

***The GitHub Revolution
is Coming to MBSE –
Are You Ready?***

NDIA 27th Annual Systems and
Mission Engineering Conference

Armstrong Process Group, Inc.
www.aprocessgroup.com

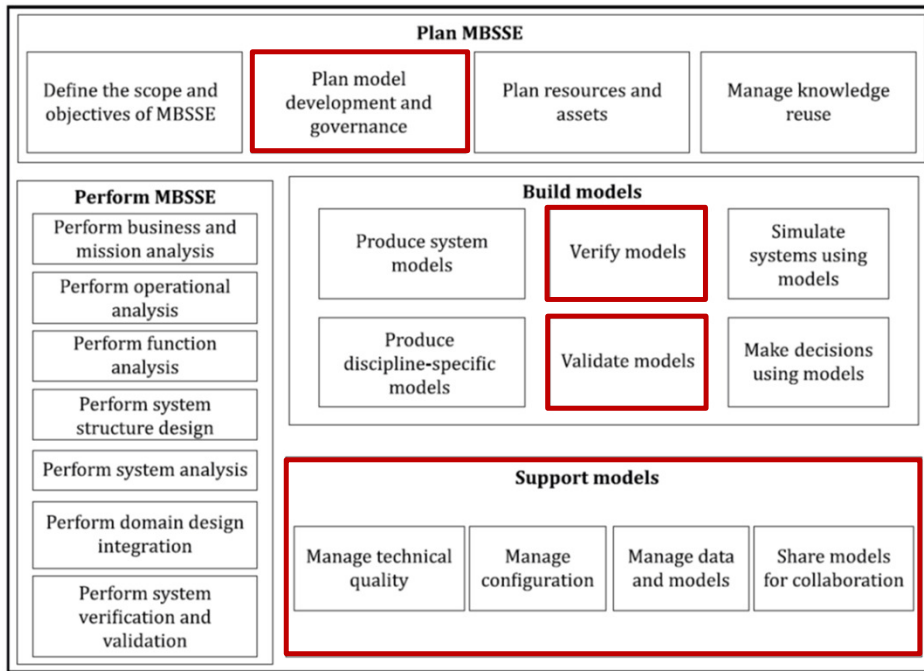
About APG

- APG mission

“Align architecture and engineering capabilities with business strategy using proven, practical processes delivering world-class results.”

- Industry thought leader in enterprise architecture, business architecture, systems and software engineering, business analysis, and agile methods
- Member and contributor to
 - UML[®], SysML[®], UAF[®] at the Object Management Group
 - TOGAF[®], ArchiMate[®], IT4IT[™] at The Open Group
 - Architecture, MBSE, and OOSEM Workgroups at INCOSE

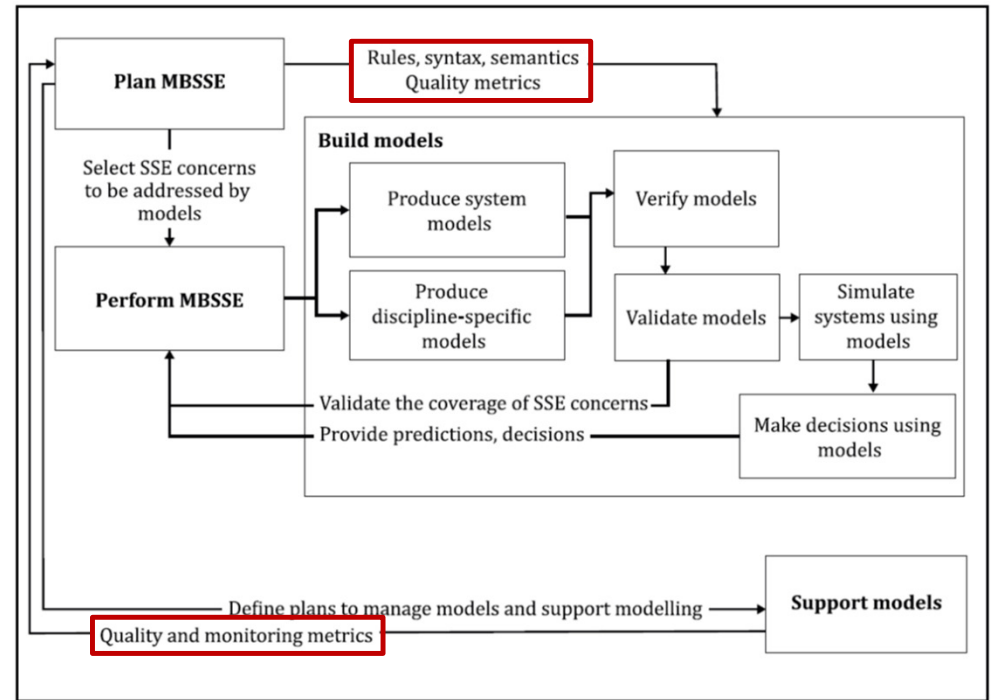
Establish CI/CD Pipeline for MBSE Modeling



