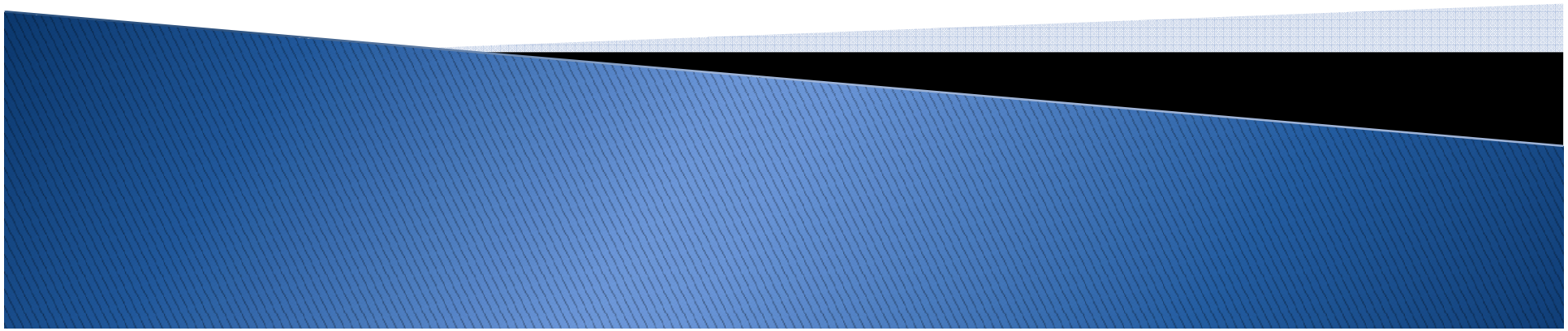
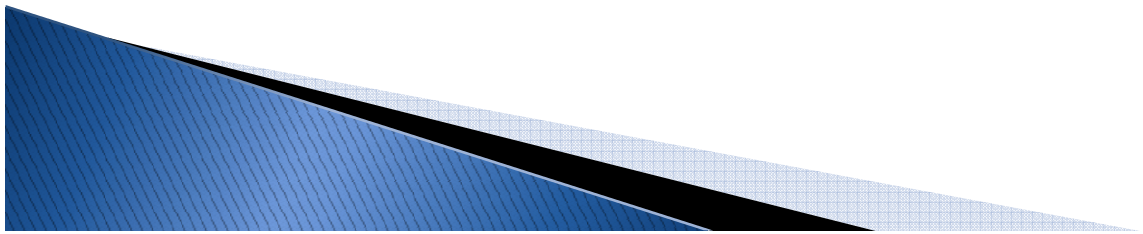
GMoDS Test Driver and Visualizer
MSE Project Presentation III

Mike Fraka



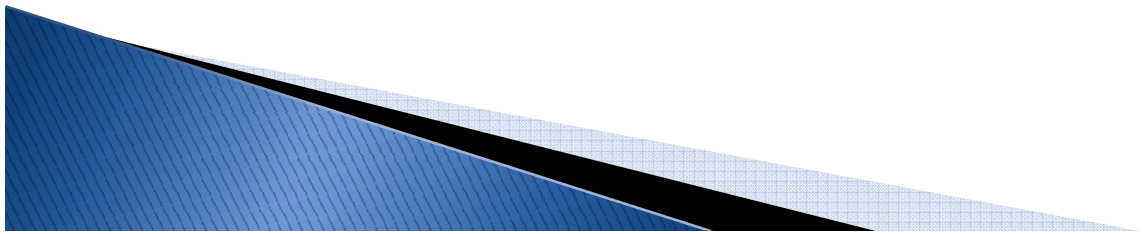
Agenda

- Action Items from Presentation II
- Component Design
- Assessment Evaluation
- Project Evaluation
- Demonstration
- Questions/Comments



Action Items from Presentation II

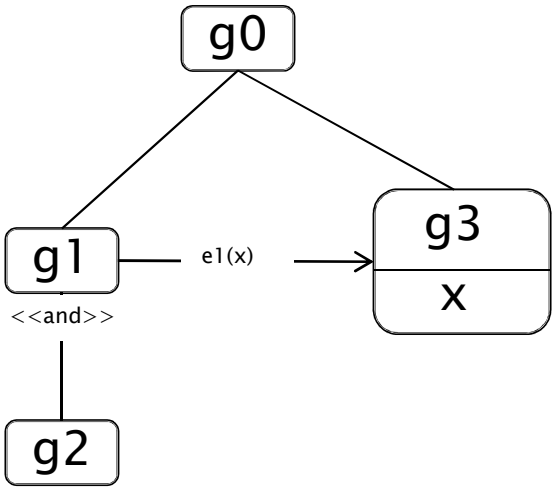
- Perform USE/OCL modeling of EventScriptImpl::addEvent(e : GoalEventImpl)
  - Limitations of USE 2.6.2
    - Does not support the OCL “isSent” operator (denoted ‘^’) necessary for the most important post conditions of the EventScriptImpl::next method
    - Does not support the “init” constraint on a class attribute
    - Unable to get more than 1 local variable defined in a “let” expression



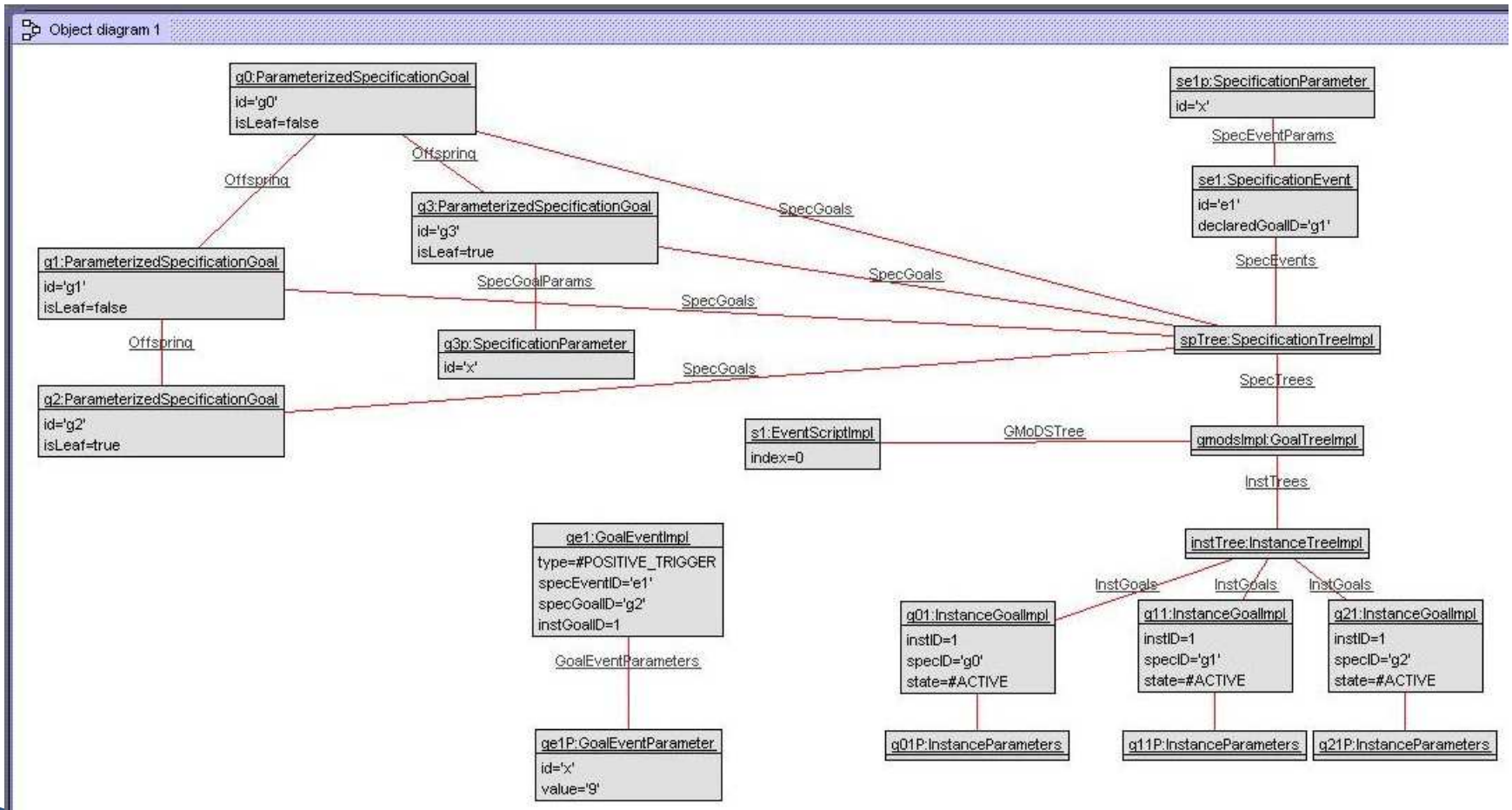
Formal Specification

```
context EventScriptImpl::addEvent(e : GoalEventImpl)
-- The event does not already exist in the script
  pre NotInScript: event->excludes(e)
-- The added event's type is valid
  pre ValidType:
      e.type = #ACHIEVED or e.type = #FAILED or e.type = #POSITIVE_TRIGGER or
      e.type = #NEGATIVE_TRIGGER or e.type = #MODIFIED
-- At least one parameter must be provided if type is #MODIFIED
  pre ModifiedReqParam: e.type = #MODIFIED implies e.param->size > 0
-- A #MODIFIED event's parameter names must match specification goal's parameter names
  pre ValidModifiedParamNames:
      e.type = #MODIFIED and e.param->size > 0 implies
      e.param->forAll(ep | gmods.specTree.goal->exists(sg | sg.id = e.specGoalID and
                                                         sg.param->exists(sgp | sgp.id = ep.id)))
-- The added event refers to a ParameterizedSpecificationGoal that
-- exists in GMoDS' specification tree
  pre ValidSpecGoal: gmods.specTree.goal->exists(sg | sg.id = e.specGoalID)
-- An #ACHIEVED event will access the special 'ACHIEVED' event of GMoDS and
-- must apply to a leaf specification goal.
  pre ValidAchievedEvent: e.type = #ACHIEVED implies e.specEventID = 'ACHIEVED' and
      gmods.specTree.goal->exists(sg | sg.id = e.specGoalID and sg.isLeaf = true)
-- A #FAILED event will access the special 'FAILED' event of GMoDS and
-- must apply to a leaf specification goal.
  pre ValidFailedEvent: e.type = #FAILED implies e.specEventID = 'FAILED' and
      gmods.specTree.goal->exists(sg | sg.id = e.specGoalID and sg.isLeaf = true)
-- If the type is #POSITIVE_TRIGGER or #NEGATIVE_TRIGGER
-- the added event refers to a SpecificationEvent that exists in GMoDS specification tree,
-- the event's specification goal is a leaf goal, the event's specification event's
-- declared goal exists, and the event's specification goal is either the goal on which the
-- event was declared or a descendant of the declared goal.
  pre ValidSpecEvent: e.type = #POSITIVE_TRIGGER or e.type = #NEGATIVE_TRIGGER implies
    (gmods.specTree.event->exists(se | se.id = e.specEventID and
                                  gmods.specTree.goal->exists(sg,dg | sg.isLeaf = true and sg.id = e.specGoalID and
                                  dg.id = se.declaredGoalID and dg.descendantsAndSelf()->includes(sg))))
-- if the type is #POSITIVE_TRIGGER or #NEGATIVE_TRIGGER
-- then it must provide the parameters required by the specification event
  pre ValidTriggerParamNames:
      e.type = #POSITIVE_TRIGGER or e.type = #NEGATIVE_TRIGGER implies
      (gmods.specTree.event->exists(se | se.id = e.specEventID and
                                    se.param->forAll(sep | e.param->exists(ep | ep.id = sep.id))))
-- The event is added to the script if all preconditions are met
  post NowInScript: event->includes(e)
-- The number of events is increased by 1
  post OneMoreEvent: (event->asSet - event@pre->asSet)->size = 1
-- The new event is appended to the end of the script
  post Appended: event->last = e
```

