Explicit Connectors for Coordination of Active Objects

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Platform: Smalltalk (VisualWorks2.0)

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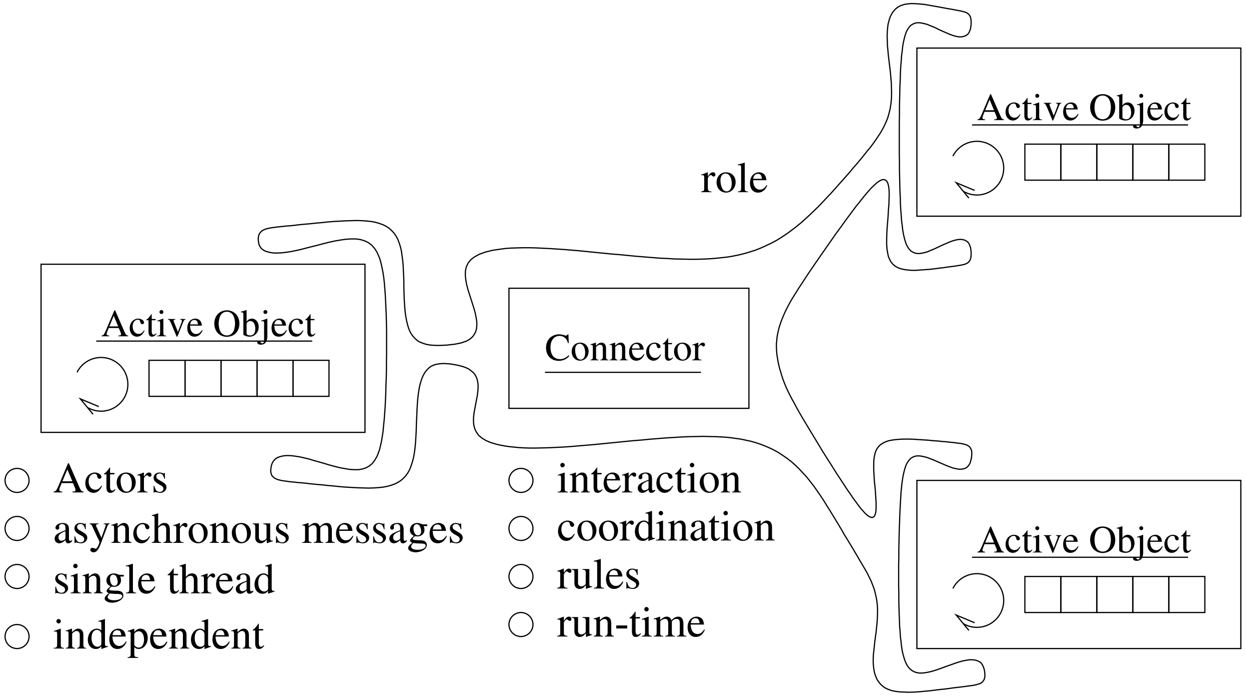
Presentation:

Goal: The FLO/c model allows object-oriented declaration of high-level **multi-object coordination**.

1. Separation of Concerns



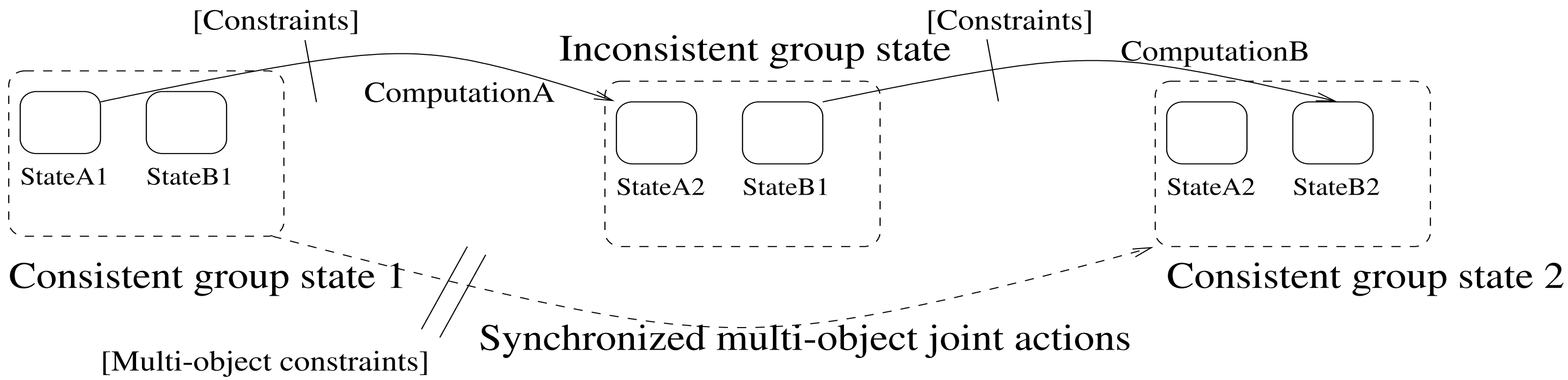
- Components vs connectors in software architecture design (Allen&Garlan).
- Computation vs coordination in parallel programming (Carriero&Gelernter).
- Domain specific code vs synchronization code in concurrent progams (Bloom).

2. Explicit Dynamic Connectors

- Run-time objects that **implement interaction** between active objects.
  - ☞ Therefore the ideal location for coordination mechanisms.
  - ☞ Run-time dynamics.
- Connectors connect components. A Connector has *roles.* The connected components plays roles in their connector
- **Independency** of components (and vice versa).
- **Monitor messages,** react with messages and executions.
  - ☞ The connector can have states and methods, and use them to react.
  - ☞ The reaction is defined by a set of user defined rules, that trigger on requests (messages).
- Can connect **groups** of objects.
- Can **collaborate with other connectors**, adding additional global properties (e.g. fairness).

3. Coordination Abstraction using Rules

Connectors react upon message sends of the objects they control.
The reaction is coded into **rules**.
Rule = request message, operator, consequence messages.
Coordination abstraction = Synchronized multi-object joint actions.



Operators to compose joint actions:

`implies`	push style computation ordering.
`impliesBefore`	pull style computation ordering.
`permittedIf`	balking style conditional synchronization.
`waitUntil`	blocking style conditional synchronization.

Operator to propagate requests (asynchronous & unprotected): `impliesLater`.

An Example Connector Specification

```
MetaConnector new;
   inheritsForm: AbstractConnector;
   name: 'JumpNCatchConnector';
   roles: 'dancer1 dancer2';
   rules: '
         dancer1jumps.     implies dancer2 catches. endRule
         dancer2 catches.  waitUntil dancer2 armsAreFree. endRule
         dancer1 jumps.    impliesLater dancer1 jumps. endRule '
```

Goal reached? Rules compose multi-object joint actions.

Joint actions can model:

- ❑ Multi-object constraints (Synchronizers of Frolund&Agha).
- ❑ Mutual exclusion on shared resources.
- ❑ Transactions.

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