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Formal Approach to Dynamic SoS Design

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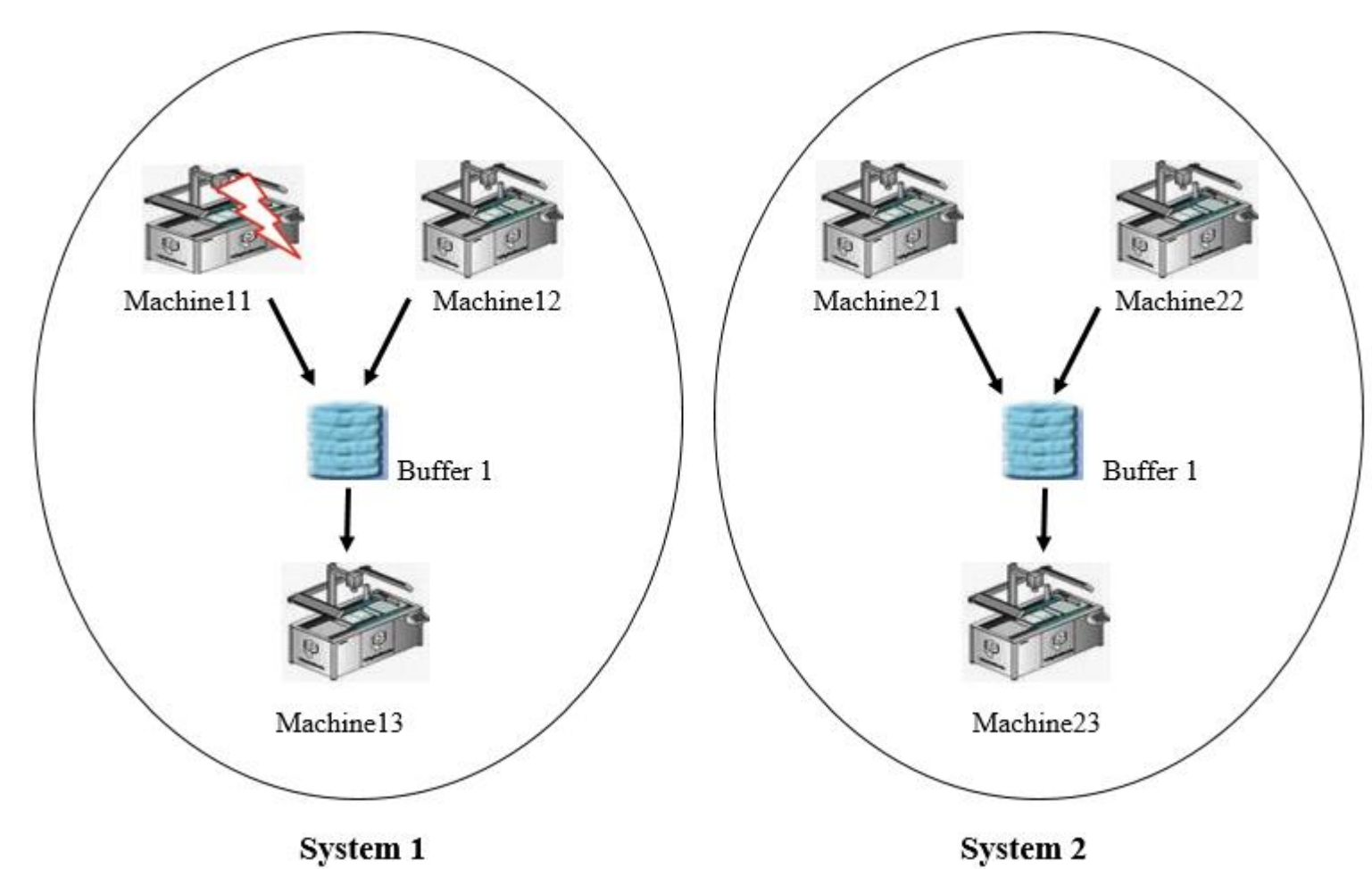
Introduction

A hierarchical framework is proposed for designing suitable switching control of dynamic System-of-Systems by using High Level Petri Nets and a multi-model approach.

