SWINBURNE UNIVERSITY OF TECHNOLOGY

Automatic Diagram Layout Support for the Marama Meta-toolset

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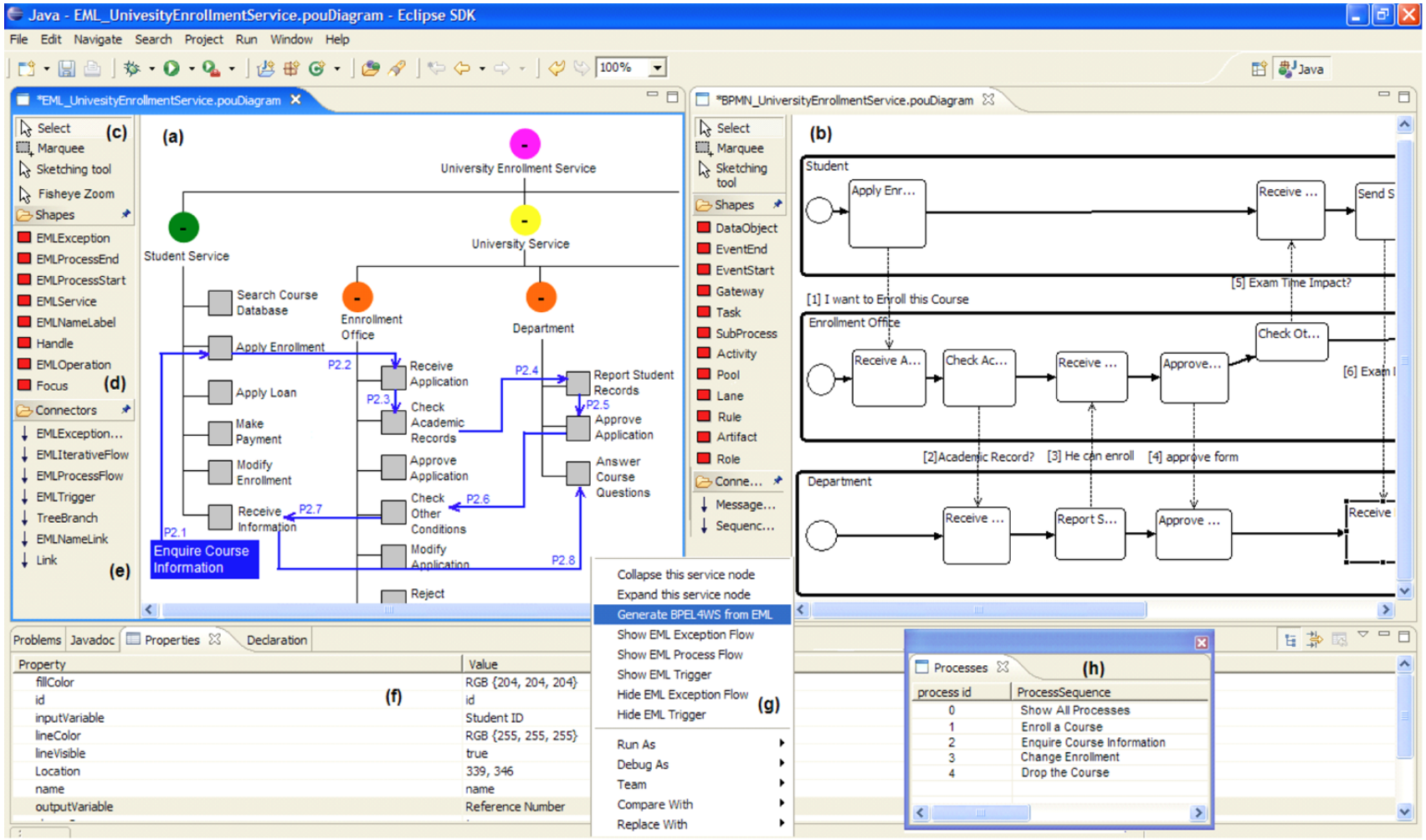
Outline

- Need for automatic layout
- Marama meta-tools
- Adding specification & generation of auto-layout to Marama meta-tools
- Example
- Future research

