Scaling Welfare with Open Source: How NAV Migrated to Managed OpenSearch

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Driving the future of public sector technology through open source and community leadership.

Dima Kan

Product Director, Search at Aiven

- PhD in Applied Mathematics (2011, machine translation)
- Host of Vector Podcast & Blogging on Medium
- Contributor to Luke, Quepid, Lucene
- 20 years of experience in developing search engines & software for startups and multinational technology giants
- Teaching LLM + Search course at the University of Helsinki
- Previous roles:
  - Senior Product Manager at TomTom (Search Unit)
  - Principal AI Scientist / Head of Engineering at Silo.AI
  - Head of Search and AI at AlphaSense

Foundations of the Nordic Welfare Model

Social Investment

Citizens contribute a significant portion of their income to a collective fund, ensuring robust public services for everyone.

Universal Care

Essential services like healthcare and education are provided as a right to all citizens, regardless of their economic status.

Social Trust

Strong trust between citizens and the government fosters social cohesion and high-quality administration.

Focusing on long-term sustainability and equitable growth for the entire society.

Nav: Delivering the Welfare Promise

5.5M Residents

33% State Budget

Managing the Norwegian social safety net with scale and precision.

The Journey: From Consultant-Led to In-House Product Mindset

BEFORE (A DECADE AGO):
Proprietary & Consultant-Led

TODAY:
In-House Product Oriented (Team Topologies)

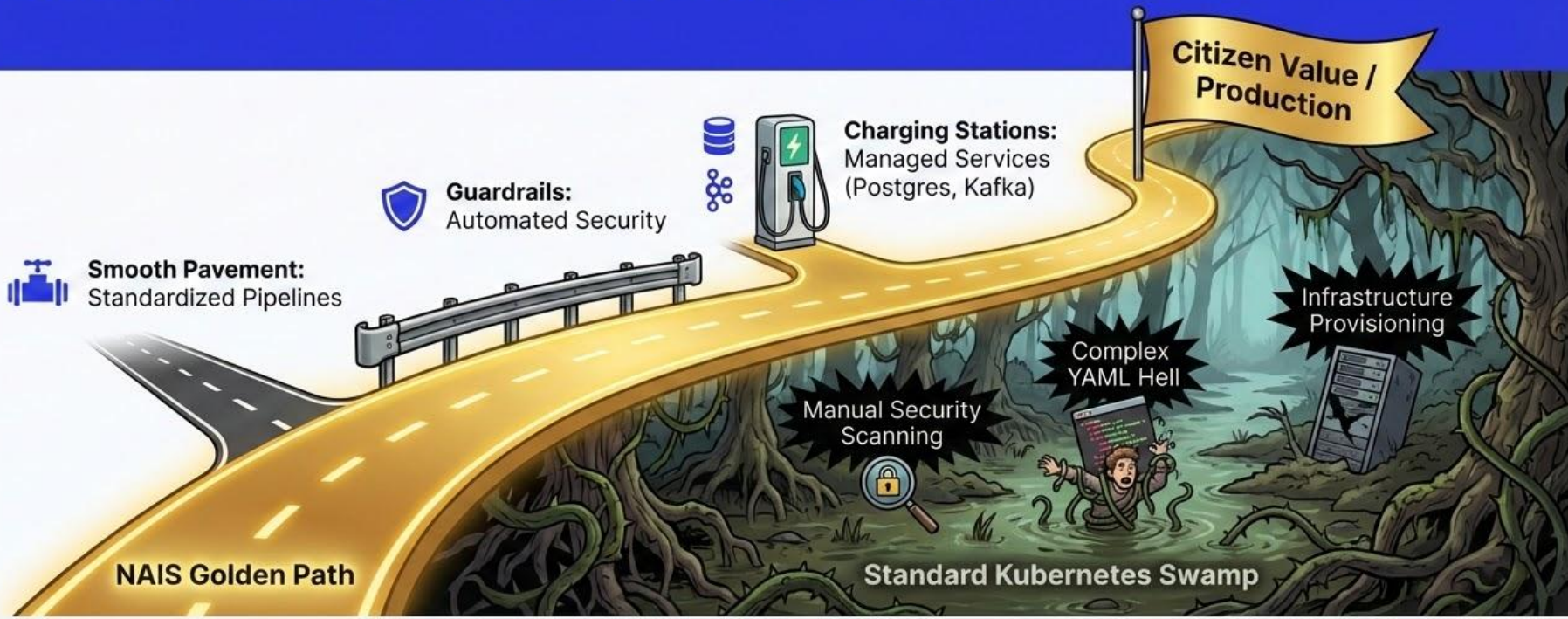
Stream-Aligned Teams
Stable, autonomous "two-pizza" teams owning specific subdomains.

