# 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

# Rendering Updates

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Emulate3D Senior Software Engineer

# What is Unreal Engine?

An advanced real-time 3D creation tool, commonly used as a game engine but with applications in many industries.

Offers major advantages:

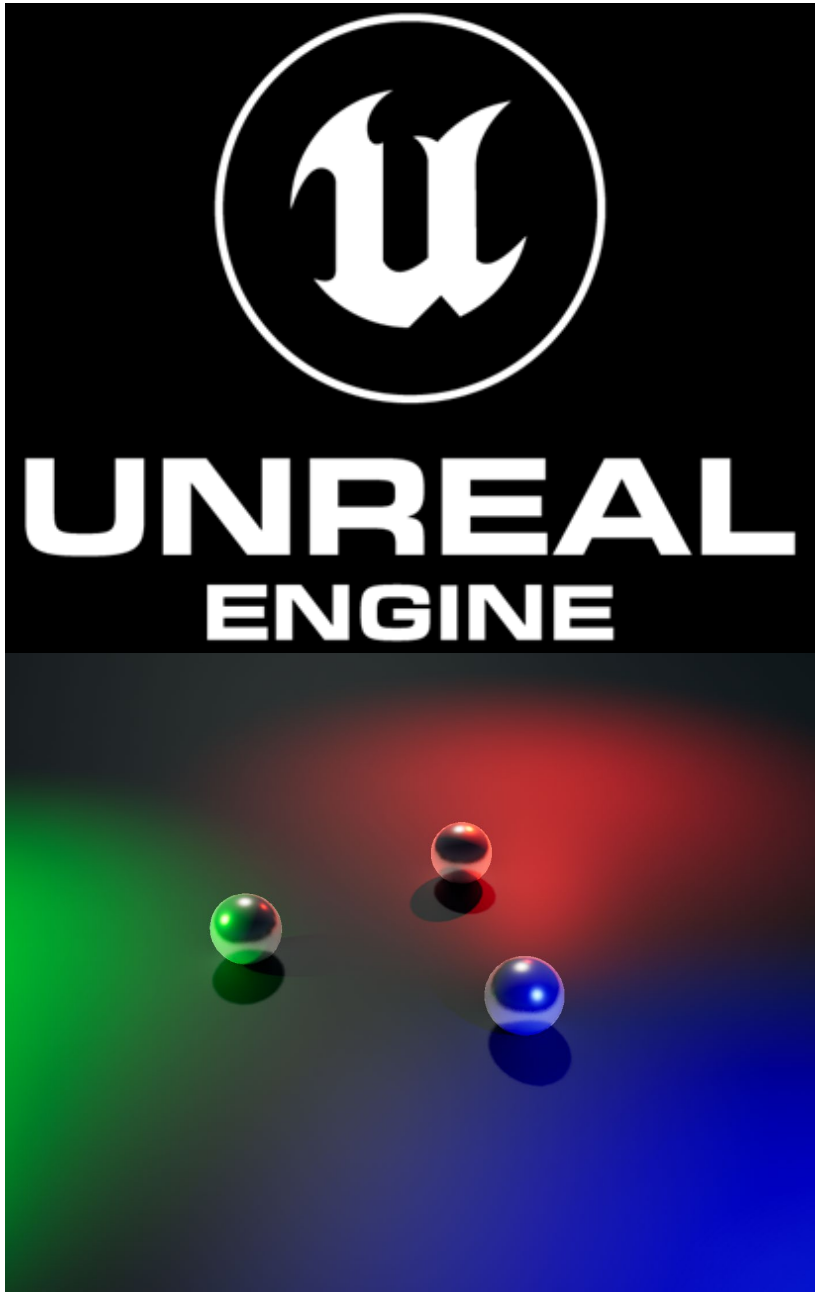
**- Improved performance**

**- Higher quality rendering**

**- Well established, reliable solution**

Available for use as a Beta in Emulate3D 2024.

Now default rendering in Emulate3D 2025.



# Unreal Performance

Unreal Engine includes many optimisations out of the box, including:

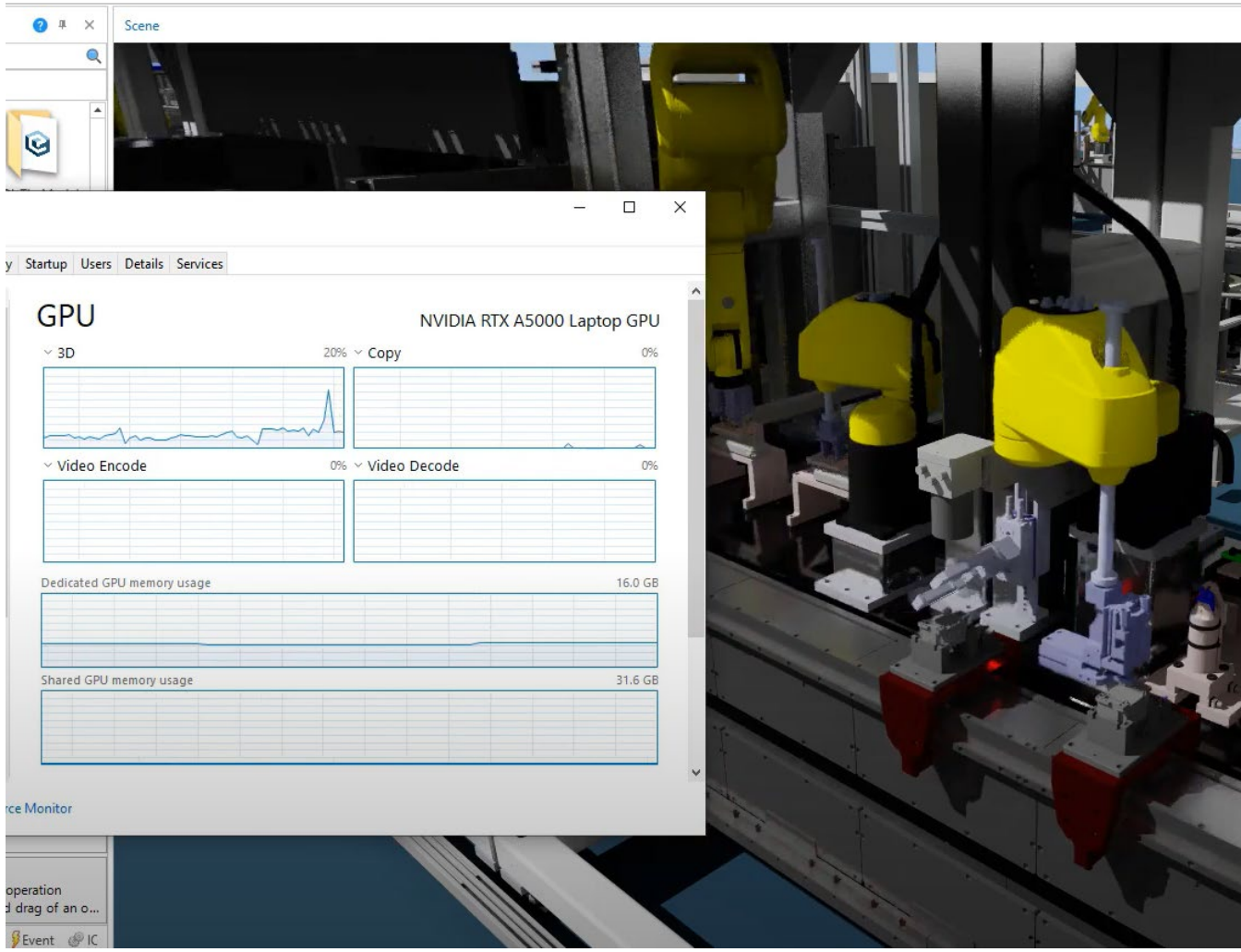
-Dynamic Mesh Instancing
-Automatic Draw Call Merging
-Mesh Draw Command Caching
-Better utilization of the GPU

Emulate3D has implemented Unreal rendering with **multithreading**.

This significantly reduces the amount of time blocking the main thread.

This improves comms processing, UI interactions, and simulation performance.

**What's Planned – further optimizations!**



Contactor Line Edits* - Emulate3D 2024

File | Home | Arrange | Visualization | •Construction | •Package Tools | •Catalog Utilities | •QuickShapes | •CAD Is The Model | •Performance Profiler

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

PerformanceProfiling

Search...

PerformanceProfiling

Performance Profiler

Note | Explor | Hierarcl | PerformanceProfil

Properties: Scene

Search

| | |
|---|---|
| **Floor** | |
| Default Floor | <None> |
| Delete Loads After | 10 s |
| **Lighting** | |
| Ambient Intensity | 4 |
| 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...

Propertie | Connector | Events: Scen | IO

Large model in E3D 2024

FPS: 4.40 | Speed: 1.00 / 1.00 | Size: 1610x833 | Default Display | Reset Layout | Loads: 0 | Time: 0:00:00:07.55

# | Tips & Tricks - Unreal and GPUs

**Unreal rendering is more reliant upon your GPU. If you see poor performance, consider:**

- Does Performance Profiler say rendering is the issue?
- Is your graphics card underpowered?
- Are you running on a VM? Is GPU passthrough set up?
- Are graphics drivers up to date?
- Is E3D incorrectly using your integrated graphics?
- Are you using battery and in power saving mode?

**If the answer is yes, then you could try:**

- Use the High Performance display mode
- Merging sections of CAD with many static children. Very high visual counts can be a CPU bottleneck!
- Try using v18.0.1+ if encountering VM rendering issues


RobotLighting* - Emulate3D 2025
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•LogTools
•Vehicle Framework Utilities
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Find Next
Select All
Navigation
Edit Custom Properties
Aspect Viewer
Edit Script
Visual Studio
Enable Debug
Version Control
Editing
Reset
Settings
Animate
Message Log
Immediate Window
Tools
Layers
Default View
Plan View
Zoom Extents
Add View
Remove View
View
Linear Physics
Physics
IO Browser
Emulation
Experiments
Event List
Analysis
Test Runner
Simulation
Catalogs
Search...
Favorites
UnrealLights
SmartConveyors
UnrealLoads
Loads
Packages
Offline Packages
Notes
Explorer
Hierarchy
Catalogs
Properties: Scene
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Movie Display
Reset Layout
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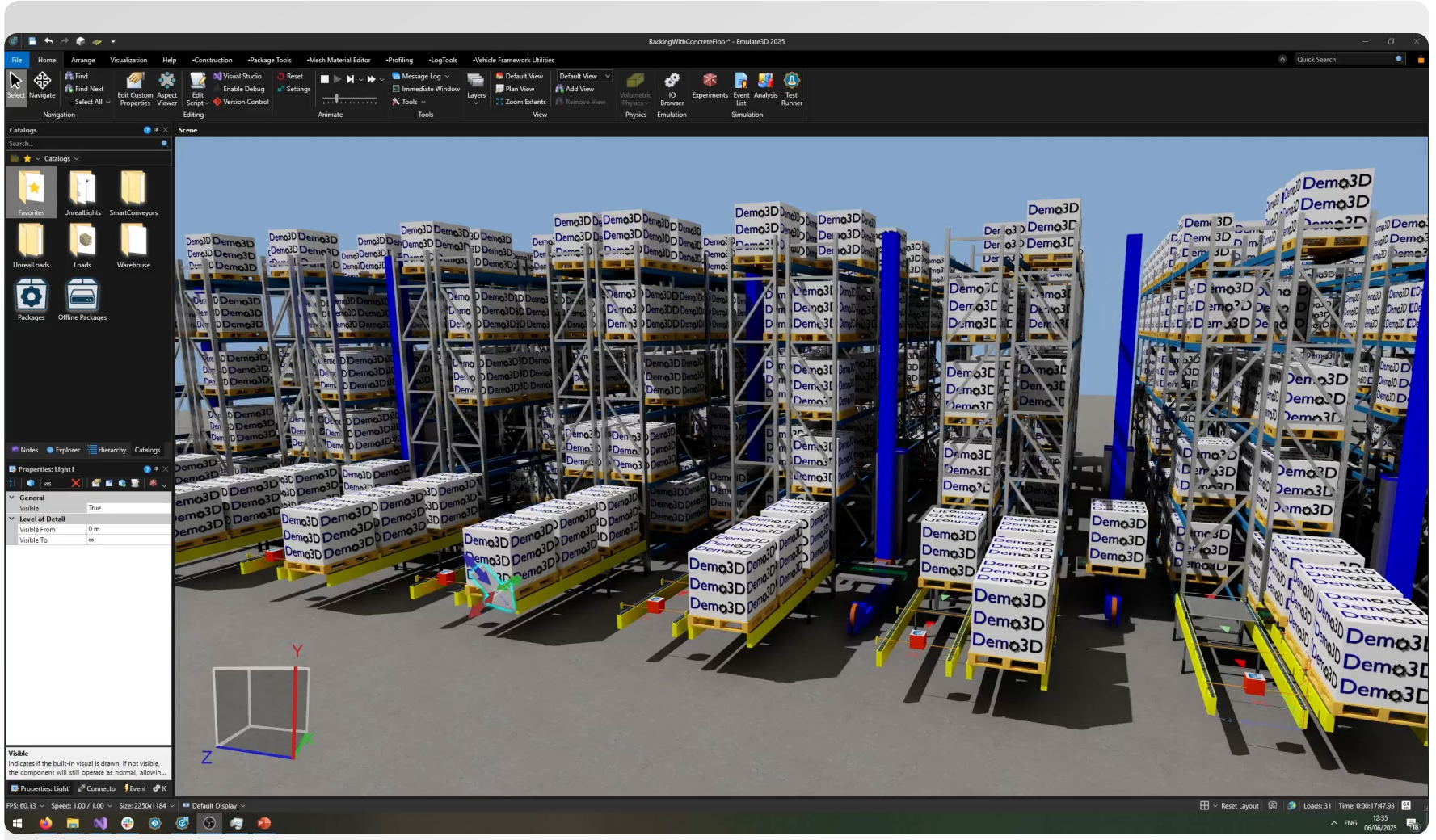
06/06/2025

