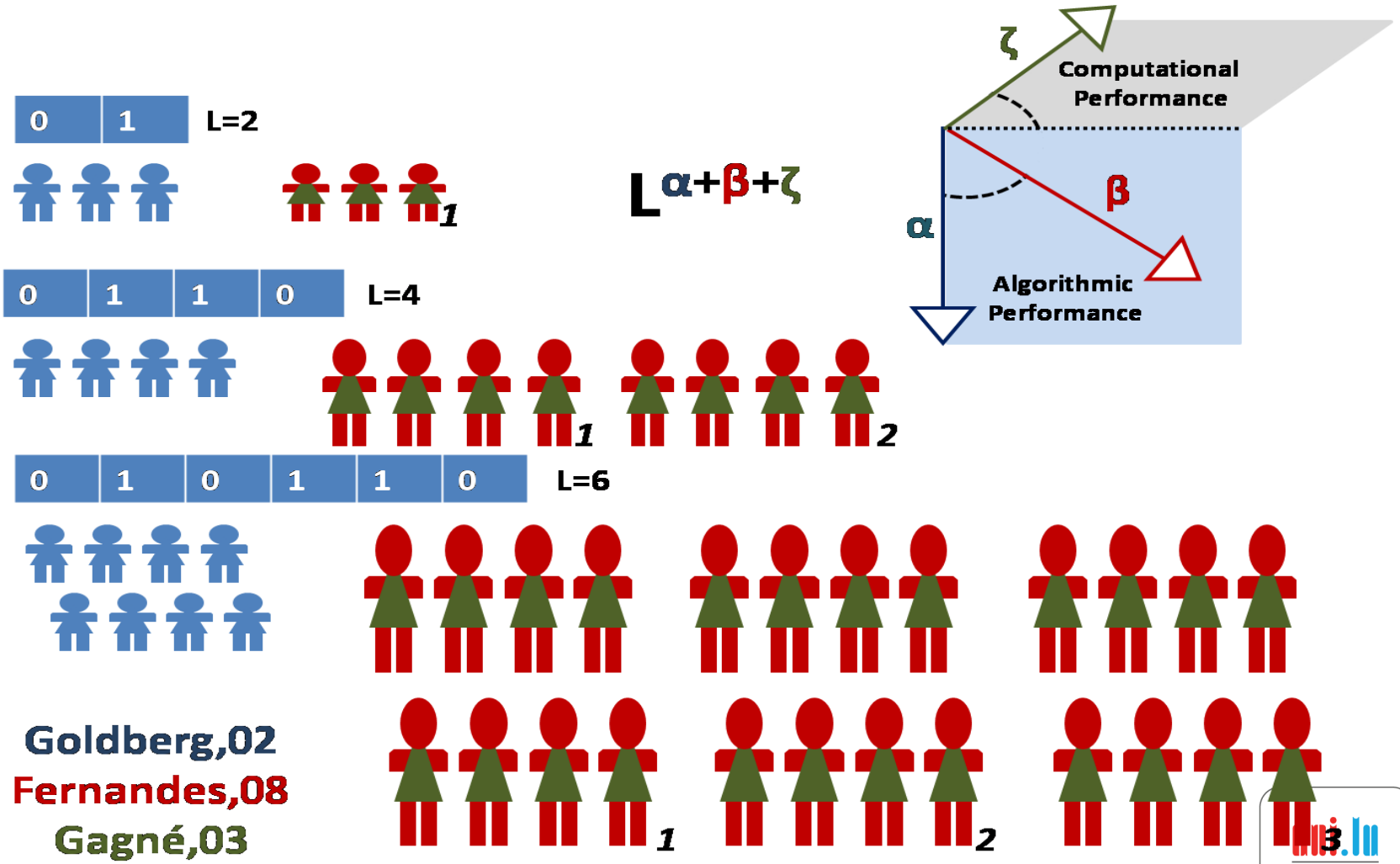
The Curse of Dimensionality



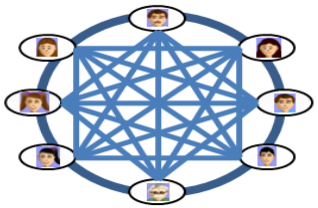
Goldberg,02

Fernandes,08

The Curse of Dimensionality

