



Methodology for the efficient execution of HPC applications in multi-core environments

Emilio Luque

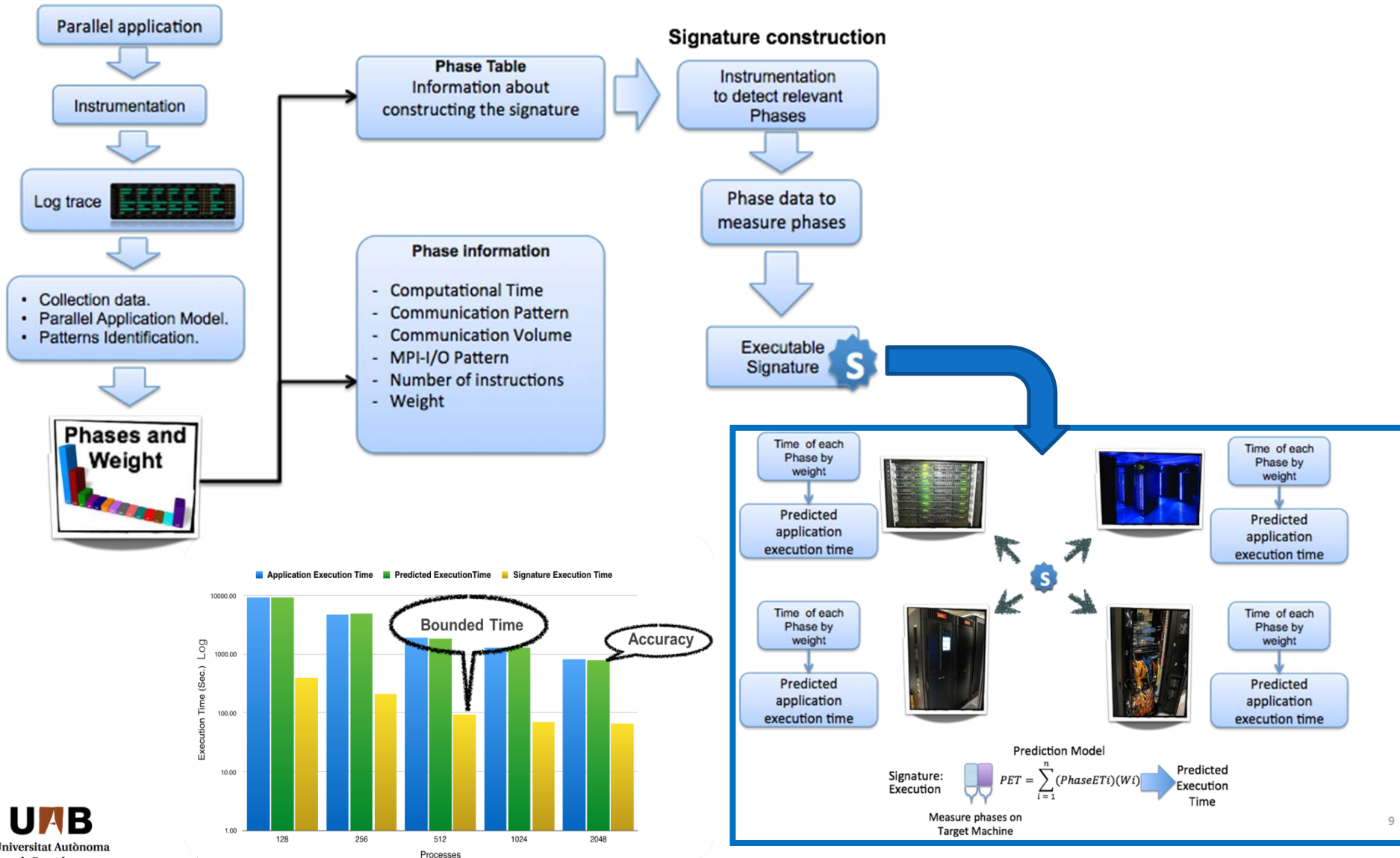
High Performance Computing for Efficient
Applications and Simulation (HPC4EAS)

The logo for CAPAP-H, featuring the text 'CAPAP-H' in a stylized font with a blue dot above the 'A'.