# | Unreal – Ray Tracing and Global Illumination

Real time ray tracing

Dynamic global illumination

Lighting adapts to changes to light sources and geometry



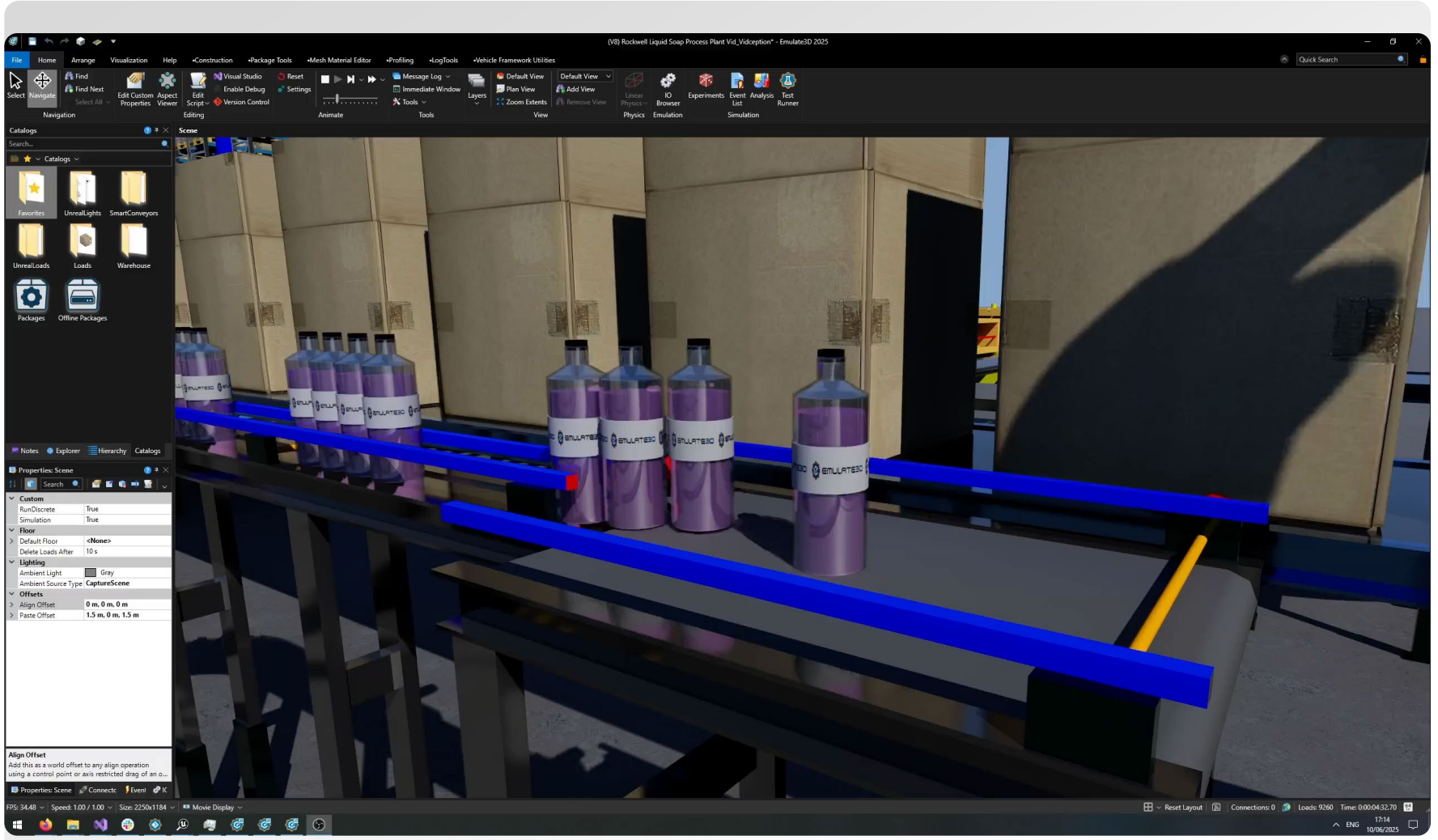
# | Unreal – Reflections

Reflections update in real time

Screen space reflections

Ray traced reflections*

* Coming in v18.0.2

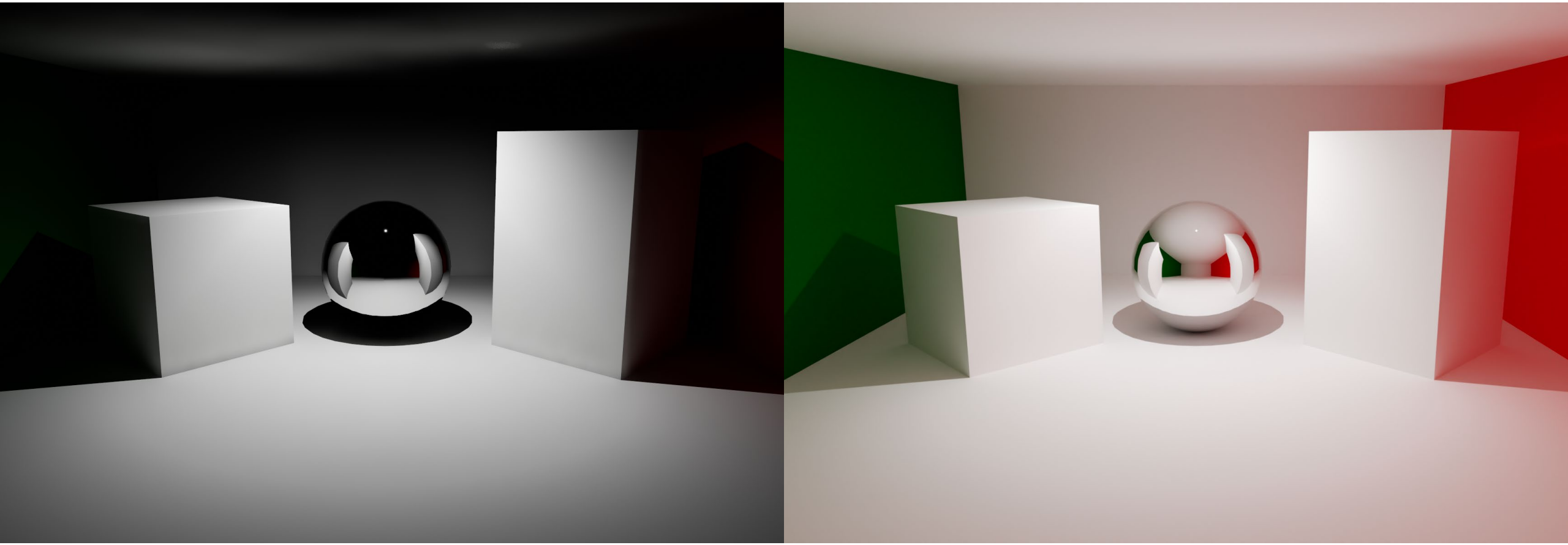


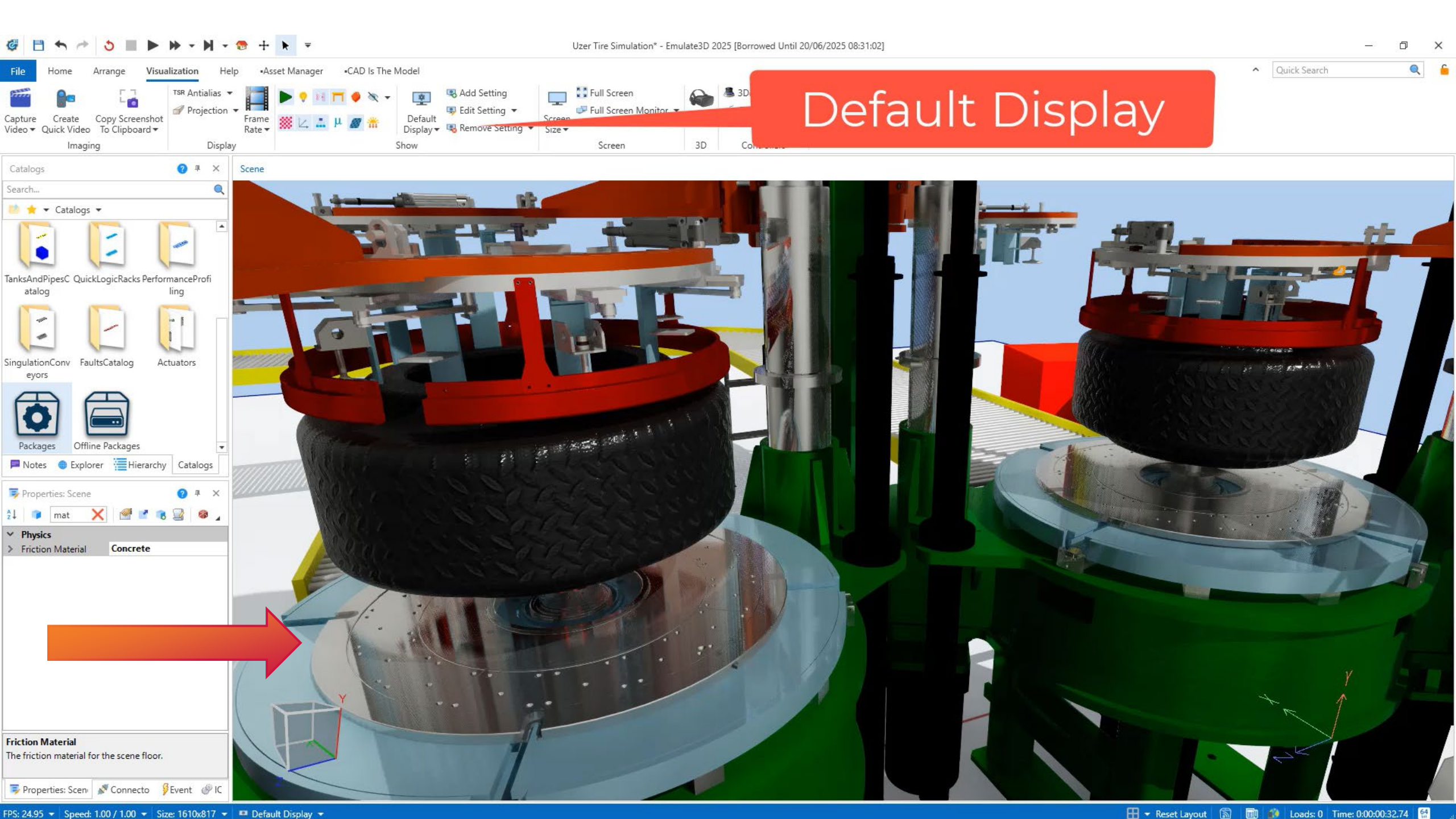
# What's Planned - Path Tracing

Create photorealistic renders and videos from within Emulate3D!
Frames take ~seconds to settle. Think Omniverse or Pov Ray!

