Event-based Environments Research

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Outline

- Event-based SEEs
- Basic requirements
- Exemplar: Serendipity-II process management environment
  - process (“workflow”) modelling
  - process enactment, tool co-ord
  - architecture/design issues
  - tool integration (mapping) issues
  - event/exception handling (John H to cover)

Summary of our Event-based SEEs work...

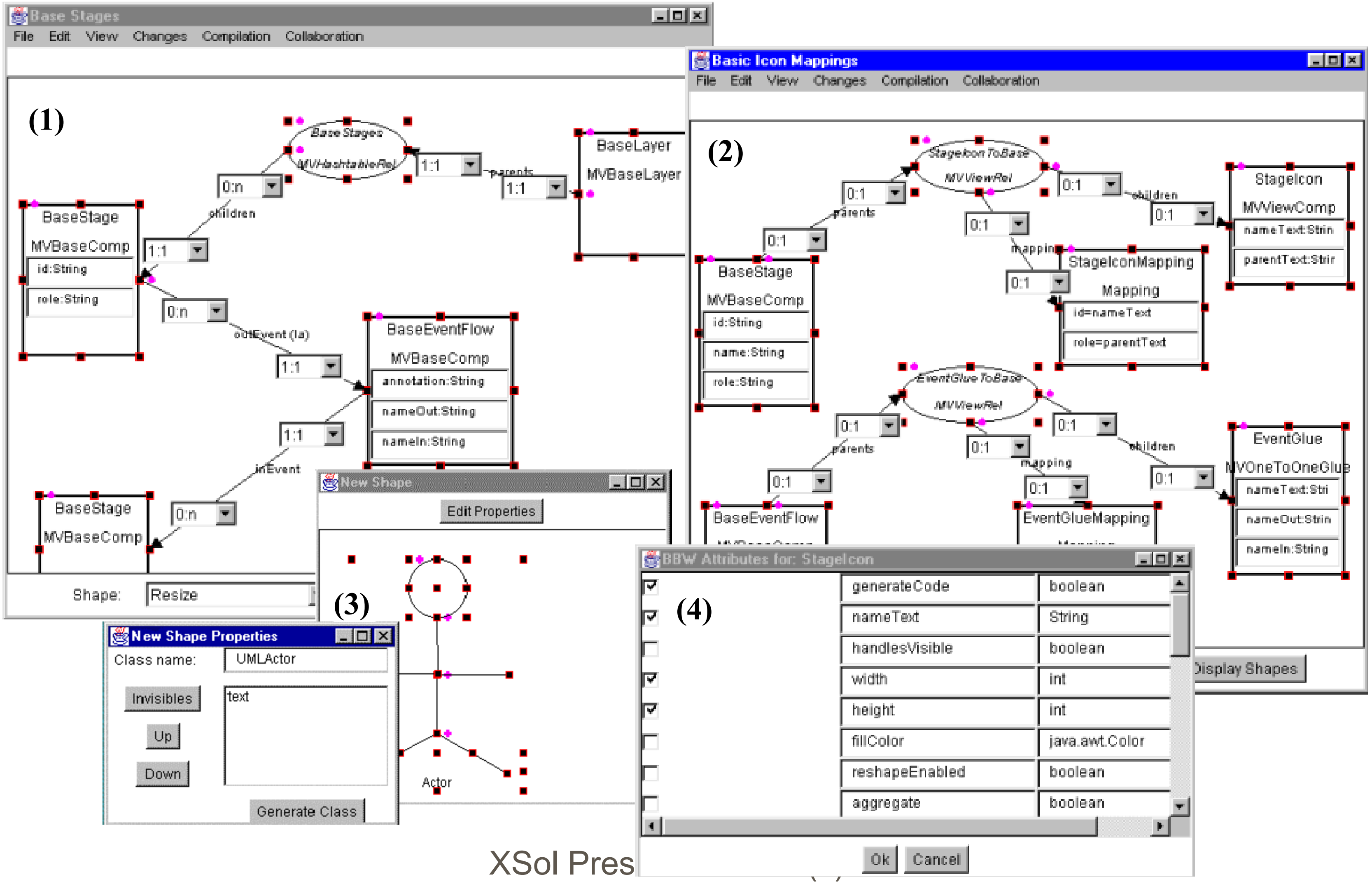
- Want:
  - integrated, multi-view support (visual langs + textual)
  - multi-user support, distributed
  - flexible, configurable
  - run-time extensible, integrate 3rd party tools

  Software engineering tools ("SEEs")
- Built architecture to realise these (JViews)
- Built lots of tools:
  - JComposer, JVisualise, Serendipity-II, SoftArch, BuildByWire, ...

Example: JViews

- Architecture for building event-based SEEs
- Abstractions:
  - uses extended JavaBeans component model
  - multiple view support
  - repository, distribution support
  - multi-user support
  - extensible user interfaces
  - limited tool integration support

Example: JComposer/BBW



☑	generateCode	boolean
☑	nameText	String
□	handlesVisible	boolean
☑	width	int
☑	height	int
□	fillColor	java.awt.Color
□	reshapeEnabled	boolean
□	aggregate	boolean