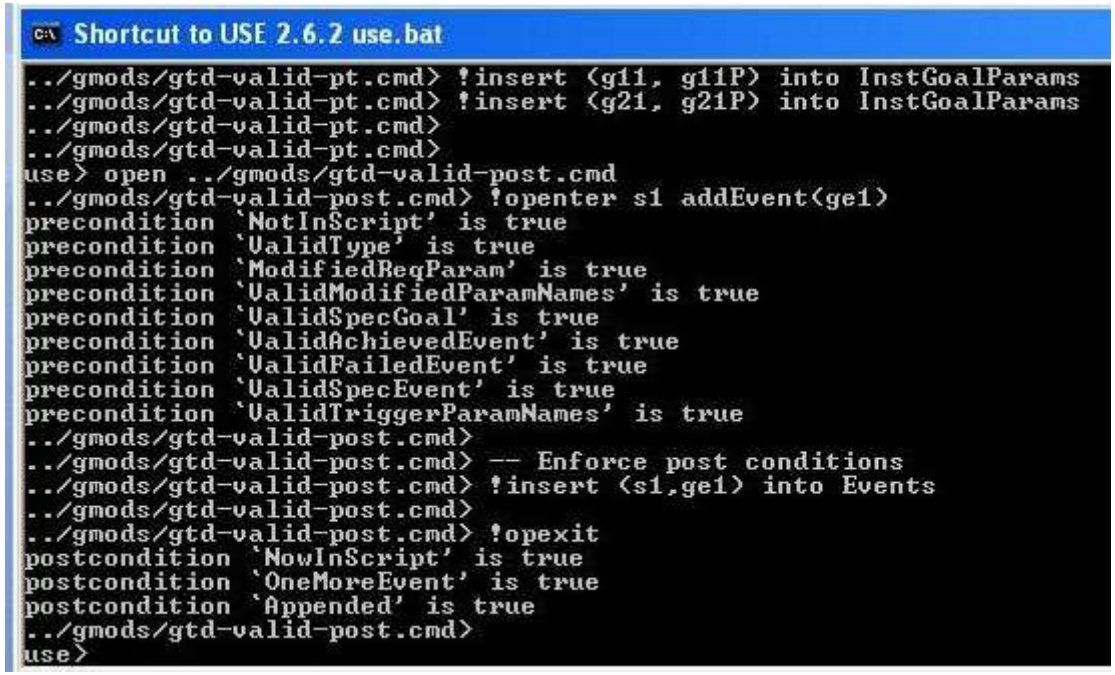
Specification Tree Modeled



Snapshot of Valid Preconditions for Adding a POSITIVE_TRIGGER

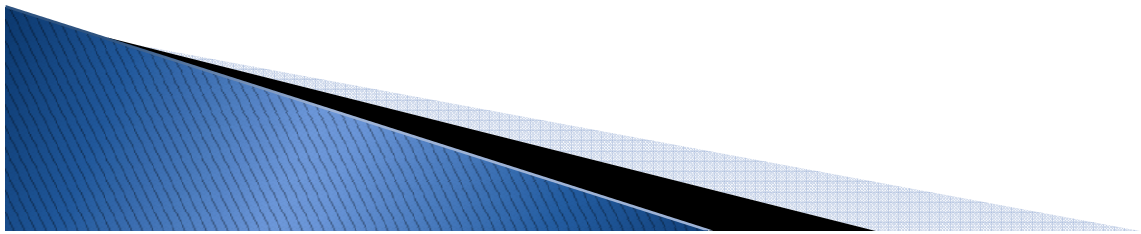


Evaluating Pre/Postconditions

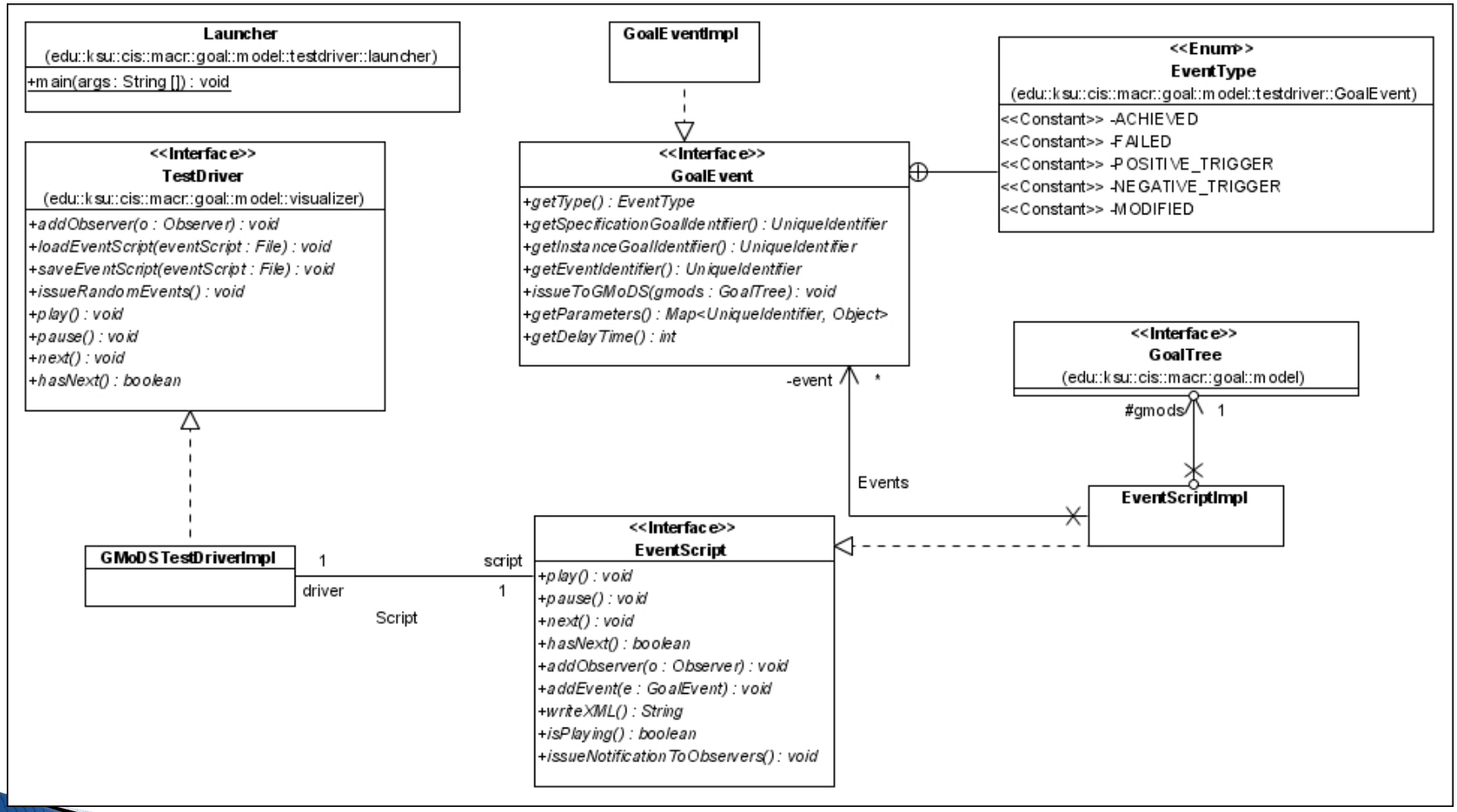


USE Modeling Affected the Formal Specification

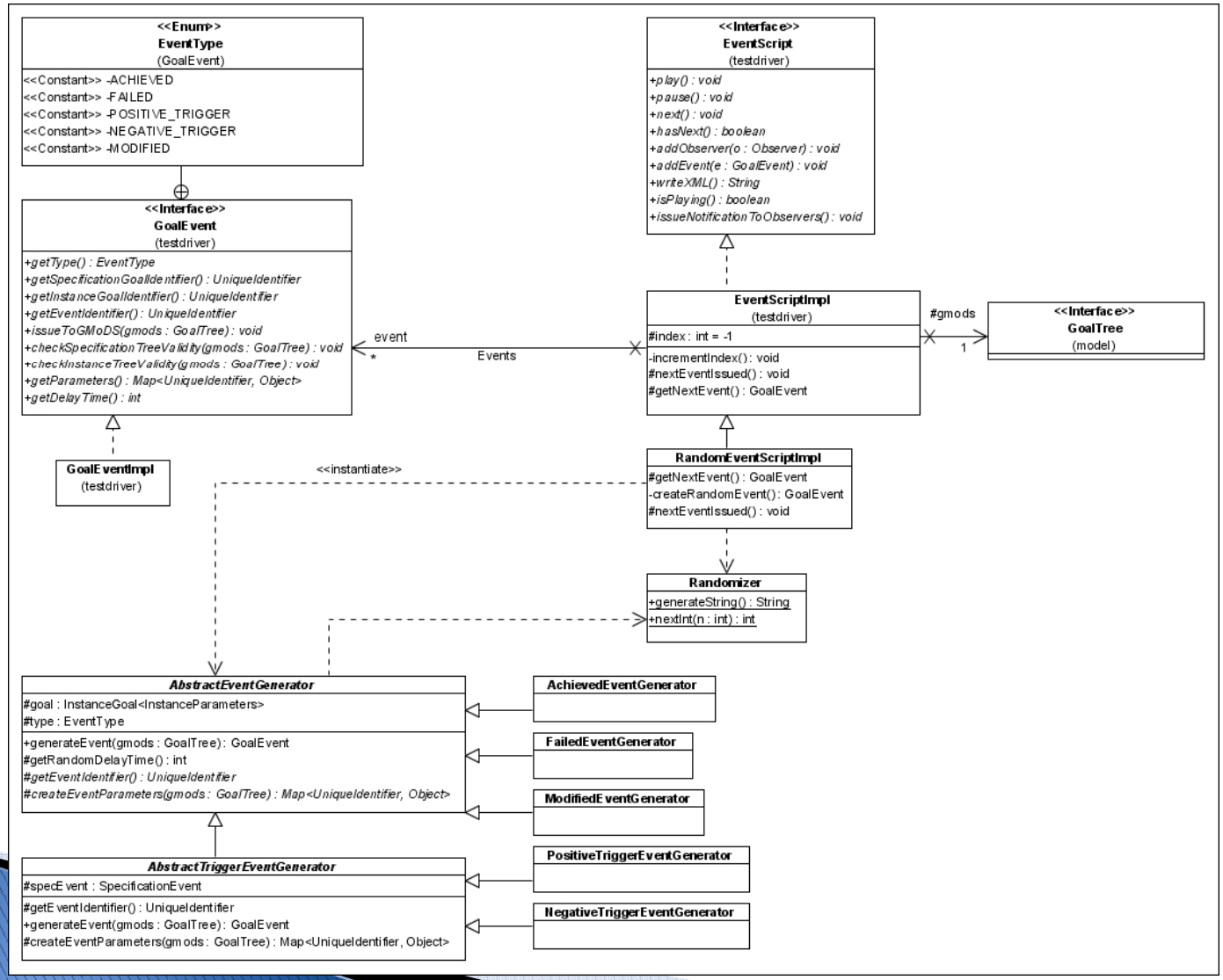
- Corrected OCL syntax
  - <> instead of !=
  - “…implies…” instead of “if …implies…”
- Realized I left out preconditions
  - ValidModifiedParamNames
  - ValidTriggerParamNames