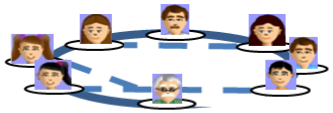


Parallel vs. Sequential



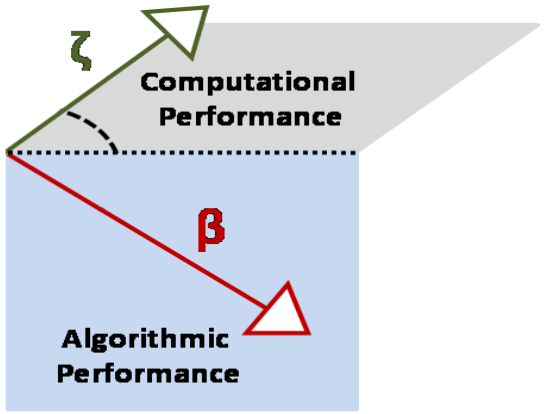
Sequential

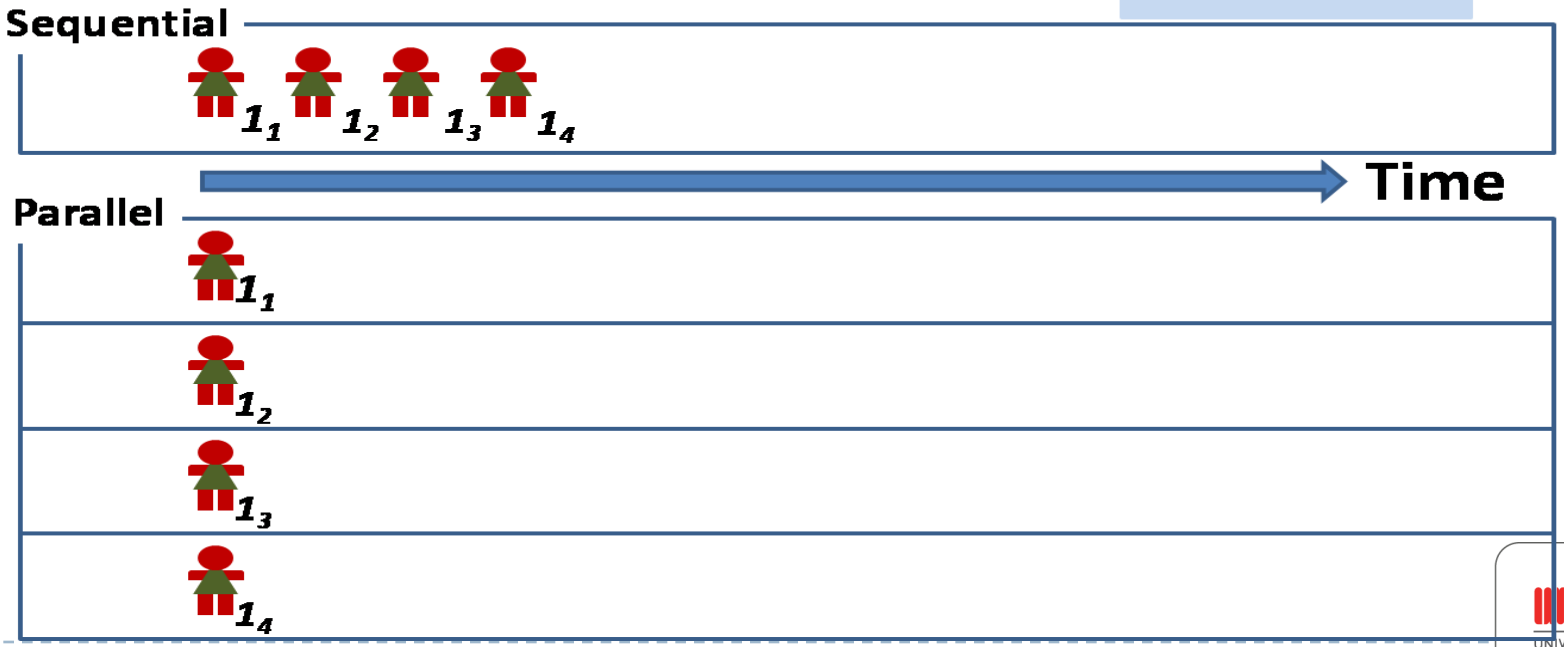
$L^{\alpha+\beta+\zeta}$



