Generating Web-based User Interfaces for Diagramming Tools

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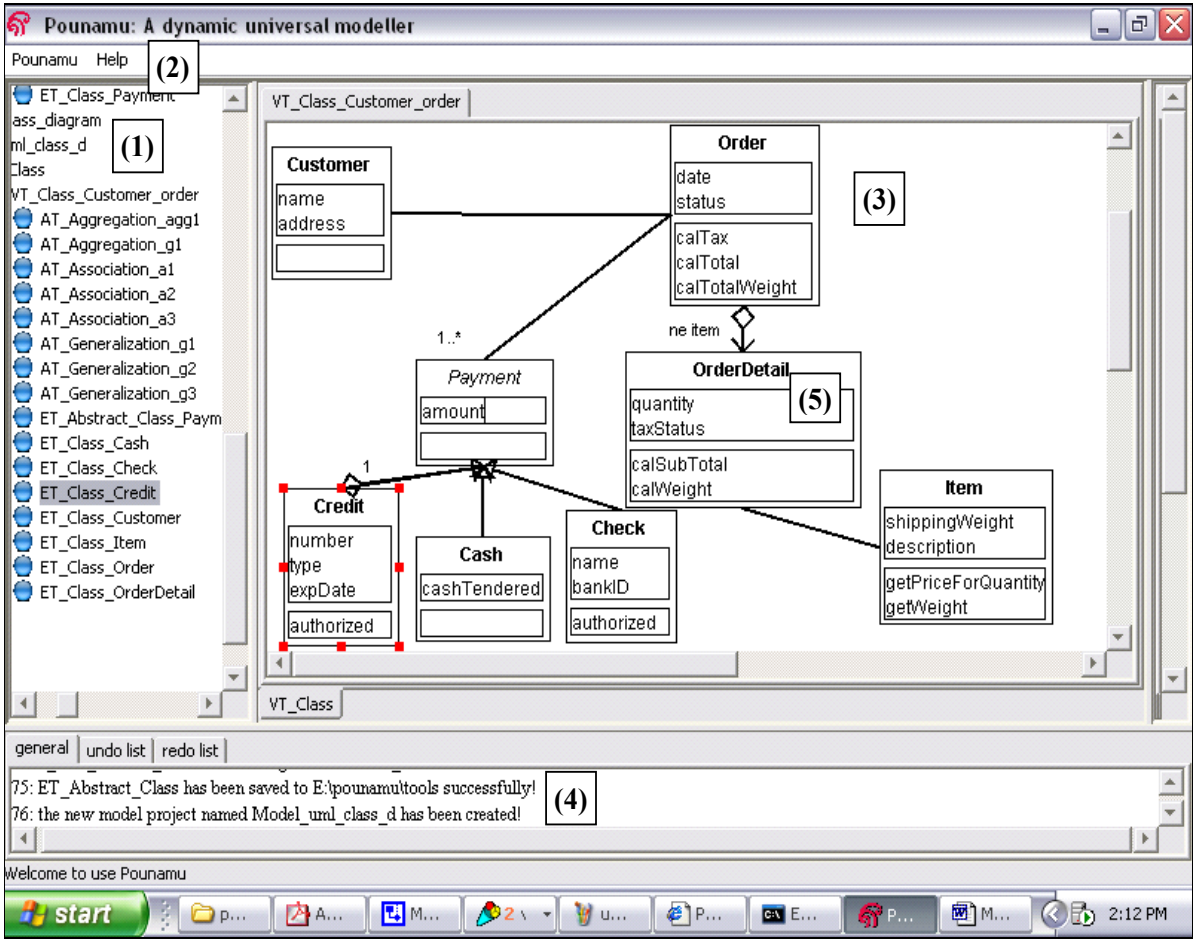
Outline

- Why need web-based diagramming tools??
- Overview of our approach
- Examples of using web-based diagramming:
  - GIF-based diagram editing
  - SVG server-side editing
  - SVG multi-update caching
  - SVG browser-side drag-and-drop
- Evaluation
- Conclusions and Future Research

Why Web-based Diagramming?



