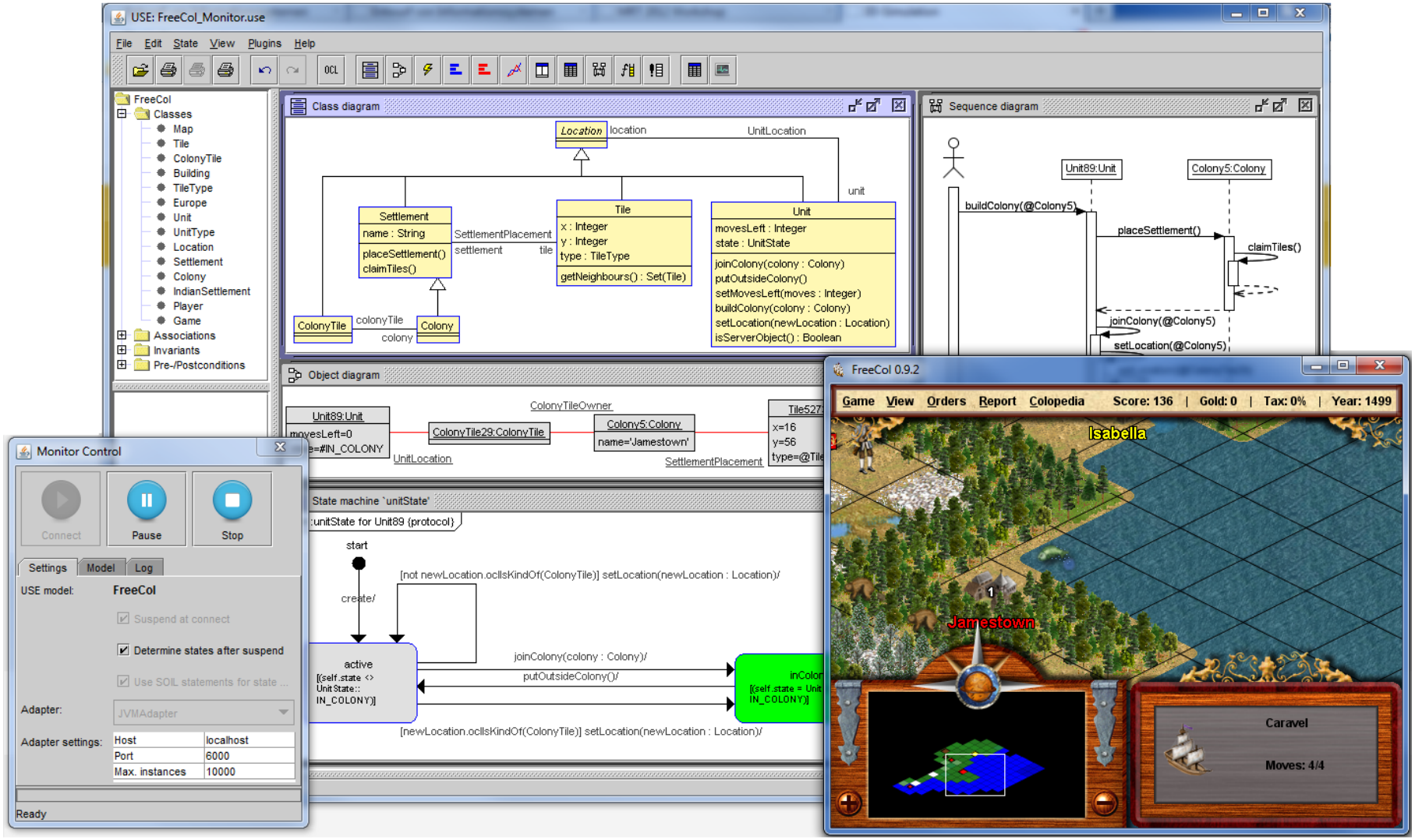
Towards Supporting Multiple Execution Environments for UML/OCL Models at Runtime

