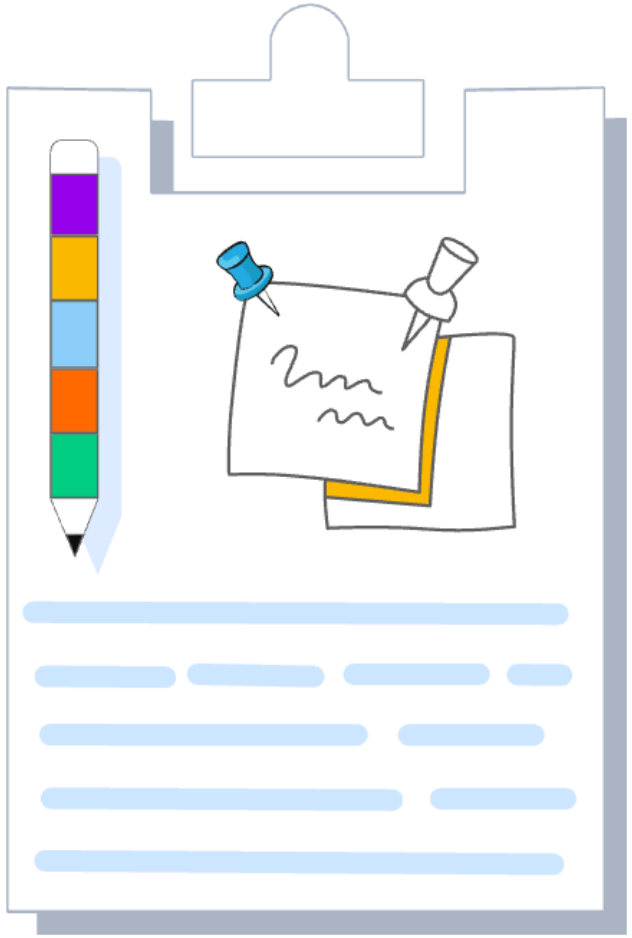
Case Studies – Importance

Very Important – Key part of certification exam

Download – From ***Official Guide***

Think Like Architect – Apply Google Cloud service knowledge and reasoning

- **Google Cloud Well-Architected Framework** - Best practices for designing, building, and operating secure, efficient, and reliable cloud solutions on Google Cloud
- ***Cloud Architecture Center*** - *Discover reference architectures, design guidance, and best practices*



Case Studies – Mindset & Exam Tip

Best Attitude – Test yourself as architect

- **Understand Domains** – AI, ML, Gen AI, Healthcare, Retail, Media & Streaming
- **Analyze & Reflect** – Form your own opinions
- **Challenge Solutions** – Don't accept recommendations blindly

During Exam – You can read case study but don't depend on it

- **Before Exam** – Get clear overview of each case
- **Exam Tip** – Group questions per case study and answer together

Altostrat Media Case Study – Overview

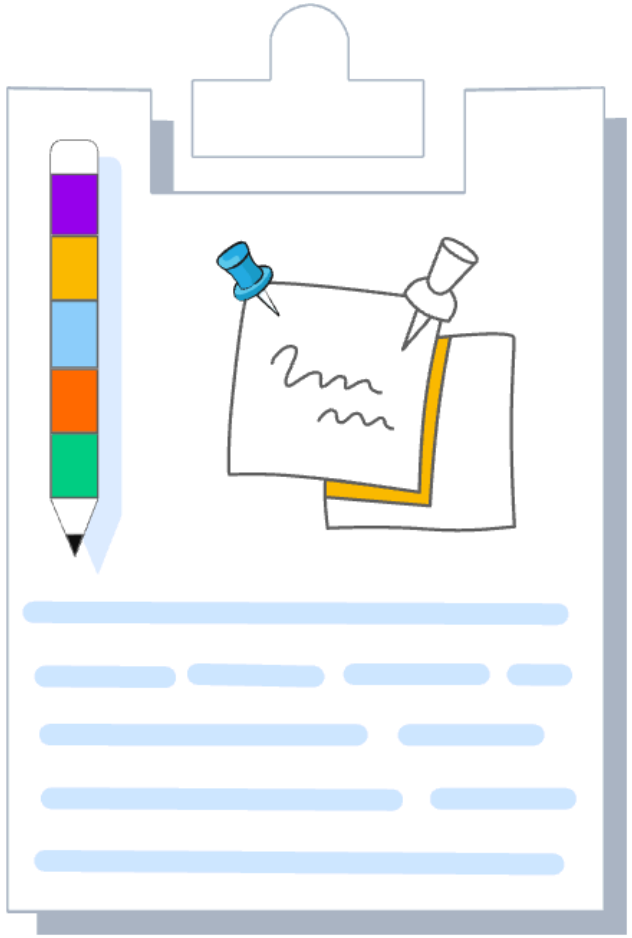
Company – Leading media provider with vast audio and video library

Goal – Modernize content management using Google Cloud

Vision – Use Generative AI for personalization and engagement

Focus – Smarter recommendations, summaries, and dynamic pricing

Outcome – Better customer experience and new revenue channels



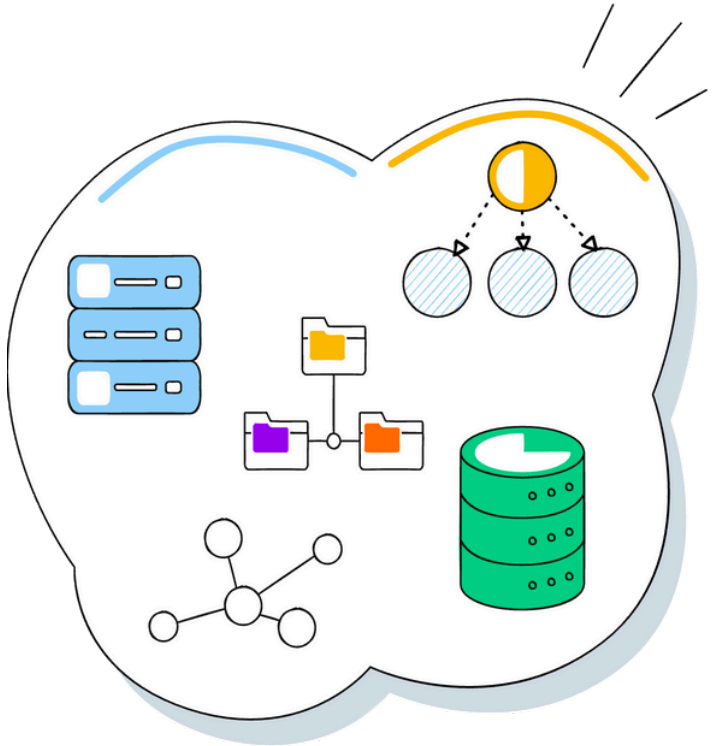
Altostrat Media – Existing Technical Environment

Compute – GKE for scalable, highly available workloads

Serverless – Cloud Run for event driven tasks (video transcoding, metadata extraction, and personalized content recommendations)

Storage – Cloud Storage for media assets (audio, video, docs)