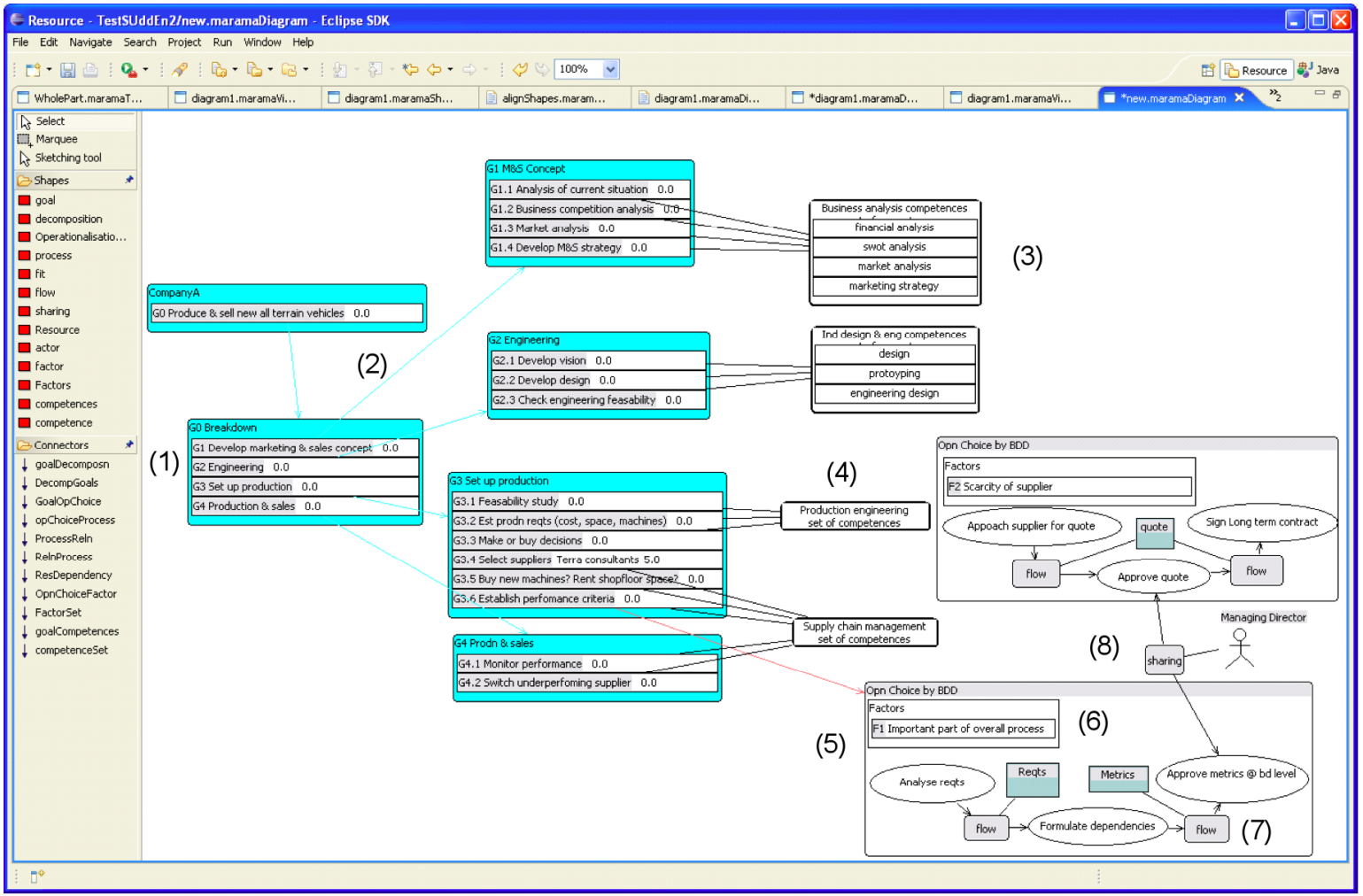
Need for automatic layout

- Example 1: MaramaEML enterprise modelling tool



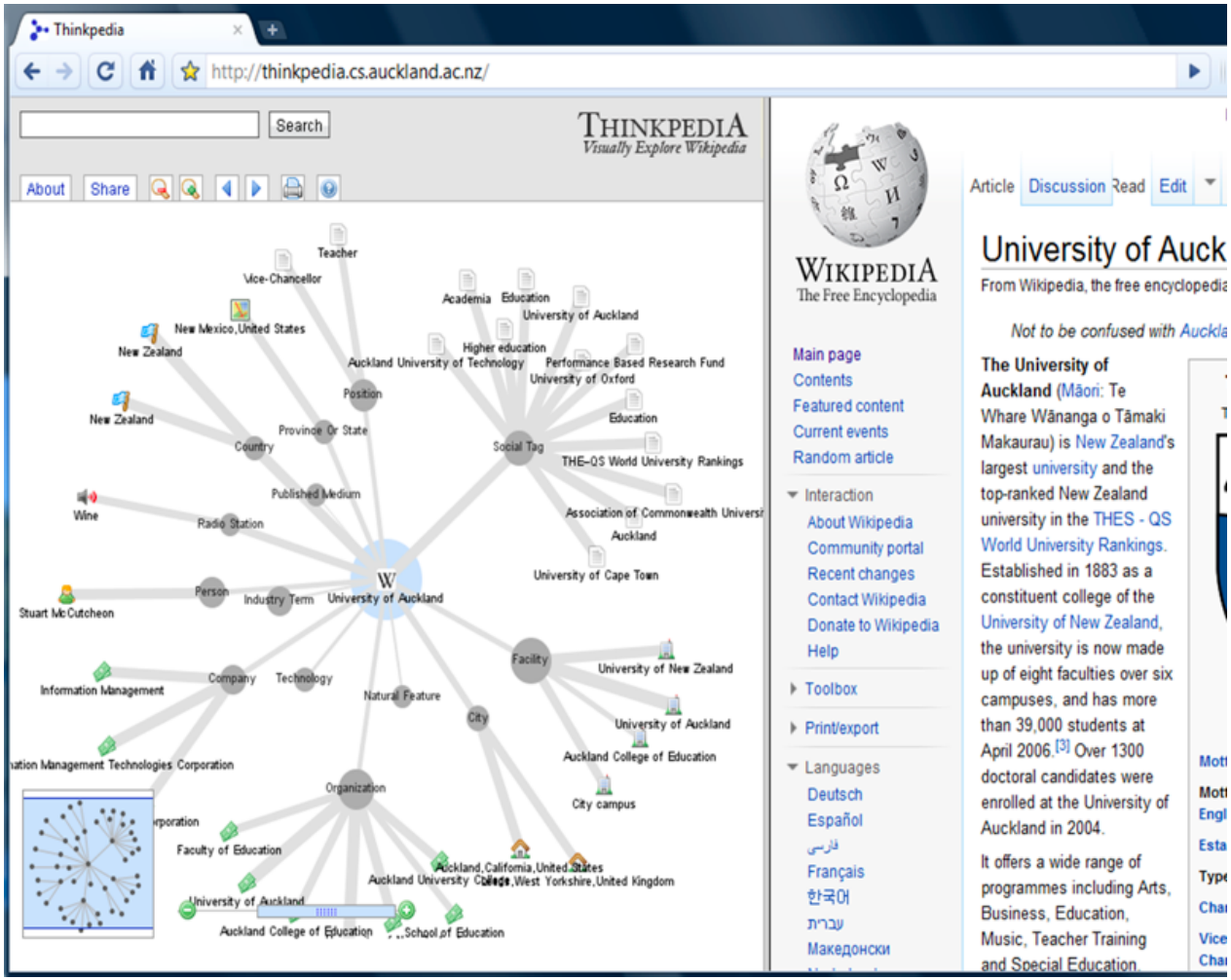
Need for automatic layout

- Example 2: MaramaSUDDEN supply chain modeller



Need for automatic layout

- Example 3: Visual Wiki

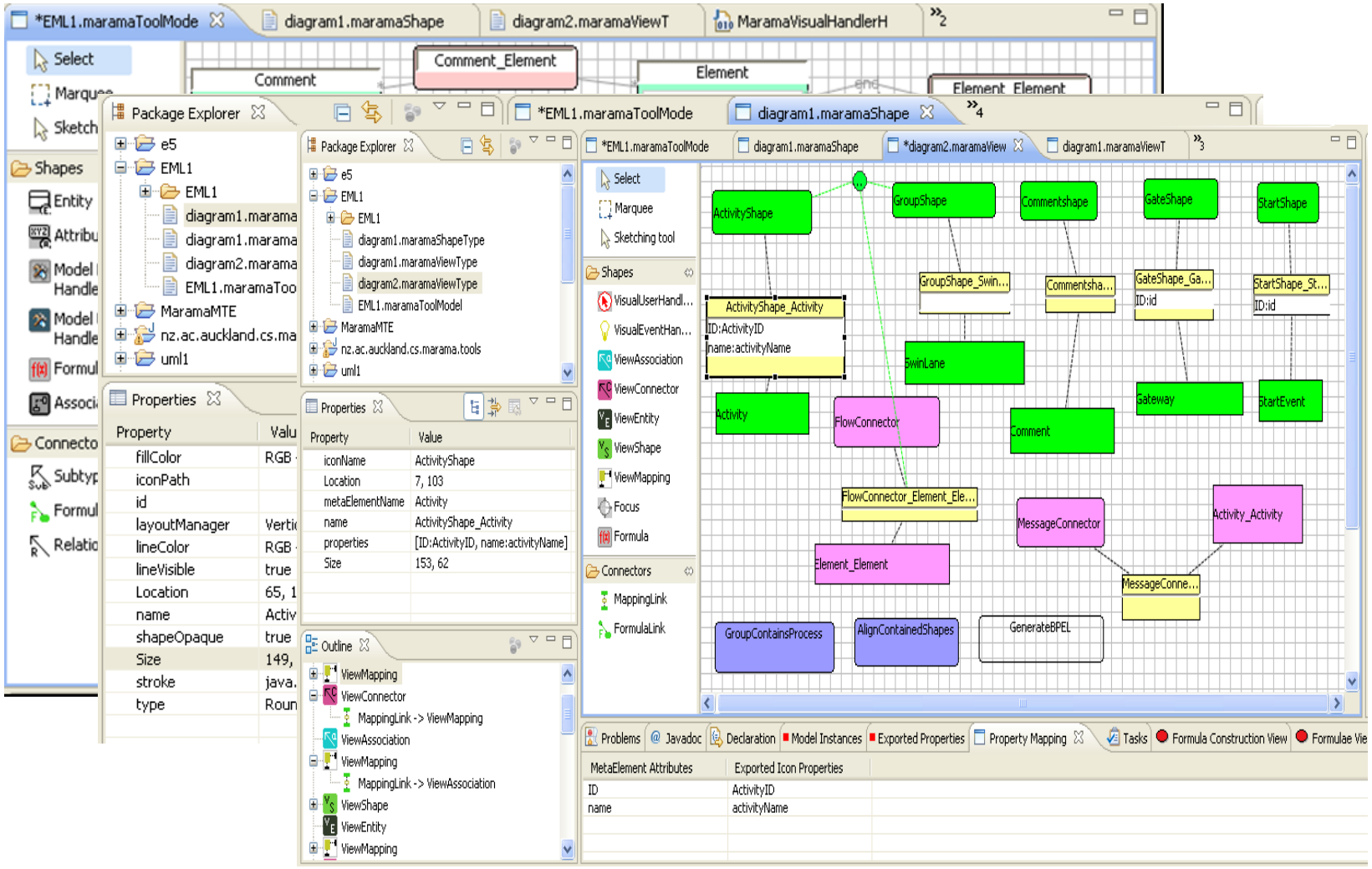


Marama meta-tools

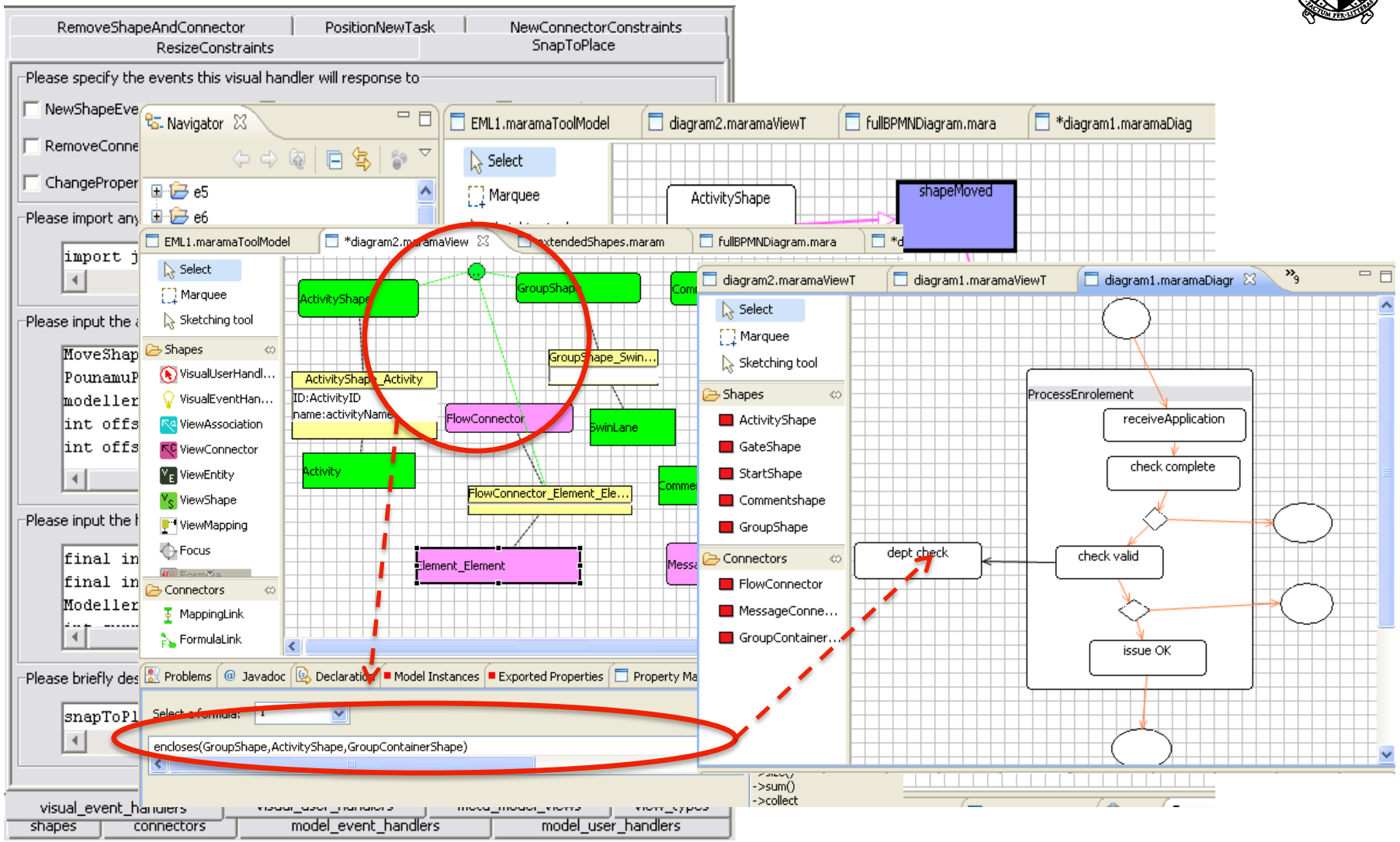
- Set of (mostly) visual specification tools for Domain-Specific Visual Language (DSVLs)
- Meta-model designer, shape designer, view type (diagram) designer, various behaviour designers
- Java API with dynamic Java code plug-ins (scripts) – “event handlers” – for complex behaviour, integration

Marama examples - MaramaEML

- Specifying MaramaEML tool:



Specifying layout…



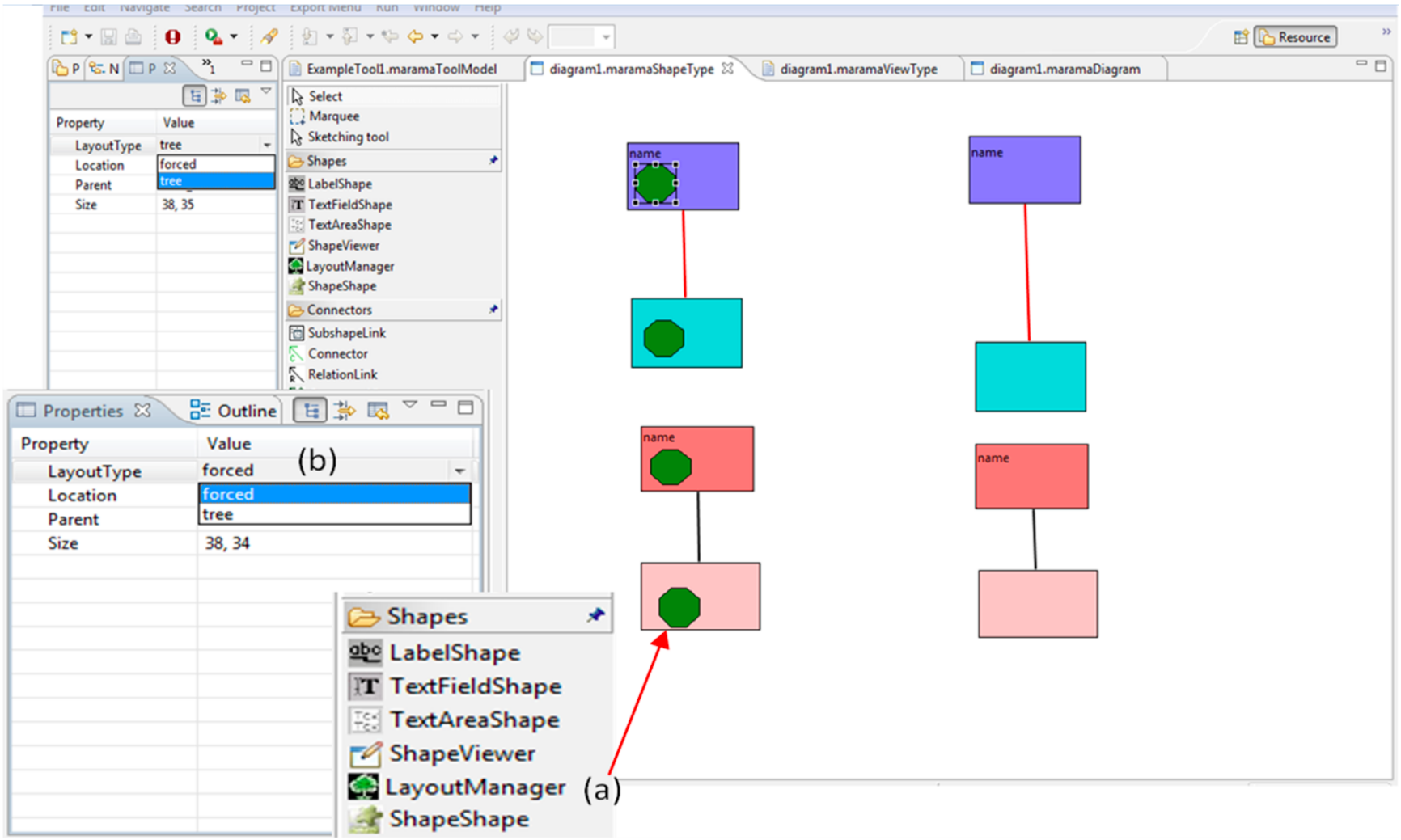
Issues…

- Event handlers too complex/low-level for many Marama tool developers
- Kaitiaki (visual event handlers) also somewhat complicated to do e.g. force-directed, tree layouts
- View designer formulae require reusable event handler code and augmented shape descriptions (for layout control) – can't do without lots of manual augmentation; easy to make mistakes; very hard to change once done (high viscosity)

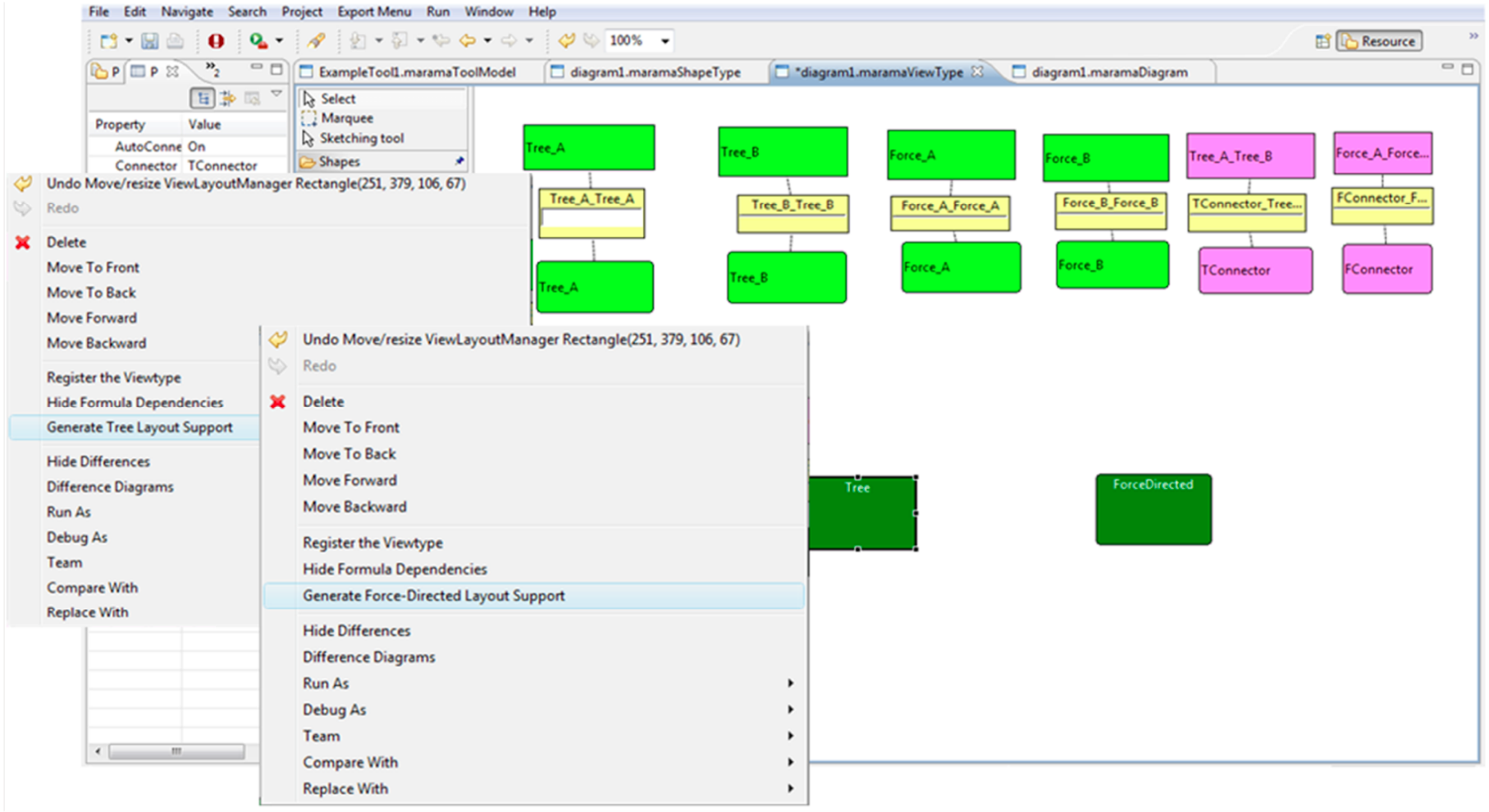
A new approach: MaramaALM

- Want to provide “minimal” augmentation of visual specifications to affect powerful layouts e.g. multi-level tree, force-directed, auto-layout
  - “I want this, this and this shape in a vertical tree layout for this view type…”
- Want to leverage internal Marama/Eclipse capabilities without any technical knowledge from tool developer
- Want specify-and-click to realise
- Want to be extensible approach
- Want minimal impact on Marama meta-tools vs additional meta-tool

