DIGITAL ENGINEERING SUMMIT

16-17 June 2025

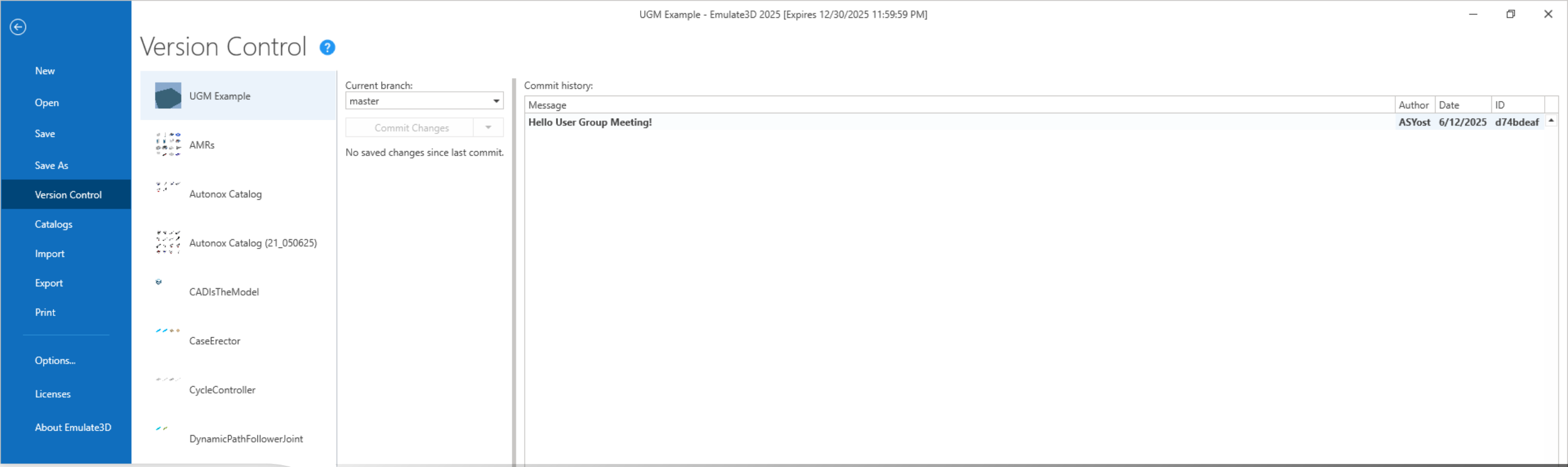
Rome Marriott Park Hotel, Italy

EMULATE3D

by ROCKWELL AUTOMATION

ROK LIVE EMEA

Creating the Future of INDUSTRIAL OPERATIONS



Rockwell Automation

expanding **human possibility**®

Native GIT Integration and Testing

Andrew Deeble, Emulate3D Product Manager

Andre Yost, Emulate3D Simulation Engineer

What is Git?

Git is a free and open-source distributed version control system that tracks versions of files.

Git records changes to a files over time so that you can recall specific versions later.

Git is often used for collaborative development, and tracks **who** made **what** changes **when**.

It is the most popular distributed version control system, with nearly 95% of developers reporting it as their primary version control system.

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Why Native Version Control within Emulate3D

There are 101 reasons why to do version control... here are three

Backup your work

Previous approach is Options -> Autosave.

Now, create checkpoints for each stable change.

Jump back to these checkpoints if something didn't work.

Create an audit trail

Previous approach uses demo3dx / catlog3dx format.

Now, this will be standard and accessible for all.

Full log of who did what and why, complete with more readable file diffs.

Collaborate on projects

Previous approach uses package feeds and versioning.

Now, develop in your chosen repo then deploy as package.

Use branching and merging tools to simultaneously work on catalogs and scripts.

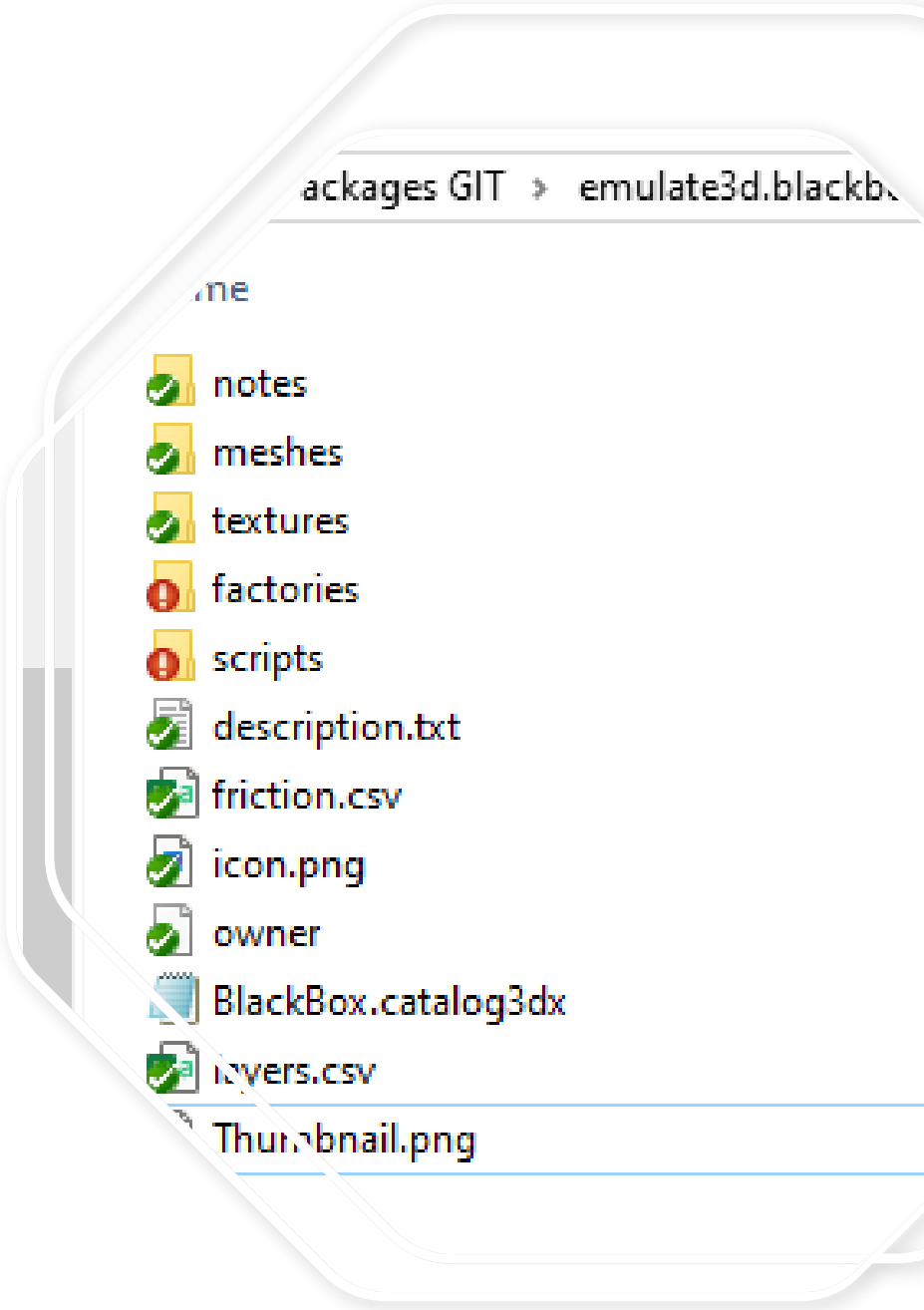
What have we done?

