QBurst | A High AI-Q™ Company

Engineering an AdTech Platform for Smarter Campaign Delivery

Transforming a telecom giant's network footprint into a connected, data-driven digital out-of-home (DOOH) advertising platform powered by aggregated insights, cloud automation, and edge-based Android devices.

Overview

- Re-engineered a cloud-native, microservices-based AdTech platform with automated campaign management.
- Integrated contextual targeting (time and location) for dynamic content delivery.
- Developed interactive in-vehicle tablet application to engage passengers and streamline ad delivery.
- Implemented real-time observability and analytics pipelines for campaign performance and ROI tracking.
- 63% faster campaign activation and 45% improvement in engagement through contextual targeting.

Client Profile

Leading telecommunications company that provides wireless voice and data services to customers in the United States.

Challenges: Building a Scalable and Insight-Driven AdTech Platform

- **Disjointed systems:** Existing digital screens and applications operated in silos, lacking a unified management and reporting layer.
- **Manual operations:** Campaign scheduling, ad approvals, and reporting were manually executed, delaying go-live cycles and reducing efficiency.
- **Device management complexity:** Managing and monitoring thousands of connected screens without centralized control made uptime tracking and issue resolution difficult.
- **Scalability issues:** Ensuring the ad playback data pipeline could support a rapidly expanding fleet of 16,000+ devices across geographies was a key challenge.

- **Limited observability:** Inconsistent telemetry and performance metrics from devices hindered proactive maintenance and operational reliability.
- **Lack of contextual adaptation:** Ads could not dynamically adjust to contextual factors such as location or time-of-day, impacting engagement and relevance.
- **Isolated analytics:** Fragmented data and analytics systems prevented unified visibility into impressions, reach, and ad spend, limiting campaign optimization.

QBurst Solution: Unified Advertising Ecosystem

We engineered an end-to-end AdTech platform that unifies CRM, CMS, and ad delivery systems to automate and optimize DOOH advertising campaigns.

AdTech CMS

- Centralized content management platform designed to manage and distribute digital advertising content across target locations and connected devices.
- Supports multi-tenant access for both internal and third-party users, enabling efficient campaign creation, scheduling, and delivery.
- Manages all key entities of the in-store AdTech ecosystem, including Store & Device Management, Orders, Advertisers, Creative Assets, and Playlists.
- Integrated with Auth0 for secure authentication, tenant switching, and role-based access control (RBAC) to ensure users access only relevant features.
- Built using Angular 14, SCSS, HTML, Auth0, and Jest, ensuring a robust, scalable, and maintainable front-end framework.

AdTech Player App

- Android-based player application responsible for executing ad campaigns as configured in the CMS.
- Communicates with content management API to retrieve assigned playlists, download creatives, and manage smooth sequential playback.
- Displays a default playlist during content downloads to maintain uninterrupted display experiences.

- Integrated with MDM for device provisioning, remote updates, and centralized management across retail endpoints.
- Supports Supply-Side Platform (SSP) integration for dynamic ad delivery from third-party sources.
- Implements a ping-based monitoring mechanism to log playback events and provide real-time performance analytics to the business team.

AdTech White-Label App (Third-Party Version)

- Specialized Android application built on a white-label architecture to enable seamless branding for enterprise clients without duplicating development efforts.
- Provides tailored ad delivery experiences for different retail partners while maintaining a unified, efficient codebase.
- Utilizes a loop-based ad playback system combining real-time slots with offline-capable assets to ensure uninterrupted operation.
- Integrates multiple backend APIs to ensure stability and observability.
- Ensures reliable playback, strong monitoring, and ease of maintenance across multiple client deployments.

Interactive In-Vehicle Tablet Application

- Android tablet application enhances travel experiences for passengers through interactive entertainment and branded content.
- Built with Java and Kotlin using MVVM architecture, integrating TensorFlow, Media3 Exoplayer, Google Maps SDK, and Firebase for configuration and analytics.
- Offers interactive games, trivia challenges, weather updates, and content rooms with video feeds, music, and celebrity interviews.
- Features live location tracking, nap mode, and user-friendly controls for passengers to personalize their experience.
- Integrates with programmatic DOOH AdTech platform for exclusive content delivery and creative ad production platforms for interactive ad and mini-game creation.

- CI/CD implemented using GitLab CI, AWS CLI, and AWS Secrets Manager for secure, automated deployments.

Driver Companion Mobile Application

- Native iOS and Android app for managing driver accounts, payments, referrals, and tablet logistics.
- Developed using SwiftUI (iOS) and Jetpack Compose (Android) under MVVM architecture.
- Integrates Stripe and Plaid for payouts, Firebase for push notifications and crashlytics, and Datadog for analytics.
- Key features include real-time earnings tracking, cash-out and prize-out options, referral program management, shipping preferences, and profile updates.
- Employs biometric authentication and end-to-end encryption for secure access and data protection.
- Offers flexible UI themes with dark/light mode for improved accessibility and personalization.

Analytics and Real-Time Business Insights

- **Data Integration and Modeling:** Delivered Tableau dashboards that consolidated data from the CRM, CMS, and ad playback pipelines into a Snowflake data warehouse. This unified data model enabled a single source of truth for campaign performance analytics.
- **Audience Measurement and Attribution:** Applied industry-standard audience metrics to translate playback data into standardized measures of impressions, campaign reach, and ad spend distribution across regions.
- **Real-Time Performance Insights:** Data pipelines refreshed every few minutes, giving marketing and operations teams live visibility into campaign reach and device uptime across all deployed endpoints.

Implementation Approach

- **Architecture:** Distributed microservices deployed on AWS, ensuring horizontal scalability, high availability, and failover resilience.
- **Workflow Automation:** Automated campaign approvals, playlist rotation, and ad publishing managed through a Python-based microservice layer built with Django and FastAPI.
- **Telemetry and Data Collection:** FastAPI services capture ad playback events and uptime telemetry from over 16,000 edge devices in near real time.
- **Observability:** Integrated Prometheus and Grafana dashboards for performance monitoring, uptime visualization, and proactive alerting.
- **Security:** Implemented OAuth 2.0 and JWT-based authentication; all inter-system communication secured via HTTPS.
- **CI/CD:** Established GitLab pipelines with AWS ECR for streamlined deployments across multiple environments.

Impact

- 63% reduction in campaign activation time through workflow automation.
- 45% boost in ad engagement via context-aware targeting (location, weather, and time-based).
- 99.7% uptime achieved across 16,000+ edge devices with real-time observability.
- Unified DOOH and in-vehicle media under a single intelligent AdTech platform, improving operational efficiency.
- Enhanced passenger engagement and dwell time with interactive tablet content powered by AI and media SDKs.
- Empowered advertisers with real-time analytics, measurable ROI, and dynamic creative optimization.