🎧 MelodyUD: Platform Design Inspired by Spotify’s Business Model

Exploring Database Structures for Scalable Music Platforms

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🧩 Business Model

Spotify's Freemium Model

- **Free Users**: Ad-supported, limited skips
- **Premium Users**: Ad-free, Hi-Fi audio, offline listening
- **Revenue Streams**:
  - Subscriptions (main)
  - Advertisements (supporting growth)

📋 Functional Requirements

- **Account Management**: Email/social sign-in, profile updates
- **Content Ingestion**: Upload tracks, enrich with ML
- **Playback & Delivery**: Adaptive bitrate, caching
- **Discovery**: Search + Recommendations
- **Advertising**: Campaigns, real-time targeting
- **Analytics**: Real-time dashboards for creators
- **Governance**: Tokenization, audit logs

⚙ Non-Functional Requirements

- **Performance**:
  - Playback start ≤ 300ms
  - Search ≤ 150ms
- **Scalability**:
  - ≥ 1B users, 20M streams
  - 10TB daily audio ingest
- **Availability**:
  - ≥ 99.95% uptime
- **Maintainability**:
  - OpenAPI docs, microservices < 3K LOC

👤 User Roles

- **Listener**: Play, search, create playlists
- **Creator**: Upload, view analytics, promote
- **Advertiser**: Create and monitor campaigns
- **Engineer**: Ensure uptime, scale, trace errors
- **Compliance Officer**: Enforce GDPR, log retention

📌 Some User Stories

Listener: Create Account

- ✅ Sign up via email or social login
- 🔐 Credentials hashed + MFA

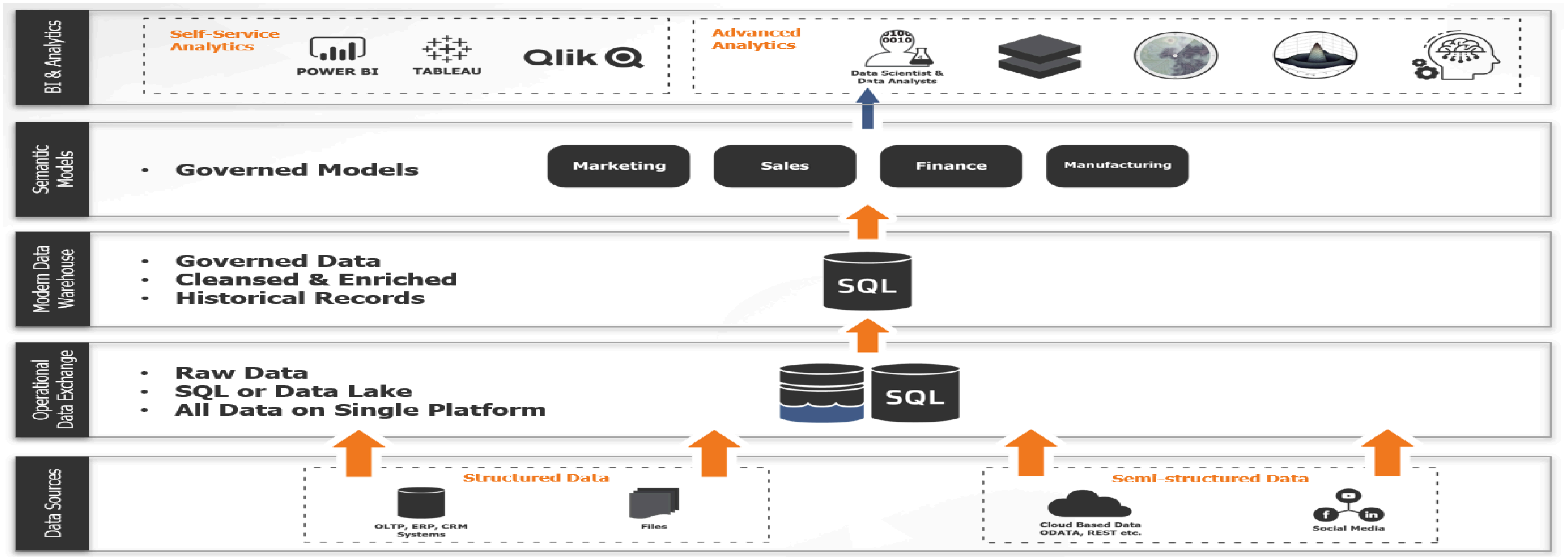
Creator: Upload Audio

- ✅ Submit file + metadata
- 🗂️ Stored in catalog after validation

🗃️ Initial Database Architecture

Goal: Scalable, consistent, real-time data processing using only open-source tools.