Analytics – BigQuery for audience insights and trend analysis



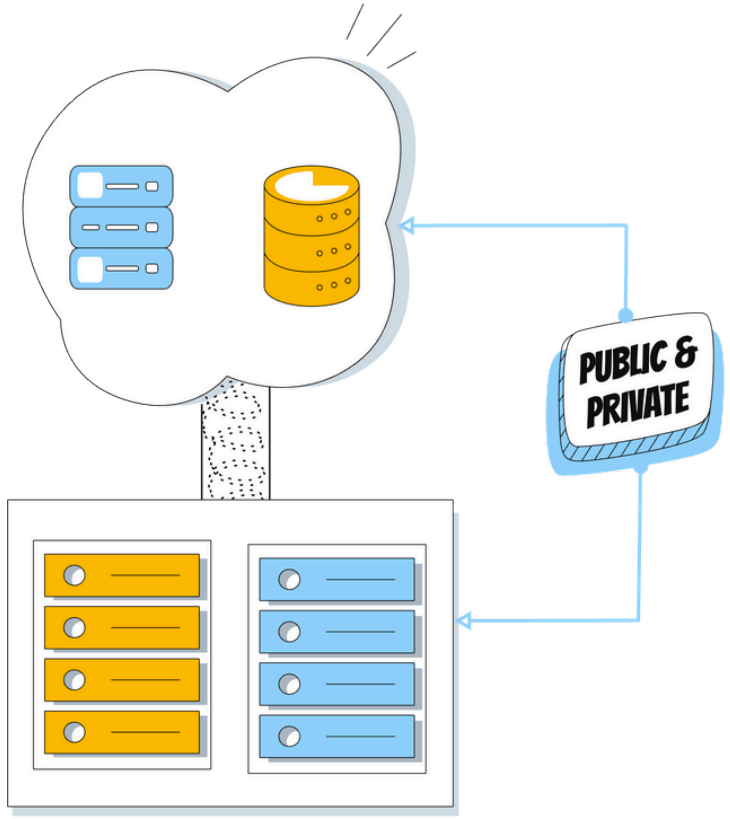
Altostrat Media – Existing Technical Environment - 2

Hybrid Setup – Some legacy on-prem for ingestion and archival

- Slated for modernization and migration to Google Cloud in the near future

Monitoring – Cloud Monitoring + Prometheus with email alerts

Identity – Google Identity + third-party providers



Altostrat Media – Business Requirements

Workflow Speed – Improve reliability and automation across hybrid environments

Simplify Infra Management – Faster CI/CD and app deployment

Cost Optimization – Reduce storage cost while maintaining high availability and scalability

Analytics – Inform content strategy and decision-making with data

Altostrat Media – Business Requirements - 2

AI Interaction – Enable natural language chat and support (24 X 7)

Content Summarization – Auto-summarize audio and video

Metadata Extraction – Use NLP and computer vision for tagging

Content Filtering – Detect and remove inappropriate content

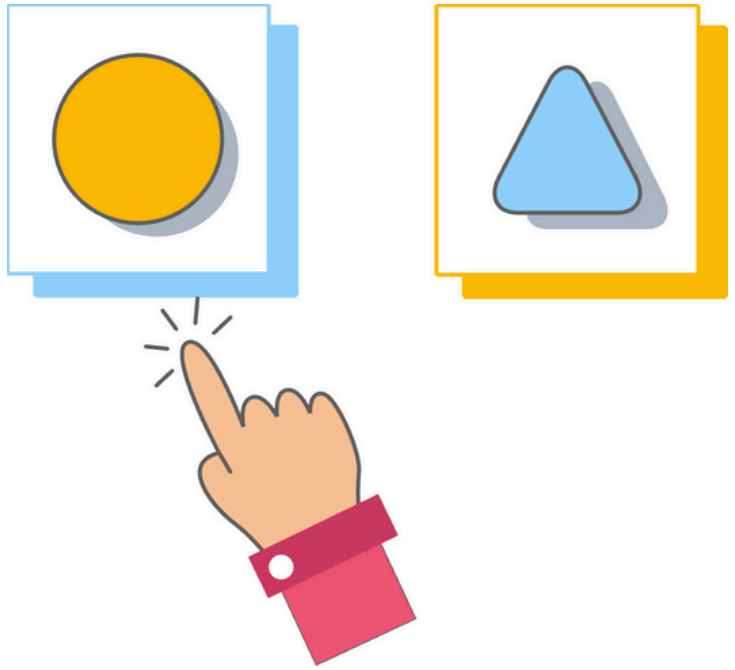
Altostrat Media – Technical Requirements

Modernize CI/CD – Centralized, modern container deployment management

Hybrid cloud connectivity – Secure, high-performance hybrid cloud connectivity for data ingestion

Scalability – GKE clusters across hybrid environments

Storage Efficiency – Optimize Cloud Storage costs for growing media



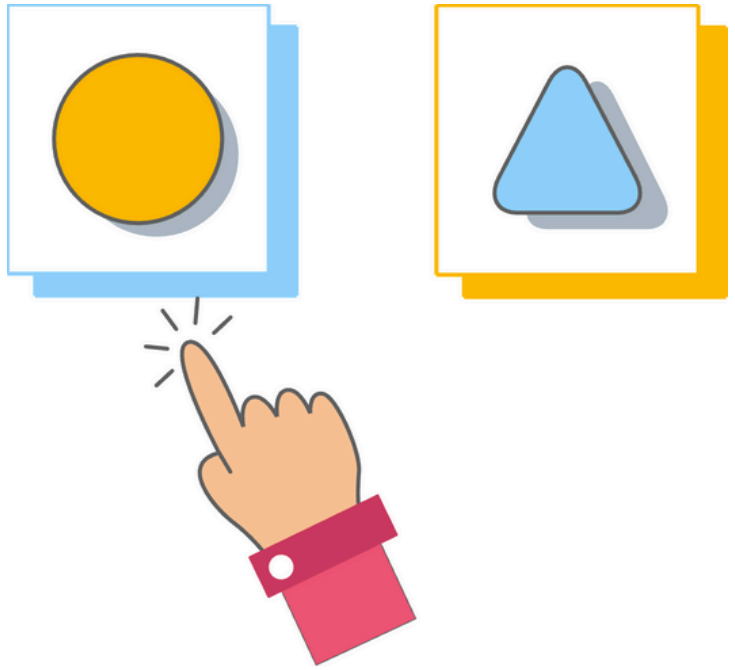
Altostrat Media – Technical Requirements - AI

AI Systems – Detect harmful content, ensure auditability and explainability

Leverage LLMs and Conversational AI – Personalize experiences and recommendations

Develop Advanced Chatbots – Natural language assistance via Vertex AI

Automation – Summarization for multi-format media



Altostrat Media – Executive Statement

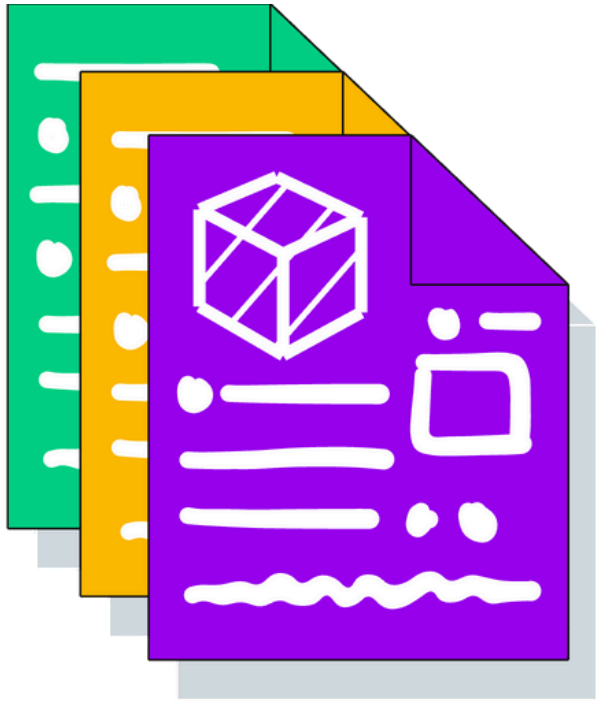
Vision – AI-driven media transformation

Goal – Smarter discovery, deeper engagement (personalized recommendations), higher retention

Focus – Reliability, scalability, cost control

Outcome – Data-informed strategy, stronger loyalty, unlock new revenue streams

Future – Generative AI central to innovation and success



Altostrat Media – Discussion

Service	Discussion
GKE (Hybrid)	Scalable container platform for hybrid workloads (with Workload Identity Federation)
BigQuery	Analyze user behavior, content trends,..
Dataflow / Pub/Sub	Real-time ingestion and transformation pipelines
Cloud Storage	Tiered storage for cost optimization
Cloud CDN	Reduce latency for global users
Cloud Monitoring + Logging	Unified observability and alerting
Cloud Build/Deploy + Artifact Registry	Containers & policies(Binary Authorization)
Cloud Interconnect	Secure, high-performance hybrid connectivity