Scientific Framework

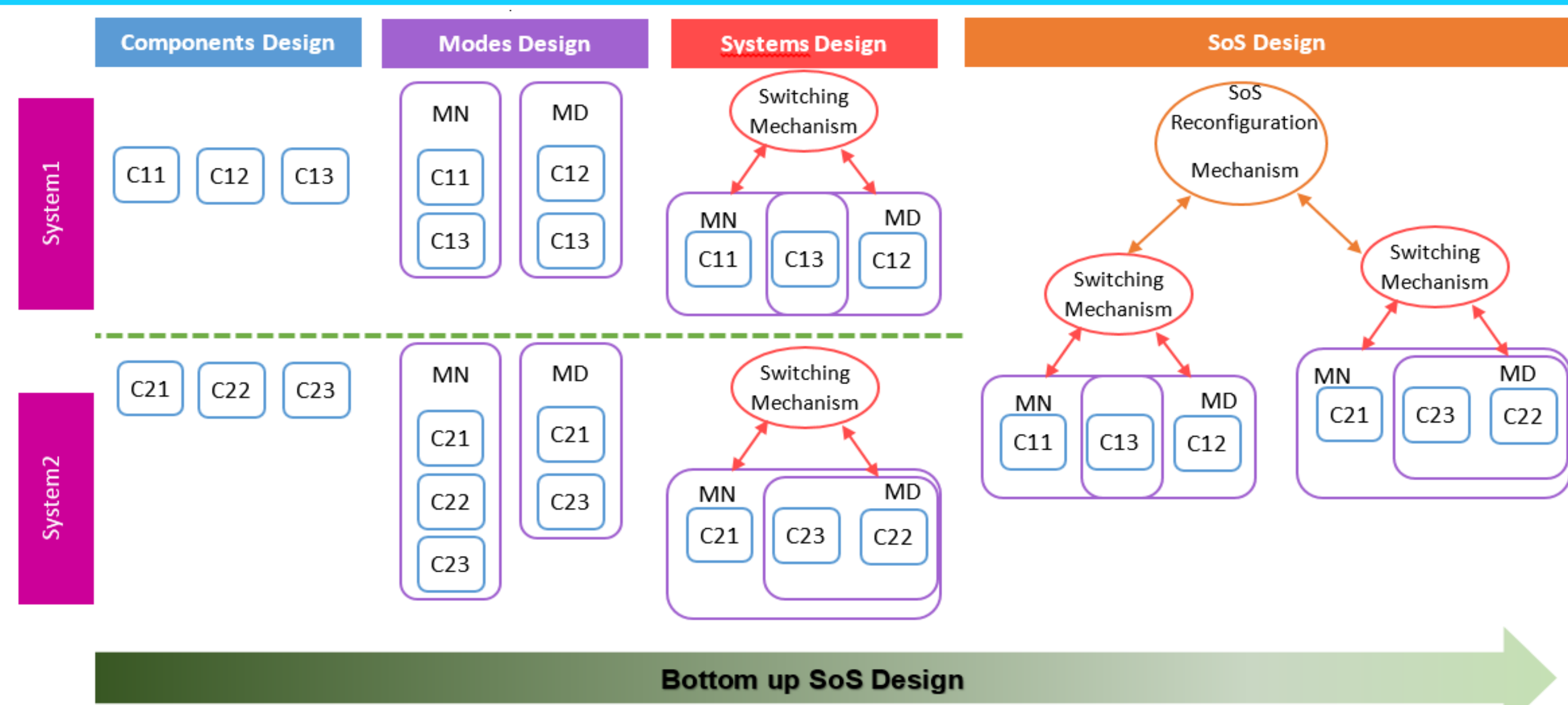
SoS, Discrete-Event System, HLPN, Operating modes, Control design, Reconfiguration, Supervisory control theory