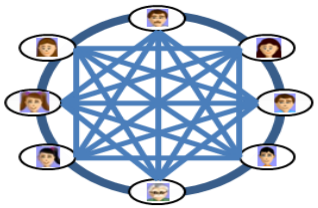
Parallel

$L^{\beta+\zeta}$



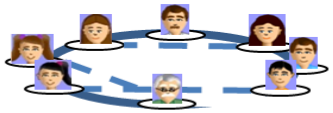


Parallel vs. Sequential



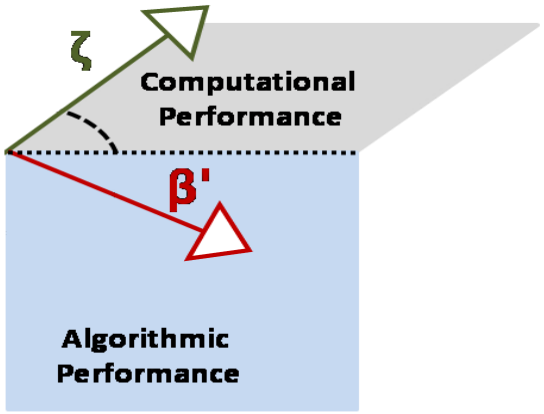
Sequential

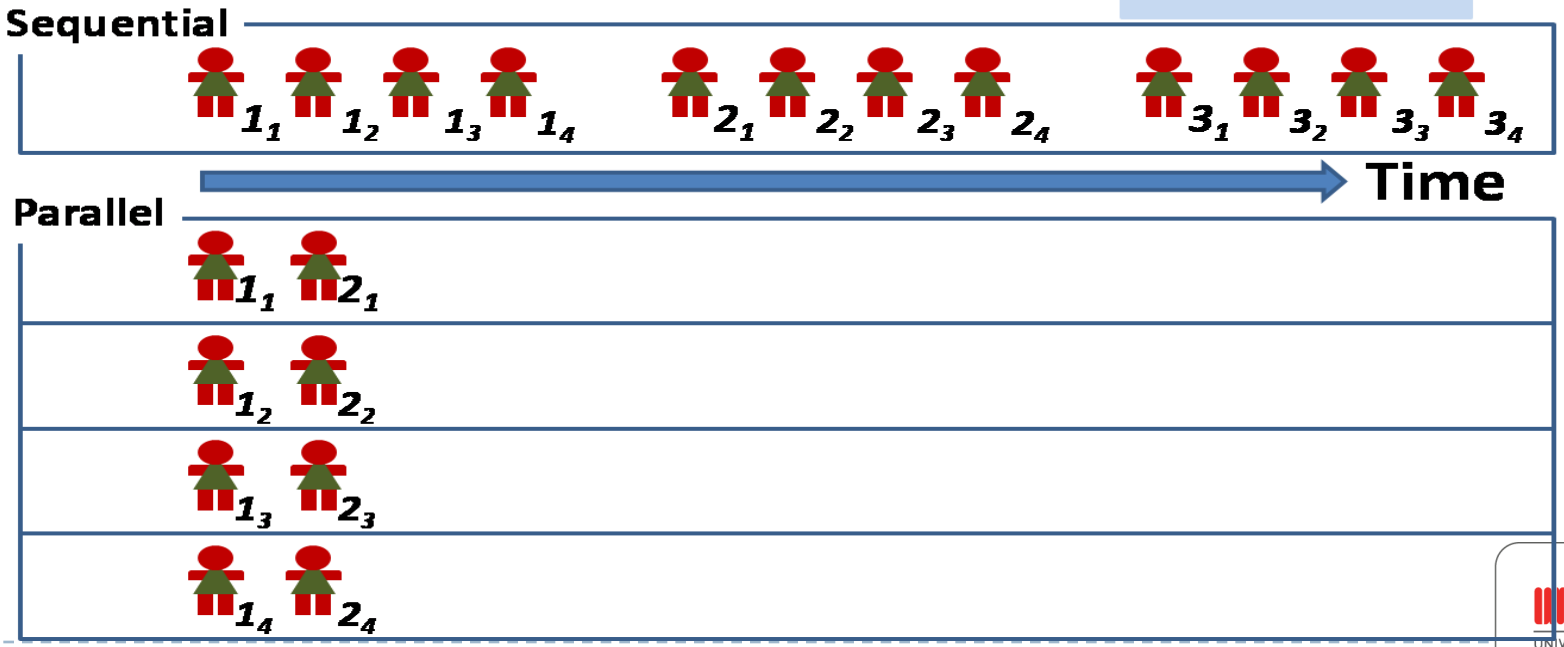
$L^{\alpha+\beta+\zeta}$



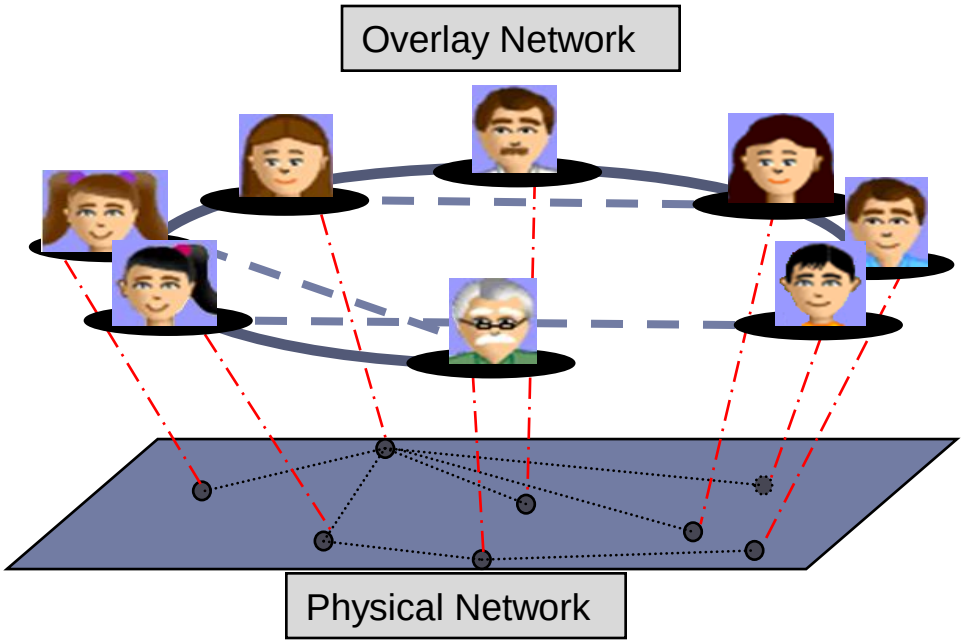
Parallel

$L^{\beta'+\zeta}$