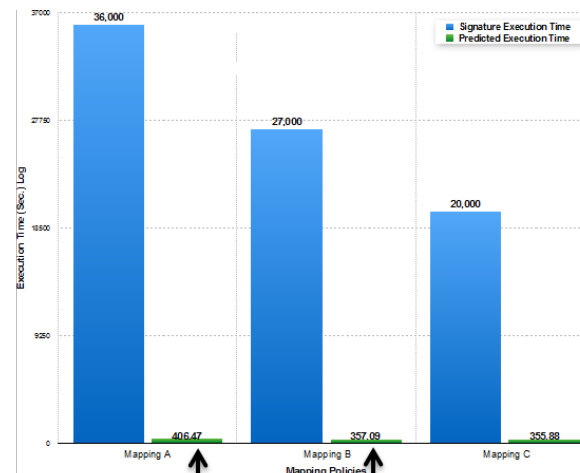
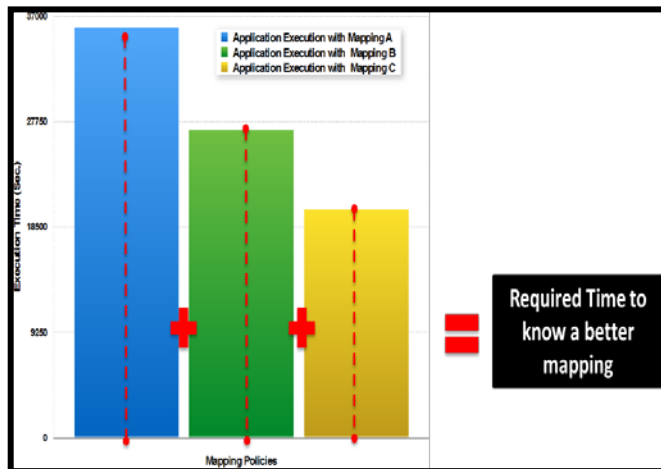
"VIII Seminario de Invierno Red CAPAP-H.
30-31 de Enero 2017, Elche"

Red de Computación de Altas Prestaciones sobre Arquitecturas Paralelas Heterogéneas

PAS2P: Application analysis and Performance Prediction

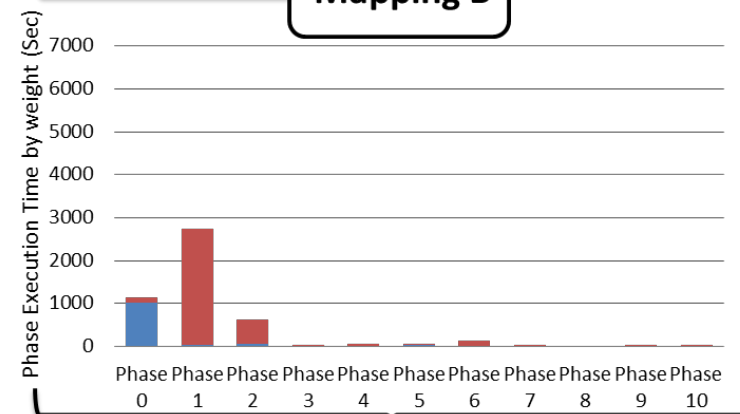
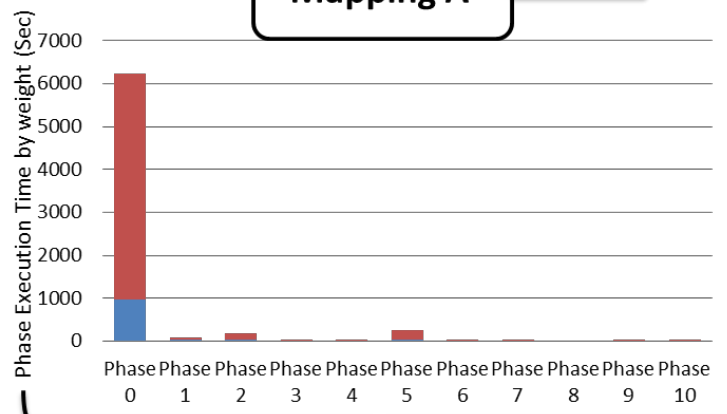


