Persistent | Google Cloud

Accelerating AWS to Google Cloud Modernization in the Agentic Era

A Deterministic, Human-in-the-Loop Framework for Enterprise Cloud Transformation





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Executive Summary

Enterprise cloud strategies have reached an inflection point. While moving virtual machines between clouds offers marginal infrastructure savings, true competitive advantage is realized by adopting Google Cloud native data, compute and serverless ecosystem.

However, traditional enterprise migrations across complex environments spanning Amazon EKS, ECS, Lambda, relational databases (RDS, PostgreSQL) and object storage have historically been fraught with high engineering friction, prolonged delivery timelines and risk of operational downtime. Ad-hoc GenAI prompting attempts to bridge this gap, but raw Large Language Models (LLMs) often hallucinate non-existent parameters, omit critical security perimeters and lack persistent state across multi-week initiatives. Moving that estate to Google Cloud has historically meant months of manual discovery, spreadsheet-driven planning, hand-written conversion and long, fragile test cycles. The result was a strong pull toward lift-and-shift, which moves the cost and the technical debt together.

Agentic modernization turns an AWS-to-Google Cloud migration from a years-long, people-limited project into a supervised, evidence-driven pipeline where AI agents do the analysis, conversion and testing and humans own every decision that carries risk.

This e-book outlines an enterprise framework combining the generative speed of Agentic AI with Deterministic Compiler Guardrails and Human-in-the-Loop (HITL) governance keep architects, database owners, security and compliance officers in control of the decisions that matter: target design, data cutover, control mappings and go-live.

In it, specialized agents built on Google Gemini take on the repetitive, high-volume work: discovering the estate, mapping dependencies, proposing target architectures, converting code and infrastructure, generating tests and collecting compliance evidence.

Co-engineered through deep engineering collaboration between Persistent and Google Cloud this framework provides an automated, reviewable and compliant modernization factory.

What you will take away:

- A clear before-and-after picture of modernization, from the manual landscape to the agentic one.
- A service-by-service view of how EKS, ECS, Lambda, RDS, PostgreSQL, storage and other managed services map to Google Cloud and what changes beyond the mapping.
- How Persistent, working with Google Cloud, packages agents, accelerators and human oversight into a repeatable modernization factory.
- How regulatory and compliance obligations are preserved by design rather than re-verified at the end.
- How workloads are validated after modernization, so that sign-off rests on evidence and not on confidence.

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Chapter 01

The Modernization Landscape — Earlier v/s Agentic Era

01

1.1 The Legacy Migration Paradigm (The "Earlier World")

In traditional migration programs, modernization across disparate AWS primitives (EKS, ECS, Lambda, RDS, S3, IAM) into Google Cloud target equivalents was hampered by significant structural friction:



Semantic Divergence:
Translating AWS-specific patterns—such as ECS Task Definitions, IAM instance profiles, or SQS-triggered Lambda workers—into Kubernetes specs or Google Cloud Run invocations required tedious manual translation.



Configuration Drift and Unknown Dependencies:
Legacy services accrued years of uncataloged environment variables, undocumented network security group couplings and hidden database triggers.



Discovery by interview and spreadsheet.
Teams exported inventories, chased application owners and reconciled CMDB records that were often out of date.



Conversion by hand.
Engineers rewrote CloudFormation as Terraform, adapted Lambda handlers, translated IAM policies and converted database code one stored procedure at a time.

60%

The Validation Bottleneck:
Because manual test suites could only exercise a fraction of production runtime scenarios, engineers spent up to 60% of migration cycles on testing, regression triaging and defect mitigation.

The consequences were predictable: long timelines, cost overruns, scope cut back to lift-and-shift and cutover weekends defined by anxiety.

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1.2 The Agentic Modernization Paradigm

The Agentic Era replaces manual, siloed steps with a collaborative swarm of specialized AI agents coordinated by an intelligent platform orchestrator:

01 Autonomous Decomposition

Multi-modal agents ingest codebases, CloudFormation scripts and live AWS telemetries to build unified Abstract Syntax Trees (ASTs) and application dependency graphs.

02 Context-Aware Transpilation

Code, data structures and infrastructure definitions are converted with semantic fidelity rather than simple keyword substitution.

