# External model connectivity for digital twins

The AnyLogic Conference
September 5-6, 2023
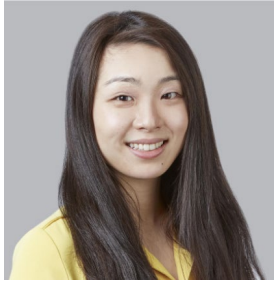
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# Agenda

1. Introduction & Background
2. Solution Motivation
3. Demo
4. Making It Feel Real
5. Technical Learnings
6. Vision for the future
7. Q&A

# 1

Introduction & Background
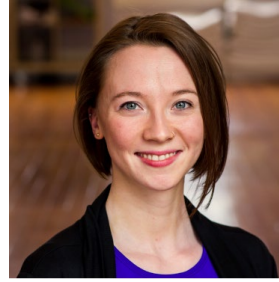
# Meet the team



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# Our project: create a digital twin that interacts directly with software designed to connect with physical production environments

**SAP Digital Manufacturing is a cloud-based software solution for manufacturing and industrial environments**

- Model equipment / machines and production floor

- Allows data collection, analytics, and remote monitoring

**Our objective:**

- Create a simulation model that mimics a real physical production environment

- Explore new capabilities and solve technical challenges associated with this external connectivity

# 2
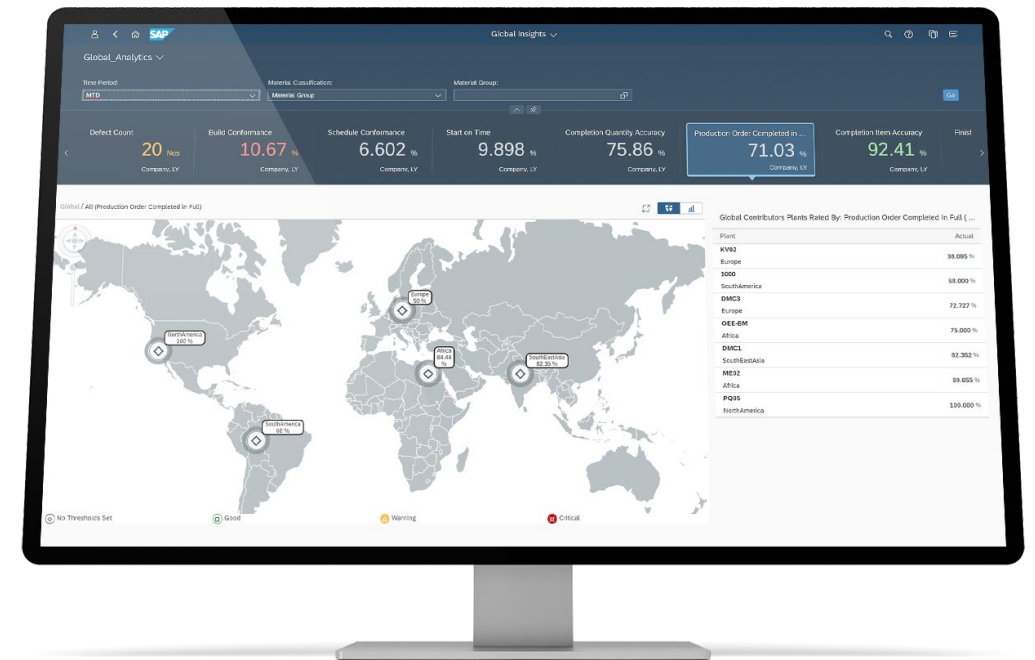
Solution Motivation

# Our goal: expand our digital twin capabilities, and create a useful demo model for our consulting teams

**Support our consulting team**

- Develop effective visual demonstrations of how we might apply the SAP module's capabilities and functionality for clients

