Coding Challenge: Interactive 3D Robot Cell Viewer

🎯 Objective

Build a browser-based interactive viewer to visualize an automation robot cell using a real 3D robot model (e.g., UR5) and primitives for other components.

This challenge is designed to:
- Be completed in 3–4 hours
- Help us understand your seniority level, especially in architecture, 3D rendering, and UI integration

📦 Scope & Requirements

1. 3D Scene Setup

- Use three.js (preferred) or Babylon.js
- Load the provided robot 3D model (e.g., UR5 in GLTF/GLB format)
- Add primitive representations (e.g., boxes/cylinders) for:
  - A conveyor
  - A pallet or box

2. Interactivity:

What Feature you think are needed and implement what is feasible in the timeframe
- Side panel showing:
  - Object list
  - Basic position info
  - (Optional) input fields to tweak position

📁 Deliverables

GitHub repo
Short README with:
  - Your approach and assumptions
  - Time spent (optional)

🧠 Technical Discussion (to be discussed in the interview)

Please prepare to answer and walk us through the following during our interview:

System Architecture

1. How would you design a scalable system for building, configuring, and visualizing complex robot cells in 3D inside a browser?
   - What layers would it include (e.g., renderer, config parser, UI, interaction logic)?
   - How would you organize reusable components?
   - How would you separate concerns?

2. How would you persist and synchronize scene configurations?
   - Between backend and frontend?
   - Between users (multi-user editing or versioning)?

3. How would you extend the system to support:
   - Loading different robot types or tool heads
   - Live kinematic simulations (basic robot arm movement)
   - Integration with external control systems (e.g., OPC-UA)

Tooling & Optimization

4. What are your thoughts on performance optimization in browser-based 3D apps?
   - What would you monitor or benchmark?
   - What would you defer until later?

5. How would you test and maintain such a 3D system in a large codebase?