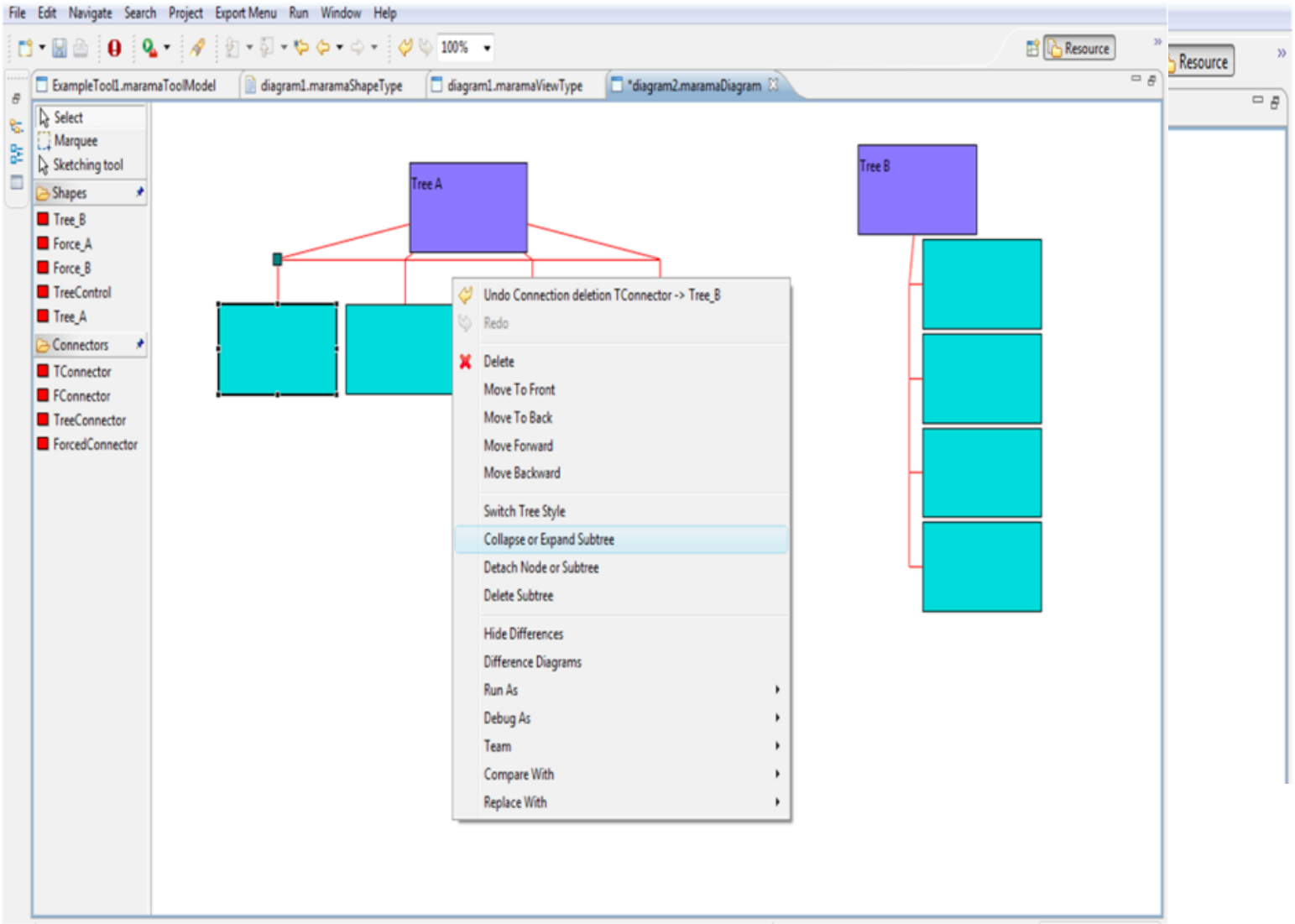
Two-step specification



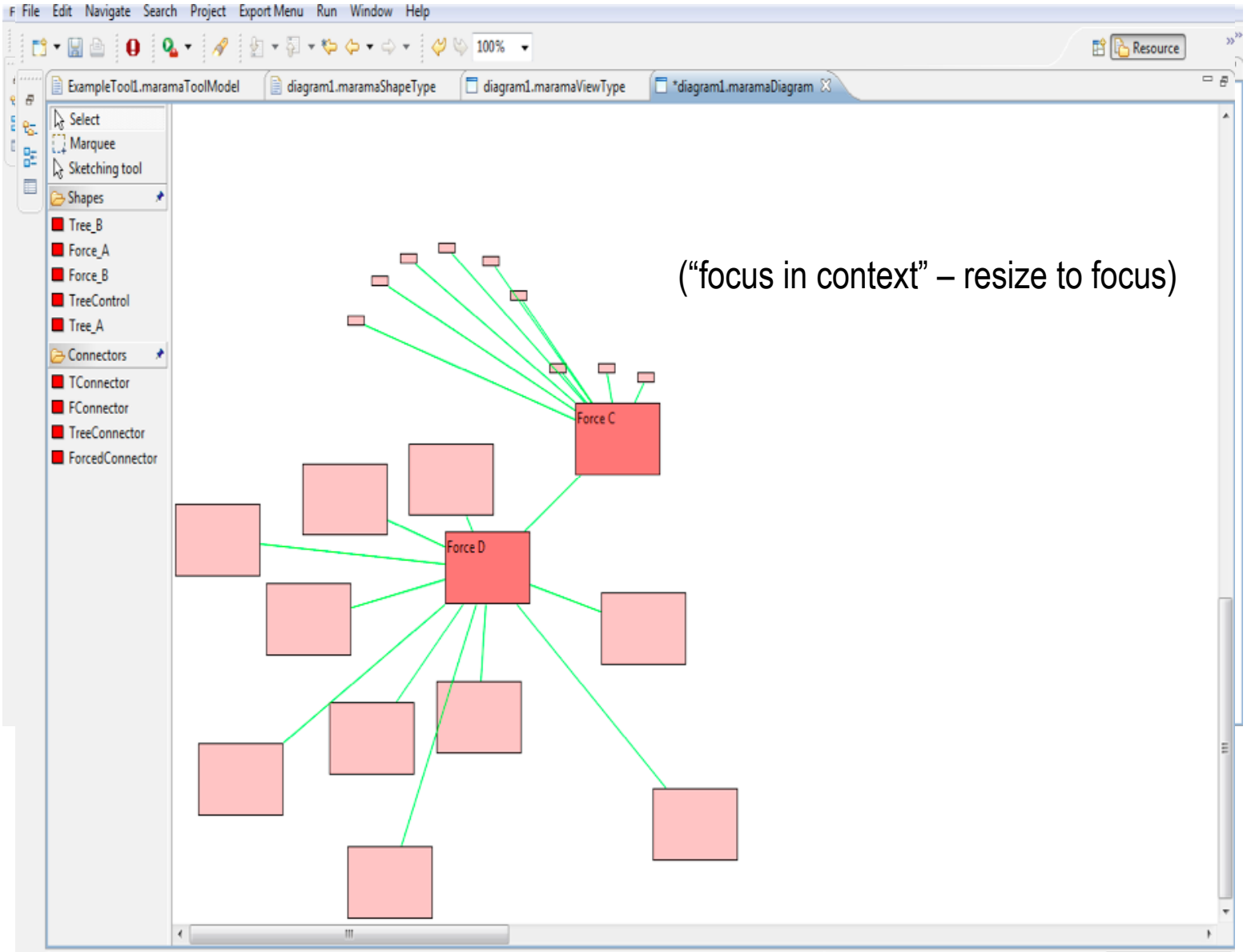
Step 2


File Edit Navigate Search Project Export Menu Run Window Help
Resource
ExampleTool1.maramaToolModel
diagram1.maramaShapeType
*diagram1.maramaViewType
diagram1.maramaDiagram
Select
Marquee
Sketching tool
Shapes
Property
Value
AutoConne
On
Connector
TConnector
Undo Move/resize ViewLayoutManager Rectangle(251, 379, 106, 67)
Redo
Delete
Move To Front
Move To Back
Move Forward
Move Backward
Register the Viewtype
Hide Formula Dependencies
Generate Tree Layout Support
Hide Differences
Difference Diagrams
Run As
Debug As
Team
Compare With
Replace With
Undo Move/resize ViewLayoutManager Rectangle(251, 379, 106, 67)
Redo
Delete
Move To Front
Move To Back
Move Forward
Move Backward
Register the Viewtype
Hide Formula Dependencies
Generate Force-Directed Layout Support
Hide Differences
Difference Diagrams
Run As
Debug As
Team
Compare With
Replace With
Tree_A
Tree_A_Tree_A
Tree_A
Tree_B
Tree_B_Tree_B
Tree_B
Force_A
Force_A_Force_A
Force_A
Force_B
Force_B_Force_B
Force_B
Tree_A_Tree_B
TConnector_Tree...
TConnector
Force_A_Force...
FConnector_F...
FConnector
Tree
ForceDirected