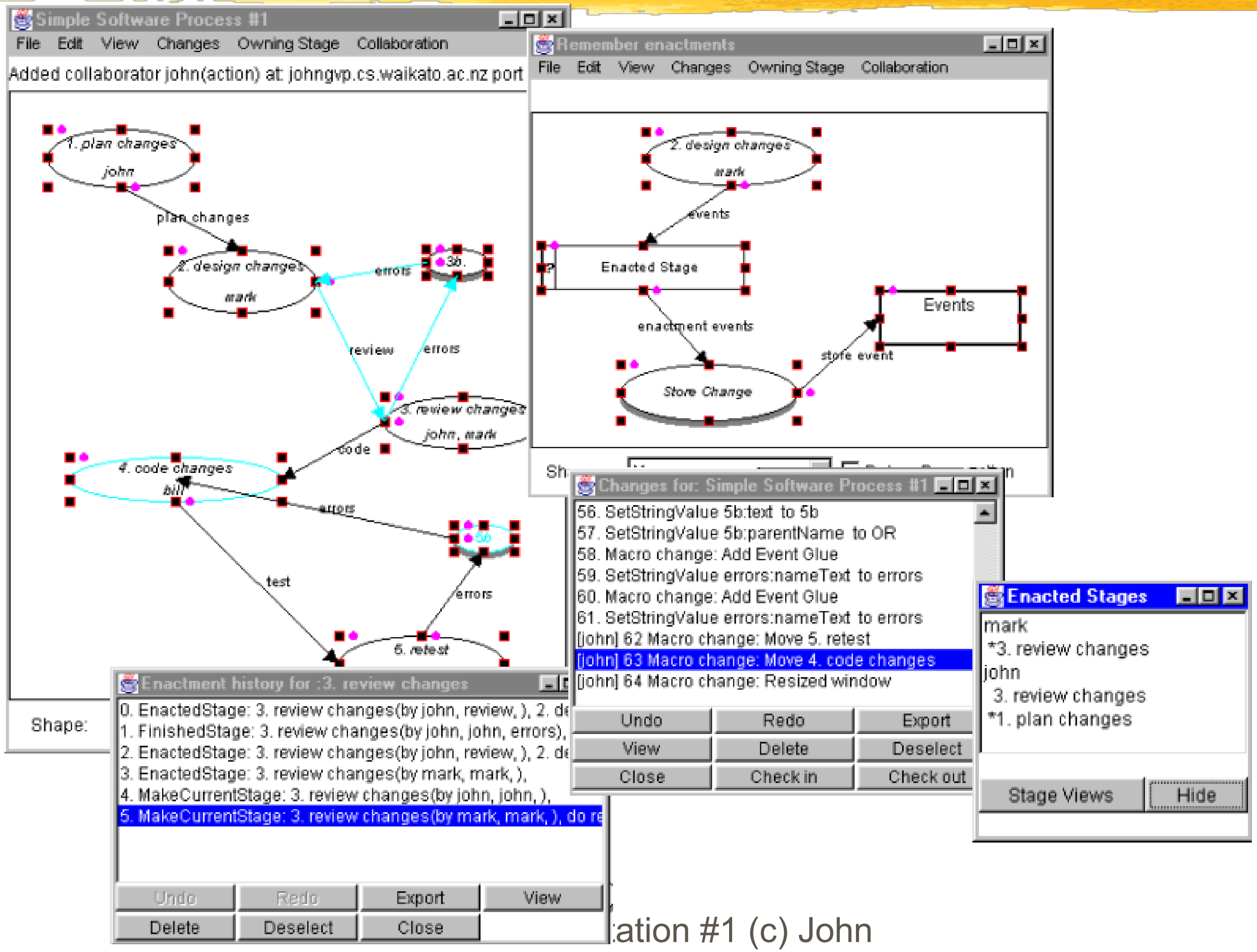
XSol Pres

Grundy 2000

Example: Serendipity-II

- Process modeling & enactment environment
- Process modeling:
  - multiple, visual views (overlapping & hierarchical)
  - multiple user editing support
  - event processing visual language
- Process enactment:
  - decentralised enactment engine; view highlights
  - decentralised to-do lists, task automation
  - tool integration

Example in use...



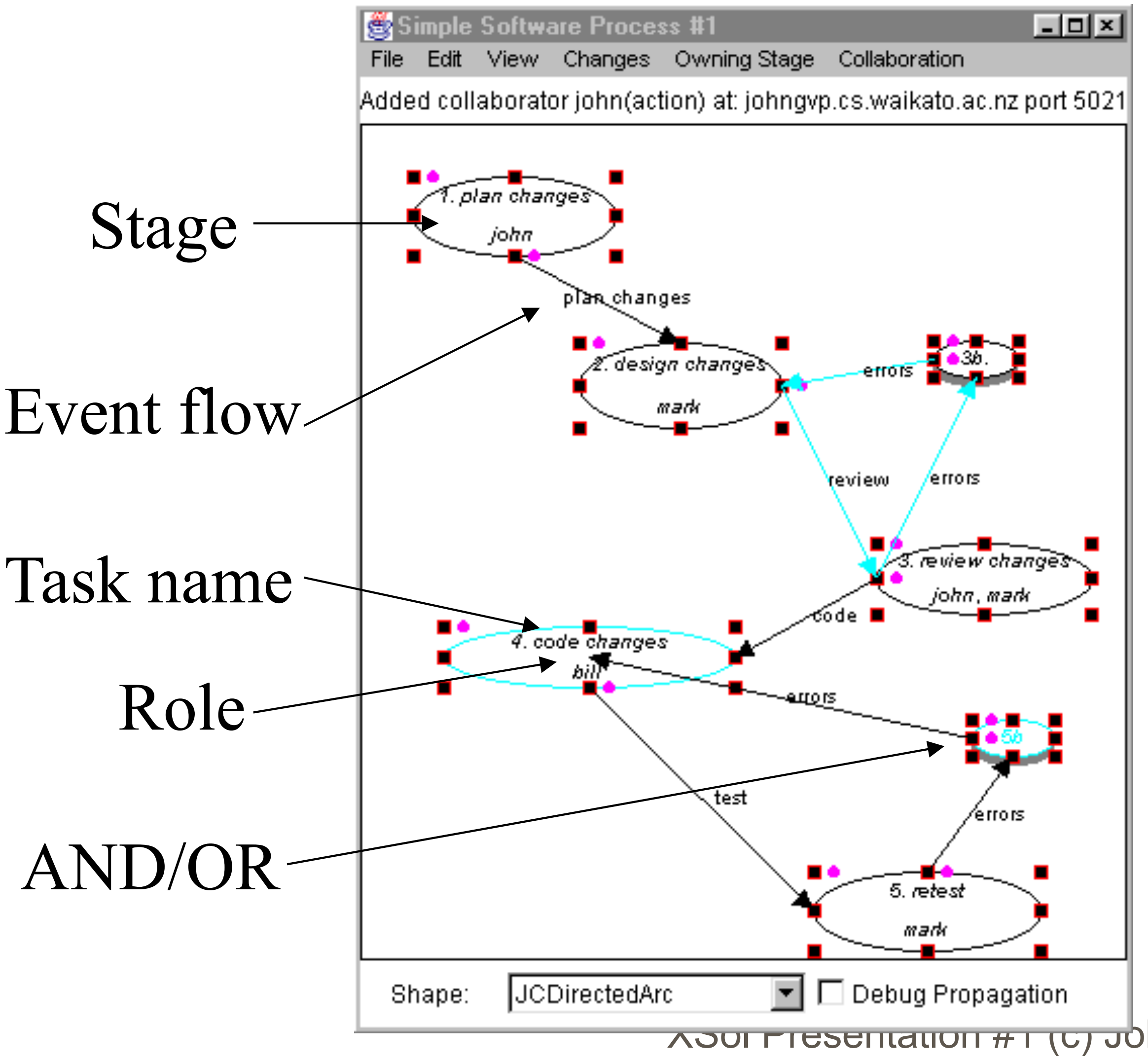
Added collaborator john(action) at: johngvp.cs.waikato.ac.nz port

56. SetStringValue 5b:text to 5b
57. SetStringValue 5b:parentName to OR
58. Macro change: Add Event Glue
59. SetStringValue errors:nameText to errors
60. Macro change: Add Event Glue
61. SetStringValue errors:nameText to errors
[john] 62 Macro change: Move 5. retest
[john] 63 Macro change: Move 4. code changes
[john] 64 Macro change: Resized window

mark
*3. review changes
john
3. review changes
*1. plan changes

0. EnactedStage: 3. review changes(by john, review,), 2. de
1. FinishedStage: 3. review changes(by john, john, errors),
2. EnactedStage: 3. review changes(by john, review,), 2. de
3. EnactedStage: 3. review changes(by mark, mark,),
4. MakeCurrentStage: 3. review changes(by john, john,),
5. MakeCurrentStage: 3. review changes(by mark, mark,), do re

Process modeling (1)

