**1. Technology Choices and Key Drivers**

Technology is selected for **scalability, reliability, maintainability, and security**.

* **Backend**: Java (Spring Boot) – Supports microservices and enterprise-grade apps.
* **Frontend**: React.js or Angular – Provides a smooth and dynamic user interface.
* **Database**:
  + **PostgreSQL/MySQL** – For structured data (bookings, payments).
  + **MongoDB/Cassandra** – For unstructured data (logs, analytics).
* **Message Broker**: Kafka – Ensures services communicate smoothly using events.
* **Caching**: Redis – Speeds up access to frequently used data (e.g., movie listings).
* **Containerization**: Docker & Kubernetes – Helps with deployment and scaling.
* **CI/CD Pipeline**: Jenkins, GitHub Actions – Automates testing and deployment.

**2. Database, Transactions, and Data Modeling**

* **Booking Transactions**: Uses the **Saga pattern** to maintain consistency.
* **Seat Availability**: Uses **optimistic locking** or a **distributed counter** to avoid double booking.
* **Data Model** (Key Tables):
  + **Users** (user\_id, name, email, preferences).
  + **Movies** (movie\_id, title, language, rating).
  + **Theatres** (theatre\_id, location, available\_seats).
  + **Bookings** (booking\_id, user\_id, movie\_id, theatre\_id, status).
  + **Payments** (payment\_id, booking\_id, amount, status).

**3. Enterprise Systems (COTS) for Specific Areas**

* **Authentication**: Okta, Keycloak – Handles user login and access.
* **Payments**: Stripe, Razorpay, PayPal – Ensures secure transactions.
* **Monitoring**:
  + **Prometheus & Grafana** – Track system performance.
  + **ELK Stack (Elasticsearch, Logstash, Kibana)** – Analyze logs and troubleshoot issues.
* **Content Management**: Contentful (Headless CMS) – Manages movie details, banners, promotions.
* **Notifications**: Twilio or SendGrid – Sends SMS and email alerts.

**4. Hosting Solution and Sizing**

* **Deployment Model**: Hybrid Cloud (AWS, GCP, or on-premise as needed).
* **Compute & Storage**:
  + **AWS EC2 & Kubernetes (EKS)** – Manages backend services.
  + **Amazon RDS / Cloud Spanner** – Handles databases and scales automatically.
  + **S3 / Google Cloud Storage** – Stores media assets.
* **Global Content Delivery**: Cloudflare or AWS CloudFront – Ensures fast access to movie listings.
* **High Availability**: Multi-region setup with auto-failover for **99.99% uptime**.

**5. Release Management & Internationalization**

* **Multi-Region Rollout**:
  + **Blue-Green Deployment** – Ensures zero downtime during releases.
  + **Canary Releases** – Test new features in selected locations before full rollout.
* **Localization (L10n) & Internationalization (i18n)**:
  + Store **movie details and UI text** in multiple languages.
  + Support **local payment options** (e.g., UPI in India, PayPal in Europe).

**6. Monitoring & Log Analysis**

* **System Performance Tracking**:
  + **Prometheus & Grafana** – Monitor CPU, memory, and latency.
  + **Zipkin or OpenTelemetry** – Helps trace request flow.
* **Log Analysis & Alerts**:
  + **ELK Stack (Elasticsearch, Logstash, Kibana)** – Centralized log management.
  + **AWS CloudWatch / Datadog** – Detects issues early.
* **Security Monitoring**:
  + **SIEM Tools (Splunk, Wazuh)** – Protects against threats.

**7. Key Performance Indicators (KPIs)**

* **Performance Goals**:
  + API response time **< 200ms** for 95% of requests.
  + Booking confirmation within **2 seconds**.
  + Search results delivered within **500ms**.
* **Scalability & Reliability**:
  + Support **500,000 concurrent users**.
  + Auto-scale services based on demand spikes.
* **Security & Compliance**:
  + **Zero major security breaches**.
  + **Compliance**: OWASP Top 10, GDPR, PCI-DSS.

**8. Project Plan & Cost Estimates**

**Project Timeline**

| **Phase** | **Duration** | **Key Activities** |
| --- | --- | --- |
| **Phase 1** | 1-2 Months | Requirements, architecture design |
| **Phase 2** | 3-4 Months | Develop booking, payments, seat management |
| **Phase 3** | 2-3 Months | Beta release, feedback, performance optimization |
| **Phase 4** | 3-6 Months | Global rollout, full-scale launch |

**Estimated Costs**

| **Component** | **Estimated Cost (Monthly)** |
| --- | --- |
| **Cloud Hosting (AWS/GCP)** | $50,000 - $100,000 |
| **DevOps & Monitoring** | $10,000 - $20,000 |
| **Third-Party Services (Payments, Auth)** | $5,000 - $15,000 |
| **Engineering Team Salaries** | $200,000 - $500,000 (Annual) |