

8 Ball

Real-Time NBA Analytics Platform

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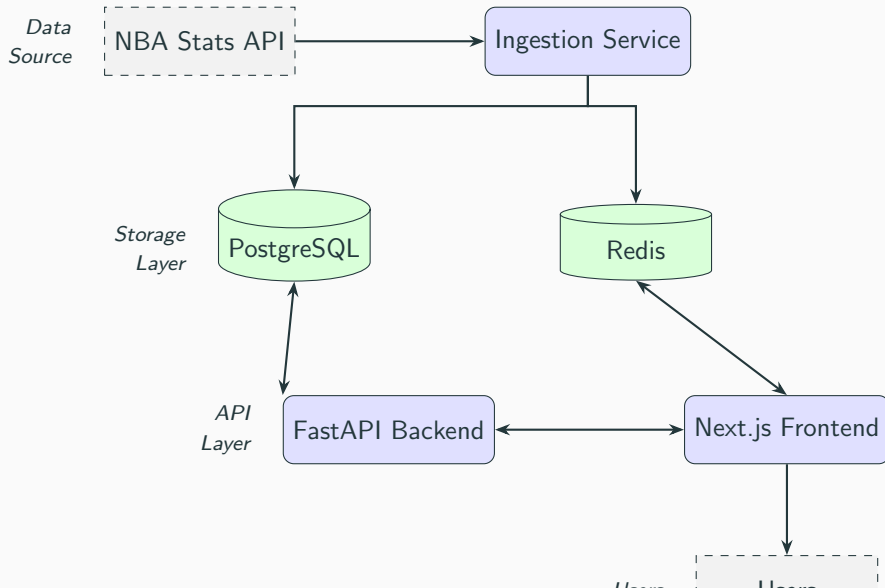
CSCI 5253: Datacenter Scale Computing
University of Colorado Boulder

What is 8 Ball?

- Follow your favorite teams and players: real-time NBA game stats and analytics
- See who's on top: track standings and leaderboards over the course of the season
- Scale to hundreds of concurrent users

- **Backend:** Python, FastAPI, PostgreSQL, Redis
- **Frontend:** Next.js, TypeScript, Material-UI
- **Cloud:** GCP Cloud Run, Cloud SQL, Memorystore
- **IaC:** Terraform, Docker

System Architecture



Key Features

Data & Analytics:

- 2 seasons of historical data (2024-2026)
- Live game updates every 15-30 seconds
- Statistical leaders (PTS, REB, AST, STL, BLK)
- Conference standings with streaks
- Team performance analysis

Visualizations:

- **3D Shot Charts:** Plotly.js with parabolic arcs
- **2D Heatmaps:** Recharts with full court rendering
- **Play-by-Play:** Real-time event feed with icons
- **Box Scores:** Quarterly scoring tables
- **Team Trends:** Point differential over season

Scalability & Debugging

Debugging and testing:

- FastAPI autodocs
- Browser devtools console; tested on multiple browsers and platforms
- pytest unit testing framework
- Manual end-to-end testing for a week's worth of games
- pydantic type checking for debugging

Bottlenecks:

1. NBA API rate limit (0.6s/req)
2. Statistical leader queries (200ms)
3. Plotly.js bundle size (3MB)

Solutions:

- Redis caching (1hr TTL for leaders)
- Lazy loading for 3D charts
- Incremental ingestion mode
- Client-side rendering

Demo