Enabling Teams
Bridging expertise gaps: Security, Compliance, and Coaching.

Platform Teams
The "Golden Path": Building NAIS and NADA for domain value.

Shifting from temporary contracts to empowered, stable teams with full ownership.

nais.io: The Golden Path for Teams

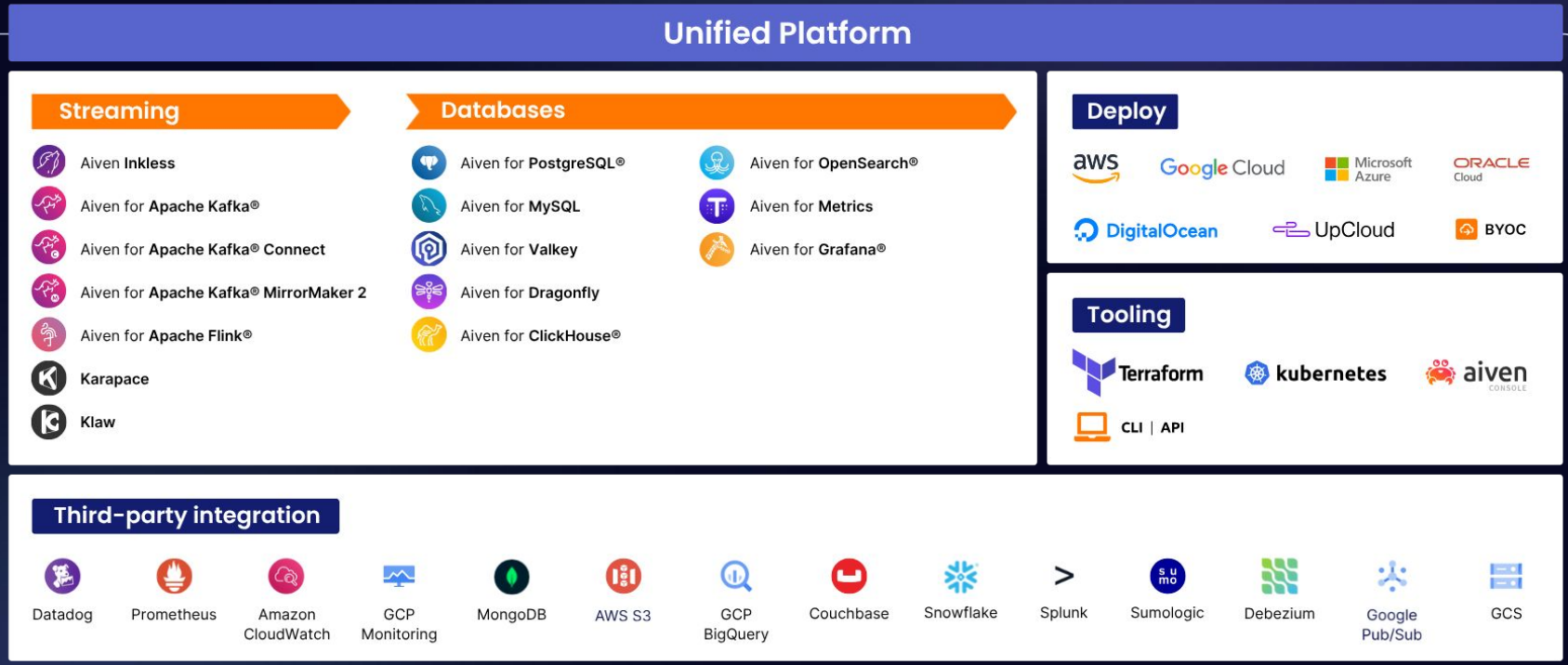


100+ Product Teams

3000+ Weekly Deploys

Self-service infrastructure providing a seamless path to production.

