Congestion-aware Task Migration Model for MPSoCs

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Goal: **Adapt the placement of tasks at runtime to reduce the congestion of the system**

Outline:

- **NoC and application model**
- **Congestion**

NoC Model

Simulation Environment:
Ptolemy II
From UC Berkeley

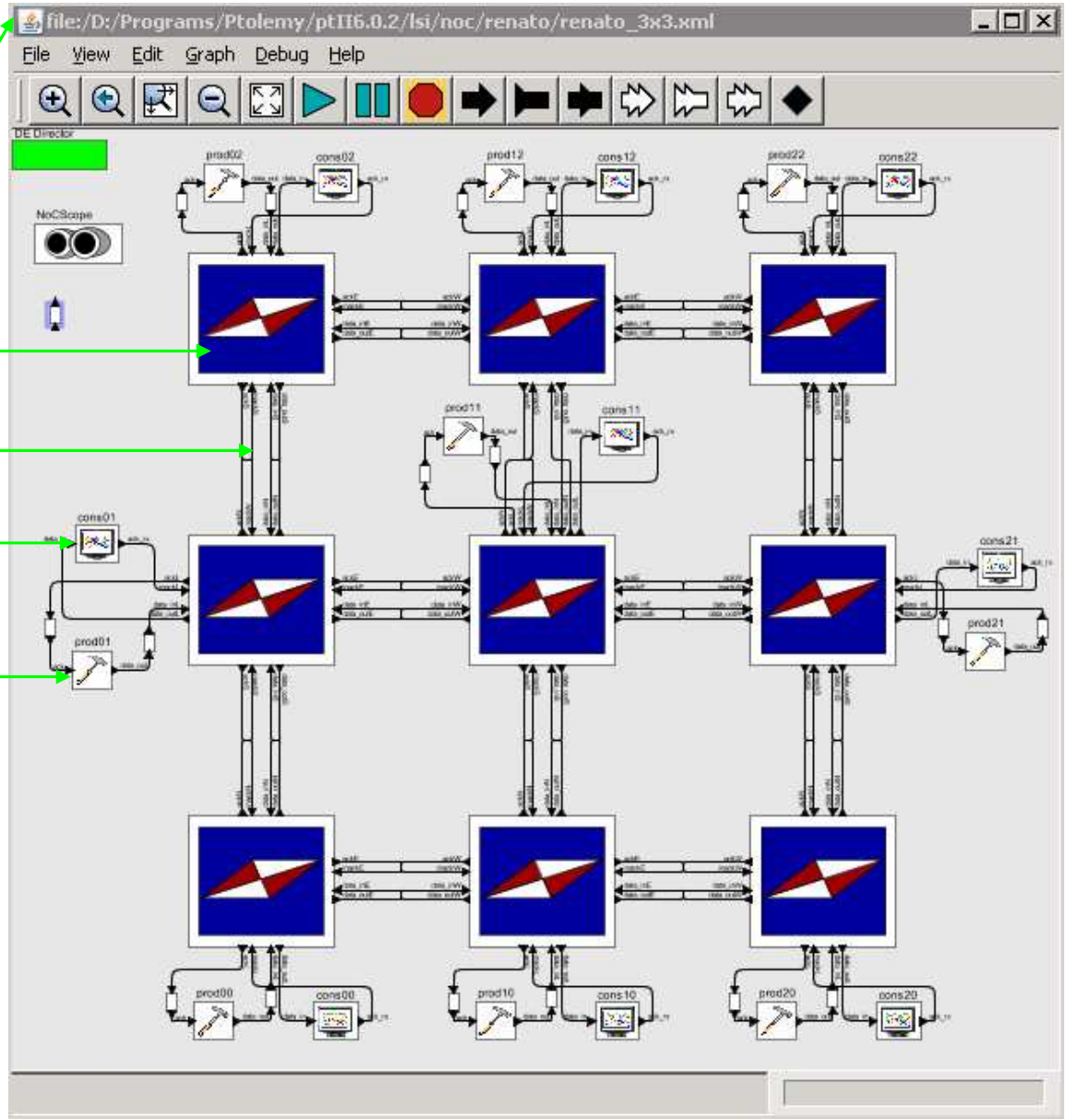
Router

Link

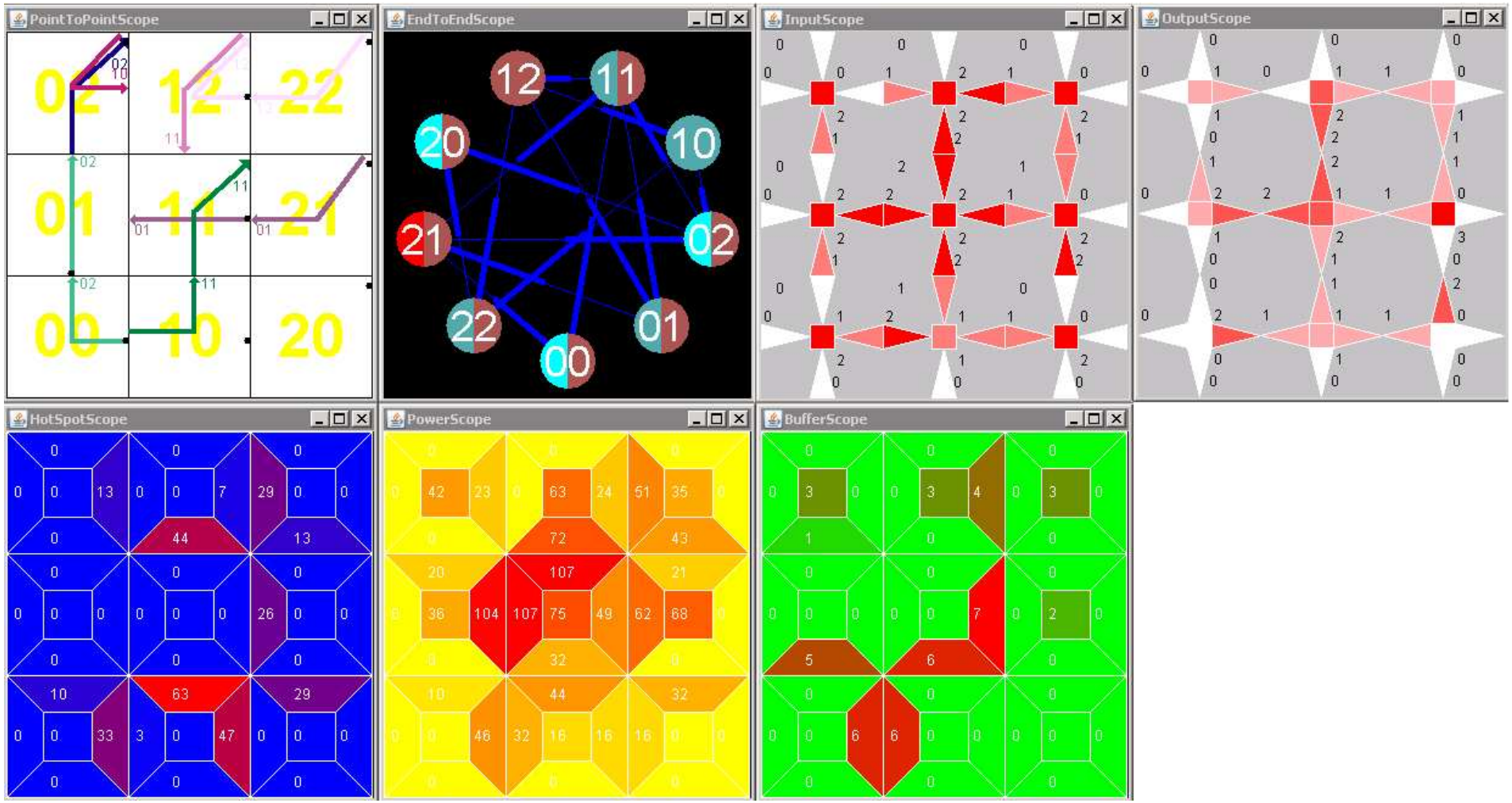
