Net-Components

An Approach to Structured Application-Programming with Petri Nets

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Motivation

- Project WS 2001/2002:
  Agent-oriented software-engineering (AOSE)
  - Development of an distributed computer-version of the popular game “Settlers of Catan”
  - Based on the multi-agent system Mulan (MULti-Agent Nets).

Project: AOSE

- Main task of participants
  - Developing of the protocols, i.e.: Petri nets
- Main problems:
  - No common layout of nets (developer / team)
  - No support for recurrent tasks in programming
  - No support for code reutilization
  - No support for debugging

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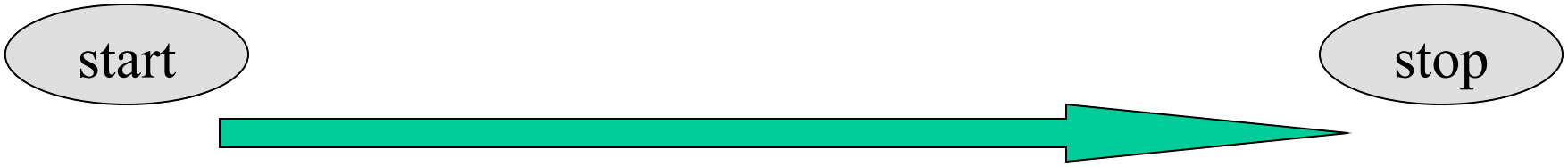
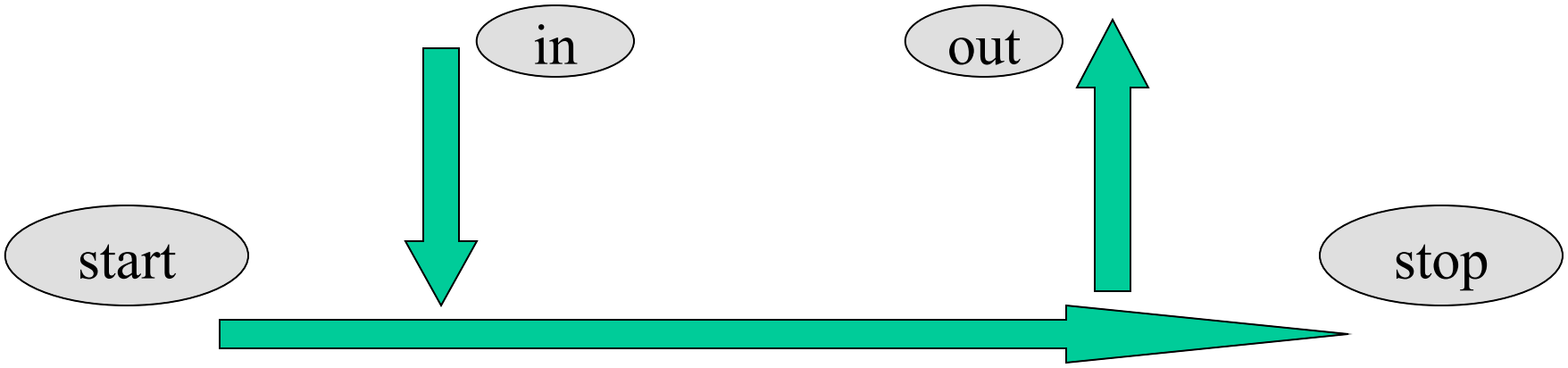
Mulan-Protocol

- Petri Net
- Beginning (start) / Ending (stop)



Mulan-Protocol

- Petri Net
- Beginning (start) / Ending (stop)
- Receive Message (in) / Send Message (out)



