From Interaction Overview Diagrams to PEPA nets

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Motivation

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- System consists of several locations. Some objects can move between locations. Within a location objects can interact with others.
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UML 2.0 vs PEPA nets

Dynamic Models in UML 2.0

- Individual behaviour is modelled using state diagrams - intra-object behaviour.
- Collaborative behaviour is modelled using interaction diagrams - inter-object behaviour. These diagrams include
  - Sequence diagrams
  - Interaction overview diagrams (IODs)

Sequence diagrams

- Are a visual scenario-based formalism.
- Describe the instances involved in an interaction, and the messages exchanged for the interaction (partially ordered over time).
- Contain two dimensions: a vertical dimension denoting time; a horizontal dimension representing the instances involved in the interaction.

Sequence diagrams in UML 2.0

- Have new improved structure and expressiveness (through so-called *interaction fragments*)
- Loops and conditional branching can be indicated more clearly
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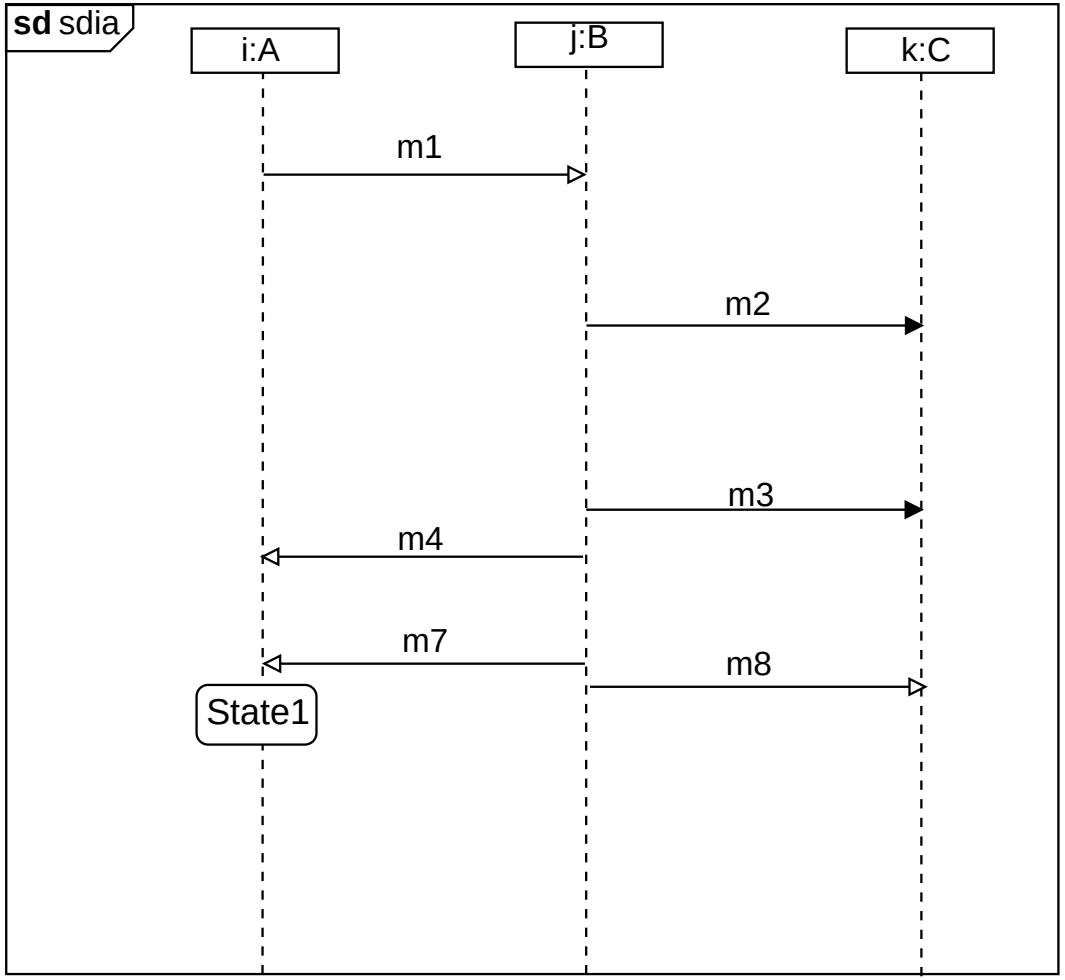
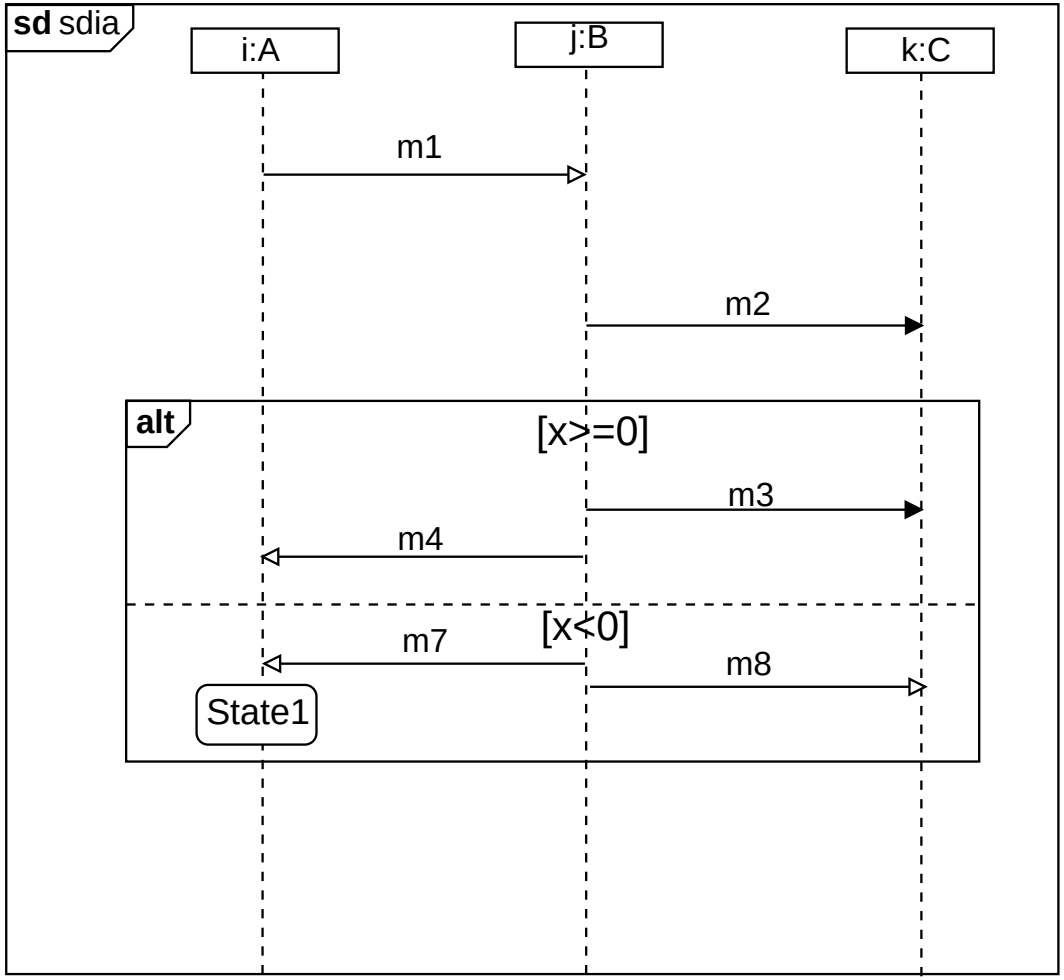
- Loops and conditional branching can be indicated more clearly **loop** **alt**
- Parallel behaviour can be expressed as well as ordering of non-related communications **par** **strict**