03 Closed-Loop Self-Correction

When compilation, static security scanning, or unit validation fails, agents analyze stdout/stderr logs, iteratively correct the code and re-test before human escalation.

04 Strategic Modernization Over "As-Is" Shifting

Workloads are systematically elevated to cloud-native target architectures—converting rigid VMs into serverless containers or replatforming legacy relational bottlenecks to distributed, scalable Google Cloud engines

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1.3 The Modern Agentic Era with HITL Governance

The modern approach pairs LLM reasoning with deterministic verification engines, operating strictly within a review-first, GitOps-native framework. Agents execute heavy discovery, code transformation, IaC generation and validation, while human engineers retain explicit approval gates over architecture decisions, IAM grants and production cutovers.

Ask this first	Scope this	Start with
Discovery Depth	Manual spreadsheets; incomplete dependency mapping.	Agent-led live API + repo scanning; continuous dependency graph building.
Assessment	Sampled, workshop-driven	**Every workload scored**: code, data, runtime, compliance and cost signals.
Target Design	Architect drafts from experience	**Agent proposes options** with trade-offs and cites evidence; architect approves.
Code & IaC Translation	Hand-crafted Terraform & Kubernetes YAML.	**Context-aware translation** with automated API/syntax remapping. Agents convert and refactor; engineers review diffs and edge cases.
Verification & Safety	Manual peer review; errors caught during deployment.	**Hybrid Verification**: Offline compiler checks (terraform validate, manifest contracts) before output.
Compliance	Assembled at the end	Controls mapped up front, **policy-as-code enforced**, evidence collected continuously.
Deployment Model	Direct console/API execution ("ClickOps")	**GitOps-Native PRs:** All changes submitted as reviewable Pull Requests.

1.4 What does not change

Agents do not remove accountability. Data owners still own data, security teams still own risk acceptance and business owners still decide priorities. The change is that these people decide with better evidence, sooner and across the whole estate rather than a sample of it.

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Chapter 02

The Modernization Spectrum — Service-by-Service Translation

02

Modernizing from AWS to Google Cloud requires cross-cloud mapping across compute, serverless runtimes, databases, storage and networking layers. Specialized agents handle the underlying nuances of each transition.

Modernization approach across 10 service domains



Refactor X3 Replatform X2 Modernize X3 Optimize X1 Decouple X1

AWS SOURCE → GOOGLE CLOUD TARGET	MODERNIZATION APPROACH & AGENT ACTION
KUBERNETES Amazon EKS → GKE Autopilot	**Refactor** Translate EKS manifests, Helm charts, IRSA bindings and ALB ingresses to GKE Gateway API and Workload Identity. Eliminate node management via Autopilot.
CONTAINERS Amazon EKS → Cloud Run / GKE	**Replatform** Convert ECS task definitions into OCI-compliant container definitions and Cloud Run
VM COMPUTE Amazon EC2 → Compute Engine / GKE	**Modernize** Utilize Migrate to Containers agent capabilities to extract application layers into
SERVERLESS Amazon EKS → Cloud Run / GKE	**Refactor** Decouple proprietary Lambda handlers and event sources into standard HTTP/CloudEvents web services (Flask/Express/Go)

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AWS SOURCE → GOOGLE CLOUD TARGET	MODERNIZATION APPROACH & AGENT ACTION
RELATIONAL DB Amazon RDS / Aurora → AlloyDB / Cloud SQL	**Replatform & Upgrade** Schema translation via DMS preflight checks; upgrade PostgreSQL workloads to AlloyDB to leverage its columnar engine for HTAP analytics.
NOSQL DB Amazon DynamoDB → Cloud Bigtable / Firestore	**Refactor** Restructure data access patterns into Firestore for real-time document synchronization or Bigtable for continuous, high-throughput time-series ingest.
OBJECT STORAGE Amazon S3 → Cloud Storage (GCS)	**Optimize** Migrate object data via Storage Transfer Service; implement automated lifecycle rules across Standard, Nearline, Coldline and Archive tiers.
NETWORKING AWS ALB / NLB → Cloud Load Balancing	**Modernize** Map multi-region ALBs to Google Cloud Global Anycast Load Balancing, eliminating complex DNS failover logic.
DATA WAREHOUSE Amazon Redshift → BigQuery	**Modernize** Automated SQL dialect translation via BigQuery Migration Service; transition to serverless analytical processing without vacuum/cluster overhead.
MESSAGING AWS SQS / SNS → Pub/Sub / Cloud Tasks	**Decouple** Map SNS/SQS event sources to global Pub/Sub topics or Cloud Tasks for rate-controlled asynchronous processing.