Mapping Policies effects on Application Execution Time



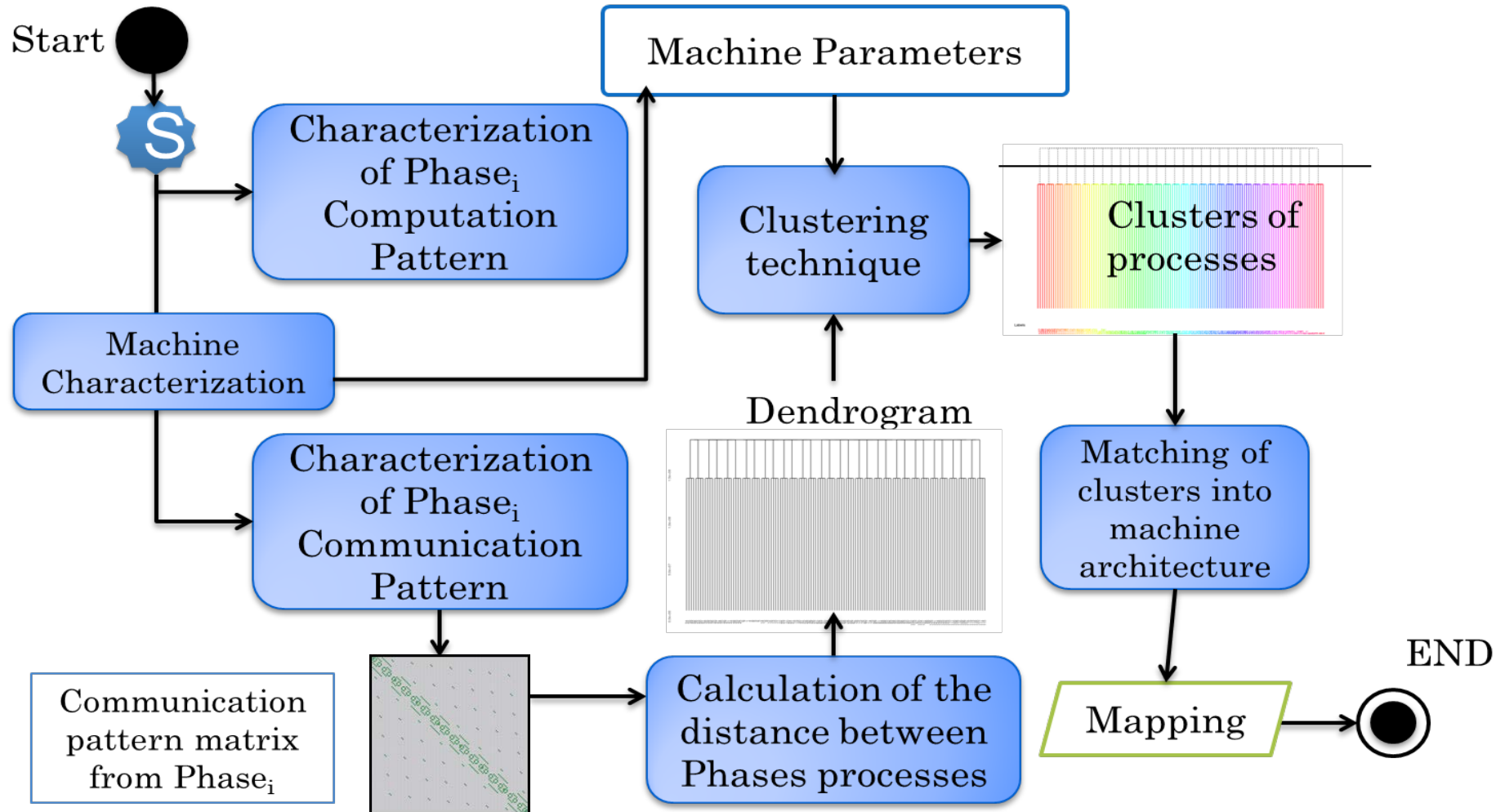
Mapping A

Mapping B



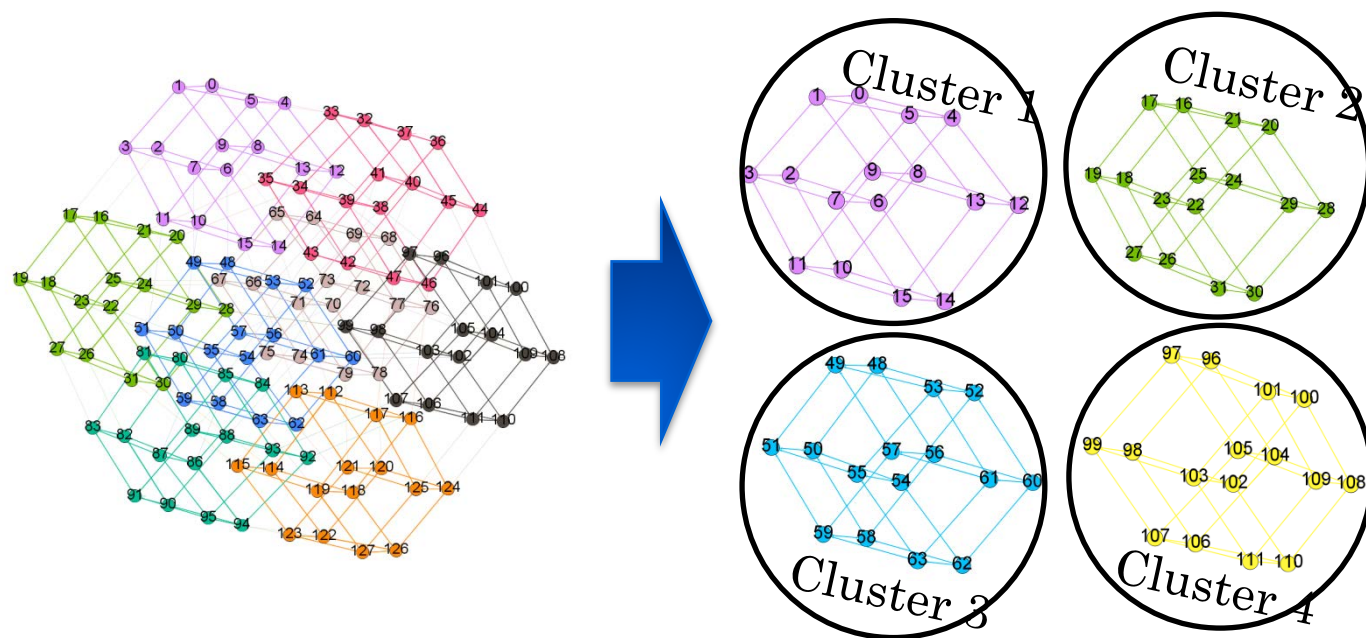
Objective and methodology

Objective: select better mapping policies, allowing to reduce the application execution time and improve its efficiency in the HPC system resources.

