Modernising the Indian Railway System

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Overview of the Indian Railway System (IRS)

8.5B+

Annual Passengers

Serving billions of passengers each year.

₹2LakhCr

Annual Transactions

Significant financial scale in yearly operations.

1.6M

Daily Ticket Bookings

IRS Consumption and Resource Requirements

Bandwidth

- Peak usage: ~60 Gbps
- Daily data transfer: 15–20 TB/day

Processing

- Concurrent users: 1.5–2 million
- Peak TPS: 10,000–15,000
- Need for High Availability & Disaster Recovery

Storage (Approx. Annual)

Data Type	Daily	Annual
Ticket Logs	500 GB	180 TB
Train Data	50 GB	18 TB
User Profiles	200 GB	73 TB
Payment Data	300 GB	110 TB
Total		381 TB/year

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Existing Architecture of IRS

Application Layer

The current system relies on monolithic C/Fortran codebases for critical applications like PRS and CONCERT. This architecture can limit agility and scalability for modern demands.

Database Technologies

IBM DB2 manages PRS reservation data, while Oracle 11g serves as the centralised database for train scheduling. These established systems are foundational to current operations.

On-Premise Data Centres

Critical applications and databases are hosted in on-premise data centres located in major cities: New Delhi, Mumbai, Kolkata, and Chennai. This infrastructure forms the backbone of the IRS's current operational capabilities.

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Comparative Analysis of Architectures

Architecture Model	Scalability	Flexibility	Security & Compliance	Operational Complexity	Cost Efficiency	Suitable for IRS?
Hybrid Cloud	High	High	High	Medium	High	Yes ✅
Microservices	Very High	Very High	Medium	High	Medium	Yes ✅
Serverless	High	Medium	Medium	Low	High	⚠ Partially
Containerised (Standalone)	High	High	Medium	Medium	High	Yes ✅

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Best from Most Worlds: Hybrid Approach with Containers & Microservices

Scalability & Flexibility

Microservices allow independent scaling, while containers enable rapid deployment. Hybrid cloud balances on-premise for sensitive data with AWS for scalable workloads.

Security & Compliance

Hybrid cloud keeps sensitive data on-premise for compliance. Microservices and containers enhance security through service isolation, ensuring data integrity and regulatory adherence.

Operational Efficiency

Containers provide consistent development and deployment environments. Microservices allow independent management, speeding up development and streamlining operations.

Cost Efficiency

Hybrid cloud balances on-premise infrastructure with scalable AWS resources. Containers maximise resource utilisation by sharing the host OS, optimising overall expenditure.

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AWS Services for IRS Migration

Compute & Containers

EC2, ECS, EKS, Lambda

Storage

S3, EFS, RDS, DynamoDB

Networking

VPC, Direct Connect, ELB

Monitoring & Security

CloudWatch, X-Ray, IAM, KMS, Shield, WAF

Migration Tools

AWS DMS

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Migration Plan: Phased Approach

1

Phase 1: Assessment & Planning

Inventory applications, define migration strategy (7 Rs), assess compliance, and engage stakeholders for alignment.

2

Phase 2: Design & Architecture

Design hybrid cloud integration, break monoliths into microservices, plan Docker containerisation, and implement AWS security practices.

3

Phase 3: Implementation & Migration

Set up AWS infrastructure, deploy microservices to EKS, migrate databases, establish CI/CD pipelines, and configure monitoring.

4

Phase 4: Testing & Validation

Conduct functional, performance, and security testing. Perform User Acceptance Testing to ensure system readiness.

5

Phase 5: Optimisation & Scaling

Tune performance, implement auto-scaling, optimise costs, and plan for disaster recovery and business continuity.

6

Phase 6: Continuous Improvement

Establish feedback loops, provide ongoing training and documentation, and explore new AWS technologies for continuous innovation.