Example Diagram



Example Diagram



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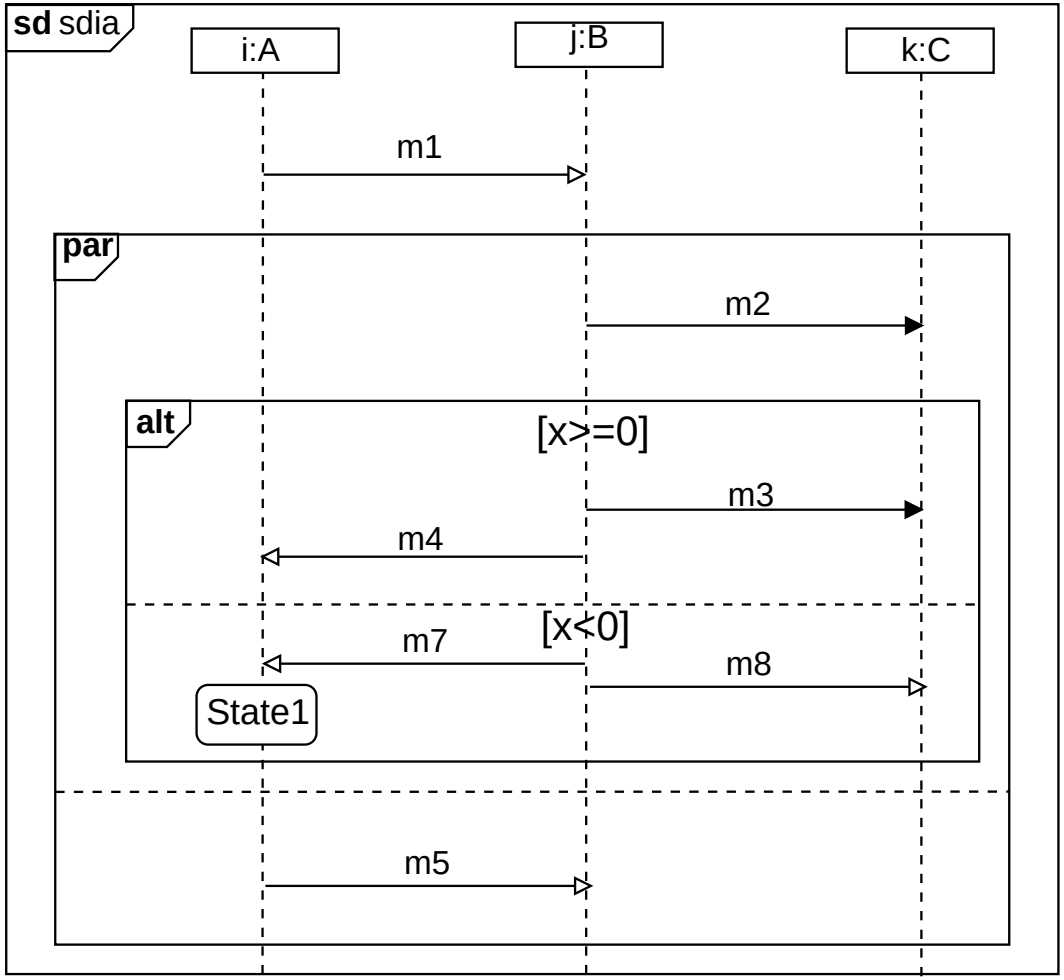
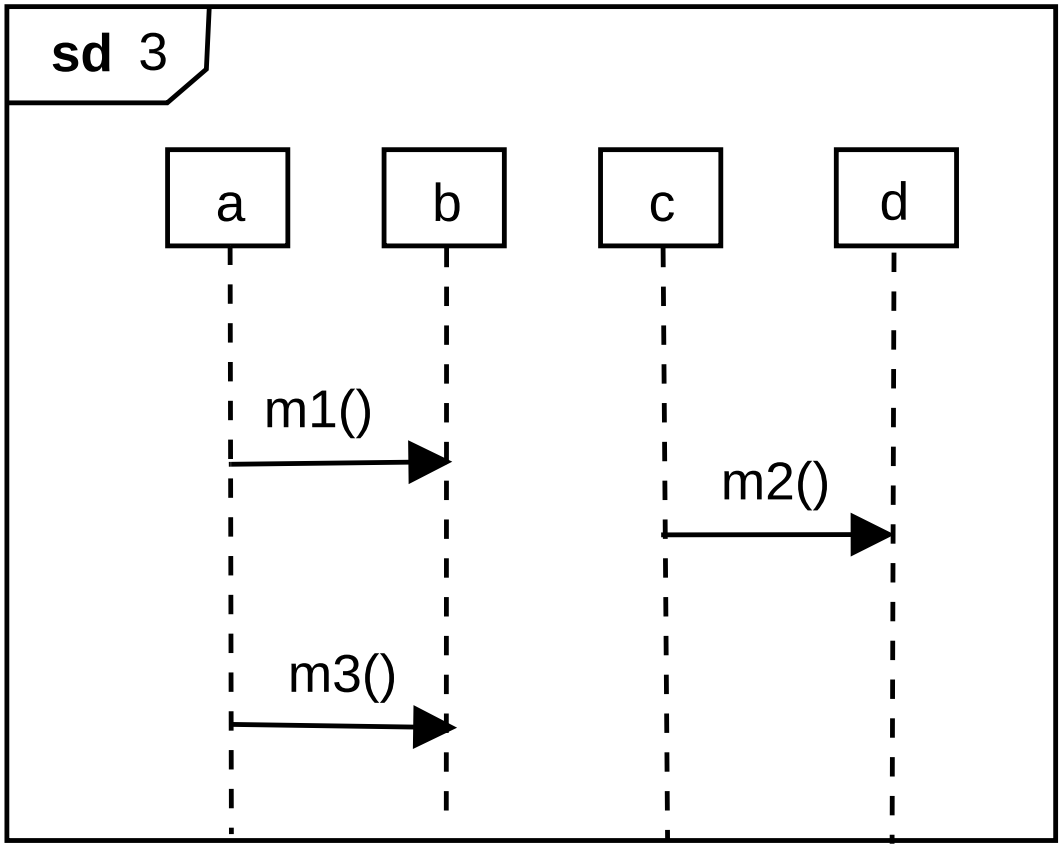