Altostrat Media – Discussion – 2

Service	Discussion
Vertex AI and/or BigQuery ML	Generative AI for summaries, recommendations, Personalization
Vertex AI Model Registry, Explainable AI	MLOps, Auditability & Explainability
RAG with Vertex AI Vector Search	Search over metadata/transcripts
Vertex AI Safety/Guardrails	Content Filtering / Safety
Speech-to-Text, Translation	Media Understanding & Metadata
Vision AI / Video Intelligence	Image and video based intelligence
Media Translation & Video AI	Auto-captioning, inappropriate content detection
Vertex AI Agent Builder + Dialogflow + Contact Center AI	Conversational AI (24×7)

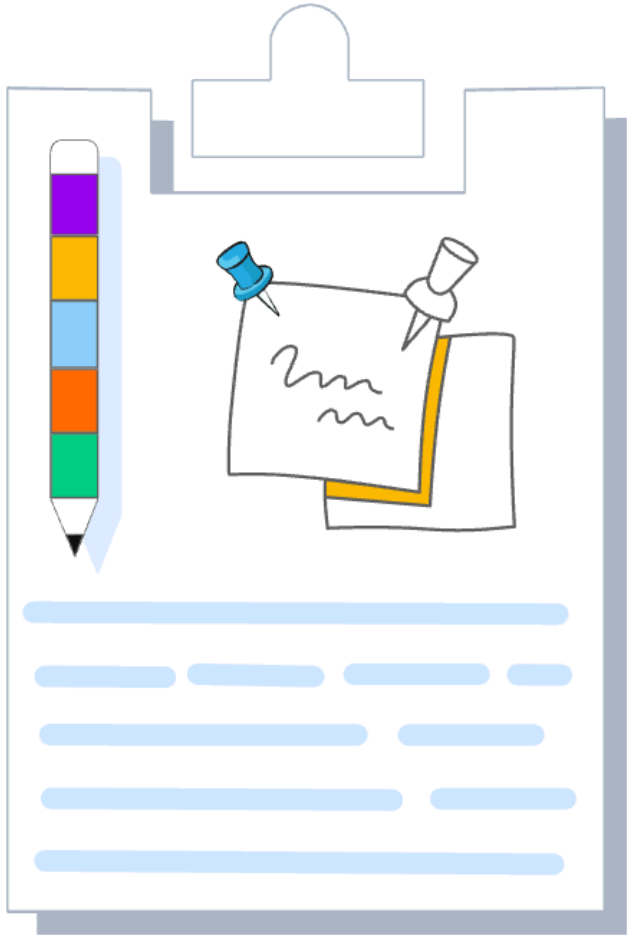
Cymbal Retail Case Study – Overview

Company – Online retailer experiencing significant growth with diverse product portfolio

Challenge – Complex catalog management and manual workflows

Solution Concept: 3 Focus Areas

- **1:** Catalog and Content Enrichment
- **2:** Conversational Commerce with Product Discovery
- **3:** Technical Stack Modernization



Cymbal Retail Case Study – 3 Focus Areas

Solution Concept: 3 Focus Areas

- **Catalog and Content Enrichment** – Use Gen AI to automate & improve accuracy of product catalog
  - Generate product attributes, descriptions, and images from supplier-provided information
  - **Goal**: Streamline catalog mgmt, reduce manual effort and errors, and ensure consistent info across sales channels
- **Conversational Commerce with Product Discovery** – Integrate AI-powered agents to provide personalized experience through natural language conversations
- **Technical Stack Modernization**: Streamline operations and reduce manual costs by modernizing:
  - Cloud-based infrastructure
  - Secure and efficient data handling
  - Proactive monitoring and security

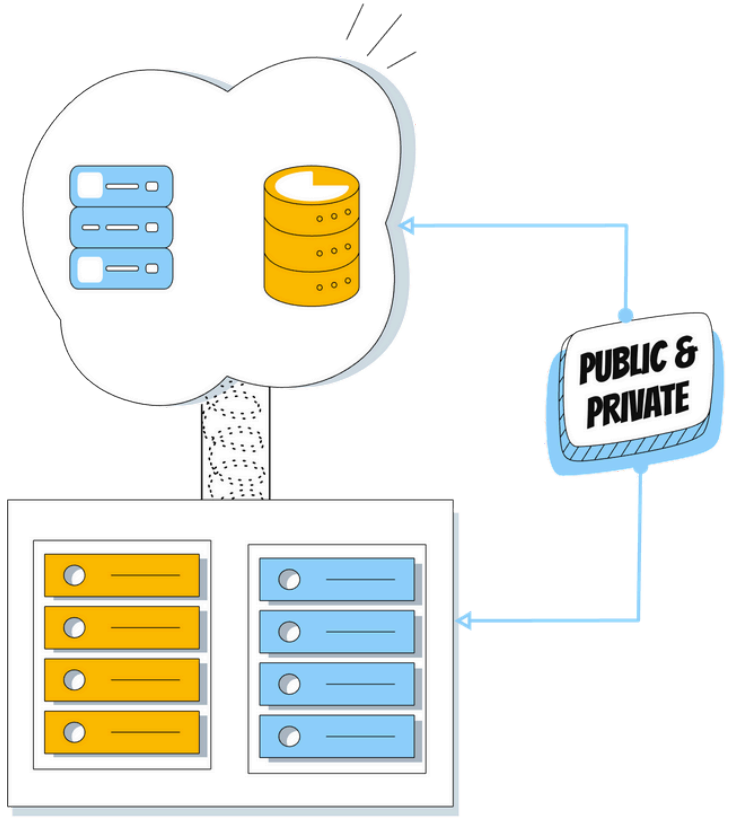
Cymbal Retail – Existing Technical Environment

Infrastructure – Mix of on-prem and cloud

- **Databases** – MySQL, SQL Server, Redis, MongoDB
- **Apps** – Kubernetes clusters running workloads
- **Integrations with on-prem** – Legacy file transfers + batch ETL jobs

Applications: Web App + IVR

- **Web App** - Browse product catalog querying databases for names and categories of products
- **IVR (Interactive Voice Response)** – Handle customer calls and routing to appropriate departments or agents
- **Call center agents** - Handle transfers from IVR and manually enter orders when customers face issues

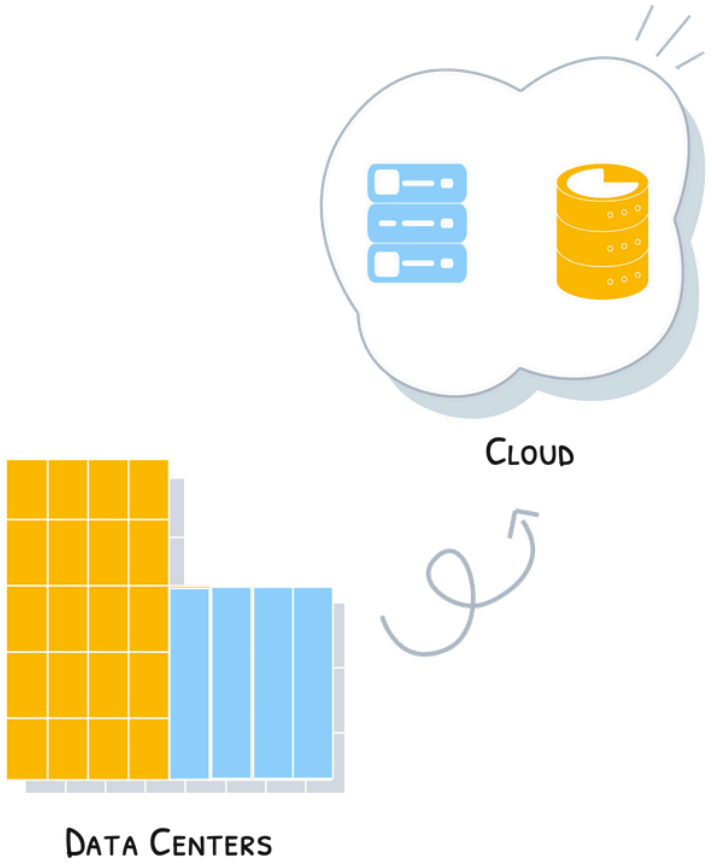


Cymbal Retail – Existing Technical Environment - 2

Monitoring – Various open source tools - Grafana, Nagios, Elastic

Challenges:

- **Manual Processes**: Time-consuming and error-prone
- **Data Silos**: Limits unified view of the customer journey
- **Integrating New Technologies**: Is difficult



Cymbal Retail – Business Requirements

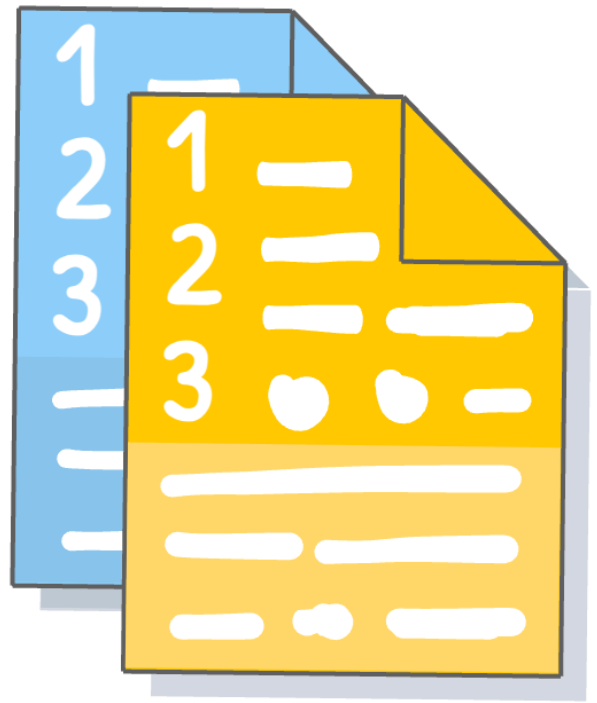
Automate Product Catalog Enrichment – AI-driven attributes, descriptions, and images

Improve Discoverability – Smarter search and recommendations

Increase Customer Engagement – Interactive and personalized shopping experience

Drive Conversions – Intuitive and helpful shopping experience

Cut Costs – Reduce call center staffing costs and data-center hosting costs

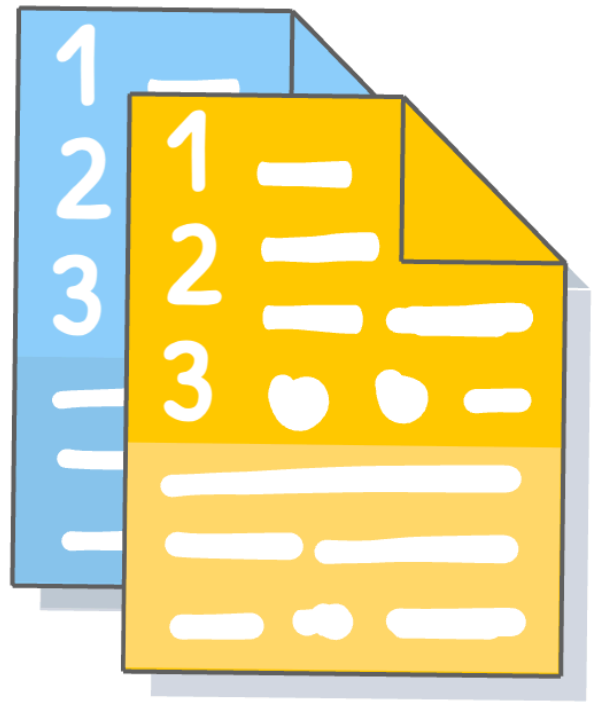


Cymbal Retail – Technical Requirements

Attribute Generation - Derive product attributes from supplier data - titles, descriptions, and images

Image Generation and Enhancement - Create variations from base image (support background changes, color adjustments, text overlays)

Automate Product Discovery – Natural language search for customers



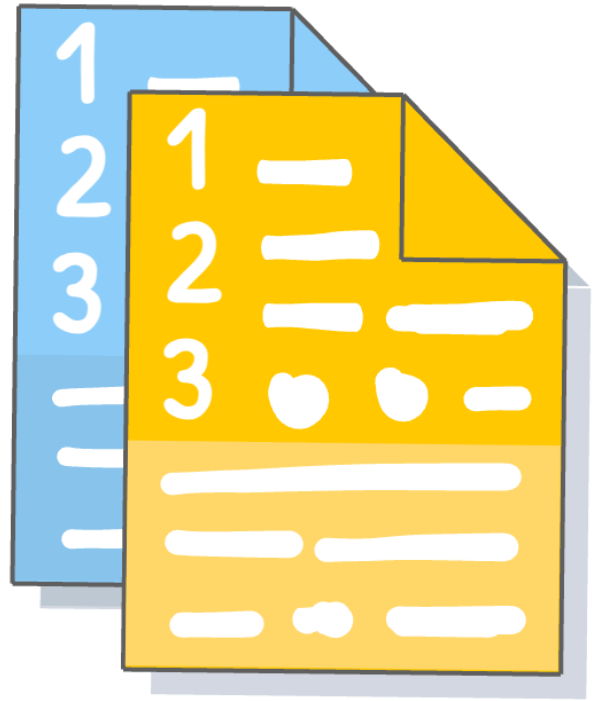
Cymbal Retail – Technical Requirements - 2

Scalability and Performance – Handle growing catalog with consistent performance

Human-in-the-Loop (HITL) Review – Provide a user interface (UI) for associates to review and manage Gen AI-generated content

- Allow associates to approve, reject, or modify suggestions before updating the product catalog

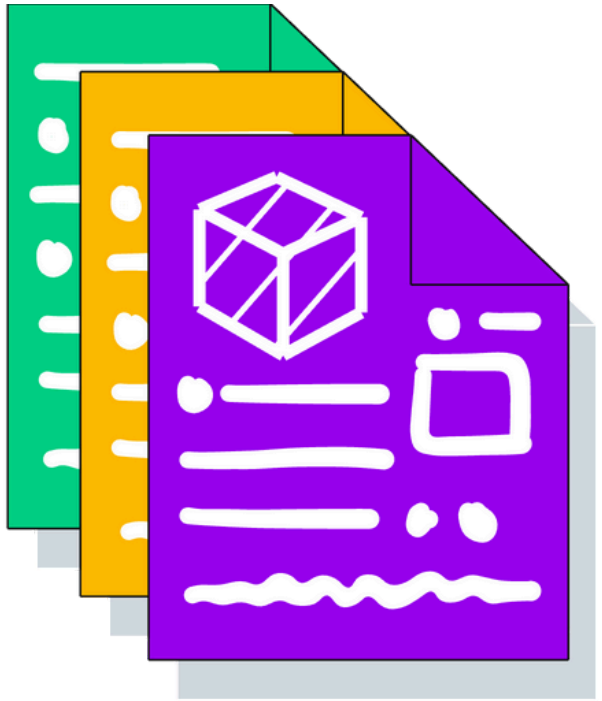
Data Security & Compliance – Protect data and meet regulations



Cymbal Retail – Executive Statement

Invest in Generative AI: Position Cymbal to thrive in online retail landscape

- **Reduced operational costs**: Automation of catalog management tasks
- **Increased efficiency and speed**: Onboarding new products and updating existing ones
- **Improved accuracy and consistency**: Of product information across all sales channels
- **Engaging and personalized shopping experience**: Cater to modern customer preferences
- **Enhanced product discoverability**: Leading to increased sales