Without Path Tracing

With Path Tracing Preview




Uzer Tire Simulation* - Emulate3D 2025 [Borrowed Until 20/06/2025 08:31:02]
File
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•Asset Manager
•CAD Is The Model
Quick Search
Capture Video
Create Quick Video
Copy Screenshot To Clipboard
Imaging
TSR Antialias
Projection
Frame Rate
Display
Default Display
Add Setting
Edit Setting
Remove Setting
Show
Full Screen
Full Screen Monitor
Screen Size
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Default Display
Catalogs
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Catalogs
TanksAndPipesCatalog
QuickLogicRacks
PerformanceProfiling
SingulationConveyors
FaultsCatalog
Actuators
Packages
Offline Packages
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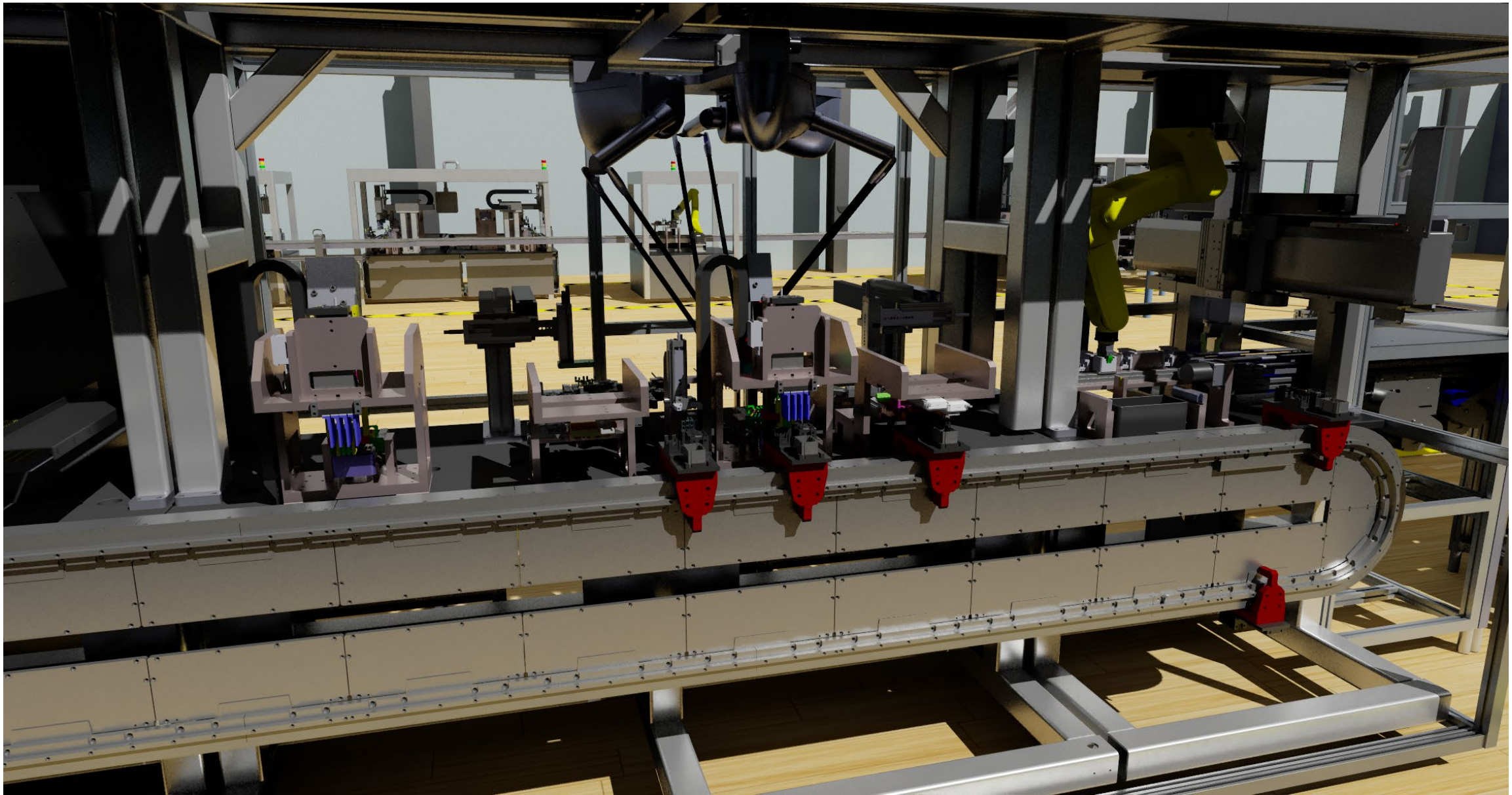
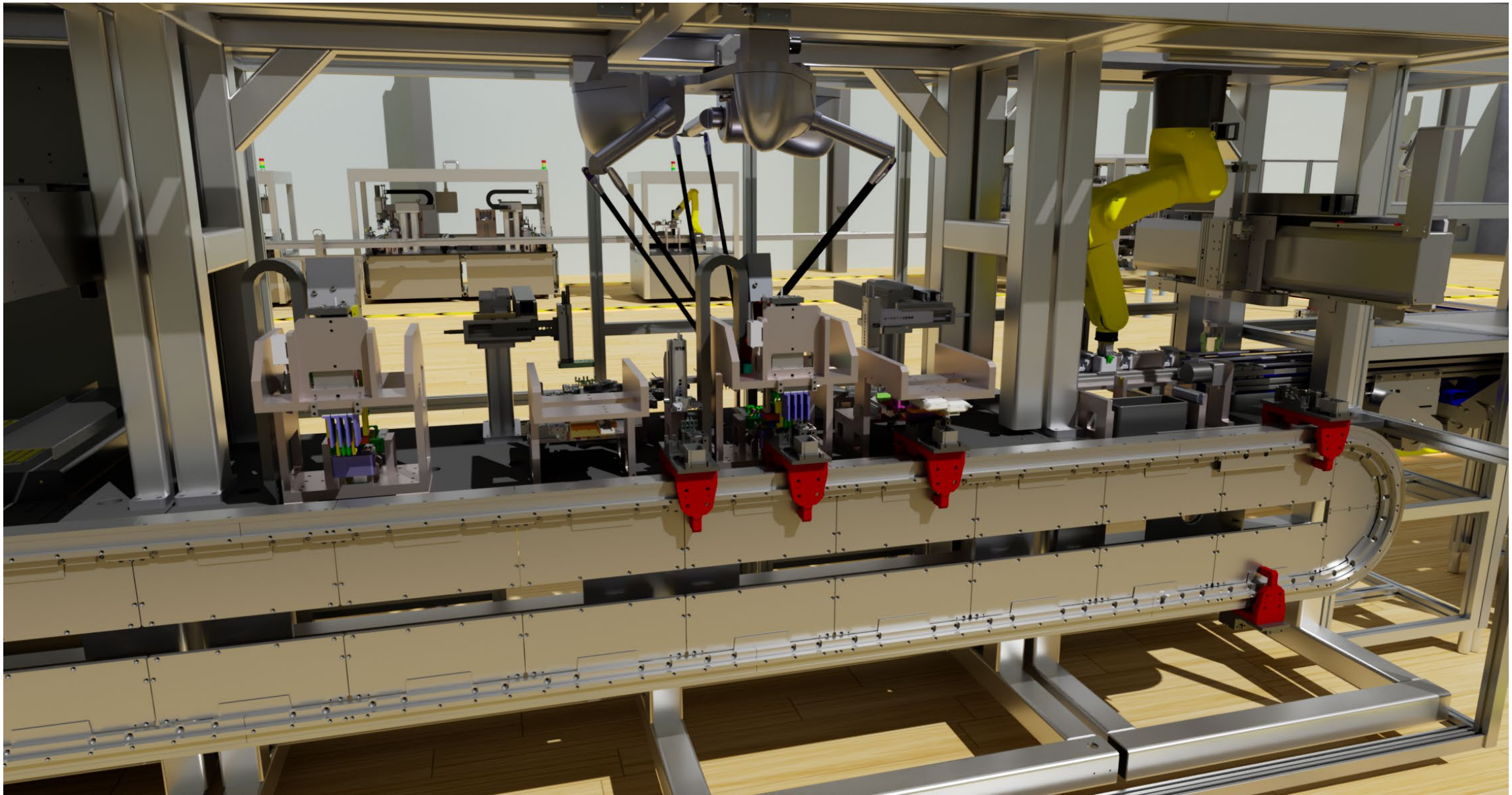
# Path Tracing Off



# Path Tracing On



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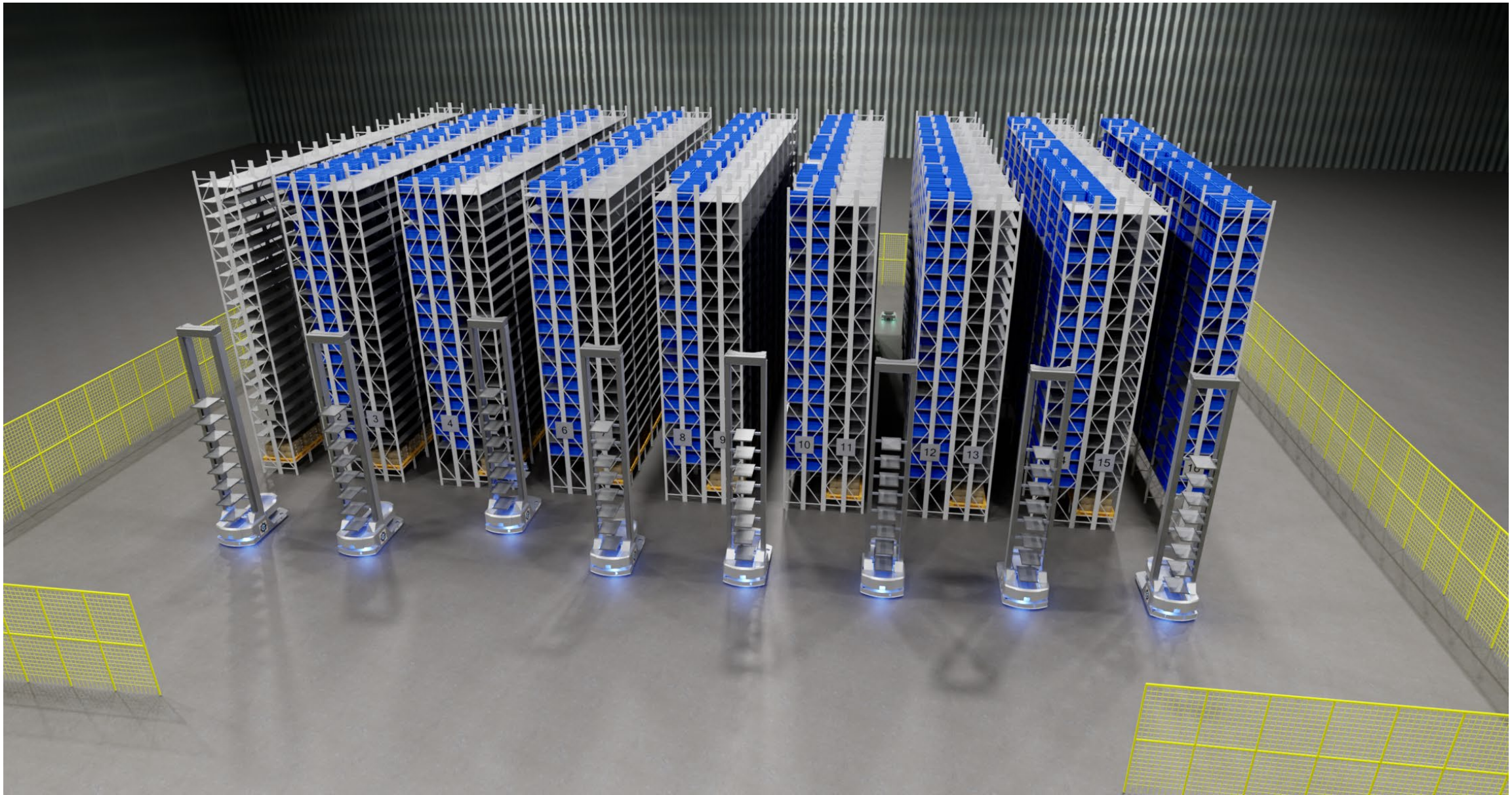