Hierarchical SoS Design



Case Study

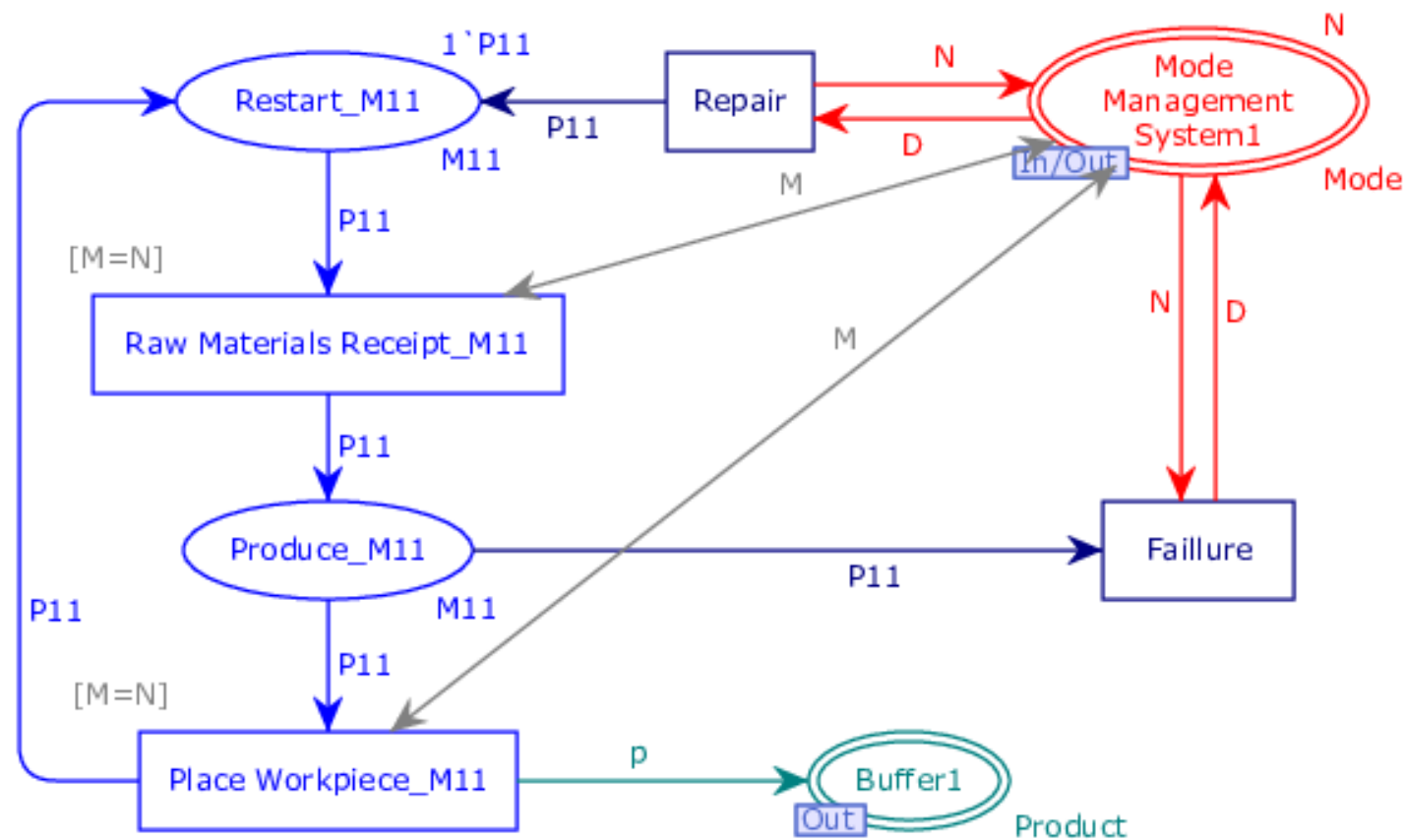
Design Steps



Bottom up SoS Design