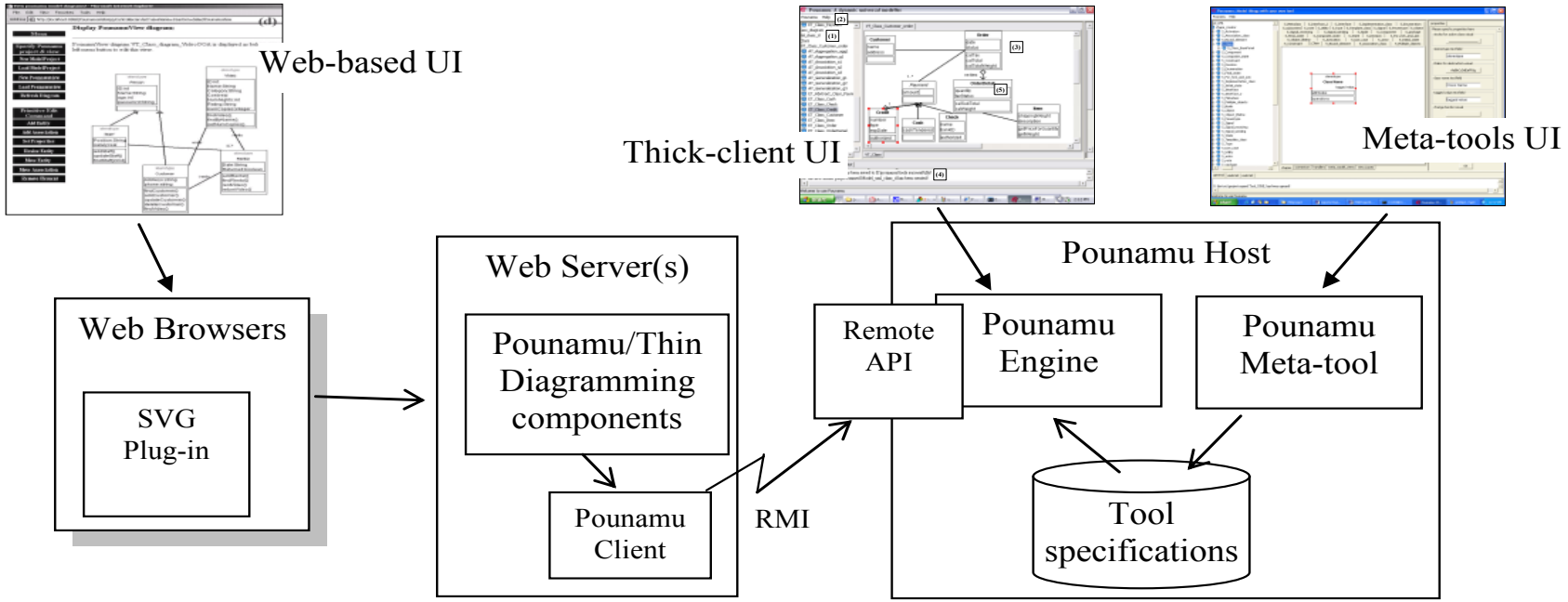
- Traditional CASE and other diagramming tools use "thick client" UI:
  - (1) hierarchy
  - (2) menus
  - (3) drawing pane
  - (4) messages
  - (5) pop-up menus, drag-and-drop editing
- Must install on all users' PCs/port to different OS etc
- Must update on all PCs
- Heavy-weight support for collaboration

Our Motivation

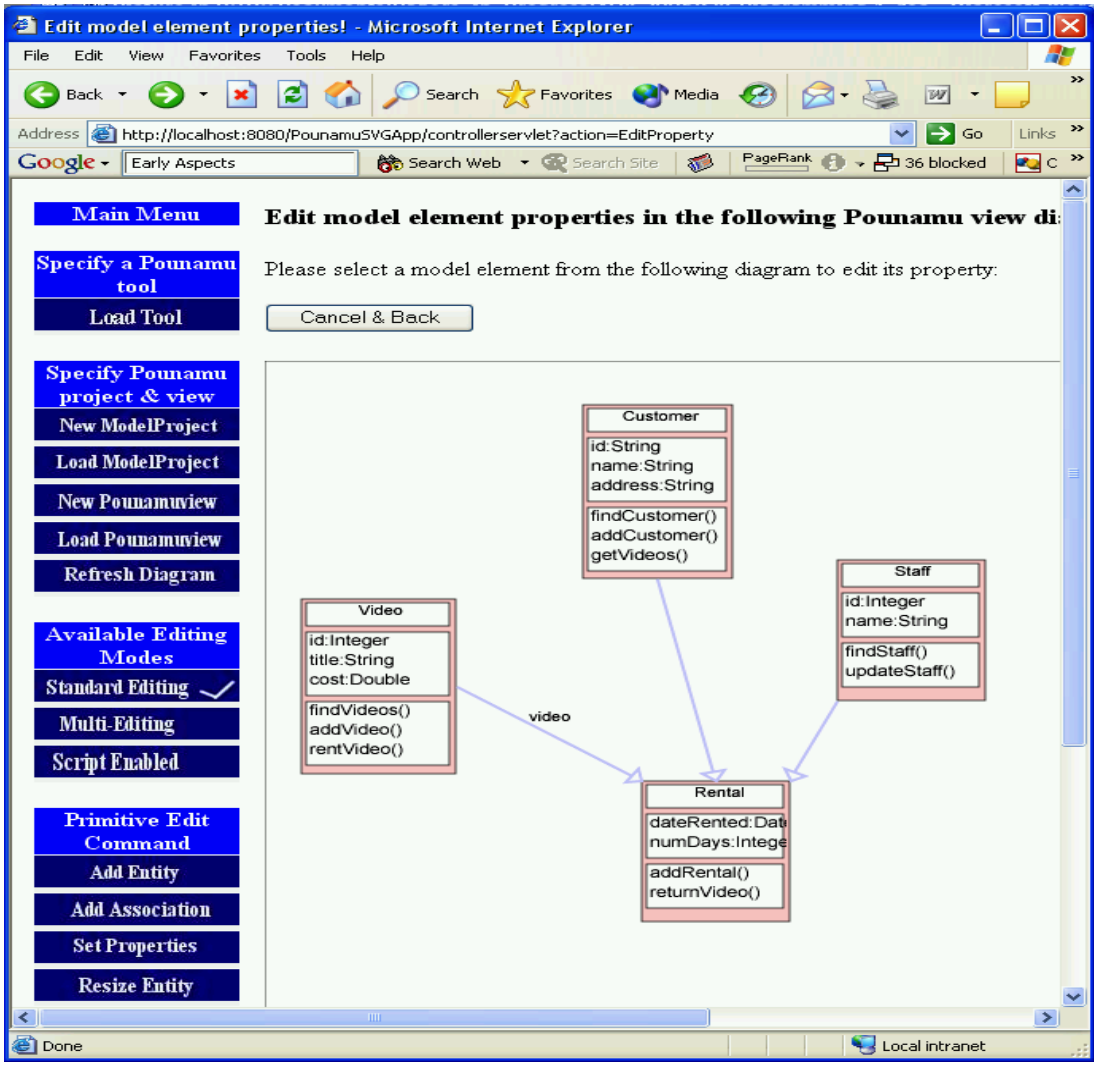
- Wanted to see if we could realise visual design tools in web browser
- Potential application areas for web-based diagramming:
  - E-learning, process modelling, data visualisation
  - Collaborative design
  - ASP model of design tool delivery
- Wanted to develop suitable architecture for these tools
- Wanted to explore usability of these tools
- Wanted to identify alternative editing approaches to thick-client e.g. page-based editing to fit web browser metaphor etc
- Wanted to support collaborative design using web-based architecture
- It was a fun challenge… ☺