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2.1 Workload by Workload- Deep Dive

Modernization requires shifting operational burden to Google's managed and serverless offerings. The table below maps standard AWS services to their cloud-native Google Cloud equivalents, detailing the automated modernization path executed by agents.

2.1.1. Containers

Amazon EKS & Amazon ECS Google Kubernetes Engine (GKE) & Cloud Run

The Complexity: AWS ECS task definitions rely on proprietary JSON schemas, AWS-specific network modes (awsvpc) and task execution IAM roles. In EKS, ingress controllers (ALB Ingress), CSI drivers and IAM Roles for Service Accounts (IRSA) tie workloads closely to AWS infrastructure.

The Agentic Pipeline

01 ECS-to-GKE/Cloud Run Agent

Ingests task definitions, service definitions and task placement policies. The agent evaluates whether microservices should be deployed as modern GKE deployments or serverless Cloud Run containers (ideal for stateless, bursty APIs).

02 Spec Conversion & CRD Modernization

Converts ECS container definitions into production-grade Kubernetes YAML manifests (Deployments, StatefulSets, Services, Horizontal Pod Autoscalers).

03 Identity Transpilation

Translates AWS IRSA configurations into Google Cloud Workload Identity Federation, linking Kubernetes service accounts directly to Google Cloud IAM roles without static keys.

04 Ingress & Networking

Transforms AWS Application Load Balancer annotations into Google Cloud GKE Gateway API or Managed Ingress specs, standardizing TLS and traffic routing.

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2.1.1. Serverless

AWS Lambda → Google Cloud Functions & Cloud Run

The Complexity: Lambda code is heavily coupled with AWS SDK bindings (boto3, @aws-sdk), AWS context parameters, dead-letter queues (DLQ) and proprietary event payloads (S3 Event Notifications, DynamoDB Streams, API Gateway V2 payloads).

The Agentic Pipeline

01 SDK Decoupling Agent

Analyzes source code ASTs, isolating AWS SDK calls and swapping them with idiomatic @google-cloud client libraries.

02 Trigger & Ingestion Refactoring

Maps AWS event schemas to Google Cloud CloudEvents and Pub/Sub push/pull triggers.

03 Runtime Optimization

Workloads exceeding standard serverless quotas are refactored by the agent into containerized Cloud Run services, lifting cold-start restrictions, supporting concurrency scaling up to 1,000 requests per container and reducing compute footprint.

2.1.3. Databases

Amazon RDS / Aurora (PostgreSQL, MySQL) → AlloyDB & Cloud SQL

The Complexity: Cross-cloud database modernization involves dialect-specific stored procedures, proprietary extensions (e.g., PostGIS, pgcrypto), parameter tuning, connection pooling and continuous delta replication under strict cutover windows.

The Agentic Pipeline

01 Schema & Code Assessment Agent

Scans schema definitions, table indexes, partition logic and query histories. Identifies proprietary extensions, complex stored procedures and triggers requiring modernization.

02 Trigger & Ingestion Refactoring

Rewrites legacy queries to leverage AlloyDB for PostgreSQL's columnar engine and analytical accelerators, delivering up to 4x transactional performance over standard PostgreSQL.

03 Migration Orchestration

Provisions Google Cloud Database Migration Service (DMS) or continuous replication jobs, monitors Change Data Capture (CDC) replication lag and manages cutover steps to minimize downtime.