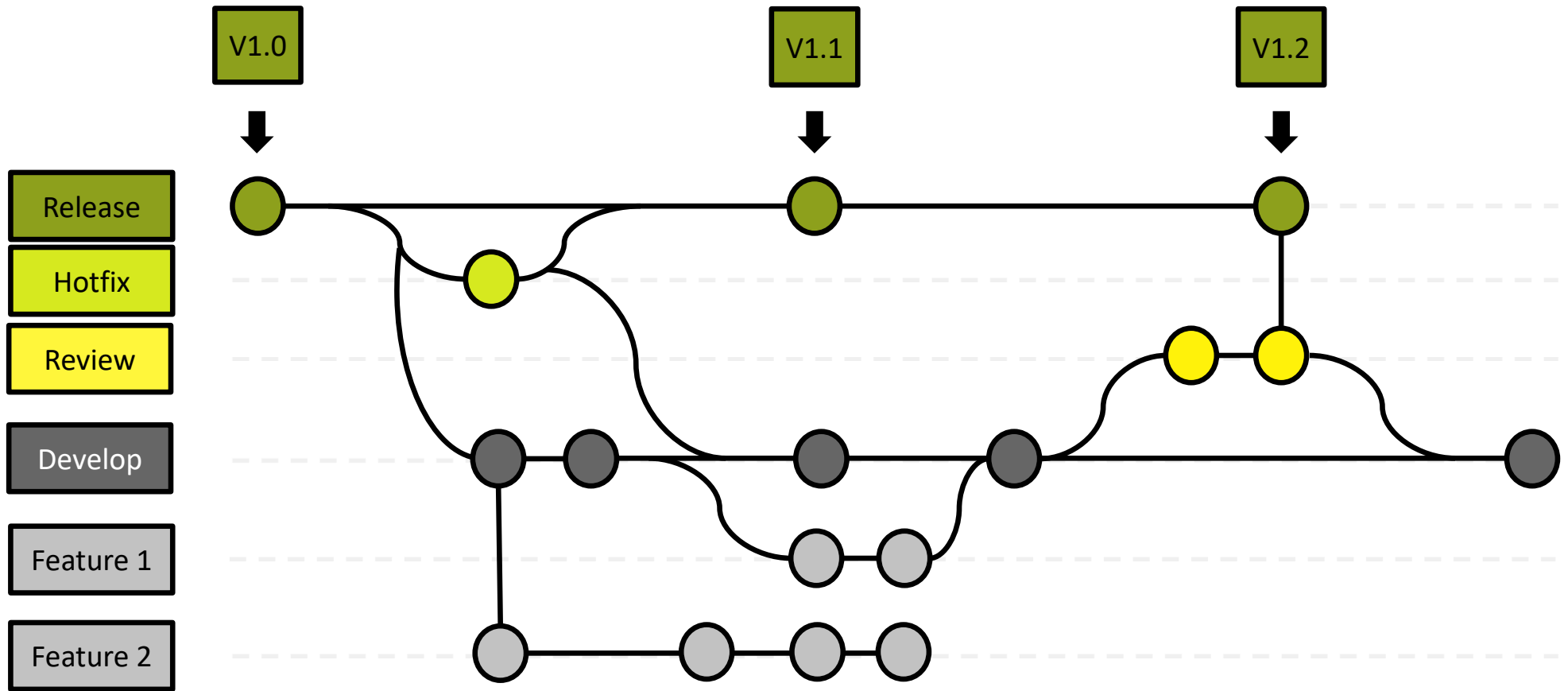
CI/CD Pipeline Automation



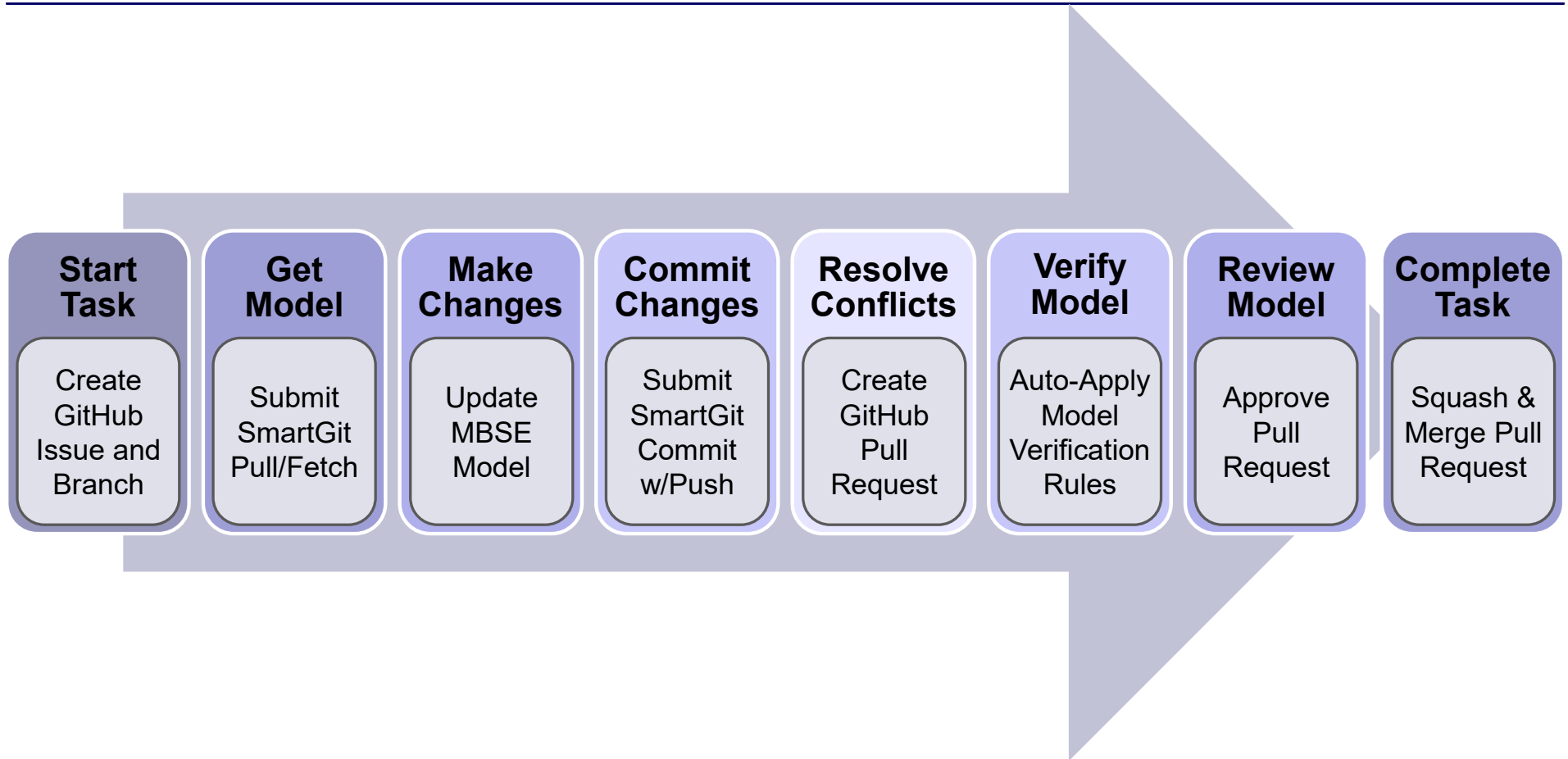
Modeling Tools



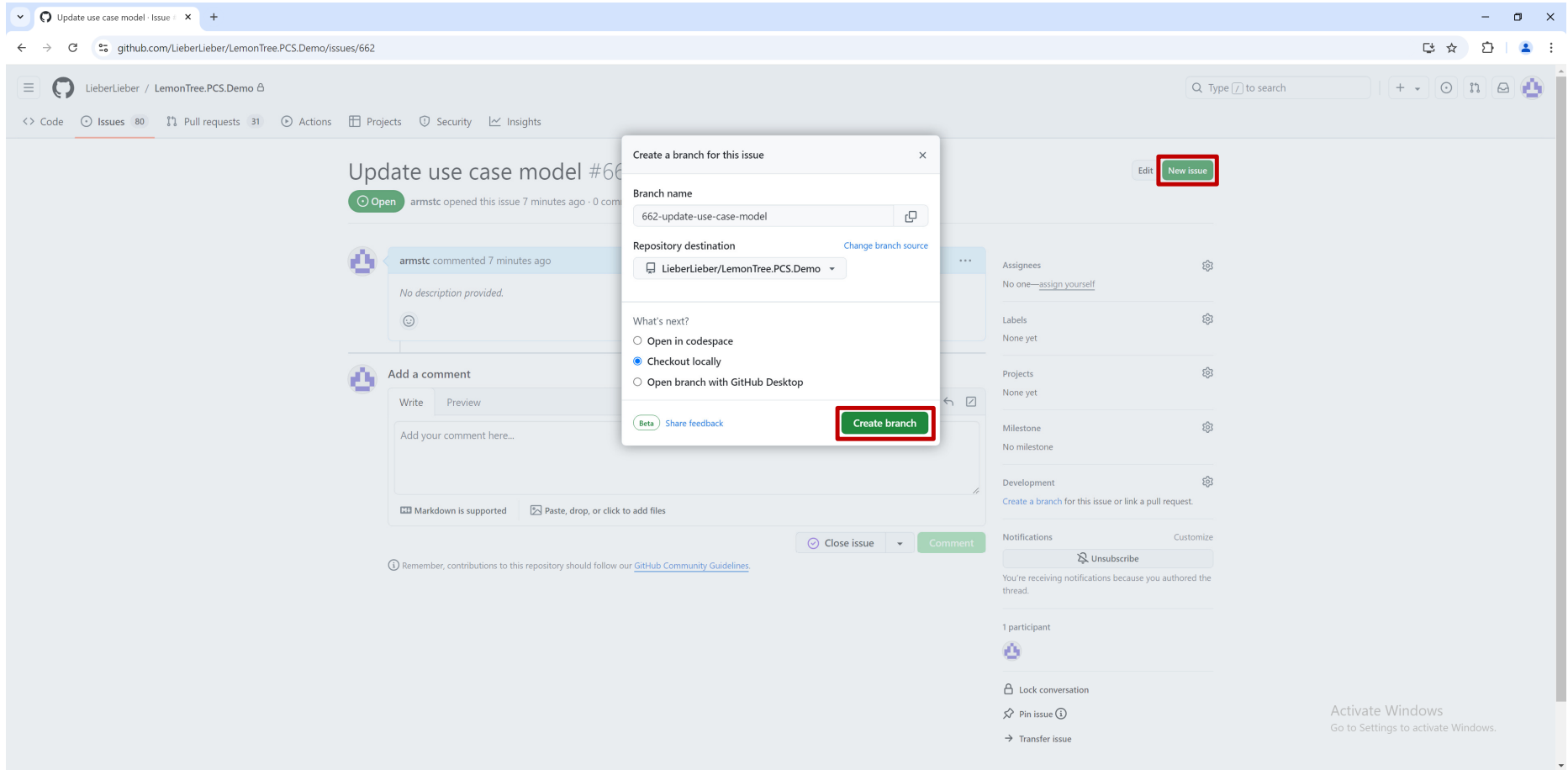
Gitflow Branching Strategy



Approach – GitHub Flow



Start Task: Create GitHub Issue and Branch



Get Model: Submit SmartGit Pull/Fetch

The screenshot displays the SmartGit application interface for a repository named 'LemonTree.PCS.Demo'. The main window shows a pull request for the branch 'origin/662-update-use-case-model' against the 'main' branch. The pull request is titled '662 update use case model (#656)' and is submitted by Chris Armstrong on 10/11/2024 at 02:21 PM. The interface includes a commit history on the right, a file list on the left, and a central area for comparing files. The 'Model.qeax' file is highlighted in the file list. The status bar at the bottom indicates 'Command succeeded.' and 'File size exceeds configured limit of 1,000,000 bytes.'