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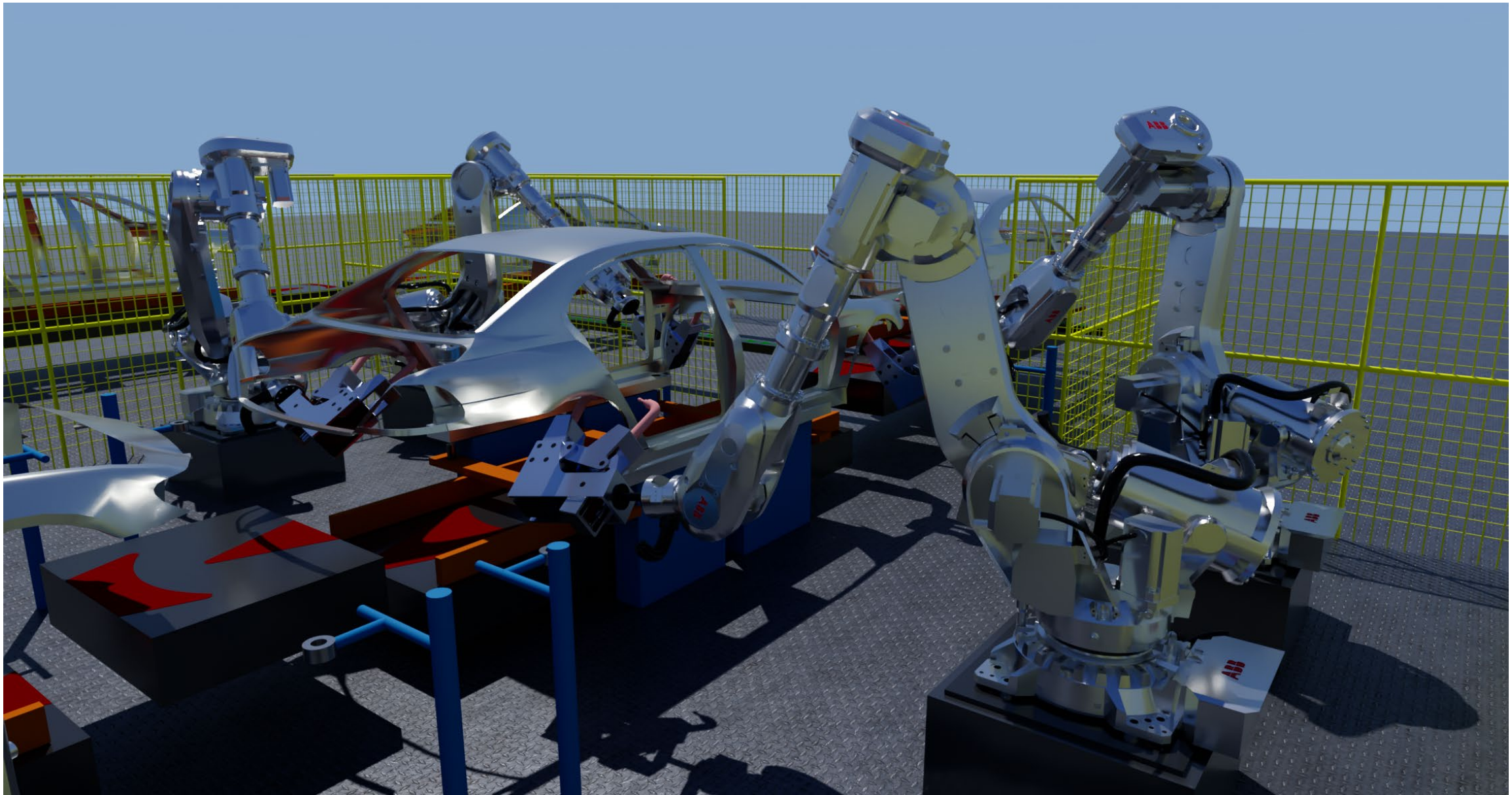

# Path Tracing On

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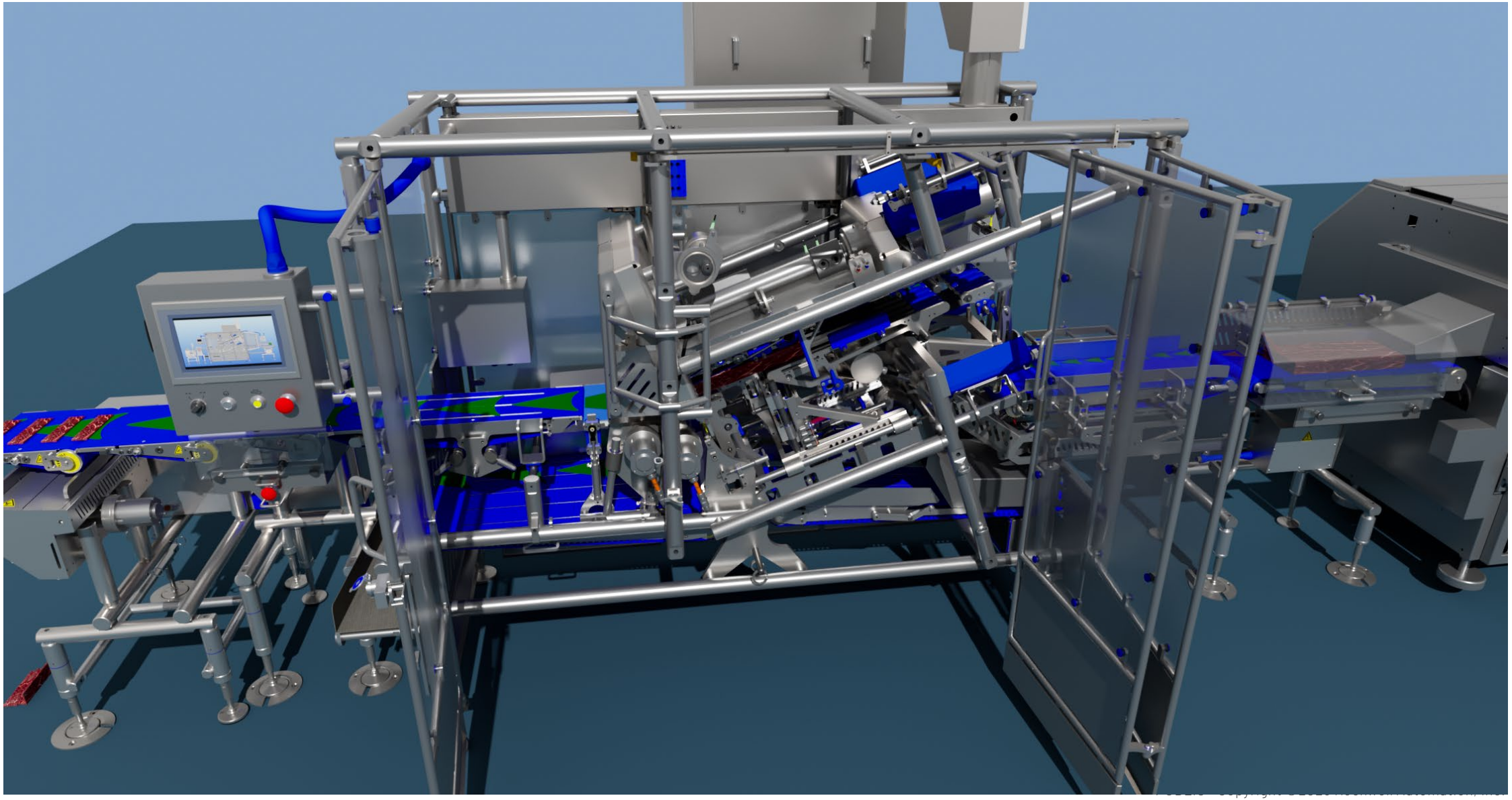
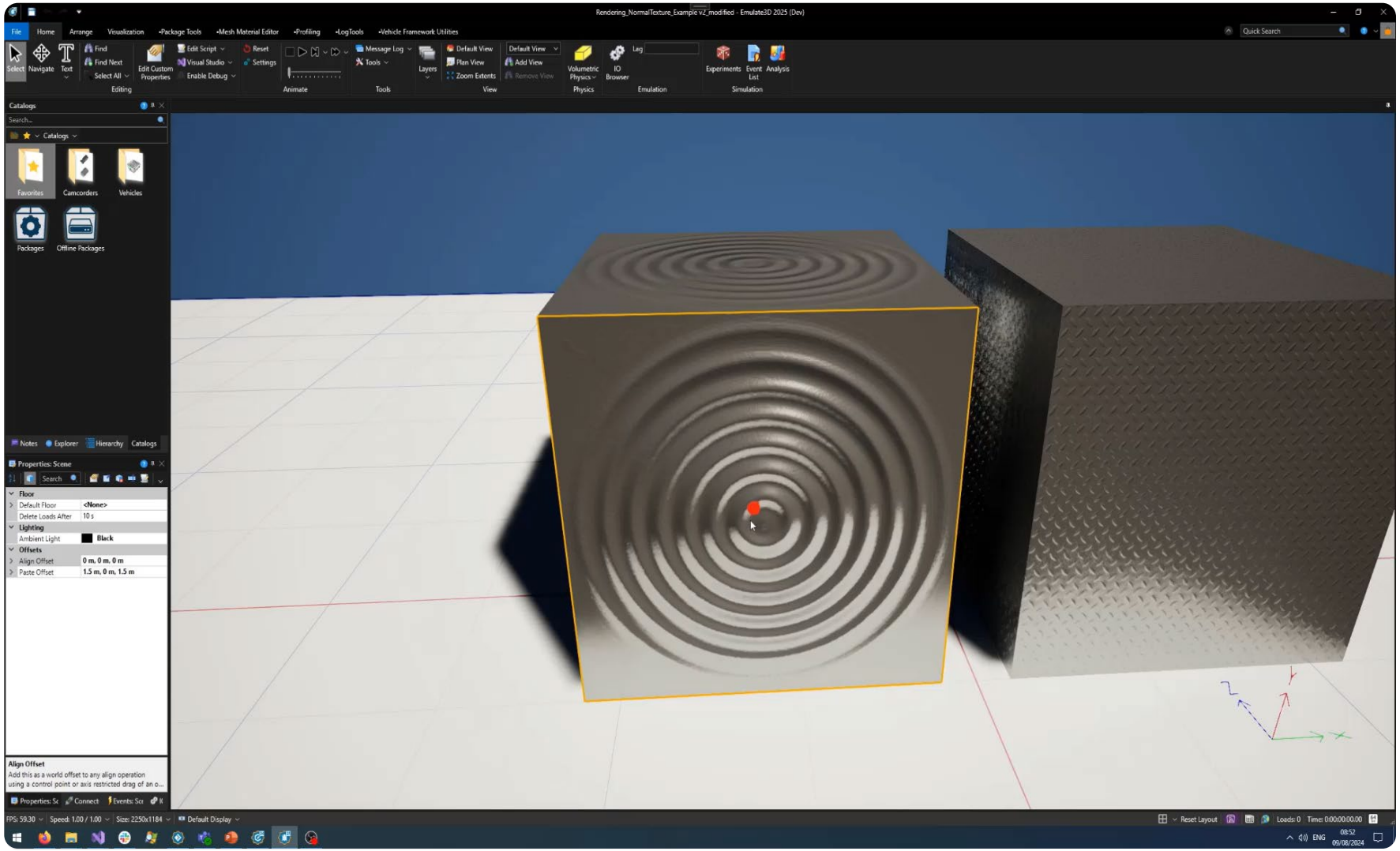


# | Unreal – Material Options

Advanced shading models using Physically Based Rendering.

Control over how materials interact with light, including Normal Textures, and Ambient Occlusion.

Minimal performance cost!



# | Tips & Tricks - Material Properties

The Materials contains properties which were used for POV Ray only. These affect Unreal rendering!

- Set a Reflectivity. You could even use a script to make all grey metallic colours slightly reflective.