Our Approach

- Add plug-in to existing thick-client meta-tool
- Web server to provide GIF and SVG diagram rendering
- Web browsers to render/post or with SVG plug-in support (limited) client-side scripting for drag-and-drop diagram editing
- Currently support diagram editing but not meta-facilities…

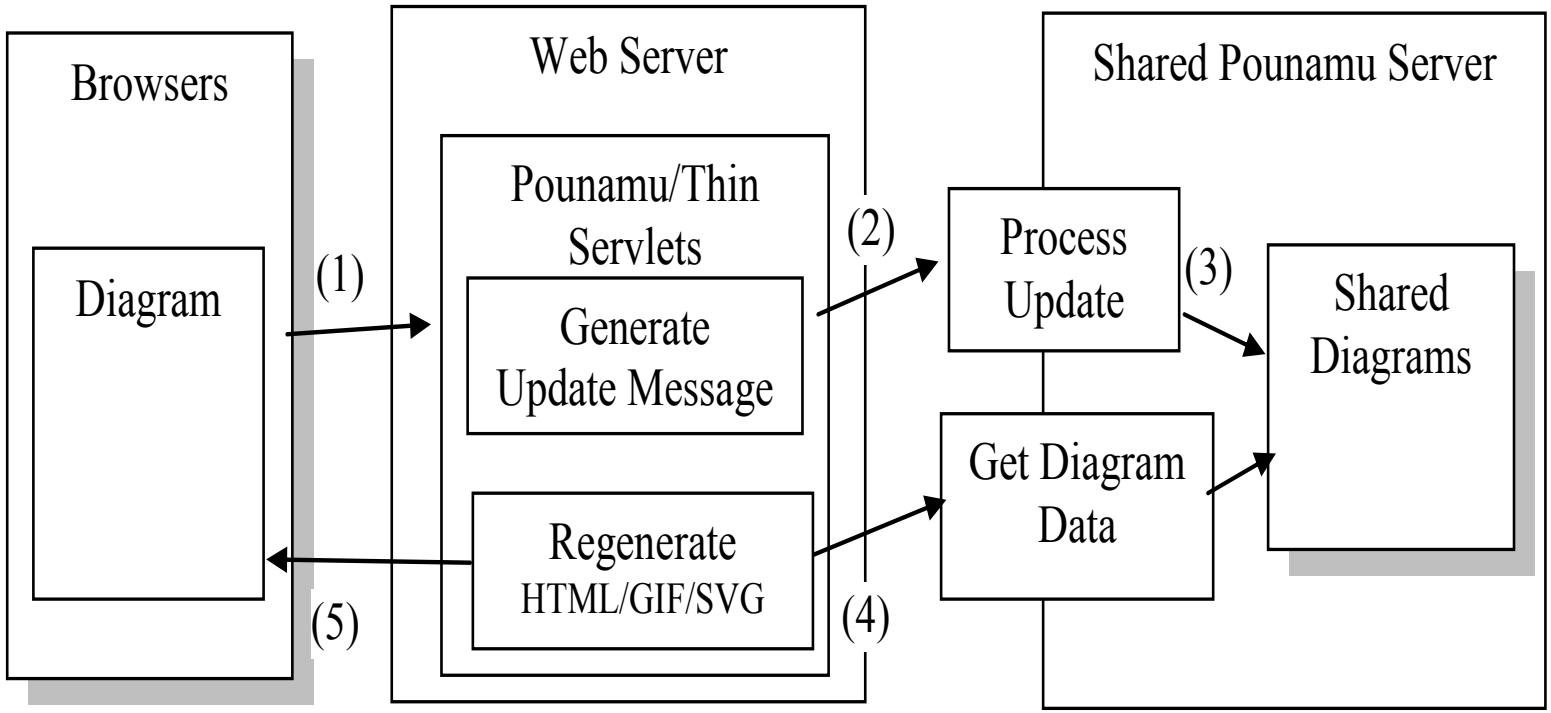


Example of Pounamu/Thin

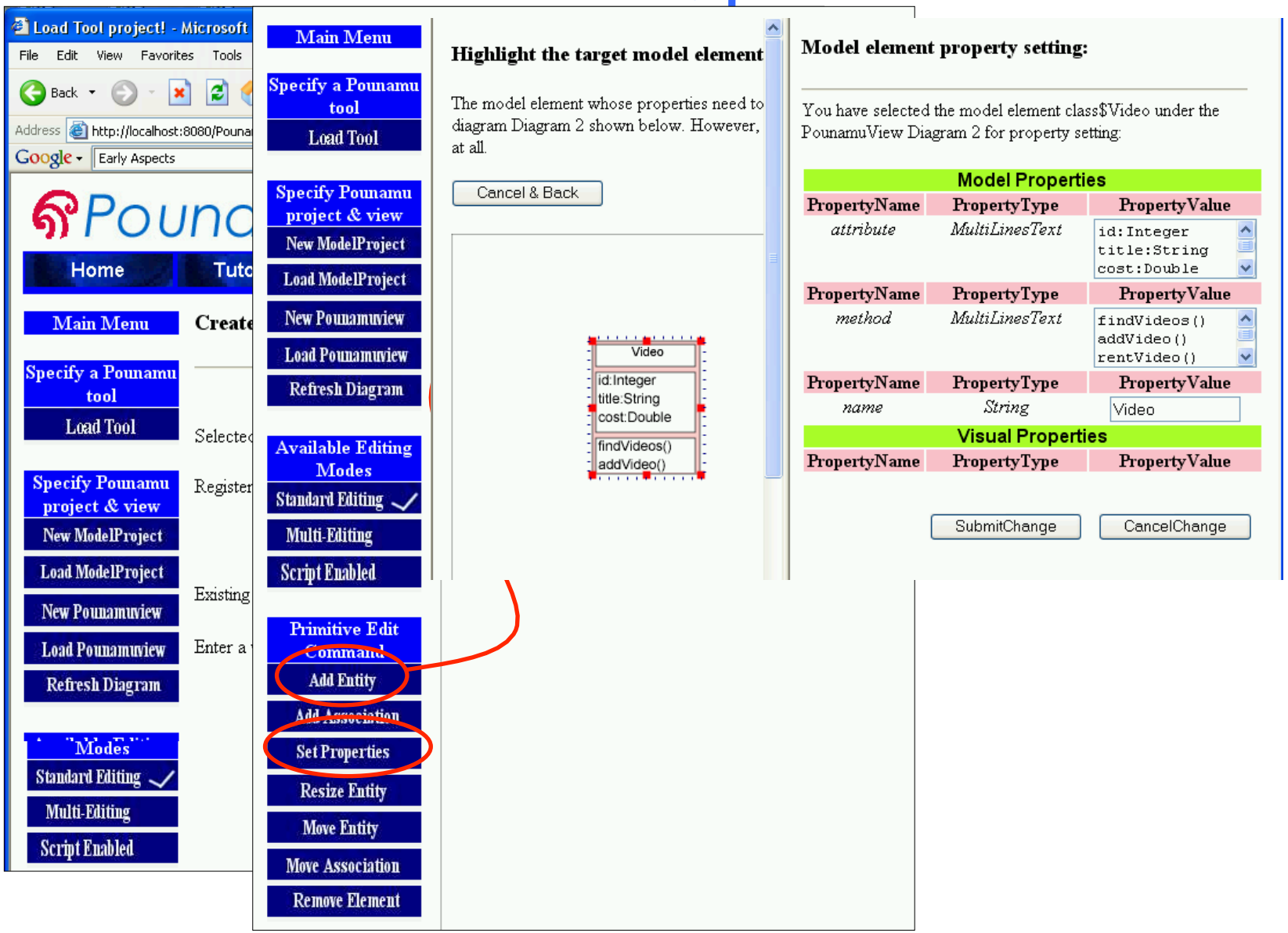


- Page with diagram & controls via buttons
- Groups of controls – view management; editing style; editing modes
- Diagram in either GIF or SVG image formats