Mulan-Protocol

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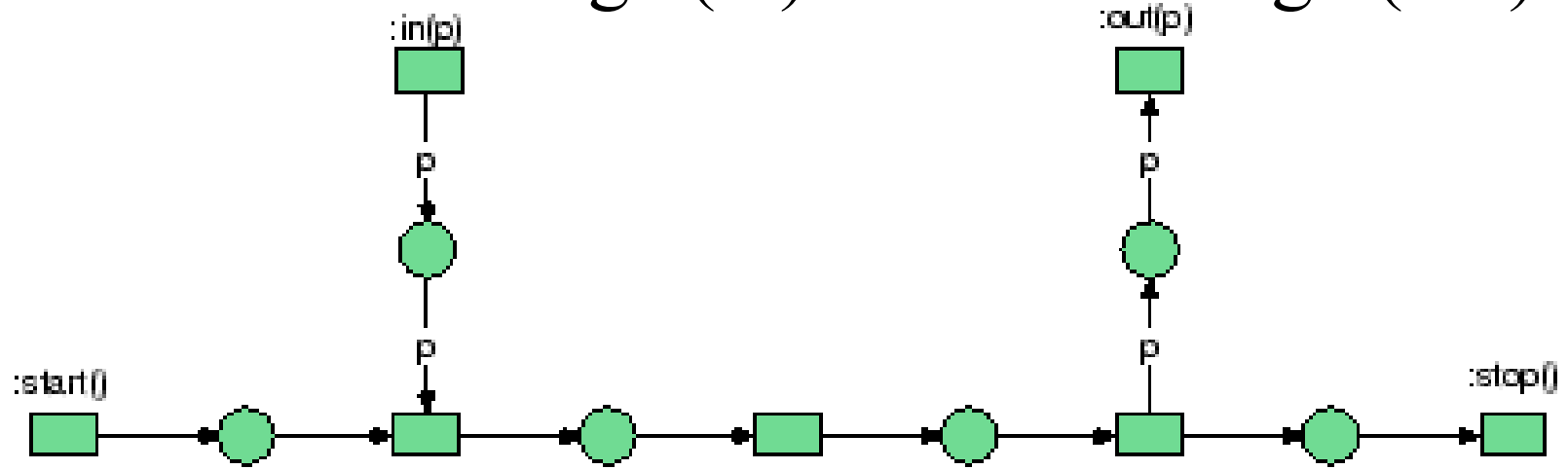
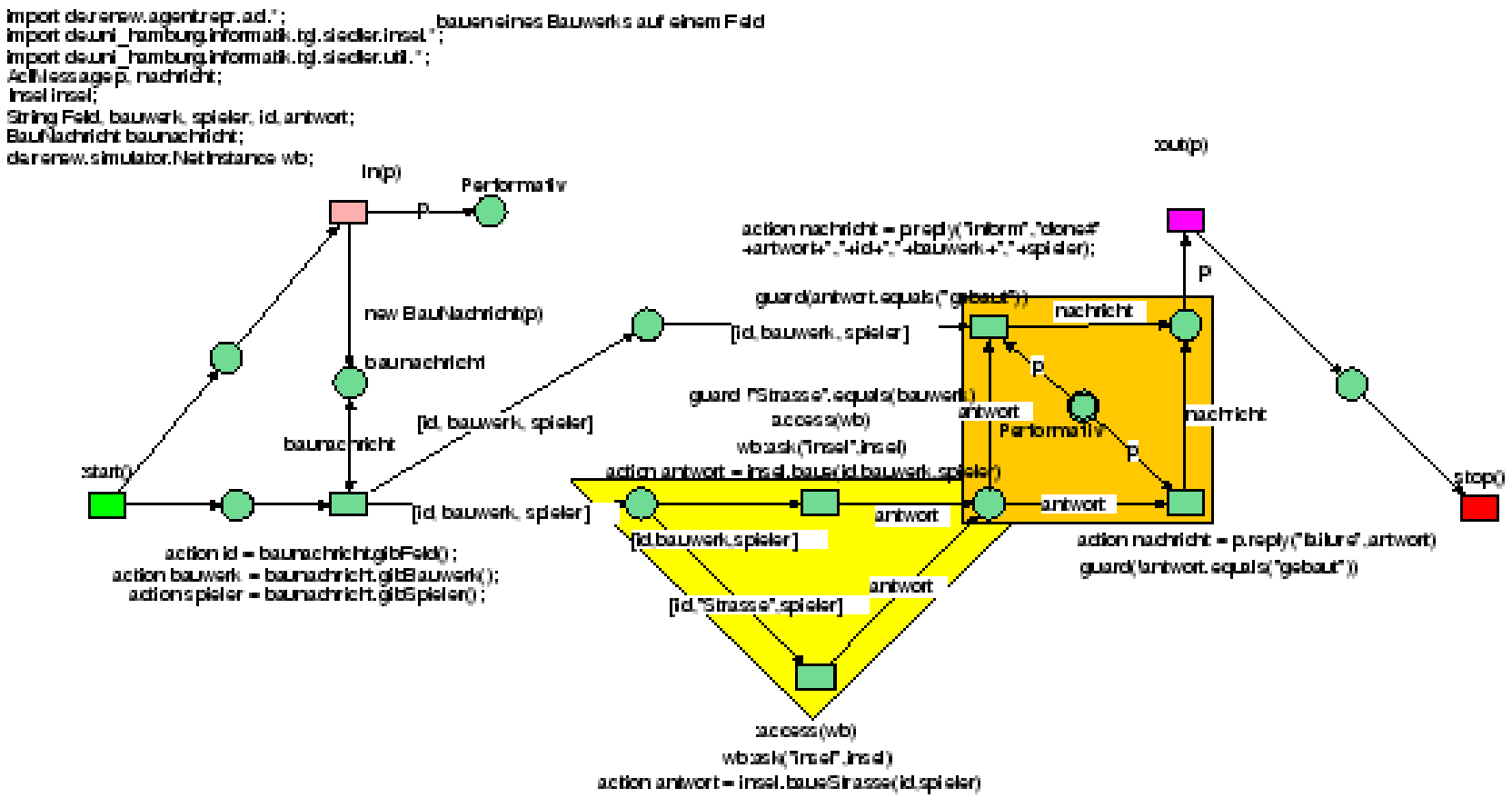