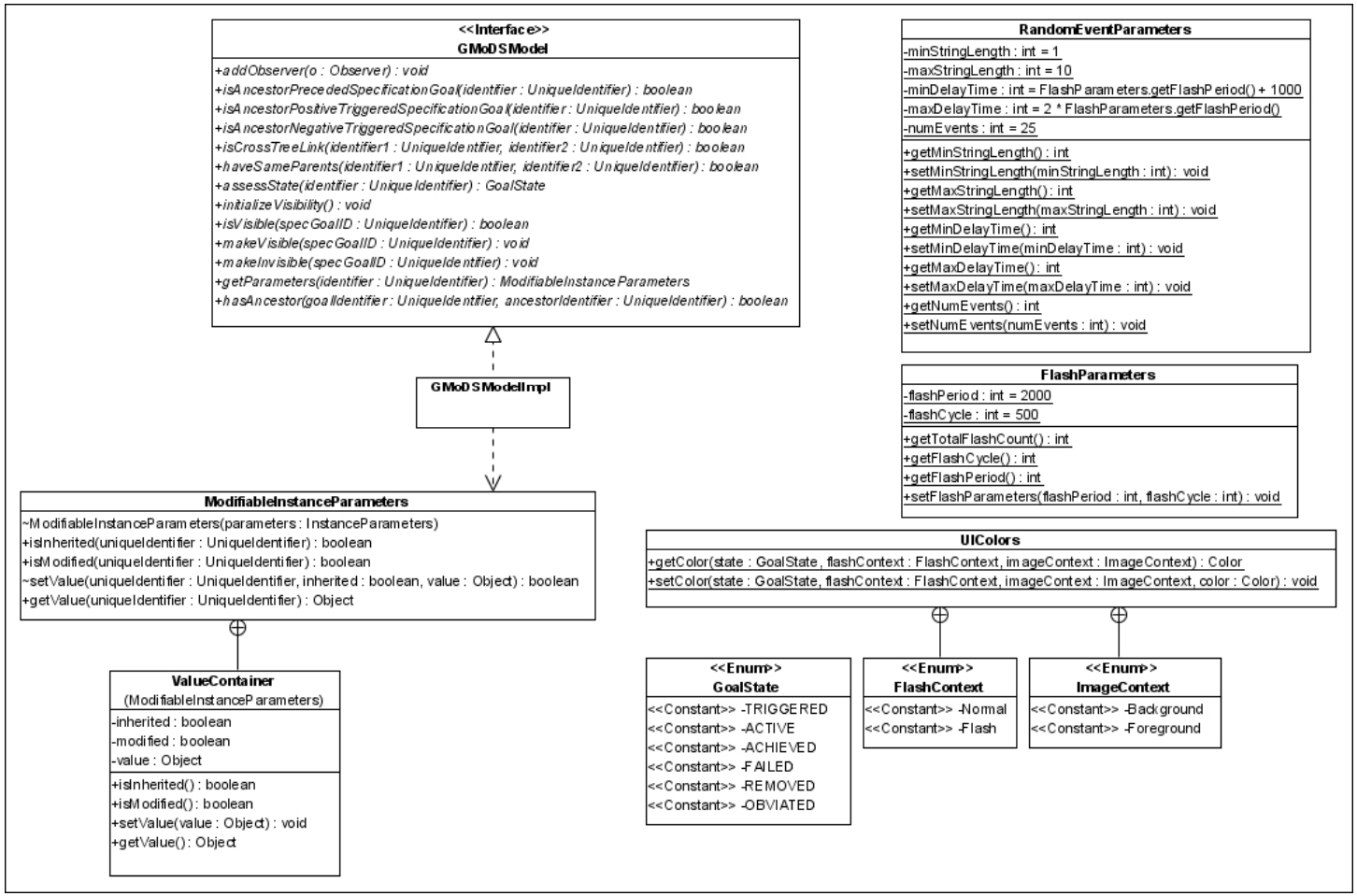
GMoDS Test Driver Architecture



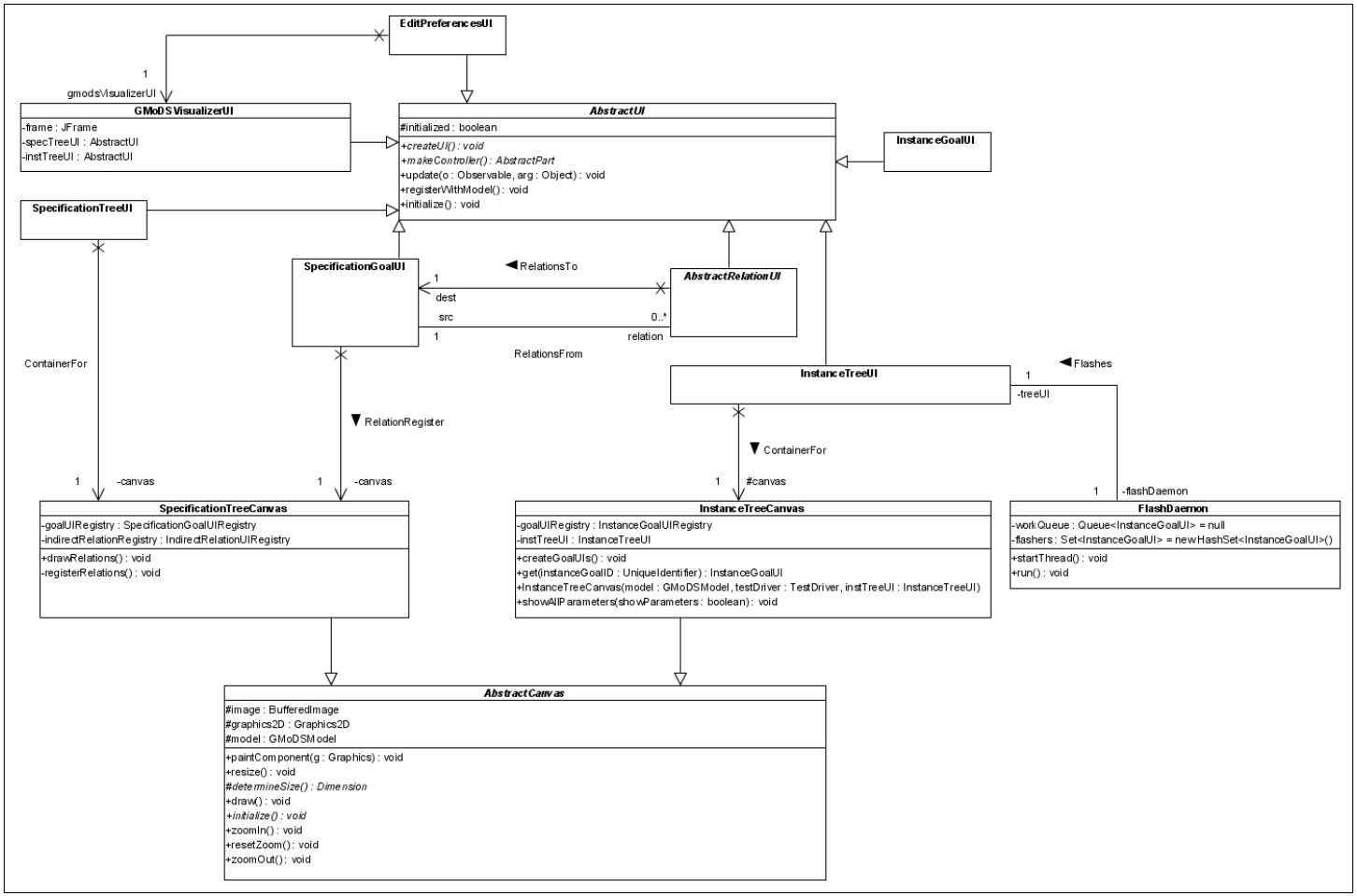
GMoDS Test Driver
Random Events



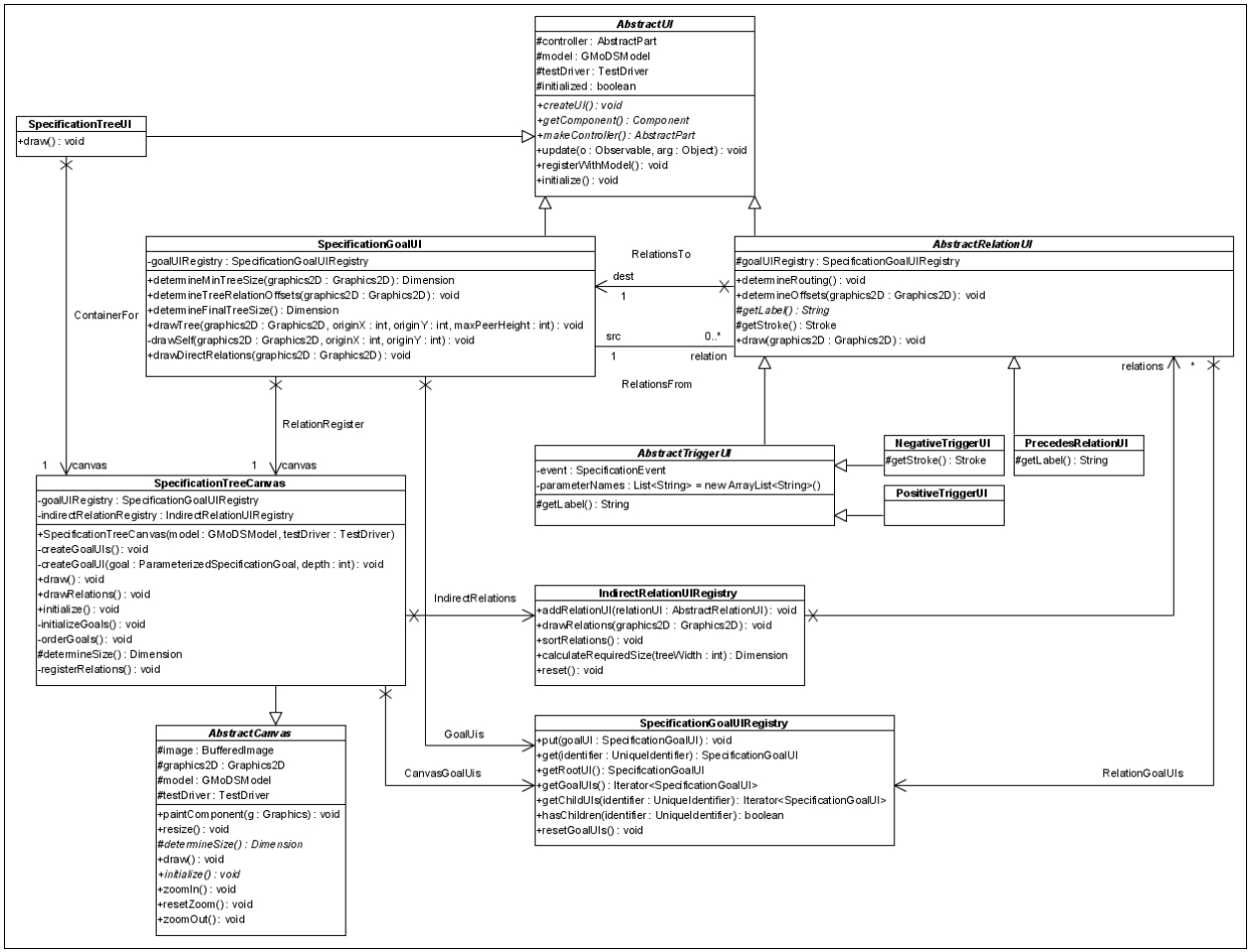