Models@runtime Workshop 2012
Lars Hamann, Martin Gogolla, Daniel Honsel

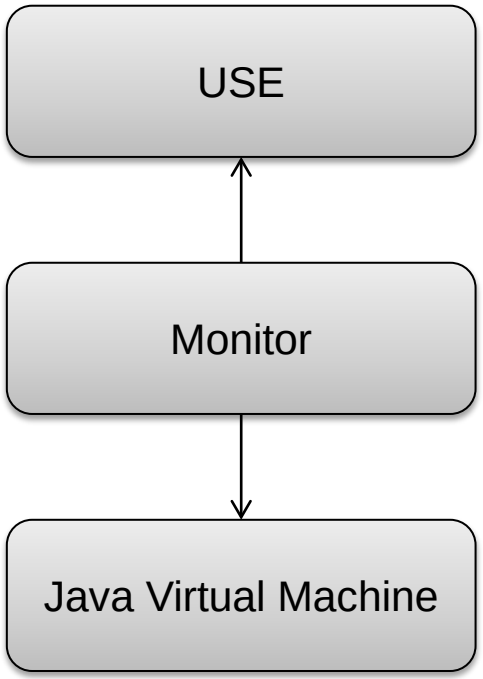
Runtime Monitoring with USE

- USE: UML-based Specification Environment
  - Validate UML / OCL models by:
    - Samples / Scenarios: Given execution sequence
    - Execution: Action Language (SOIL)
    - Model Finding: Model Finder / Generator
  - Subset of UML
  - Huge subset of OCL based on formal semantics
- Monitor: 4th option to bring models to life by linking them to a runtime environment