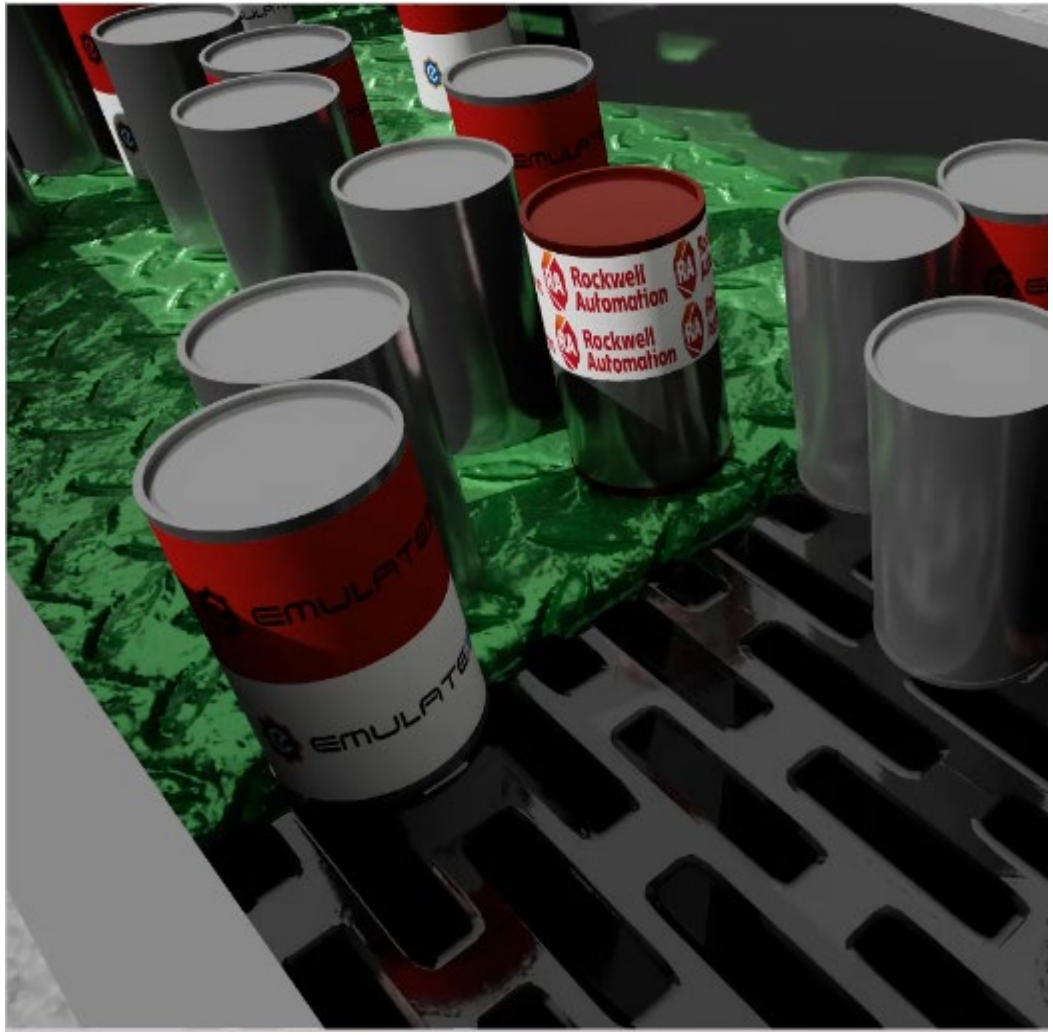
- Set a Luminosity to make a visual glow.

- Set a Normal Texture to give a visual bumpiness.

- Use the Normal Depth to increase bumpiness effect, or invert depending on the file format used!

- Use free (CC0 licensed) texture packs which contain both textures and normal textures.

**What's Planned – Material Overhaul!**
Use a set of texture maps for even higher quality lighting and reflections (e.g. PBR).



# | Unreal – Light Sources

Multiple light sources with a range of light casting types

- Directional
- Spot
- Point
- Sky

Fully dynamic!

Ray traced shadows

Hard or Soft shadows

# Display Modes

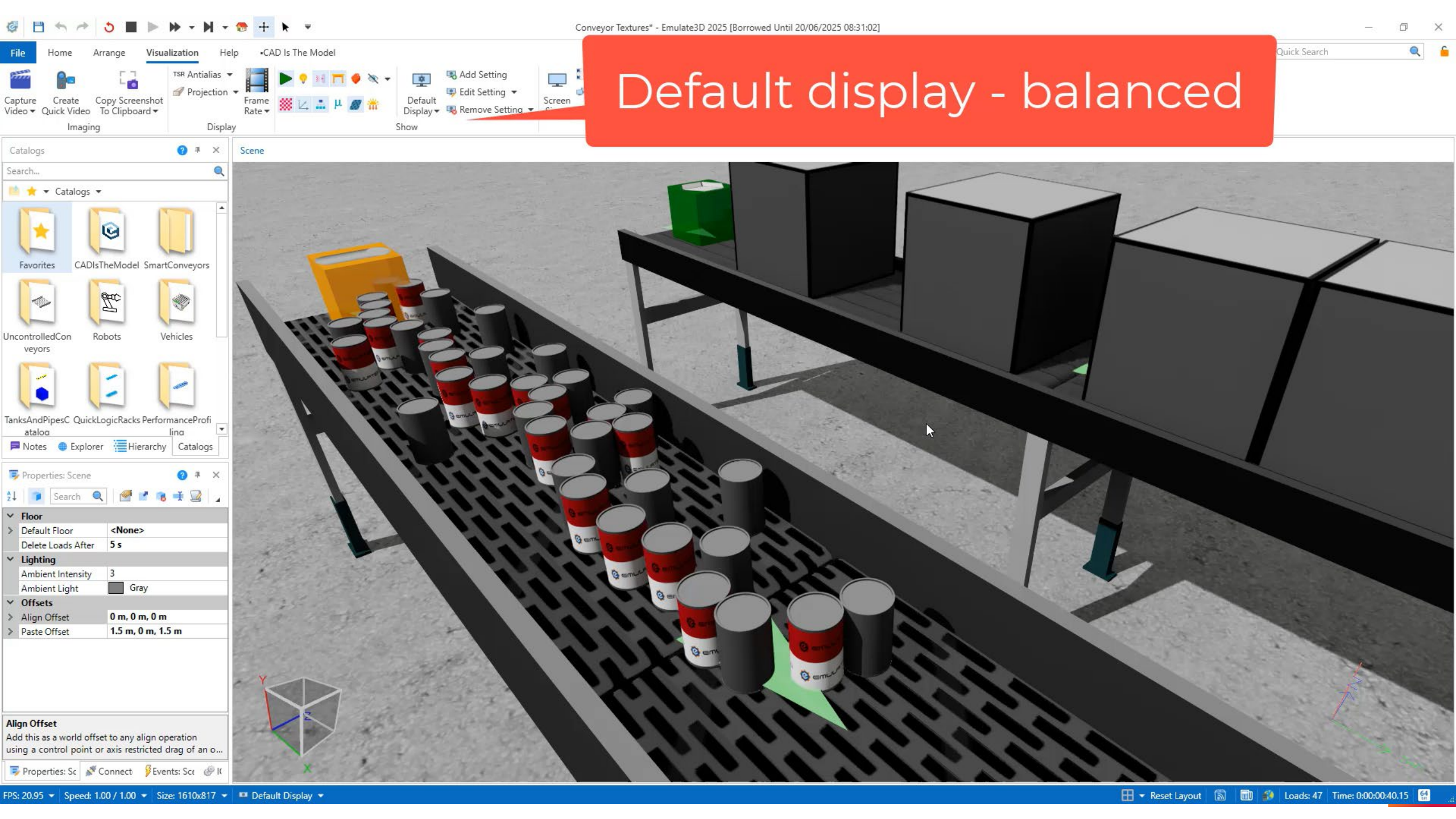
Quickly toggle between Unreal Rendering settings to get the best result

Unreal Rendering is highly configurable. We've created four Display Modes to suit different needs:

Use **Build** display mode for a clear visualisation which is most similar to the 2024 rendering
Use **Movie** display mode for high quality images and videos
Use **High Performance** to run Unreal as lean and fast as possible
And **Default** display model is a great compromise for general use!

| Setting | Description | Performance | Build | Default | Movie |
|---|---|---|---|---|---|
| Antialias | Smooth pixelated edges | Off | Low (FXAA) | High (TSR) | High (TSR) |
| Shadows | How the shadows are displayed | Off | Vertical | Ray Traced | Translucent |
| Textures | If material textures are displayed | | ✓ | ✓ | ✓ |
| Lighting | How lights are displayed | Off | Downlight | Custom | Custom |
| Reflections | Mirror effect if material reflectivity set | | | ✓ | ✓ |
| Global Illumination | Transfer colour from nearby objects | | | ✓ | ✓ |
| Ambient Occlusion | Shadows in closed off spaces | | | ✓ | ✓ |
| Tonemapper | Better display differences in brightness | | | ✓ | ✓ |
| Utilities | Axes, direction arrows, references | ✓ | ✓ | ✓ | |

# Default display - balanced

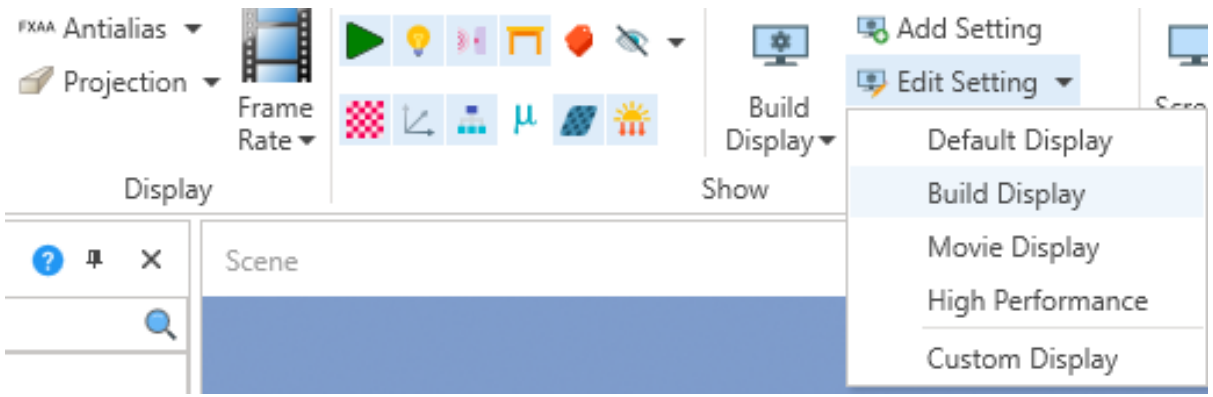


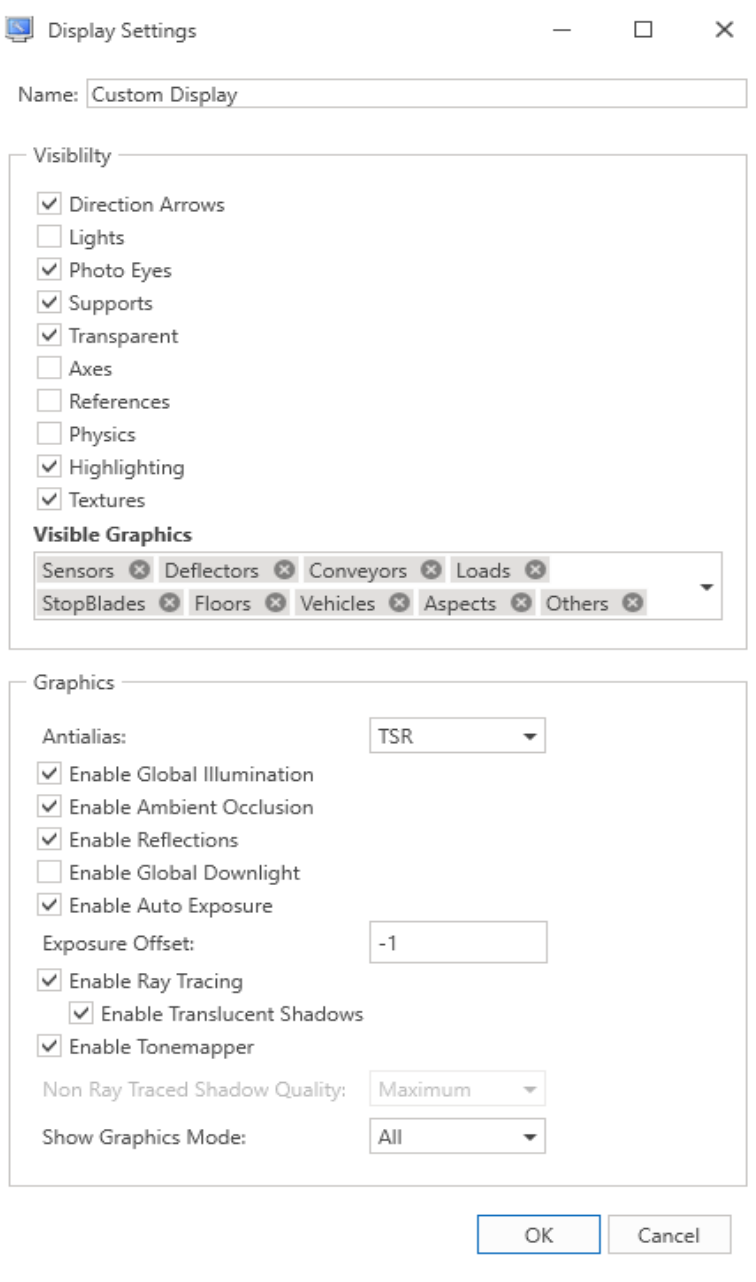
# | Tips & Tricks - Custom Display Modes

## Create custom display modes according to your needs:

- Show or hide utilities like direction arrows on conveyors, reference orbs, and axes in the corner of the view window.
- Turn on physics view, or hide certain physics collision groups.
- Fine tune graphics settings according to preference, such as exposure and tonemapping.

