Usability

July 12, 2010

V 6

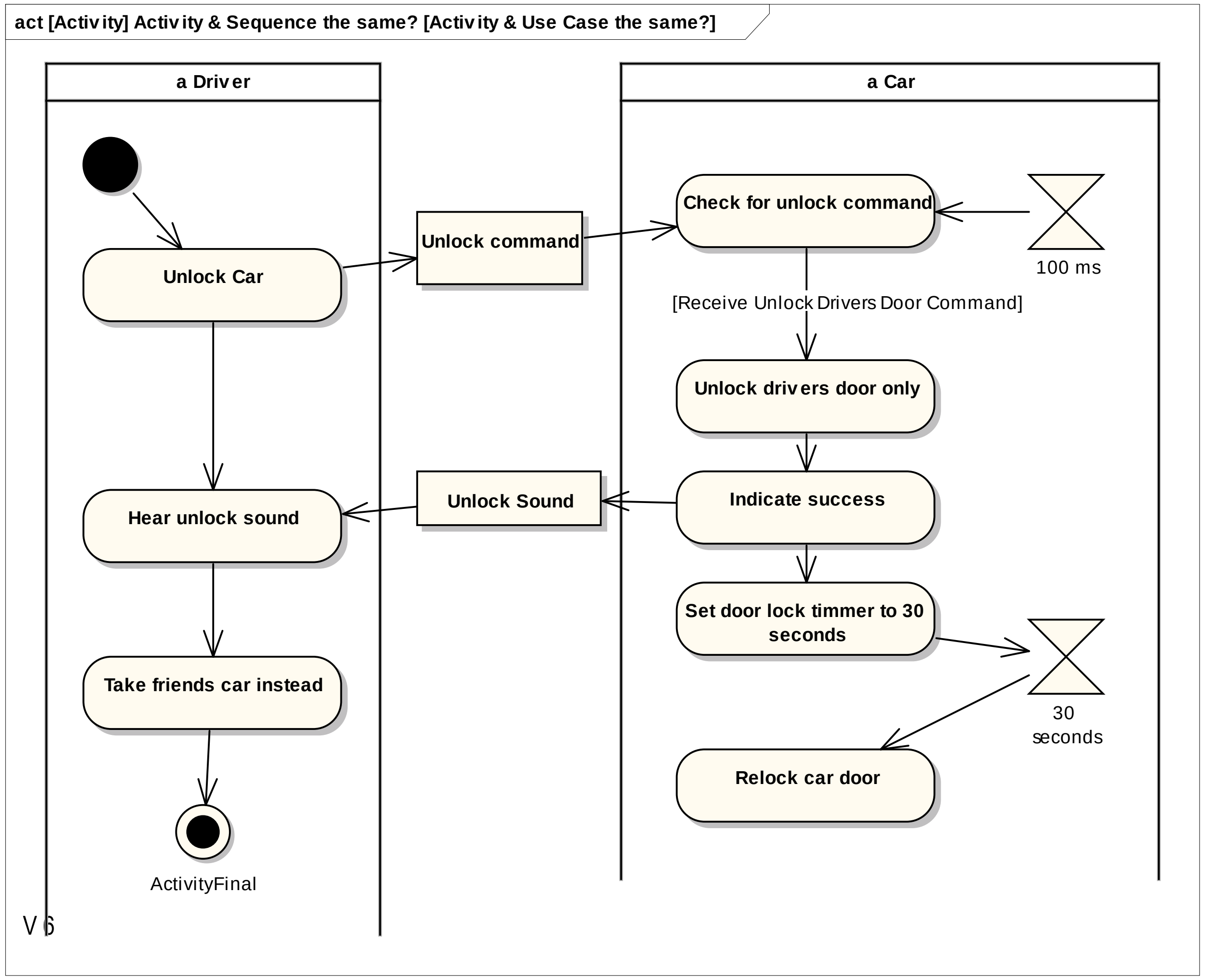
Introduction

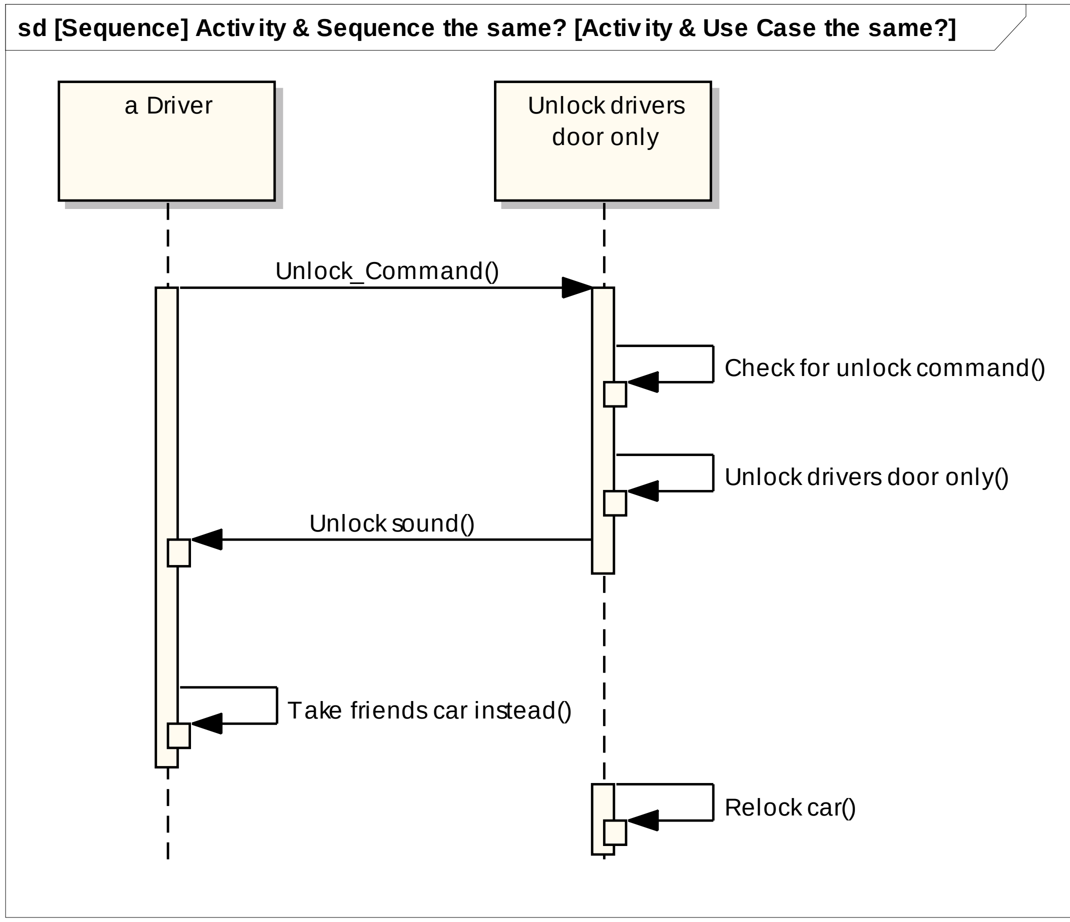
- Address usability items that cause waste or add customer value

- Usability items
  - Want a Language that is
    - Clean and consistent
    - Tailor able to the language of the user
    - Easy to train
    - Easy to remember
  - Want Methods that
    - Correct and Consistent Modeling Standards
    - Handoffs between
  - Want tools that
    - Executable Behaviors
    - Analyzable Constraints
    - Document Generation
    - Implementation Generation
      - Network Tables
      - Runtime Middleware
    - Manage and share versions of elements/relationships between teams