Make Changes: Update MBSE Model

The screenshot shows the Enterprise Architect interface with a use case diagram. The diagram on the left shows a 'User' actor connected to three use cases: 'Merge Model', 'Diff Model', and 'Validate Model'. A list of actions is overlaid on the diagram:

- Delete “Merge Model” use case
- Rename “Diff Model” to “Compare Model”
- Add new “Demo Integration” use case

The diagram on the right shows the updated state: the 'User' actor is connected to 'Compare Model' and 'Validate Model', and a new 'Demo Integration' use case is added below. The 'Validation Results' table at the bottom shows one error:

Severity	Category	Rule	Description
❌	Requirements	0163_REQUIREMENTVERIFY	Requirement: Integrate with modern version control systems is not verified.

Commit Changes: Submit SmartGit Commit w/Push

The screenshot displays the SmartGit application interface. At the top, the title bar reads "LemonTree.PCS.Demo - SmartGit 24.1 RC 3". Below the title bar is a menu bar with options: Repository, Edit, View, Remote, Local, Branch, Query, Tools, Window, Help. The main workspace is divided into several panes:

- My History:** Shows a list of branches, with "662-update-use-case-model" selected.
- All branches:** A commit log for the selected branch, listing various commits with their messages and hashes. The most recent commit is "662-update-use-case-model/ Added new use case #662".
- Commit Message:** A text area containing the commit message "Added new use case #662". This area is highlighted with a red box.
- Changed files:** A list of files that have been modified, including "Model.qeax".
- Bottom Panel:** A status bar showing "File size exceeds configured limit of 1,000,000 bytes." and "Command succeeded."

Resolve Issues: Create GitHub Pull Request

The screenshot shows the GitHub interface for creating a pull request. At the top, the browser address bar shows the URL: `github.com/LieberLieber/LemonTree.PCS.Demo/compare/662-update-use-case-model?expand=1`. The repository name is `LieberLieber / LemonTree.PCS.Demo`. The main heading is **Open a pull request**, with a subtext: *Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across forks](#). [Learn more about diff comparisons here.](#)*

The comparison bar shows: `base: main` and `compare: 662-update-use-case-model` with a green checkmark and the text `✓ Able to merge. These branches can be automatically merged.`

The **Add a title** section has a text input field containing `Review use case changes #662`.