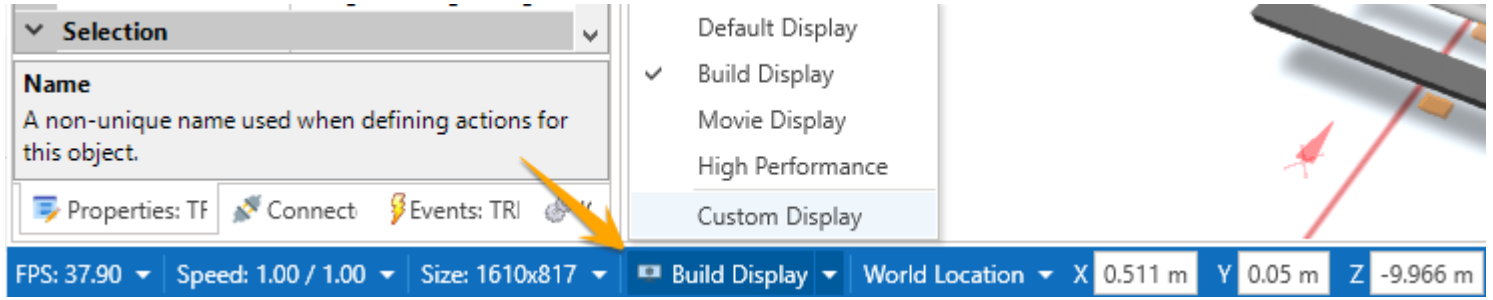
## Or customize the default display modes!



# | Tips & Tricks - Custom Display Modes

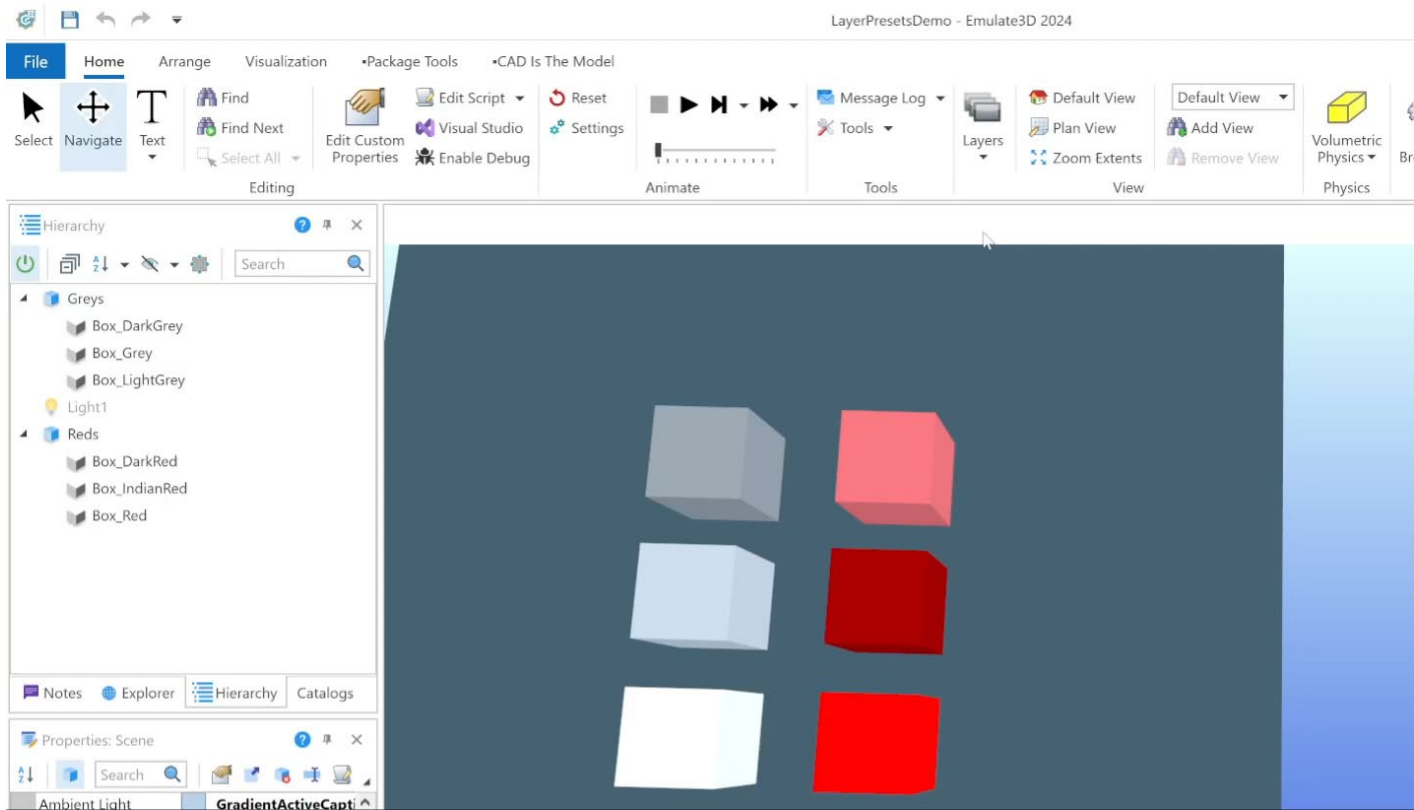
Quickly swap between views using the bottom toolbar:




Combine with other tools such:

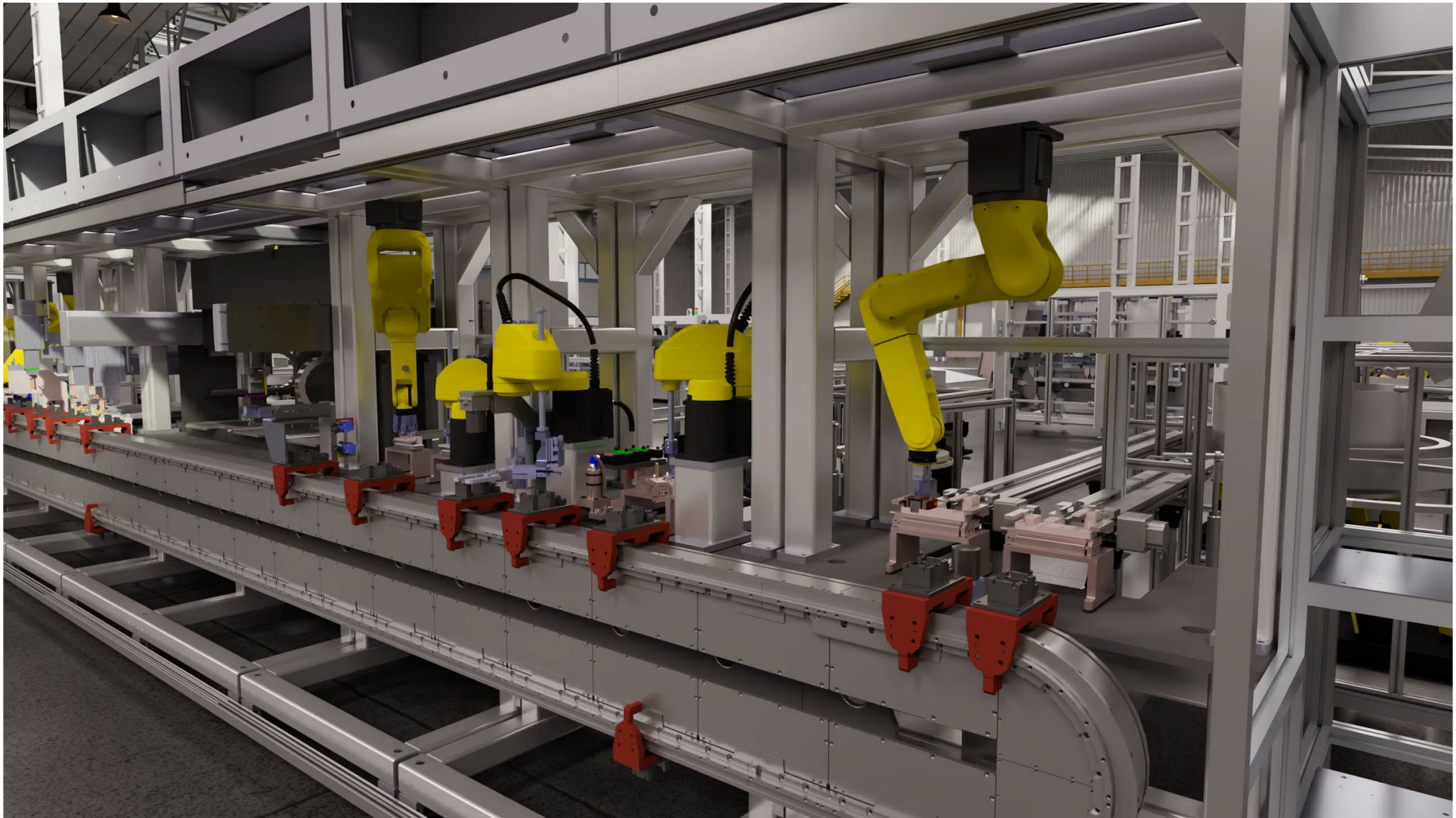
- Saved views
- The new Layer Presets

To quickly swap between a “Build” environment, a “Test” environment, and a “Movie” environment



# Omniverse Rendering

**Omniverse still offers the highest quality renders, alongside amalgamation of multiple USD sources**

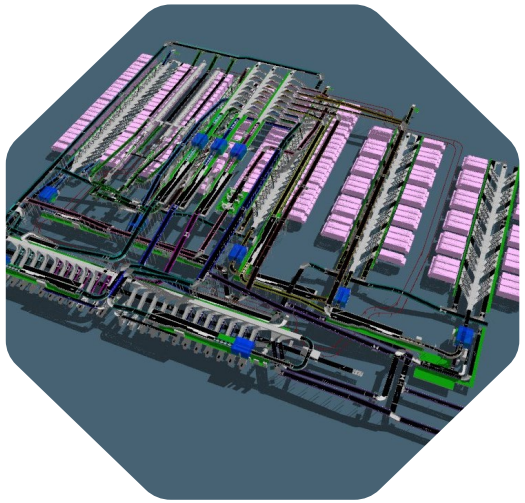


# Enterprise Customers Need their Digital Twins to Scale

However…

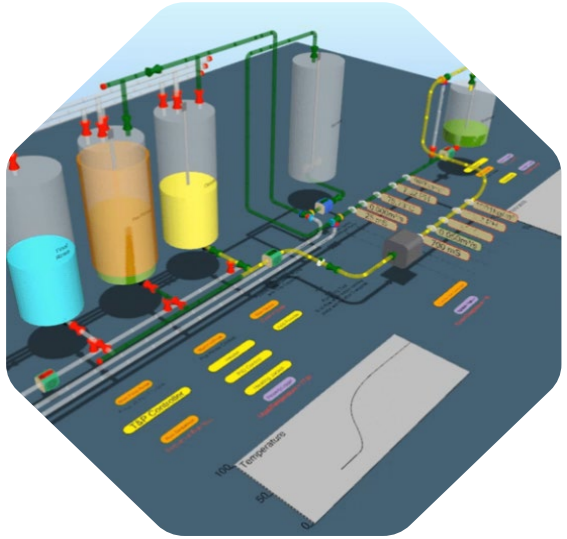
## Factories can be huge

High fidelity physics, thousands of moving product, high speed machinery…
That's too much for one computer to model without compromising on detail.



## Processes are specialized

Mechanical, Electrical, Controls Process, Robotics, Device Behaviour …
That's too much for a single engineer to fully understand and model.



