3D CAR CUSTAMIZATION AND VISUALIZATION

Team Name: Aether

Team number: 44

Team members:

Meghana

Nishanth J

Chethan S

Preethi Y L

1. Introduction & Executive Summary

AutoViz360 is a proposed cloud-based software platform that empowers users to visualize, customize, and configure vehicles in high-fidelity, real-time 3D. Targeting both consumers and automotive businesses (OEMs, dealers, aftermarket parts retailers), the platform aims to bridge the gap between imagination and reality in the car buying and customization process.

By leveraging cutting-edge real-time rendering technology, users can change colors, wheels, trim, interior materials, and even aftermarket parts with photorealistic accuracy from any device. The goal is to increase user engagement, boost consumer confidence, and drive sales conversion rates for our business clients.

2. Problem statement

THE CURRENT CAR BUYING AND CUSTOMIZATION EXPERIENCE IS OFTEN FRAGMENTED AND UNIMAGINATIVE:

2D LIMITATIONS: ONLINE CAR CONFIGURATORS OFTEN USE STATIC 2D IMAGES OR

PRE-RENDERED VIDEOS, WHICH FAIL TO PROVIDE A TRUE SENSE OF DEPTH,

MATERIAL QUALITY, AND PERSONAL CONNECTION.

LACK OF REALISM: IT IS DIFFICULT FOR CUSTOMERS TO ACCURATELY VISUALIZE

HOW THEIR CHOSEN OPTIONS (E.G., A SPECIFIC PAINT COLOR UNDER DIFFERENT

LIGHTING, A NEW SPOILER) WILL LOOK ON THE ACTUAL VEHICLE.

IMAGINATION GAP: THIS LEADS TO UNCERTAINTY, HESITATION, AND POTENTIALLY

HIGHER RETURN RATES OR DISSATISFACTION IF THE FINAL PRODUCT DOESN'T

MEET EXPECTATIONS.

FOR BUSINESSES: OEMS AND DEALERS LACK A DEEPLY ENGAGING TOOL TO

SHOWCASE THEIR PRODUCT'S FULL POTENTIAL AND HIGHER-MARGIN

CUSTOMIZATION OPTIONS.

3. Solution & Value PropositionAutoViz360 solves

these problems by providing

Immersive 3D Visualization: High-fidelity, real-time 3D models that users can rotate, zoom, and inspect from every angle.

Intuitive Real-Time Customization: An easy-to-use interface to modify virtually every aspect of the vehicle with instant visual feedback.

Photorealistic Quality: Advanced rendering (ray tracing, PBR materials) that accurately simulates

materials (metal, leather, carbon fiber), lighting (showroom, sunlight, sunset), and environments.

Cross-Platform Accessibility: Functionality across web browsers, mobile devices, and in-dealership kiosks or VR/AR setups.

A Platform for Business: A B2B SaaS model that provides automotive companies with a powerful marketing and sales tool, complete with analytics and lead generation features.

4. Target Audience Primary (B2C):

Car enthusiasts, potential buyers, and owners looking to customize their vehicles.

Primary (B2B):Automotive OEMs (e.g., Ford, Toyota, BMW) for their official online configurators.

Car Dealerships for use on their websites and in showrooms.

Aftermarket Parts Companies (e.g., Wheel brands, performance parts manufacturers) to showcase their products on virtual cars.

Secondary: Automotive media and marketing agencies.

5. Core Features & Functionality

5.1. User-Facing Features (Front-End)

3D Viewer: WebGL-based viewer with orbit controls, zoom, pan, and pre-set camera angles (front, side, interior, etc.). Customization Modules

Exterior: Paint color (solid, metallic, pearlescent, chrome), wheels (design, size, finish), brake calipers, body kits, spoilers, lowering kits, window tint.

Interior: Upholstery material (leather, fabric, Alcantara), color stitching, dashboard trim (wood, carbon fiber, aluminum), floor mats.

Performance & Parts: Visual representation of performance parts (exhausts, cold air intakes) optionally integrated.

Environment & Lighting Selector: Change the background scene (e.g., showroom, city street, desert highway, night/day) to see the car in different contexts.

Save & Share: Ability to save configurations, generate a shareable link, or create high-resolution images/videos for social media.

Specs & Pricing: Real-time updating of specifications and pricing based on selected options.

5.2. Administrative Features (Back-End - B2B Portal)

Digital Asset Management (DAM): A secure portal for clients to upload and manage their 3D models, materials, textures, and option sets.