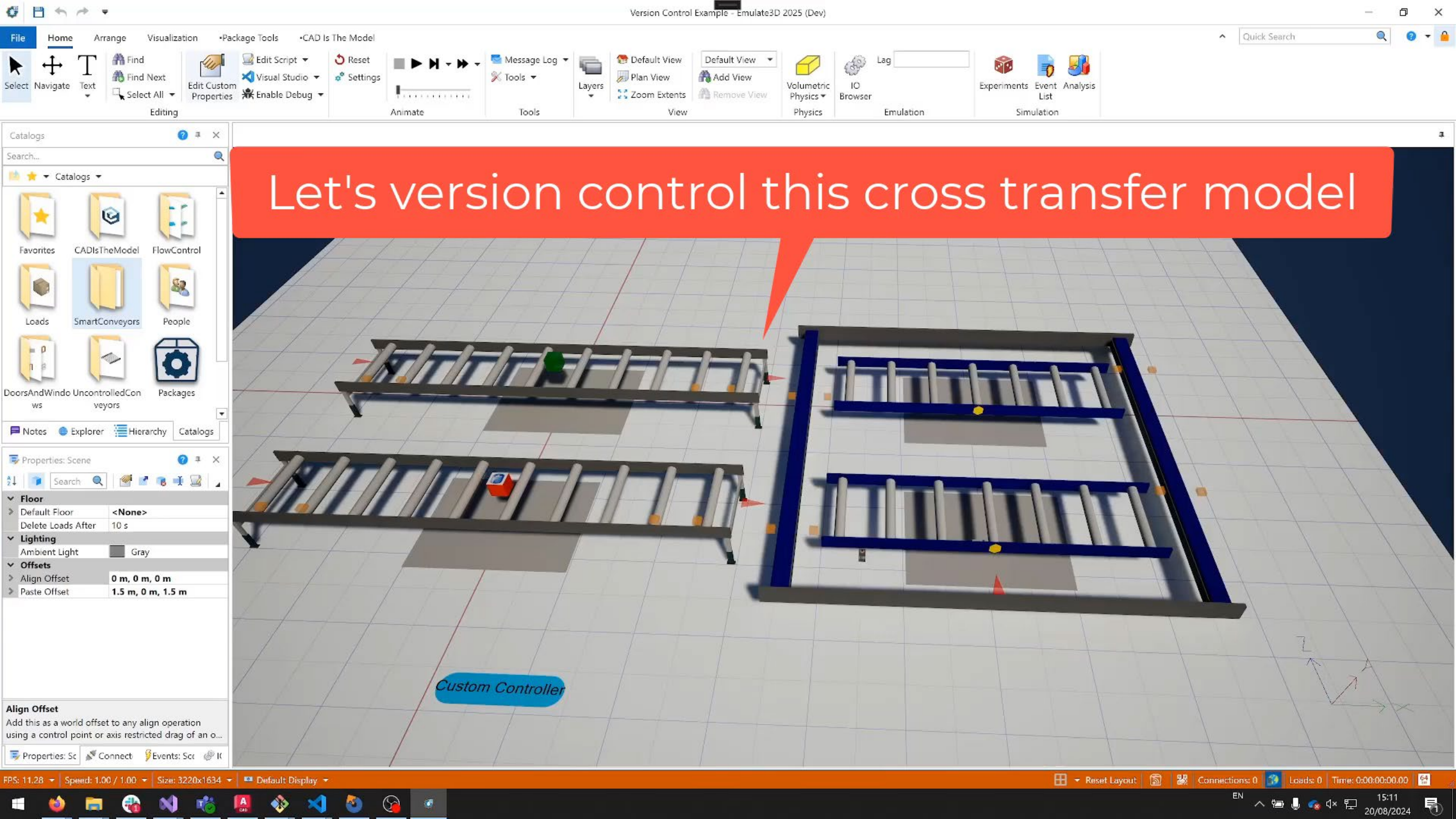
Improved the demo3dx and catalog3dx formats.

Added tools to create a local repo and commit a model or catalog in a single click.

User interface to commit changes from File menu.

User interface to view commit history, undo local changes, load a previous commit, switch branch, and revert to a previous commit.




Version Control Example - Emulate3D 2025 (Dev)
File
Home
Arrange
Visualization
•Package Tools
•CAD Is The Model
Quick Search
Select
Navigate
Text
Find
Find Next
Select All
Edit Custom Properties
Edit Script
Visual Studio
Enable Debug
Reset
Settings
Message Log
Tools
Layers
Default View
Plan View
Zoom Extents
Default View
Add View
Remove View
Volumetric Physics
IO Browser
Lag
Experiments
Event List
Analysis
Editing
Animate
Tools
View
Physics
Emulation
Simulation
Catalogs
Search...
Favorites
CADIsTheModel
FlowControl
Loads
SmartConveyors
People
DoorsAndWindows
UncontrolledConveyors
Packages
Notes
Explorer
Hierarchy
Catalogs
Properties: Scene
Search
Floor
Default Floor
<None>
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10 s
Lighting
Ambient Light
Gray
Offsets
Align Offset
0 m, 0 m, 0 m
Paste Offset
1.5 m, 0 m, 1.5 m
Align Offset
Add this as a world offset to any align operation using a control point or axis restricted drag of an o...
Properties: Sc
Connect
Events: Sc
Let's version control this cross transfer model
Custom Controller
Z
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Size: 3220x1634
Default Display
Reset Layout
Connections: 0
Loads: 0
Time: 0:00:00:00.00
EN
15:11
20/08/2024

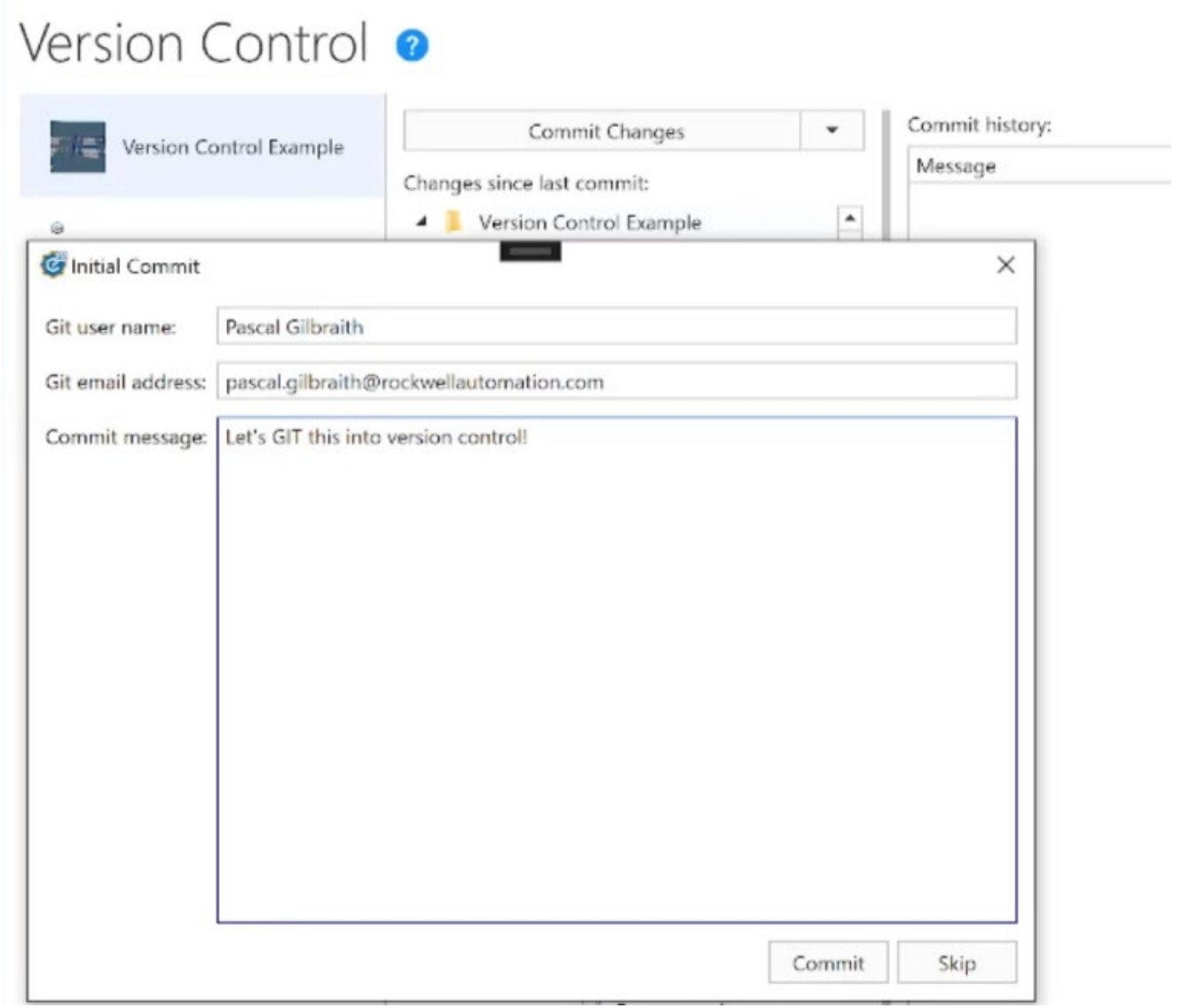
Bringing a Model into Version Control

Simplifying repository creation

With *one click*, Emulate3D will...