Cymbal Retail – Discussion

Service	Discussion
Vertex AI Generative AI Studio, Gemini Models, Vertex AI Workbench, AutoML	Automate product catalog enrichment and improve content accuracy
Vertex AI Text Models (Gemini), Model Garden	Generate product attributes and descriptions from supplier data
Vertex AI Imagen, Generative AI on Vertex	Create and enhance product images (color, background, text overlays)
Vertex AI Data Labeling, App Engine / Cloud Run (custom UI)	Enable Human-in-the-Loop (HITL) content review and approval
Vertex AI Agent Builder, Dialogflow CX, CCAI Platform	Build interactive conversational shopping assistants and chatbots

Cymbal Retail – Discussion - 2

Service	Discussion
Vertex AI Search and Conversation	Enable natural language product search and discovery
Vertex AI Recommendations AI, BigQuery ML	Deliver personalized product recommendations to users
Dialogflow CX Voice Gateway, CCAI Insights	Integrate conversational AI with IVR and call center operations
BigQuery ML, Vertex AI Pipelines	Build predictive models for customer and sales analytics
Apigee API Gateway	Connect and orchestrate conversational APIs with backend systems
VPC Service Controls, Cloud KMS, IAM, Cloud DLP	Ensure data security, privacy, and compliance during enrichment

Cymbal Retail – Discussion - 3

Service	Discussion
Google Kubernetes Engine (GKE), Cloud Run	Modernize application hosting for scalability and performance
Dataflow, Pub/Sub, BigQuery	Modernize ETL and analytics workflows for real-time data insights
Committed Use Discounts, Autoclass Storage, GKE Autoscaling	Optimize infrastructure and storage costs
Dataplex, Data Catalog, Cloud DLP	Enforce data governance and cataloging across environments
Cloud SQL, AlloyDB, Firestore, MemoryStore (Redis)	Support scalable, low-latency databases for catalog and transactions

Cymbal Retail – Discussion - 4

Service	Discussion
Cloud Build, Artifact Registry, Cloud Deploy	Implement automated CI/CD pipelines for faster deployment
Cloud Monitoring, Cloud Logging, Error Reporting, Trace	Enable proactive observability and issue tracking
Cloud Interconnect, HA VPN, Private Service Connect	Ensure secure hybrid connectivity with on-prem systems
Security Command Center	Protect data and ensure compliance across workloads

EHR Healthcare Case Study – Overview

Company – Leading provider of electronic health record (EHR) software

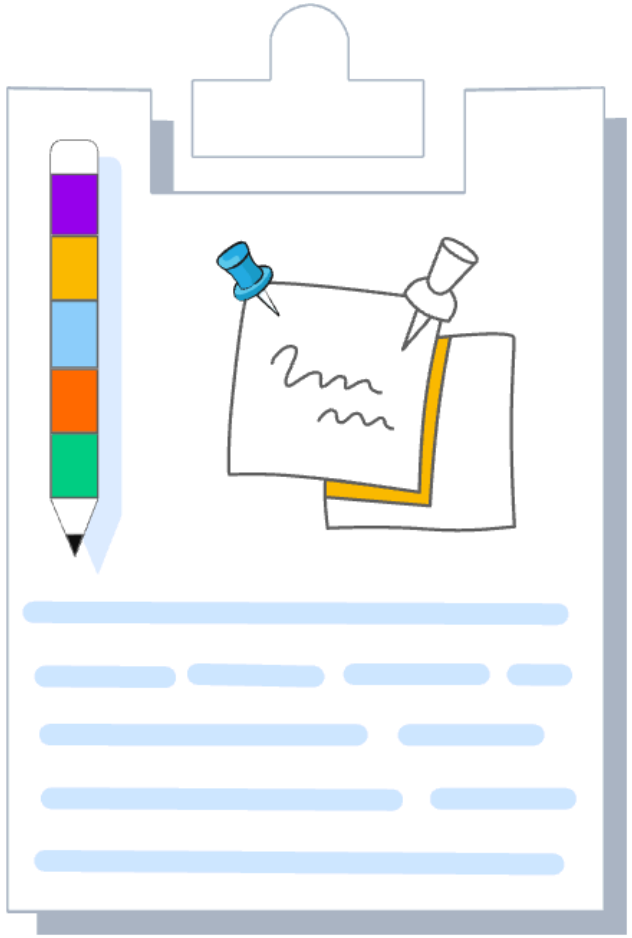
- **Model** – SaaS for hospitals, clinics, insurance providers

Challenge – Handling exponential growth

- **Solution** – Cloud migration for scalability, resilience, and agility

Goal – Modernize and scale - Google Cloud

- Adapt existing disaster recovery plan
- Update software at a fast pace (roll out new continuous deployment capabilities)



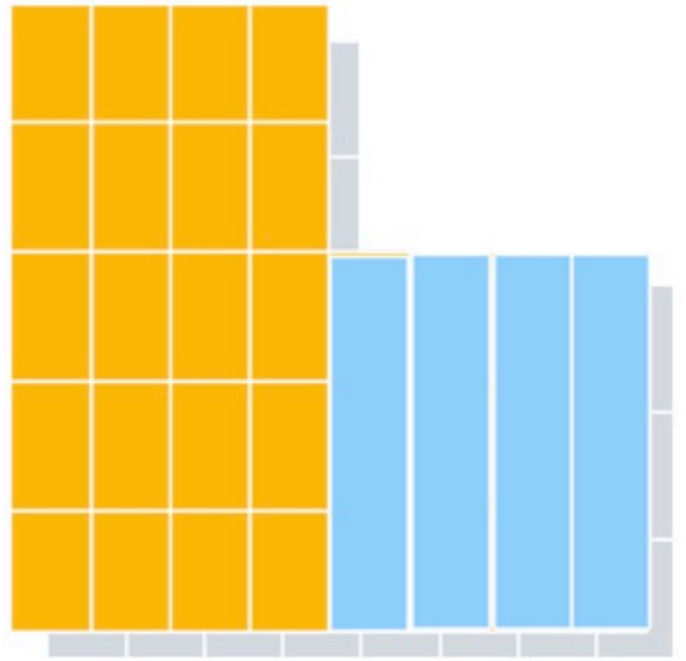
EHR Healthcare – Existing Technical Environment

Hosting – Multiple colocation facilities, one lease expiring soon

- **Apps** – Web-based, containerized on Kubernetes clusters
- **Data** – MySQL, MS SQL Server, Redis, MongoDB mix
- **Integrations** – Legacy file/API-based insurance systems on-prem (scheduled to be replaced)

Identity – Microsoft Active Directory

Monitoring – Open source tools (BUT alerts ignored often)



EHR Healthcare – Business Requirements

Faster Partner Onboarding: Add new insurance providers quickly

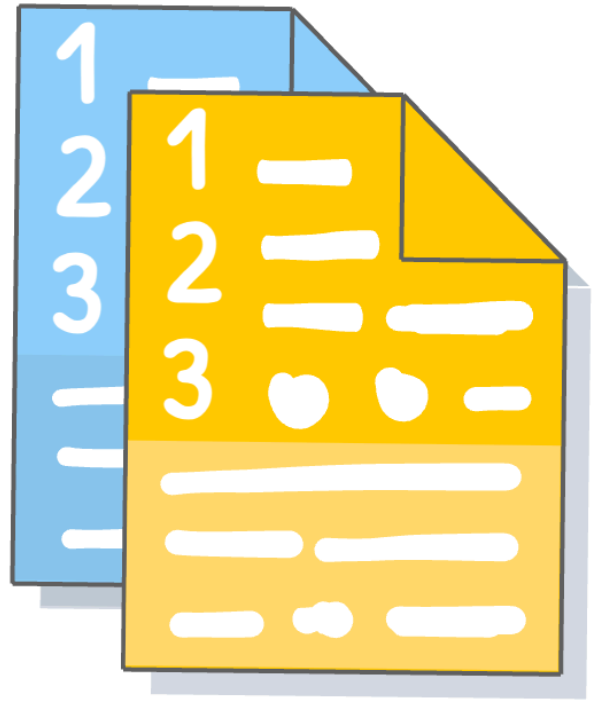
High Availability: Maintain min 99.9% uptime