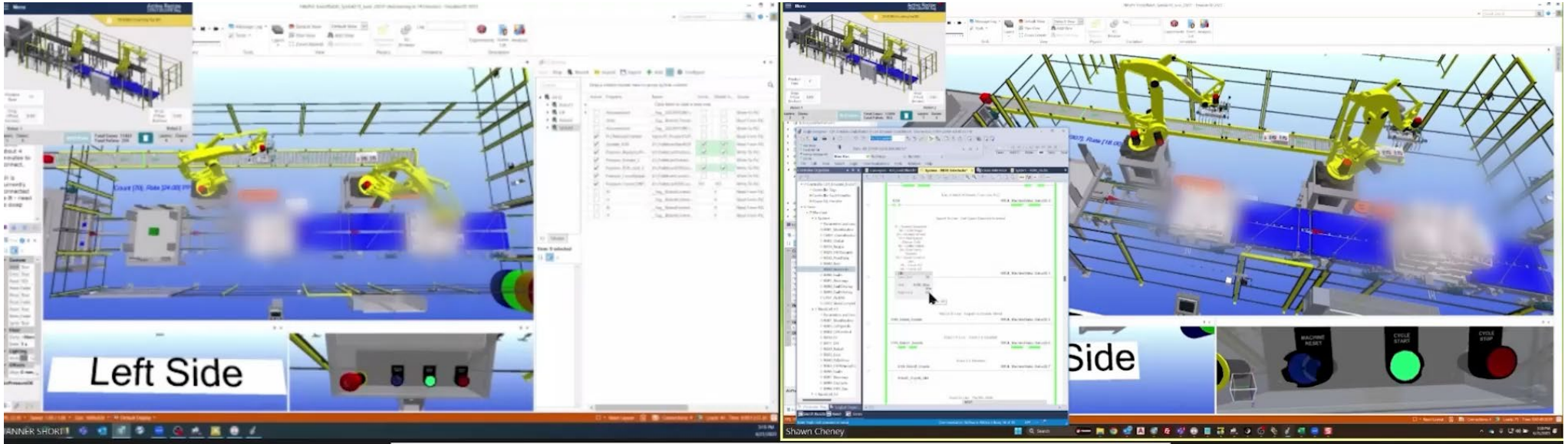
## Collaboration is critical

Whether its different teams, or suppliers from different companies…
Engineers must combine their areas of responsibility together, for system tests

**Solution – Create section models which are verified by domain experts.**
**Combine these models for Factory Scale Simulation and Emulation.**

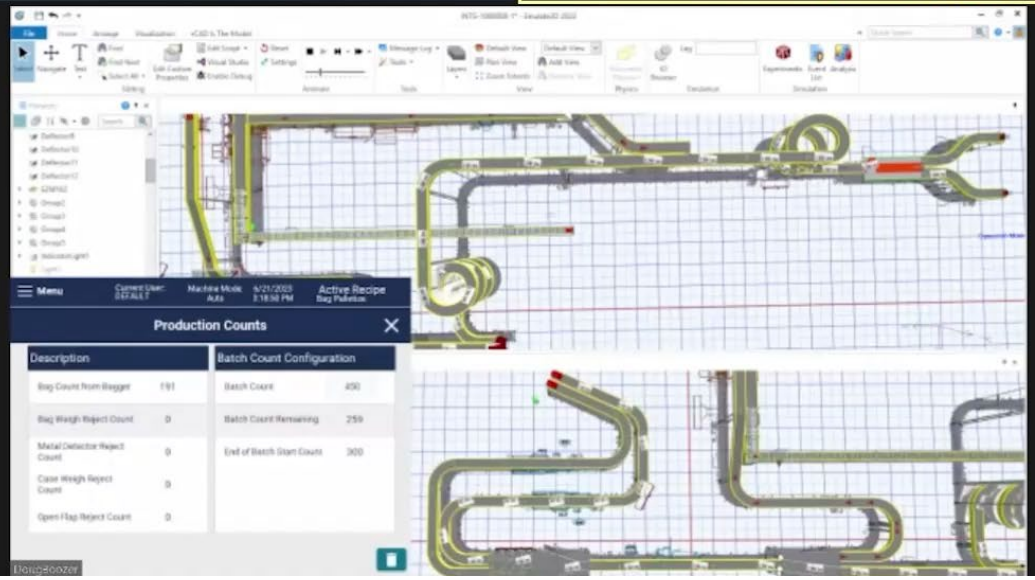
# Enhancing Controls Engineering Workflow with Emulate3D