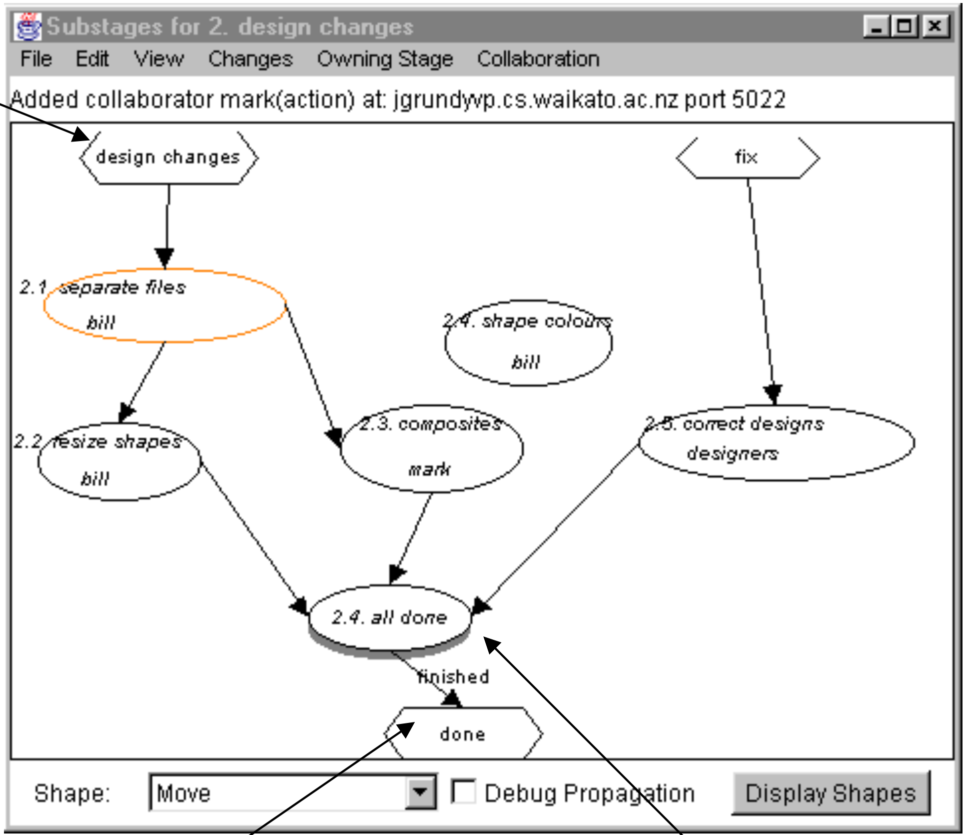


Added collaborator john(action) at: johngvp.cs.waikato.ac.nz port 5021

- Multiple, visual views
- Process model, process stage, sub-stages notions
- Collaboratively edit
- Can have “private” views

Process modeling (2)

Start Stage



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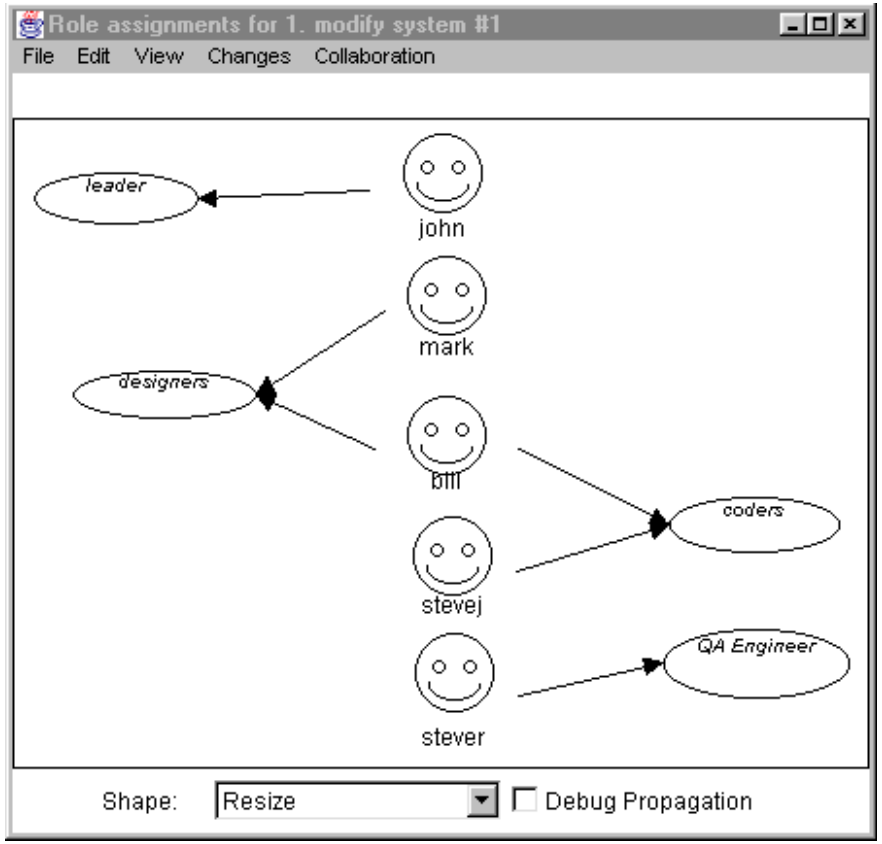
Stop stage

AND (sync)

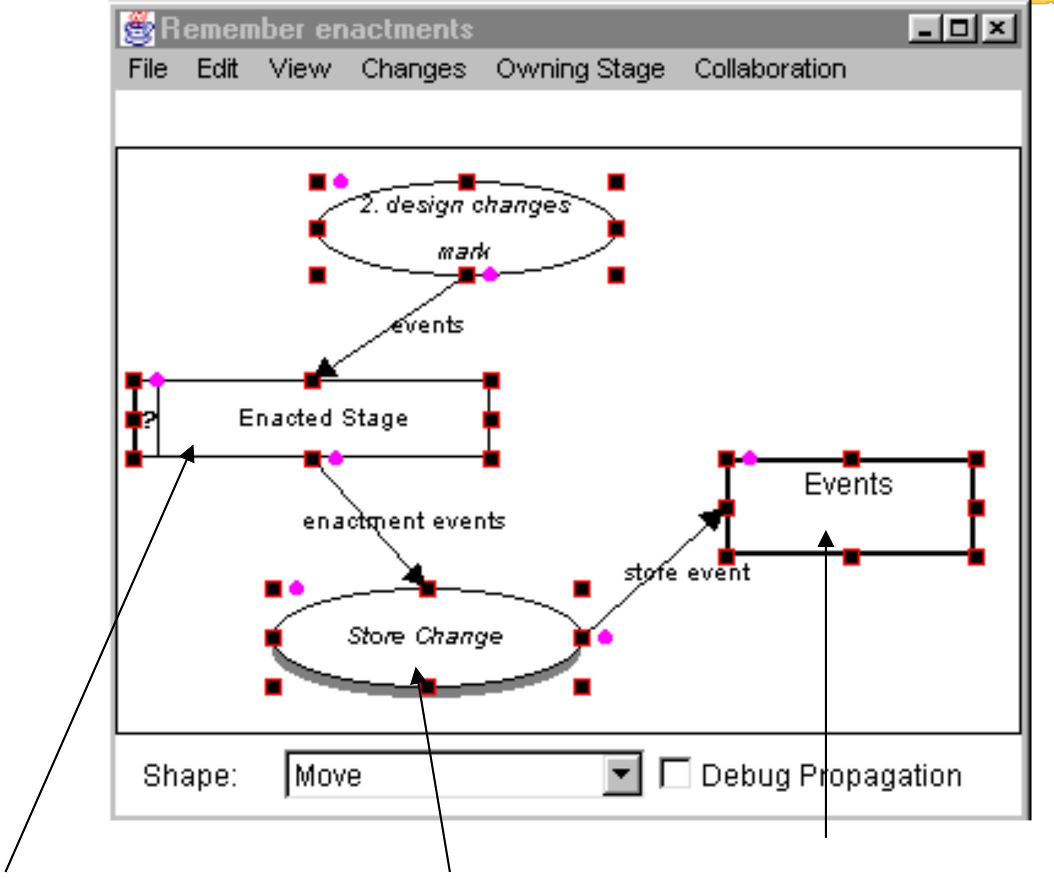
- Sub-process views
- Start/stop stages
- AND/OR, constraints
- Inter-task synchronisation
- “Partially complete” models