- **Global Reach**: Reduce latency - worldwide customers

Centralized Visibility: Monitor system performance proactively

Data Insights: Generate healthcare trend analytics

Regulatory Compliance: Maintain security and privacy standards



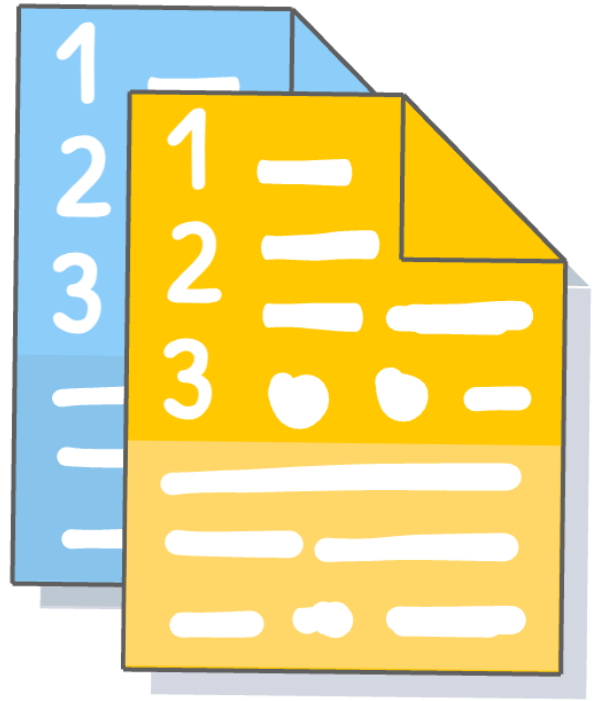
EHR Healthcare – Technical Requirements

Hybrid Connectivity – Secure high speed link between on-prem and cloud (for legacy interfaces to insurance providers)

Container Management – Multiple environments with consistency

- **Scalability** – Auto scale environments
- **Observability** – Consistent logging, log retention, monitoring, and alerting capabilities

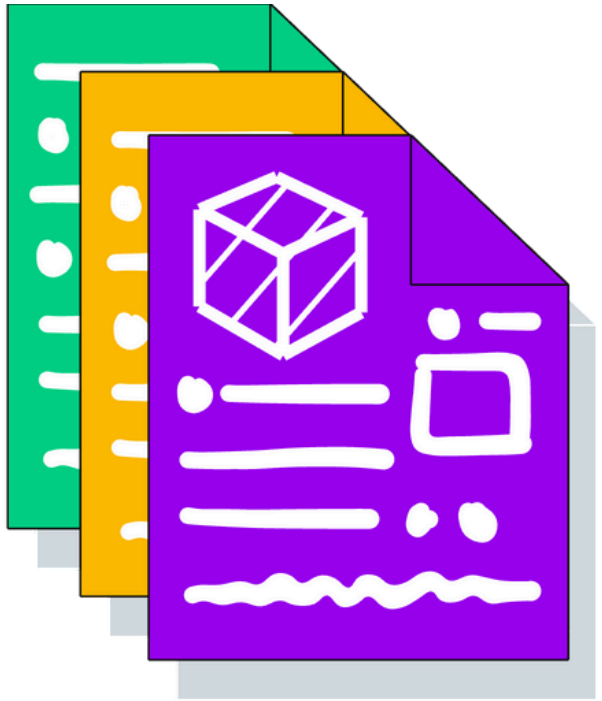
Create New Provider Interfaces – To ingest and process data



EHR Healthcare – Executive Statement

Current Approach: On-premises strategy worked successfully for years

- **High Effort**: Major investment for team training
- **Complex Operations**: Teams managing similar but separate environments
- **Frequent Outages**: Caused by misconfigured systems and capacity limits
- **Monitoring Gaps**: Inconsistent practices led to delayed responses



Future Direction: Use Google Cloud to build scalable, resilient, multi-environment platform

EHR Healthcare – A Few More Details

Web-based customer-facing applications running on Kubernetes clusters

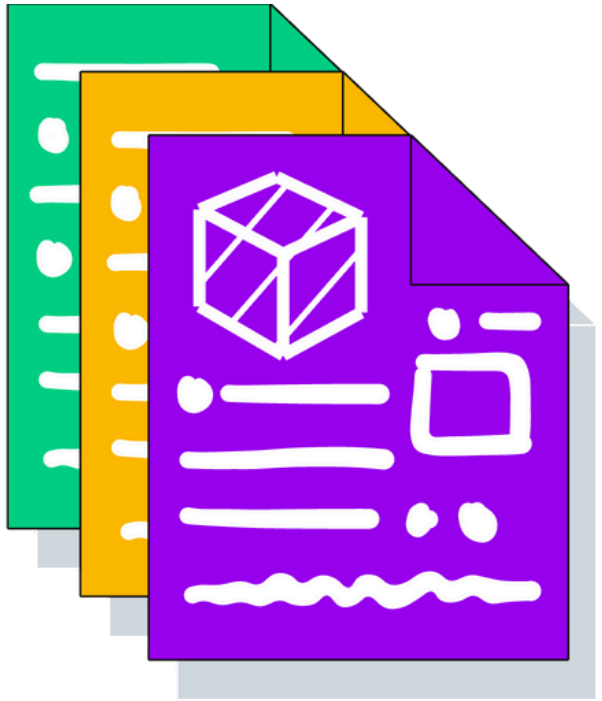
- Requirement: Consistent way to manage container apps
- Requirement: Manage multiple container-based environments

Legacy file- and API-based integrations with insurance providers

- Scheduled for replacement over next few years - Will NOT be moved to Google Cloud

Facing outages: With mis-configured systems

- Inadequate capacity to manage spikes



Case Study - EHR Healthcare - Discussion

Service	Discussion
Anthos	Run Kubernetes clusters anywhere (cloud and on-premises) Config Mgmt - Central policies - Kubernetes API, Service Mesh, Access control Service Mesh (dashboards, logging, monitoring, distributed tracing) CI/CD - Watch for updates in the Git repository and applies changes to all relevant clusters automatically
Cloud Logging, Cloud Monitoring	Alerting Policies for Notifications
Cloud Logging > (Cloud Storage, BigQuery)	Log Retention
BigQuery	Make predictions and generate reports on industry trends Batch: Cloud Storage > Dataflow > (BigQuery, ...) Stream: Cloud Pub/Sub > Dataflow > (BigQuery, ...)

Case Study - EHR Healthcare - Discussion - 2

Service	Discussion
Cloud Dedicated Interconnect	Secure and high-performance connection
Cloud CDN	Reduced latency
Active Directory Federation Services (AD FS)	For single sign-on Google Cloud Directory Sync (synchronize users and groups from Active Directory to Cloud Identity)
Databases	MySQL, MS SQL Server => Cloud SQL Redis => Memorystore MongoDB => (Deploy using Cloud Marketplace or Use Datastore)

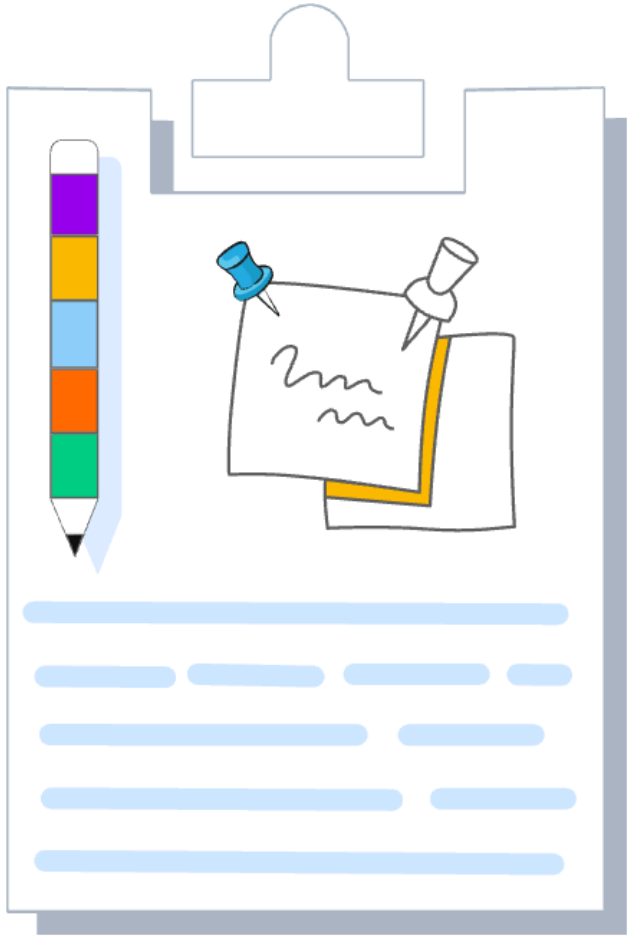
KnightMotives Automotive Case Study – Overview