Ordering



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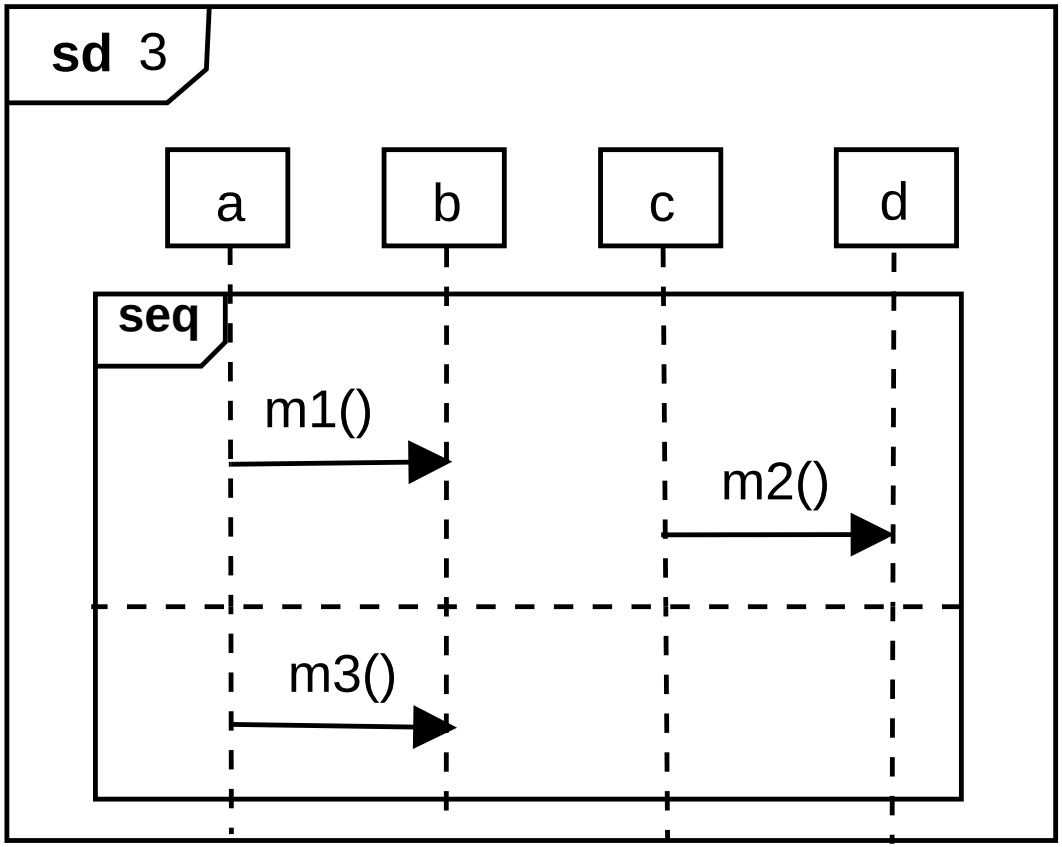

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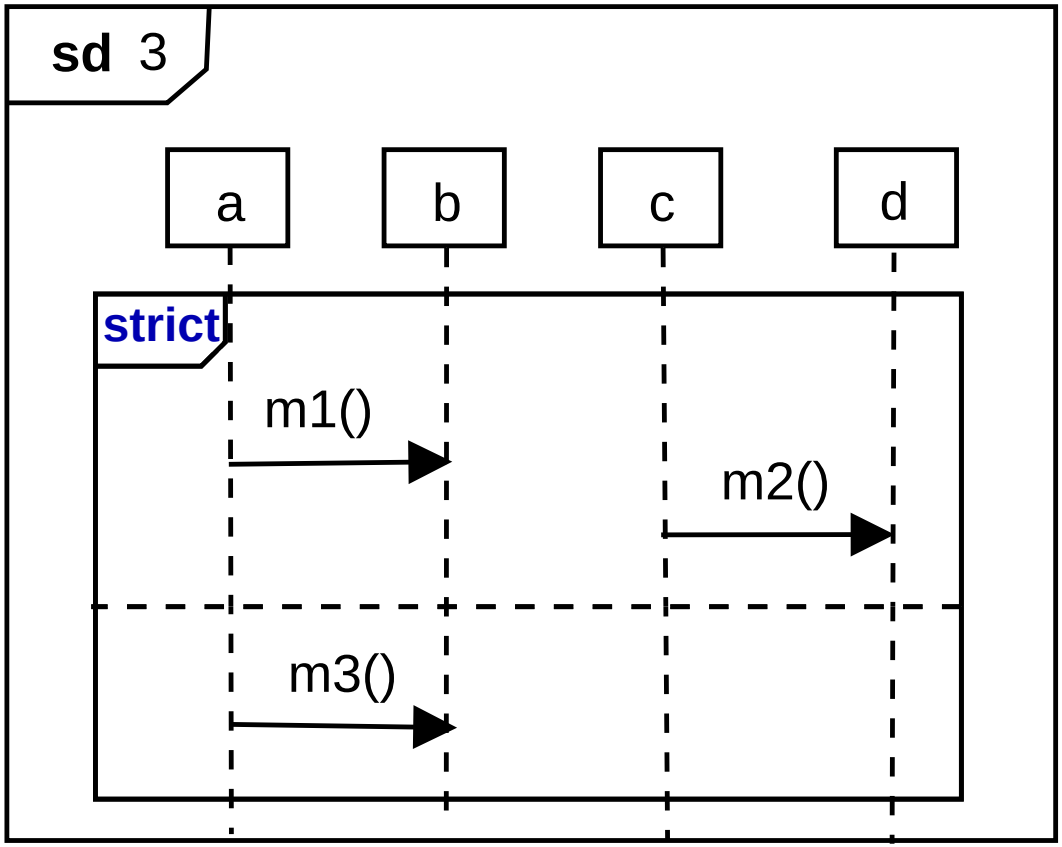