Process modelling (3)



- Extra process info:
  - Role assignment
  - Resource assignment
  - Tool assignment
- Shared vs private process info

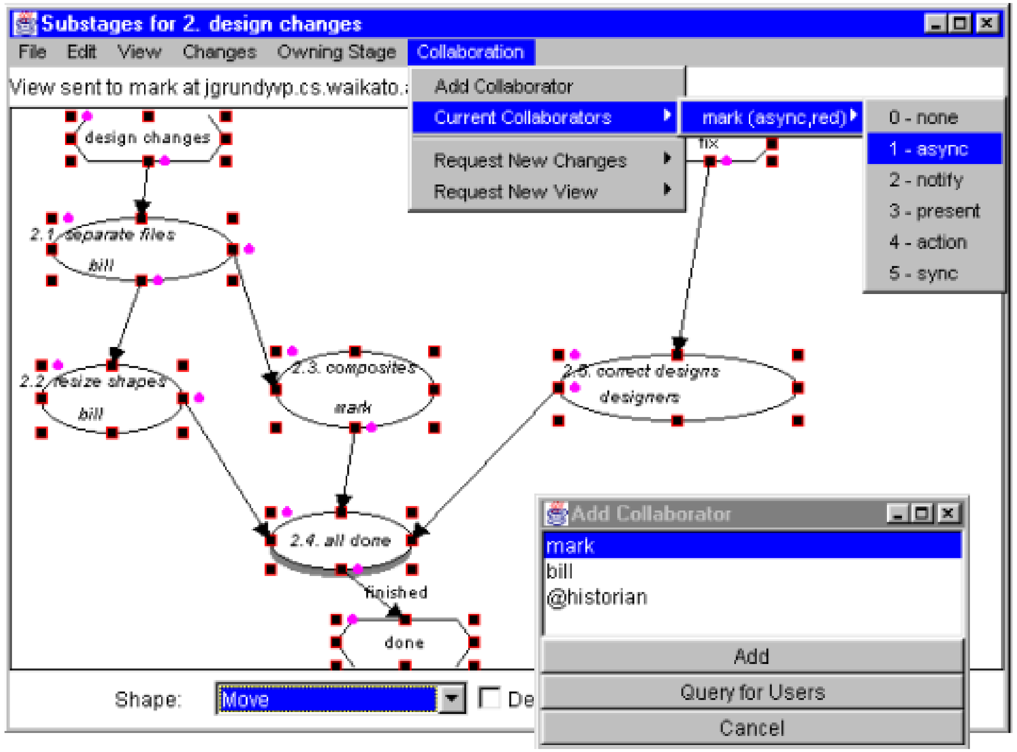
Process modeling (4)



Filter Action Resource

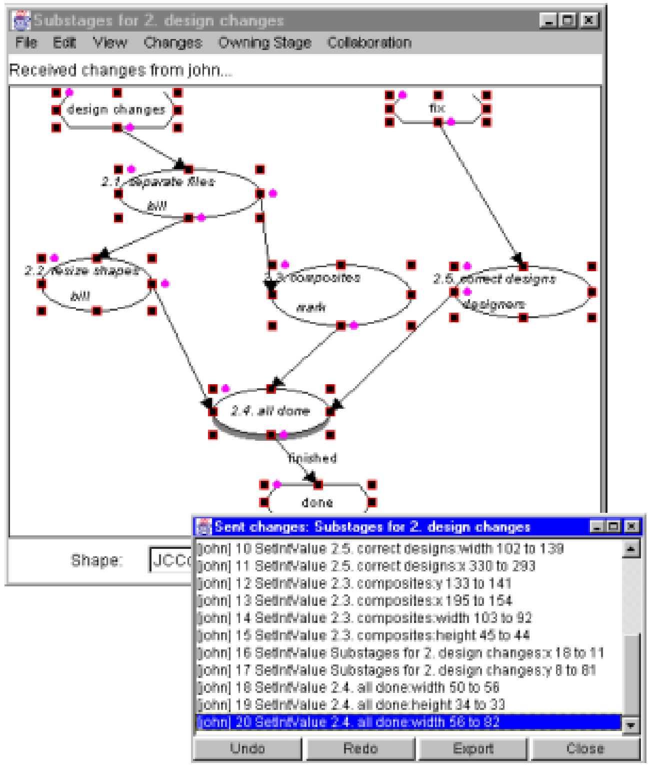
- Event handling
- Visual language for specifying arbitary event filtering/actioning
- All kinds of uses
- John H will describe in more detail...