Consumer

Producer

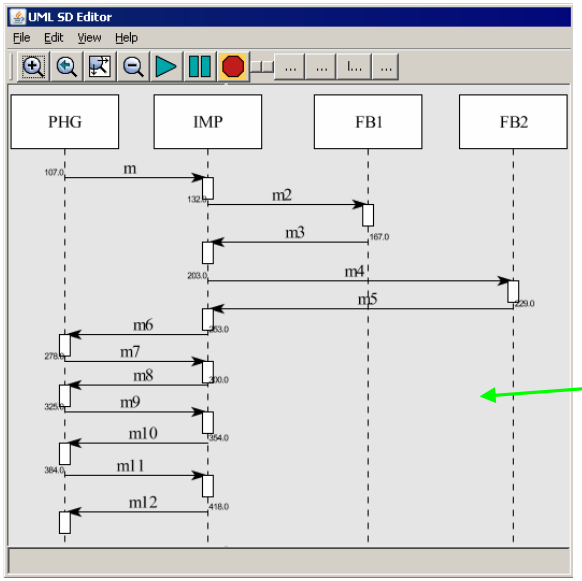
Producer + Consumer =
IP Core

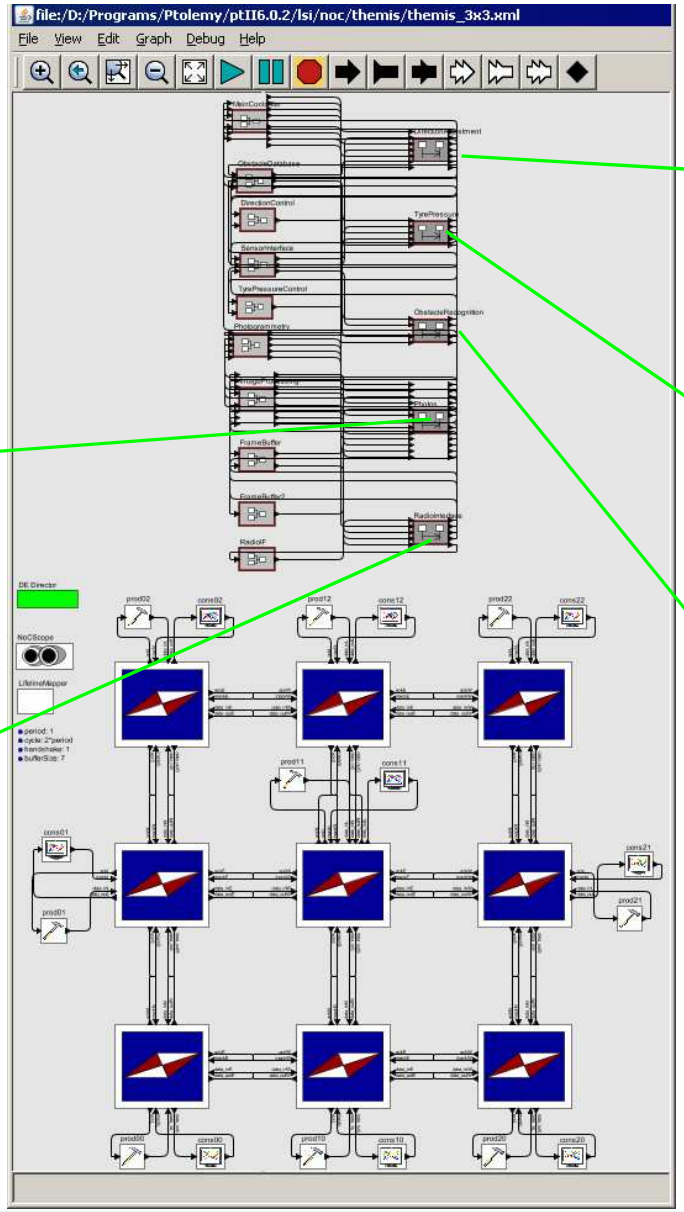


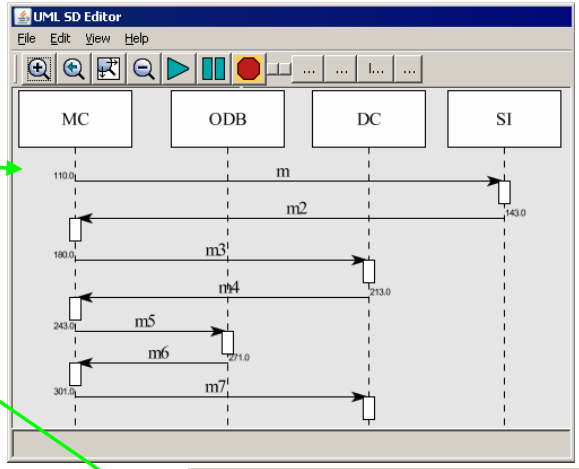
Monitoring System

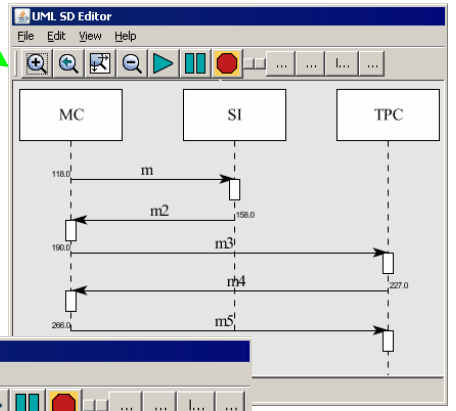


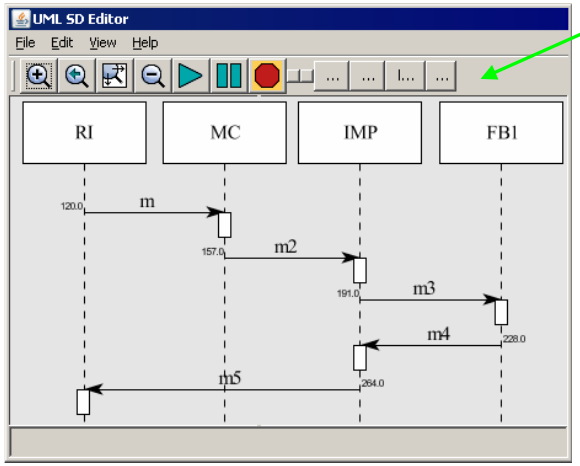
Application Model

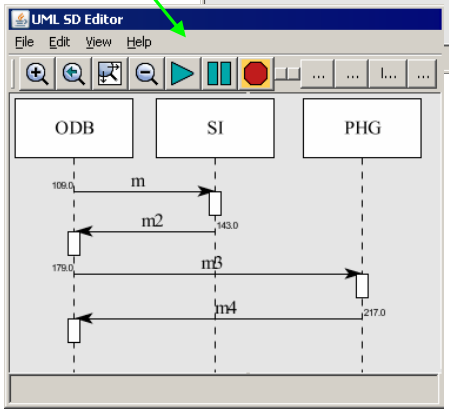




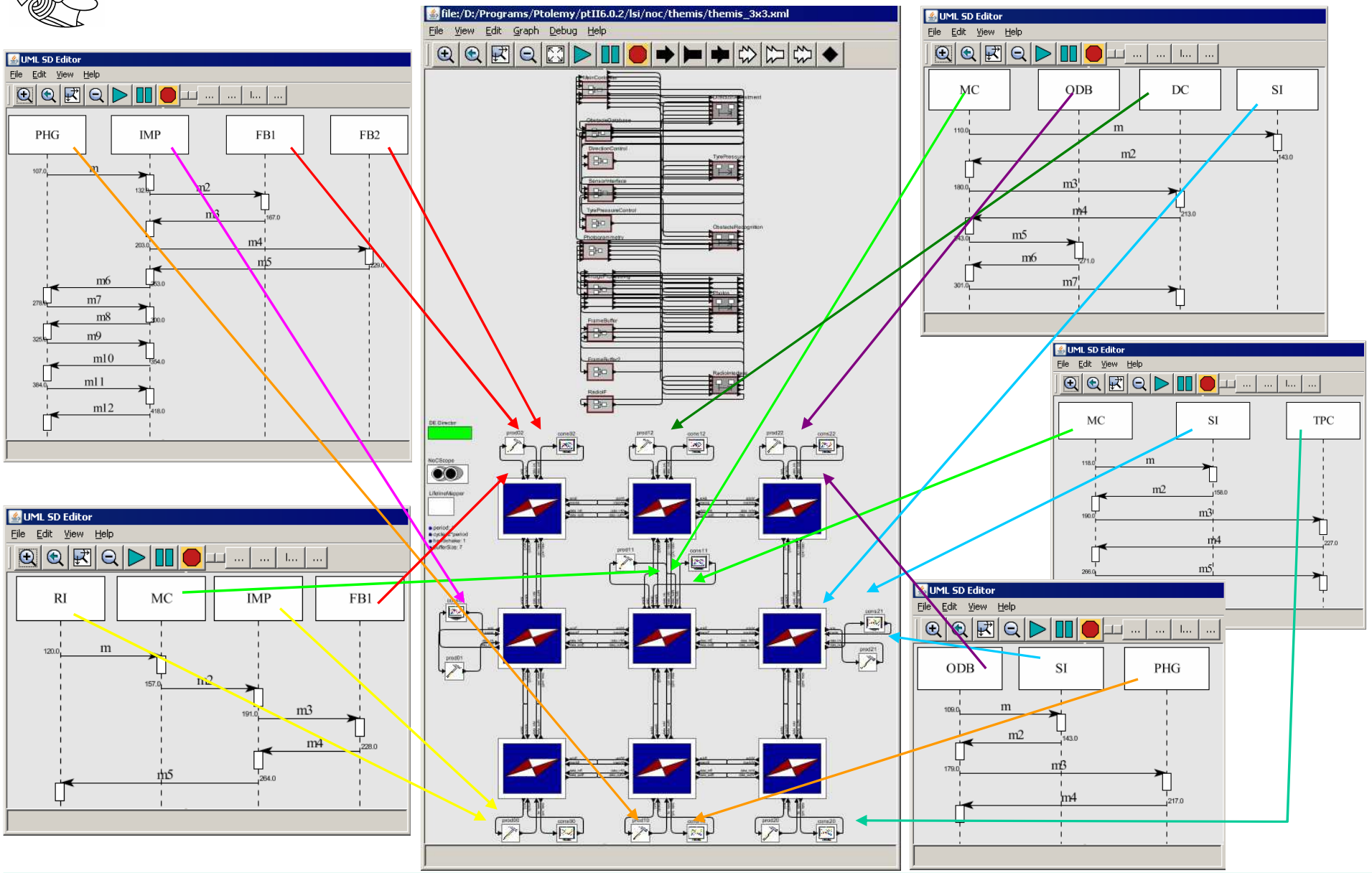