Examples in use

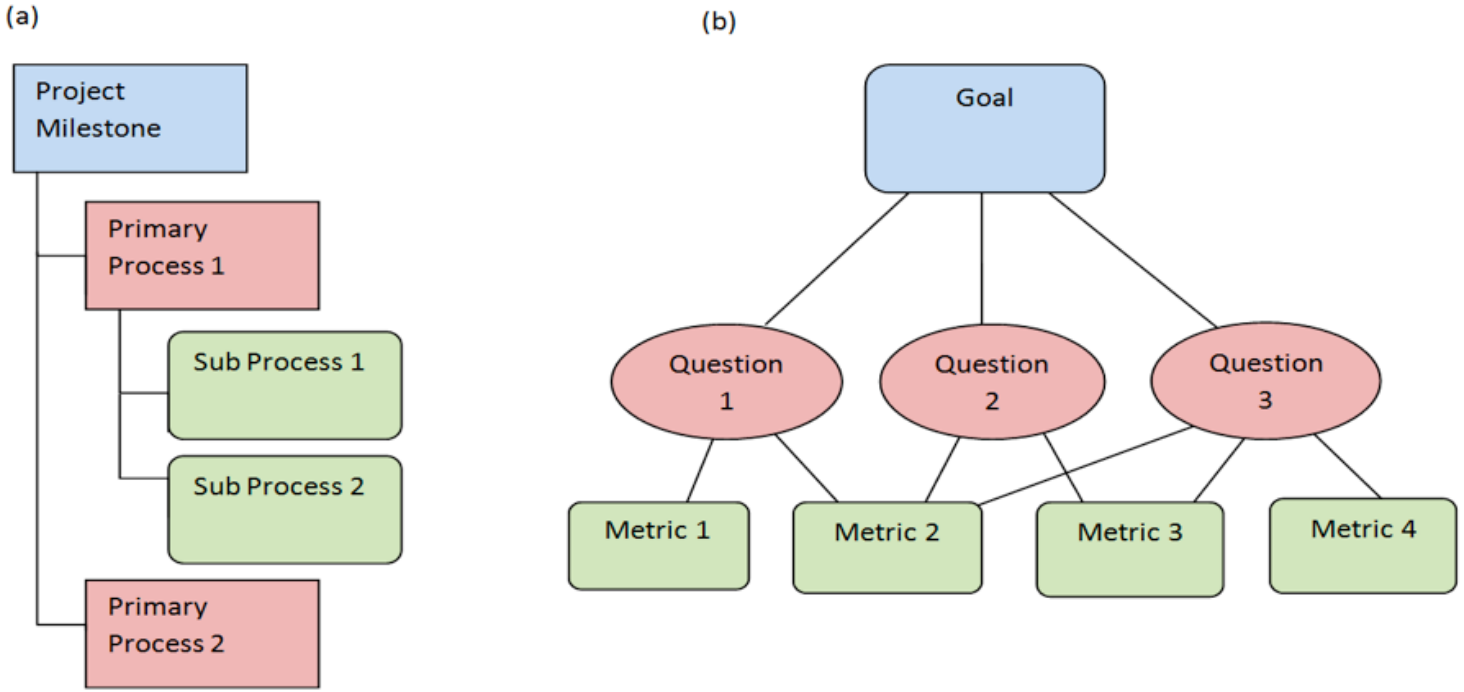


Example

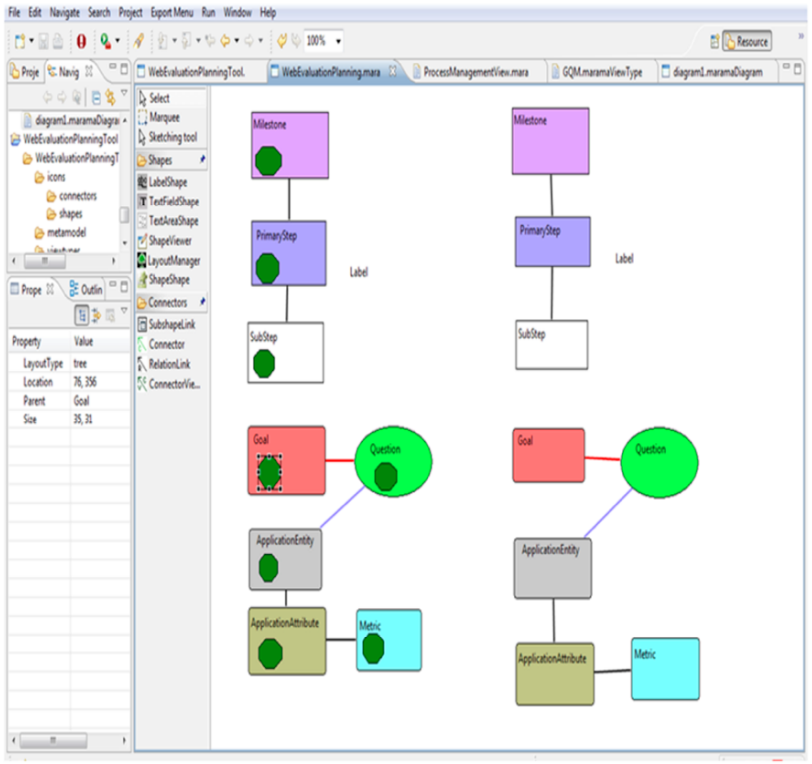


("focus in context" – resize to focus)