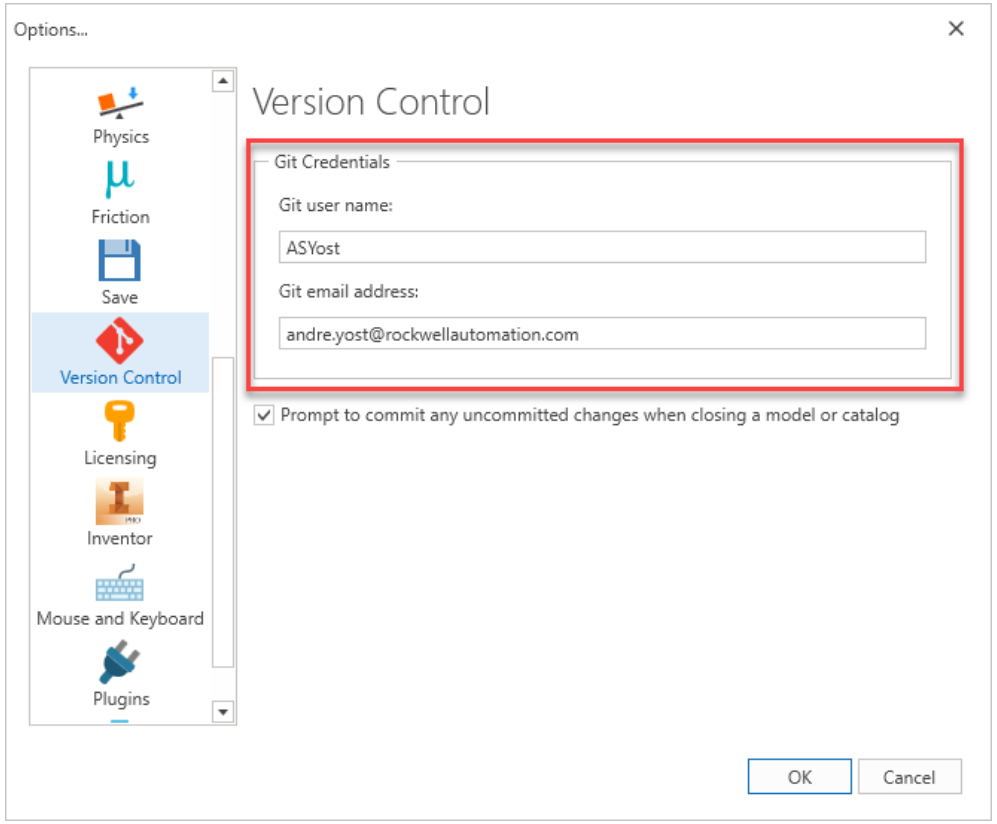
- Create a local repository
- Convert and save your model in demo3dx, or catalog in catalog3dx format, which are version control friendly
- Commit to the local repository
- Use the users GIT credentials defined in the options menu

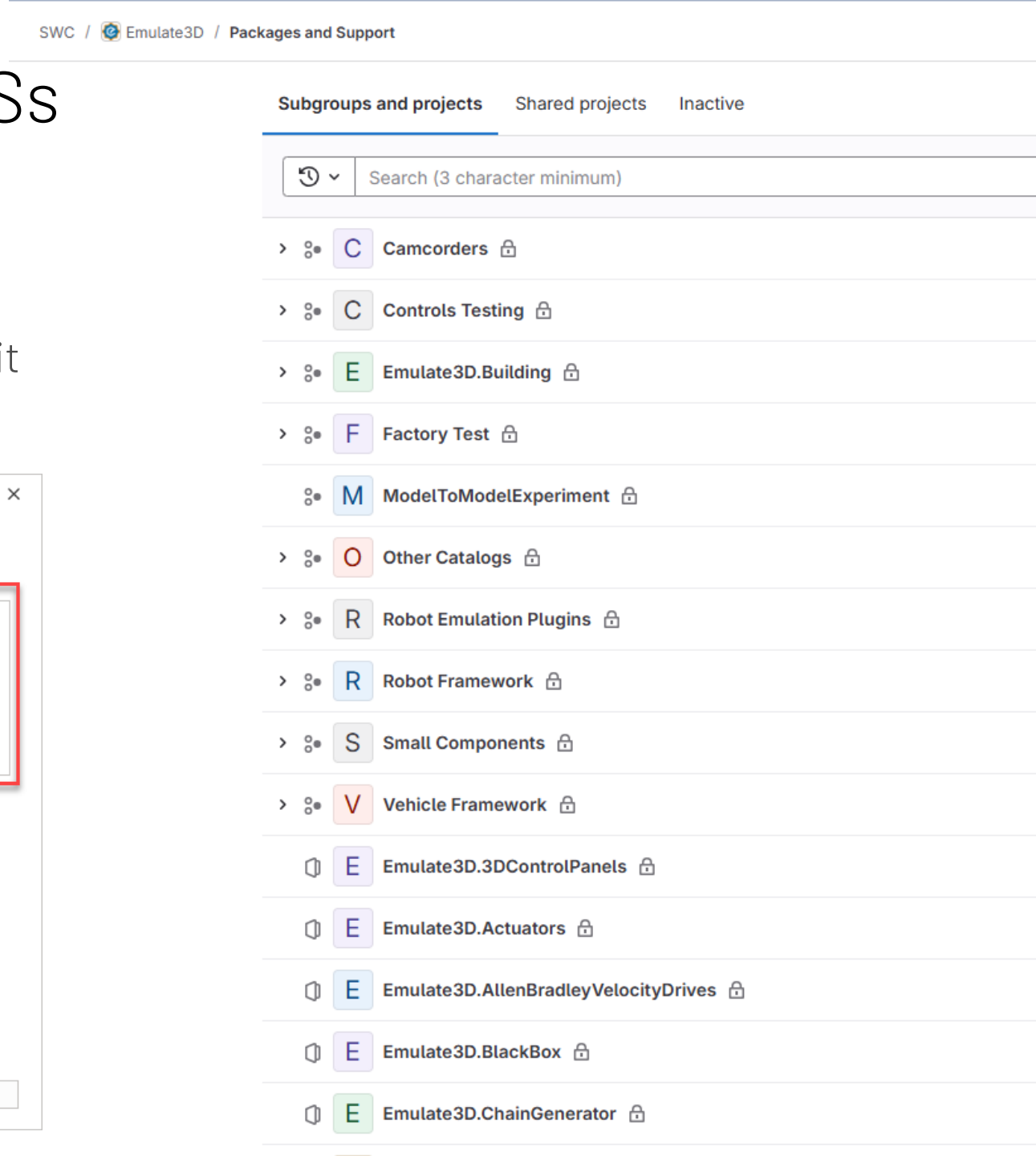
...making version control accessible to all!

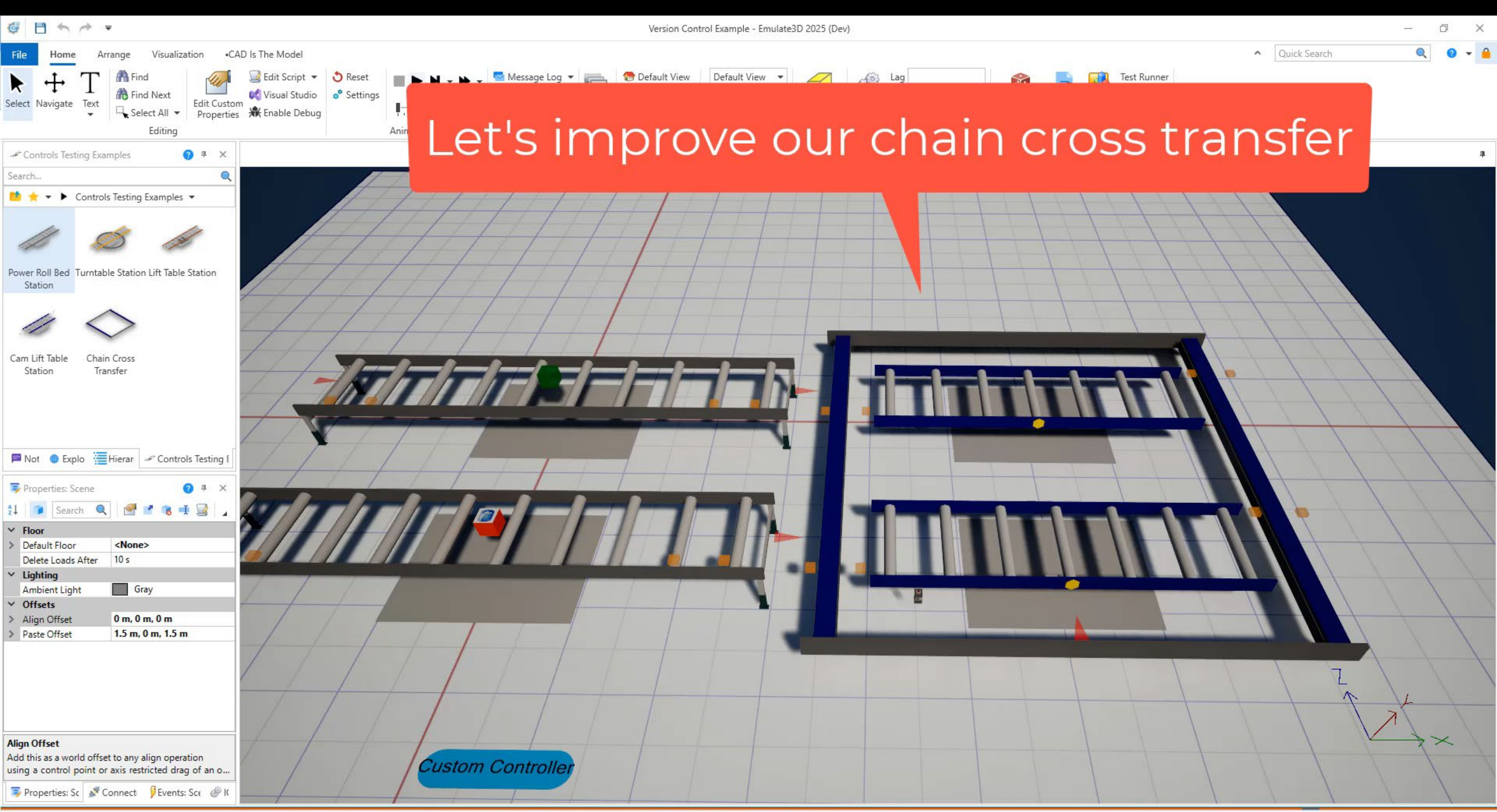


Tips - Git credentials & VCSs

- Save your git credentials in your model
- Your local repo can be pushed to your preferred git provider, such as GitHub or GitLab



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Navigate
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Find
Find Next
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Editing
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Edit Script
Visual Studio
Enable Debug
Reset
Settings
Message Log
Default View
Default View
Lag
Test Runner
Let's improve our chain cross transfer
Controls Testing Examples
Search...
Controls Testing Examples
Power Roll Bed Station
Turntable Station
Lift Table Station
Cam Lift Table Station
Chain Cross Transfer
Properties: Scene
Search
Floor
Default Floor
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Paste Offset
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Align Offset
Add this as a world offset to any align operation using a control point or axis restricted drag of an o...
Properties: Sc
Connect
Events: Sce
Custom Controller

Making a Commit – what just happened?