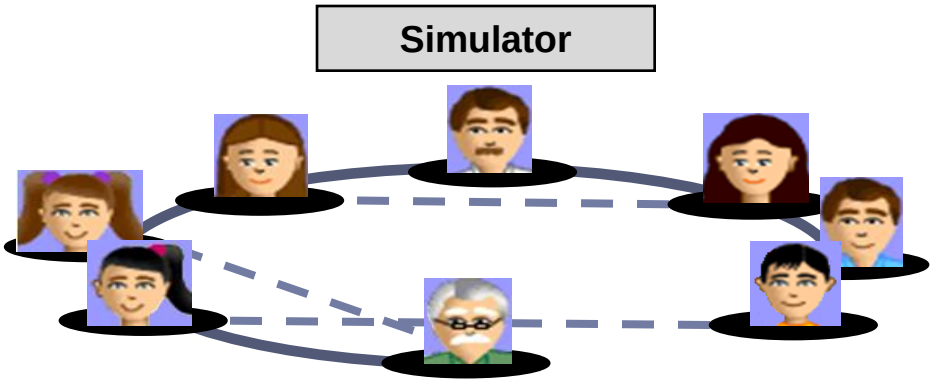


Evolvable Agent

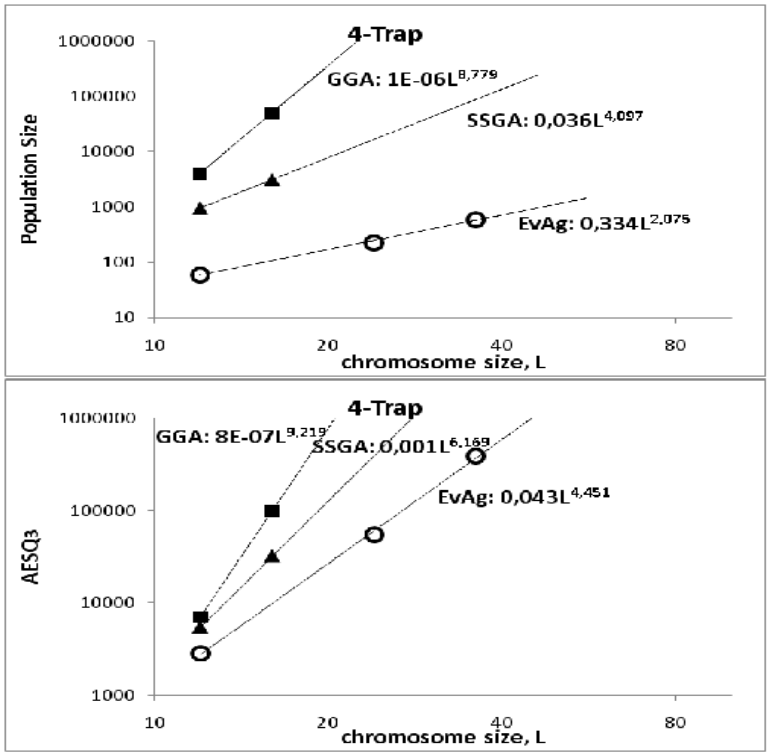


- Agent-based approach
- Fine-grain parallelization
- Spatially structured EA
- Local Selection