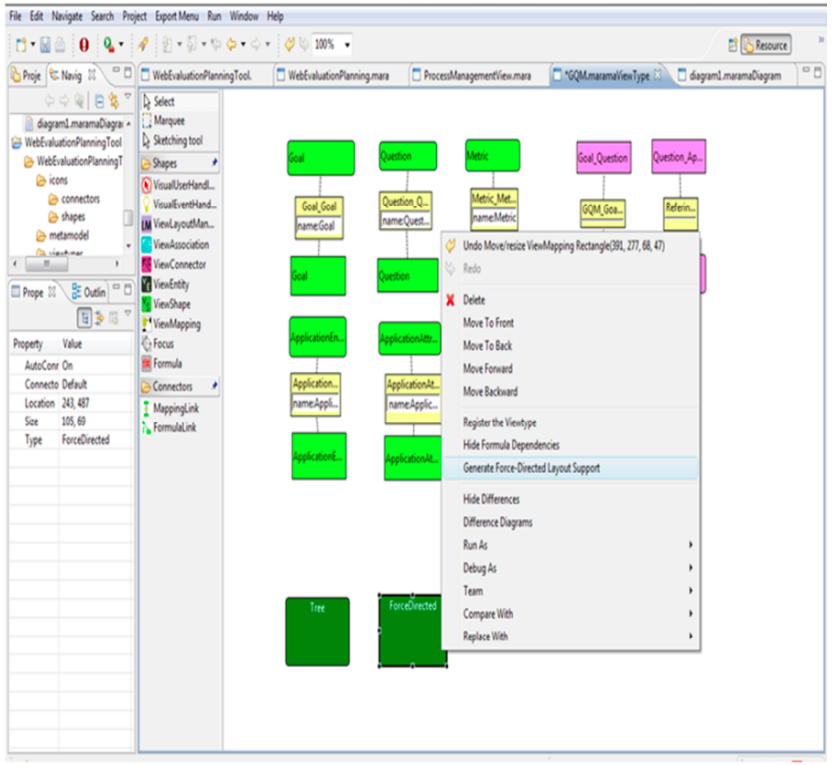
Case study: web metrics



Specifying

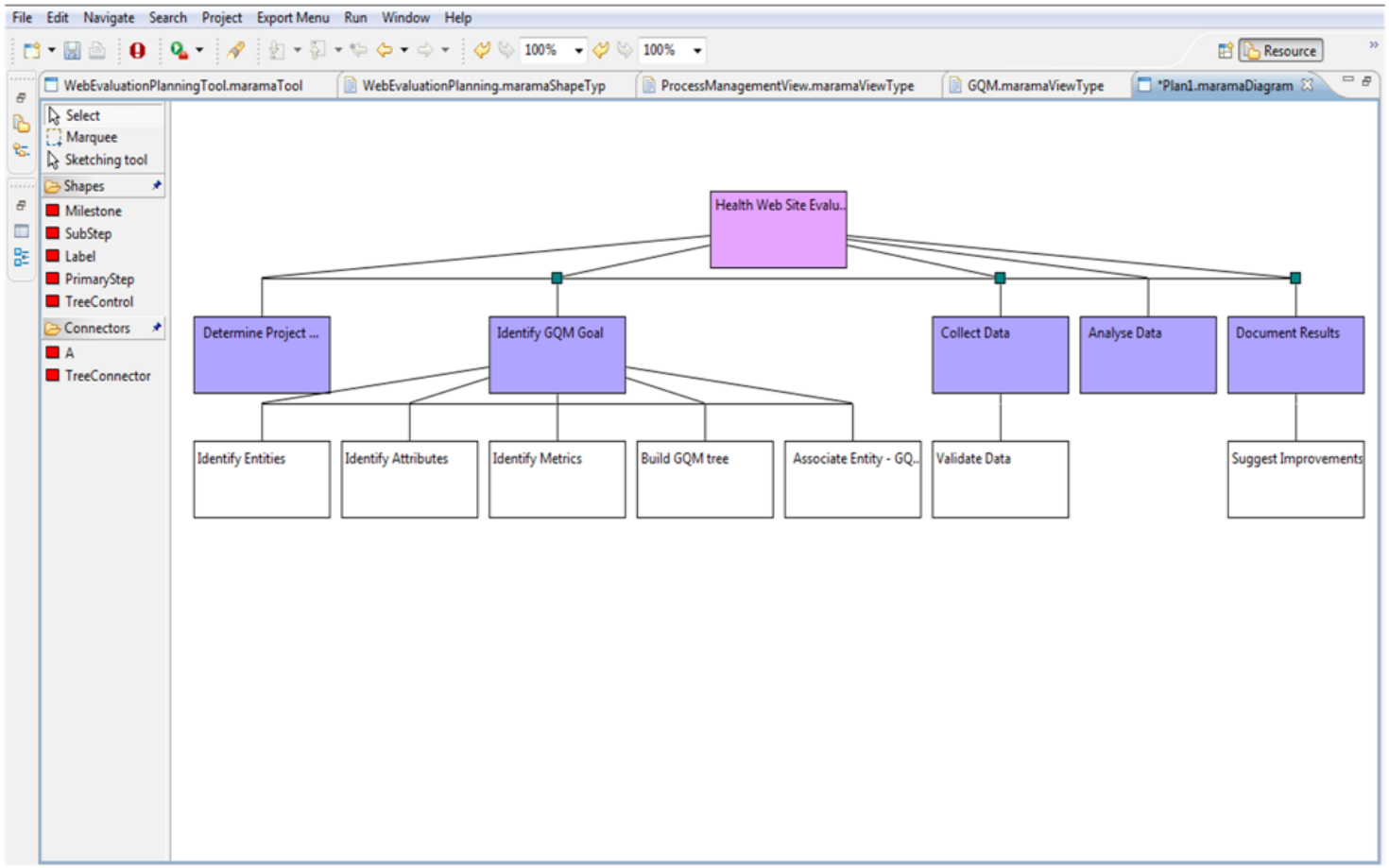


(a) Shape Designer

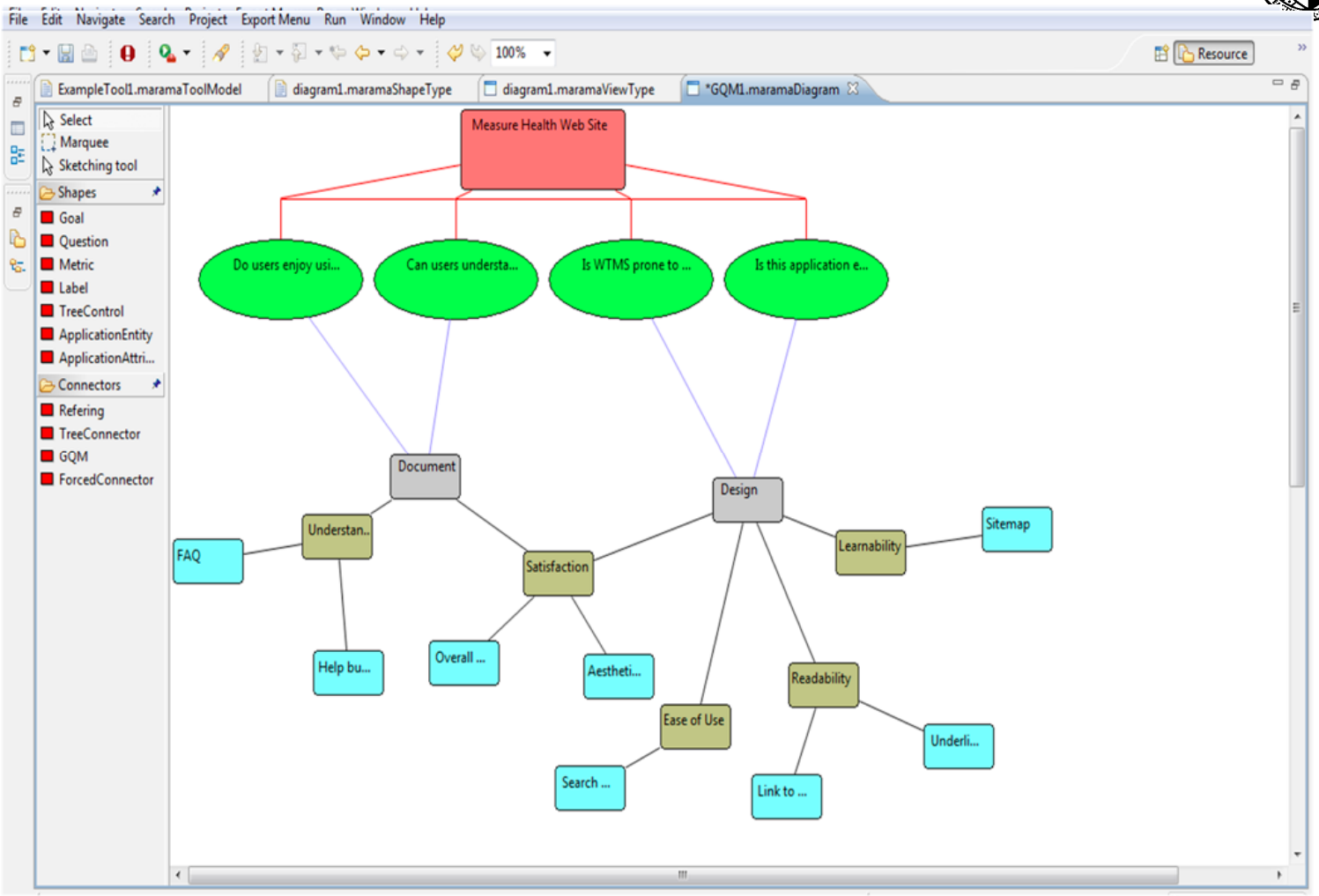


(b) View Definer

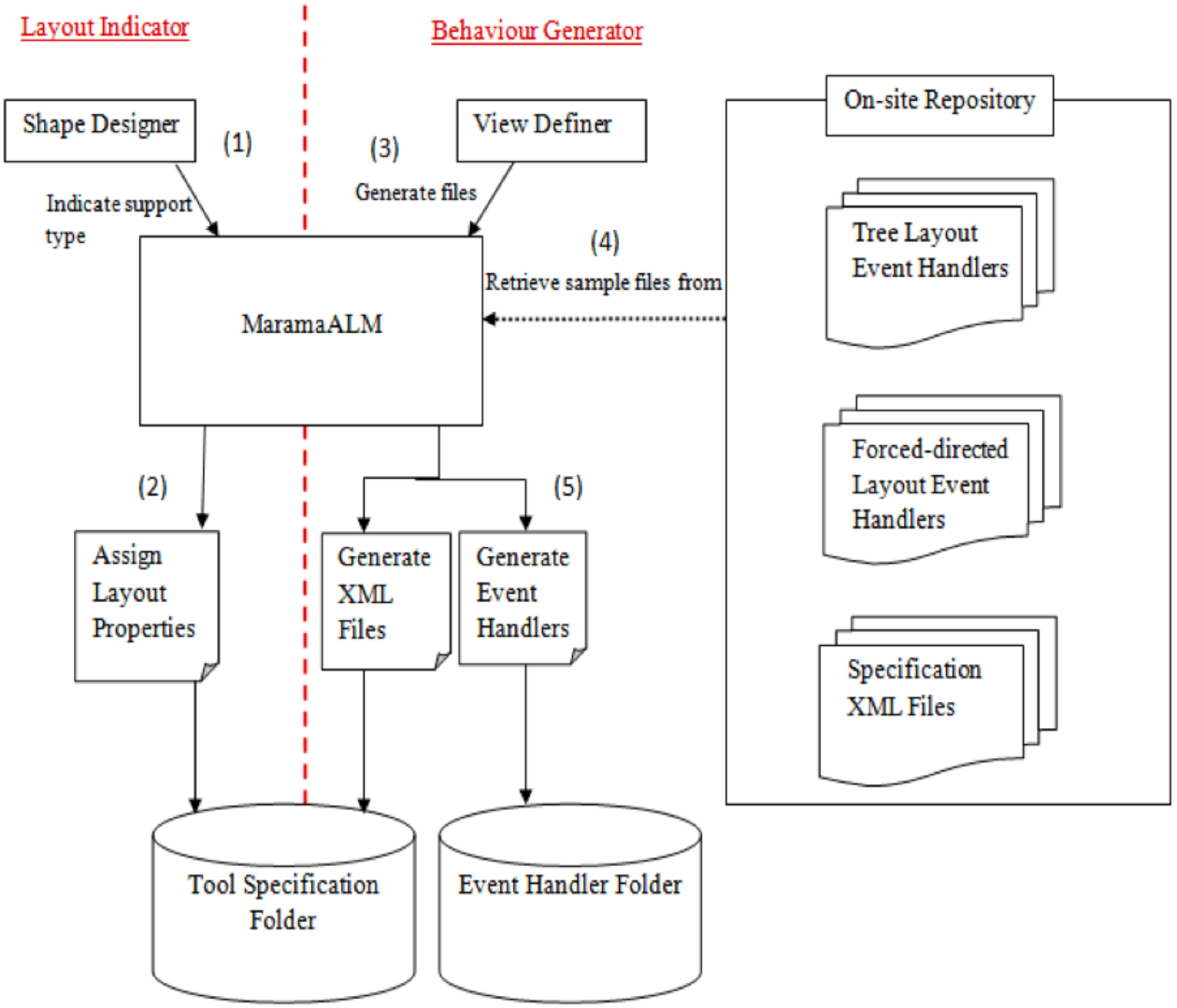
Using in generated tool



Using (2)


File Edit Navigate Search Project Export Menu Run Window Help
100%
Resource
ExampleTool1.maramaToolModel
diagram1.maramaShapeType
diagram1.maramaViewType
*GQM1.maramaDiagram
Select
Marquee
Sketching tool
Shapes
Goal
Question
Metric
Label
TreeControl
ApplicationEntity
ApplicationAttri...
Connectors
Refering
TreeConnector
GQM
ForcedConnector
Measure Health Web Site
Do users enjoy usi...
Can users understa...
Is WTMS prone to ...
Is this application e...
Document
Design
Understan...
FAQ
Satisfaction
Learnability
Sitemap
Help bu...
Overall ...
Aestheti...
Readability
Ease of Use
Underli...
Search ...
Link to ...

Architecture & Implementation



- Augmented the shape designer & view designer with additional meta-elements
- Set of layout handlers (Java)
- Augment shape, views from meta-elements – layout control properties, layout event handlers
- Generate augmented tool specificaitons

Evaluation

- Very fast to add to Marama tools; easy to change
- Auto-generates implementation in tool from visual specs
- Range of layout control for tool end user
- Can combine multiple layouts in same diagrams easily
