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CASE STUDY

In-Flight Entertainment for a Global Airline

A leading international airline sought to modernize its legacy in-flight entertainment (IFE) platform to deliver a personalized, always-available digital experience for passengers. Anuyat partnered with the airline to engineer a next-generation AI-enabled IFE system—a distributed architecture that seamlessly connects aircraft, edge servers, and enterprise systems.

By deploying agentic automation, standardized APIs, and continuous cloud-edge synchronization, the airline achieved 40% faster release cycles, 80% uptime improvement, and real-time passenger analytics across its global fleet.

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Client Details

A globally respected full-service airline operating a diverse fleet of over 300 aircraft across 40+ international destinations. Renowned for its premium passenger experience and operational excellence, the airline is deeply invested in digital transformation initiatives aimed at enhancing connectivity, personalization, and in-flight engagement. By partnering with Anuyat, the airline set out to modernize its in-flight entertainment ecosystem and establish a scalable foundation for AI-driven passenger experiences.

Business Context

The airline operated a vast global fleet across major regions, but its in-flight entertainment (IFE) infrastructure lagged behind modern traveler expectations.

A rigid, hardware-dependent IFE system and siloed data flows hindered real-time updates, personalization, and visibility across the airline's digital ecosystem.

The airline began a digital overhaul of its IFE, focusing on synchronization, AI personalization, and automation — with Anuyat leading the design and deployment of a global, cloud-edge platform.

- Slow content updates and software releases.
- High operational overhead for manual device synchronization.
- Disconnected in-flight and ground systems.

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Technical Challenges (Few of many)

Limited Bandwidth
Between aircraft and cloud environments

Offline-first Operations
With delayed data synchornisation

Integration Complexity
Across multiple legacy systems

Anuyat Solution

Anuyat architected a next-generation, AI-enabled in-flight entertainment (IFE) platform designed to operate seamlessly across aircraft, ground systems, and cloud environments. The goal was to transform a legacy, siloed setup into a resilient, intelligent, and self-evolving ecosystem that delivers consistent passenger experiences regardless of connectivity or location.

The solution was implemented through a modular, distributed cloud-edge architecture, ensuring high availability, efficient data synchronization, and flexibility to scale across 300+ aircraft.

Edge-aware Architecture with real-time sync when connected

Content Delivery using predictive AI models for caching preferences

MCP Based Standardization for agentic API orchestration

ACP Powered Commerce Flows for in-flight upsell and partner integrations

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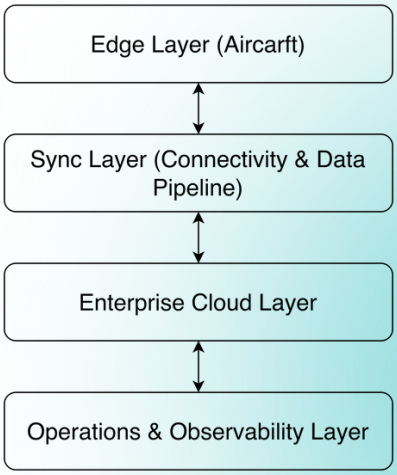
System Architecture

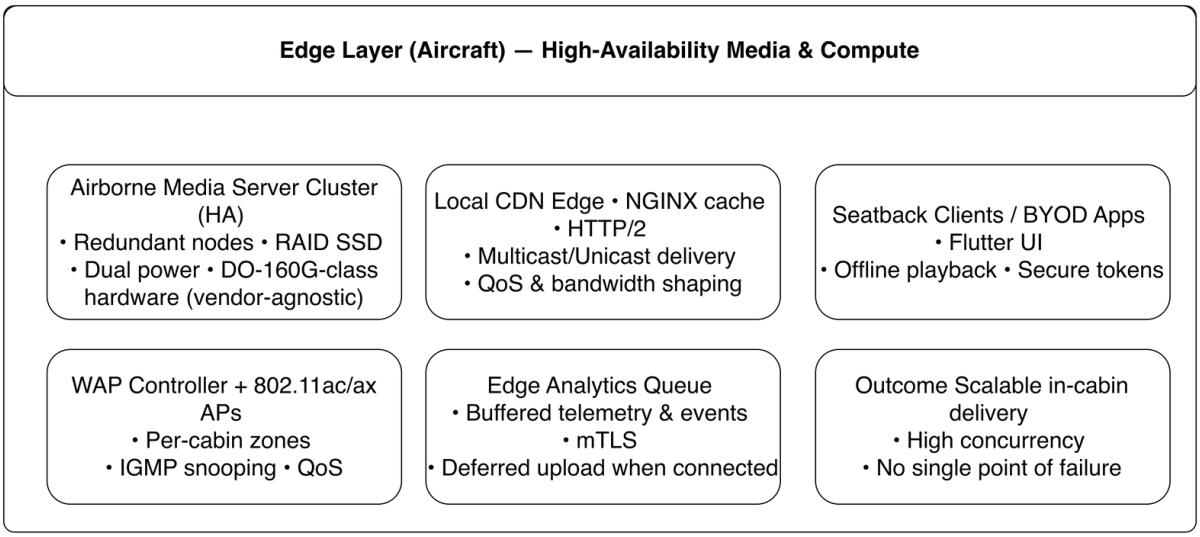
We built a distributed cloud–edge architecture engineered for high concurrency, resilience, and offline tolerance. Each aircraft operates as a self-sufficient node with redundant compute, high-throughput media delivery, and intelligent sync to the enterprise cloud.



