

Scalable and reusable models for HLA-Ptolemy
cosimulation framework
2016 Ptolemy Miniconference

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HLA three main goals

Interoperability

Plug and play federates inside a federation

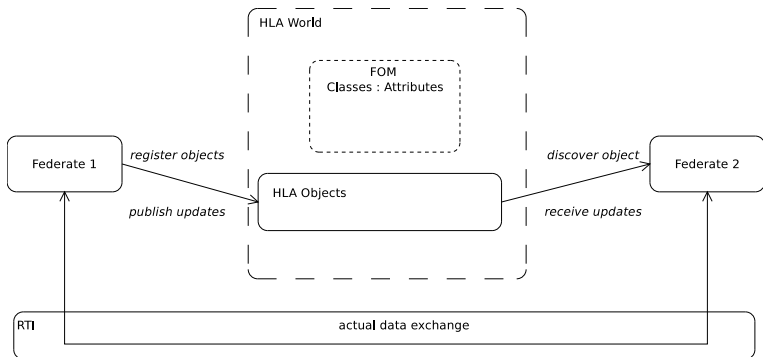
Reusability

A federate can easily be used in another federation

Reproductability

Same results from one run to another

The HLA world



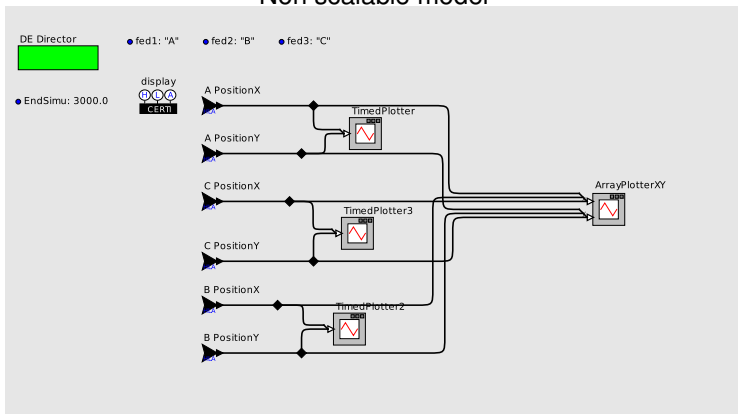
Reusability with the previous version

Goal

Reuse models from one simulation to another without any changes

Can't make any assumption on the number of HLA objects to handle

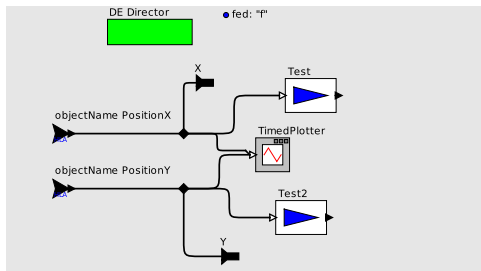
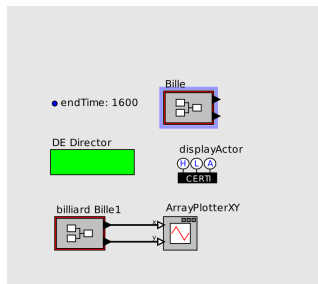
Non scalable model



Key idea number 1

Use Ptolemy classes and objects to simplify the design phase

One HLA class -> One Ptolemy class with HLASubscriber inside

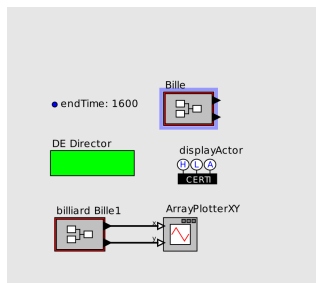


Key idea number 2

Instantiate a new actor when an object is discovered if needed

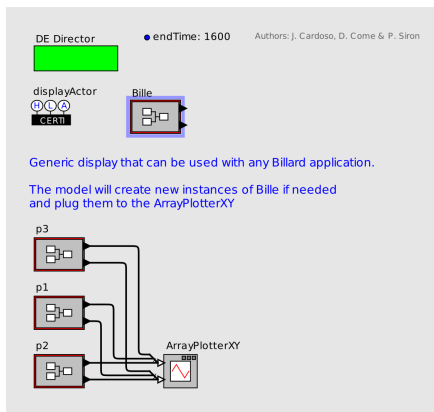
Minimal model design required

Previous model handling 3 objects



Federation :

- 3 bouncing balls, each own by a federate
- The display shown previous slide

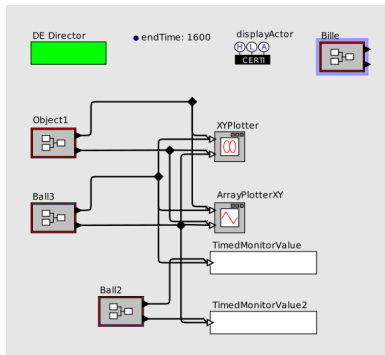
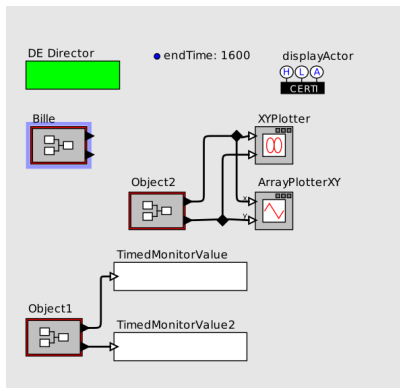


What to do with new objects

Main idea

Use existing instances like role model

Visual explanation of the policy used



Removing an actor

$$CR_{A_i}^- : H \mapsto \{A_i \in H, i \neq j\} \quad (1)$$

Adding an actor

$$CR_A^+ : H \mapsto H \cup \{A\} \quad (2)$$

An atomic actor A is extended in

$$A' = (I, O, S', s'_0, F', P', D', T') \quad (3)$$

with

$$S' = S \cup \{CR\} \quad (4)$$

$$s'_0 = s_0 \cup \{CR \mapsto \emptyset\} \quad (5)$$

$$F'(s, x) = \begin{cases} F(s, x) & \text{if } CR = \emptyset \\ \forall o \in O, o = \perp & \text{otherwise} \end{cases} \quad (6)$$

$$P'(s, x) = \begin{cases} P(s, x) & \text{if } CR = \emptyset \\ s & \text{otherwise} \end{cases} \quad (7)$$

$$D'(s, x) = \begin{cases} D(s, x) & \text{if } CR = \emptyset \\ 0 & \text{otherwise} \end{cases} \quad (8)$$

$$T'(s, x, d) = \begin{cases} T(s, x, d) & \text{if } CR = \emptyset \\ (s, CR \mapsto \emptyset) & \text{otherwise} \end{cases} \quad (9)$$

$$\bigodot_{f \in A} f(H) = \begin{cases} f_1 \circ \dots \circ f_n(H) & \text{if } H \neq \emptyset \\ \text{Identity} & \text{otherwise} \end{cases} \quad (10)$$

$$CRs = \bigcup_{i=1}^n CR \quad (11)$$

$$P'(s, x) = \{P(s, x) \mid H \mapsto \bigodot_{f \in CRs} f(H)\} \quad (12)$$

```
For each iteration
  execute Change Requests
  initialize new actors
  pre = director.prefire
    processHLAMessages()
  if (pre = true)
    director.fire
    for each actor A to fire
      if (A.prefire)
        A.fire
        A.postfire
    director.postfire
```

- HLA and Ptolemy : both great technologies
 - HLA-CERTI : tries to bring the best of them to model designers
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- Tried to eased the designer life
 - First good step, more work to do