### Project: SanskritiAR - AR-Based Cultural Heritage Platform

**1. Introduction & Problem Statement**

India's cultural heritage sites face risks of degradation and limited public access, especially for those in remote areas or with disabilities. Existing digital archives lack immersive engagement, and low-bandwidth internet in rural areas presents a significant barrier. This project aims to create an accessible, engaging AR platform to digitally preserve and promote India's heritage for all.

**2. Proposed Solution**

SanskritiAR is a mobile AR application offering two modes: an **On-Site Mode** to overlay historical reconstructions onto monuments in real-time, and a **Remote Mode** to explore tabletop 3D models anywhere. The platform is optimized for low-bandwidth environments using highly compressed 3D models (glTF with Draco) and an offline feature, ensuring accessibility for rural users.

**3. Key Features**

* High-fidelity, interactive AR visualizations.
* Multilingual audio narratives and gamified learning.
* Optimized offline mode for low-connectivity areas.
* Cloud-based Content Management System (CMS) for easy updates.
* User analytics dashboard to measure engagement.

**4. Technologies to be Used**

* **Frontend:** **Flutter** (Dart) for building a cross-platform mobile application, integrated with native AR libraries.
* **Backend:** Node.js (Express.js), REST APIs
* **Database:** **MySQL** for all relational data, including user information and site metadata.
* **Cloud & Storage:** **Amazon Web Services (AWS)**, utilizing **Amazon S3** for 3D model storage, **Amazon RDS** for MySQL, and **CloudFront** as the CDN.
* **3D Format:** glTF with Draco compression

**5. System Architecture**

The platform uses a three-tier architecture: a mobile frontend, a backend API layer, and a cloud-based data layer for scalability and efficient content delivery. The Flutter-based app communicates with backend services hosted on AWS, which in turn manage data persistence in a MySQL database and object storage in S3.

**6. Data Flow**

Admins upload content via a CMS, which is processed, compressed, and stored on AWS. Users download this optimized data to their mobile app from the CloudFront CDN. The app then renders the 3D models in AR, sending engagement analytics back to the server.

**7. Use Cases**

* **Tourists:** Enhanced, interactive site visits.
* **Students:** Virtual field trips from the classroom.
* **Researchers:** Non-invasive architectural analysis.
* **Cultural Bodies:** Digital archiving and tourism promotion.

**8. Implementation Plan**

* **Phase 1 (8 weeks):** Build the core AR application and backend with one pilot heritage site.
* **Phase 2 (8 weeks):** Integrate key features (offline mode, CMS) and add four more sites.
* **Phase 3 (8 weeks):** Test, optimize, and deploy to app stores.

**9. Impact & Benefits**

This solution digitally preserves national treasures, democratizes access to cultural education, and boosts tourism through an innovative and engaging platform. Its scalable architecture ensures long-term sustainability and usability.

**10. Possible Enhancements**

* AI-powered virtual guide (chatbot).
* Fully immersive VR (Virtual Reality) mode.
* Community-sourced content features.