Video Feed App – Specifications Document

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🎯 Project Overview

Project Name: Flutter Video Feed App - TikTok-Style Social Media Application
Duration: 4 days (Internship Assignment)
Platform: Android & iOS (Flutter)
Scope: Mobile application with vertically scrollable video feed, smart caching, user authentication, and social interactions

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⚙ Functional Requirements

F1 - User Authentication (High Priority)

- Anonymous authentication by default
- Email/password registration and login (Bonus)
- Persistent authentication across sessions
- Secure logout functionality

F2 - Video Feed Display (High Priority)

- Full-screen video playback in vertical scroll format
- Automatic play/pause when videos come into view

- Smooth swipe transitions between videos
- Basic video controls (play/pause overlay)

F3 - Smart Video Caching (High Priority)

- Cache 3-video window (previous, current, next)
- Background downloading of upcoming videos
- Automatic cache cleanup and storage management
- Offline playback for cached content

F4 - Social Interactions (Medium Priority)

- Like/dislike buttons with visual feedback
- Real-time counter updates
- User interaction persistence in Firebase
- Visual indication of previous user actions

F5 - Video Metadata (Medium Priority)

- Display video title, creator info, duration
- Like/dislike counters
- Synchronization with Firestore database

F6 - Comment System (Bonus - Low Priority)

- Comment input and display interface
- Real-time comment updates
- User attribution for comments

🚀 Non-Functional Requirements

Performance

- Video loading: < 2 seconds for cached videos
- Smooth 60fps scrolling transitions
- Memory usage: < 200MB peak
- App startup: < 3 seconds

Reliability

- Network failure recovery with retry mechanisms
- Offline functionality for cached content

- Graceful error handling with user-friendly messages
- Data consistency between local cache and Firebase

Security

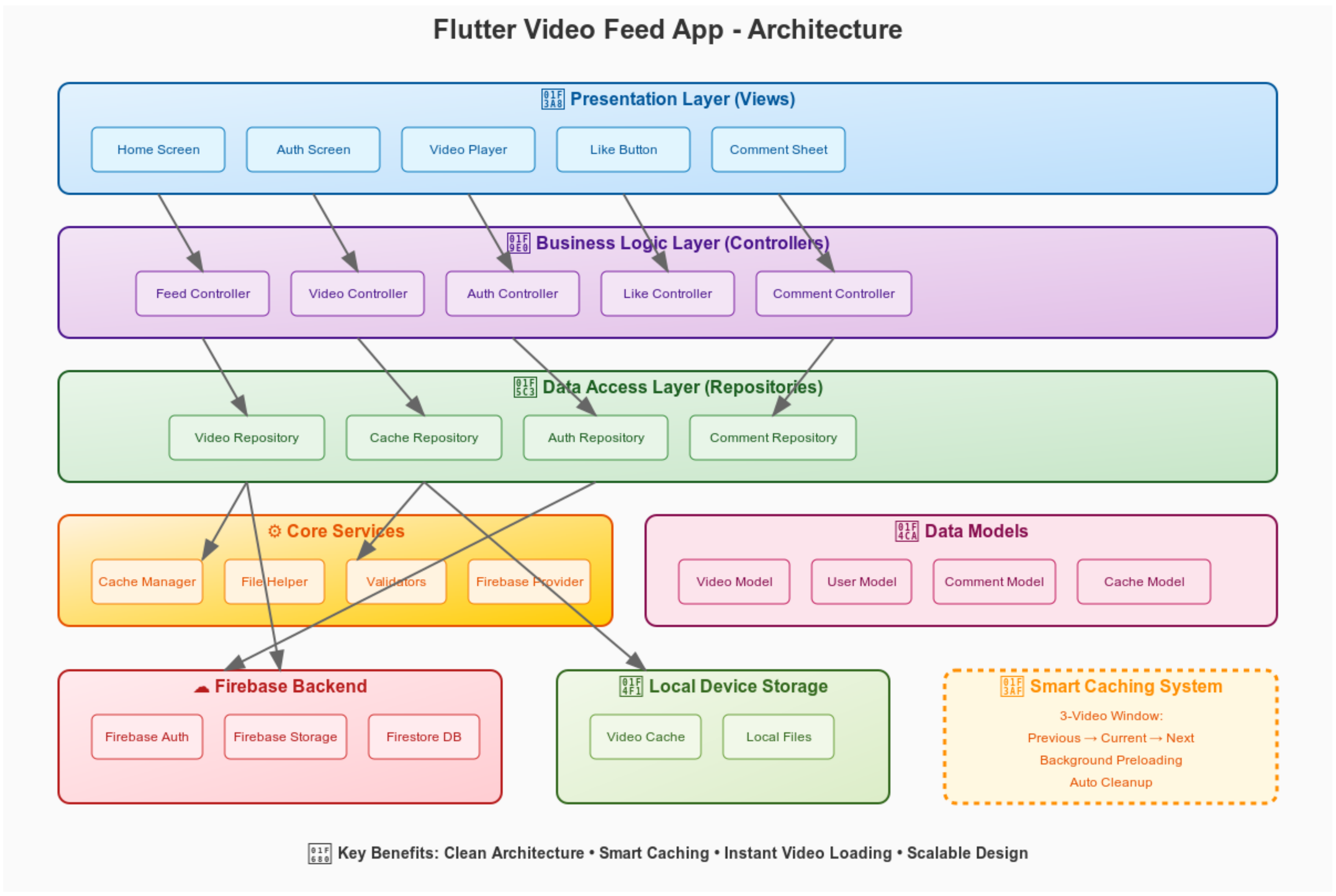
- HTTPS/TLS encryption for all communications
- Firebase security rules implementation
- Secure authentication token management
- Input validation and sanitization