One Cloud Data Platform



aiven

Observability: A Core Business Pillar

Modern digital services rely on observability to transform raw logs into business insights and operational stability.

Centralized Logging

Aggregating application and server logs into Loki for deep-dive debugging and audit trails.

Golden Signals

Monitoring metrics to identify performance trends and error rates in real-time.

Distributed Tracing

Tracking requests across microservices with Tempo to find bottlenecks and logic errors.

Leveraging open standards like OpenTelemetry to ensure data sovereignty and eliminate vendor lock-in.

Adoption Hurdles: The Loki Experiment

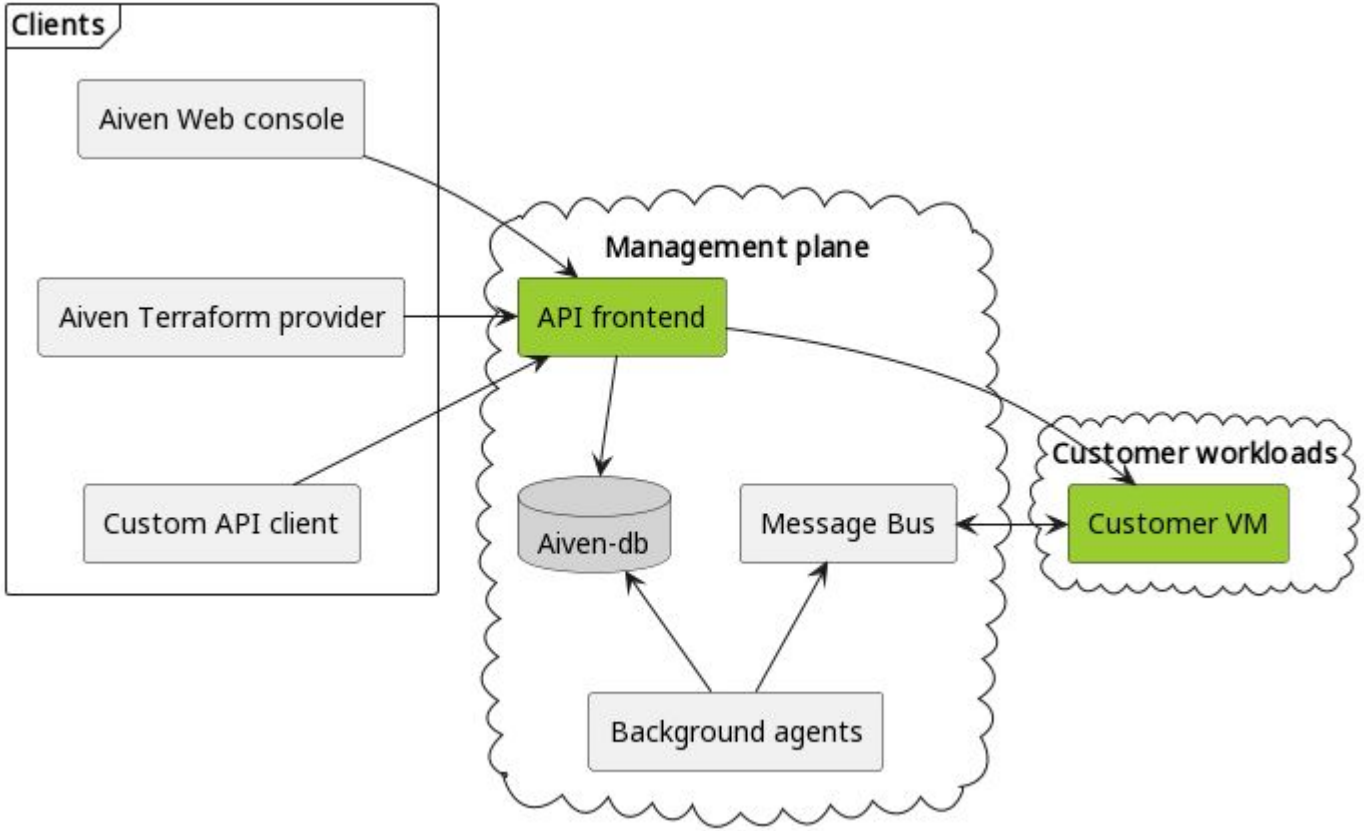
The initial attempt to migrate all users from Elasticsearch to Loki faced significant friction due to technical trade-offs.