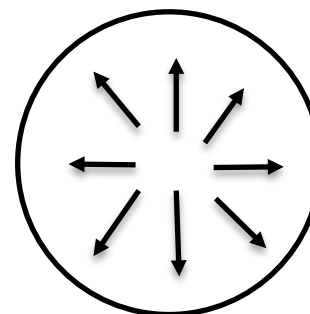
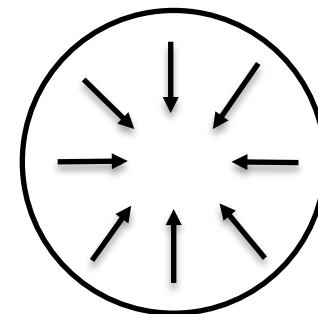


Clustering “forces”

Applying “Clustering” to the Application Signature



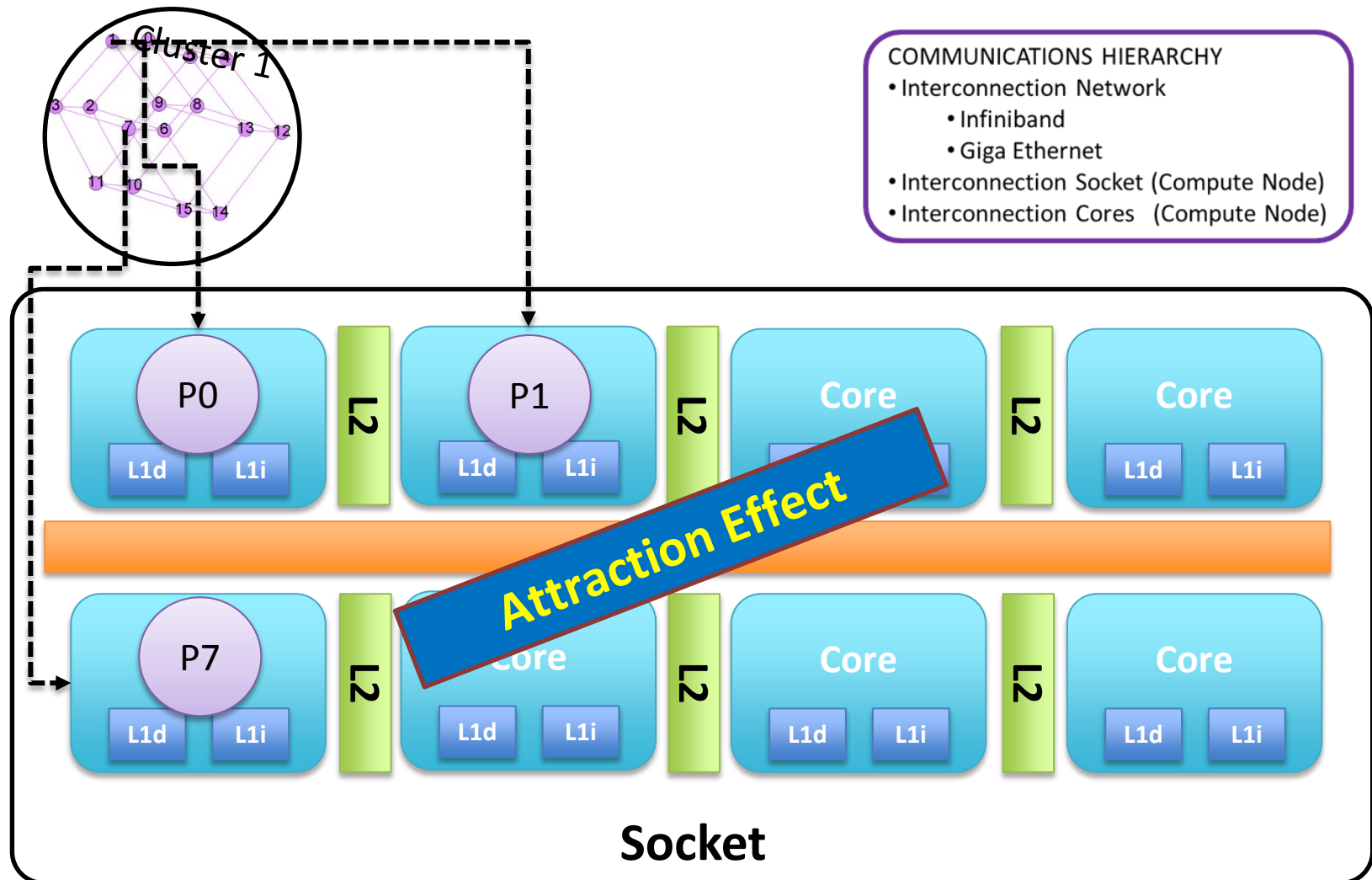
Comm.
Clustering



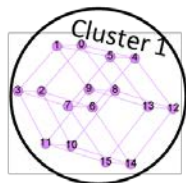
Mem.Sharing
Clustering