Sequence Diagram & Activity Diagram

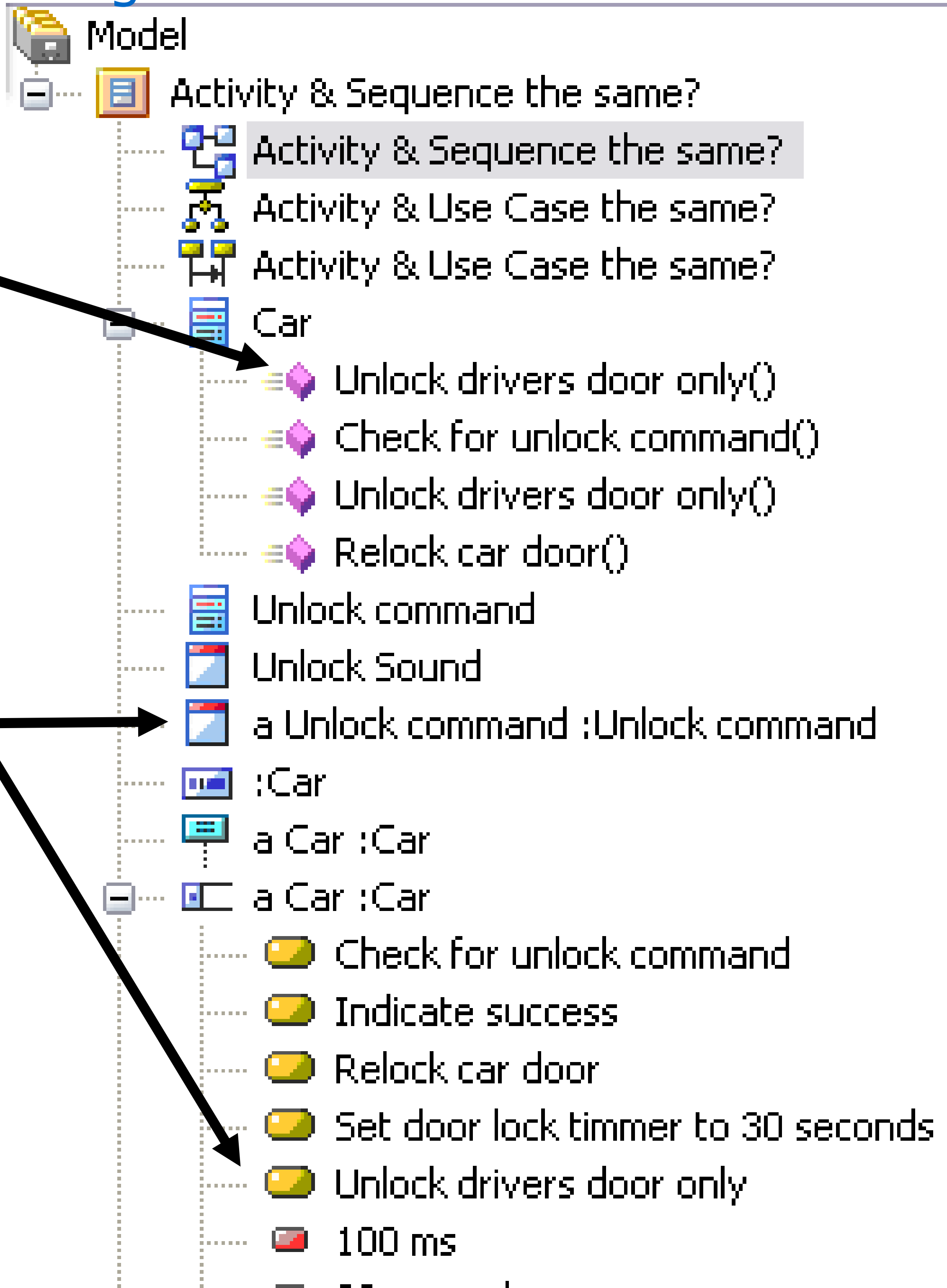
- Language
  - Sequence diagrams and activity diagrams. Why aren't they the same model with two different views?
    - Users naturally draw them the same
    - Sequence diagram operator is the same as an activity / call action is the same as an operator on a block/class




sd [Sequence] Activity & Sequence the same? [Activity & Use Case the same?]
a Driver
Unlock drivers door only
Unlock_Command()
Check for unlock command()
Unlock drivers door only()
Unlock sound()
Take friends car instead()
Relock car()