GMoDS Visualizer Model



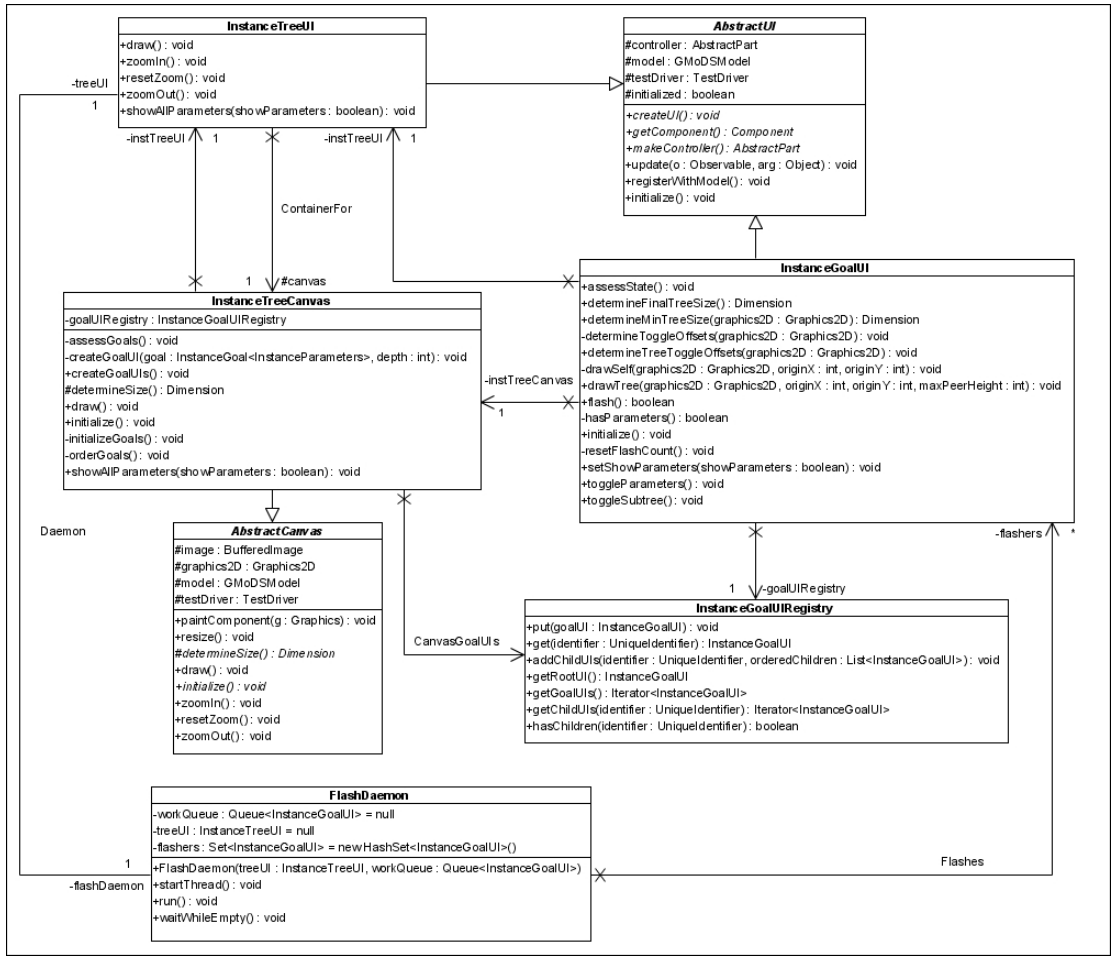
GMoDS Visualizer View Architecture



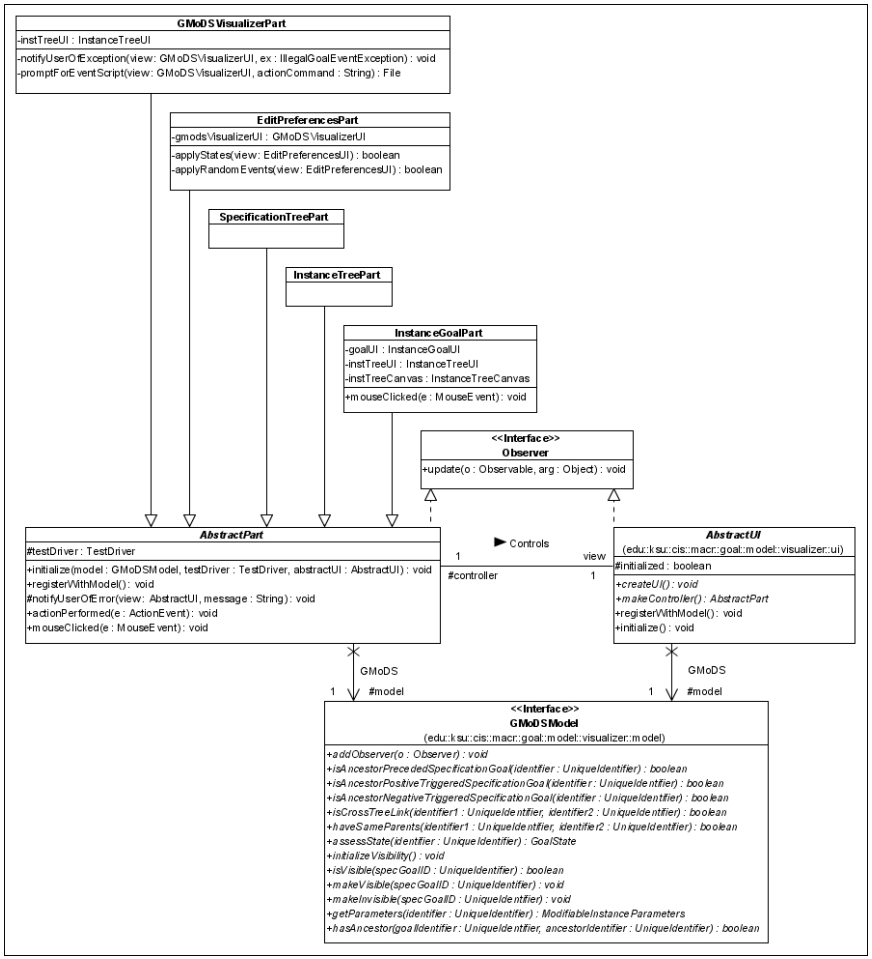
GMoDS Visualizer Specification Tree View