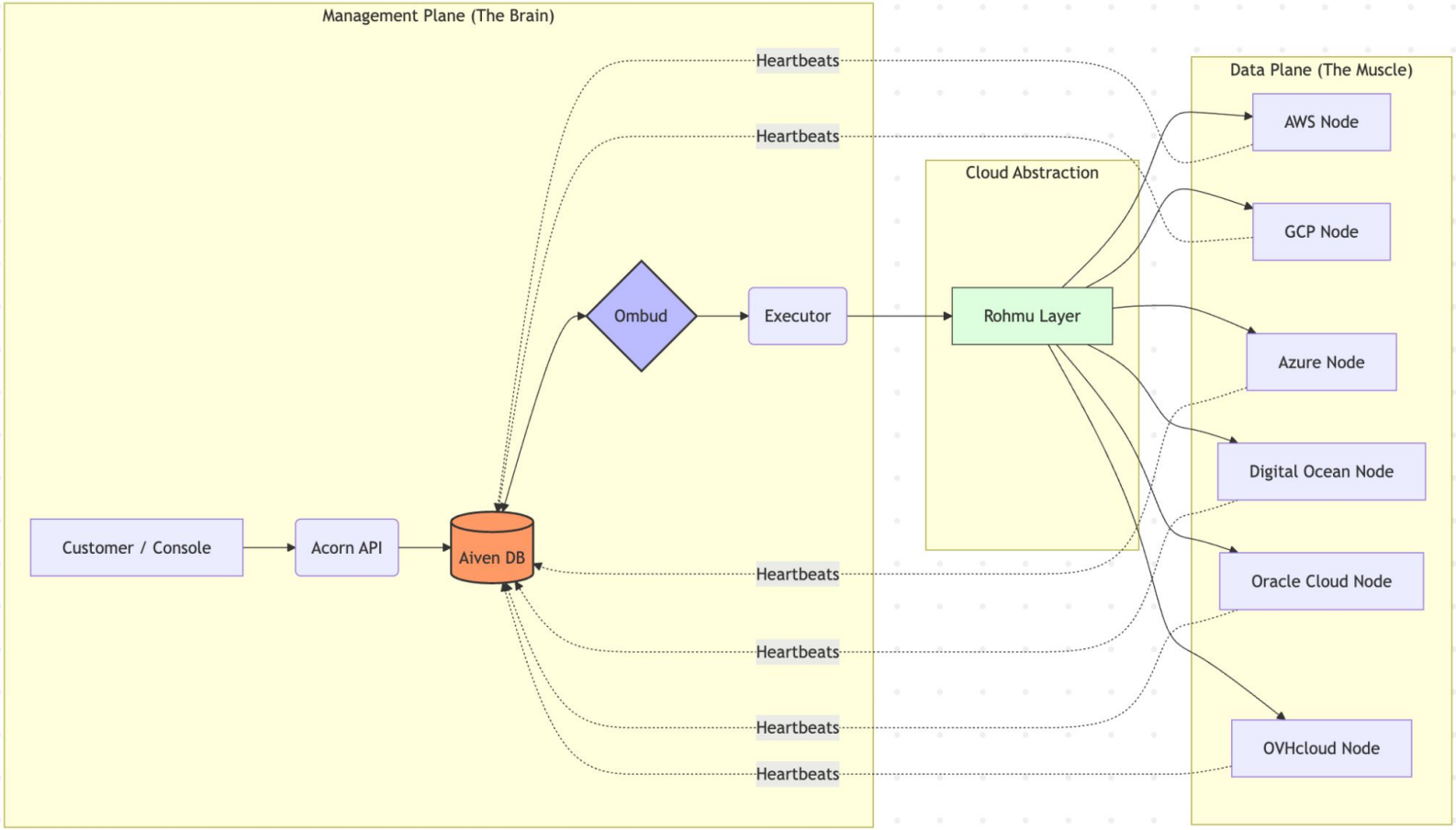
- **Performance Barriers:** High-cardinality queries often triggered bottlenecks.
- **Limited Text Search:** Lack of native full-text search hindered root-cause analysis.
- **Adoptability Gap:** Workflow switching was difficult without feature parity.