Sequence Diagram & Activity Diagram

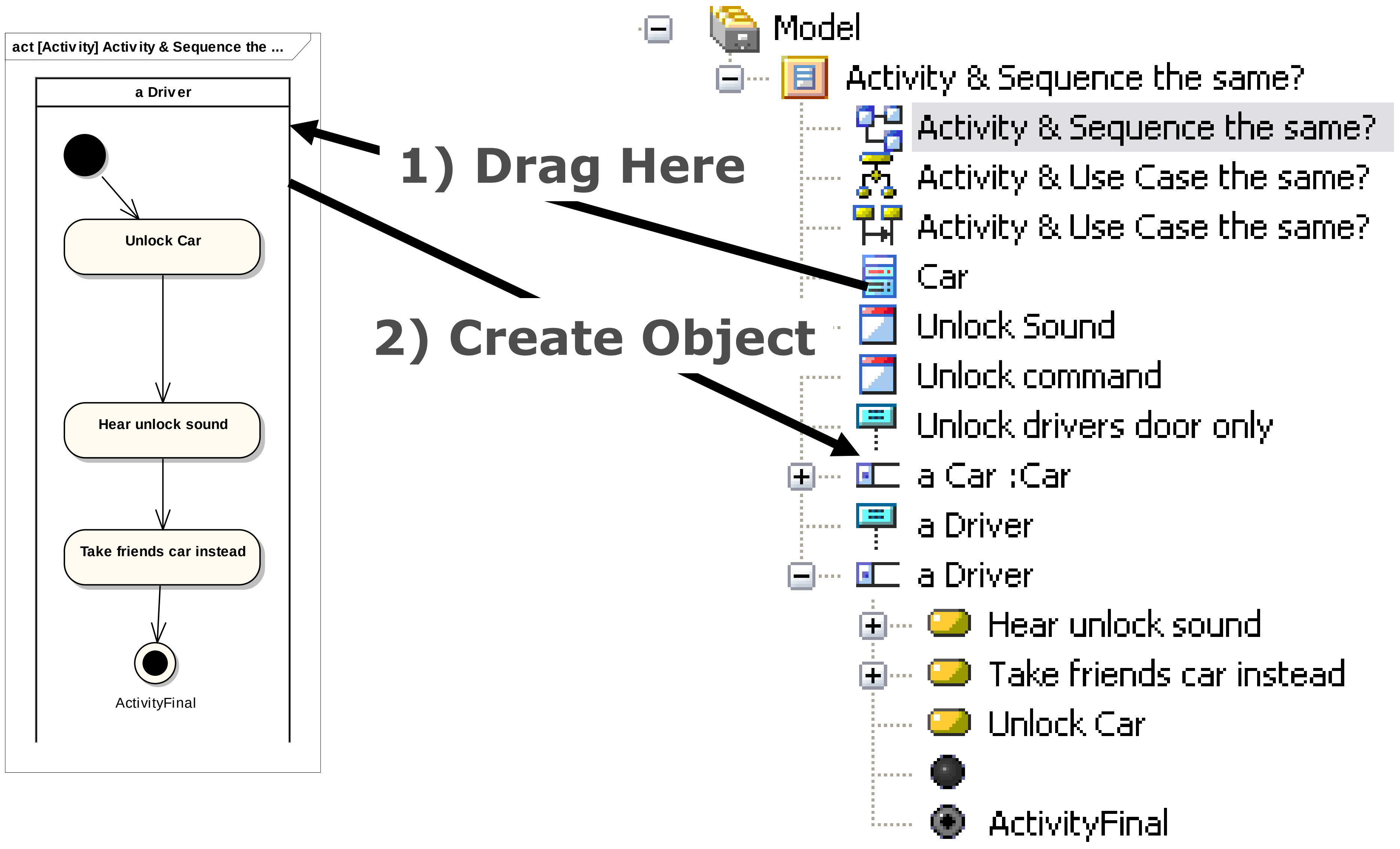
- Language
  - Activities/Actions and Operators should be the same
  - Sequence diagrams need to be updated to describe flowport information