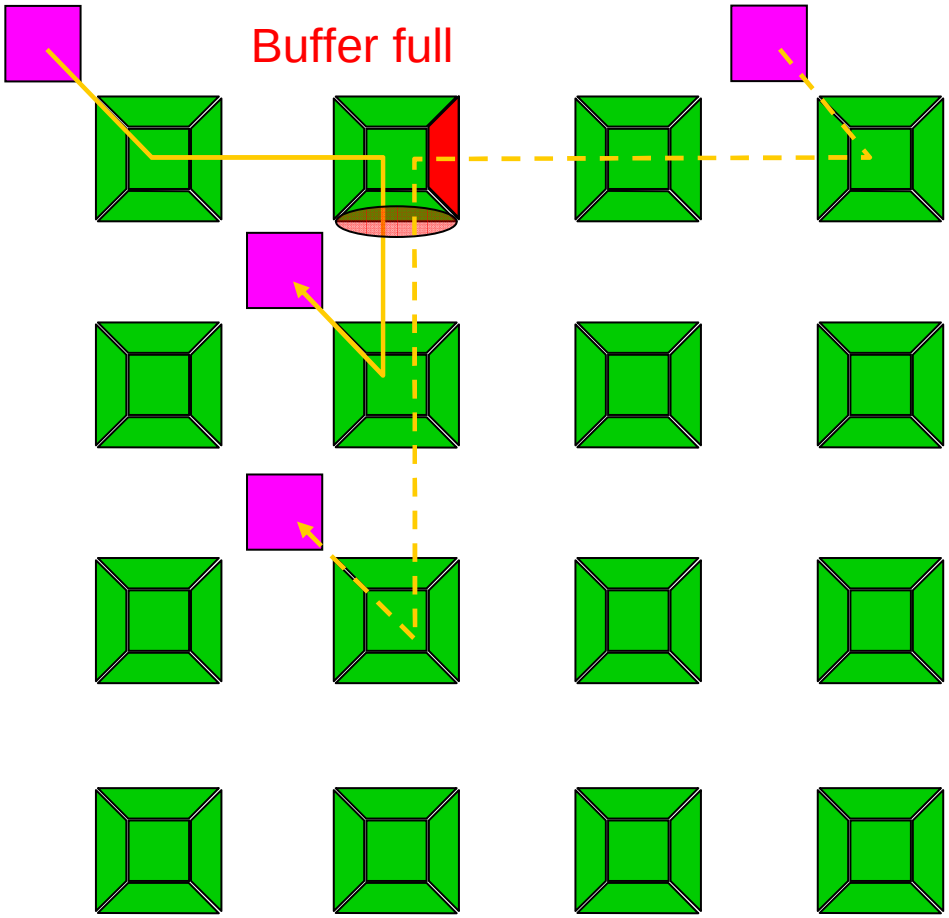




Mapping Example

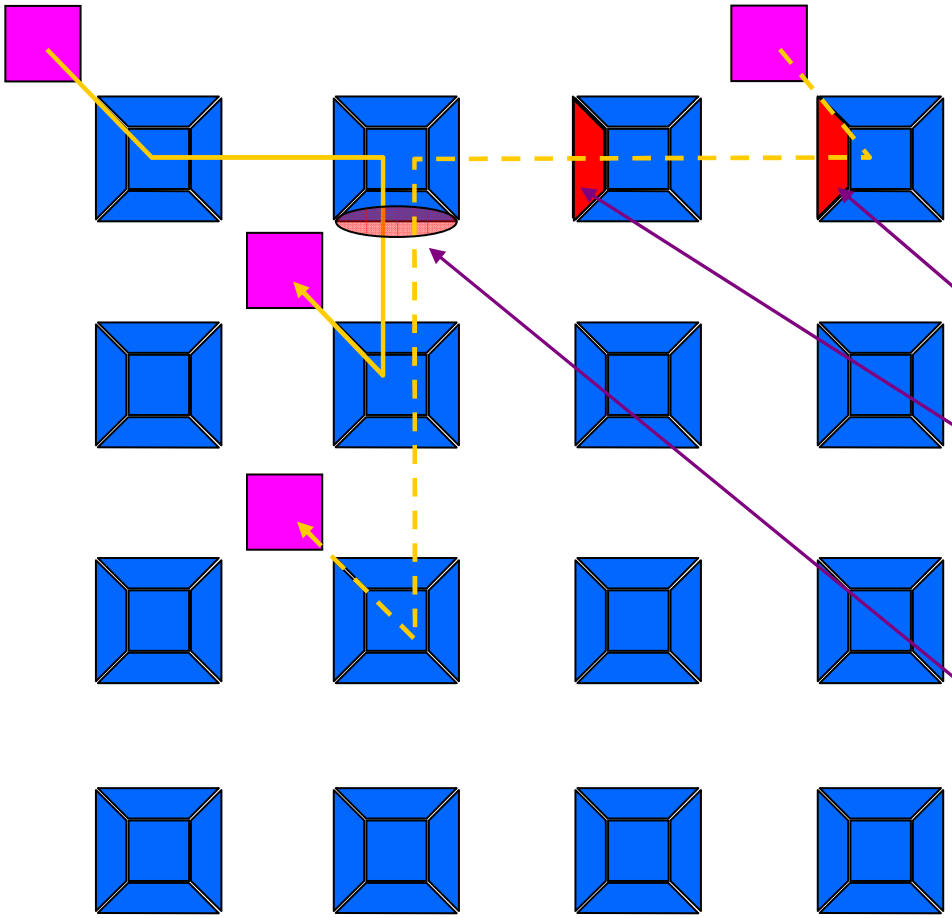


Congestion



BufferScope perspective

Congestion



HotSpotScope perspective

Several not acknowledges received.

Maybe this is not a good placement of tasks. But then? **What** to change? Source? Target? Both? Other communications?

Any. Most important thing is **where** to change to? To a place where source and target can communicate through a less congested path.

How to find out a less congested path? HotSpotScope marks the output ports that are receiving not acknowledges. A BottleneckScope could be built to mark the bottlenecks that are causing congestion on the network.

Open questions?

Are the places not marked by the hotspotScope or a bottleneckScope good places to migrate tasks?
Maybe, it can happen that the places that are not marked by these scopes already contain a communication in progress. Therefore, a second communication sharing the same links could recreate the same problem in this new place. And what is worse: the system would go to a thrashing state, wasting resources to migrate tasks and not reaching a better solution.

Is a path that is not **currently** in use a good candidate for new tasks?
Probably, but it can be the case that this path was used frequently a short time ago and will be used again in the near future (temporal locality).

Should the system keep a history of the recently used paths of communication to better choose a place for tasks to migrate?
It would help the decision process, but the costs of area and power consumption to maintain this control should be carefully evaluated.