Edge Layer (Aircraft)

- Redundant edge compute: Rugged x86 LRUs (ARINC 600) with NVMe RAID and dual power for no single point of failure.
- Onboard cache cluster: Chunked, high-throughput media delivery that supports hundreds of concurrent seatbacks + BYOD.
- 10GbE/AFDX backbone: Deterministic switching between LRUs, WAPs, and seatbacks with QoS for streams.
- Wi-Fi 6E control: Captive portal, device classification, bandwidth shaping, and per-client QoS.
- Local telemetry & queue: Buffered events and analytics with guaranteed delivery when the link restores.

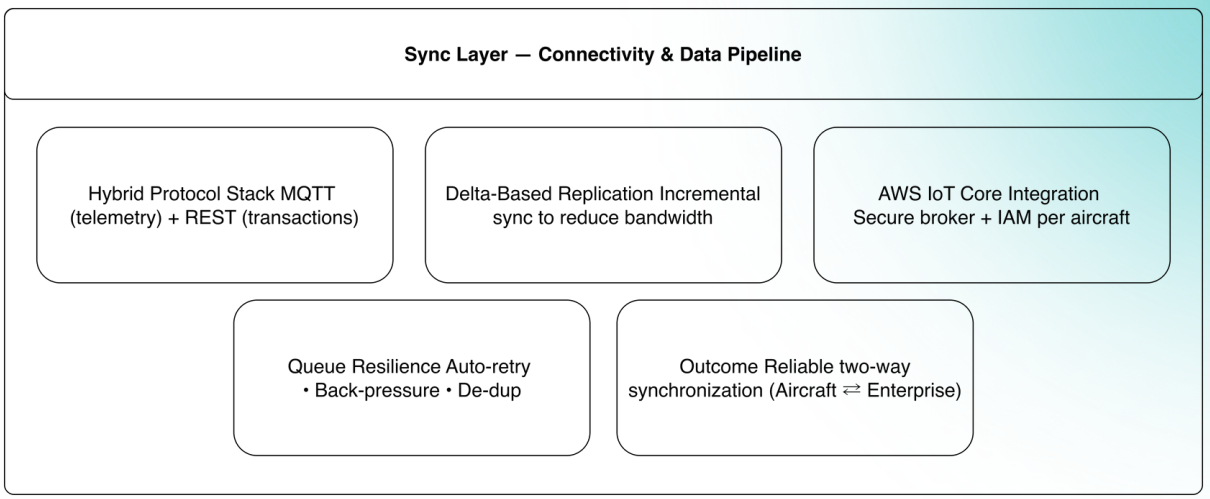
Result: Consistent, low-latency passenger experience—even during connectivity drops.



Sync Layer (Connectivity & Data Pipeline)

- Hybrid protocols: MQTT for lightweight telemetry; REST for manifests and transactional updates.
- Delta replication: Sends only incremental changes to reduce satcom costs; resumable chunk transfers.
- AWS IoT Core: Per-aircraft identities, policy-scoped topics, and secure brokering.
- Resilient queues: Auto-retry, back-pressure, and de-duplication.