GIT terminology can be daunting for the unfamiliar!

We created a **repository –** this is a directory that stores the project. It also contains files (.git/) which tracks changes made to files, building a history over time.

Using **demo3dx files** – an unzipped model file. We save out scripts, meshes, locations and properties of visuals as separate files, and as human readable.

We made a **commit –** this is a snapshot or milestone in the repository.

And viewed **commit history –** a log of all the commits. **Who** changed **what** and **when.**

GIT was designed for code, which makes it great for managing scripts……

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Version Control Example - Emulate3D 2025 (Dev)

File | Home | Arrange | Visualization | •Package Tools | •CAD Is The Model

Quick Search

Select | Navigate | Text | Find | Find Next | Select All | Edit Custom Properties | Edit Script | Visual Studio | Enable Debug | Reset | Settings | Message Log | Tools | Layers | Default View | Plan View | Zoom Extents | Default View | Add View | Remove View | Volumetric Physics | IO Browser | Lag | Experiments | Event List | Analysis

Editing | Animate | Tools | View | Physics | Emulation | Simulation

Catalogs

Search...

Catalogs

Favorites | CADIsTheModel | FlowControl | Loads | SmartConveyors | People | DoorsAndWindows | UncontrolledConveyors | Packages

Notes | Explorer | Hierarchy | Catalogs

Properties: Scene

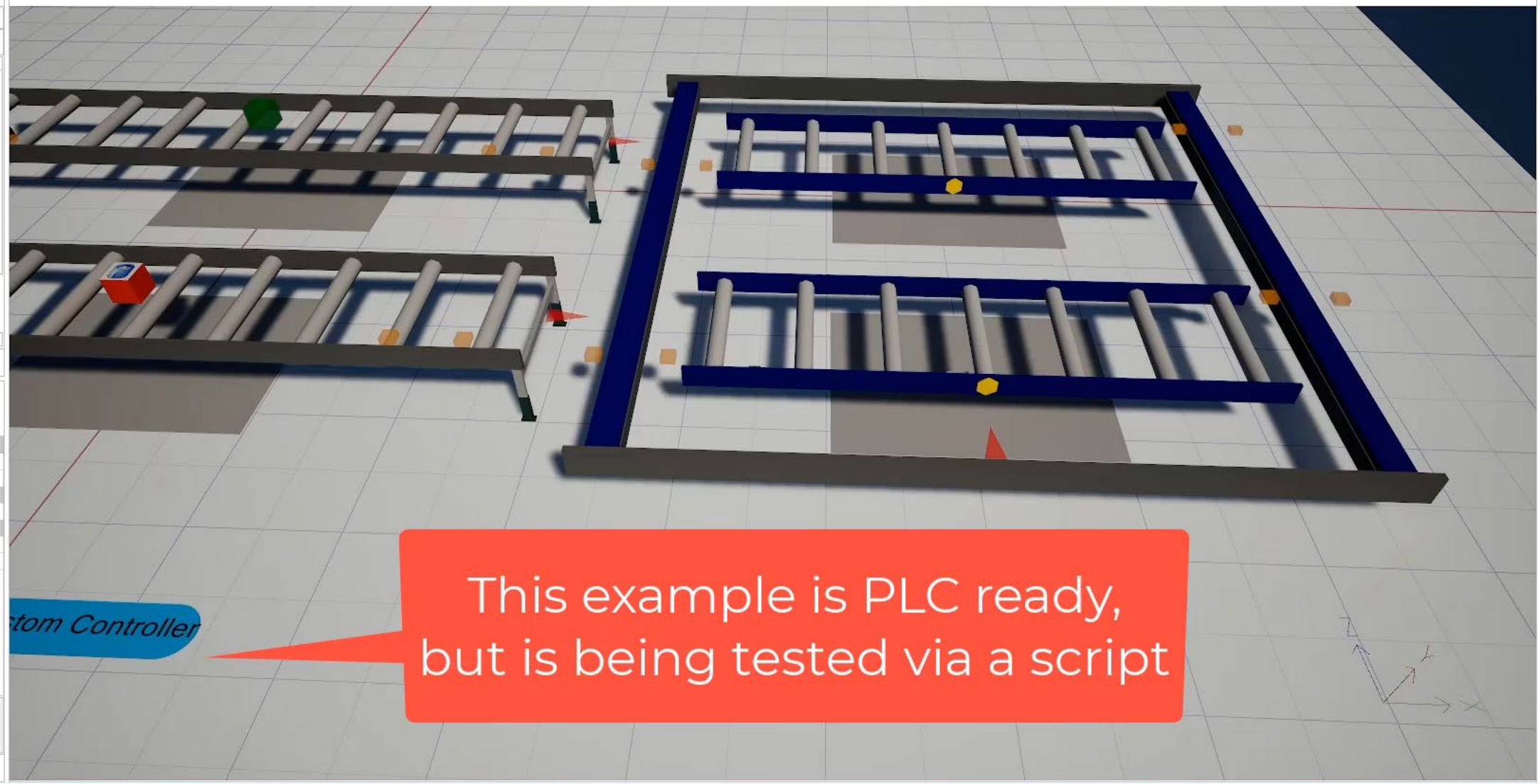
Search

Floor	
Default Floor	<None>
Delete Loads After	10 s
Lighting	
Ambient Light	Gray
Offsets	
Align Offset	0 m, 0 m, 0 m
Paste Offset	1.5 m, 0 m, 1.5 m

Align Offset

Add this as a world offset to any align operation using a control point or axis restricted drag of an o...

Properties: Sc | Connect | Events: Sc



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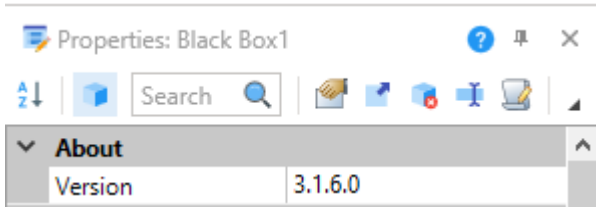
| Tips and Future – Component Versioning

Tip - Define an assembly version to your scripts & display using a custom property.

- Models are automatically updated with higher versioned scripts in catalogs.
- Add[illegible] same version numbers.

```
[assembly: AssemblyVersion("3.1.6.0")]

[Auto]
1 reference
public class BlackBox : NativeObject {
    0 references
    public BlackBox(Visual sender) : base(sender) {
        sender.AddSimpleProperty("Version",
                                 Assembly.GetExecutingAssembly().GetName().Version.ToString(),
                                 "Current script version");
```



What's Planned – Define Assets within Emulate3D, with version numbers.

- Pushed or pulled Asset updates from catalogs and package manager.
- Change an Asset's template to update every instance in the model.
- Or override the template's properties to tweak a single Asset instance.

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Version Control

Version Control Example
CADIsTheModel
DoorsAndWindows
FlowControl
Loads
People
SmartConveyors
UncontrolledConveyors

Current branch:
main

Commit Changes

No saved changes since last commit.

Commit history:

Message	Author	Date	ID
Increased delay before lift table lowers, to drive load against the pin stop	**Pascal Gilbraith**	**20/08/2024**	**d6d0006c**
Add a pin stop to the transfer	Pascal Gilbraith	20/08/2024	39cb01aa
Let's GIT this into version control!	Pascal Gilbraith	20/08/2024	2efb9463

Commit message:
Add a pin stop to the transfer

Changes in this commit:
Analysis.xlsx
Thumbnail.png
Version Control Example.demo3dx

Switching, Reverting, Branching, Merging…?

GIT terminology can be daunting for the unfamiliar!

We **switched** to a previous commit, like loading a past checkpoint for our model

We returned to the **main branch,** which it the latest update. This is what our colleagues would see when they load the model.