Model
Activity & Sequence the same?
Activity & Sequence the same?
Activity & Use Case the same?
Activity & Use Case the same?
Car
Unlock drivers door only()
Check for unlock command()
Unlock drivers door only()
Relock car door()
Unlock command
Unlock Sound
a Unlock command :Unlock command
:Car
a Car :Car
a Car :Car
Check for unlock command
Indicate success
Relock car door
Set door lock timmer to 30 seconds
Unlock drivers door only
100 ms

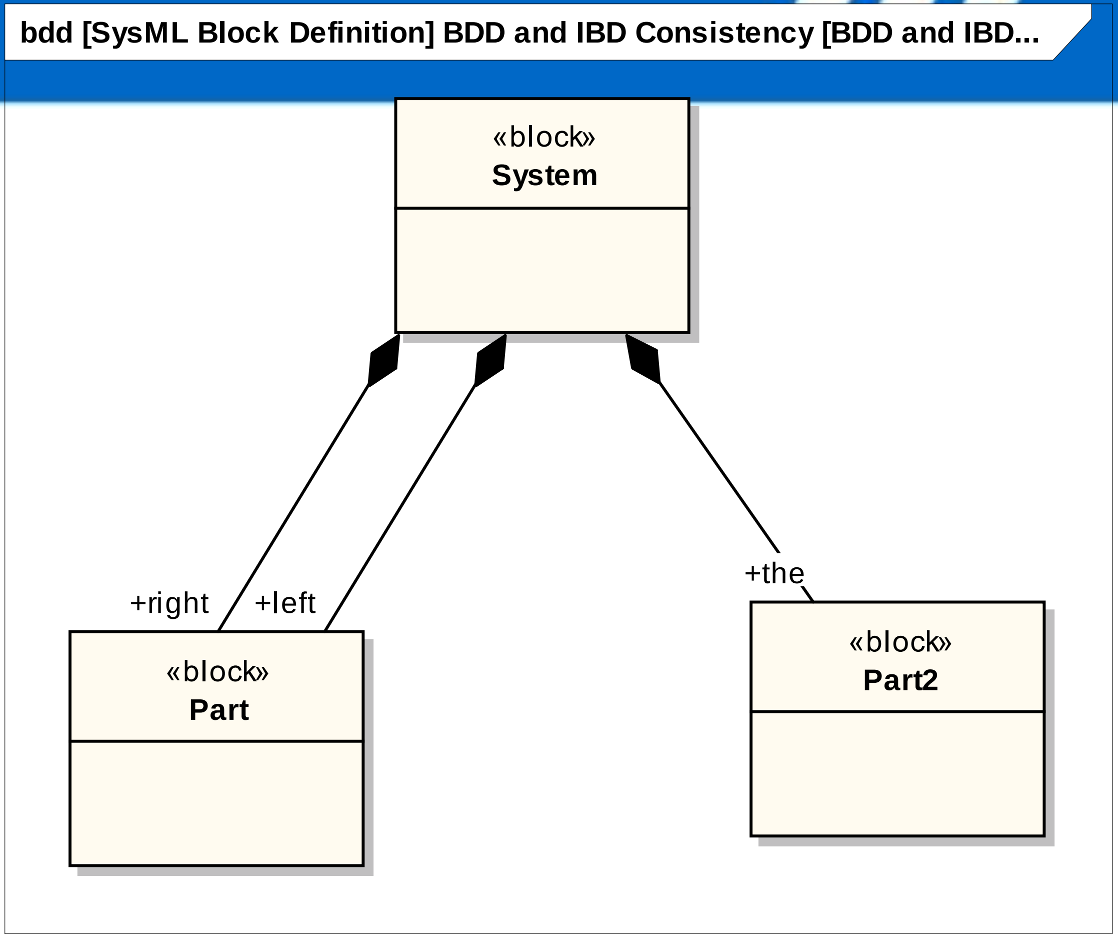
Activity Diagram Building

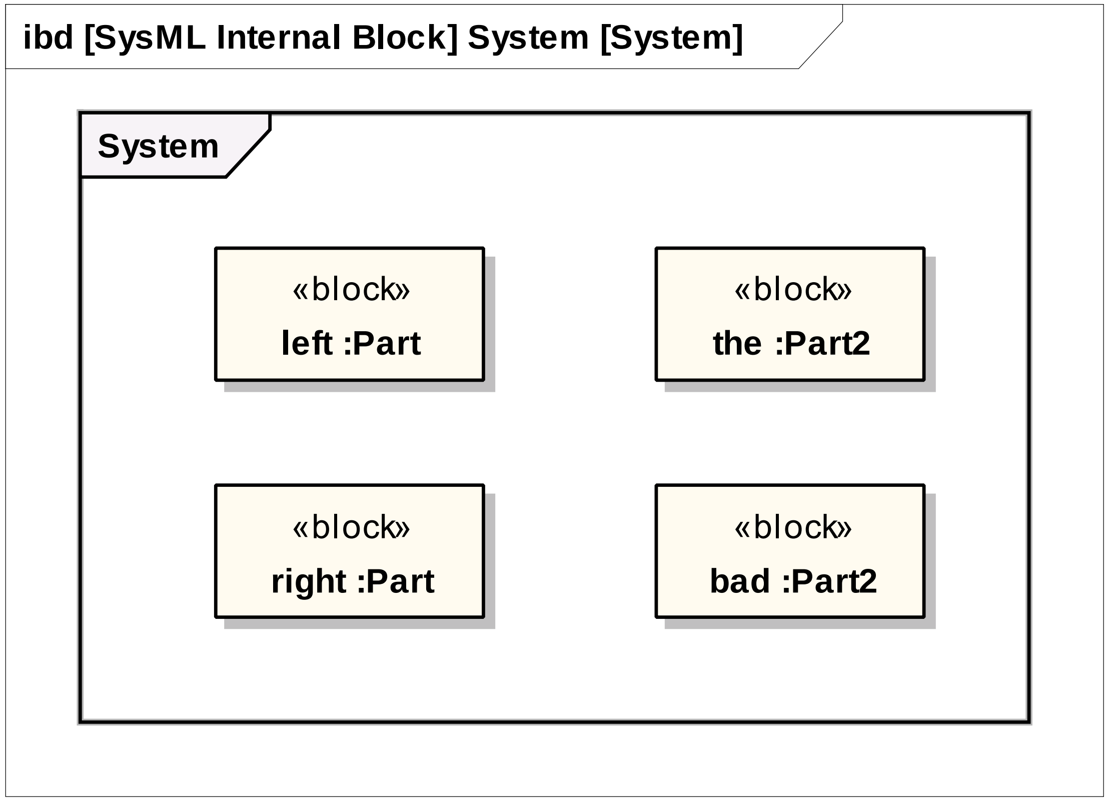
- Methodology & Tools
  - Block on activity diagram becomes partition/swim lanes