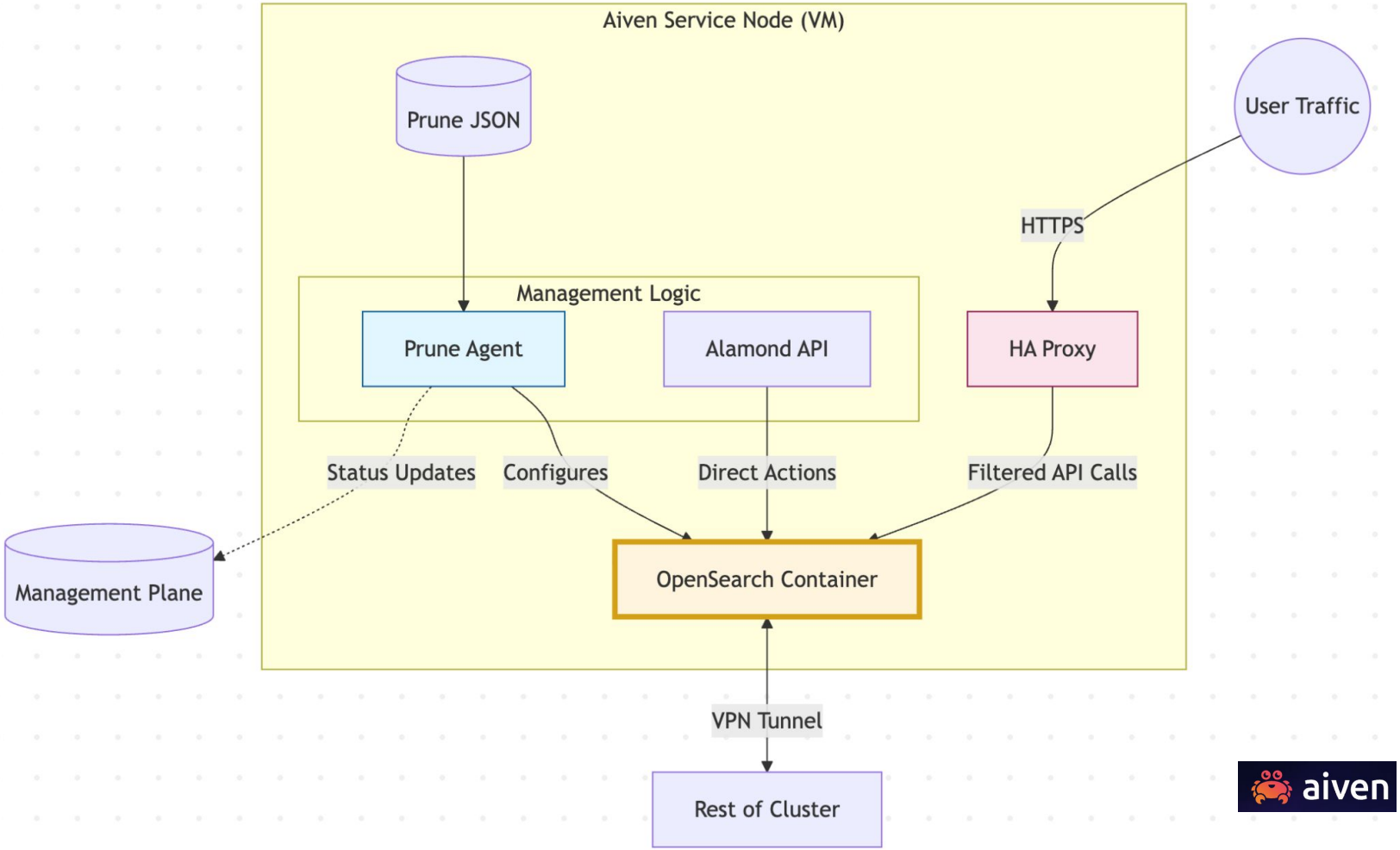
Strategic Outcome
Pivot to OpenSearch

"The first attempt failed to gain broad adoption due to performance and search limitations."