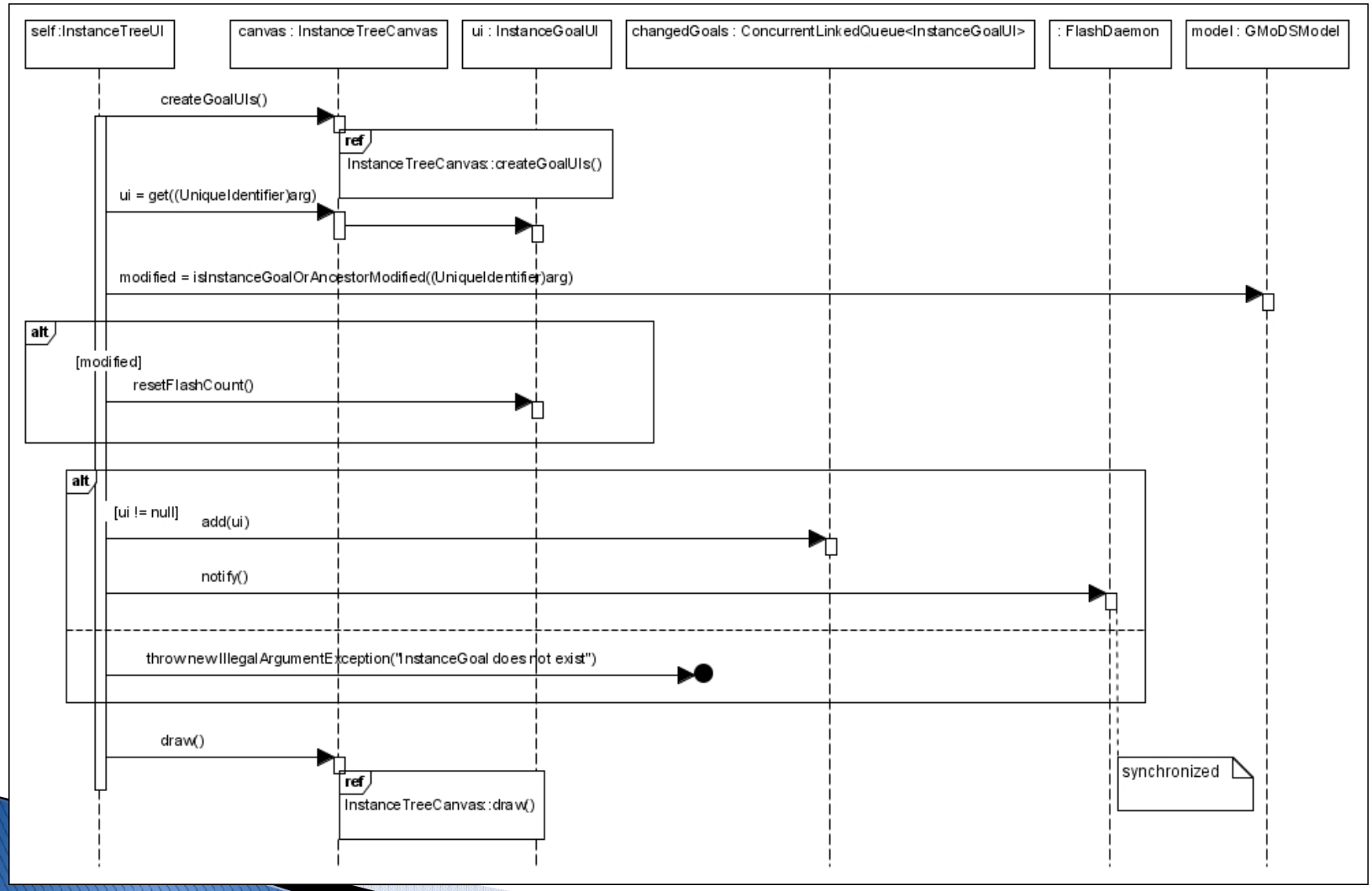
GMoDS Visualizer Instance Tree View



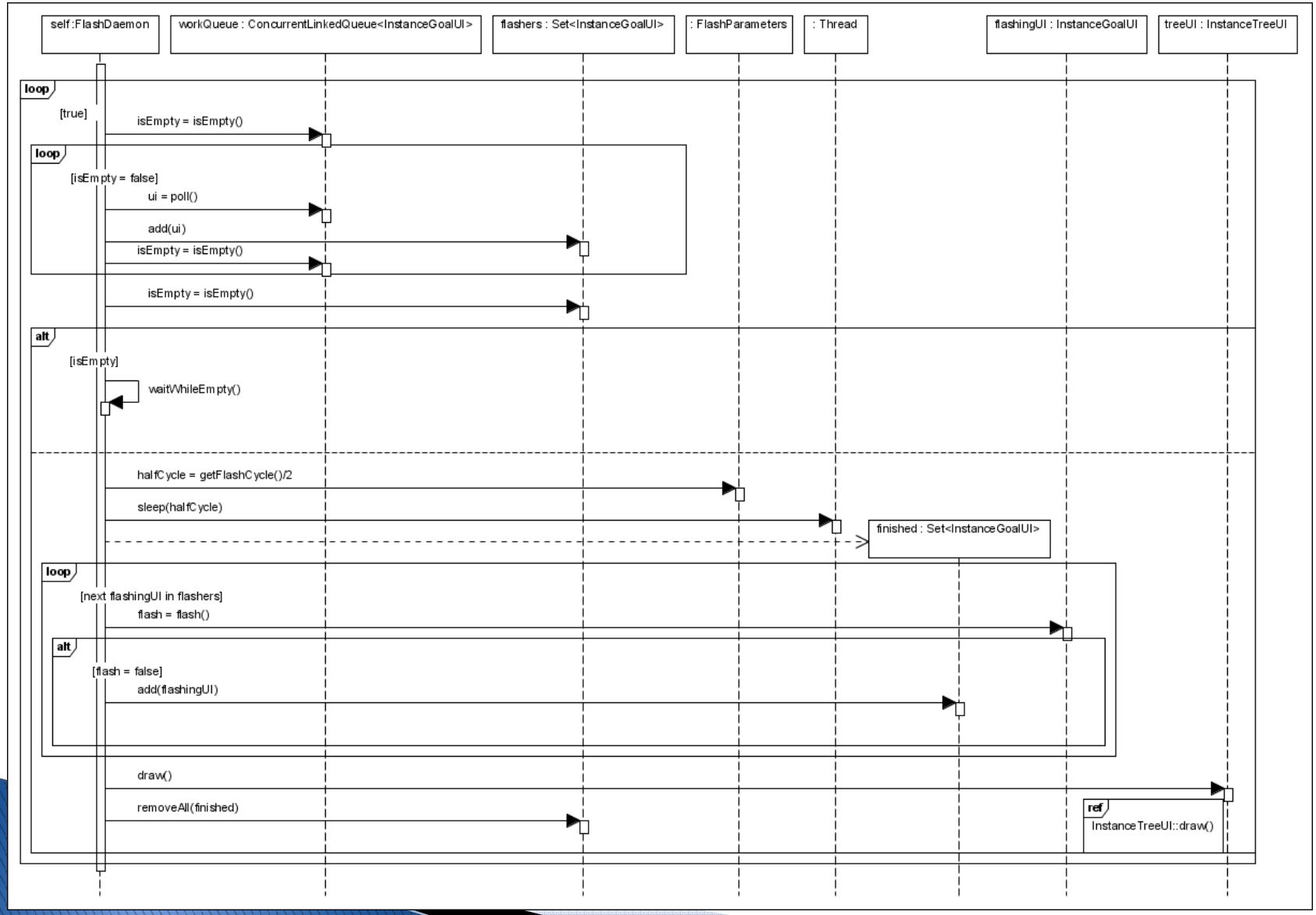
GMoDS Visualizer Part



InstanceTreeUI update(arg : Object)



FlashDaemon run()

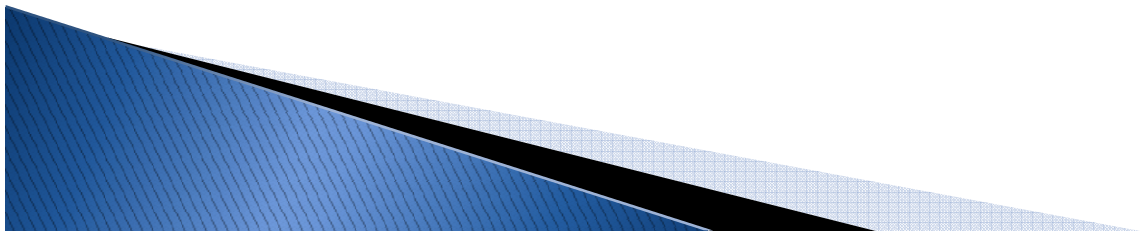


Assessment Evaluation Summary

Test Case ID	Test Case Title	Results
TC.GTD-1	Load Event Script	Pass
TC.GTD-2	Event Script Operation	Pass
TC.GTD-3	Random Event Script Operation	Pass
TC.GTD-4	Save Event Script	Pass
TC.GV-1	Display Specification Tree	Pass
TC.GV-2	Display Instance Tree	Pass
TC.GV-3	Zooming	Pass
TC.GV-4	Show/Hide Instance Goals of Specific Types	Pass
TC.GV-5	Show/Hide All Specification Goal Parameters	Pass
TC.GV-6	Show/Hide All Instance Goal Parameters	Pass
TC.GV-7	Show/Hide Specific Instance Goal Parameters	Pass
TC.GV-8	Collapse/Expand Instance Goal Sub-tree	Pass
TC.GV-9	Change Instance Goal State Colors	Pass

Assessment Evaluation Problems Encountered

Test Case	Failure	Action to Resolve
TC.GTD-2 – Event Script Operation	Failed to catch an IllegalGoalEventException thrown when an invalid GoalEvent is encountered during event script play.	Deferred and accumulated IllegalGoalEventExceptions while it is unsafe to throw them. Added try/catch surrounding applicable code in the play, pause, and hasNext methods. Added throw of the cumulative IllegalGoalEventException when it becomes safe to do so.
TC.GV-1 – Display Specification Tree	Rightmost specification goal cutoff in drawing.	Add margins to the image on the right and bottom.
TC.GV-3 – Zooming	Specification tree right/bottom cutoff when zoomed in.	The content of the JScrollPane, the AbstractCanvas, resets its preferred size and then calls the method “revalidate” after a zoom.
TC.GV-5 - Show/Hide All Specification Goal Parameters	Specification tree trigger parameters not hidden.	Added a flag to AbstractTriggerUI to prevent drawing parameters when hidden.
TC.GV-2 – Display Instance Tree	MODIFIED event results in incorrect colors and flashing	Reset flash count if instance goal is modified.