BDD & IBD

- Methodology / Tools
  - Inconsistency between BDD and IBD is possible


bdd [SysML Block Definition] BDD and IBD Consistency [BDD and IBD...
«block»
System
+right
+left
+the
«block»
Part
«block»
Part2



SysML Language Complexity

- Language
  - Why is there an activity and action? Can’t the activity and action be the same? A call action seems to be the same as an activity.
- Methods
- Tools
  - Nesting and Data model browser should reflect each other
  - Relationships between requirements and other blocks created by drag and drop instead of a diagram

Handoff between people

- Methodology
  - What artifacts are handed off and shared down a layer
    - Requirements and constraints
    - Interfaces Definitions
    - Concept of Operations
    - Functions / States
    - Structure
    - Executable Model
  - What artifacts are integrated together up a layer
    - Interface Definitions
    - Executable implementation
- Tools
  - Distributed workforce (USA, India, Brazil, Japan, …)
    - Need models that perform like they are locally installed but act like they are in a common repository/database
  - How are hand-off artifacts kept consistent and complete

Lifecycle of MBSE elements and relationships

- How can I know which part of a model is right and which part is wrong (obsolete or inconsistent)?
  - Models evolve and change over time. This results in stagnant and obsolete model elements and relationships.
- Methodology
  - Need a way to identify the maturity of diagrams, elements and relationships.
    - Designed, Analyzed, Peer Reviewed, Implemented, Validated, Verified, Obsolete
- Tools, & standards
  - Need to tie design into downstream processes to force updating model with new changes
    - Share with subteams
    - Execute behavior models
      - Run, pause, stop single step
      - Annimate blocks during execution
      - View and plot results
      - Ability to customize execution and documentation of the execution results
    - Analyze models
    - Verify models
    - Validate models

Conclusion

- Multiple copies of the same types of information in SysML are hard to maintain and bloat models. Cross diagram connections are hard to create and maintain.
- Recommend Simplifying the SysML Language
- Recommend researching methodologies
  - Hand-off, Share, and Reuse specific configuration versions of model elements and relationships
  - Artifacts communicated between design teams (contracts)
- Recommend enhancing tools
  - Behavior simulation simplification
  - Analysis tools
  - Verification & Validation tools

Backup slides (other thoughts)

Other Usability Categories

- Handoff between tools
- Handoff between people
- Lifecycle of MBSE elements and relationships
  - What is correct
  - What is shared
- Share and Reuse MBSE elements and relationships
  - What version am I using
  - What version is program x using
  - How can I reuse work done on program X
  - How can I change shared elements?
- Backup and Restore MBSE elements and relationships
- SysML Language Complexity
- Abstraction and Hierarchy of models (30k foot view)
- Scalable (100 to 1m elements and relationships)

Handoff between tools

- Need to exchange models between
  - Design and analysis
  - Design and design (different design tools or versions of a common tool)
  - Design and simulation
  - Design and implementation
  - Design and testing

- Exchange is more than standards. Vendors claim standards compliance (theory, not practice)
  - Need a standards validation process
  - Vendors need to show that they pass the validation process
  - Need to show that tools that meet the validation process are able to exchange the model and the diagrams

Share and Reuse MBSE elements and relationships

- Baseline/restore
- Backup/restore
- Version management
- Share different versions of the same element/relationship
- Manage change on shared element/relationship
- Difference
- Merge
- Notify of change
- Live data updates
- Ownership – a person or group as read/write access to change shared element/relationships
- Library of common behaviors
  - Share behavior models (math, matrix, io, aerospace, hydraulic, …)

Lifecycle of MBSE elements and relationships

- Models evolve and change over time. This results in stagnant and obsolete model elements and relationships.
  - Need a way to identify the maturity of diagrams, elements and relationships.
    - Designed, Analyzed, Peer Reviewed, Implemented, Validated, Verified, Obsolete
  - Need a way to create diagrams from the model
    - Auto layout
    - Auto route lines