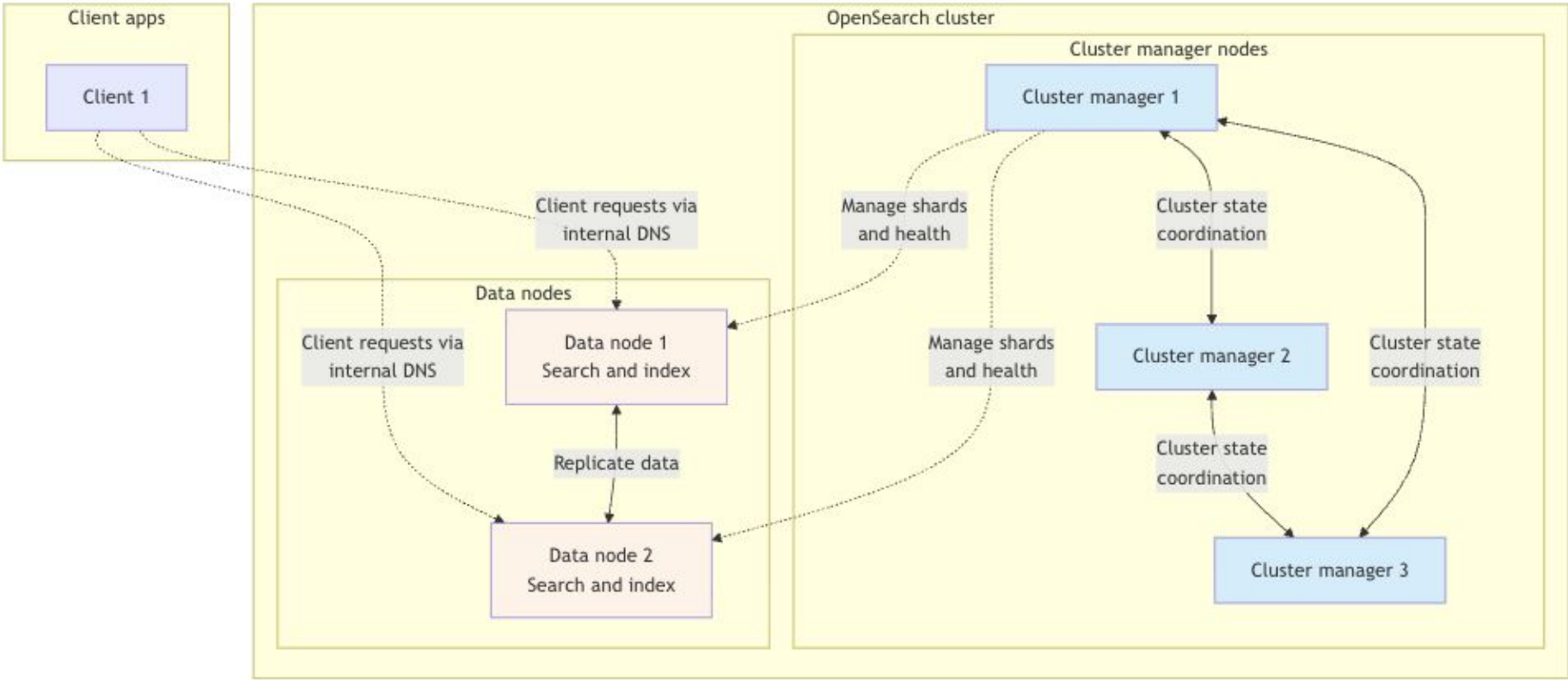
Aiven's Platform at a glance




Management Plane (The Brain)
Heartbeats
Heartbeats
Ombud
Executor
Customer / Console
Acorn API
Aiven DB
Heartbeats
Heartbeats
Heartbeats
Heartbeats
Cloud Abstraction
Rohmu Layer
Data Plane (The Muscle)
AWS Node
GCP Node
Azure Node
Digital Ocean Node
Oracle Cloud Node
OVHcloud Node