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AWS Source	Typical Google Cloud Target	Migration Approach
RDS for PostgreSQL	Cloud SQL for PostgreSQL, or AlloyDB for PostgreSQL	Database Migration Service with continuous replication
Aurora PostgreSQL	AlloyDB for PostgreSQL	Logical replication or Database Migration Service; validate extensions
RDS for MySQL and Aurora MySQL	Cloud SQL for MySQL	Database Migration Service, binlog-based replication
RDS for SQL Server	Cloud SQL for SQL Server	Backup and restore or log shipping, then cutover
RDS for Oracle	Cloud SQL alternatives, Oracle on Google Cloud, or conversion to PostgreSQL	Strategy decision first; conversion tooling and code refactor if converting
Amazon DynamoDB	Bigtable, Firestore or Spanner	Access-pattern analysis decides the target
Amazon ElastiCache	Memorystore	Configuration and eviction policy mapping
Amazon Redshift	BigQuery	Schema, SQL dialect and workload conversion
Amazon DocumentDB and Neptune	Firestore or MongoDB-compatible options; graph alternatives	Case-by-case assessment

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2.1.4. Storage & Messaging

Amazon S3 & SQS/SNS/MSK → Google Cloud Storage (GCS) & Pub/Sub

The Complexity: Moving petabytes of data requires complex policy rewrites (Bucket Policies → Uniform Bucket-Level IAM), lifecycle transition mappings and re-architecting event distribution pipelines.

The Agentic Pipeline

01 Schema & Code Assessment Agent

Deploys and manages the Google Cloud Storage Transfer Service, orchestrating data movement across standard, Nearline, Coldline and Archive classes while validating checksums via MD5 and CRC32C.

02 Event Bus Modernization

Decouples proprietary AWS SNS fanout and SQS dead-letter patterns, modernizing them into Google Cloud Pub/Sub schemas or enterprise Confluent Cloud on Google Cloud, including automatic dead-letter topic bindings and message retention alignments.

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Chapter 03

Modernization Agents with Human-in-the-Loop (HITL), Persevering Regulatory, Security and Compliance Postures

03

True enterprise readiness requires balancing automated agent agility with strict, auditable human oversight. The Persistent modernization framework enforces a multi-tier agent architecture where autonomous agents propose actions, execute safe steps and systematically pause for human validation at critical operational gates.

Tier 1 **Act and report**	Tier 2 **Propose and approve**	Tier 3 **Prepare and decide**	Tier 4 **Human only**
Agent behavior Agent acts on its own and logs what it did	**Agent behavior** Agent prepares a change and waits for approval	**Agent behavior** Agent assembles evidence; a human decides and executes or authorizes	**Agent behavior** Agent has no authority
Examples Inventory, dependency mapping, documentation, test generation, sandbox deployments	**Examples** Target architecture, code diffs, Terraform plans, IAM bindings	**Examples** Data cutover, production traffic shift, decommissioning source resources	**Examples** Risk acceptance, regulatory attestations, exceptions to control mappings
Spot-check reports	Review and approve	Decide, with rollback plan	Own the decision

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HITL works when agents are autonomous in reversible, low-risk work and stop for a named human at every decision that is irreversible, regulated or costly to reverse.



Each gate has a fixed evidence pack that the agents assemble: what changed, what was tested, what differed from the source, which controls apply and what the rollback plan is. The approver sees the evidence in one place and records a decision, so the audit trail captures who approved what and why.

Phase	Focus	Key outputs	Gate
0. Mobilize	Objectives, governance, agent guardrails, compliance scope	Charter, control catalog, agent access model	Gate 1
1. Discover and assess	Full estate discovery, dependency graph, strategy per workload	Wave plan, target-state options, business case	Gates 1 to 2
2. Landing zone	Organization, projects, networking, identity, logging, policy-as-code	Approved landing zone, baseline evidence	Gate 5 (baseline)
3. Pilot wave	A few representative workloads across compute, data and storage	Proven patterns, measured effort, tuned agents	Gates 3 to 6
4. Scale waves	Factory execution across the estate in parallel streams	Migrated workloads, evidence packs, updated pattern library	Gates 3 to 6 per wave
5. Optimize and decommission	FinOps, SLO tuning, source decommission	Cost and performance report, decommission approvals	Gate 7

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3.1 The Three Cardinal HITL Gates

GATE 1 Architectural Blueprint & Sizing Approval

AGENT ROLE	HUMAN ACTION
Analyzes AWS utilization telemetry, discovers hidden dependencies, right-sizes compute and memory and generates target Google Cloud architecture blueprints (Terraform Cloud Foundation Fabric).	Lead Enterprise and Cloud Architects review cost-optimization curves, resource sizing assumptions, network ingress boundaries and target topology before infrastructure is provisioned.