Collaborative Editing



View sent to mark at jgrundywp.cs.waikato.a

(a) John's view



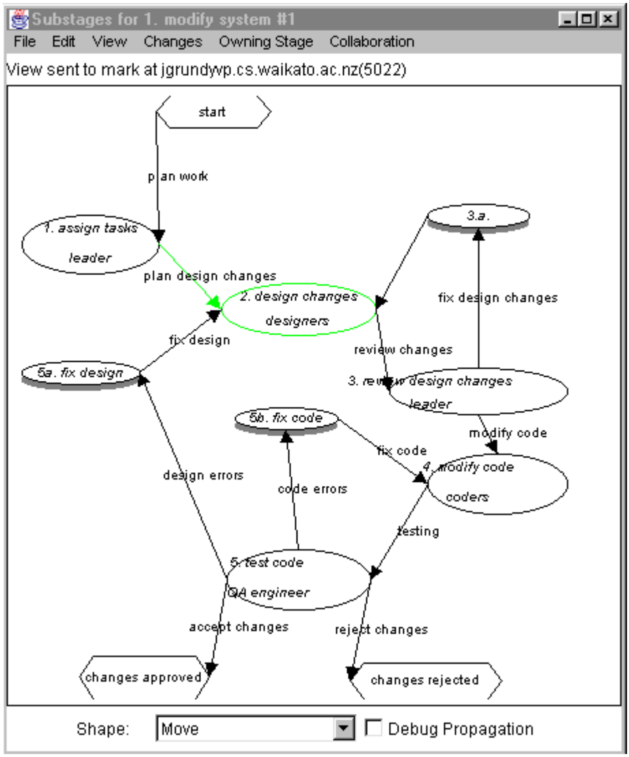
Received changes from john...

```
[john] 10 SetIntValue 2.5. correct designs:width 102 to 139
[john] 11 SetIntValue 2.5. correct designs:x 330 to 293
[john] 12 SetIntValue 2.3. composites:y 133 to 141
[john] 13 SetIntValue 2.3. composites:x 195 to 154
[john] 14 SetIntValue 2.3. composites:width 103 to 92
[john] 15 SetIntValue 2.3. composites:height 45 to 44
[john] 16 SetIntValue Substages for 2. design changes:x 18 to 11
[john] 17 SetIntValue Substages for 2. design changes:y 8 to 81
[john] 18 SetIntValue 2.4. all done:width 50 to 56
[john] 19 SetIntValue 2.4. all done:height 34 to 33
[john] 20 SetIntValue 2.4. all done:width 56 to 82
```

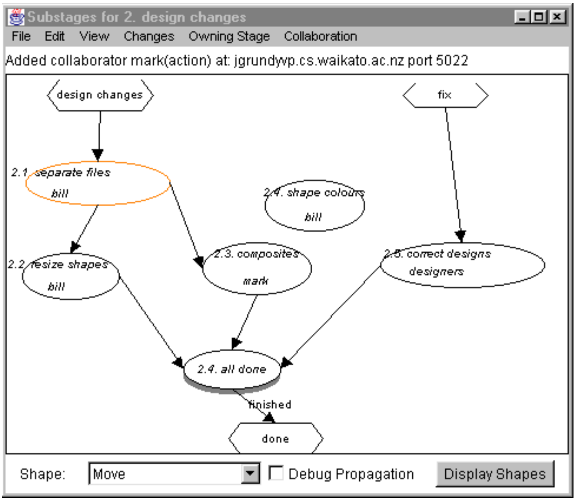
(b) Mark's View

- Asynchronous to synchronous supported...

Process enactment (1)



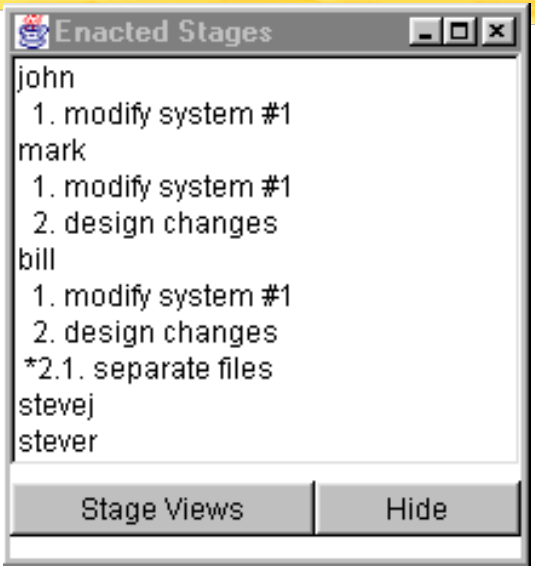
View sent to mark at jgrundywp.cs.waikato.ac.nz(5022)



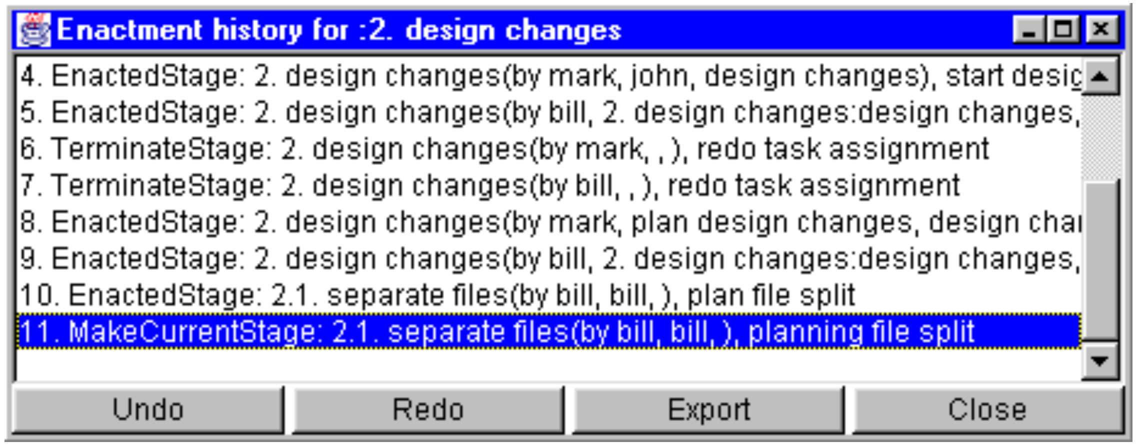
Added collaborator mark(action) at: jgrundywp.cs.waikato.ac.nz port 5022

- Enact (run) process to co-ordinate work…
- Stages enacted, suspended, terminated, completed, “current work”
- Multiple roles…

Process enactment (2)