Usability

- Intuitive swipe navigation controls
- Consistent UI design patterns
- Loading states and progress indicators
- Responsive design for different screen sizes

🏗️ Technical Architecture

Architecture Pattern



Layer Structure

1. **Presentation Layer** - UI components and user interactions
2. **Business Logic Layer** - State management and business rules (Provider)
3. **Data Access Layer** - Repositories and API calls
4. **Core Services Layer** - Utilities and cross-cutting concerns

Smart Caching System

- **3-Video Window:** Previous → Current → Next
- **Background Preloading:** Automatic download of upcoming videos
- **Memory Optimization:** Intelligent cleanup and storage management

📊 Data Models

Video Model

- id, url, title
- likes, dislikes counters
- createdAt timestamp
- thumbnailUrl, duration

User Model

- uid, email, displayName
- isAnonymous flag
- createdAt, lastLoginAt timestamps

Comment Model (Bonus)

- id, videoId, userId
- content, createdAt
- likes counter, parentCommentId

Video Cache Model

- videoId, localPath
- cachedAt timestamp
- fileSize, download progress
- Cache management metho

🎨 User Interface Specifications

Main Video Feed Screen

- **Layout:** Full-screen vertical PageView
- **Navigation:** Swipe gestures (up/down)
- **Overlay Elements:**
  - Video title (bottom-left)
  - Like/dislike buttons (bottom-right)
  - Progress indicator (top)
  - Loading spinner (center)

Authentication Screen

- Centered form with app branding
- Email/password input fields
- Login/register buttons with anonymous option
- Error message display

Design System

- **Theme:** Dark theme optimized for video content
- **Typography:** Roboto font family
- **Icons:** Material Design icons
- **Animations:** Smooth transitions and loading states

🔥 Firebase Configuration

Required Services

1. **Firebase Authentication**
   - Anonymous authentication (enabled)
   - Email/password authentication (bonus)
2. **Firestore Database Collections:**

```
/videos/{videoId}
├── url, title, likes, dislikes
├── createdAt, duration, thumbnailUrl

/users/{userId}
├── email, displayName, isAnonymous
├── createdAt, lastLoginAt

/user_interactions/{userId}/videos/{videoId}
├── isLiked, isDisliked, timestamp

/comments/{commentId} (Bonus)
├── videoId, userId, content
├── createdAt, likes, parentCommentId
```

3. **Firebase Storage Structure:**

```
/videos/
├── video1.mp4, video2.mp4, video3.mp4

/thumbnails/ (Optional)
├── video1_thumb.jpg, video2_thumb.jpg
```

Security Rules

- Videos readable by all authenticated users
- User interactions private to each user
- Proper write permissions with validation

📅 Development Timeline

Day 1: Foundation Setup

Morning (4h):

- Project setup and Firebase configuration
- Authentication implementation
- Basic navigation and folder structure

Afternoon (4h):

- Video models and Firestore integration
- Basic video feed UI setup
- Video player integration

Day 2: Core Features

Morning (4h):

- Video feed logic with PageView
- Video playback controls
- Like/dislike functionality

Afternoon (4h):

- Basic caching implementation
- User interaction tracking
- Error handling and loading states

Day 3: Smart Caching

Morning (4h):

- 3-video window caching system
- Background downloading logic
- Memory optimization

Afternoon (4h):

- Performance optimization
- Offline functionality
- Cache cleanup algorithms

Day 4: Polish & Bonus

Morning (4h):

- Email/password authentication (Bonus)
- Real-time Firestore listeners
- Advanced error handling

Afternoon (4h):

- Comment system (Bonus)
- Final testing and bug fixes
- Documentation and code cleanup

🧪 Testing Approach

Basic Testing Strategy

- **Manual Testing:** Test core features on device/emulator
- **Key Areas to Test:**
  - Video playback and scrolling
  - Authentication flow
  - Like/dislike functionality
  - Caching behavior
  - Network connectivity scenarios

Simple Testing Checklist

- ✅ Videos load and play correctly
- ✅ Smooth scrolling between videos
- ✅ Like/dislike buttons work
- ✅ Authentication persists across app restarts
- ✅ App handles poor network conditions
- ✅ Memory usage stays reasonable

🚀 Deployment & Delivery

Development Environment

- **IDE:** VS Code or Android Studio
- **Flutter Version:** 3.0+

- **Target Platforms:** Android 5.0+, iOS 11.0+

Delivery Requirements

- ✅ Source code in public GitHub repository
- ✅ Comprehensive README.md with setup instructions
- ✅ Firebase configuration guide
- ✅ Architecture documentation
- ✅ Working demo on physical device or emulator

Repository Structure

```
flutter-video-feed/
├── README.md
├── lib/
│   ├── core/
│   ├── features/
│   └── main.dart
├── assets/
├── android/
├── ios/
└── pubspec.yaml
```

✅ Success Criteria

Minimum Viable Product (MVP)

- ✅ User authentication (anonymous)
- ✅ Vertical video feed with smooth scrolling
- ✅ Video playback from Firebase Storage
- ✅ Basic caching functionality
- ✅ Like/dislike interactions
- ✅ Firebase Firestore integration

Complete Solution

- ✅ Smart 3-video caching system
- ✅ Background preloading
- ✅ Memory optimization
- ✅ Error handling and offline support
- ✅ Clean, documented code