GATE 2 Code Transpilation & Blast-Radius Diff Analysis

AGENT ROLE	HUMAN ACTION
Synthesizes Kubernetes manifests, converts Lambda functions into Cloud Run code, rewrites SQL procedures and resolves compilation errors in a self-healing loop.	Application Owners and Security Engineers review semantic code diffs, verify external dependencies, inspect sensitive variable handling and sign off on container base image security profiles.

GATE 2 Cutover Validation & Data Parity Sign-Off

AGENT ROLE	HUMAN ACTION
Executes automated dual-run test suites, measures CDC replication drift, validates row counts and cryptographic checksums and assesses network canary health.	Platform Operations and Line-of-Business (LOB) stakeholders verify transaction parity metrics and authorize final DNS and network cutover to Google Cloud.

3.2 Compliance-as-Code in the Pipeline

The compliance agent converts a customer's control catalog into automated checks. Terraform plans are scanned against Organization Policy and custom policy rules; container images are scanned and signed; identity bindings are compared with approved patterns; encryption and location settings are verified before deployment. A failed check blocks promotion and routes an exception to the owner. The result is a living, queryable record of which control applies to which resource and whether it passed.

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Open Policy Agent (OPA) Gatekeeper

Every Kubernetes manifest generated by modernizing agents is pre-screened against strict policy constraints. Containers attempting to run as root, lacking resource limits, or missing image attestation are automatically rejected.

Binary Authorization on GKE

Ensures that only cryptographically signed container images created through verified Google Cloud Build or GitHub Actions pipelines can execute on production clusters.

Terraform Sentinel & Config Validator

Infrastructure templates are inspected for compliance before deployment, verifying that no storage buckets or database instances can be exposed to public networks.

3.3 Preserving Regulatory and Compliance Posture

Compliance is preserved by treating controls as code from the first day of the program, so every migrated workload lands inside guardrails and produces its own evidence.

Principles

01 Controls first, workloads second

The landing zone enforces guardrails before any workload arrives.

02 Map, do not assume

Every control in force on AWS is mapped to a Google Cloud equivalent and gaps are documented and owned.

03 Continuous evidence

Evidence is collected automatically during migration, not reconstructed afterward.

04 Shared responsibility stays explicit

Google Cloud secures its platform and holds relevant certifications; the customer remains responsible for configuration, data and access. The program documents that split for auditors.

05 Humans attest

Agents gather and organize evidence; compliance officers make attestations.

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3.4 Data Encryption and Privacy by Design

01 CMEK Everywhere

Persistent agents configure Cloud Key Management Service (KMS) across all targets (Cloud Storage, AlloyDB, Cloud SQL, Persistent Disks), aligning encryption policies with enterprise compliance standards.

02 Sensitive Data Protection (Cloud DLP)

During migration discovery and data transfer, automated DLP agents identify, mask, or tokenize Personally Identifiable Information (PII) and Protected Health Information (PHI) before migration into test or lower Google Cloud environments.

03 Identity and Access Management (IAM)

AWS IAM roles and complex nested policies are restructured into Google Cloud granular role hierarchies. Agents enforce **Principle of Least Privilege (PoLP)** and automate **Segregation of Duties (SoD)** controls to eliminate privilege creep.

AWS IRSA to Google Cloud Workload Identity

The Security Agent automatically parses AWS IAM roles attached to EKS service accounts, translates them into Google Service Accounts (GSAs) and generates precise Workload Identity annotations.

Least-Privilege Optimization

Instead of translating broad wildcard permissions (s3:*), agents inspect historical AWS CloudTrail access logs to generate minimal, role-specific Google Cloud IAM bindings.

3.5 Security Perimeter & Data Isolation Architecture

01 VPC Service Controls (VPC-SC)

Agents automatically scaffold VPC Service Control perimeters within generated Terraform blueprints, isolating sensitive data stores (Cloud SQL, AlloyDB, BigQuery) from unauthorized egress.

02 Secret Management

AWS Secrets Manager assets are mapped directly to Google Cloud Secret Manager. Credentials and private service account keys are never hardcoded or stored in persistent agent state.