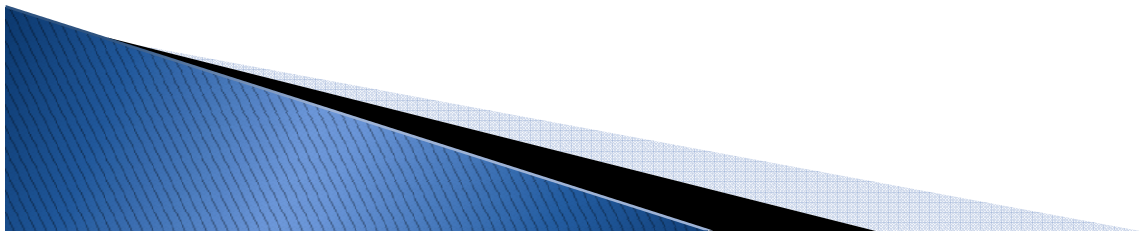
Project Evaluation

Project Size

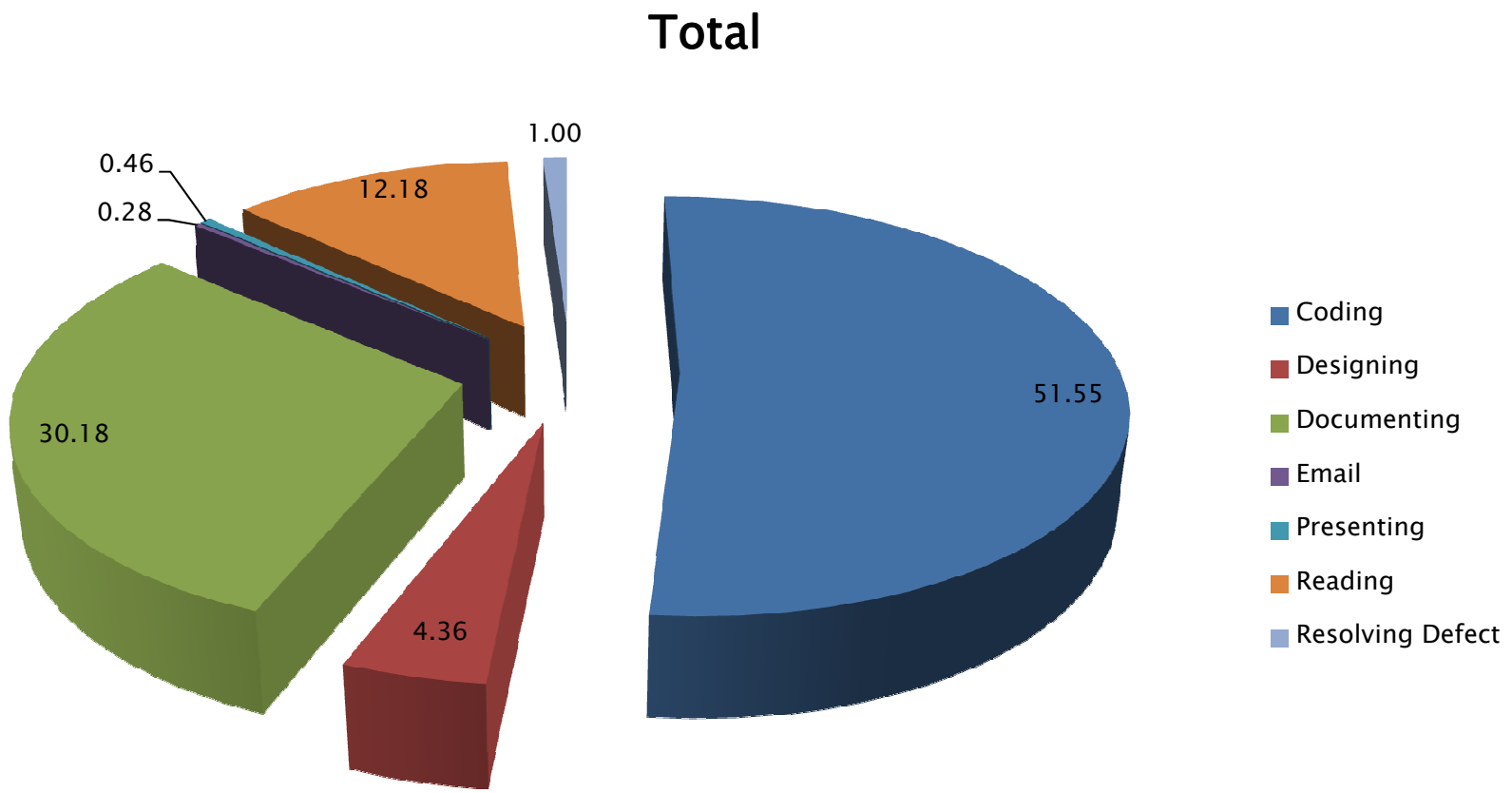
Phase	SLOC Estimate
Phase 1	4K
Phase 2	7K
Phase 3	8.3K (Actual)

Project Duration

Phase	Estimated End Date	Actual End Date
Phase 1	11/10/2010	11/22/2010
Phase 2	2/14/2011	1/13/2011
Phase 3	4/14/2011	3/16/2011