Aiven Service Node (VM)
Prune JSON
User Traffic
HTTPS
Management Logic
Prune Agent
Alamond API
HA Proxy
Status Updates
Configures
Direct Actions
Filtered API Calls
Management Plane
OpenSearch Container
VPN Tunnel
Rest of Cluster

Scaling with node roles



Open challenges with managed OpenSearch

- Disaster Recovery: does not exist. Possible components:
  - CCR = Cross Cluster Replication
  - BTAR = Backup To Another Region
  - Semi-realtime snapshots
- Multi-tenancy
  - What if your client builds a platform for different consumption levels for their customers?
  - You will encounter “noisy neighbour problem”
  - Key is the ability to separate different consumption patterns of different customers

Challenge 1: Large-scale Cluster

Is Aiven up to handling this scale?

Nav operated very large clusters, with one instance having 40 nodes, and another with 15-20 nodes, requiring up to 60TB of disk storage

Solution:

- Aiven demonstrated its capability to manage this scale during a Proof of Concept (PoC).
- The team maintained transparent communication and a weekly meeting cadence with Nav.
- The cluster size was progressively increased to meet Nav's requirements

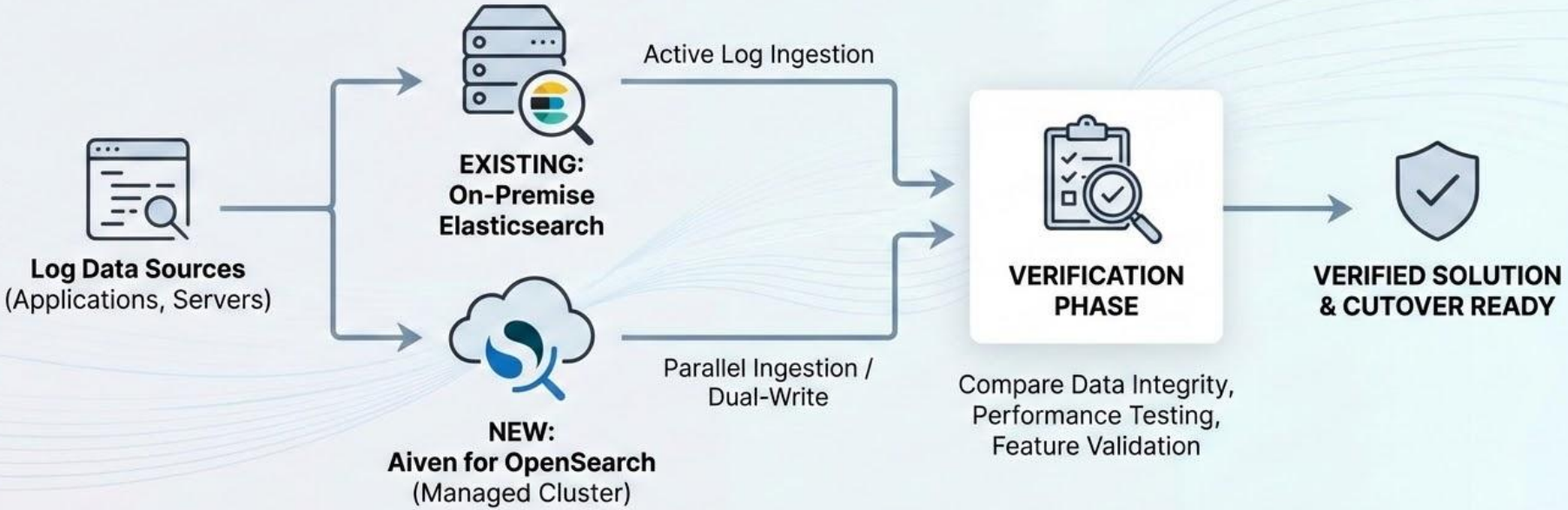
Challenge 2: Zero-Downtime Data Migration

Self-managed Elasticsearch -> managed OpenSearch

A critical requirement was to migrate massive, mission-critical datasets from Nav's self-managed Elasticsearch to Aiven for OpenSearch without any service interruption

Solution: A dual-write strategy was implemented. This involved routing logs to both the old and new systems in parallel, ensuring a seamless and low-risk cutover without downtime

Parallel Deployment & Verification: Elasticsearch to Aiven OpenSearch



Running the new Aiven OpenSearch cluster alongside the existing on-premise Elasticsearch deployment for **risk-free verification** before final cutover.