Attraction by communication
Repulsion by memory sharing

Communication Clustering (Attraction)

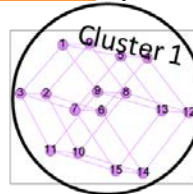
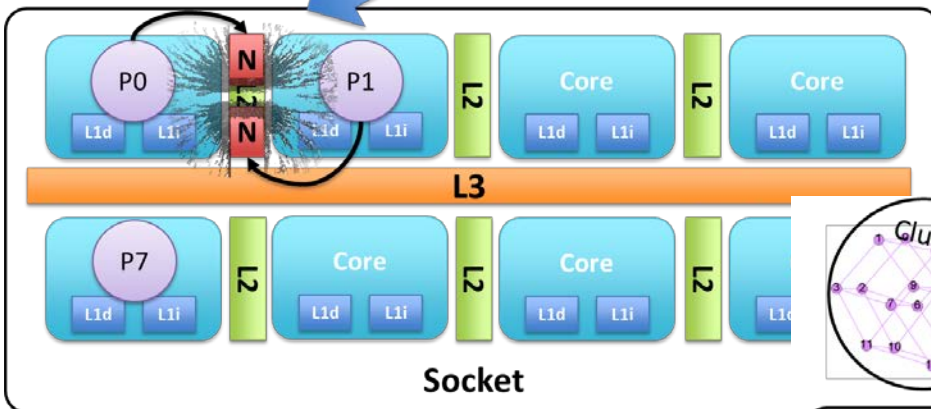


“Computation” Clustering (Repulsion)



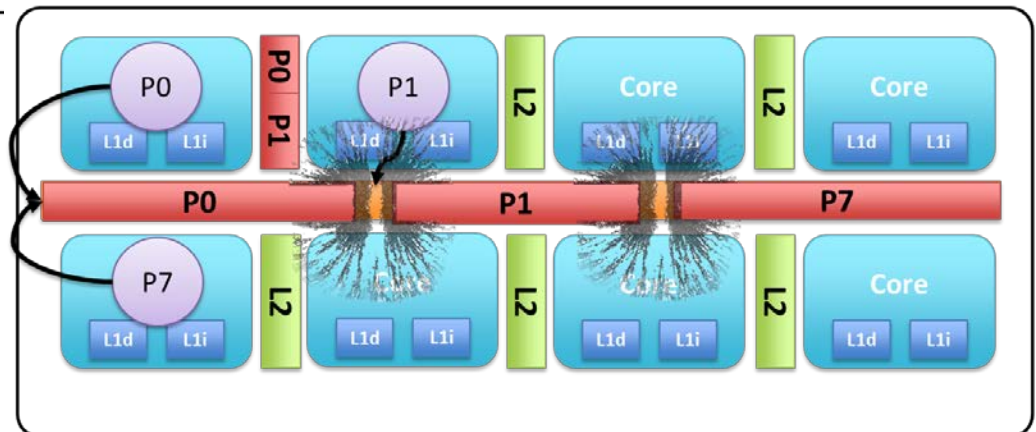
IF (P0 Data size + P1 Data size) > L2 CACHE SIZE