03 Read-Only Agent Access

During discovery, agents utilize read-only AWS IAM roles (SecurityAudit, ReadOnlyAccess), ensuring source production environments remain completely un-mutated.

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Chapter 04

The Persistent Systems & Google Co-Innovation Advantage

04

Persistent System's Google Business Unit (GBU) provides specialized IP, tooling and delivery expertise that set its modernization capabilities apart from generic cloud migration methods.

4.1 Persistent Differentiation

Strategic Dimension	The Persistent + Google Engineering Edge	
Recognition & Scale Modernization Partner	Winner of Google Cloud Modernization Partner of The Year-2025	Recognised as Partner of The Year in Supply Chain and Logistics
	30+ Experience migrating 30+ AWS- Google Cloud Customer	**5000+** Track record of migrating 5000+ Microservices and moving over 100 PB of mission critical data

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Proprietary IP: QSuite, SUREedge and GalaxyONE	**Built on Gemini to automate Quality Engineering - Autonomous test generation, AST Code, refactoring across legacy and modern cloud stacks** **Autonomous Test Synthesis:** Analyzes source AWS application behaviors and automatically generates corresponding Google Cloud unit, contract and end-to-end integration test suites. **Automated Code Parsing:** Proprietary transpilation engines parse application source files (Java, Python, Node.js, Go) to substitute AWS dependencies with native Google Cloud idioms. **SUREedge Modernization Agents:** Enables zero-downtime, block-level and application-consistent system transformations for mission-critical enterprise workloads. GalaxyOne- Orchestrate end to end development right from BRD/PRD to Design-Development-Deployment (including Spec to Code and Code to Spec)
Engineering Governance	**Intelligent Platform Operations Portal integrating automated tenant onboarding, IAM entitlements, catalog and live Gemini Cloud Assist telemetry**
Engineering Led Economics	**Delivers high-touch, domain-tailored engineering at nearly half the cost profile of standard Professional Services (PSO) backed by dedicated Onshore Resident Architects.**

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4.2 Google-Native GKE Migration Agent

Google's open-source GKE Migration Agent acts as a specialized, compiler-grade transformation plugin designed around strict deterministic guardrails:

01 Deterministic State Graph

Workflows are orchestrated via server-controlled Directed Acyclic Graphs (DAGs) that strictly enforce prerequisite execution steps.

02 GCS Workspace Ledger

Multi-persona state (Migration Admin, Platform Engineer, Workload Owner) is persisted in Cloud Storage buckets, ensuring seamless, asynchronous handoffs across teams.

03 Review-First GitOps Model

The agent never applies infrastructure changes directly to live clusters; all outputs are emitted as structured Pull Requests.

4.3 Persistent Systems (PSL) Modernization Agent

The **PSL Modernization Agent** extends this model across the entire enterprise estate, expanding functional execution beyond Kubernetes:

01 Broad Service Coverage

Extends automated assessment, refactoring and execution across EKS, ECS, EC2, RDS, PostgreSQL, Lambda and S3.

02 Live Source Discovery & Application Analysis

Combines live AWS API resource calls with deep static analysis of underlying GitHub application code.

03 Automated Cloud Build Execution

Executes long-running migration operations through managed Cloud Build pipelines, returning tracked execution links, generated artifacts and network prerequisites directly to engineers.

04 Self-Healing & Runtime Remediation

Features automated remediation and rollback pathways for specific, coded deployment failure modes.

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4.4 Selective Modernization Over Plain Migration

While commodity migration programs focus solely on lift-and-shift compute relocations, Persistent champions Selective Modernization:

01 Upgrading unmanaged database clusters directly to managed, auto-scaling Google Cloud primitives (AlloyDB, Cloud SQL).

02 Decomposing brittle ECS monolithic tasks into clean, autoscaled GKE Autopilot workloads or lightweight Cloud Run microservices.

03 Embedding Site Reliability Engineering (SRE) practices, automated Golden Signals monitoring and policy guardrails into CI/CD pipelines from day one.

4.5 Multi-Agent Architecture Stack

Under the hood, specialized sub-agents coordinate specific domain tasks under human oversight:

01 Program Orchestrator Agent

Maintains wave timelines, manages inter-service dependencies and presents go/no-go recommendations to human leads.