- Limited layouts: trees and force-directed
- Very limited control of layouts (spacing, resizing etc)
- Can’t specify new layouts directly
- Can’t “see” the target layout in meta-tools – just annotations used to generate them

Summary / Future Work

- Extended Marama meta-tools with high-level layout control
- MaramaALM generates augmented tool specifications with additional properties & event handlers
- Usable by non-technical tool developers

- Add other layouts; reuse 3rd party layout libraries
- Allow meta-level specification of layout control
- Visualise the layout specifications better in meta-tools
- Add animation e.g. for force-directed layout

References

- Li, L, Grundy, J.C., Hosking, J.G. A visual language and environment for enterprise system modelling and automation, Journal of Visual Languages and Computing, vol. 25, no. 4, April 2014, Elsevier, pp. 253-277
- Grundy, J.C., Hosking, J.G., Li, N., Li, L., Ali, N.M., Huh, J. Generating Domain-Specific Visual Language Tools from Abstract Visual Specifications, IEEE Transactions on Software Engineering, vol. 39, no. 4, April 2013, pp. 487 - 515.
- Pei, Y.S., Hosking, J.G. and Grundy, J.C. Automatic Diagram Layout Support for the Marama Meta-toolset, In Proceedings of the 2011 IEEE Symposium on Visual Languages and Human-Centric Computing, Pittsburgh, USA, Sept 18-22 2011, IEEE Press.