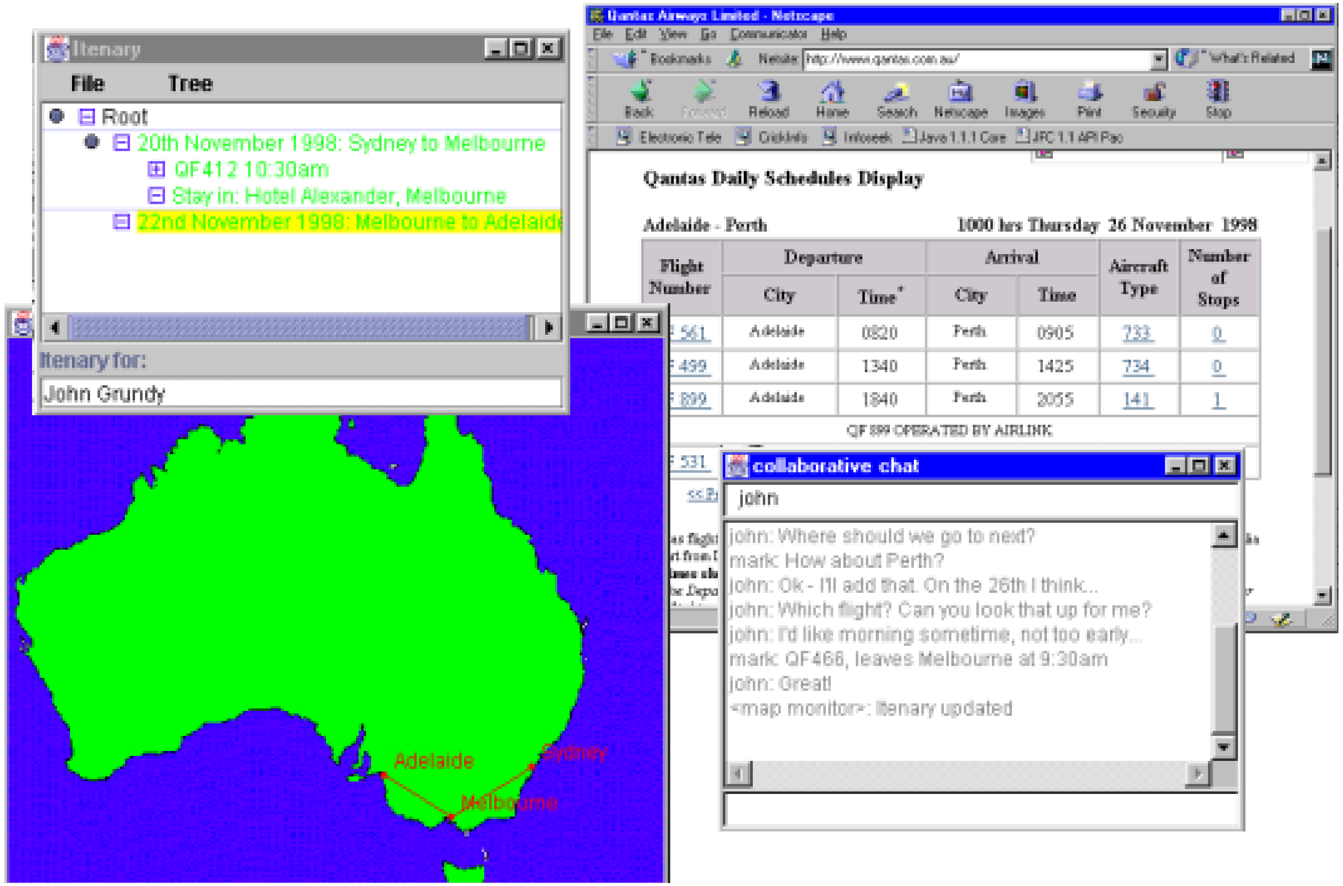
```
john
  1. modify system #1
mark
  1. modify system #1
  2. design changes
bill
  1. modify system #1
  2. design changes
 *2.1. separate files
stevej
stever
```



```
4. EnactedStage: 2. design changes(by mark, john, design changes), start desic
5. EnactedStage: 2. design changes(by bill, 2. design changes:design changes,
6. TerminateStage: 2. design changes(by mark, , ), redo task assignment
7. TerminateStage: 2. design changes(by bill, , ), redo task assignment
8. EnactedStage: 2. design changes(by mark, plan design changes, design chai
9. EnactedStage: 2. design changes(by bill, 2. design changes:design changes,
10. EnactedStage: 2.1. separate files(by bill, bill, ), plan file split
11. MakeCurrentStage: 2.1. separate files(by bill, bill, ), planning file split
```

- Enactment history - enactment events
- To-do list - shared
- Group awareness

Tool integration/building collaborative systems...



- Root
  - 20th November 1998: Sydney to Melbourne
    - QF412 10:30am
    - Stay in: Hotel Alexander, Melbourne
  - 22nd November 1998: Melbourne to Adelaide

Itenary for: John Grundy

Qantas Daily Schedules Display

Adelaide - Perth 1000 hrs Thursday 26 November 1998

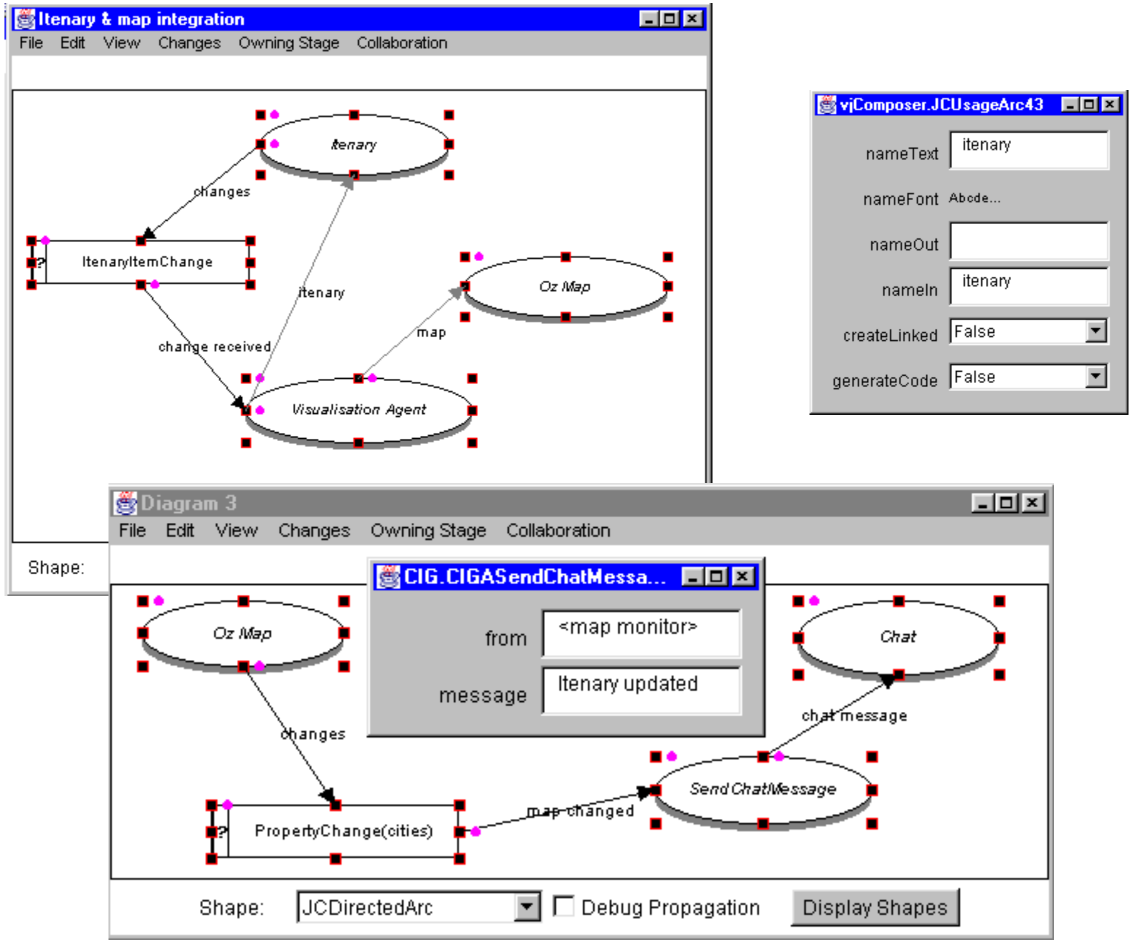
Flight Number	Departure		Arrival		Aircraft Type	Number of Stops
	City	Time*	City	Time		
F 561	Adelaide	0820	Perth	0905	733	0
F 499	Adelaide	1340	Perth	1425	734	0
F 899	Adelaide	1840	Perth	2055	141	1
QF 899 OPERATED BY AIRLINK						
F 531						

john

john: Where should we go to next?
mark: How about Perth?
john: Ok - I'll add that. On the 26th I think...
john: Which flight? Can you look that up for me?
john: I'd like morning sometime, not too early...
mark: QF466, leaves Melbourne at 9:30am
john: Great!
<map monitor>: Itenary updated