The **Add a description** section features a rich text editor with a toolbar (bold, italic, link, etc.) and a text area containing `Add your description here...`. Below the editor are checkboxes for `Markdown is supported` and `Paste, drop, or click to add files`.

On the right side, there are several metadata sections: **Reviewers** (No reviews), **Assignees** (No one—[assign yourself](#)), **Labels** (None yet), **Projects** (None yet), and **Milestone** (No milestone). Below these is the **Development** section with the text: *Use [Closing keywords](#) in the description to automatically close issues*.

At the bottom right, there is a **Helpful resources** section with a link to `GitHub Community Guidelines`.

A green **Create pull request** button is highlighted with a red rectangular box.

At the bottom of the page, a summary bar shows: `1 commit`, `1 file changed`, and `1 contributor`. Below this, the commit history shows a commit on `Oct 11, 2024` titled `Added new use case #662` by `armstc`, committed 3 minutes ago.

Resolve Issues: Review Model Changes

Demo/pull/663

Review use case changes #662 #663
armstc wants to merge 1 commit into main from 662-update-use-case-model

Update use case model #662

github-actions bot commented 1 minute ago

✓ No merge conflicts in model

Modified Elements in SystemArchitecture:

Found 1 Diagrams.

Model.Use_Cases.Demo_Use_Cases

[package] Use Cases

User

Compare Model

Validate Model

Demonstrate Integration

Review Changes with LemonTree: [Desktop](#) / [Web](#)
Install [LemonTree 3.3+](#) to open the Review Session file.

github-actions bot commented now

Compare

Session Details

No Custom Root

Show All Changes

Impacted Elements [4 / 4] 0 Conflicted

Search...

Model

Use Cases

Demo Use Cases

-Demonstrate-Integration

Diff Model

Merge Model

User

Model_base.qeax

A / Thers

Model_head.qeax

B / Mine

Demo Use Cases:UseCaseDiagram

By Pan and Zoom

By Selected Element

No Sync

Unmodified

Child modified

Element Properties

GraphEdges

[unnamed] - { User, Diff Model },

[unnamed] - { User, Validate Model },

[unnamed] - { User, Merge Model }

GraphEdges

[unnamed] - { User, ~~Diff~~Compare Model },

[unnamed] - { User, Validate Model },

[unnamed] - { User, Merge Model }

Verify Model: Auto-Apply Model Validation Rules

Demo/pull/663

Review use case changes #662 #663
armstc wants to merge 1 commit into main from 662-update-use-case-model

github-actions bot commented 7 minutes ago

IncQuery Validator for Enterprise Architect

Analysis were executed on Model.qeax with the SAIC Digital Engineering Validation ruleset containing 91 rules.

The following type of issues were detected:

Level	Findings
Error	3
Info	1

Out of the 91 rules, 4 have findings.

✖ The model failed the validation criteria, there should be no errors or fatal errors.

To view the full report download the SAIC Digital Engineering Validation analysis result artifacts from [here](#).

github-actions bot commented 7 minutes ago

[Validation Report](#)

Some checks were not successful
1 failing and 3 successful checks

- Verify IncQuery Validator / IncQueryValidatorForEA (pull_request) Failing after 1m
- LTA publish review session to PR / PublishReviewSession (pull_request_target) Successful in 46s
- LTA update review session to PR's after commit to main / build (push) Successful in 7s
- Verify Modelcheck / ModelReadinessCheck (push) Successful in 30s

This branch has no conflicts with the base branch

Validation Report

Overview

Severity	Rules with findings	Findings
Error	3 rules	3/81 (4%)
Info	1 rule	1/1 (100%)