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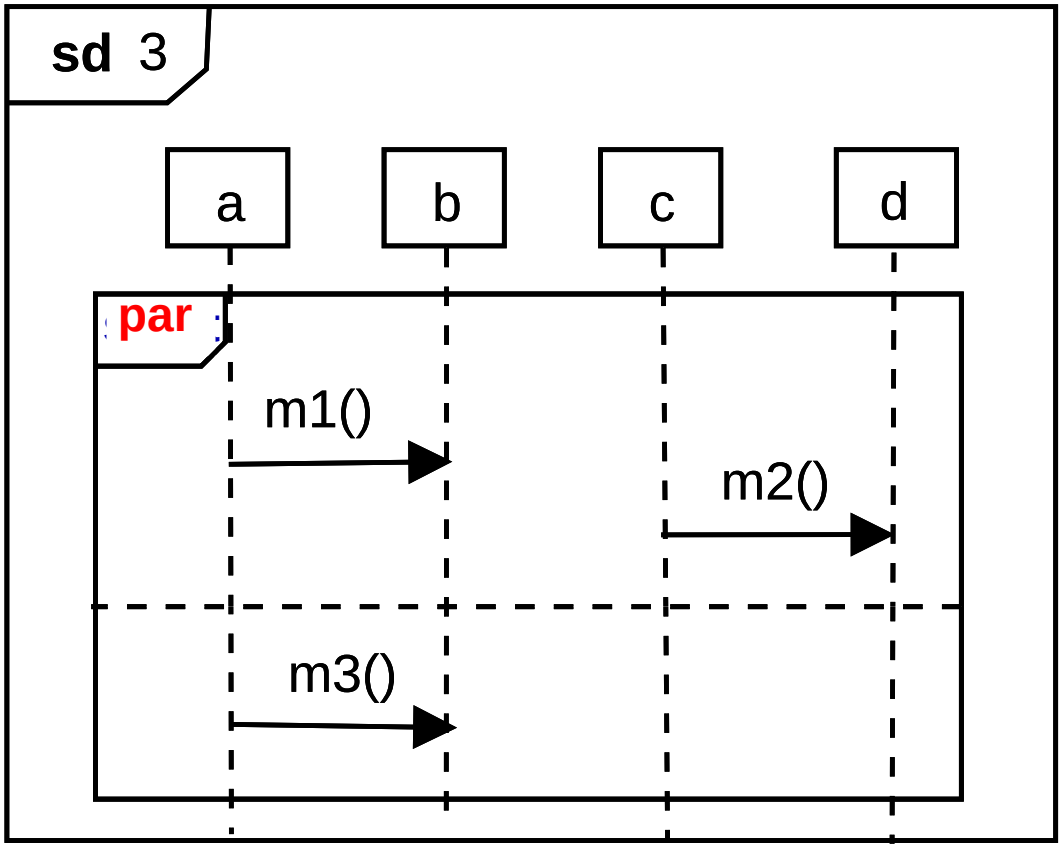
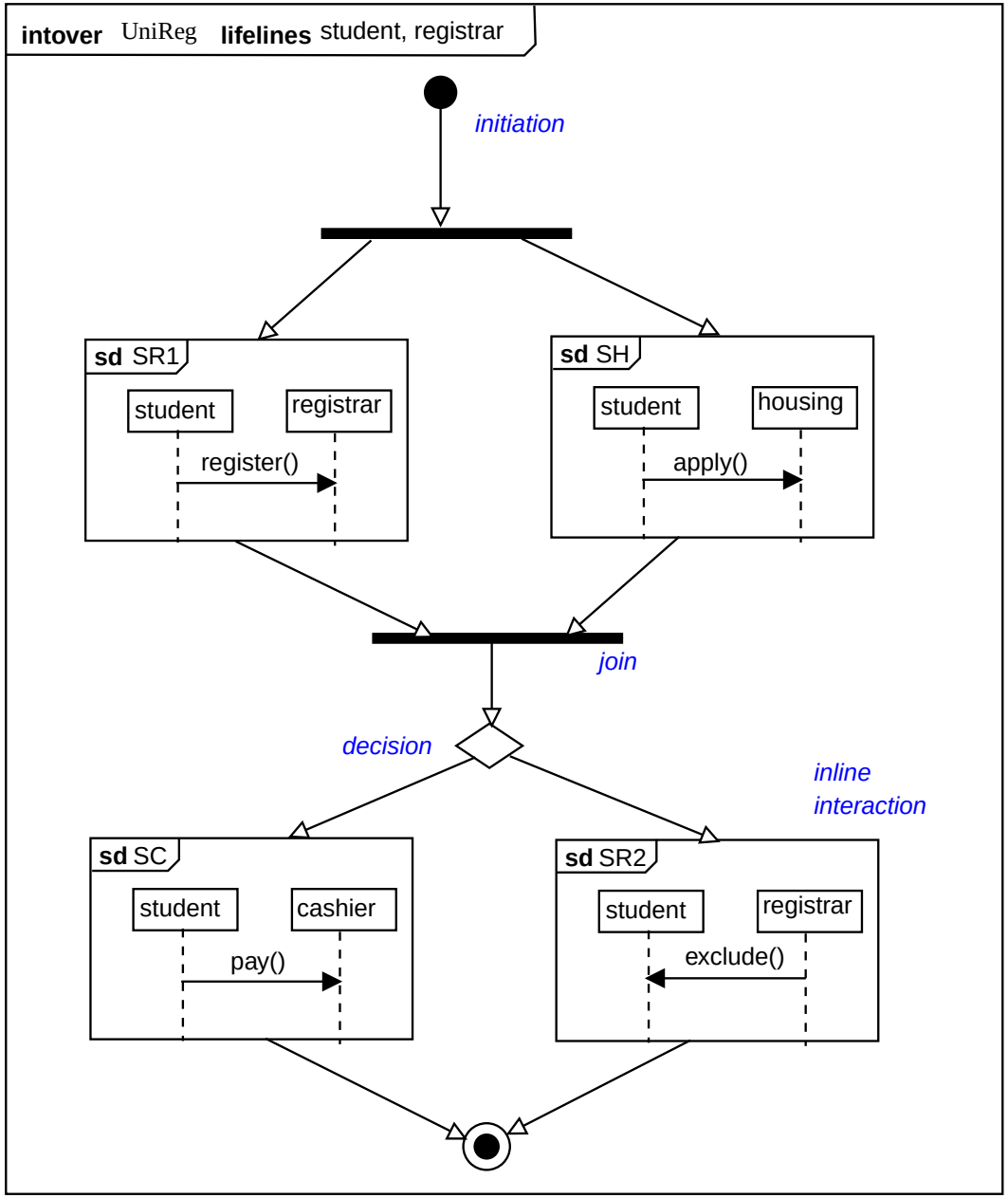