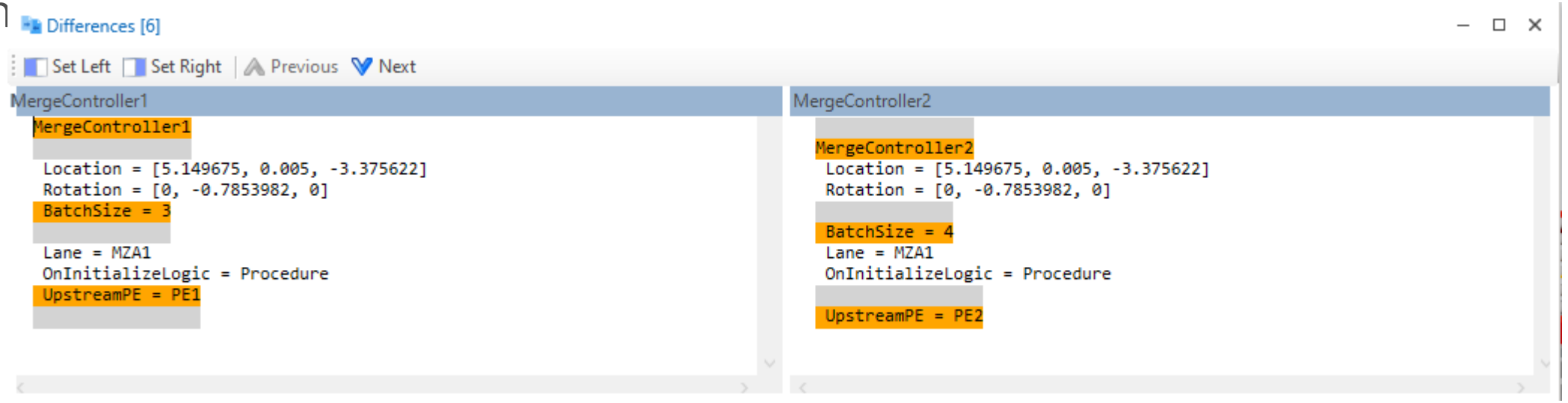
We **reverted** changes to roll back a bad commit for everyone

We could work on our own **branch,** make local commits, and then **merge** changes into the main branch when we're done.

What's Planned – Divide the model into sections using Assets, and work on each area without risk of conflicts. Run the whole model together, or as multi-model sections.

Tips and Future – Comparing Commits

Tip – The differences window can be used to select two objects and compare them



What's Planned - Improved comparison tools

Assets are given individual demo3dx subfiles, making it clearer to see changes

Visual comparison tools to highlight which visuals and properties have changed.

Overlay two different versions of a model or asset!

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Cross Transfer Testbed - Emulate3D 2025 (Dev)

File | Home | Arrange | Visualization | •Asset Manager | •CAD Is The Model

Quick Search

Select | Navigate | Text | Find | Find Next | Select All | Edit Custom Properties | Edit Script | Visual Studio | Enable Debug | Reset | Settings | Message Log | Tools | Layers | Default View | Plan View | Zoom Extents | Default View | Add View | Remove View | Volumetric Physics | IO Browser | Lag | Experiments | Event List | Analysis | Test Runner

Editing | Animate | Tools | View | Physics | Emulation | Simulation

Controls Testing Examples

Search...

Controls Testing Examples

Power Roll Bed Station | Turntable Station | Lift Table Station | Cam Lift Table Station | Chain Cross Transfer

Not | Explo | Hierar | Controls Testing I

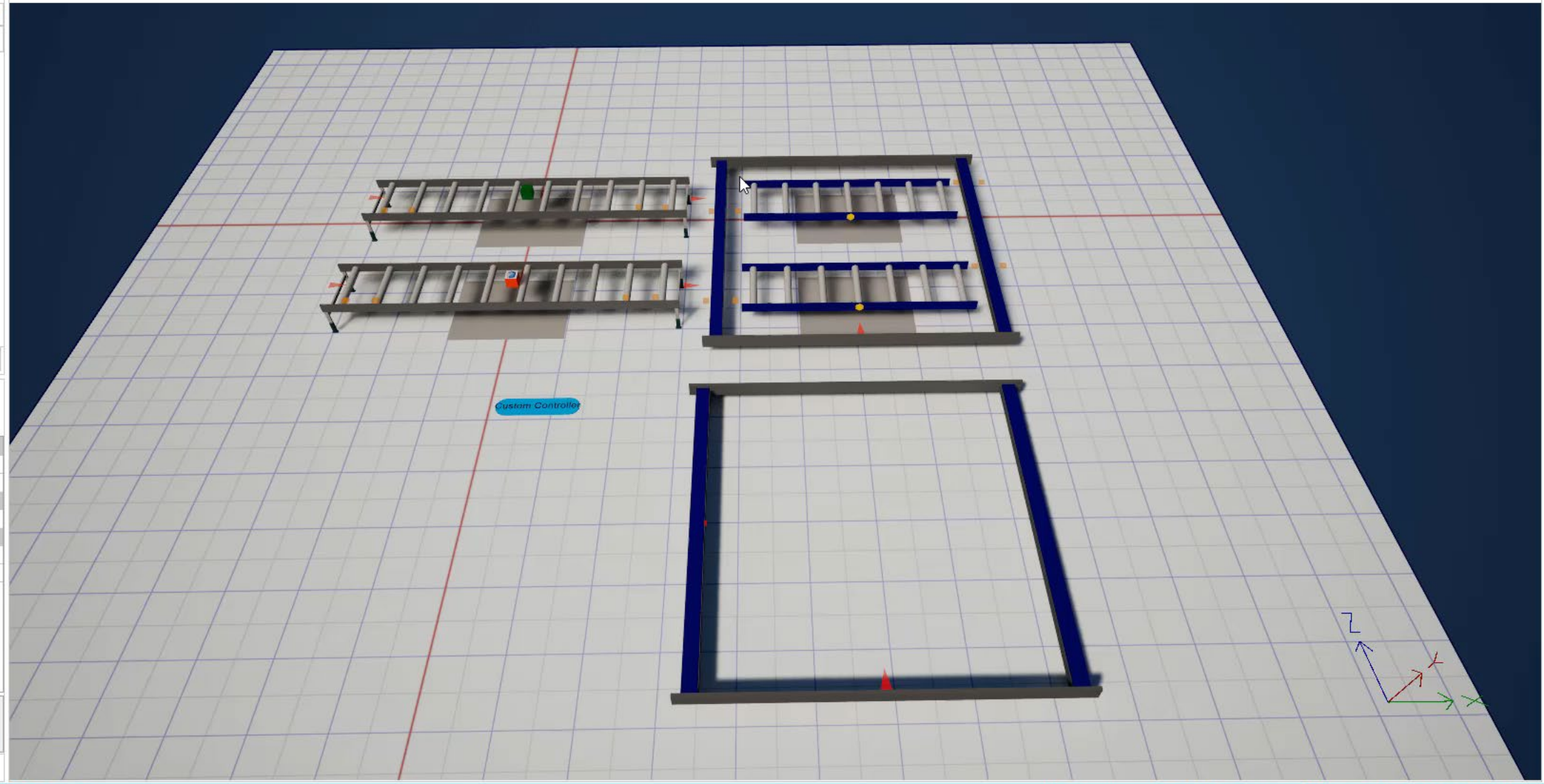
Properties: Scene

Search

Floor	
Default Floor	<None>
Delete Loads After	10 s
Lighting	
Ambient Light	Gray
Offsets	
Align Offset	0 m, 0 m, 0 m
Paste Offset	1.5 m, 0 m, 1.5 m

Align Offset
Add this as a world offset to any align operation using a control point or axis restricted drag of an o...

Properties: Sc | Connect | Events: Sce | I



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Developing Catalogs with Emulate3D 2025