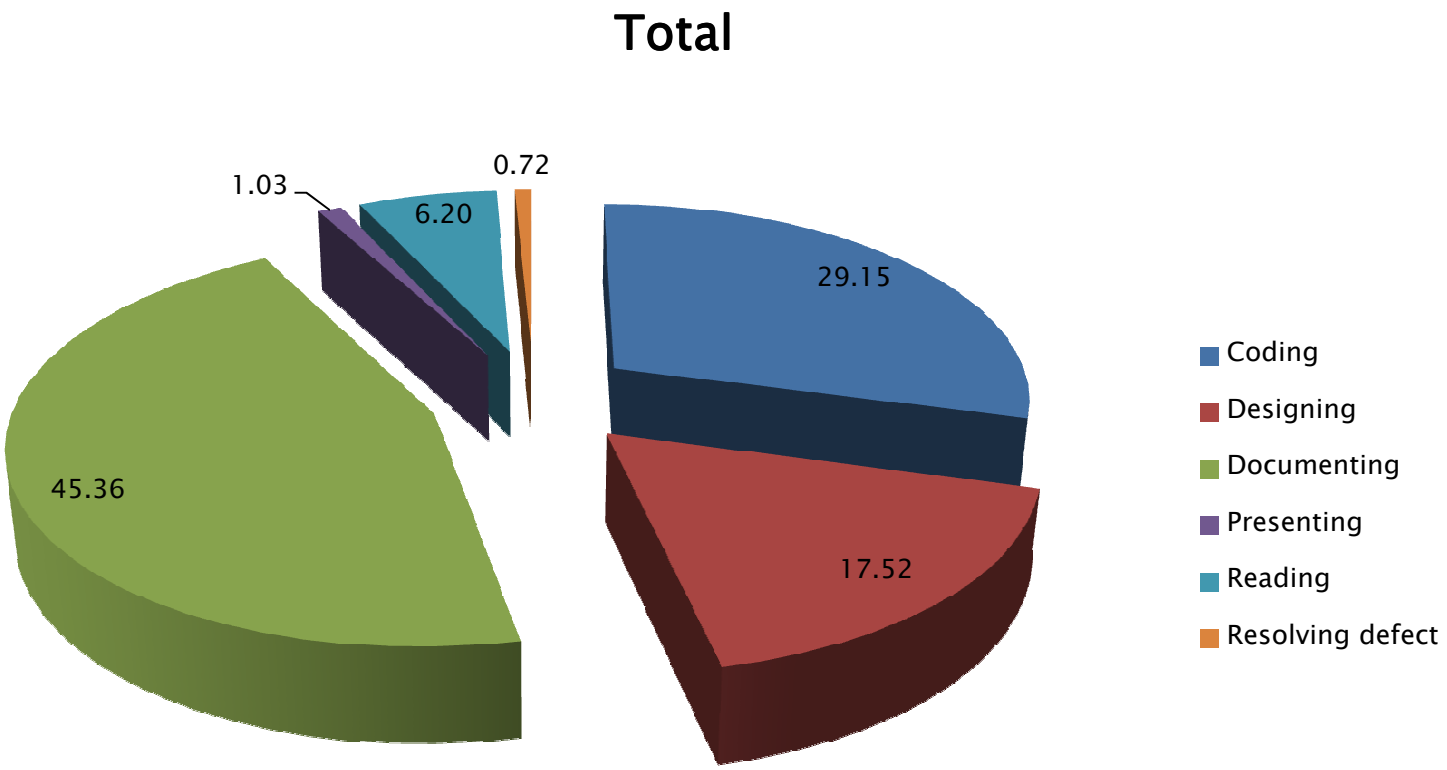


Task Breakdown in Phase 1



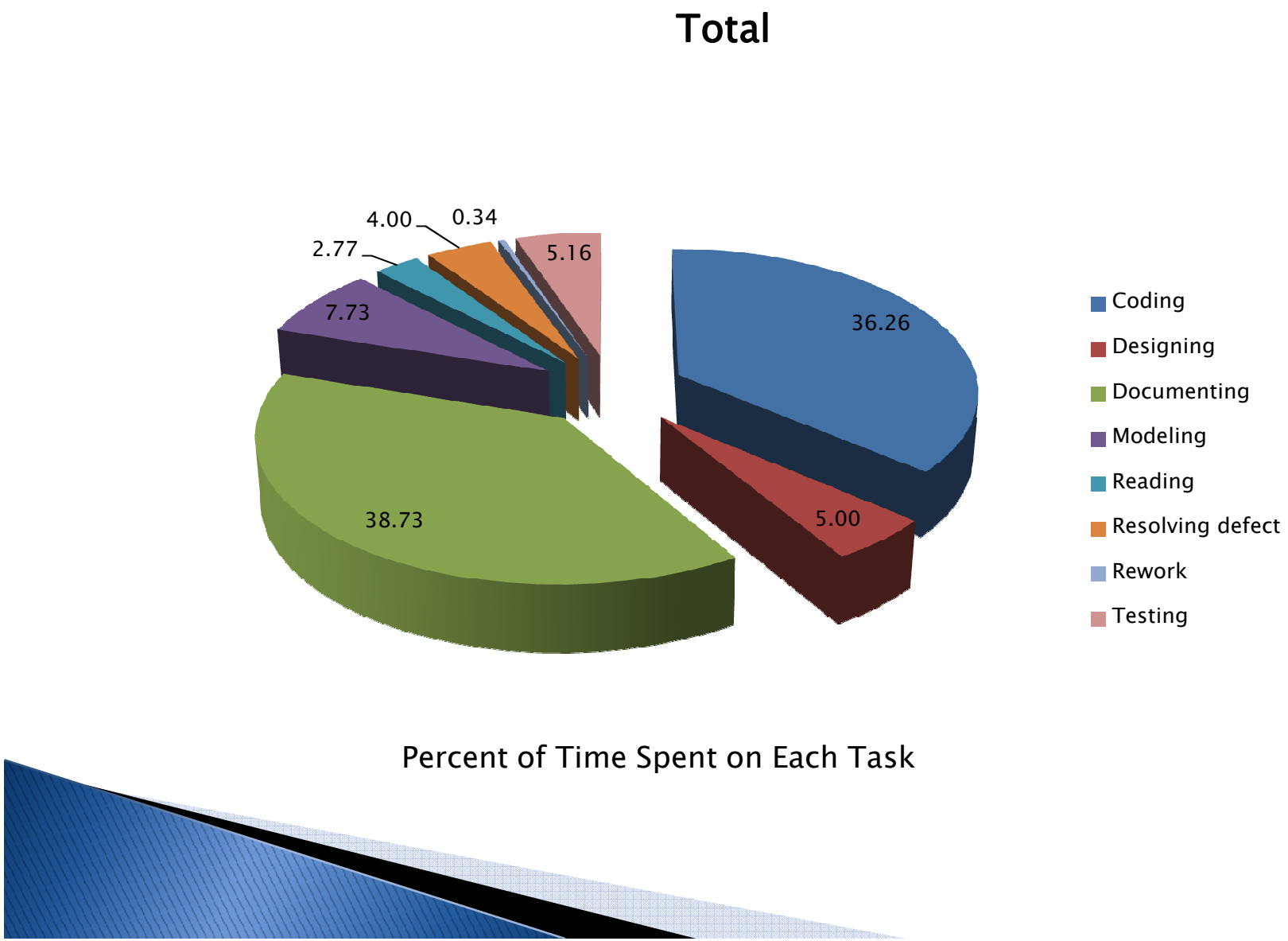
Percent of Time Spent on Each Task

Task Breakdown in Phase 2



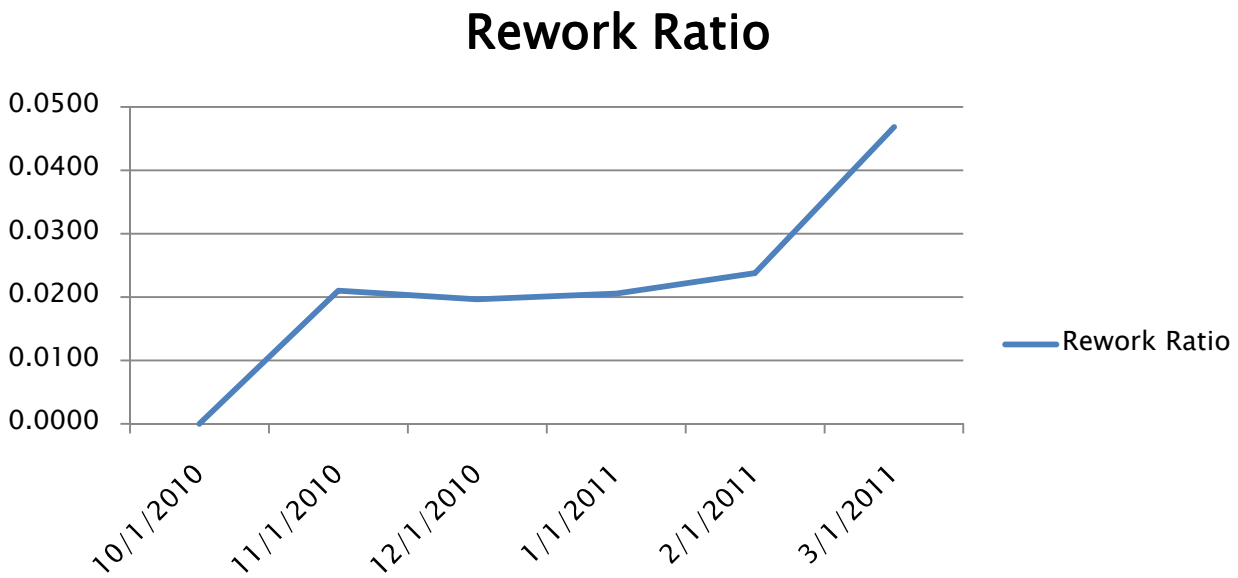
Percent of Time Spent on Each Task

Task Breakdown in Phase 3

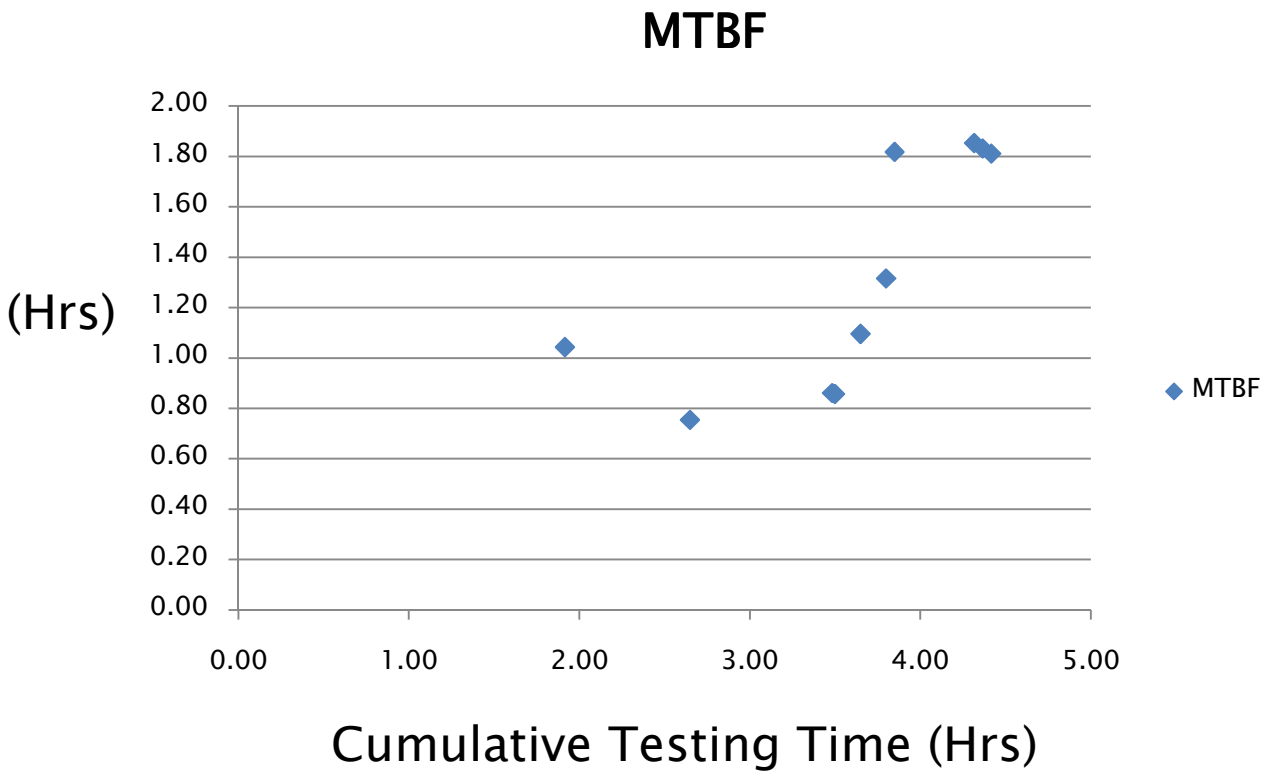


Product Quality
Rework Ratio

$$RW = \frac{E_{Defects}}{E_{Development}}$$

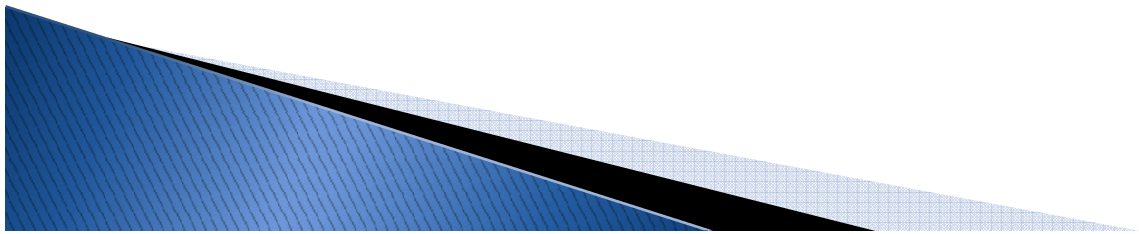


Product Quality
Mean Time between Failures



Future Work

- Dynamic specification tree display
- Display events executed in the GMoDS Test Driver



Demonstration

Questions/Comments