Interaction Overview Diagram

- High level structuring mechanism for sequence diagrams.
- Special kind of activity diagram with control flow only.
- Nodes are interactions (sequence diagrams); edges show the order in which these interactions occur.
- Uses forks, joins, decision and merge nodes from activity diagrams.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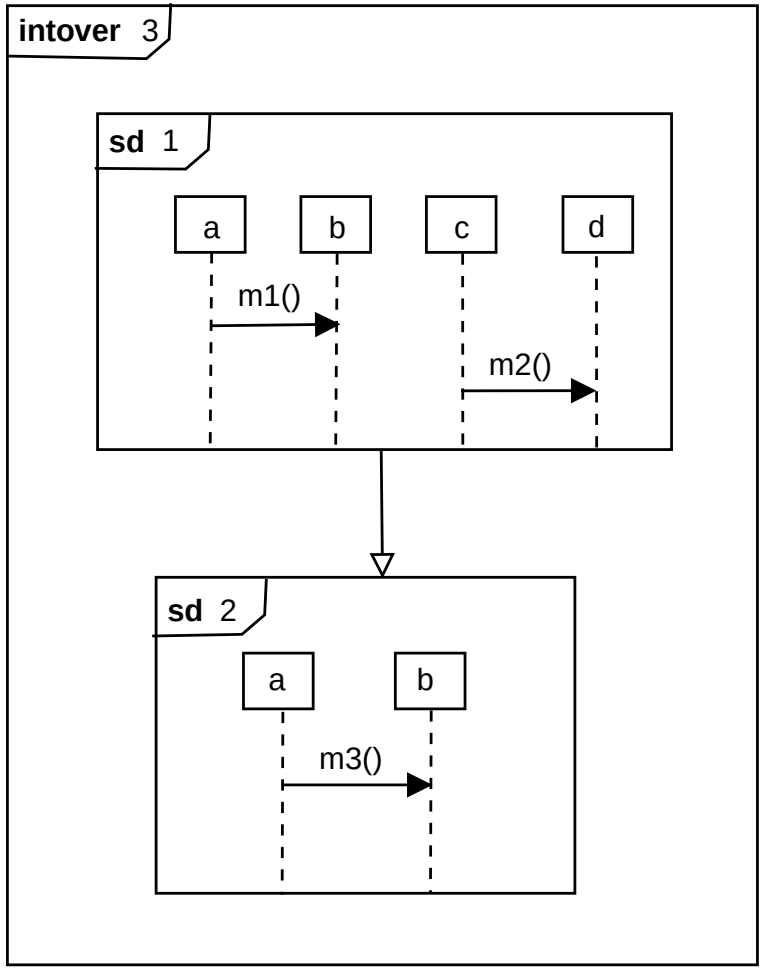
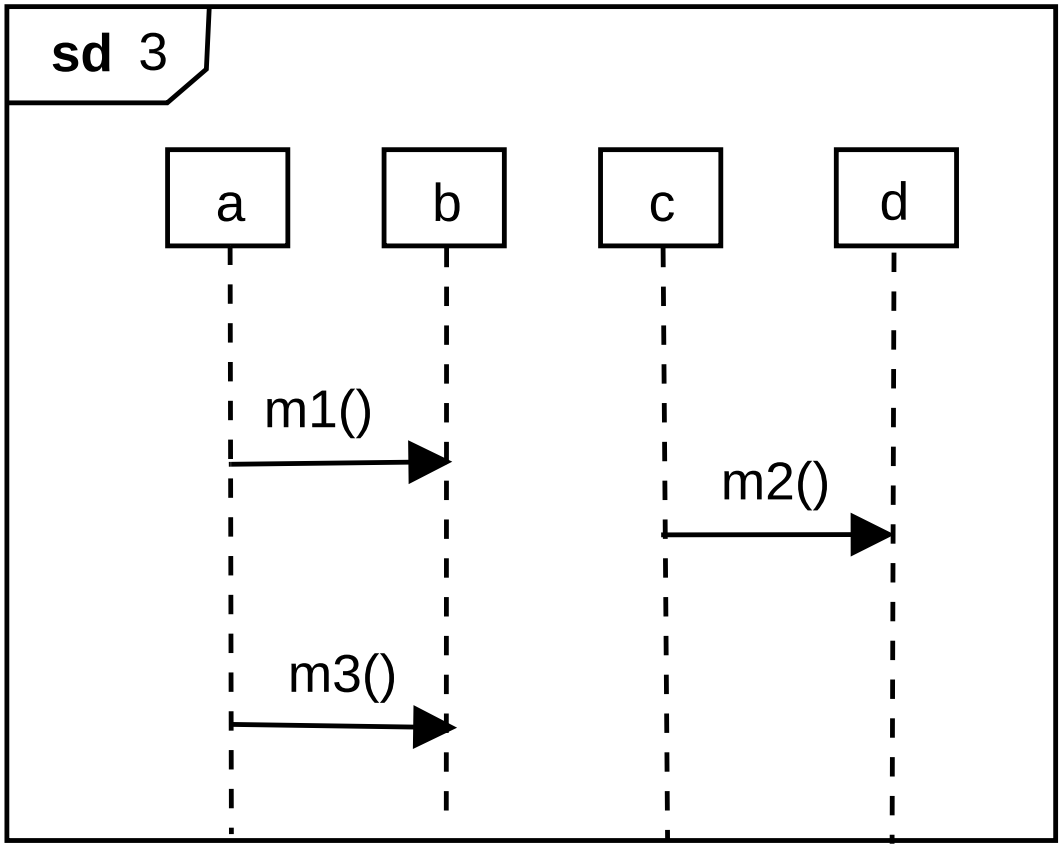
initiation
sd SR1
student
registrar
register()
sd SH
student
housing
apply()
join
decision
inline
interaction
sd SC
student
cashier
pay()
sd SR2
student
registrar
exclude()