- Use GIT version control to make commits to your catalogs and scripts

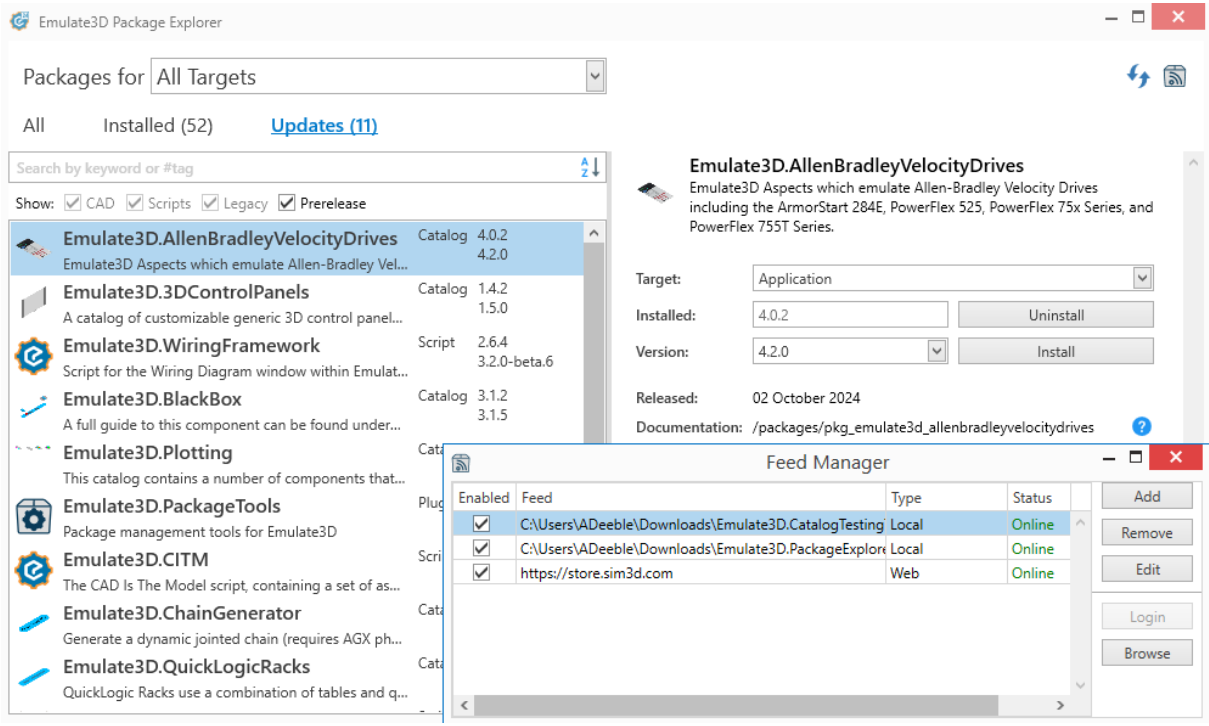
- Optionally push to a shared repository for collaborative development

- Use Test Runner and NUnit to run automated tests

- Deploy tested catalogs to a custom package feed, with dependencies and documentation.

- Colleagues are notified of a package update!

What's Planned – Catalog Development Tools



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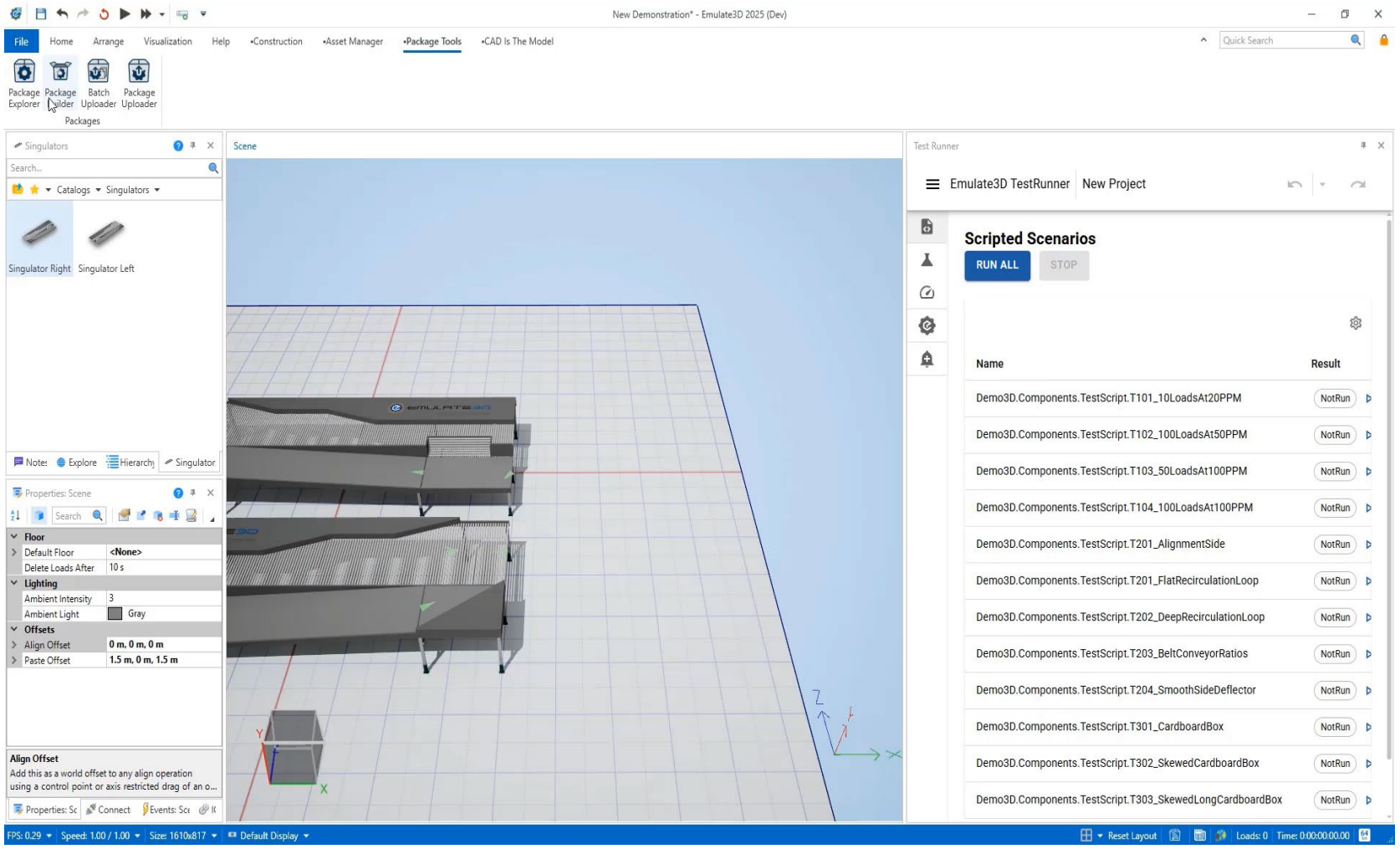
| Tips – Custom Package Feeds

Create a custom package feed, which can even be a local folder.

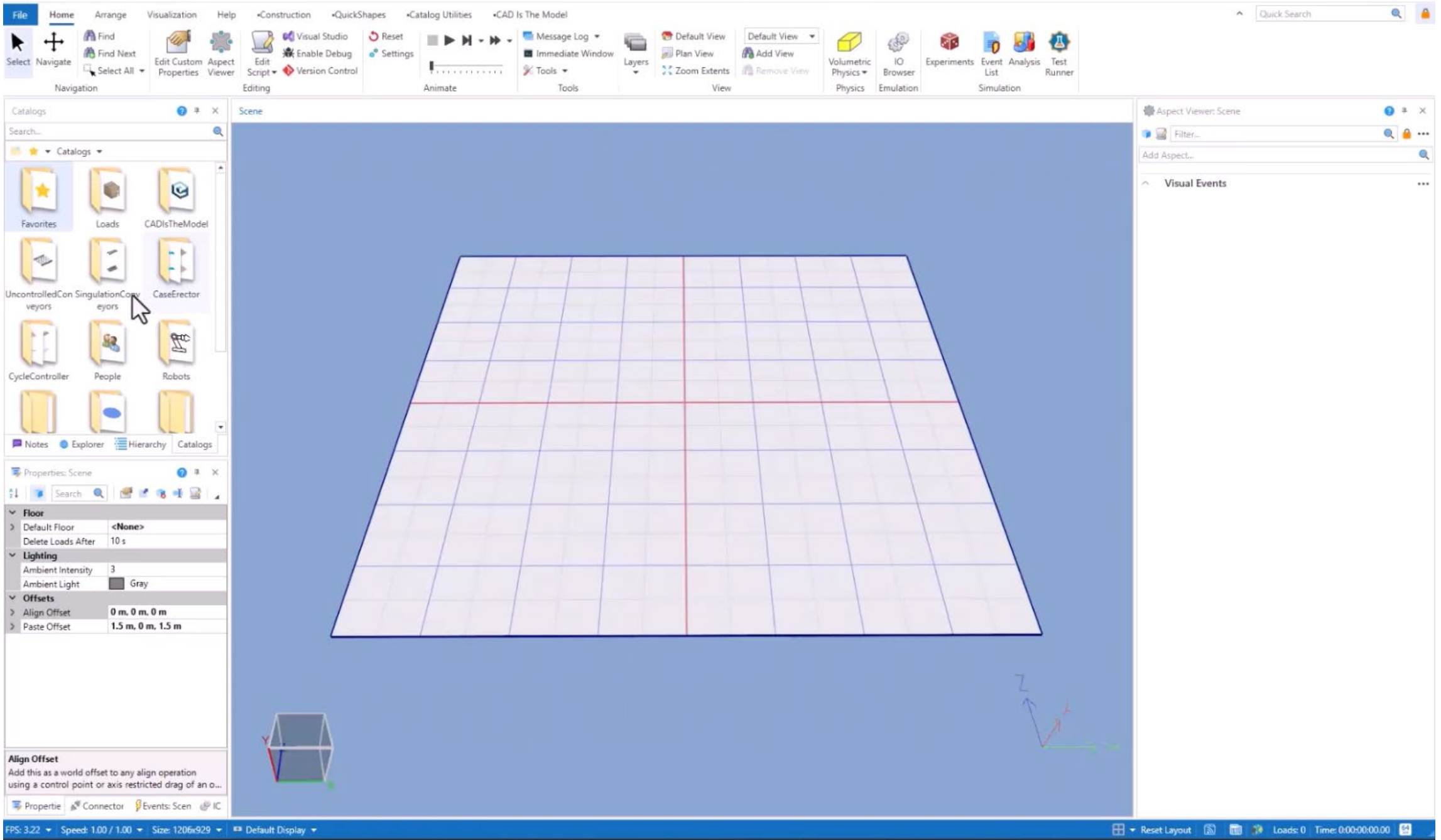
Publish catalogs and updates. Think of these versions as “landmark” commits!