Mulan-Protocol Example



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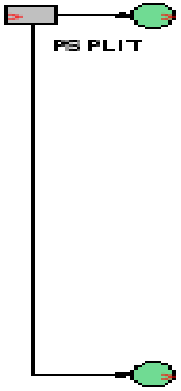
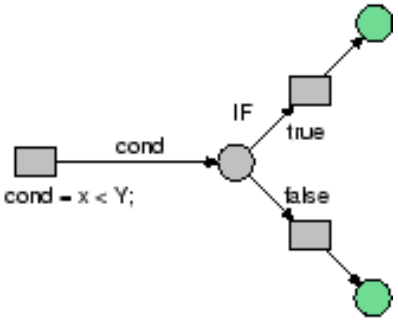
Net-Component

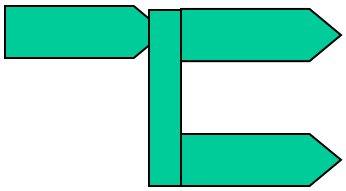
- Reusable set of code
- Manage one basic task
- Easily identifiable / distinguishable
- geometrical arrangements of elements
- Common language of the team
- Emphasize the control flow
- Examples:
    - Receive /send message, conflict, iterator,...

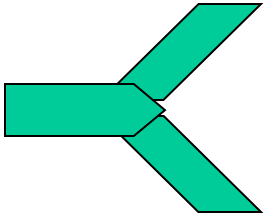
Net-Components

- Concurrency / Conditional

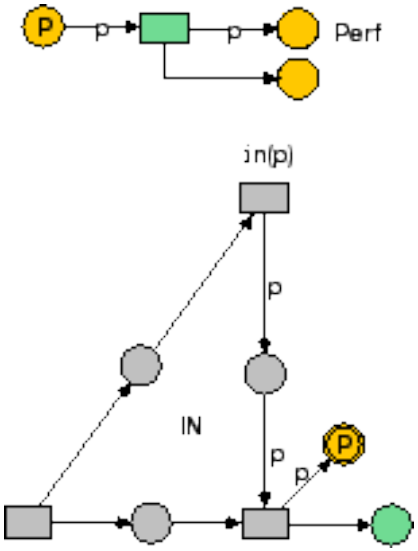




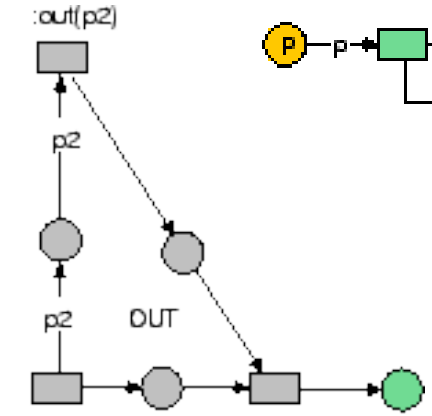


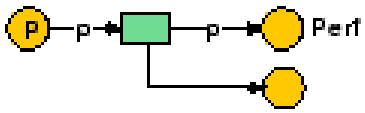


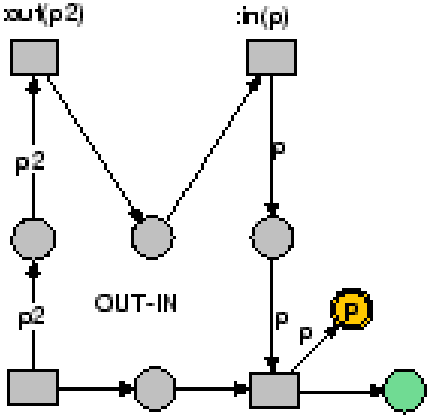
Net-Components



- Message in / out / out-in

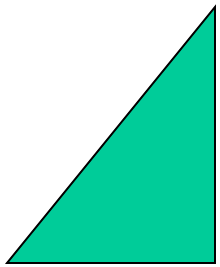


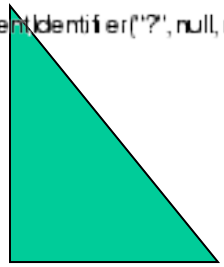


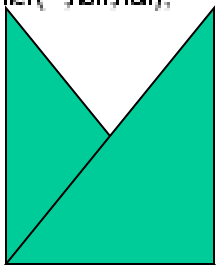



```
action p2= new AclMessage(
   "inform",
   null,
   new AgentIdentifier("?", null, null),
   "?")
```

```
action p2=new AclMessage(
   "request",
   null,
   new AgentIdentifier("",null,null),
   "")
```







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Player Registration (original)

