Virtual Try-On E-Commerce Application - Architectural Decision Document

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1. Purpose
The purpose of this document is to define the architectural decisions, supporting processes, and technology choices for a virtu

2. Scope
The system will allow users to:
1. Input their body measurements to generate a personalized 3D avatar.
2. Automatically match the avatar with clothing that is proportional to their measurements.
3. Visualize the avatar wearing selected clothing items in 3D in real-time.
Exclusions: catalog management, cloud storage, dynamic garment simulation per user beyond scaling/morphing, or in-app 3D

3. Key Concepts & Definitions
Avatar: 3D representation of the user.
Base Avatar: Pre-generated 3D human mesh template.
Clothing Item: 3D model of a garment prepared for attachment.
GLB: 3D model file format.
Pre-alignment: Offline step to position clothing relative to avatar.
Runtime Fitting: Adjustment of avatar and clothing dimensions at runtime.
Evergine: 3D engine used to render avatars and clothing.
MAUI App: Cross-platform UI interface.

4. Architectural Overview
High-Level Flow:
1. User inputs measurements.
2. Avatar generation (runtime morphing).
3. Clothing matching.
4. Clothing attachment & runtime fitting.
5. Visualization.

5. Supporting Pipeline (Offline Preparation)
Step - Tool - Purpose - Frequency
Base Avatar Generation - MakeHuman - Generate parametric base avatars - One-time
Clothing Reference Scan - Polycam - Capture clothing - One-time per item
Clothing Cleanup & Pre-Alignment - Blender - Clean geometry, align - One-time per item
Export GLB - Blender - Export optimized 3D model - One-time per item

6. Technology Stack
Frontend/UI: .NET MAUI
3D Engine: Evergine
Avatar Template Generation: MakeHuman
3D Model Cleanup: Blender
Clothing Capture: Polycam
Data Management: Local JSON / Optional DB

7. Architectural Decisions
1. Use Pre-Generated Base Avatars
2. Pre-Align Clothing in Blender
3. Runtime Scaling & Morphing in Evergine
4. Offline Pipeline for Clothing Preparation
5. Metadata-Driven Clothing Matching

8. Scalability Considerations