Viability

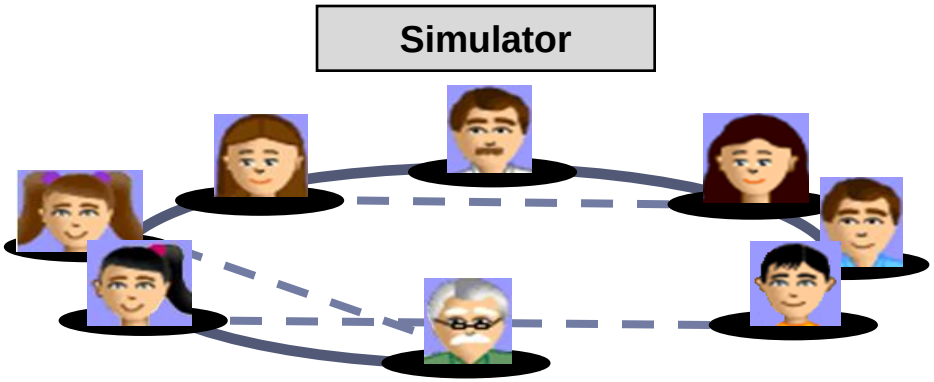


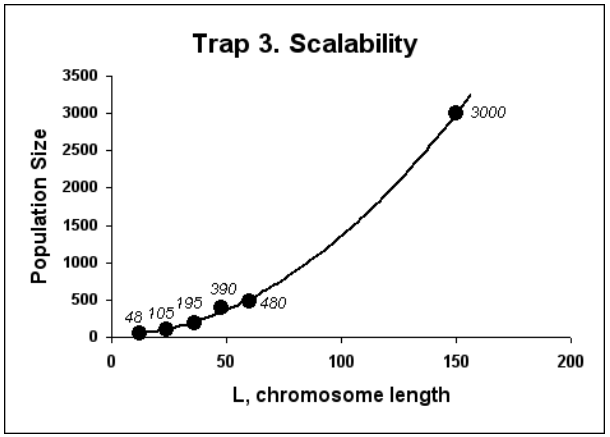
Simulator conducted experimentation!!!



J.L.J. Laredo, A.E. Eiben, M. van Steen, J. J. Merelo.
EvAg: a scalable peer-to-peer evolutionary algorithm.
Genetic Programming and Evolvable Machines , 11(2):227-246. 2010.

Simulations



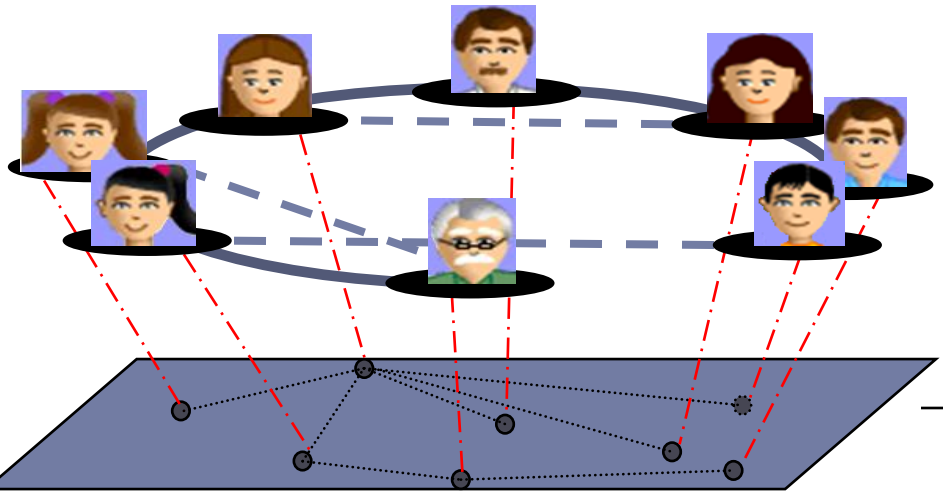


Simulator conducted experimentation!!!

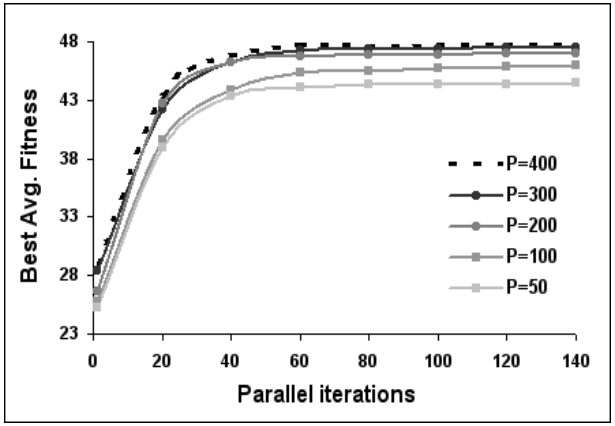
Instance	P	Avg. N. Gen	Max. N. Gen.
L=48	390	85	140
L=150	3000	173	250