Who: Global car manufacturer specializing in autonomous and self-driving vehicles

- **Product Range**: Battery Electric Vehicles (BEVs), Hybrids, & Internal Combustion Engine (ICE) cars

Current Status: BEVs feature modern in-vehicle systems, but hybrid and ICE models lag behind

Market Challenge: Outdated technology in hybrids and ICE vehicles causing declining sales and satisfaction



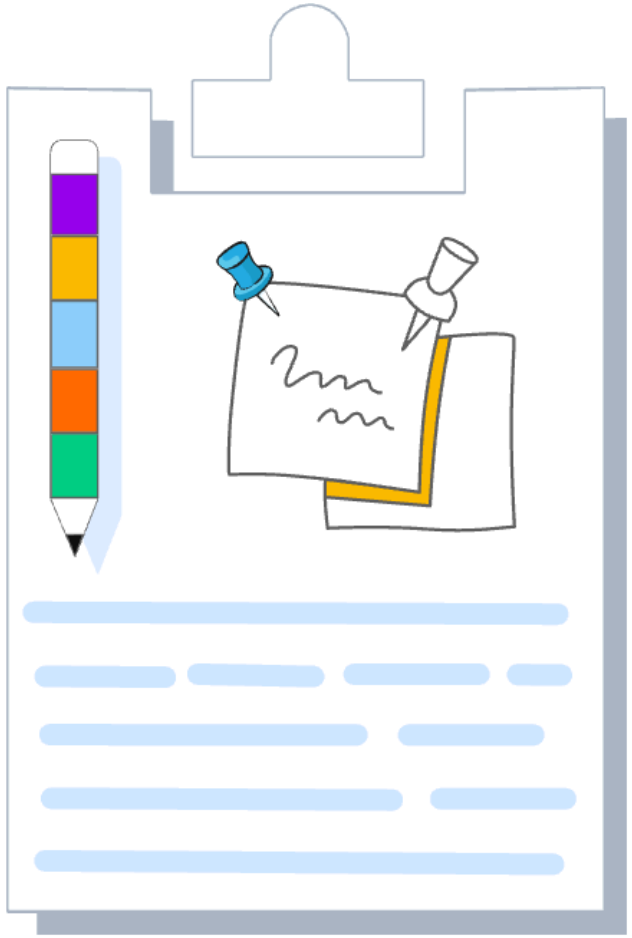
KnightMotives Automotive Case Study – Overview - 2

Vision: Modernize the consumer experience across all vehicle types within five years

Opportunity: Use Artificial Intelligence to transform in-vehicle, shopping, and service experiences

Dealer Challenge: Online ordering system unreliable and straining dealer relationships

Goal: Enhance dealer tooling and data reliability for built-to-order vehicles and customer satisfaction



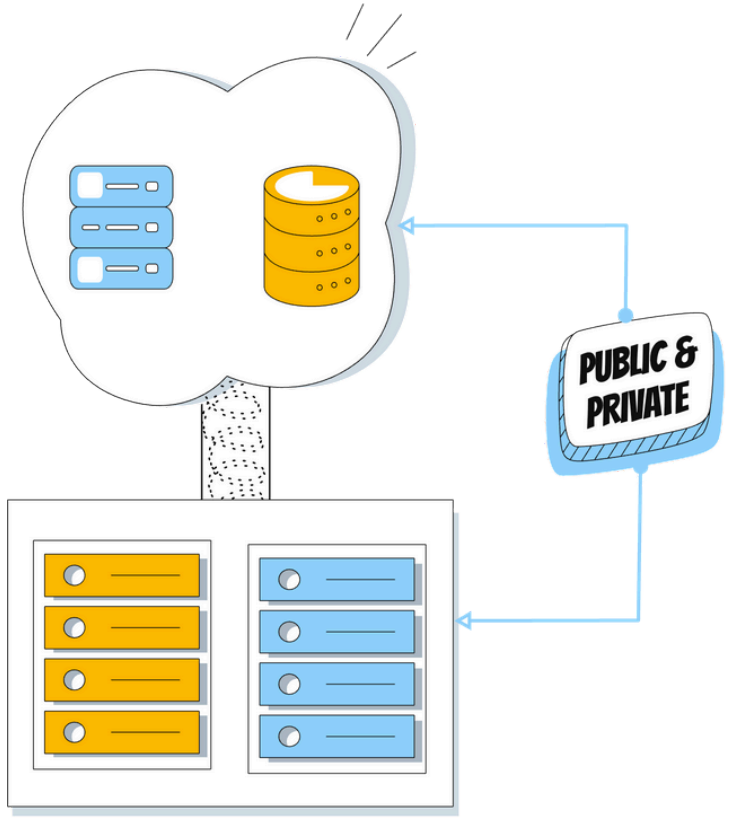
Existing Technical Environment – KnightMotives Automotive

Infrastructure: Mostly on-premises with few workloads on major cloud platforms

- **Core Systems**: Supply chain & ERP on outdated mainframes
  - **Limitation**: Hard to launch new promotions and dealer discounts
- **Dealer Constraint**: Limited budget for h/w upgrades
- **Connectivity Gaps**: Unreliable links to manufacturing plants and rural vehicles

Code Fragmentation: Multiple code bases across vehicle models

- **Technical Debt**: Heavy backward compatibility requirements slowing innovation



Business Requirements – KnightMotives Automotive

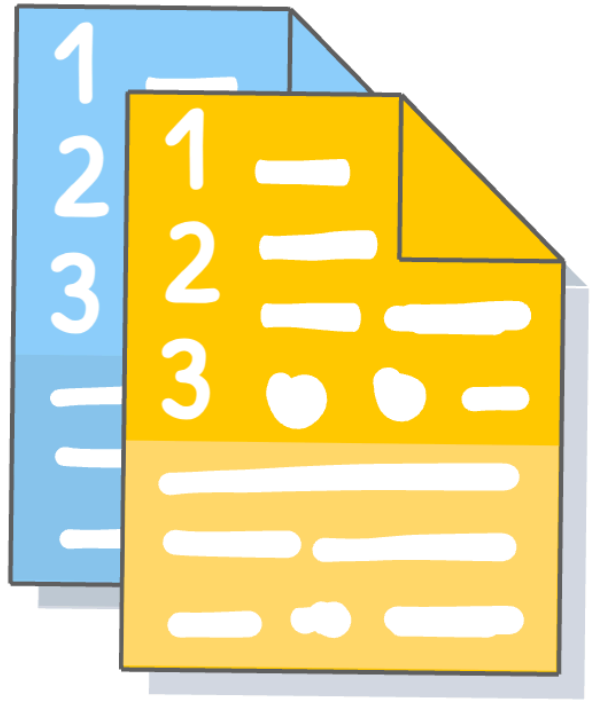
Personalized Experience: Build deeper, data-driven relationship with every driver

- **Unified Experience**: Deliver consistent in-vehicle experience across all models