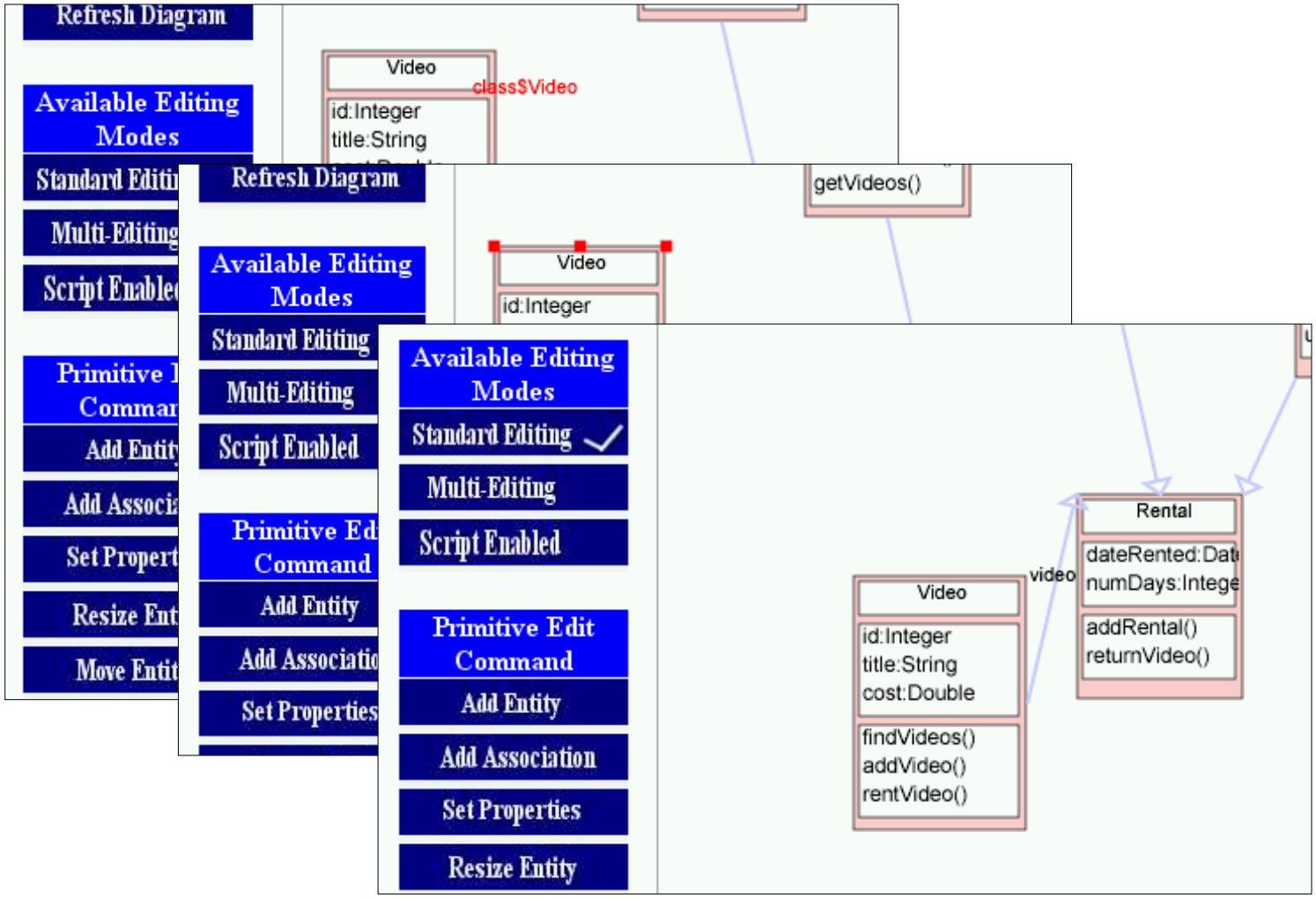
1. Server-side Diagram Editing



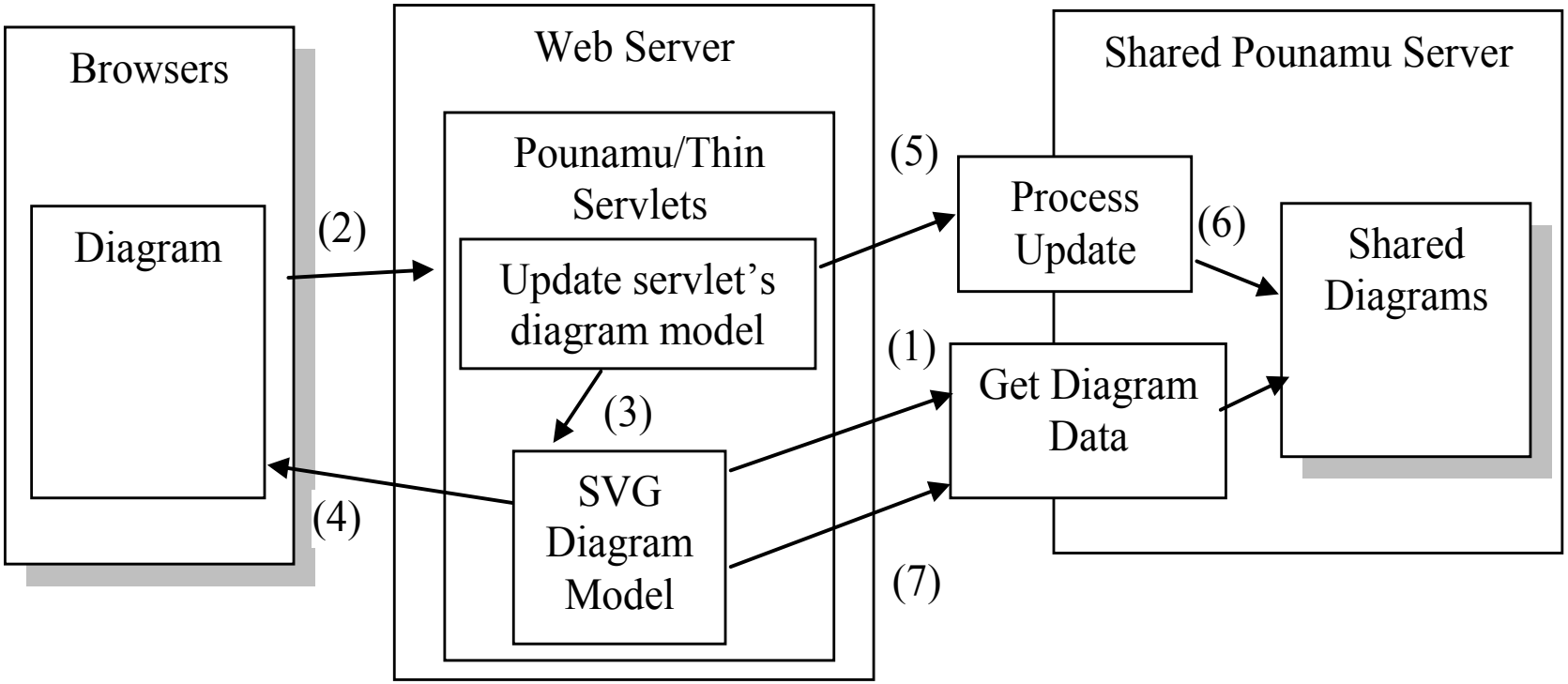
Example


Load Tool project! - Microsoft
File Edit View Favorites Tools
Back
Address http://localhost:8080/Pouna
Google Early Aspects
Pounc
Home Tutc
Main Menu
Create
Specify a Pounamu tool
Load Tool
Selected
Specify Pounamu project & view
New ModelProject
Load ModelProject
Register
New Pounamuview
Load Pounamuview
Existing
Refresh Diagram
Enter a
Modes
Standard Editing
Multi-Editing
Script Enabled
Main Menu
Specify a Pounamu tool
Load Tool
Specify Pounamu project & view
New ModelProject
Load ModelProject
New Pounamuview
Load Pounamuview
Refresh Diagram
Available Editing Modes
Standard Editing
Multi-Editing
Script Enabled
Primitive Edit Command
Add Entity
Add Association
Set Properties
Resize Entity
Move Entity
Move Association
Remove Element
Highlight the target model element
The model element whose properties need to
diagram Diagram 2 shown below. However,
at all.
Cancel & Back
Video
id:Integer
title:String
cost:Double
findVideos()
addVideo()
Model element property setting:
You have selected the model element class$Video under the PounamuView Diagram 2 for property setting:
Model Properties
PropertyName PropertyType PropertyValue
attribute MultiLinesText
id:Integer
title:String
cost:Double
PropertyName PropertyType PropertyValue
method MultiLinesText
findVideos()
addVideo()
rentVideo()
PropertyName PropertyType PropertyValue
name String Video
Visual Properties
PropertyName PropertyType PropertyValue
SubmitChange
CancelChange