Swap back to previous versions, automatically update models.

Share with other E3D Users



Catalog Tests with the Test Runner



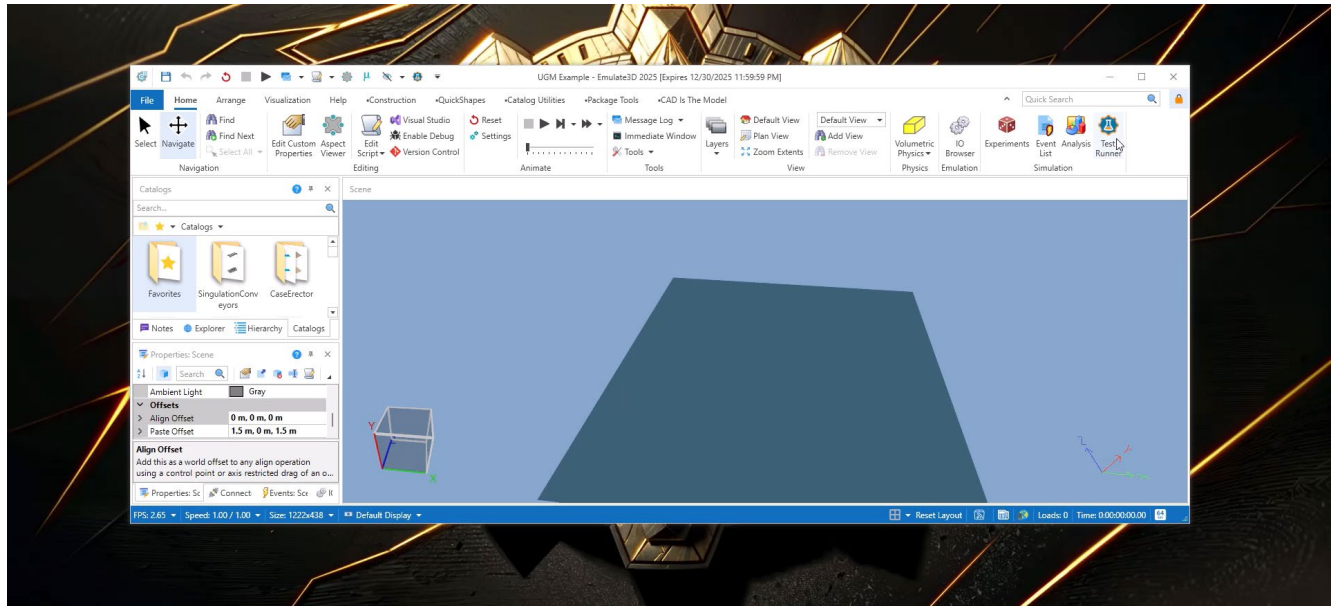
Tips – Catalog Unit Testing

```
[OneTimeSetUp]
0 references
public void SetUpParcelSingulatorTesting() {
    FindInstallPackage("Emulate3D", "Loads");
    FindInstallPackage("Emulate3D", "UncontrolledConveyors");
    ModelAction(() => {
        DeleteVisuals();
        App.Invoke(App.Reset);
    });
}
```

```
[TearDown]
0 references
public void CleanUpTest() {
    LoadList.Clear();
    ModelAction(() => {
        DeleteVisuals();
        App.Invoke(App.Reset);
    });
}
```

- NUnit attributes: Setup/Teardown
- Run tests from the command line interface
- Position the Test Runner window anywhere in E3D or externally
- Engage forum

What's Planned – Catalog Best Practice guidelines



1. Test Runner for Simulation 3 LIKE

Rockwell Staff
Deebs

Posted Apr 04, 2025 03:27:00 AM

REPLY

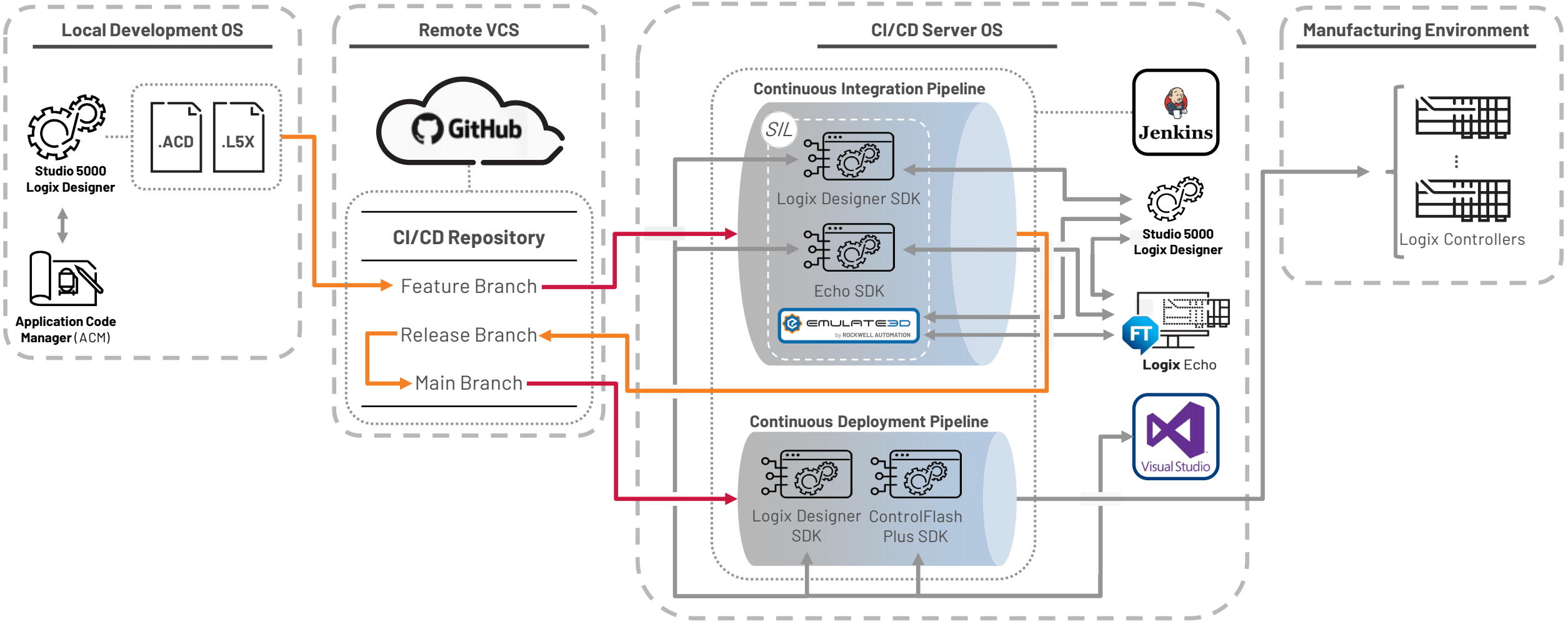
Test Runner is a fantastic tool that can be applied, to simulation to catalog development to virtual commissioning. This final thread will look at using Test Runner to experiment and optimize your system designs. You can learn about the other use cases in other threads!

Test Runner Scenarios are a bit like Sim3D Experiments but supercharged!

engage
A ROCKWELL AUTOMATION COMMUNITY

CI/CD for Logix Control Systems: Example Data Flow Diagram

CI/CD with Software-in-the-Loop Testing



We're using this ourselves…

Previously used .catalog3dx with GitLab for catalog dev.