Semantics of an IOD



Flattening



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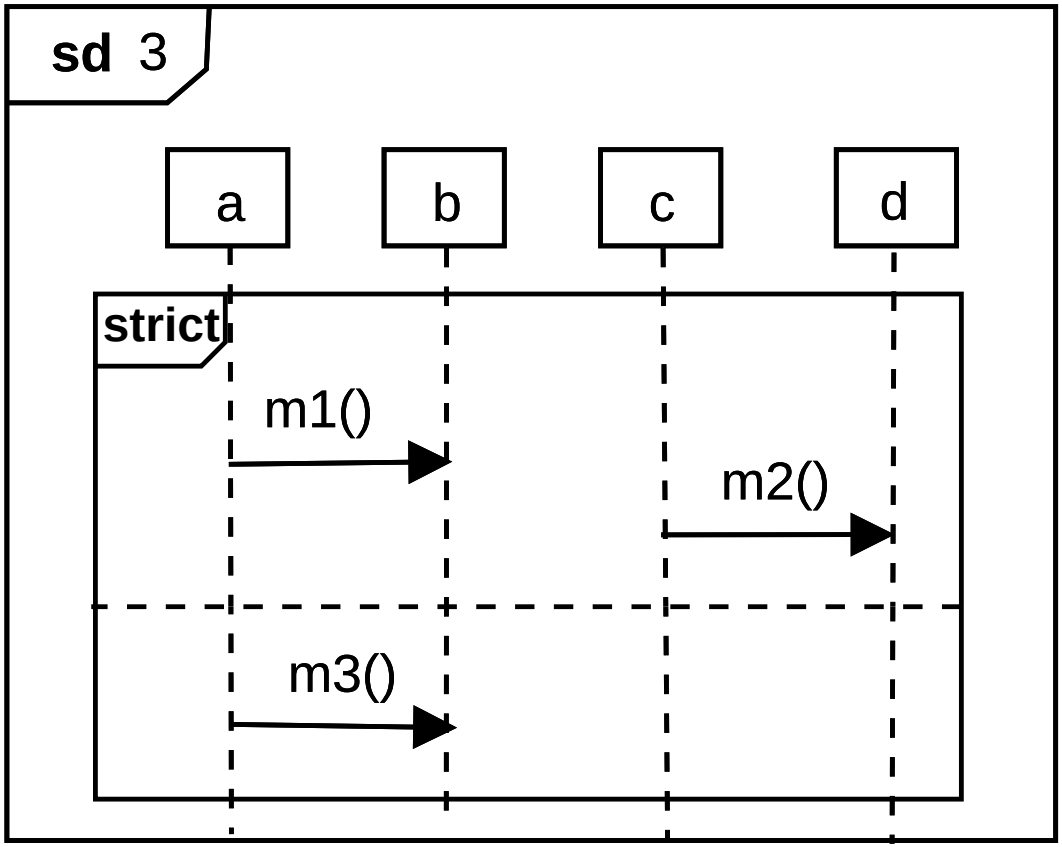
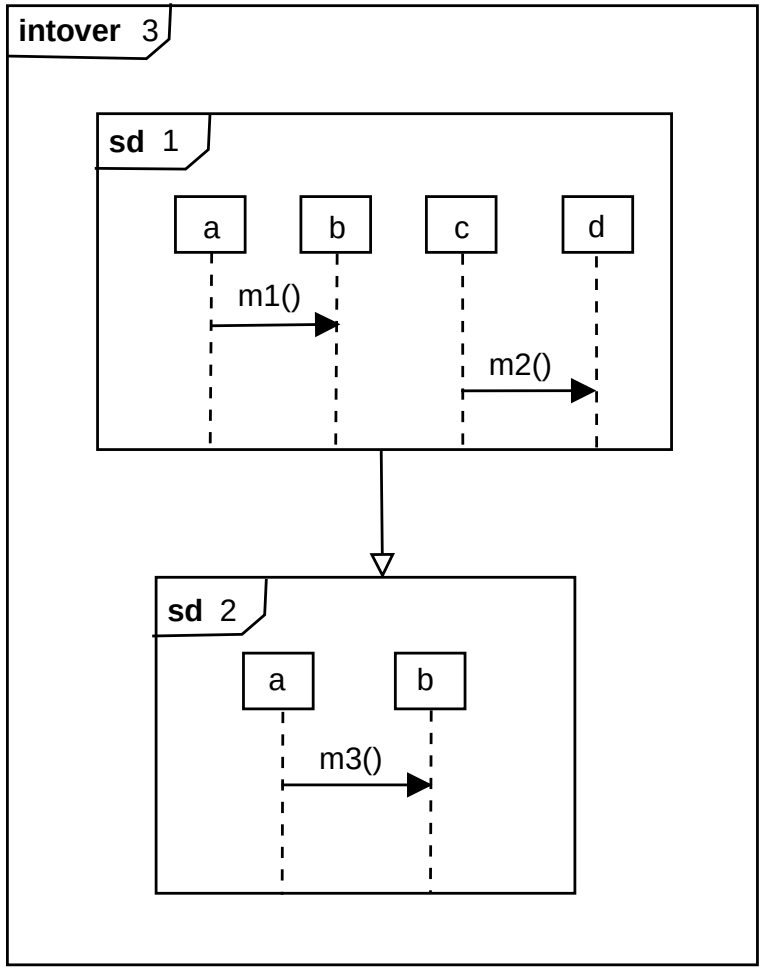


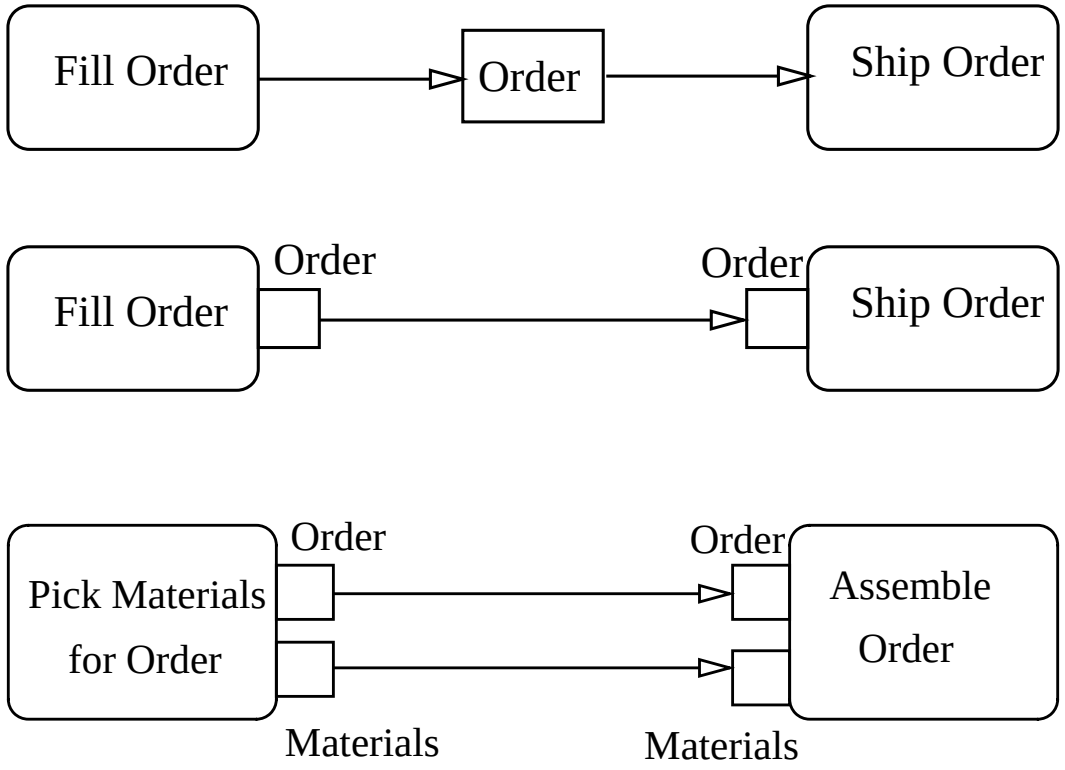
Which Case to Allow?