02 Discovery & Dependency Agent

Ingests Migration Center exports, AWS CloudTrail/Config data and source code to map application-level service calls.

03 Compute Modernization Agent

Parses Kubernetes manifests/Helm charts, translates deprecated APIs and generates GKE Autopilot and Cloud Run IaC.

04 Serverless Refactoring Agent

Refactors Lambda code into standard HTTP container handlers, generates Dockerfiles and configures Cloud Build triggers.

05 Data & Database Agent

Configures Database Migration Service (DMS) replication tasks, translates stored procedures and optimizes schemas for AlloyDB.

06 Security & IAM Agent

Maps AWS IAM policies and IRSA roles into Google Cloud Service Accounts and Workload Identity bindings.

07 Validation & Quality Agent

Executes syntax checks, contract validations and dual-run parity tests before cutover.

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Chapter 05

Continuous Workload Validation & Post-Modernization Assurance

05

A critical flaw in legacy migrations is unvalidated cutover, where errors are discovered only after live customer traffic hits the destination environment. The joint Google/Persistent framework implements a multi-stage Hybrid Verification Engine.

5.1 Stage 1: Offline Deterministic Validation

Before any configuration is presented to human reviewers, LLM-generated code must pass rigorous automated local checks:

01 IaC Compilation:

Infrastructure modules are processed through terraform validate and tflint to verify syntax, required provider attributes and module structure.

02 Kubernetes Manifest Contracts

Generated YAML files are validated against OpenAPI schemas, ensuring no deprecated Kubernetes API versions are introduced.

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5.2 Stage 2: Schema & Data Integrity Parity

To ensure functional equivalence, verification agents run non-intrusive validation routines across data engines. Data stores undergo structured verification prior to application cutover:

Preflight Schema Audits

Database Migration Service (DMS) preflight checks validate table constraints, index compatibility and data-type mappings between AWS RDS/PostgreSQL and Cloud SQL/AlloyDB.

Row-Count & Checksum Parity

Automated validation agents perform asynchronous block checksums and row-count comparisons across active source and target databases.

Schema Integrity

Verifies that foreign keys, indexes, triggers and sequences match source specifications without corruption or truncation.

Storage Consistency

Scans object metadata, access control policies and bucket lifecycle rules to verify parity between Amazon S3 and Google Cloud Storage.

5.3 Stage 3: Dual-Run Shadow Execution & Cutover Gates

For critical Tier-0/Tier-1 workloads, the framework supports shadow dual-delivery:

01 **Shadow Traffic Routing:**

Live ingress traffic is mirrored (via Cloud Load Balancing or API Gateways) to both the active AWS deployment and the new Google Cloud environment.

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02 **Response Diff Analysis & Payload Comparison:**

Validation agents compare response payloads, latency metrics and error rates in real time, against live AWS production outputs, tracking latency percentiles (p95, p99), status code consistency and business logic execution. logging variance metrics.

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01 **Human-in-the-Loop Cutover Gate:**

Cutover requires explicit approval from the Migration Admin and Lead SRE. If latency or error thresholds breach pre-set limits, traffic is immediately re-routed entirely to AWS using tested rollback paths.

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02 **Chaos & Scalability Probes**

Workloads are tested against simulated peak traffic and regional failover events to confirm that autoscalers (GKE HPA, Cloud Run concurrency) perform as designed.

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Chapter 06

Modernization Execution Roadmap & Enterprise Proof Points

06

6.1 Phased Execution Roadmap

The modernization program operates across six distinct, governed phases

Phase	Timeframe	Primary Workstreams Active	Key Milestone / Output
Phase 0: Discovery	Weeks 1–4	Deployment of Migration Center direct discovery; live AWS API and repo scanning.	Full asset inventory, dependency graph and baseline TCO signed off.
Phase 1: Foundation	Weeks 3–6	Google Cloud Organization hierarchy, Landing Zone setup (Shared VPC, IAM, VPC-SC) via Terraform.	Production-ready landing zone live; Security & Compliance baseline verified.
Phase 2: Wave 0 (Pilot)	Weeks 5-8	1-2 low-risk workloads per domain (small EKS service, async Lambda, staging DB).	End-to-end agentic deployment pipeline validated; team enablement complete.
Phase 3: Wave 1 (Bulk)	Weeks 8–16	Stateless microservices, async batch workers, non-critical data stores.	40%+ of estate migrated; automated operational runbooks established.
Phase 4: Wave 2 (Core)	Weeks 14–24	Core application microservices, transactional databases, external API gateways.	Core business operations running on Google Cloud in shadow/dual-run mode.
Phase 5: Cutover	Weeks 22-30	Tier 0 customer-facing applications, primary transactional cutover, final DNS shift.	100% production traffic on Google Cloud; AWS decommissioning initiated.