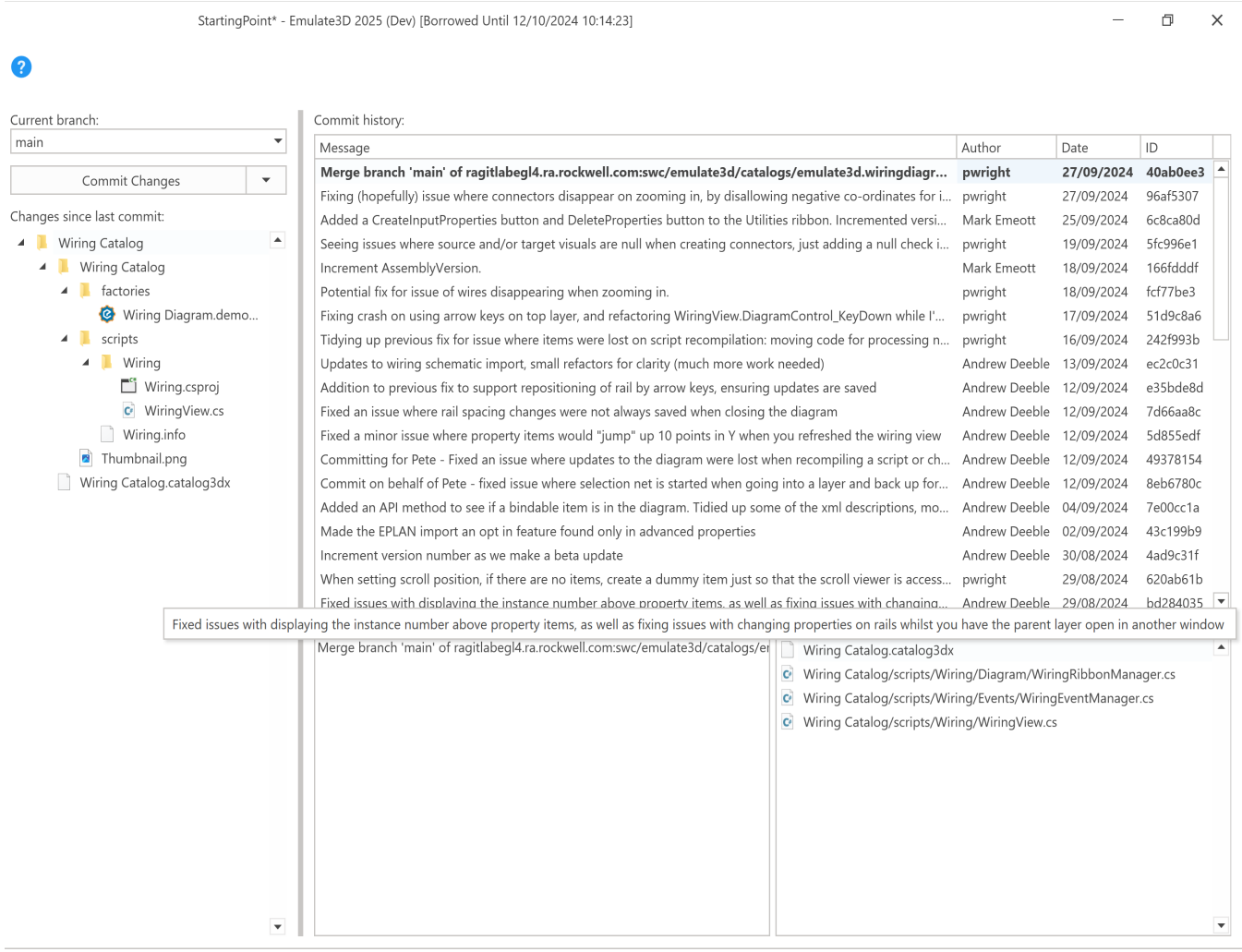
Now using the native Emulate3D GIT integration as our catalog dev workflow.

Moved our catalog regression tests from a previous tool to now use Test Runner.

What's Planned –

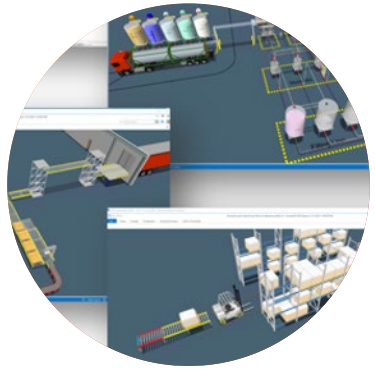
Improved Package Tools

Catalog Dev Best Practice Documentation



What's Planned - Emulate3D Assets

Define subsections within a model, for organization and reuse



Subdivide models into Assets.

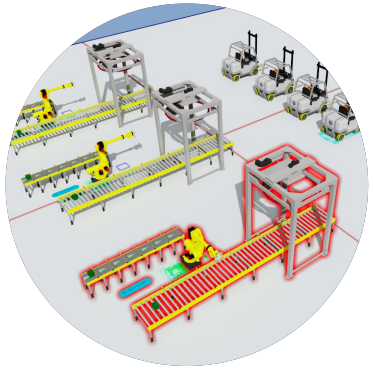
An Asset can be any scale; a line, a cell, a machine, a device.

Assets can nest and contain other Assets

Version Control assets with GIT.

Push changes from one asset to all matching assets.

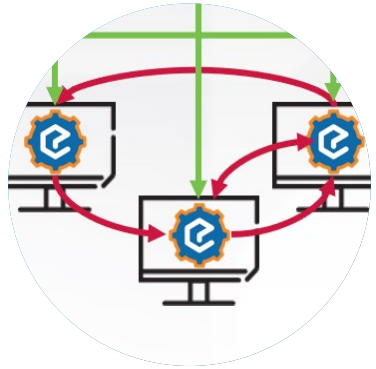
Push/pull updates from catalogs.



Comparison tools to understand model and asset changes.

Overlay and compare two versions.

Highlight differing properties.



Work on assets individually.

Work on assemblies containing many nested assets.

Use assets as Multi-Model boundaries.

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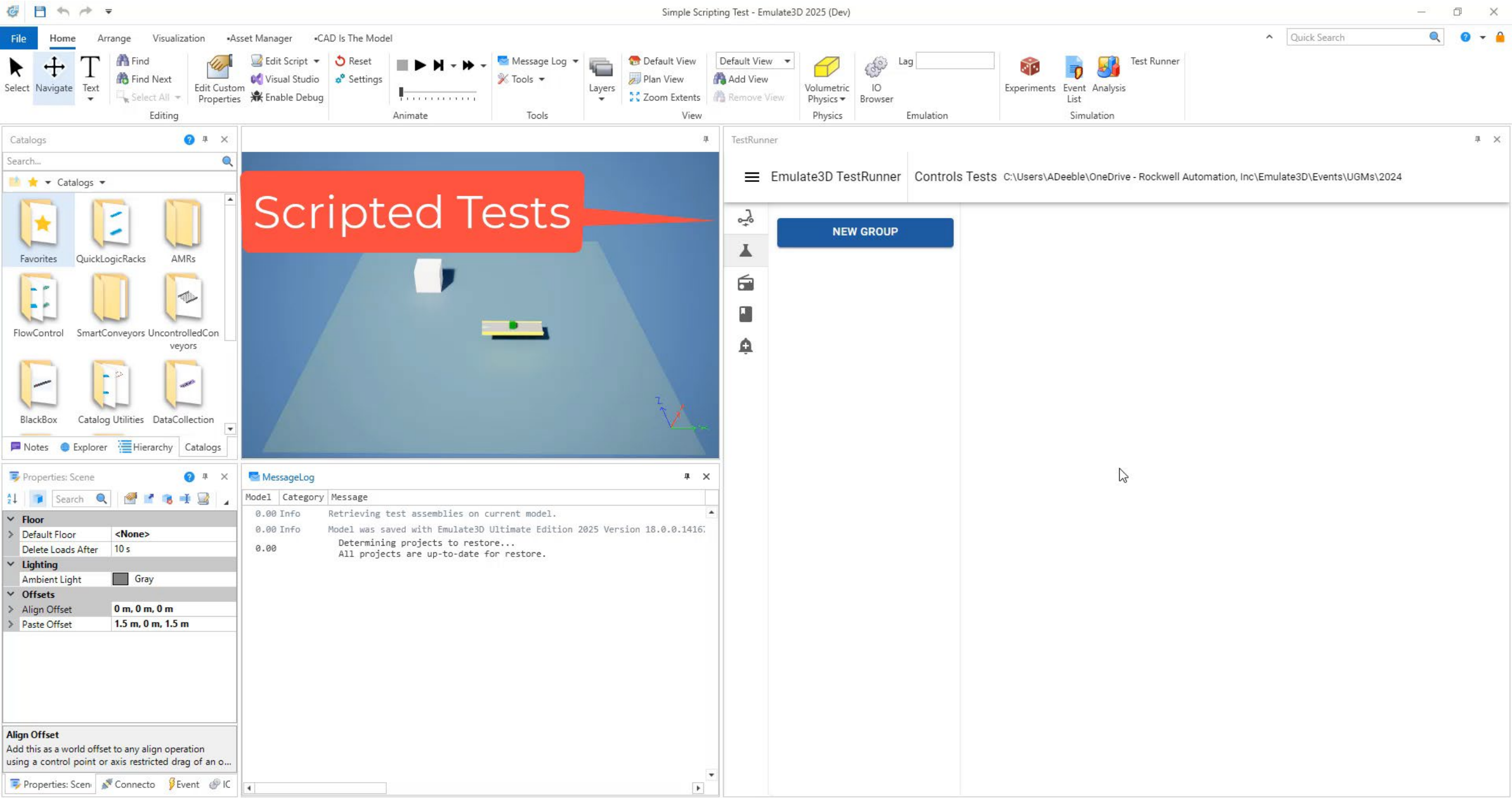
Appendix - Catalog Tests with the Test Runner Example



Thank you!

Questions? Requests? Inquiries?