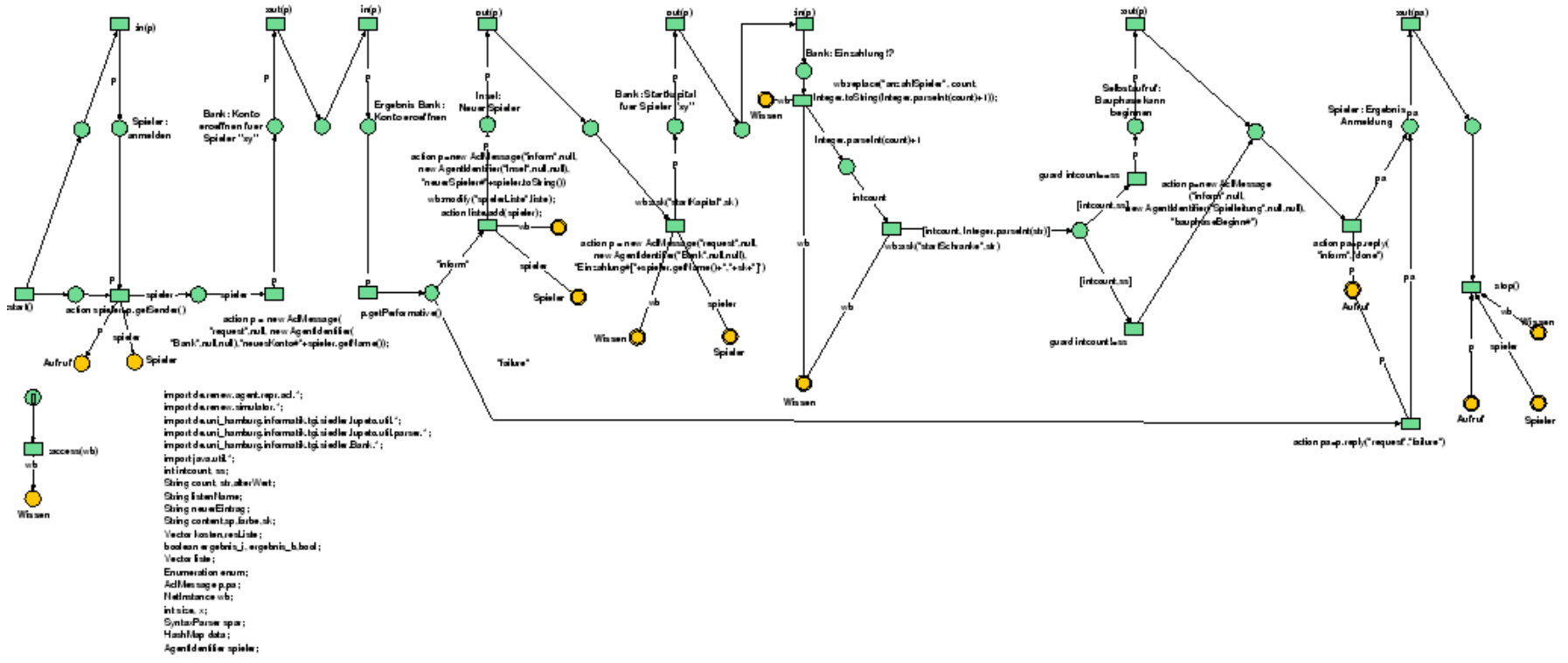


Abbildung 1: Das ursprüngliche Protokoll *anmelden* der Spielleitung.

Player Registration (NC version)