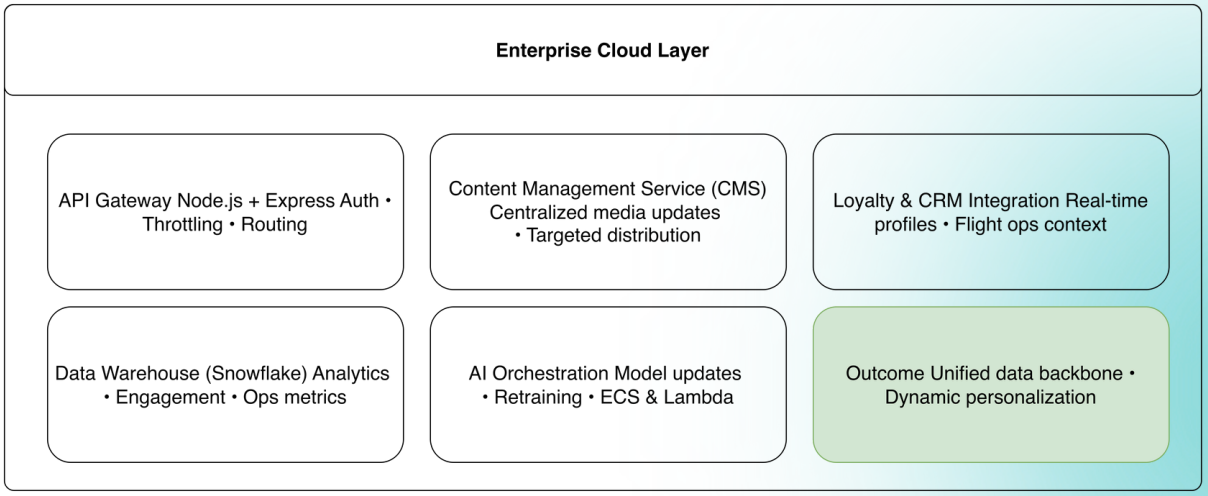
Result: Reliable two-way sync between aircraft and enterprise systems under variable networks.



Enterprise Cloud Layer

- API Gateway (Node.js/Express): Auth, throttling, routing, and versioned contracts.
- CMS: Centralized content curation and targeted distribution by aircraft/route/fleet group.
- Loyalty & CRM: Real-time context for personalized catalogs and offers.
- Data Warehouse (Snowflake): Unified analytics for engagement, cohorts, and ops metrics.
- AI Orchestration (ECS/Lambda): Model packaging, staged rollouts to edge, periodic retraining.

Result: A unified data backbone enabling enterprise-grade personalization and insights.



Operations & Observability

- CI/CD (Jenkins + Docker + Terraform): Staged releases from pilot to fleet-wide; automated rollback.
- Observability (Prometheus + Grafana): Fleet SLOs, cache-hit ratios, QoE, AP load, error budgets.
- CloudWatch + OpenTelemetry: Tracing, anomaly detection, predictive alerts.
- Security gates (Snyk, SonarQube): Pipeline-enforced quality and SBOM tracking.

Result: Continuous delivery, proactive maintenance, and full fleet visibility.

AI & Automation Layer

AI played a crucial role in automating content delivery and enhancing passenger experience:

- **Personalization Engine:** ML models trained on historical passenger behavior to curate media and offers
- **Predictive Caching:** Pre-loads content based on flight route and demographic data
- **Anomaly Detection:** Monitors sync failures or content mismatches via telemetry
- **Agentic Workflows:** Implemented via MCP—autonomous routines to manage data sync, logs, and version rollouts
- **Commerce Intelligence:** ACP-driven upsell modules optimized in-flight promotions in real-time

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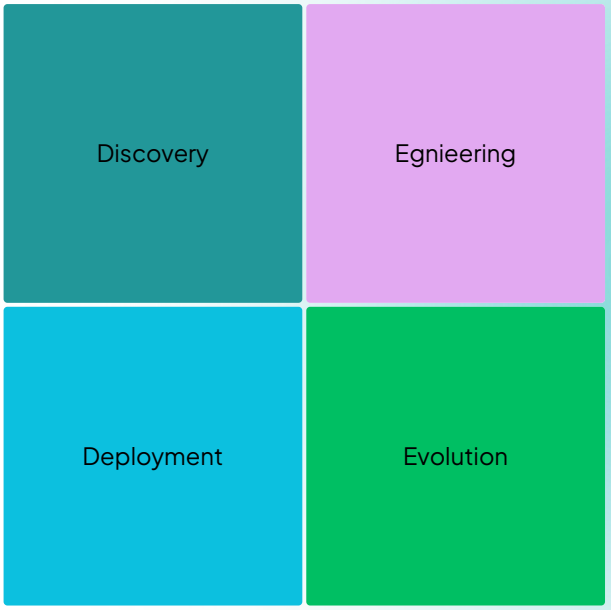
Engineering Process & Methodology