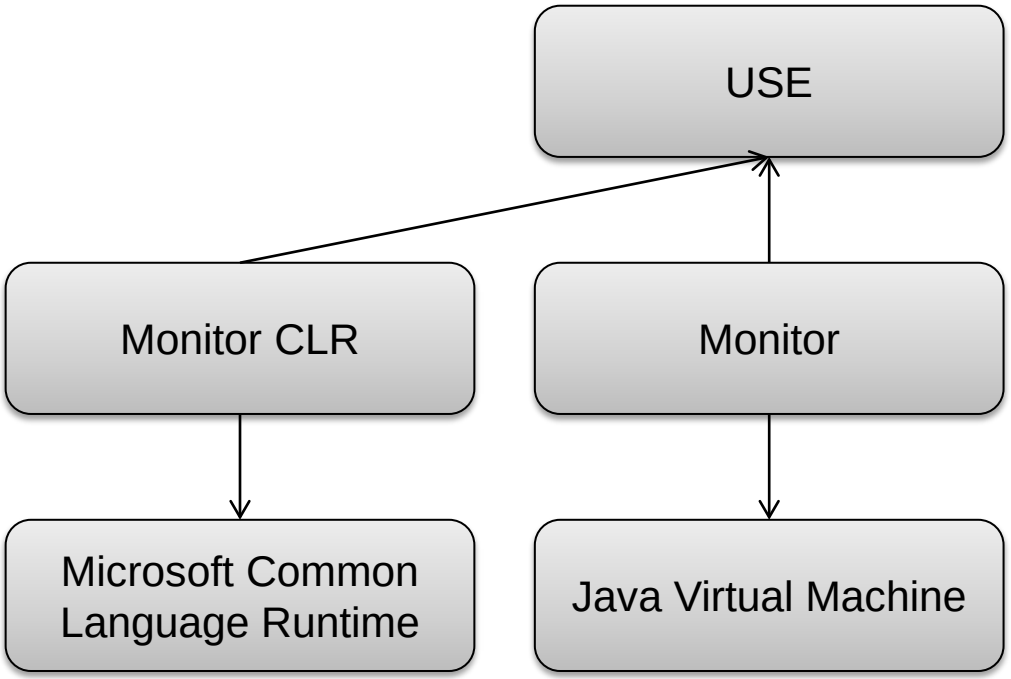
Example


USE: FreeCol_Monitor.use
File Edit State View Plugins Help
FreeCol
Classes
Map
Tile
ColonyTile
Building
TileType
Europe
Unit
UnitType
Location
Settlement
Colony
IndianSettlement
Player
Game
Associations
Invariants
Pre-/Postconditions
Class diagram
Location
location
UnitLocation
unit
Settlement
name : String
placeSettlement()
claimTiles()
SettlementPlacement
settlement
tile
Tile
x : Integer
y : Integer
type : TileType
getNeighbours() : Set(Tile)
Unit
movesLeft : Integer
state : UnitState
joinColony(colony : Colony)
putOutsideColony()
setMovesLeft(moves : Integer)
buildColony(colony : Colony)
setLocation(newLocation : Location)
isServerObject() : Boolean
ColonyTile
colonyTile
colony
Colony
Sequence diagram
Unit89:Unit
Colony5:Colony
buildColony(@Colony5)
placeSettlement()
claimTiles()
joinColony(@Colony5)
setLocation(@Colony5)
Object diagram
Unit89:Unit
movesLeft=0
ColonyTile29:ColonyTile
ColonyTileOwner
Colony5:Colony
name='Jamestown'
UnitLocation
SettlementPlacement
Monitor Control
Connect
Pause
Stop
Settings
Model
Log
USE model:
FreeCol
Suspend at connect
Determine states after suspend
Use SOIL statements for state ...
Adapter:
JVMAdapter
Adapter settings:
Host
localhost
Port
6000
Max. instances
10000
Ready
State machine 'unitState'
unitState for Unit89 {protocol}
start
create/
[not newLocation.oclIsKindOf(ColonyTile)] setLocation(newLocation : Location)/
active
joinColony(colony : Colony)/
putOutsideColony()/
[newLocation.oclIsKindOf(ColonyTile)] setLocation(newLocation : Location)/
FreeCol 0.9.2
Game View Orders Report Colopedia
Score: 136 | Gold: 0 | Tax: 0% | Year: 1499
Isabella
Jamestown
Caravel
Moves: 4/4