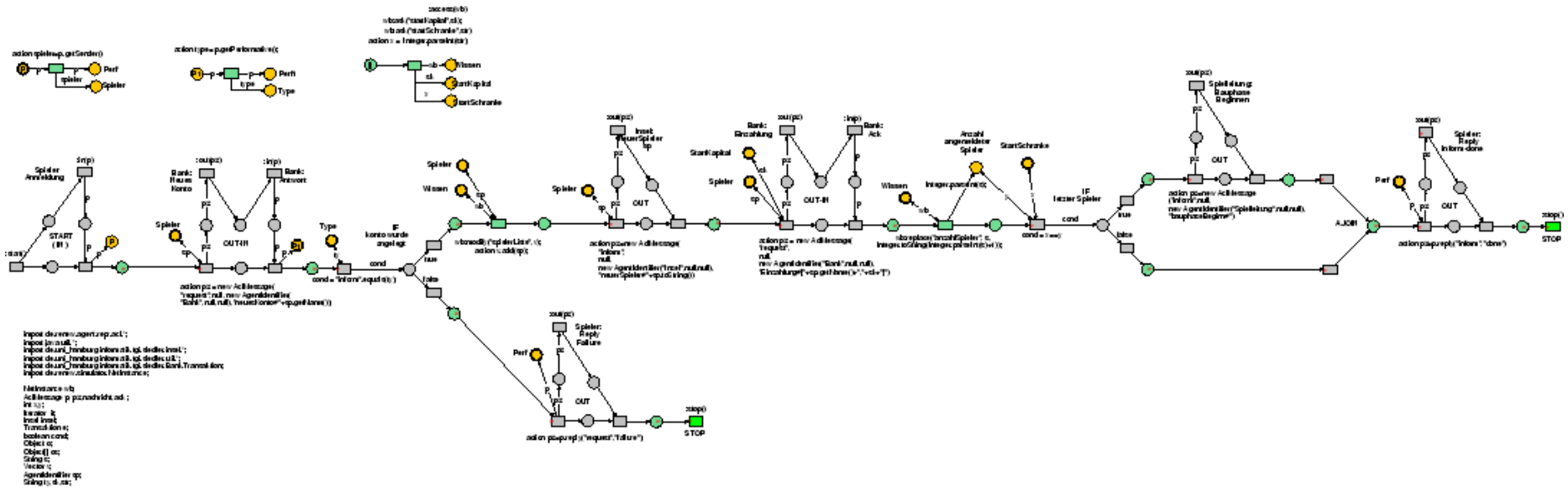
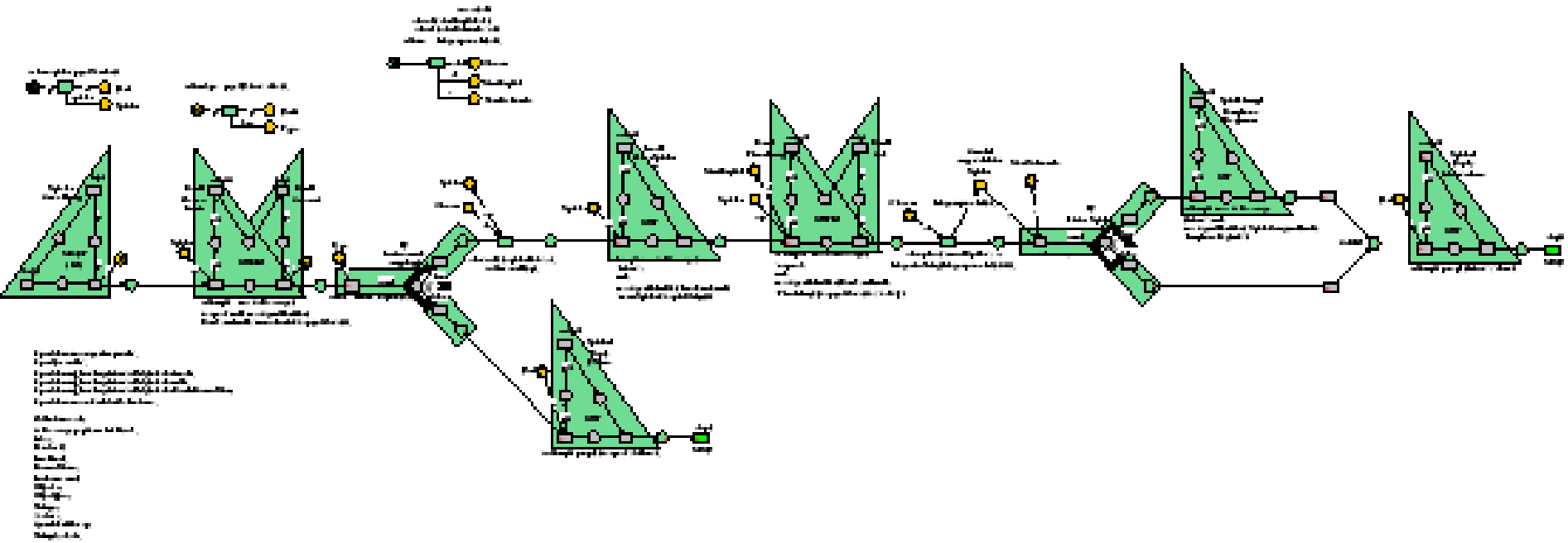


Abbildung 2: Das neue Protokoll *anmelden* mit Netz-Komponenten.

Player Registration (NC Version)