1- Components Design

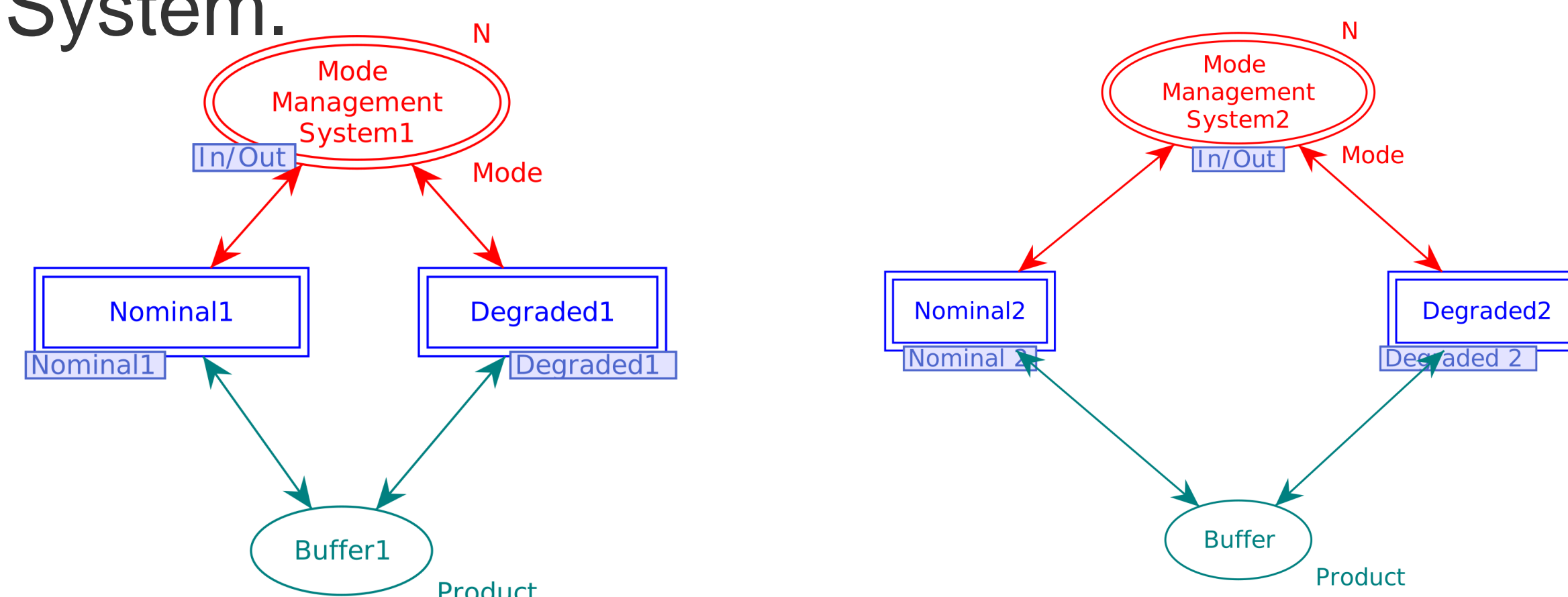
- Allows for designing each component separately.