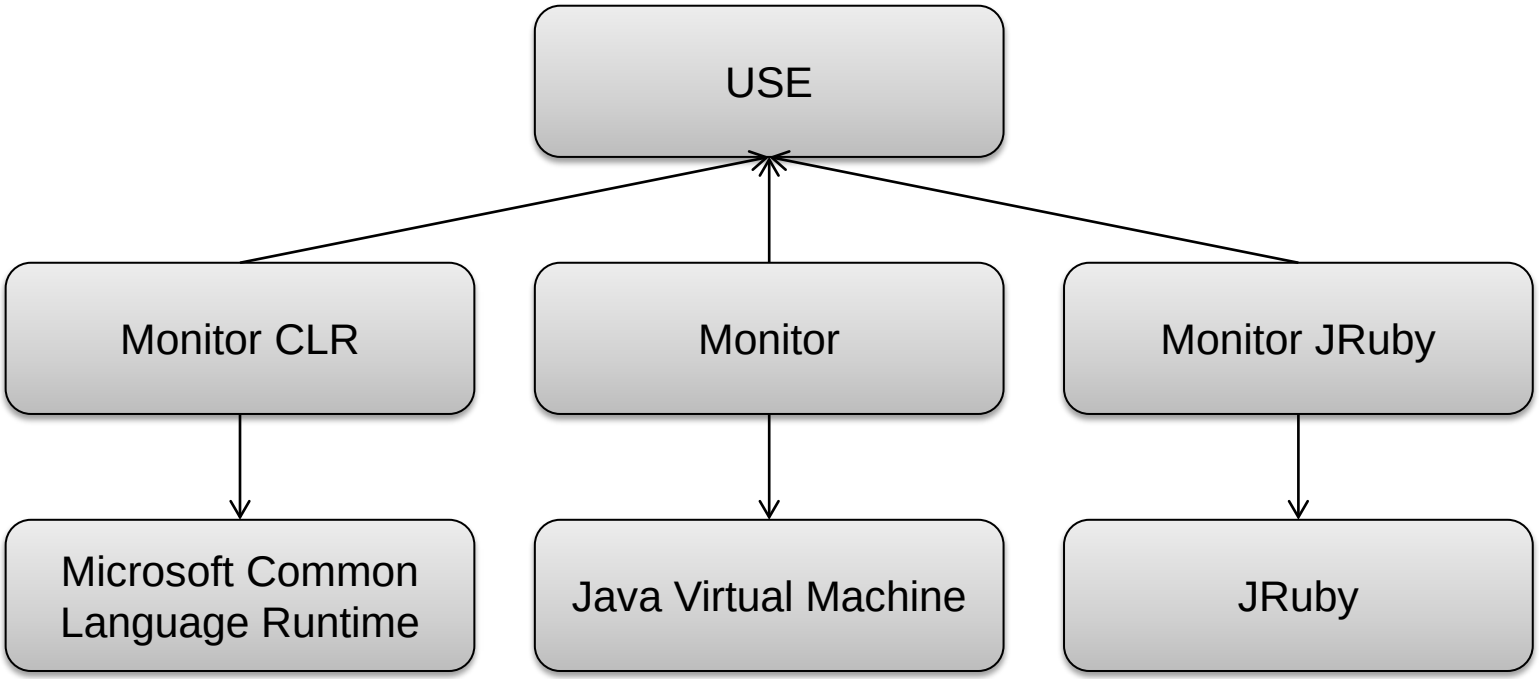
Overall idea



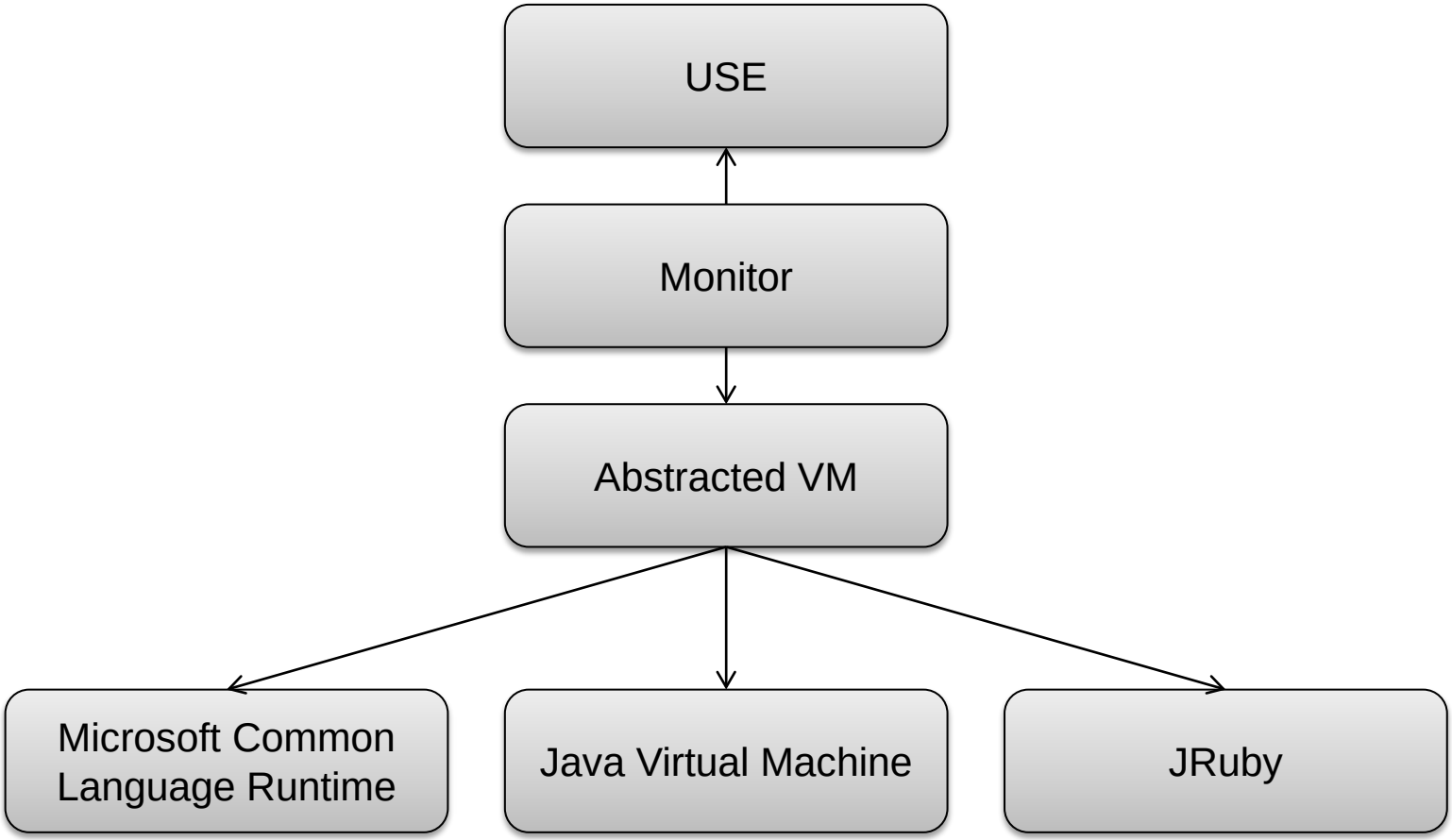
Overall idea



Overall idea



Overall idea



Conclusion and Outlook

- Common Meta-Model for Monitoring
  - Static (Snapshot)
  - Dynamic (Call-Sequences)
- Our target: Object-Oriented Virtual Machines
  - Java, CLR
- Possible other targets
  - JRuby as a language build on-top of another