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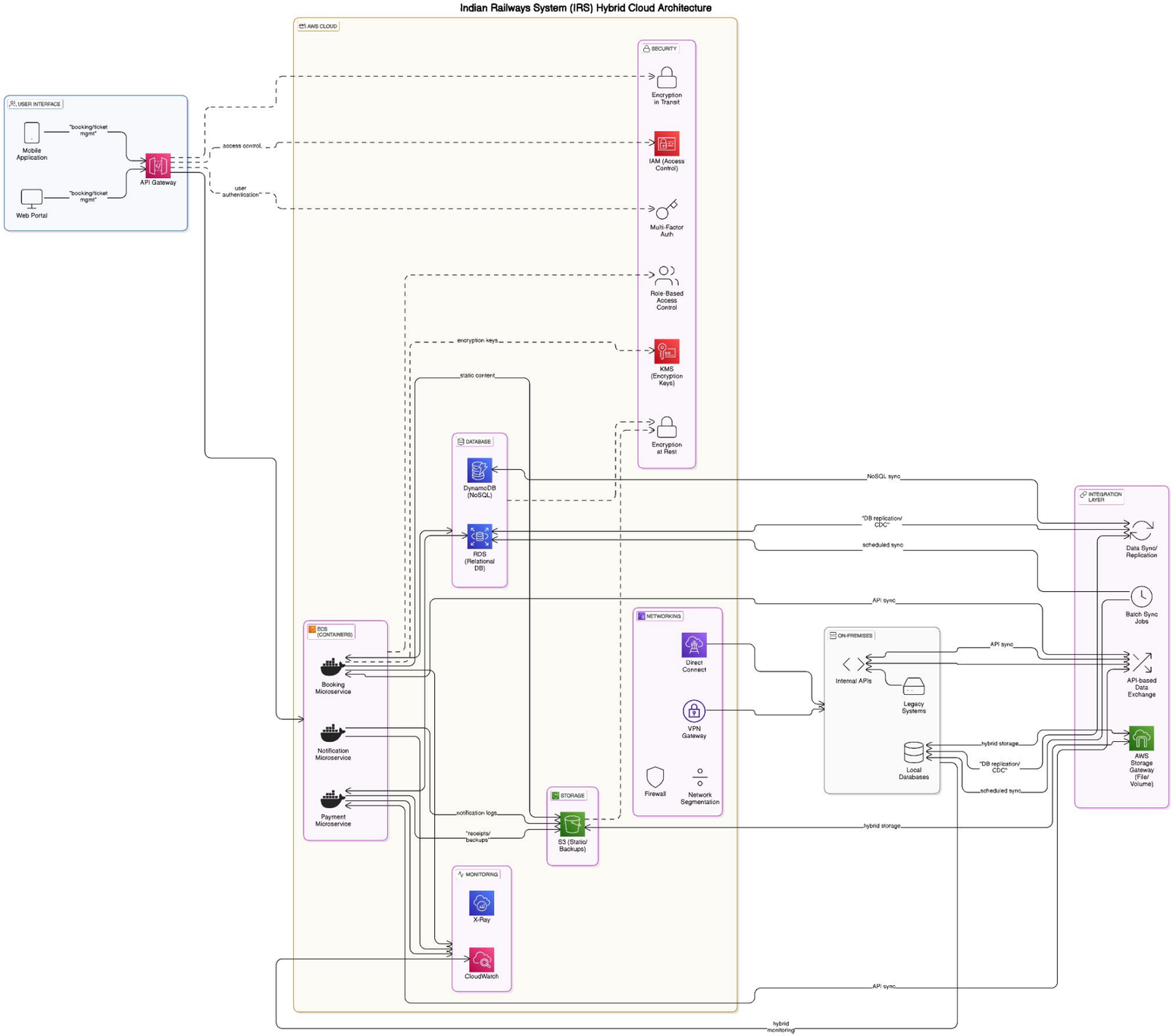