3- Systems Design

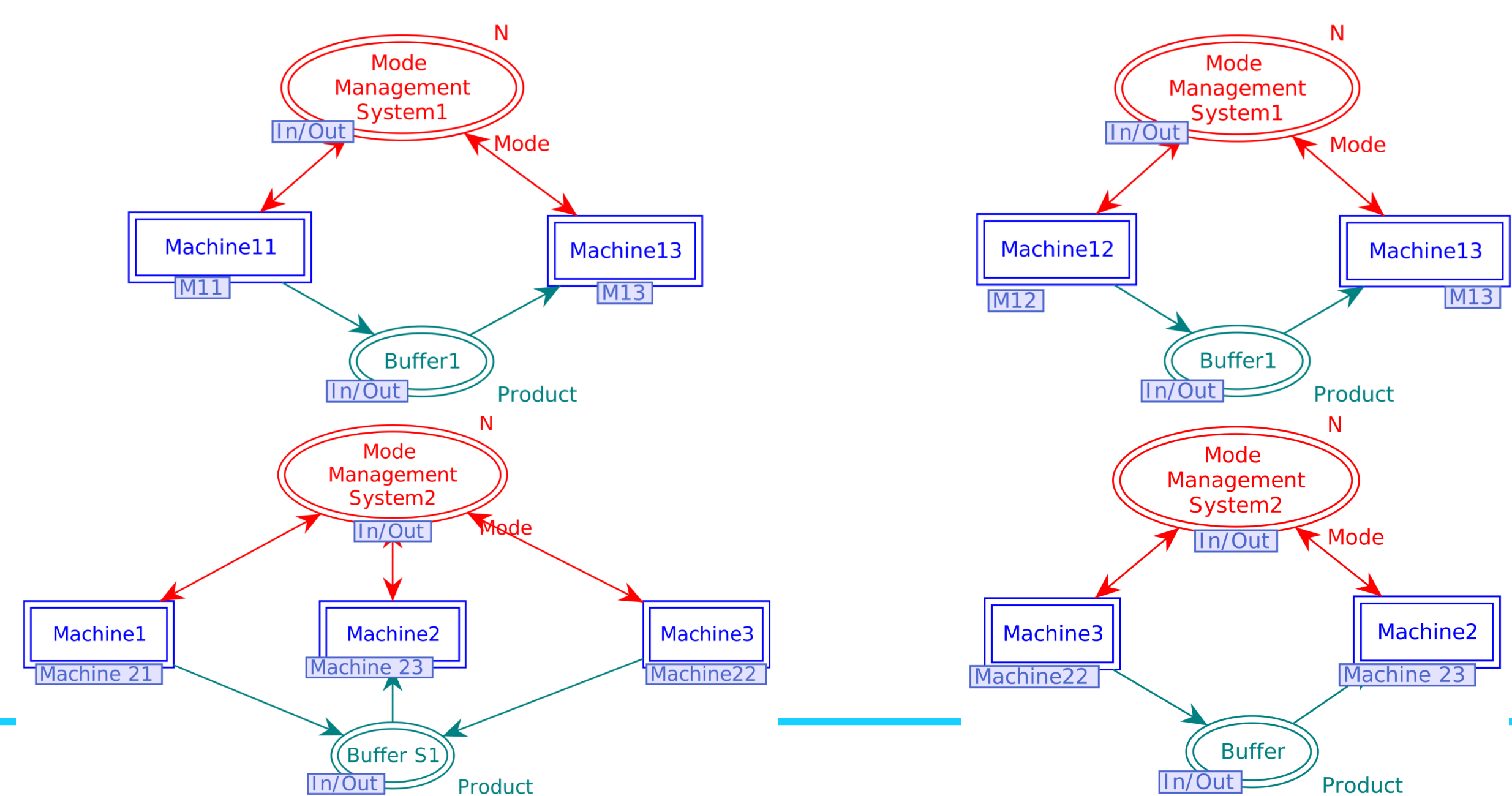
Focuses on the design of each system with its actions of reconfiguration:

- Modeling as a top layer of its mode models.
- Common components are not duplicated.
- Integration of a switching mechanism.
- A pseudo-algorithm is provided to describe the necessary steps to create a HCPN of each System.