L2 cache misses increase



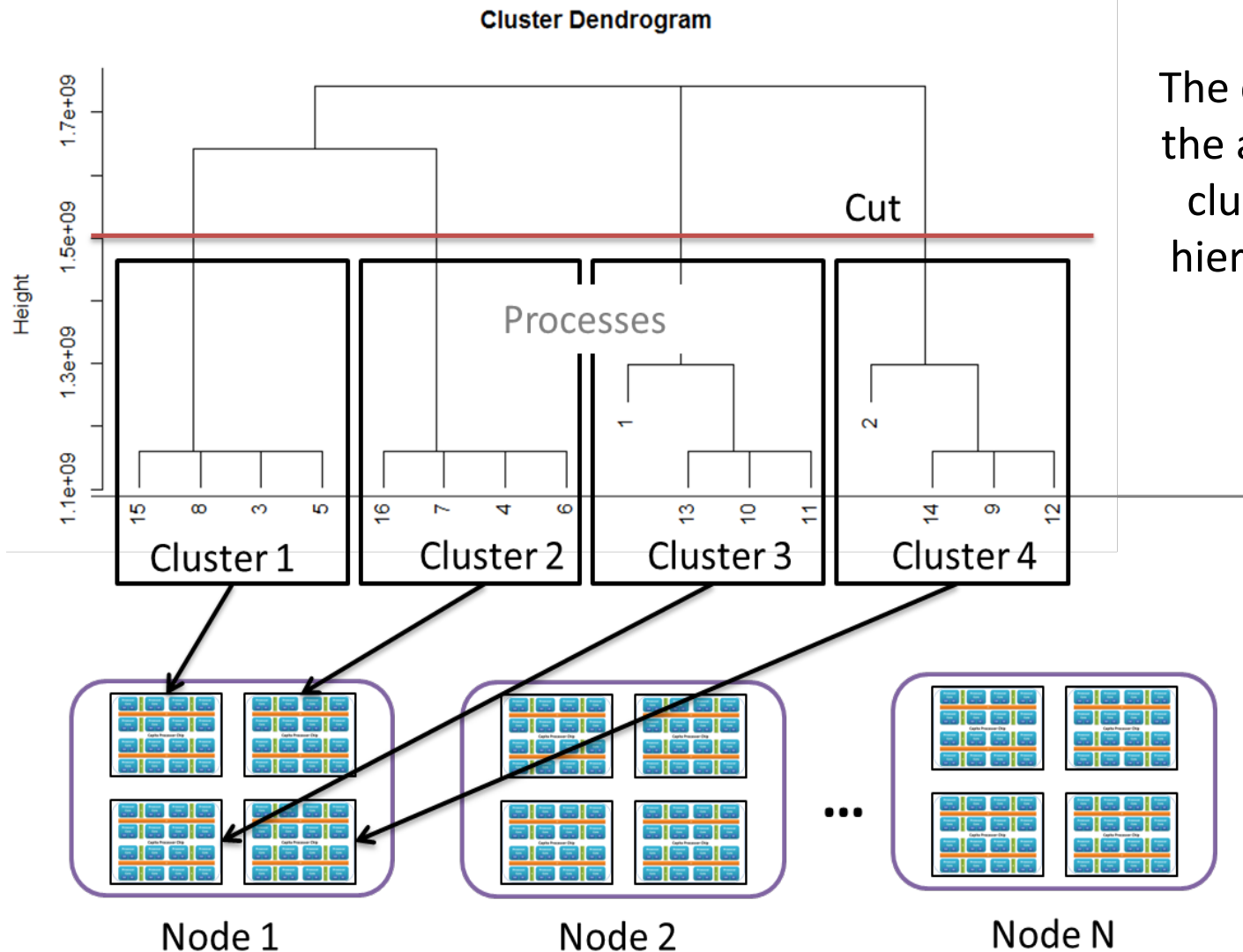
IF (P0 Data size + ... + P7 Data size) > L3 CACHE SIZE

L3 cache misses increase



Repulsion Effect

Matching clusters into machine architecture



The **dendrogram** shows the arrangement of the clusters produced by hierarchical clustering.

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<http://grupsderecerca.uab.cat/hpc4eas/>