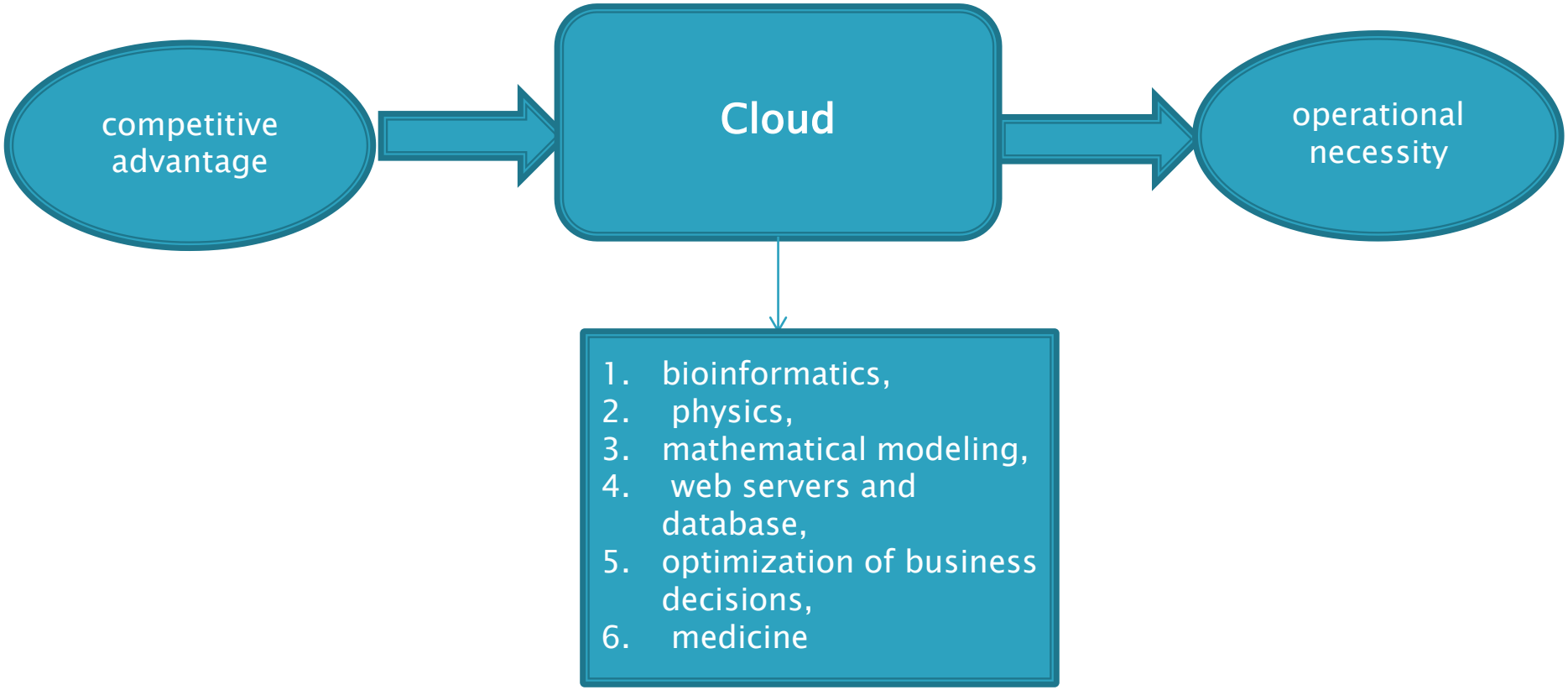
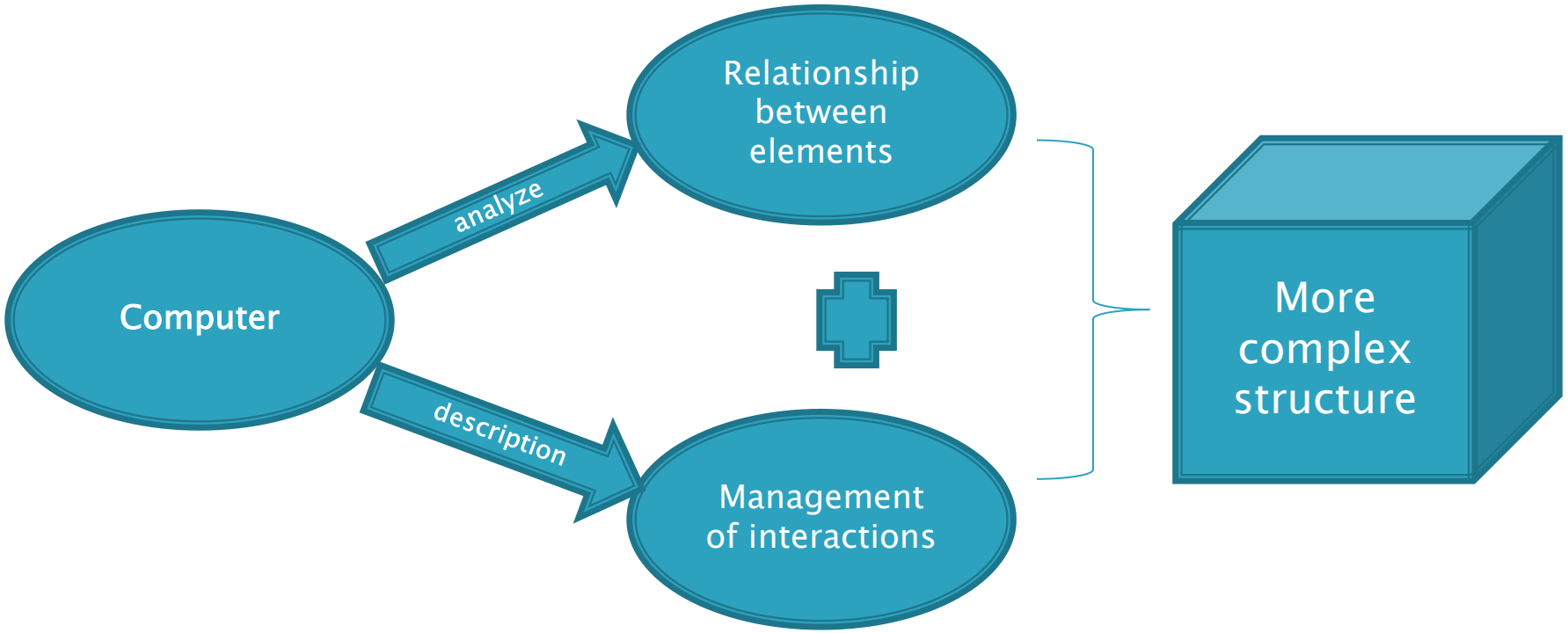
WORKFLOW PETRI NETS USED IN MODELING OF PARALLEL ARCHITECTURES