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6.2 Real-World Enterprise Impact: Major E-Commerce Modernization

Persistent Systems deployed this cloud modernization strategy for one of the world's largest AWS-to-Google Cloud migrations, demonstrating the capability of governed agentic execution:

Scale of Migration

5,000+

Microservices migrated seamlessly from Amazon EKS to Google Kubernetes Engine (GKE).

100+ PB

of active enterprise data transferred to Google Cloud.

Multi-engine database migration

MySQL | PostgreSQL | Redis | MongoDB | DynamoDB | HBase

to managed Google Cloud database offerings.

Migration of **AWS Databricks environment to Google Cloud data layers.**

Business Outcomes Realized

30%+

Total Cloud Spend Reduction through Autopilot right-sizing and native Google Cloud TCO optimizations.

Zero

Unplanned Downtime across the entire multi-month migration window, maintaining business continuity during peak commercial events.

Accelerated Delivery:
Full migration of $30M+ ARR cloud workload executed in under 3 months.

Industry Recognition:
Recognized with the 2025 Google Cloud Infrastructure Modernization Partner of the Year Award (APAC).

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Conclusion & Next Steps

The transition from AWS to Google Cloud no longer requires choosing between the slow, manual friction of traditional refactoring and the dangerous unpredictability of unguided AI chat prompts. Agents with human-in-the-loop oversight relax that trade-off: they compress discovery, conversion and testing, while gates keep people in charge of the decisions that carry risk and compliance. By unifying Google Cloud's deterministic, audit-driven agent framework with Persistent's broad execution capabilities, deep domain expertise, industry context and a factory model organization can execute cloud modernization at unprecedented speed—safely, predictably and with compiler-grade precision.

Modernization is an ongoing journey. With an agentic factory approach, organizations can build the resilience, agility and technological foundation required to lead in the digital era.

A sensible next step is a short assessment engagement: let the agents map your estate, pick a pilot wave that spans compute, data and storage and measure real throughput and quality before committing to the full program.

To initiate your modernization assessment

01 **Deploy Google Cloud Migration Center for agentless asset discovery and right-sizing analysis.**

02 **Execute a Wave 0 Agentic Pilot to validate automated IaC translation and GitOps PR workflows against your primary EKS, ECS, or serverless repositories.**

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About Persistent

Persistent Systems (BSE: 533179 and NSE: PERSISTENT) is a global services and solutions company delivering AI-led, platform-driven Digital Engineering and Enterprise Modernization to businesses across industries. With over 28,500 employees located in 21 countries, the Company is committed to innovation and client success. Persistent offers a comprehensive suite of services, including software engineering, product development, data and analytics, CX transformation, cloud computing and agentic business automation. The Company is part of the MSCI India Index and is included in key indices of the National Stock Exchange of India, including the Nifty Midcap 50, Nifty IT and Nifty MidCap Liquid 15, as well as several on the BSE such as the S&P BSE 100 and S&P BSE SENSEX Next 50. Persistent is also a constituent of the Dow Jones Best-in-Class World Index. The Company has achieved carbon neutrality, reinforcing its commitment to sustainability and responsible business practices. Persistent has also been named one of America's Greatest Workplaces for Inclusion & Diversity 2025 by Newsweek and Plant A Insights Group. As a participant of the United Nations Global Compact, the Company is committed to aligning strategies and operations with universal principles on human rights, labor, environment and anti-corruption, as well as take actions that advance societal goals. With a 22% YoY growth in brand value, Persistent has been recognized as the Fastest Growing IT Services brand globally in the 2026 Brand Finance IT Services 25 report, among the world's Top 25 IT Services brands and ranks as the 12th strongest brand.

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