- Deepen the consulting team's familiarity with the module's functionality and how to deploy it
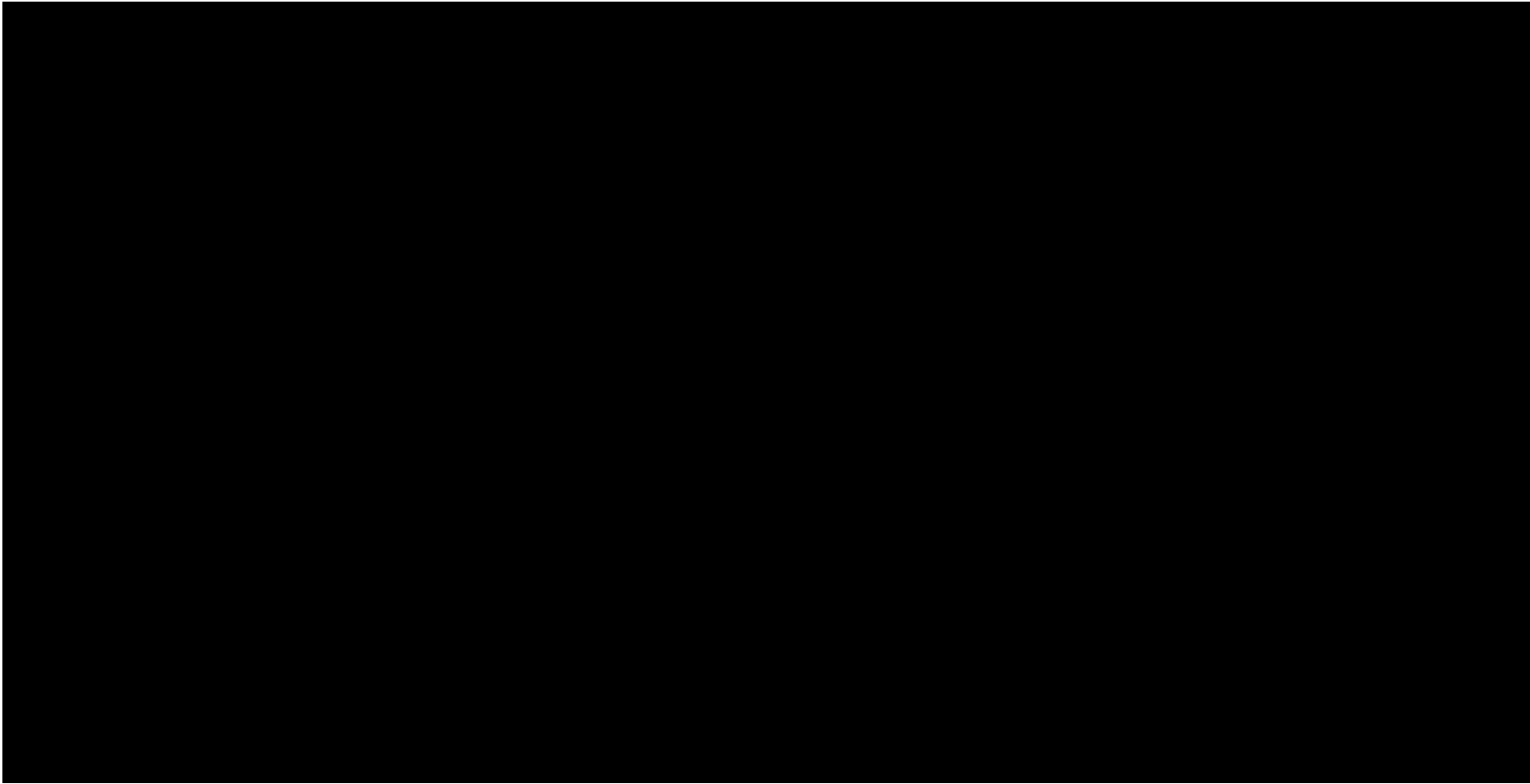
**Explore Anylogic extensibility for digital twins**

- Use APIs to share information between the outside world and the model

- Explore new approaches for digital twin applications

# 3

Demo

# Demo

# 4

Making It Feel Real

# To make the model feel real, the team had several imperatives

**Goals**

**Approach**

✓ Build our baseline understanding of the functionality and components of the SAP module

*Spun up an instance of the SAP module for testing and exploration throughout the project*

✓ Select a relevant environment for the twin to replicate, and use cases that would resonate with clients

*Collaborated with the consulting team to choose a solar panel manufacturing floor and three relevant use cases to model*