- Collaborative travel itinerary planner
- Textual & visual views
- Collaboratively edit
- Built by composing comps in Ser-II

Specification in Serendipity



nameText: itenary

nameFont: Abcde...

nameOut:

nameIn: itenary

createLinked: False

generateCode: False

from: <map monitor>

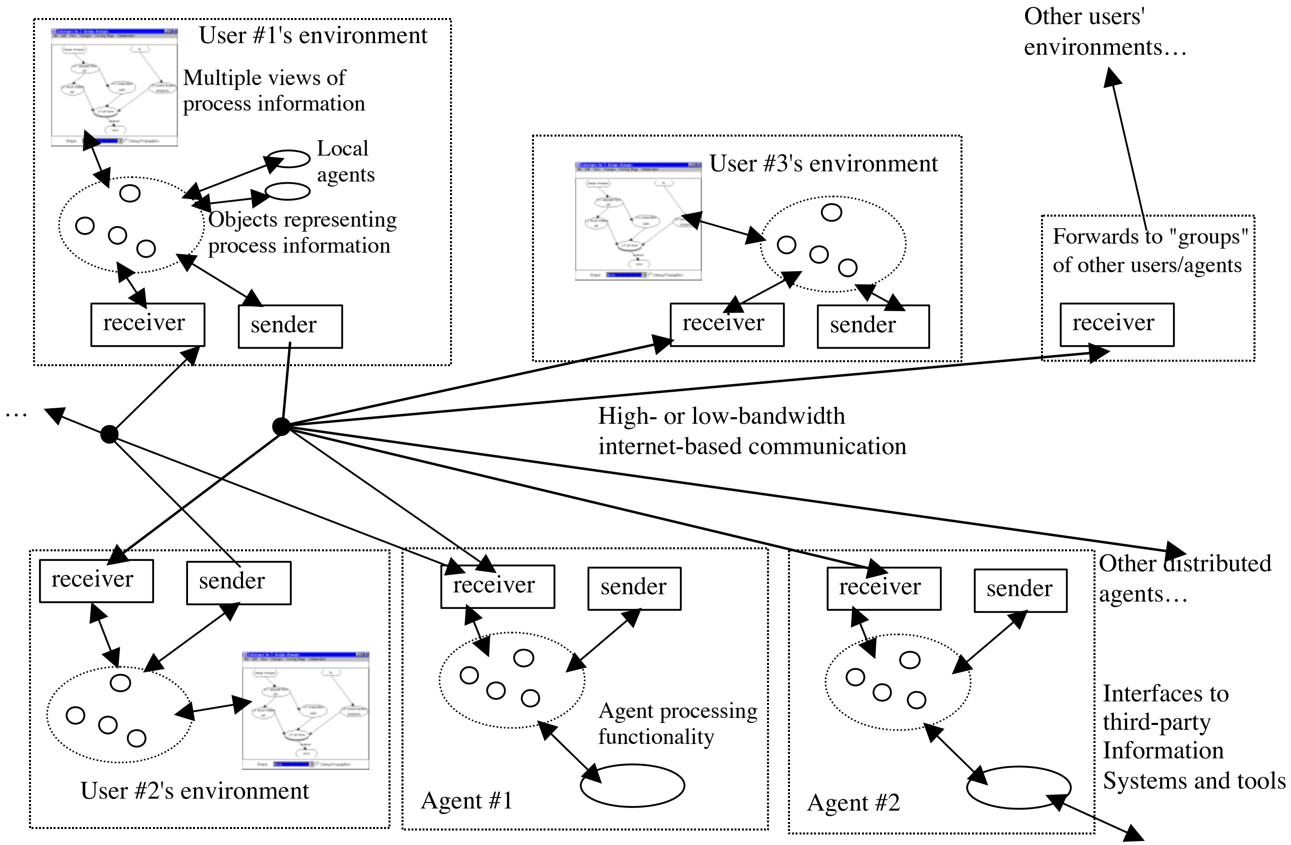
message: Itenary updated

Shape: JCDirectedArc

☐ Debug Propagation

- Create/link various components
- Event handling VL from Ser-II used
- Can co-ord usage with Ser-II process models...

Architecture (1)