Inga Țițchiev
Institute of Mathematics and Computer Science

Essence of the problem



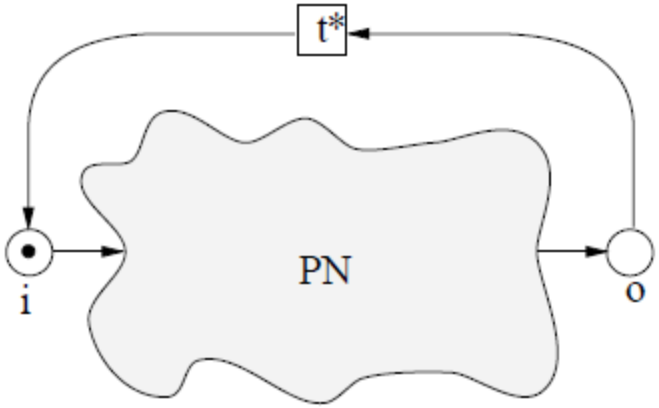

Relationship between elements
analyze
Computer
description
Management of interactions
More complex structure

Workflow Petri nets

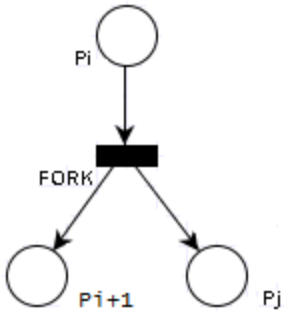
Definition *A Petri Net PN=(P,T,F) is a WF - net iff:*

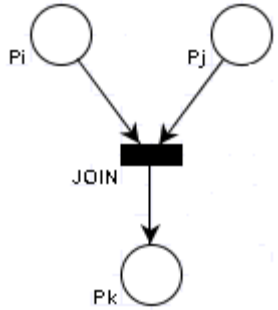
i PN has a source place i and a sink place o such that $\bullet i = \emptyset$ *and* $o\bullet = \emptyset$

ii If we add a new transition t^* *to PN such that* $\bullet t^* = \{o\}$ *and* $t^*\bullet = \{i\}$, *then the resulted Petri net is strongly connected.*