Build-to-Order Efficiency: Improve dealer-customer transparency

Data Monetization: Leverage corporate data to fund AI and innovation investments

Security Priority: Strengthen protection following past data breaches



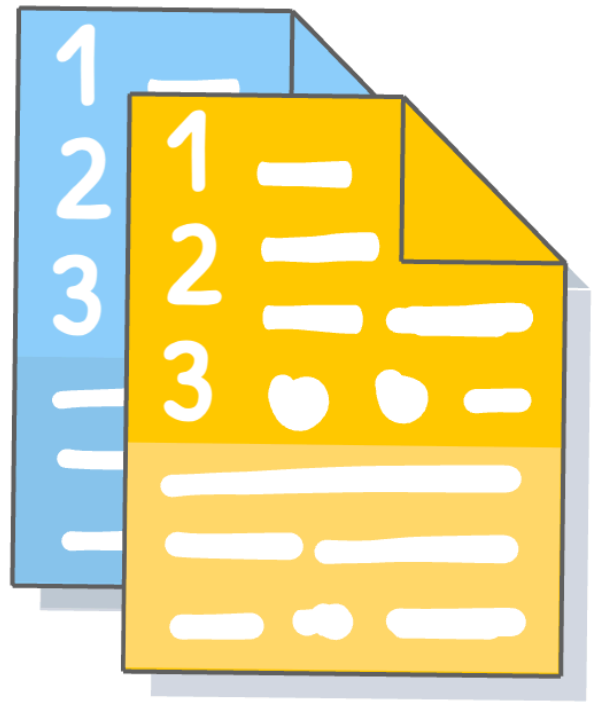
Business Requirements – KnightMotives Automotive - 2

Regulatory Focus: Ensure compliance with EU data protection laws

AI Investment: Expand fully autonomous driving in favorable regions

Workforce Enablement: Upskill employees and attract top technical talent

Cross-Team Collaboration: Foster stronger communication between business and tech teams



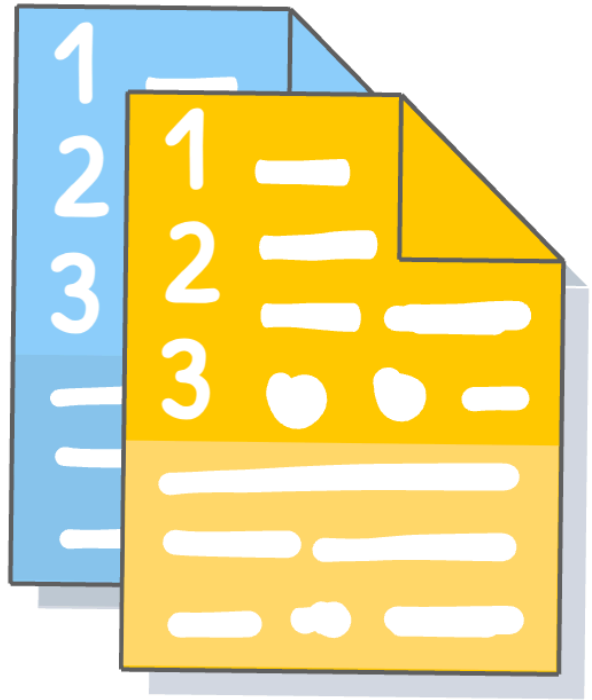
KnightMotives Automotive – Technical Requirements

Modern In-Vehicle Experience: Unified AI-powered UX across all models by upgrading legacy hardware and software

Reliable Connectivity: Strengthen network infrastructure for rural vehicle communication

Cloud Modernization: Hybrid strategy to modernize IT (& phase out legacy platforms)

Autonomous Vehicle Development: Invest in AI, ML, and simulation for testing and regulatory compliance

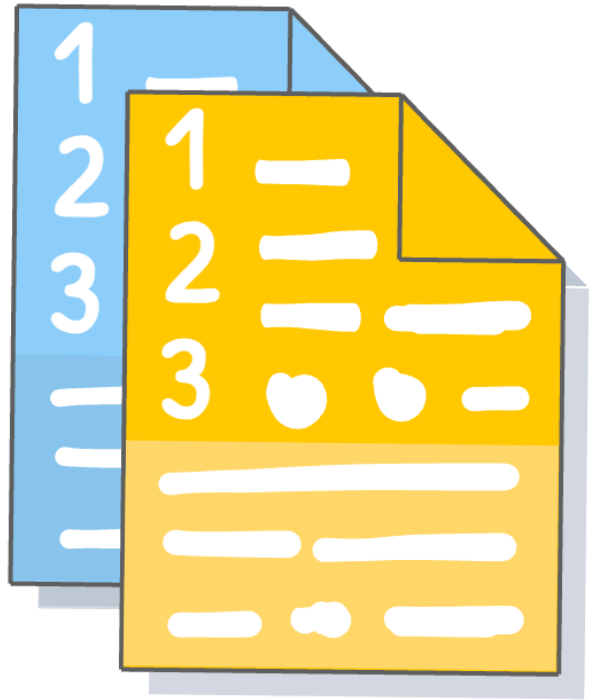


KnightMotives Automotive – Technical Requirements - 2

Data & Insights: Build secure, scalable platform for data management, monetization, and AI-driven analytics

Security & Risk Management: Establish comprehensive security framework, response plan, and employee awareness

Dealer & Customer Experience: Enhance build-to-order system, dealer tools, and CRM for seamless engagement



KnightMotives Automotive – Executive Statement

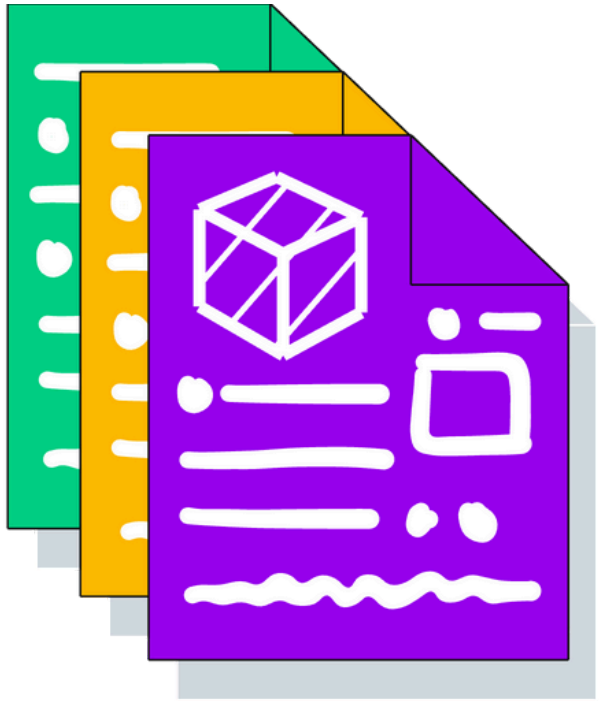
Commitment: Enhance safety and save lives through intelligent data use

Data Foundation: Leverage driving behavior, road conditions, and crash statistics

AI Excellence: Consistently outperform national safety benchmarks

Unified Experience: Deliver the trusted KnightMotives experience across all models

Vision: Create compelling, data-driven digital experiences for every driver



KnightMotives Automotive – Discussion

Service	Discussion
Android Automotive OS, ChromeOS - Automotive, Cloud IoT Core	Enable modern, connected in-vehicle infotainment and UX systems
Vertex AI, Gemini Models, Dialogflow CX	Build AI-powered voice assistants and contextual in-vehicle interactions
Pub/Sub, Dataflow, BigQuery	Stream and process telematics data from connected vehicles
Edge TPU, Vertex AI Edge Manager	Deploy ML models locally for real-time vehicle decisions
Vertex AI Simulation, Dataflow, BigQuery ML	Simulate road conditions and driving behavior for model training
Vertex AI Explainable AI	Ensure interpretability and compliance in autonomous driving models

KnightMotives Automotive – Discussion - 2

Service	Discussion
Google Kubernetes Engine (GKE), Anthos	Migrate on-prem workloads to hybrid cloud with consistent management
Cloud Interconnect, HA VPN, Private Service Connect	Ensure reliable connectivity between plants, dealers, and vehicles
Apigee API Gateway	Unify legacy systems through secure APIs for dealers and ERP systems
BigQuery, BigLake, Dataplex, Looker	Unified data analytics and monetization platform
Security Command Center / DLP API	Data protection, risk visibility, compliance enforcement