Algorithmic Results

https://forja.rediris.es/svn/geneura/drmWrapper



http://www.hlrs.de/systems/platforms/nec-nehalem-cluster



Instance	P	Avg. N. Gen	Max. N. Gen.
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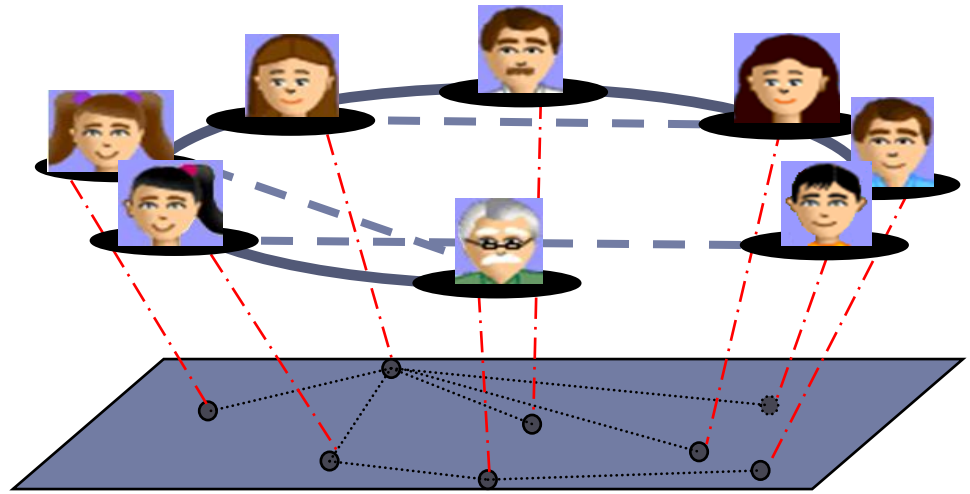
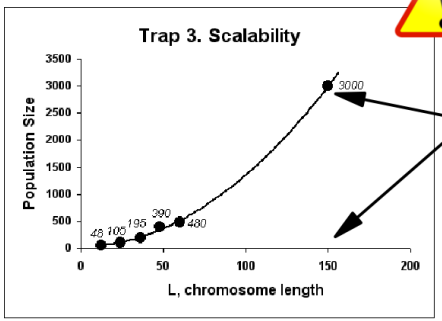
Massive Scalability

https://forja.rediris.es/svn/geneura/drmWrapper



http://www.hlrs.de/systems/platforms/nec-nehalem-cluster



L=150

→

P=3000, SR=0.98

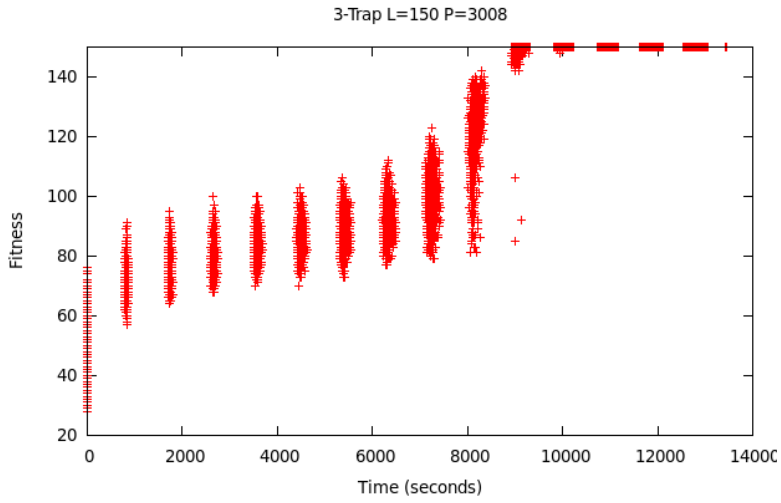
Assumption:

3000 ind. x

300 eval. x

16 sec.

~ ***167*** days of seq. computation



Conclusions

- 1st large parallel P2P EA experiment
  - 188 computers x 8 cores x 2 threads = 3008 agents

  - Seamless scalability
- Conducted experimentation meets simulations

	Generations	Pop. Size	S.R.
Simulator	85	390	0.98
Parallel	40-80	400	0.8

- Massive scalability: $Speed\_up = \frac{T_{seq}}{T_{par}} \approx 1000$

Thanks for your attention!!