✓ Rapidly create a fully functional PoC that could be demoed live at the Hannover Faire
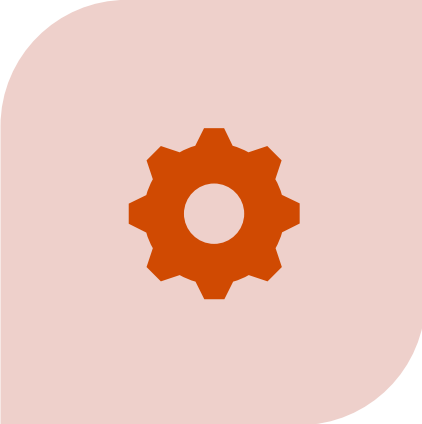
*Leveraged Anylogic's demo model library, built in process modeling blocks, and extensibility through custom Java code to rapidly create a PoC demo for the conference*
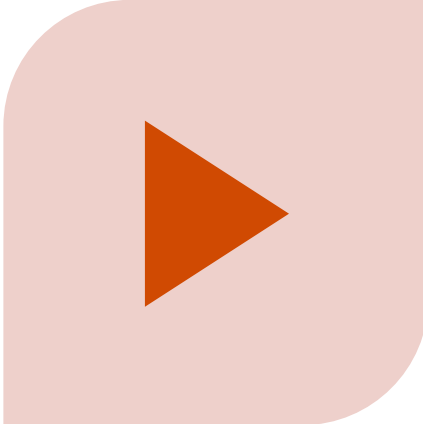
# The use cases we selected needed to resonate with the manufacturing culture
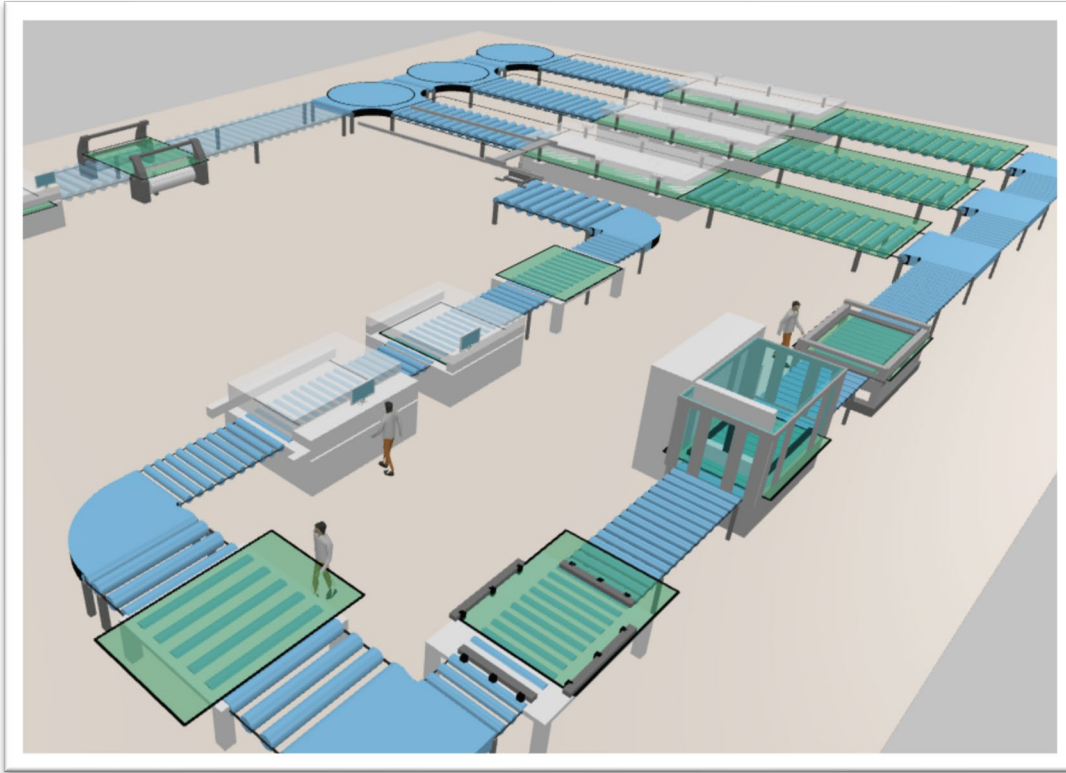
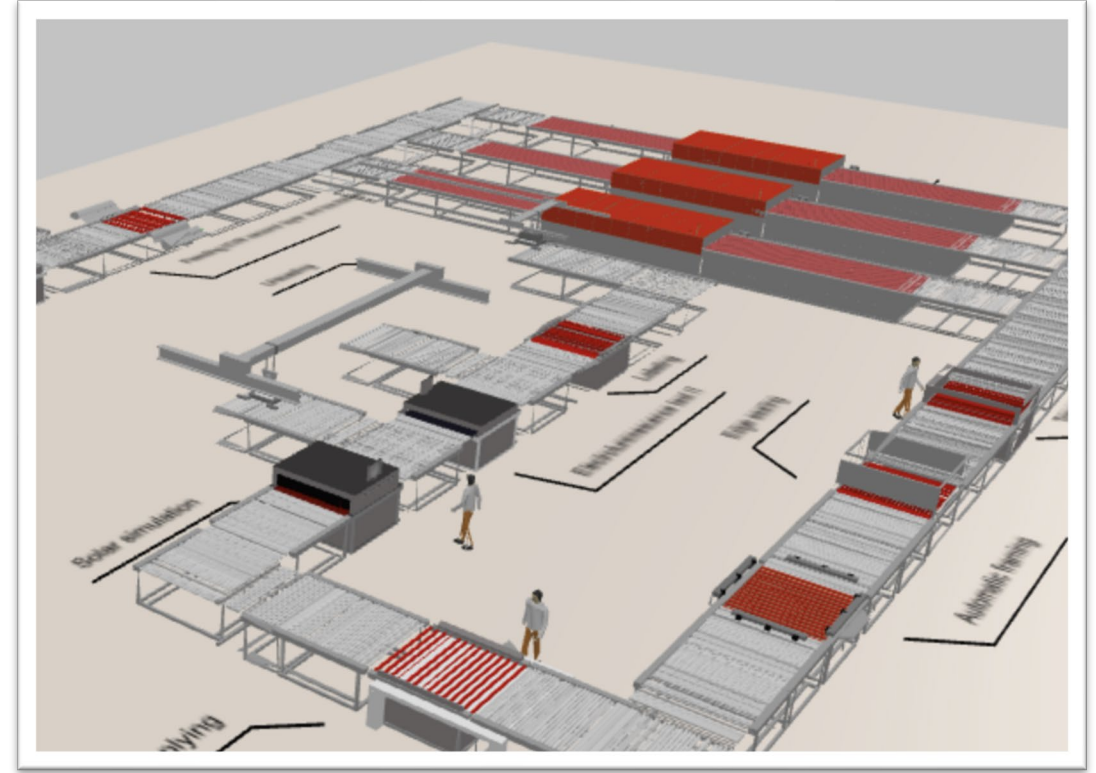QUALITY CHECK - SCRAP API