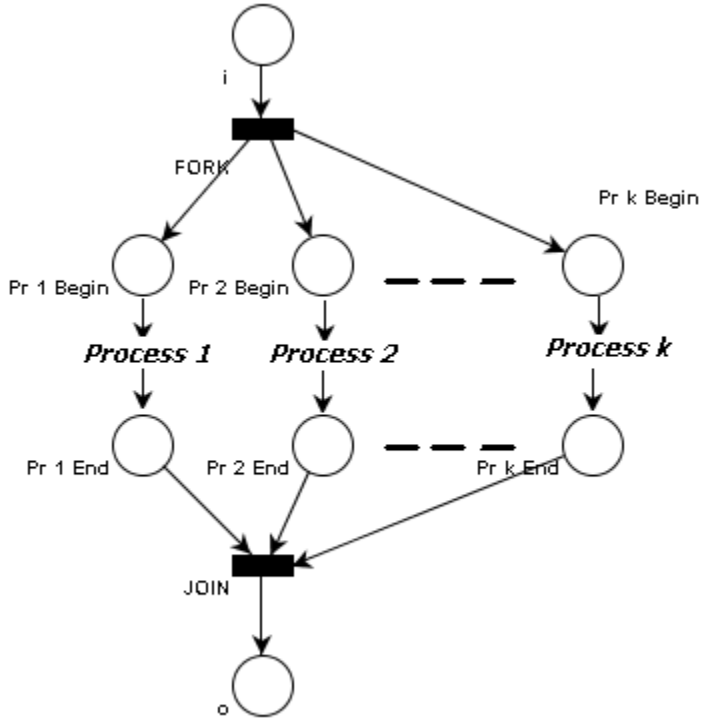


Fork and Join operations

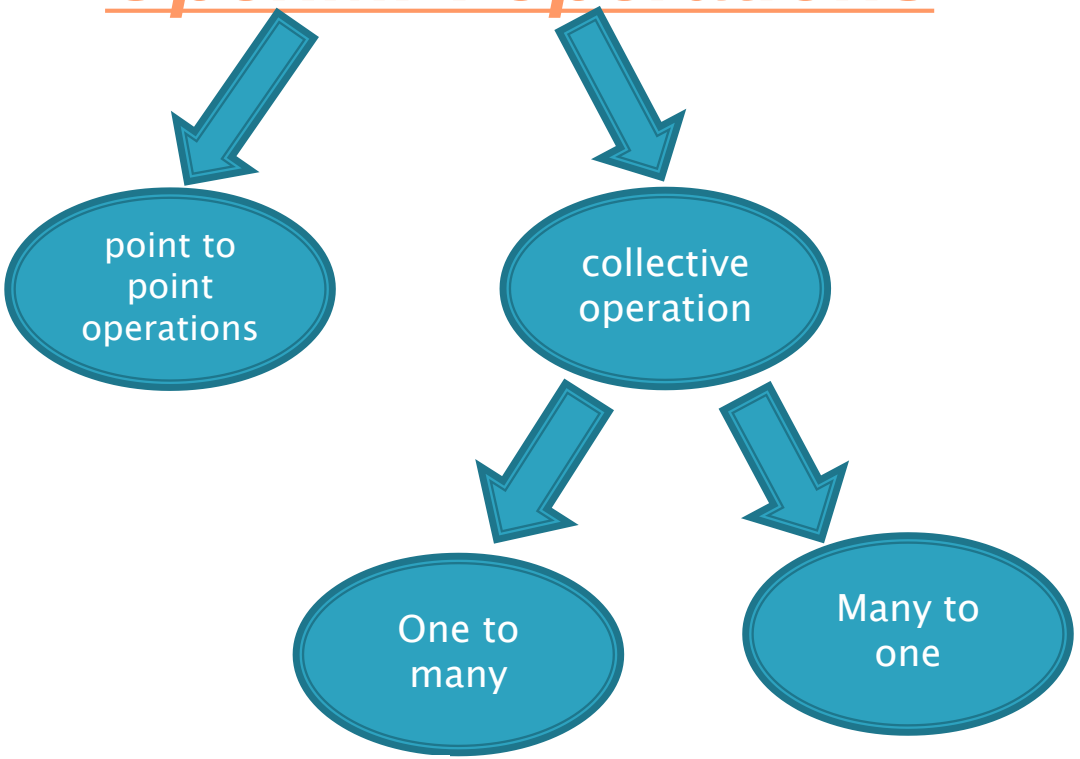


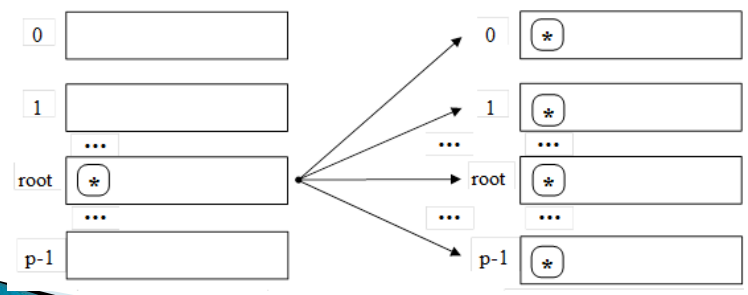


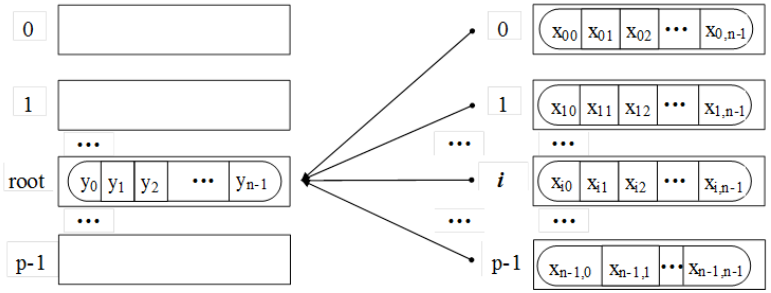
Parallel execution of k processes



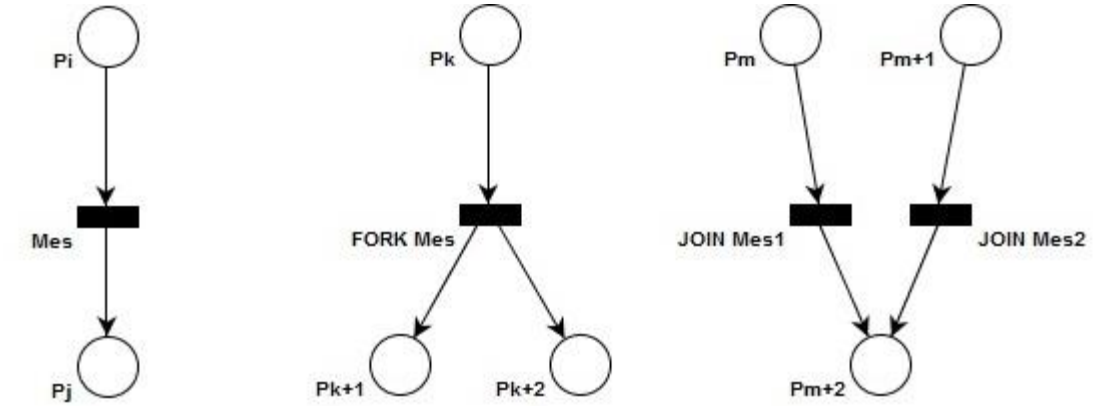
OpenMPI operations







OpenMPI operations by means of workflow Petri Nets



a) point to point operations

b) collective operations

TECHNICAL EQUIPMENT

To run applications with parallel technologies at the Institute of Mathematics and Computer Science the 48 core IMI-RENAM cluster is used. At this cluster on virtualization platforms next Home Training Infrastructures were deployed:

- MS Windows Compute Cluster 2003, 4 Nodes, 12 Cores (CPUs: QuadCore Intel Xeon E5335 2,0 GHz, QuadCore Intel Xeon E5310 1,6 GHz) to run different tasks serial, parallel, parametric sweep and task flow;
- Grid-Site: MD-02-IMI, 4 Worker Nodes, total 16 VCPU, 1 GB RAM per 1 VCPU – to test applications and prepare them for porting from local clusters to EGI GRID and to HP-SEE regional resources.;
- on Virtual Machine: 64 bit Scientific Linux 6.3; Intel(R) Parallel Studio XE 2011 (4 cores, 4 Gb RAM) – for compiling and debugging of applications.

Conclusion

- it was shown that workflow Petri nets is a convenient formal method for modeling information flow. Thus, it was shown how workflow Petri nets have been used for representation of parallel processes in order to better understand these processes. On the local cluster the applications can be tested and prepared for execution on more productive resources.