[Rules without findings](#) No findings out of 493 possible for 19 rules

[Inapplicable rules](#) 68 inapplicable rules

Rules with findings

Category	Name	Description	Severity	Findings
Completeness	0208_UCDOC DOCUMENTATION	All activities, actors, constraint blocks, operations, signals, states, stereotypes (with their public properties) and use cases must have documentation. (Activities that are methods for operations or are classifier behaviors for use cases are exempt.)	Error	1/27 (4%)
Use Case Integrity	0206_UCACT OR	Use cases not connected to other use cases via extend/include/generalization relationships must be associated with at least one actor (or actor subtype).	Error	1/27 (4%)

Complete Task: Squash & Merge Pull Request

Review use case changes #662 #663
armstc wants to merge 2 commits into main from 662-update-use-case-model

Analysis were executed on Model.qeax with the SAIC Digital Engineering Validation ruleset containing 91 rules.
The following type of issues were detected:

Level	Findings
Info	1

Out of the 91 rules, 1 have findings.
✔ The model passed the validation criteria.
To view the full report download the SAIC Digital Engineering Validation analysis result artifacts from [here](#).

github-actions bot commented now
[Validation Report](#)

uc[package] Use Cases [Demo Use Cases]

```

graph LR
    User((User)) --- CompareModel((Compare Model))
    User --- ValidateModel((Validate Model))
    User --- DemonstrateIntegration((Demonstrate Integration))
    DemonstrateIntegration -.->|«trace»| IntegrateReq[«interfaceRequirement» Integrate with modern version control systems]
    IntegrateReq --- ReqDoc["(from Requirements)"]
  
```

✔ All checks have passed
4 successful checks

- ✔ LTA publish review session to PR / PublishReviewSession (pull_request_target) Successful in 41s
- ✔ LTA update review session to PR's after commit to main / build (push) Successful in 5s
- ✔ Verify IncQuery Validator / IncQueryValidatorForEA (pull_request) Successful in 1m
- ✔ Verify Modelcheck / ModelReadinessCheck (push) Successful in 26s
- ✔ This branch has no conflicts with the base branch
Merging can be performed automatically.

Squash and merge you can also [open this in GitHub Desktop](#) or view [command line instructions](#).

- Added association from actor to new use case
- Added documentation to new use case
- Traced new use case to requirement

Activate Windows
Go to Settings to activate Windows.

Refresh Local Repository

The screenshot displays the SmartGit 24.1 RC 3 interface for a local repository named 'LemonTree.PCS.Demo'. The main window shows the commit history of the 'main' branch. A red box highlights a specific commit: 'Review use case changes #662 (#663)' by armstc, dated 10/11/2024 05:51 PM. The commit message includes '* Added new use case #662' and '* Fixed model issues #662'. The interface also shows a 'Model.qeax' file with a warning that its size exceeds the configured limit of 1,000,000 bytes. The bottom status bar indicates 'Command succeeded.'

CI/CD Principles

Principle	MBSE Perspective
Repeatable Reliable Process	<ul style="list-style-type: none"> • Consistency of process across lifecycle and environments is critical • Leverage proven software engineering practices for MBSE
Automate Everything	<ul style="list-style-type: none"> • Humans need to build models (although AI might assist) • Automate model merging, conflict resolution, verification, and reviews
Version Control	<ul style="list-style-type: none"> • Critical for regulatory certification/auditing and feature-based MBSE • Three-way merging essential for parallel development
Build In Quality	<ul style="list-style-type: none"> • Ensure projects are following organizational processes and modelers are using modeling languages appropriately
Do Hard Parts First	<ul style="list-style-type: none"> • Tackle complexity of MBSE modeling lifecycle as soon as possible • Manage technical debt associated with MBSE models
Everyone Is Responsible	<ul style="list-style-type: none"> • Provide accessibility and visibility of modeling activities to all team members
“Done” Means Released	<ul style="list-style-type: none"> • Define and enforce criteria for releasing MBSE models and derived artifacts
Continuous Improvement	<ul style="list-style-type: none"> • Difficult to improve something that is not defined, controlled, and measured

Q&A

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***Thanks for your attention
and participation!***

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