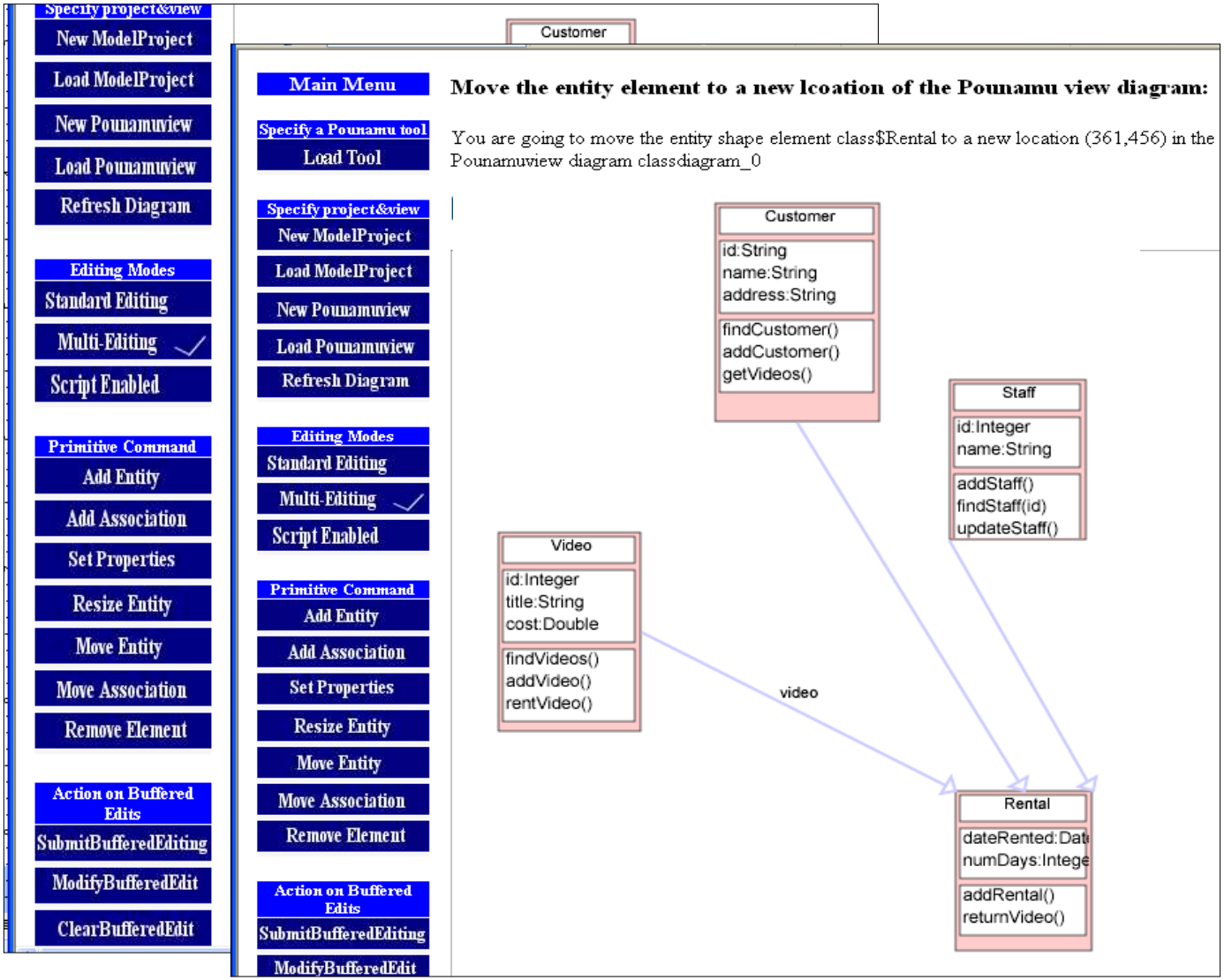
Moving a shape...