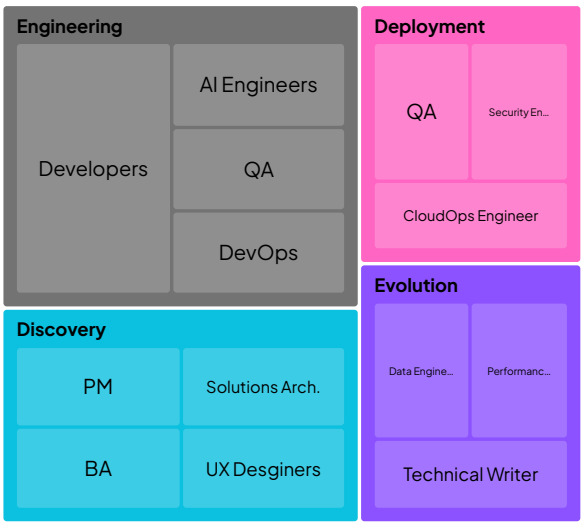
Aligned with Anuyat's A3F Methodology

- **Discovery** — Analyzed IFE operations, legacy systems, and data flows to identify integration gaps.
- **Engineering** — Built modular microservices, Flutter UIs, and Node.js APIs following A3F design principles.
- **Deployment** — Automated testing and rolling releases via Jenkins, Playwright, and Postman.
- **Evolution** — Enabled continuous telemetry with CloudWatch and Prometheus for data-driven optimization.



FTE Team

~17.5 FTEs with Interim ramp ups/downs



Team Composition

- **Discovery** — Analyzed IFE operations, legacy systems, and data flows to identify integration gaps.
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Tech Stack Summary

The In-Flight Entertainment platform was engineered using a modern, cloud-native stack designed for scalability, resilience, and intelligent automation. Each layer was purpose-built to align with Anuyat's A3F engineering principles, ensuring rapid iteration, modular deployment, and continuous optimization across devices and environments.

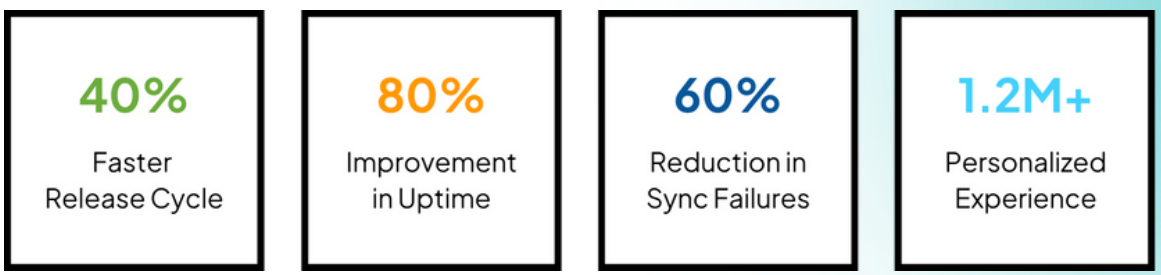
Frontend	Flutter	Unified cross-platform framework for passenger and crew IFE interfaces.
Backend	node	Microservice architecture and API gateway handling core business logic and data orchestration.
Database	MongoDB. snowflake	Hybrid data approach combining local caching for in-flight speed with enterprise-grade analytics in the cloud.
AI	LangChain TensorFlow	Agentic AI modules powering content personalization, recommendation systems, and predictive caching.
Infrastructure	Cloud Watch, ECS, IOT Core, S3	Distributed edge-cloud orchestration enabling seamless data sync between aircra and ground systems.
DevOps	Jenkins, docker, Terraform	Automated CI/CD pipelines, containerized deployments, and IaC-based environment provisioning.

Security, Compliance & Observability

- Encrypted communications using TLS 1.3 and JWT-based authentication
- Role-based access via AWS Cognito
- PII anonymization compliant with GDPR
- Real-time observability via Prometheus, Grafana, and CloudWatch Logs
- Continuous scanning with Snyk and SonarQube

Results & Outcomes

Through the A3F-guided engineering process, the airline achieved 40% faster releases, 80% higher uptime, and 60% fewer manual sync failures.
With real-time personalization for over 1.2 million passengers and integrated loyalty across all routes, the platform transformed in-flight engagement into a connected digital experience.



Business Impact Summary

- Unified Experience: Delivered a consistent and responsive in-flight entertainment experience across 380+ active aircraft, ensuring seamless access across devices and routes.
- Revenue Expansion: Introduced dynamic advertising and partner monetization, unlocking new revenue streams directly within the IFE ecosystem.
- Operational Efficiency: Reduced ground crew costs and turnaround time through process automation and synchronized maintenance alerts.
- Future-Ready Foundation: Established a scalable architecture primed for upcoming agentic AI upgrades and personalized service extensions.