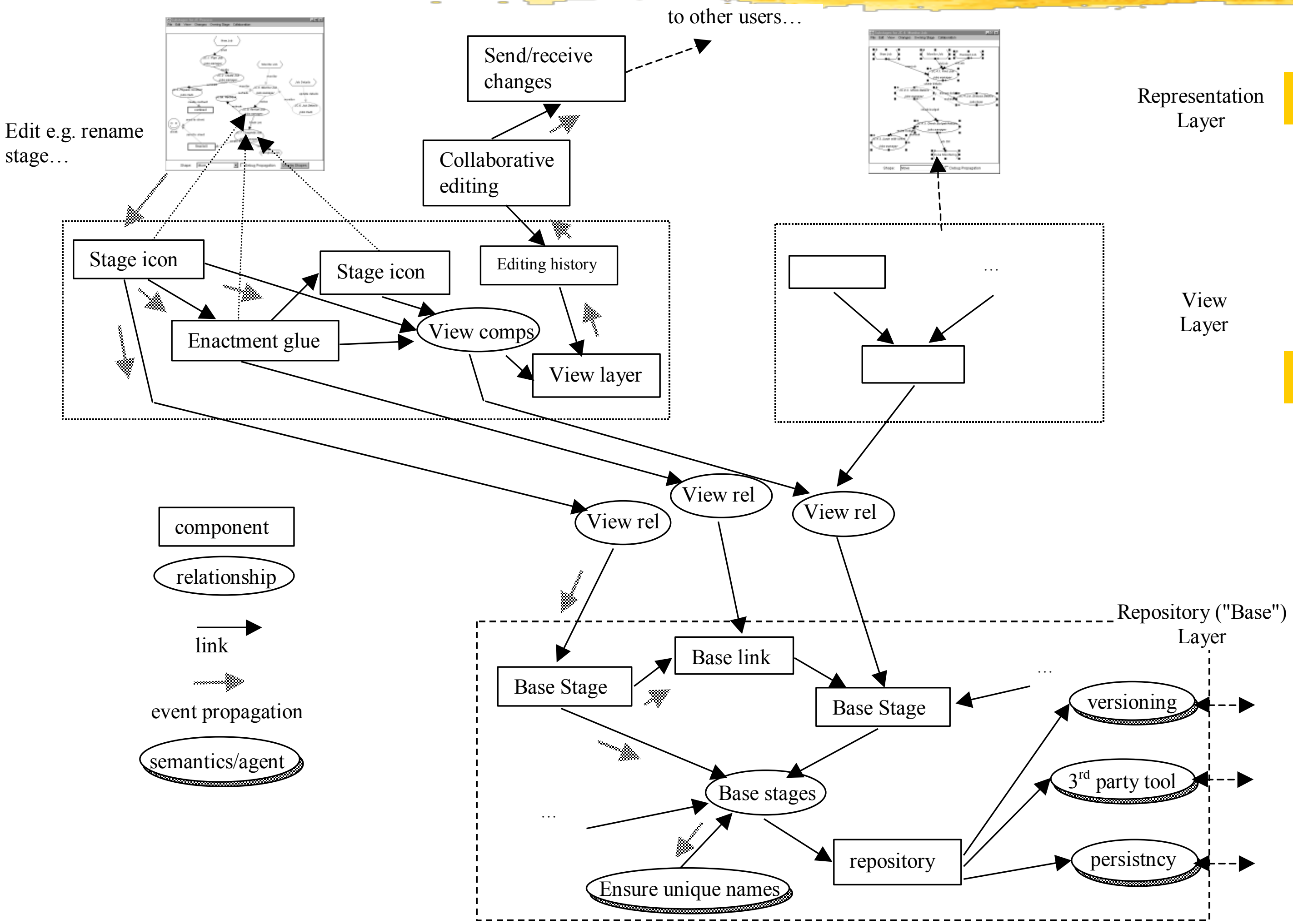

User #1's environment
Multiple views of process information
Local agents
Objects representing process information
receiver
sender
User #3's environment
receiver
sender
Other users' environments…
Forwards to "groups" of other users/agents
receiver
…
High- or low-bandwidth internet-based communication
receiver
sender
User #2's environment
receiver
sender
Agent processing functionality
Agent #1
receiver
sender
Agent #2
Other distributed agents…
Interfaces to third-party Information Systems and tools

- Decentralised
- Each env stores process model & views & “agents” (ie VL event handling specs)
- Exchange edit/ enactment events

Xsol-related Concepts...

- Integrating "work process" supporting tools
- Co-ordination of work via processes
- Versioning of process views (uses SID-like approach); exchange of updated view info
- Can enact different versions of processes
- Storage of event histories, to-do lists
- Decentralised arch uses "VDA"-like concept to cache info locally
- Exception handling important - via Ser-II/JViews events & VL-specified handlers

Architecture (2)



to other users…

Send/receive changes

Collaborative editing

Edit e.g. rename stage…

Representation Layer

Stage icon

Stage icon

Editing history

Enactment glue

View comps

View layer

…

View Layer

component

relationship

link

event propagation

semantics/agent

View rel

View rel

View rel

Repository ("Base") Layer

Base Stage

Base link

Base Stage

…

versioning

3rd party tool

persistntcy

Base stages

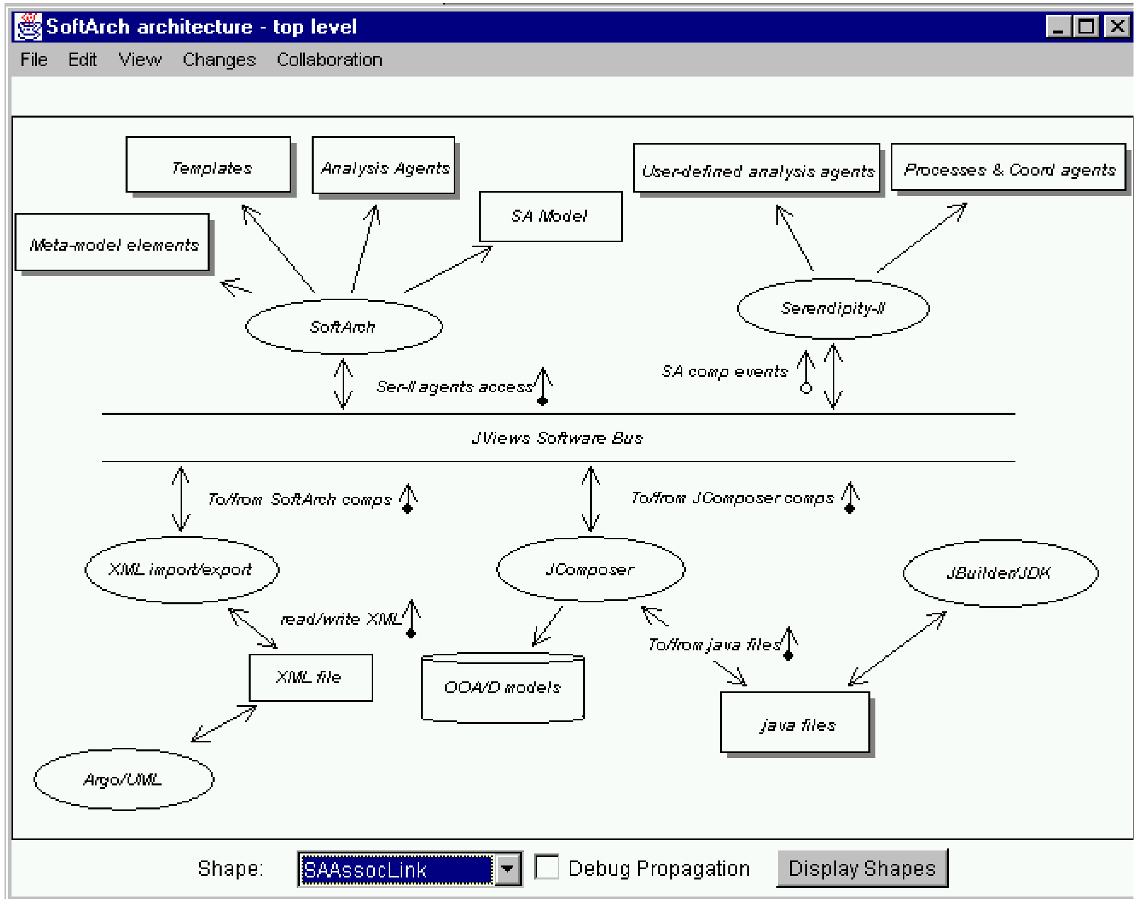
…

repository

Ensure unique names

- JViews structure of Ser-II
- Comps for repository (model); views; collaboration; persistency; tool integration etc

Tool integration (1)



Shape: SAAssocLink

☐ Debug Propagation

- Event “bus” to exchange info
- Ser-II co-ordinates usage of SoftArch, JComposer, Forte etc.
- Data exchange via XML; JViews events/comps

Tool integration (2)

- Integration of various SEEs:
  - OO, ER, ORM modelers - via “canonical” repository containing all shared info; map events between each repository & shared repository
  - SoftArch, Argo/UML - via XML-based encoding of OOA and OOD info; to/from SoftArch meta-model
  - SoftArch and JComposer - via generation/ interpretation of JComposer comps
  - Ser-II and various tools (Word, Excel, Access, Eudora, Netscape, shared file server) - via various comp-based interfaces (OLE, sockets, files, etc)

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