MACHINE DOWN - RESOURCE STATUS API

START/CONFIRM STATION

# Our model's visuals needed to look realistic and engaging



Image 1: Original Solar Panel Production model



Image 2: Solar Panel Production Model with new 3D models

# The demo had to be suited to both client demos and spontaneous discussion at conference booths

Allow a team member to demo the model even in an elevator pitch situation at a conference booth

Allow the team member to show both the digital twin model and its direct interaction with the SAP interface

# 5 Technical Learnings

# This project presented many interesting technical challenges

## Digital Manufacturing API

**Challenge:** Difficulty in verifying various error code scenarios due to inadequate API documentation.

**Approach:** Integrate confirmation checks within the API class to confirm successful API call execution.

## Timing in Model

**Challenge:** Visual delay observed during API call execution in the model.

**Approach:** Employ multithreading to mitigate lag problems when handling multiple concurrent API calls.

## Order in SAP

**Challenge:** SAP configuration needs to mirror the layout of the Anylogic process flow.

**Approach:** Validate receipt of API call by SAP system before advancing solar panel to the next station.

## Security

**Challenge:** Model needed to interface with corporate security protocols and SAP factory authentication.

**Approach:** Generate an updated bearer token every hour for API calls

# 6

Vision For the Future

# We hope to expand the model's uses in the future

## 1 Pre-implementation Sandbox

**Support implementation projects**

- Use Anylogic to test dashboarding and reporting mechanisms
- Use the Anylogic digital twin to set up correct timing within stations for the SAP dashboards

## 2 Manufacturing Optimization

**Reuse model as a testbed for resource planning**

- Use the Anylogic digital twin to help clients use their SAP module to experiment with various resource planning activities, such as
  - Optimizing floor layout
  - Prioritizing investments

## 3 Robust Digital Twins

**Integrating live data into models**

- Allow real time updates for more impactful digital twins
- Find opportunities outside manufacturing to apply API learnings

# Questions?

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