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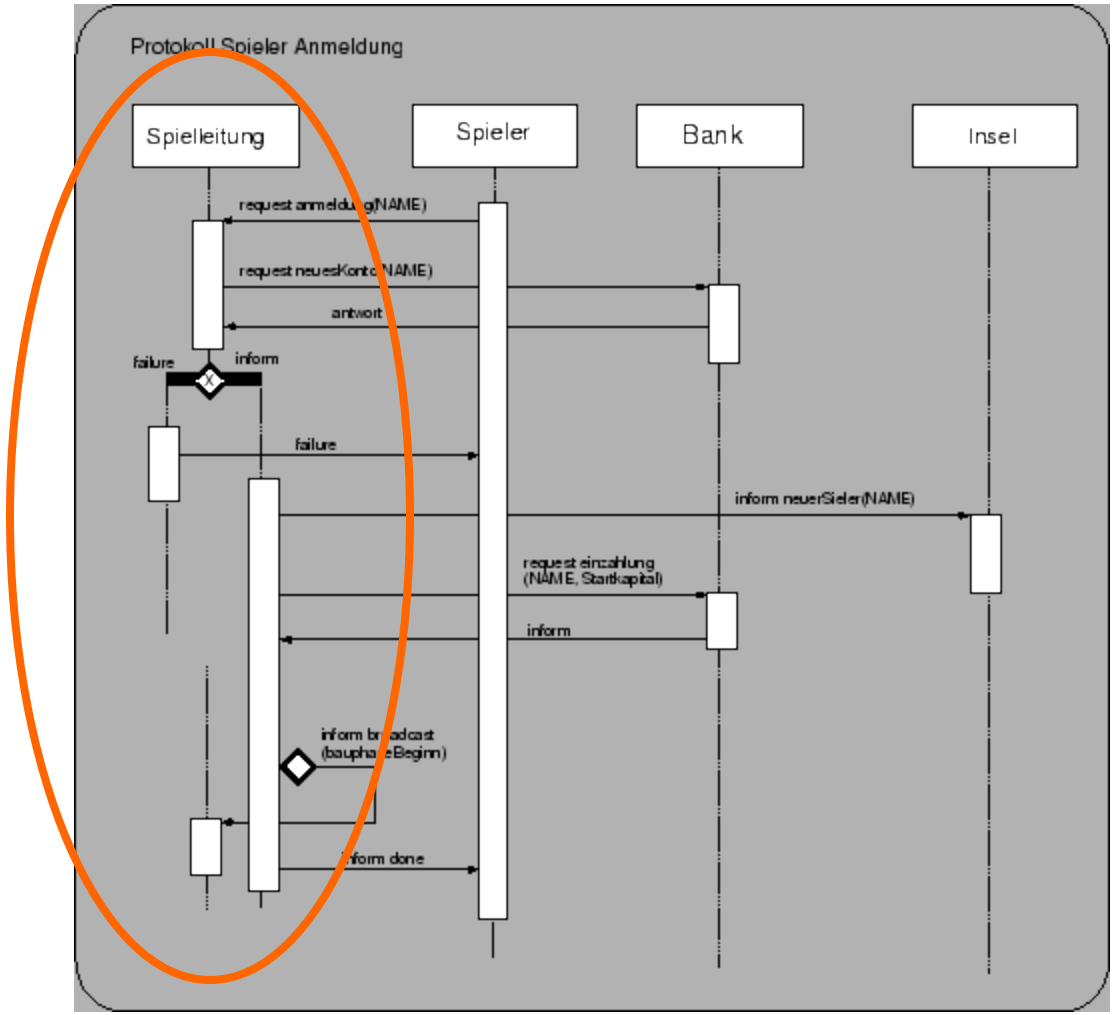
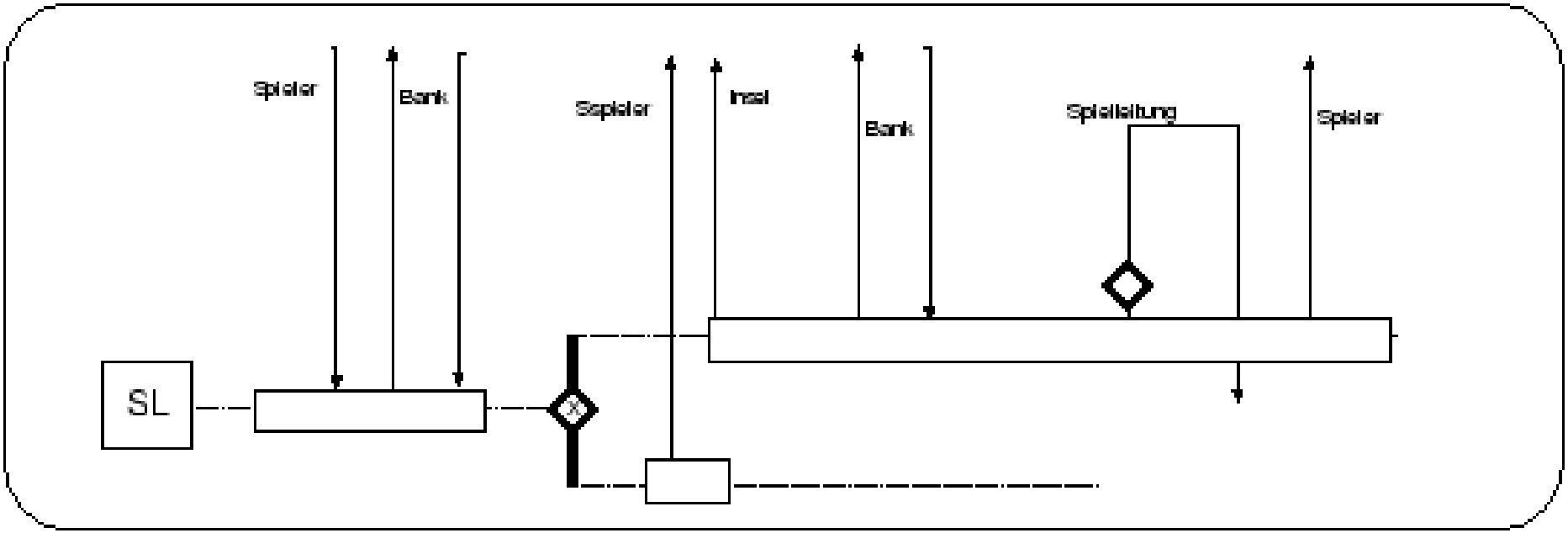
Modeling of Mulan Protocols