PEARSON PACKAGING SYSTEMS




Tanner in Utah

Shawn in Idaho

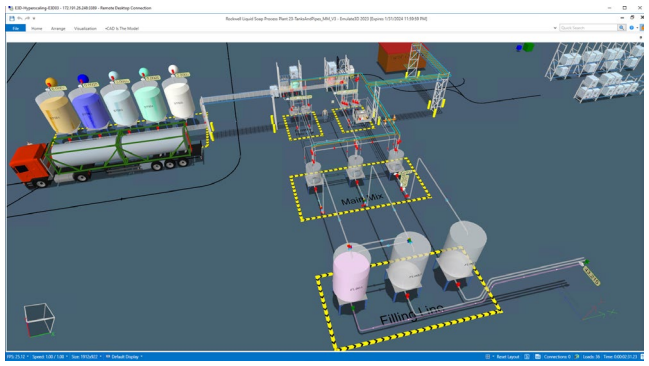


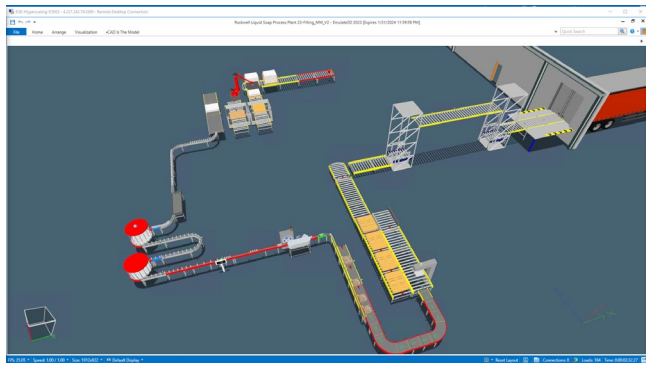

Doug in California

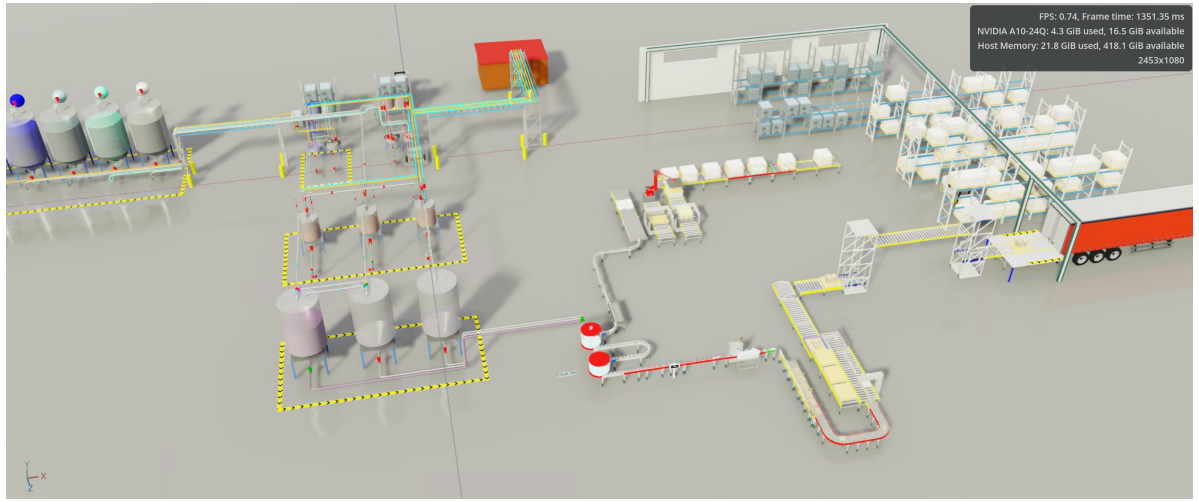
EMULATE3D

by ROCKWELL AUTOMATION

# Hyper-Scaling Architecture








Model A

Model B

Model C

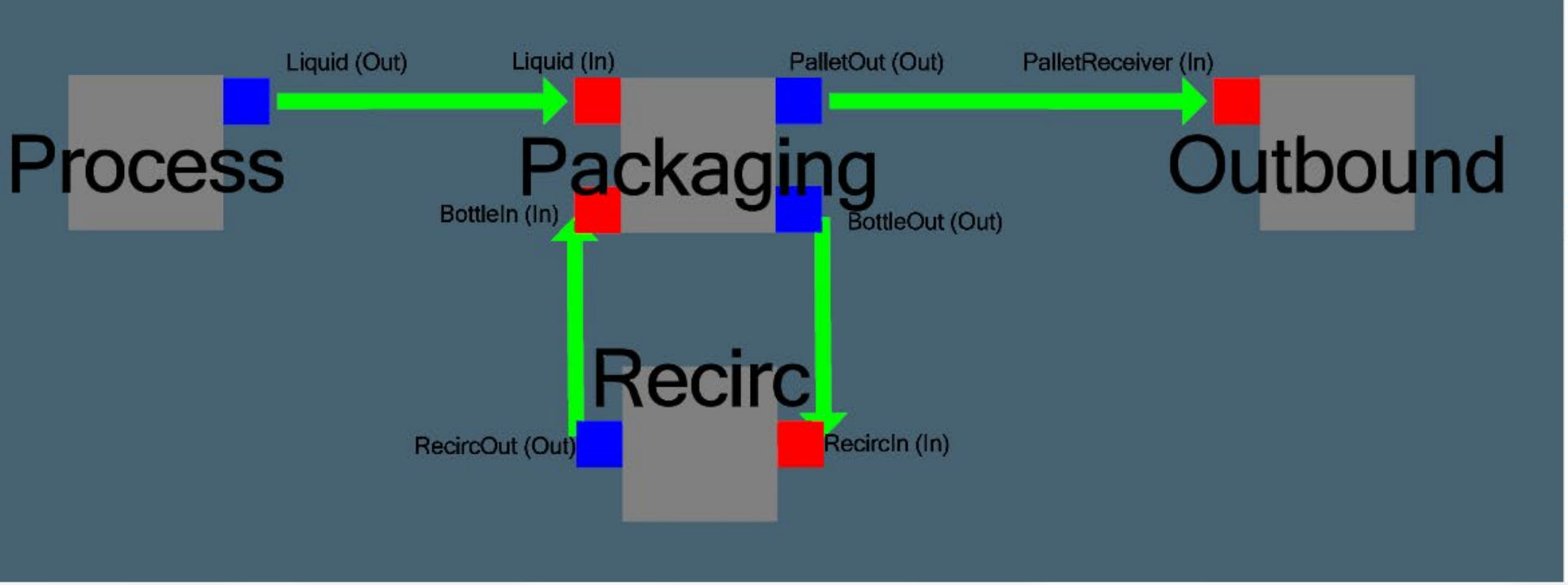
LEGEND

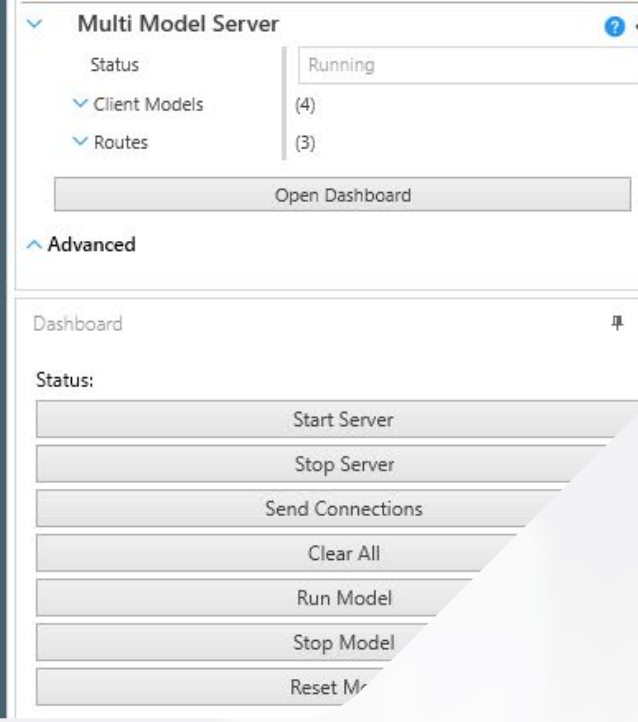
Multi-Model

Stream to Omniverse Powered View

NVIDIA OMNIVERSE™

Complete Factory View




# Liquid Soap Manufacturing

Four Engineering Disciplines
Four Emulate3D Sections

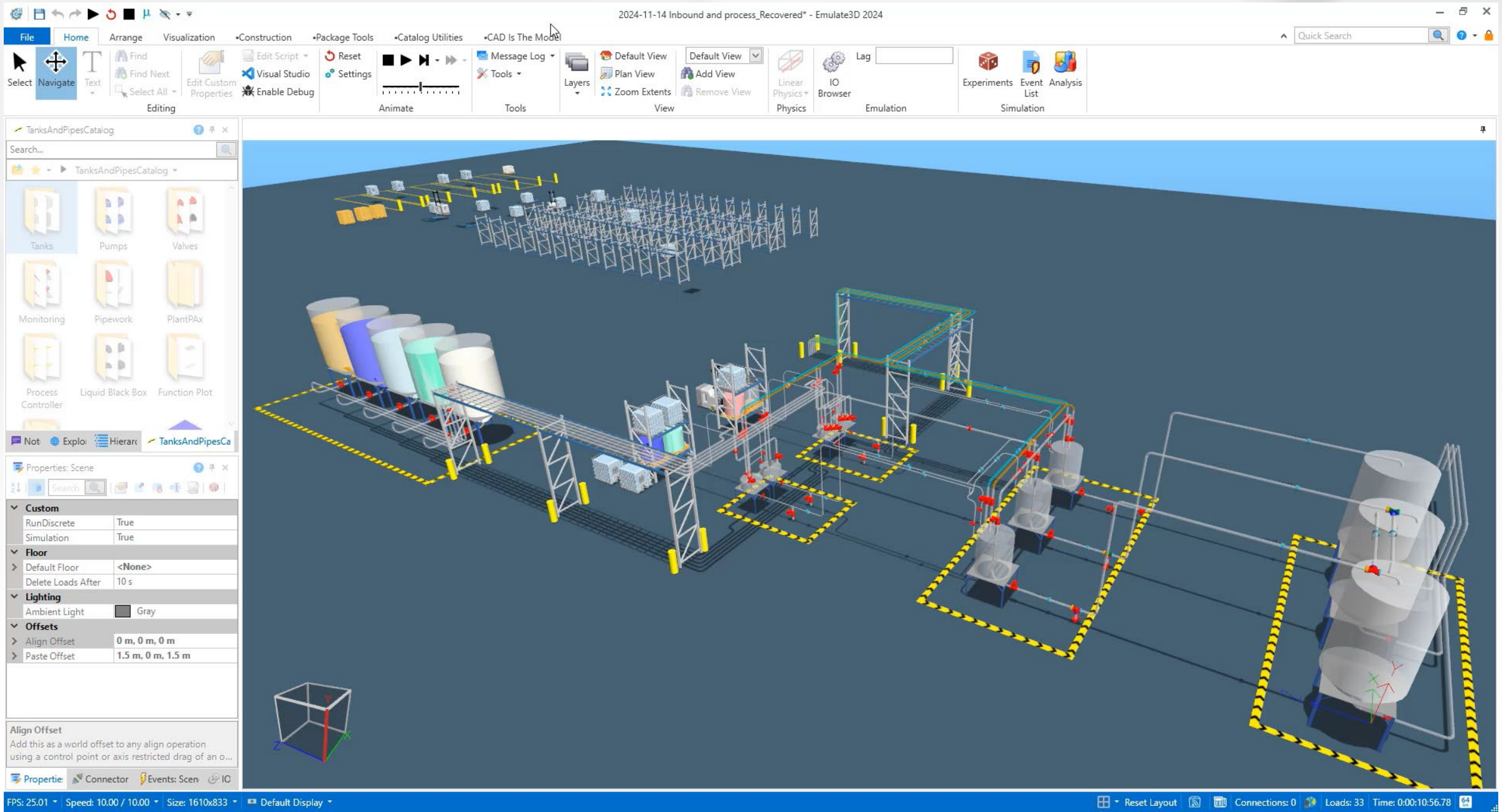
**Process Section**
FT Batch, PlantPAx, Emulate3D Tanks and Pipes fluid modelling

**Fill and Pack Section**
FANUC ROBOGUIDE, Logix Echo, PhysX Physics

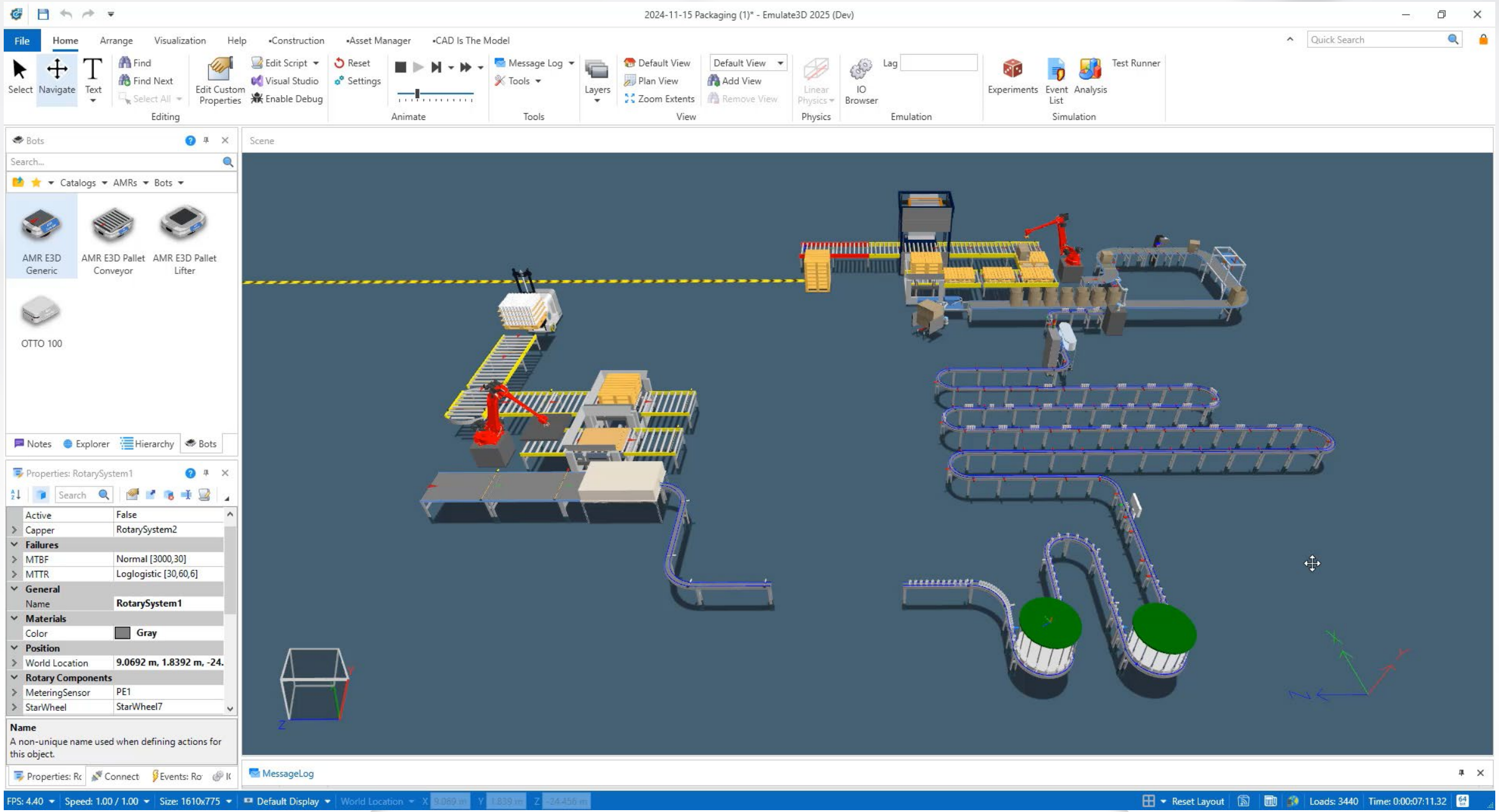
**Recirculation Table**
SOLIDWORKS CAD, AGX Physics

**Outbound Material Handling Section**
OTTO Fleet Manager, PLEX ERP, Discrete Event Physics

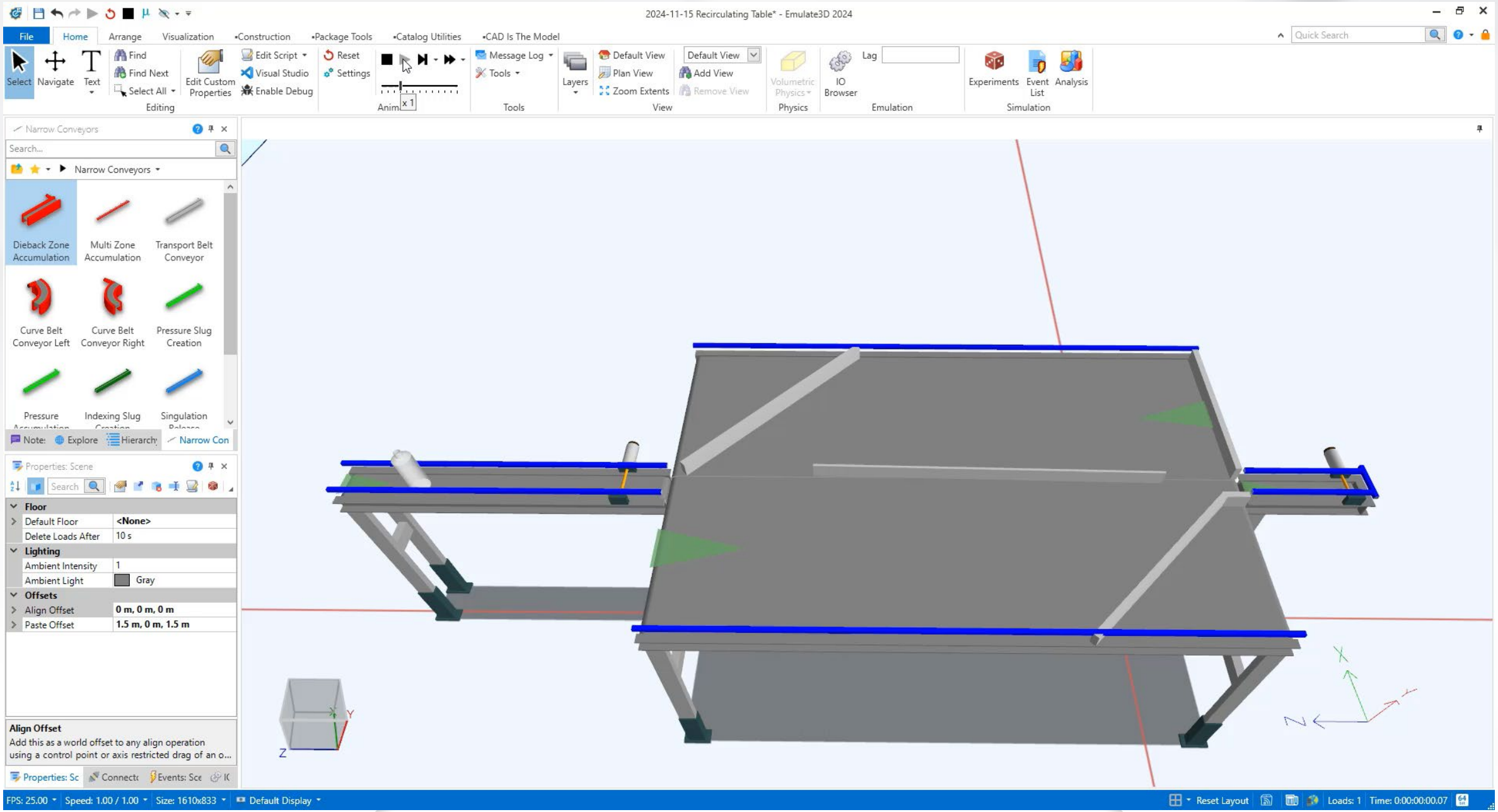
# Process Section Model in Emulate3D



# Fill and Pack Model in Emulate3D



# Recirculation Table Model in Emulate3D



# Warehouse and Outbound Model in Emulate3D

Rockwell Automation

expanding human possibility®

# Thank you

www.rockwellautomation.com