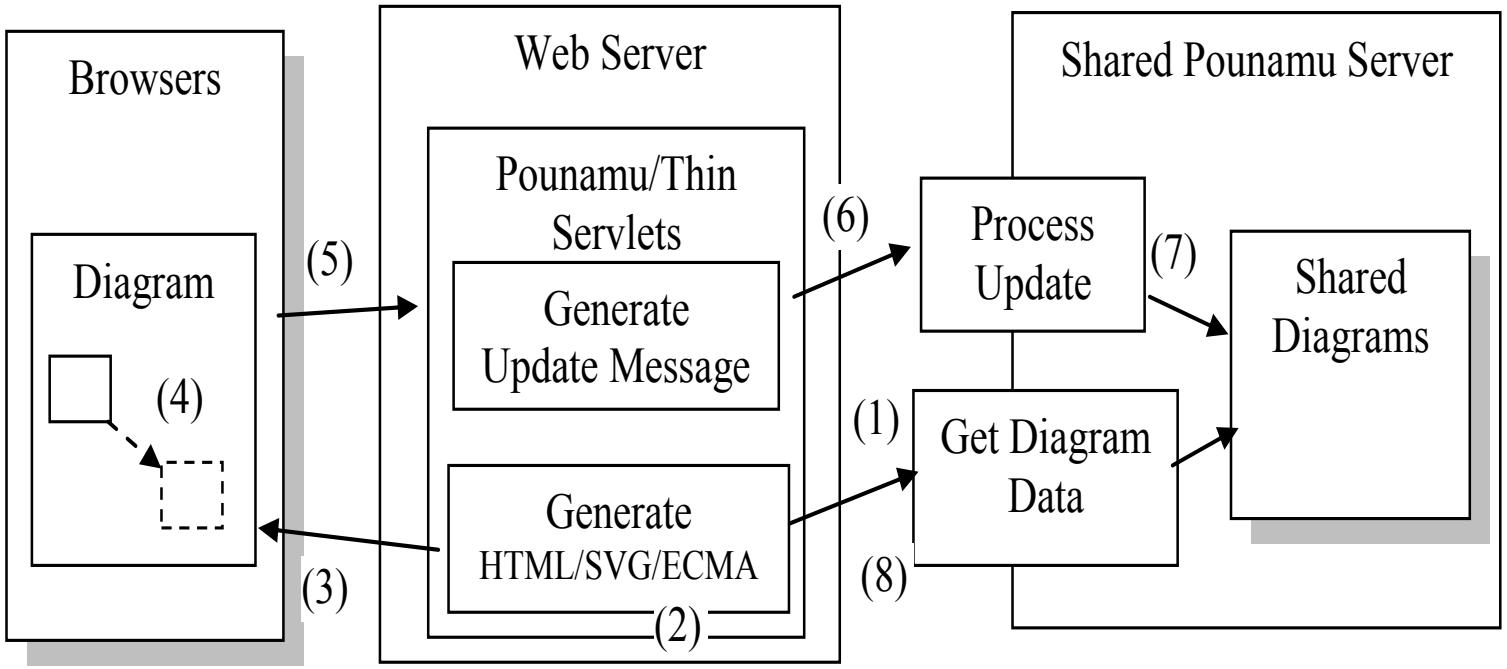
2. Multi-cached edits



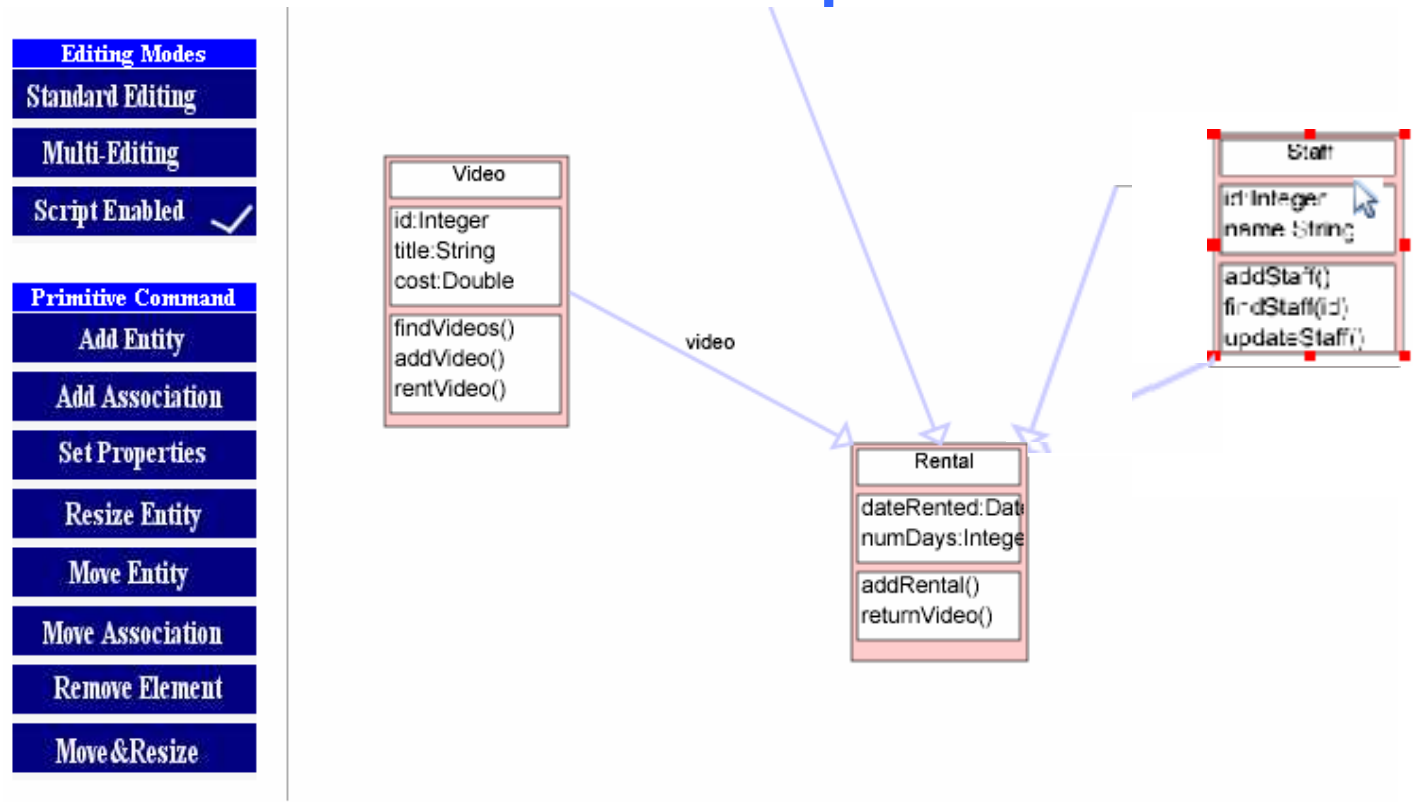
Example


Specify project&view
New ModelProject
Load ModelProject
New Pounamuview
Load Pounamuview
Refresh Diagram
Editing Modes
Standard Editing
Multi-Editing
Script Enabled
Primitive Command
Add Entity
Add Association
Set Properties
Resize Entity
Move Entity
Move Association
Remove Element
Action on Buffered Edits
SubmitBufferedEditing
ModifyBufferedEdit
ClearBufferedEdit
Customer
Main Menu
Move the entity element to a new location of the Pounamu view diagram:
Specify a Pounamu tool
Load Tool
You are going to move the entity shape element class$Rental to a new location (361,456) in the Pounamuview diagram classdiagram_0
Customer
id:String
name:String
address:String
findCustomer()
addCustomer()
getVideos()
Staff
id:Integer
name:String
addStaff()
findStaff(id)
updateStaff()
Video
id:Integer
title:String
cost:Double
findVideos()
addVideo()
rentVideo()
video
Rental
dateRented:Dat
numDays:Intege
addRental()
returnVideo()