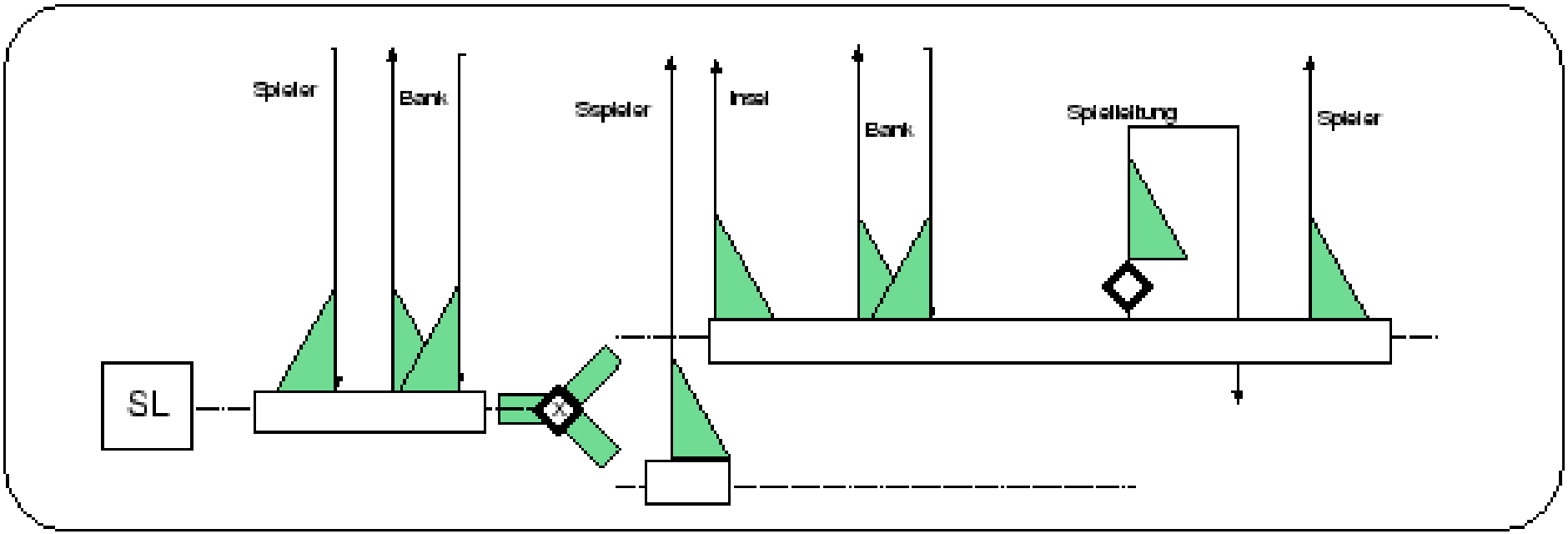
- Using Protocol Diagrams (-> FIPA)



