Usability

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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

```
act [Activity] Activity & Sequence the same? [Activity & Use Case the same?]

a Driver
Unlock Car
Unlock command
[Receive Unlock Drivers Door Command]
Check for unlock command
Unlock drivers door only
Unlock sound()
Take friends car instead()
Hear unlock sound
Unlock Sound
Indicate success
Set door lock timer to 30 seconds
Relock car door
ActivityFinal

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()
```

Unlock command
Unlock Sound
Unlock Sound
Unlock Sound
**Sequence Diagram & Activity Diagram**

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

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

1) Drag Here

2) Create Object
BDD & IBD

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