- Both interpretations are sensible: strong and weak sequential composition.
- We need different notation for each case.

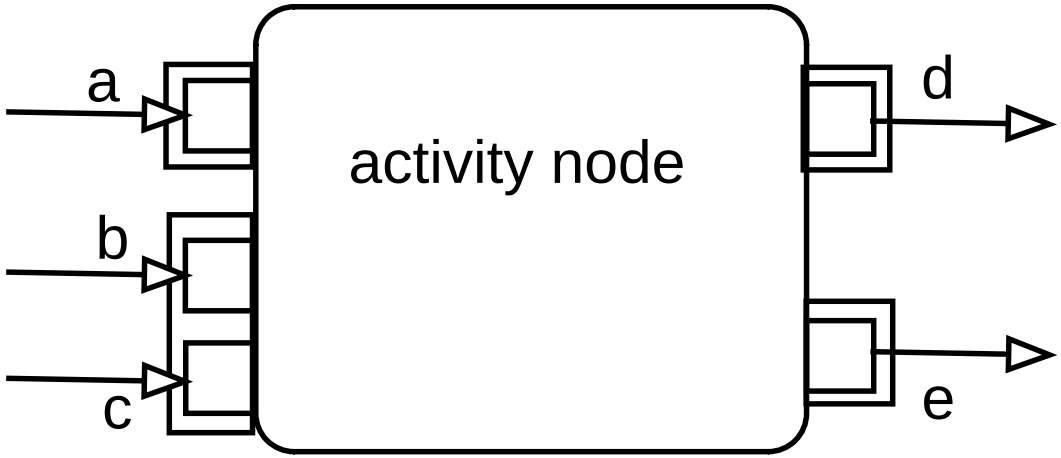
Strong Sequential Composition



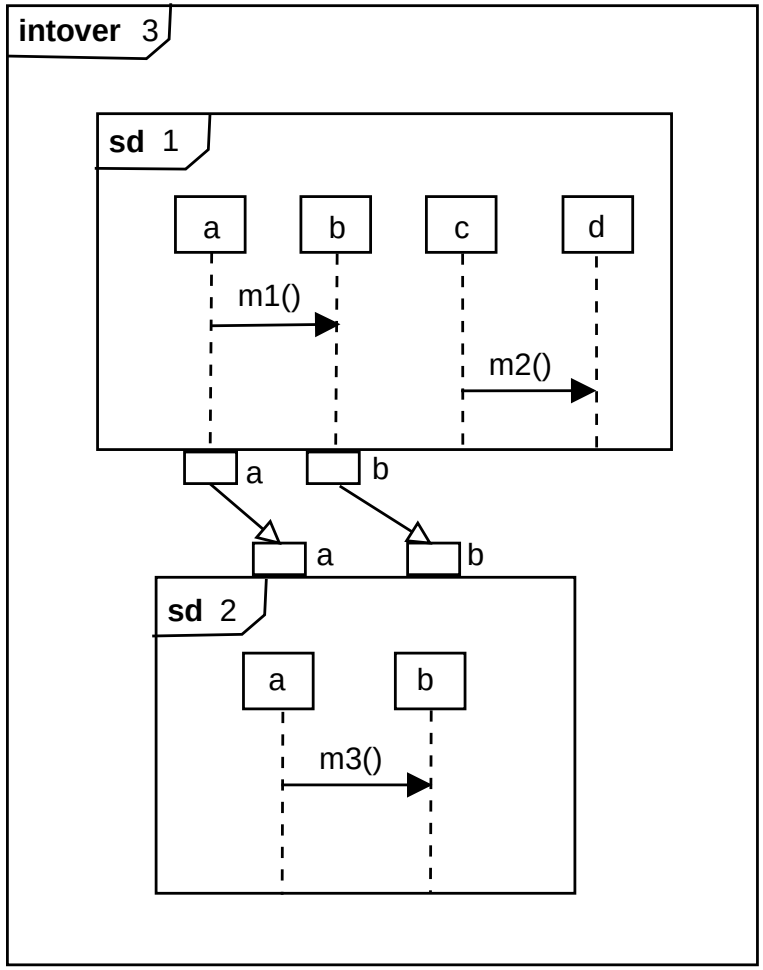
Object Flow in ADs



Alternative input/output pins



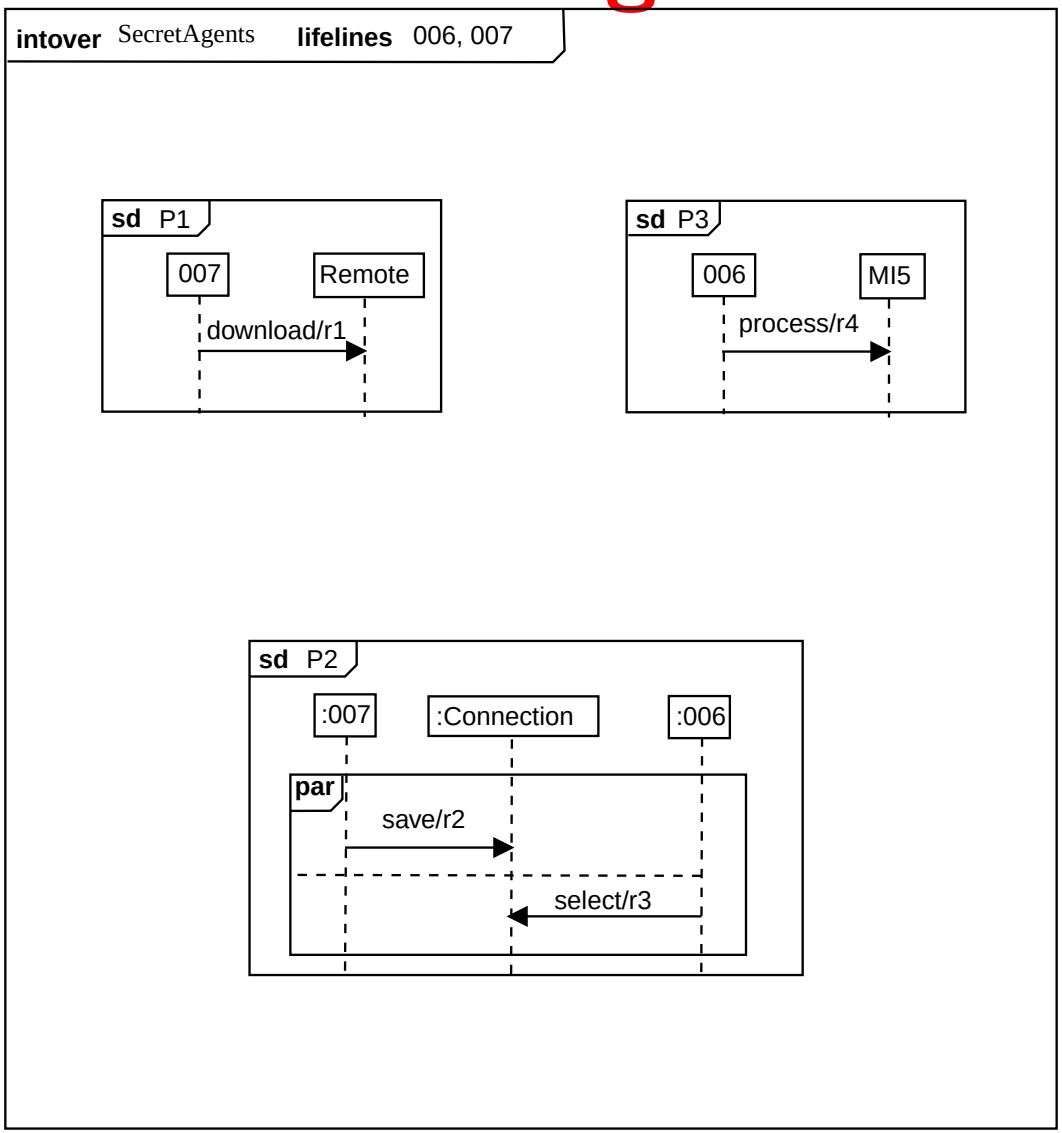
Weak Sequential Composition



IODs for Mobility

- Nodes represent locations in the system (interaction name).