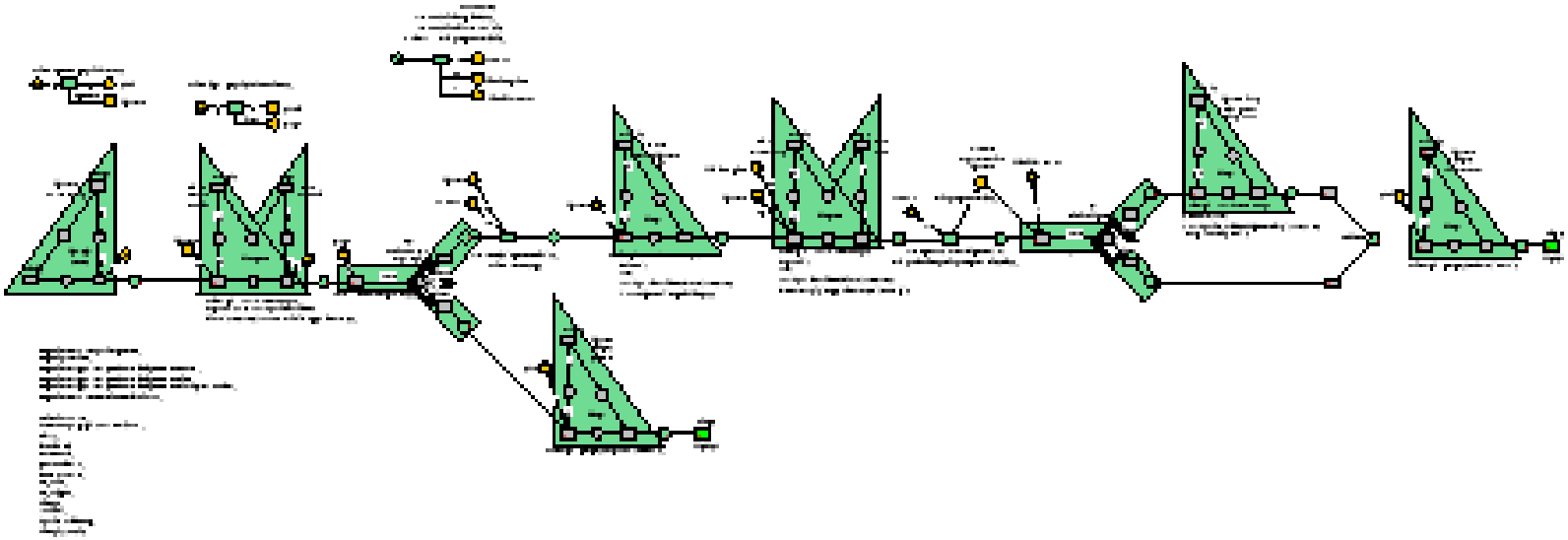
From Model to Protocol:Step 1



From Model to Protocol:Step 2



From Model to Protocol:Step 3



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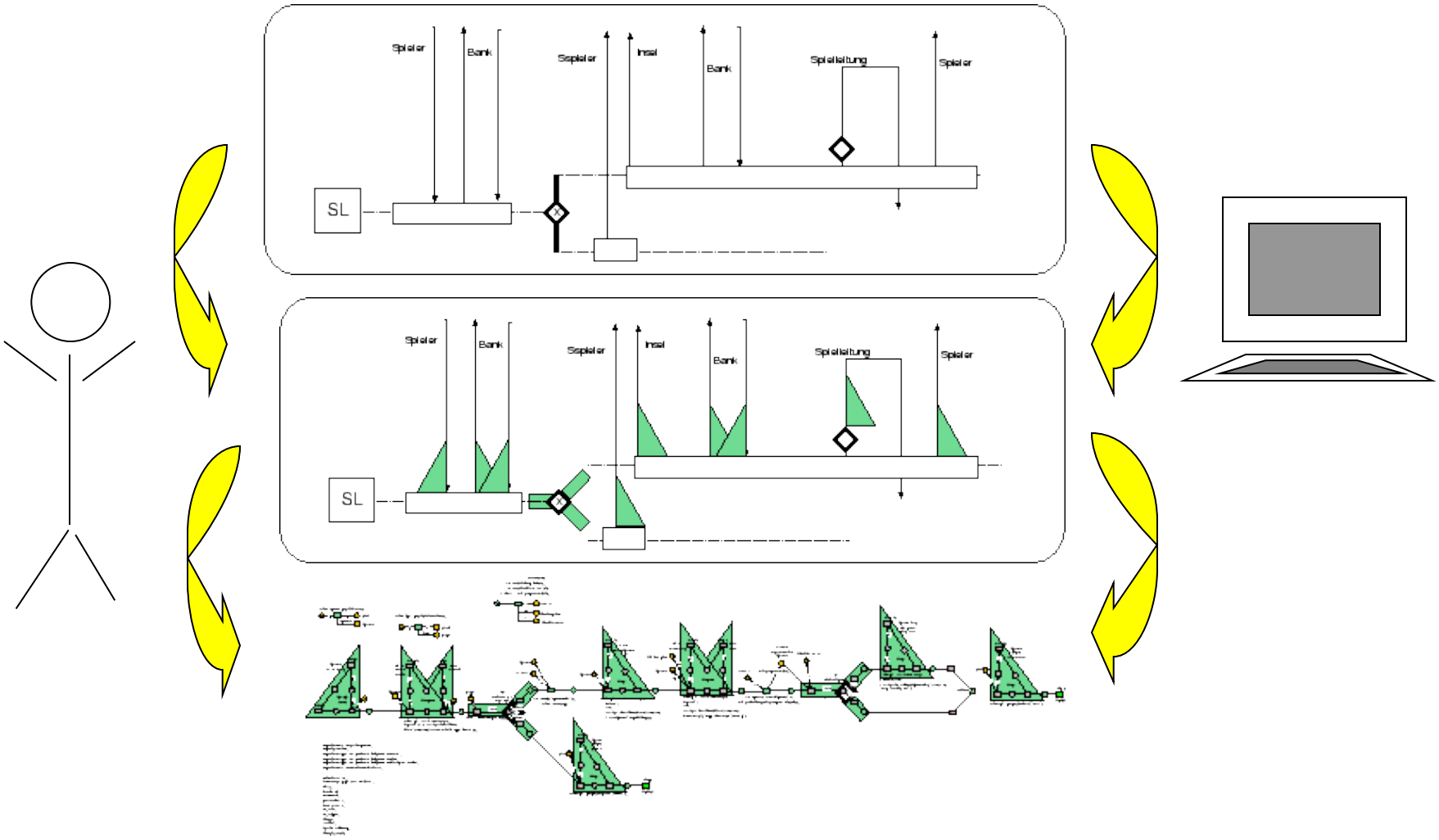
Results

- Common design
- Reduction of recurrent activities
- Faster development
- (Instant design)

Outlook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Sources

- **FIPA** http://www.fipa.org
- **Mulan** http://www.informatik.uni-hamburg.de/tgi/
- Project AOSE2001 DanielMoldt, Michael Köhler, Heiko Röhlke
- **Net-Components** *Development of Geometrically Distinguishable Components for the Unification of the Appearance of Mulan-Protocols*, Lawrence Cabac

Thank You for your attention!