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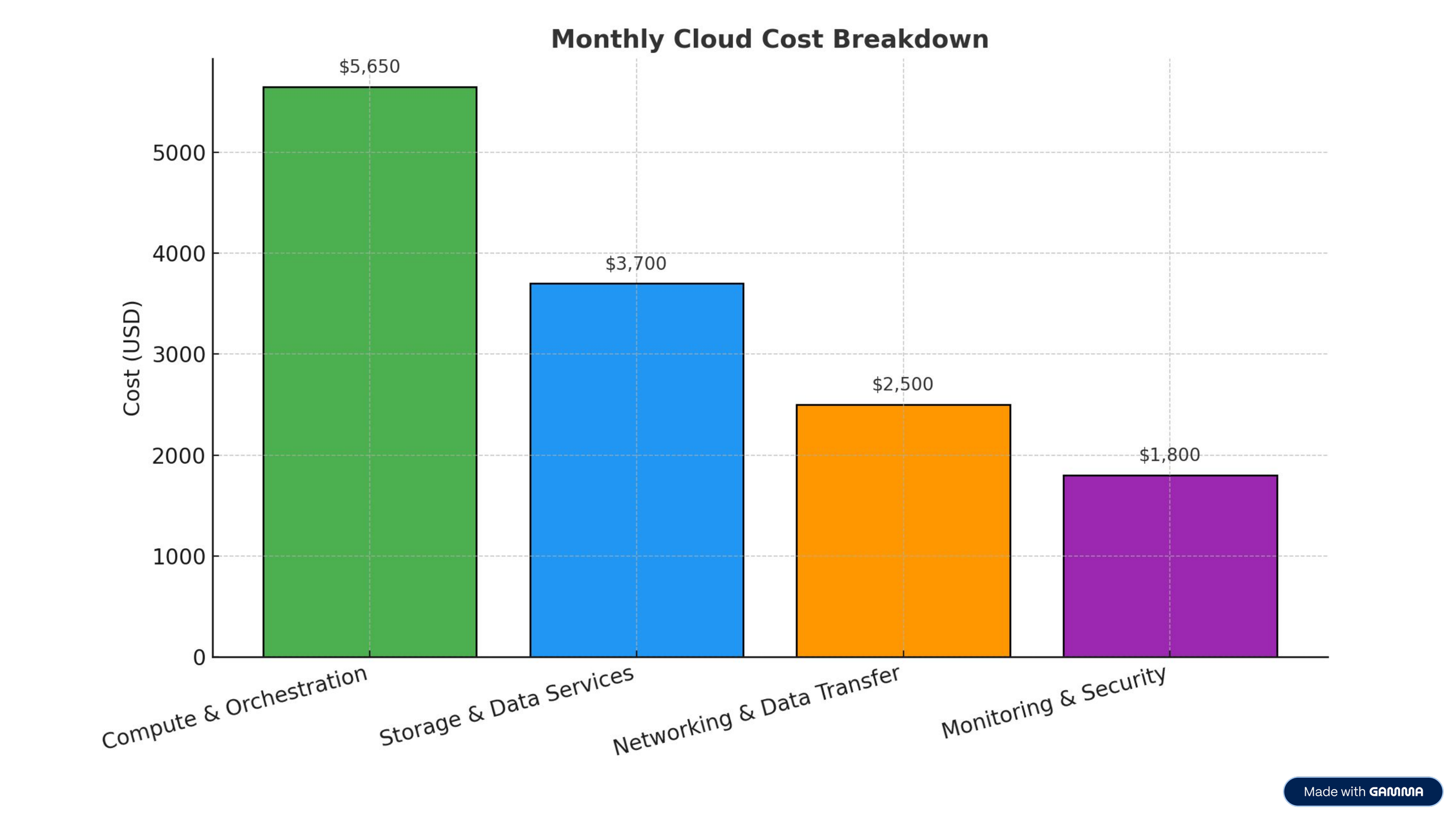

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THANK YOU