- Explicit object flow is used to indicate object mobility.
- $\{upperBound = value\}$ indicates the maximum number of tokens allowed in a pin.
- $\{initBound = value\}$ indicates the initial number of tokens in a pin.
- $\{weight = value\}$ indicates the number of tokens carried in an edge.

Secret Agents



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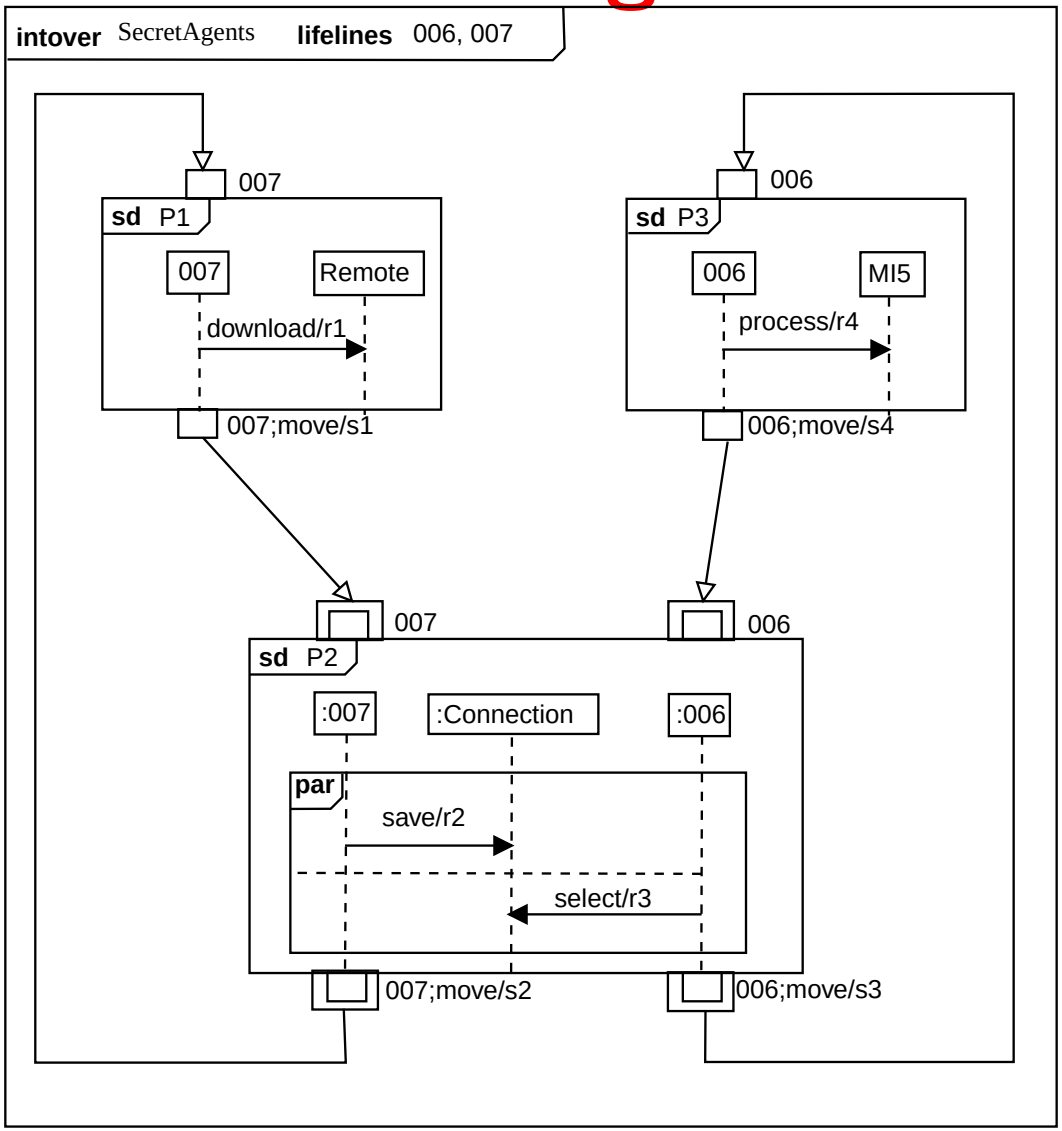

Secret Agents