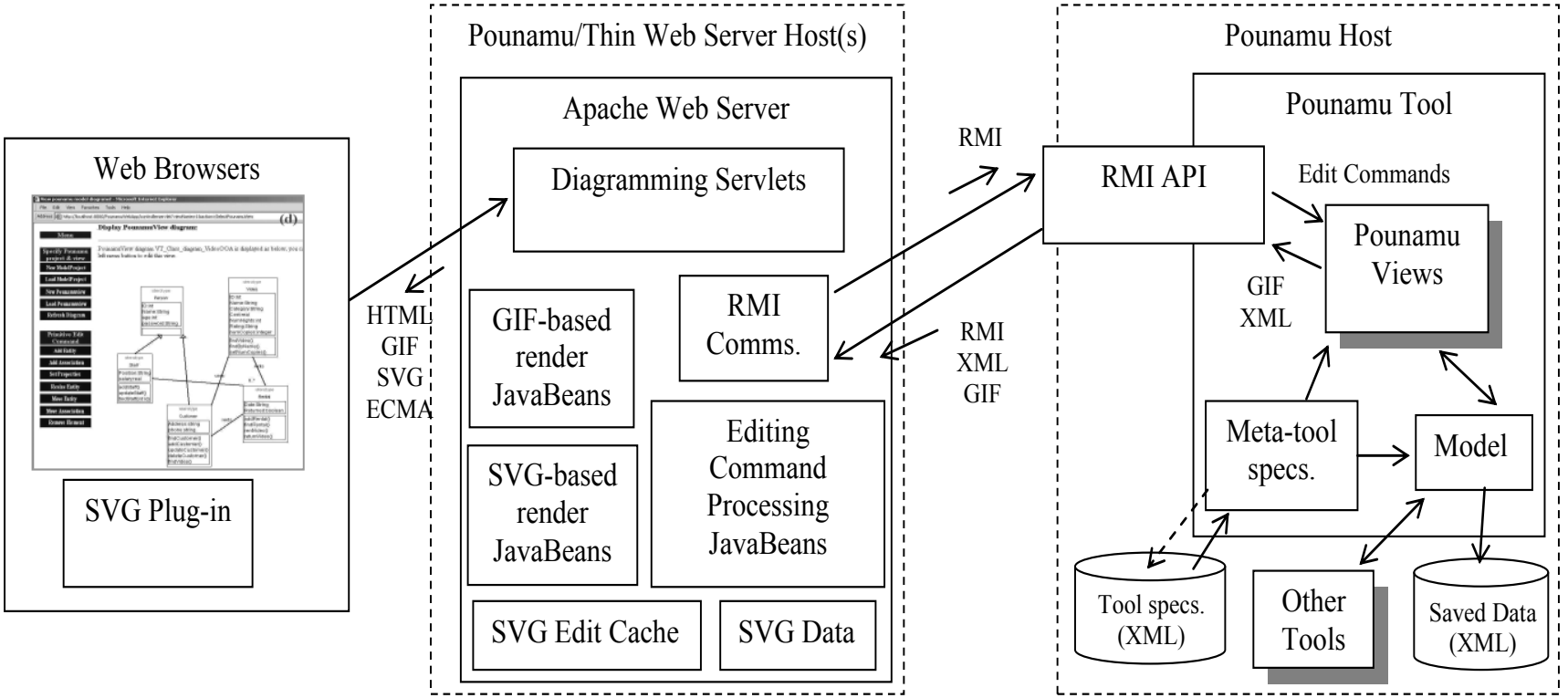
3. Client-side drag-and-drop



Example


Editing Modes
Standard Editing
Multi-Editing
Script Enabled
Primitive Command
Add Entity
Add Association
Set Properties
Resize Entity
Move Entity
Move Association
Remove Element
Move&Resize
Video
id:Integer
title:String
cost:Double
findVideos()
addVideo()
rentVideo()
video
Rental
dateRented:Dat
numDays:Intege
addRental()
returnVideo()
Staff
id:Integer
name:String
addStaff()
findStaff(id)
updateStaff()

Architecture



Evaluation

- 9 users – 4 experienced industry UML designers + 5 post-grads & academics
- 3 groups of 3; set of single and multi-user design tasks
- Each group performed these using different versions (server-side, buffered edits, client-side edits)
- Single user tasks:
  - Generally positive feedback on tools; client-side edits definitely preferred; some limitations of tools themselves were problematic for survey
- Multi-user tasks:
  - Feedback was not so positive, in part due to lack of awareness capabilities in prototype

Conclusions and Future Research

- Possible to add plug-in to existing (meta-)design tool to support web-based diagramming
- Users like some "conventional" facilities like client-side drag-and-drop, as well as web-based page metaphor
- Ideally want meta-capabilities in web browser too

- Adding other rendering support e.g. VRML for 3D navigation and interaction
- Developed mobile device version using Nokia MUPE MIDP2.0 client handset plug-in
- Want to improve collaboration support – adapting set of thick-client editing plug-ins to support this

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