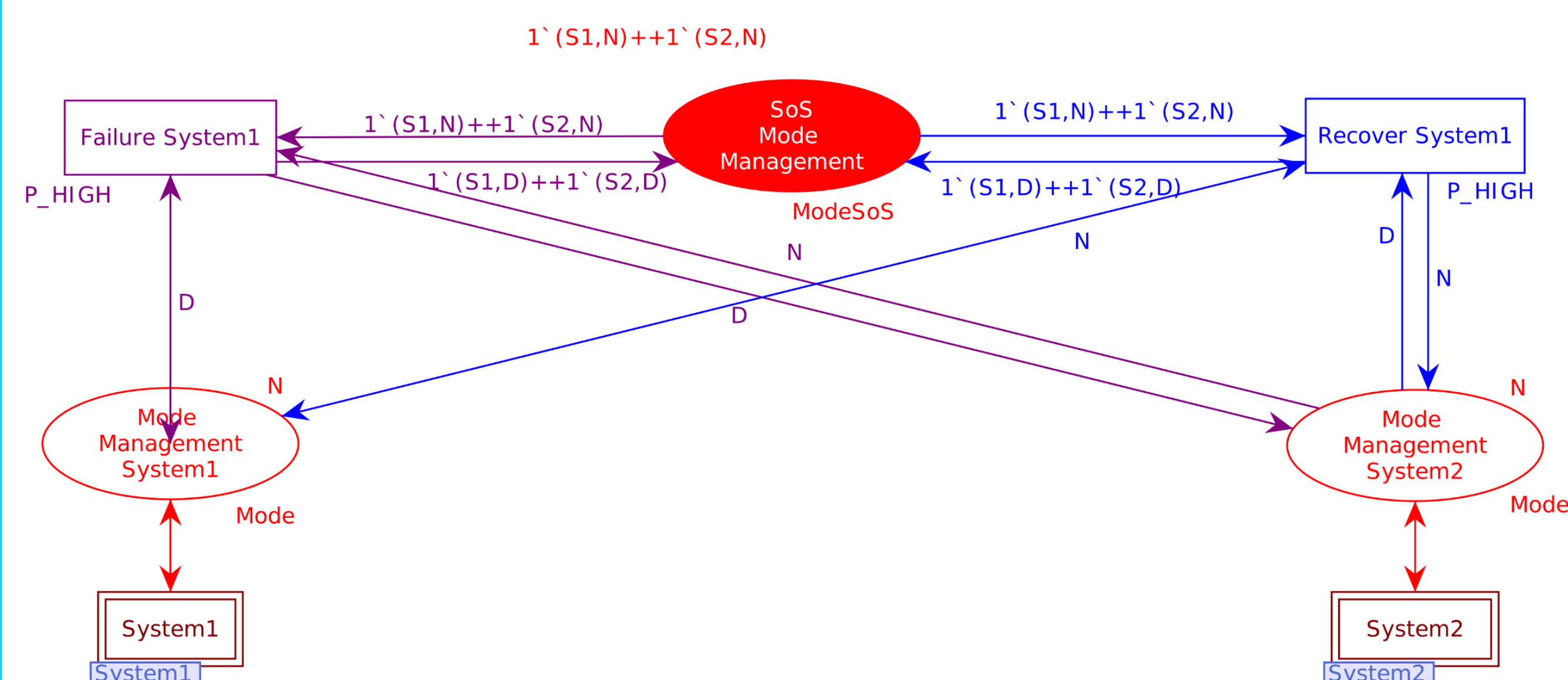
2- Modes Design

- Consists in designing the upper layer in which dependencies between the system proposed are modeled following requests for reconfiguration and in according to the SoS specifications.
- A pseudo-algorithm is provided also.



4- SoS Design

- Consists in building each mode independently from others a top layer to its component models.
- A pseudo-algorithm is provided to create mode models.



Conclusion

A hierarchical framework using HLPN and allowing to design a dynamic SoS whose systems are proposed using multimodel approach. Problems of reconfigurations and managing of common components to multiple operating modes are also resolved.