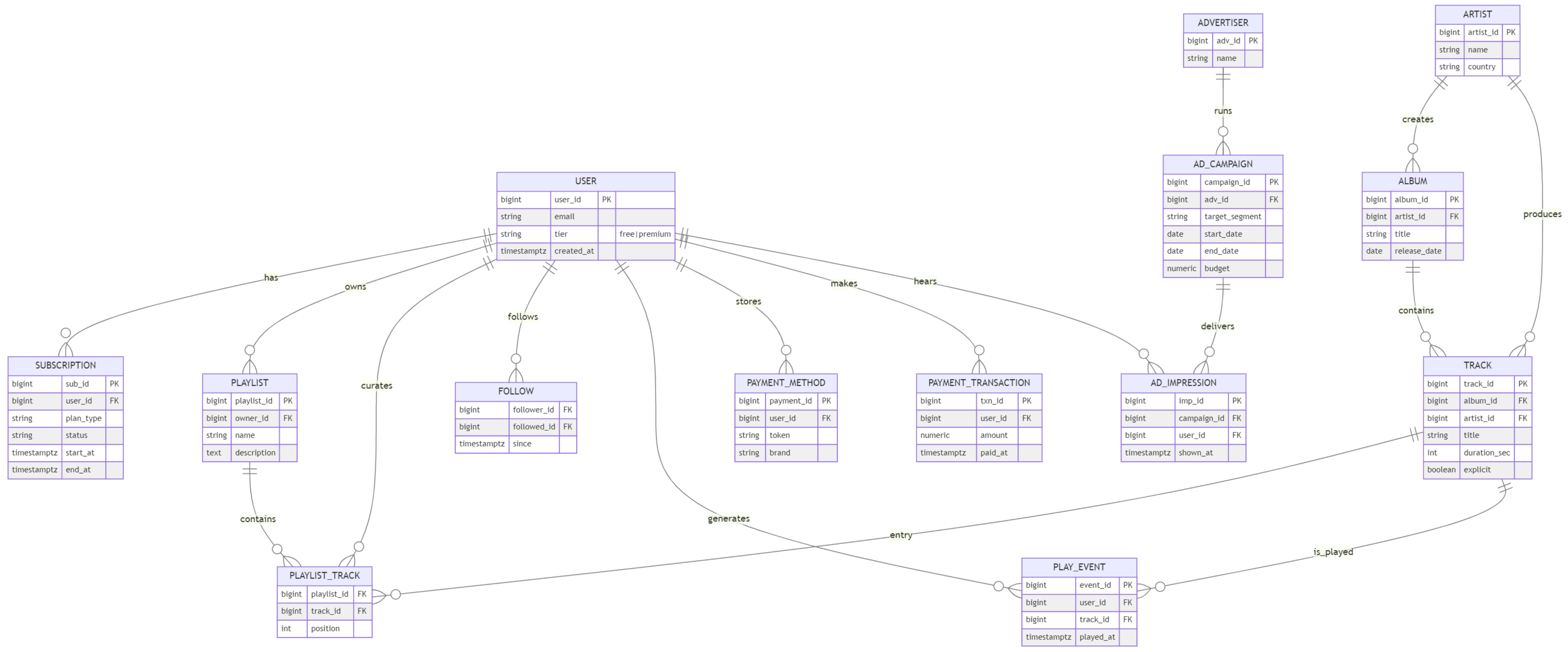
Approach: Microservice-oriented, data-layered architecture.



🏗 Data Architecture Breakdown

Layer	Purpose	Technologies
Hot OLTP	Critical ops (e.g. billing)	CockroachDB, Citus
Session Store	Playback, telemetry	Cassandra, Scylla
Object Storage	Audio, images	MinIO, Ceph
Search	Full-text autocomplete	OpenSearch
Graph Store	Social graph	Neo4j, JanusGraph
Event Stream	Activity logs	Kafka
Analytics	Real-time + Deep	Flink, Iceberg, Trino

ER Diagram Overview



✅ Conclusion

This project demonstrates:

✓ Scalable and distributed data systems

✓ Real-time features with Kafka + Flink

✓ Secure, compliant design

✓ Domain-specific data modeling

📚 References

- Music Business Research (2024)
- Investopedia – *How Spotify Makes Money*
- LinkedIn: *Spotify Tech Stack*
- Intuji – *Spotify Architecture Overview*

🙌 Thank You!

Questions?