Pricing & Rules Engine: Admin interface to define option compatibility, pricing rules, and packages (e.g., "Sport Package" automatically adds wheels and spoiler).

Branding & White-Labeling: Clients can apply their own logos, color schemes, and domains to the platform.

Analytics Dashboard: Track user engagement, most popular configurations, average time spent, and lead generation data (if integrated with a CRM).

User Management: For clients to manage their team's access to the admin portal

6. Technical Architecture Front-End:

REACT.JS OR VUE.JS FOR A RESPONSIVE UI. THREE.JS (WEBGL) FOR 3D RENDERING. POTENTIAL FOR

FUTURE NATIVE MOBILE APPS USING A FRAMEWORK LIKE REACT NATIVE.

BACK-END: NODE.JS OR PYTHON (DJANGO) FOR APPLICATION LOGIC. SERVERLESS FUNCTIONS (AWS LAMBDA) FOR SCALABLE OPERATIONS. 3D ENGINE & ASSETS: MODELS ARE CREATED AS HIGH-POLY MODELS AND OPTIMIZED FOR THE WEB USING GLTF/GLB FORMAT. PHYSICALLY-BASED RENDERING (PBR) MATERIALS FOR REALISM.

CLOUD INFRASTRUCTURE: AWS, GOOGLE CLOUD, OR AZURE FOR SCALABLE AND RELIABLE HOSTING.

KEY SERVICES INCLUDE:

COMPUTE: EC2/CONTAINERS (KUBERNETES) FOR BACKEND SERVICES.

STORAGE: S3 FOR STORING 3D ASSETS, USER IMAGES, AND CONFIGURATIONS.

CDN: CLOUDFRONT/AKAMAI TO DELIVER 3D ASSETS GLOBALLY WITH LOW LATENCY.

DATA & ANALYTICS: DATABASE (POSTGRESQL) FOR USER DATA AND CONFIGURATIONS. ANALYTICS

PIPELINE (E.G., AWS KINESIS/REDSHIFT) FOR PROCESSING ENGAGEMENT DATA.

7. Monetization Strategy (B2B Focus)

SaaS Subscription Tiers:

Basic: For small dealers. Limited number of models, basic customization, standard branding.

Professional: For larger dealers and regional groups. More models, advanced features (AR view, video export), custom branding.

Enterprise: For OEMs and large corporations. Full white-labeling, API access, custom development, dedicated support, and advanced analytics.

Setup & Onboarding Fee: One-time fee for initial model preparation and integration.

Potential Revenue Share: For aftermarket parts companies, a potential revenue share on parts sold directly through the platform.

8. Development Roadmap (Phased Approach)

Phase 1: MVP (Months 1-6)

Core 3D viewer with basic orbit controls.

Basic customization (paint, wheels).

Single environment.

Simple admin panel for one client.

Phase 2: Feature Expansion (Months 7-12) Advanced

customization (interior, body kits).

Multiple environments & lighting.

Save/share functionality.

Enhanced admin portal with analytics.

Phase 3: Scale & Innovate (Year 2+) Mobile

app development.

AR/VR integration (view your car in your driveway via smartphone).

API for third-party integrations (e.g., with dealership CRM/inventory systems).

AI-powered feature suggestions ("Customers who liked this wheel also liked this spoiler").

9. Team & Resource Requirements3D Artists: For modeling,texturing, and optimizing vehicle assets.

Front-End Developers: Proficient in JavaScript, React/Vue, and Three.js.

Back-End Developers: For server, database, and API logic.

DevOps Engineer: For cloud infrastructure and CI/CD pipelines.

UI/UX Designer: To create an intuitive and engaging user interface.

Product Manager: To oversee development and client needs.

10. Risks & Mitigations Technical:

Risk: Large 3D file sizes leading to slow loading times.

Mitigation: Aggressive optimization, LOD (Level of Detail) techniques, and progressive loading.

Content:

Risk: Difficulty acquiring accurate and high-quality 3D models from manufacturers.

Mitigation: Start with aftermarket models and build a portfolio to attract OEMs; offer a compelling value proposition to their marketing departments.

Market:

Risk: Competition from established 3D visualization companies.

Mitigation: Focus on a superior user experience, photorealism, and a flexible B2B SaaS model that is easier for smaller businesses to adopt.

Conclusion:

AutoViz360 presents a significant opportunity to modernize the automotive customization and sales industry. By providing a

powerful, immersive, and accessible 3D platform, we can create value for endusers through engagement and confidence, and

for businesses through increased conversion rates and customer insight. This document outlines a feasible path to building a successful and scalable product in this space

Thank you