Challenge 3: Log and Trace Shipping Compatibility

How to ensure a large VM fleet is monitored for health

A last-minute challenge arose when Nav's existing log and trace shipping stack, which used an Elasticsearch agent with OpenTelemetry connectors, was found to be incompatible with OpenSearch

Solution:

- The team explored several alternatives, including Data Prepper and Vector.dev.
- Aiven decided to fast-track the integration of Data Prepper, which is part of the OpenSearch project.
- The use of the OpenTelemetry Collector with a specific OpenSearch Exporter was also investigated as a viable solution.

Challenge 4: OpenSearch Version Upgrade and Index Compatibliity

Upgrading between major version IRL

Nav encountered an error while attempting to upgrade their OpenSearch version. The issue was traced to index compatibility problems between major versions (1->2.19->3)

Solution: It was determined that OpenSearch does not support index backward compatibility across more than one major version. Nav needed to use the reindex API to upgrade their indices to version 2 before they could upgrade their cluster to version 3. Aiven planned to improve its documentation to make this requirement clearer

Challenge 5: Feature Parity and Future Requirements

Ready for the future of OpenSearch?

Nav needed to ensure that all functionalities from their current Elasticsearch version (8.7/9.1) were available in OpenSearch, including index-level management and cross-cluster search

Solution: Aiven confirmed that features like index-level management were supported. They also validated that future requirements, such as the OS Neural Search plugin, could be met

Challenge 6: Onboarding Users to OpenSearch

Does feature X of Elasticsearch exist in OpenSearch?

Nav's team of over 500 in-house developers needed to be onboarded from Elasticsearch to the new OpenSearch platform

Solution: Aiven conducted a webinar for Nav's user team, which was attended by 82 participants, to facilitate the transition

Nav Team's Challenges: Migrating to OpenSearch

Conceptual confusion due to differences in naming and UI logic.

The administrative user interface was initially much worse for admins.

Difficulty linking templates, data streams, and lifecycle policies.

Unclear understanding of accessible and controllable configuration parameters.

Resolution: These specific challenges have been mostly resolved in version 3.

Aiven for
OpenSearch®

Hans Kristian Flaaten, Platform Engineer

Why Now?

License Renewal Deadline: Nav.no's Elasticsearch license was up for renewal at the end of 2025.
Strategic Cloud Migration: Nav.no is actively moving towards GCP to reduce maintenance overhead and free up internal teams.
Operational Burden: The team was spending significant time on maintenance, upgrades, and troubleshooting their self-managed clusters.

Why OpenSearch?

Operational Efficiency: Managing large, self-hosted Elasticsearch clusters is complex and resource intensive.
Cost Optimization: Field-level security is available out-of-the-box in OpenSearch.
Technical Requirements: Need for robust search and analytics capabilities for 600 developers.
Open Source Alignment: Nav.no values open-source solutions to avoid vendor lock-in.

Aiven Migration: Scaling for Innovation

Replacing Elasticsearch with Aiven for OpenSearch® eliminated operational toil and ensured reliable log processing at massive scale.

Zero Disruptions

Seamless migration of 400 GB daily logs with no impact on critical welfare services.

API-First Innovation

Direct integration into Nav's platform interface, boosting developer productivity.

Optimized Costs

Shifted from capital-intensive infra to a consumption-based, usage-aligned model.

"We've moved away from operational toil to building capacity." — Hans Kristian Flaatten, Nav

OpenSearch Cluster Status & Usage (Current Stats)

Cluster Specifications

Nodes: 15

Memory: 64 GB per node

CPU: 8 vCPU per node

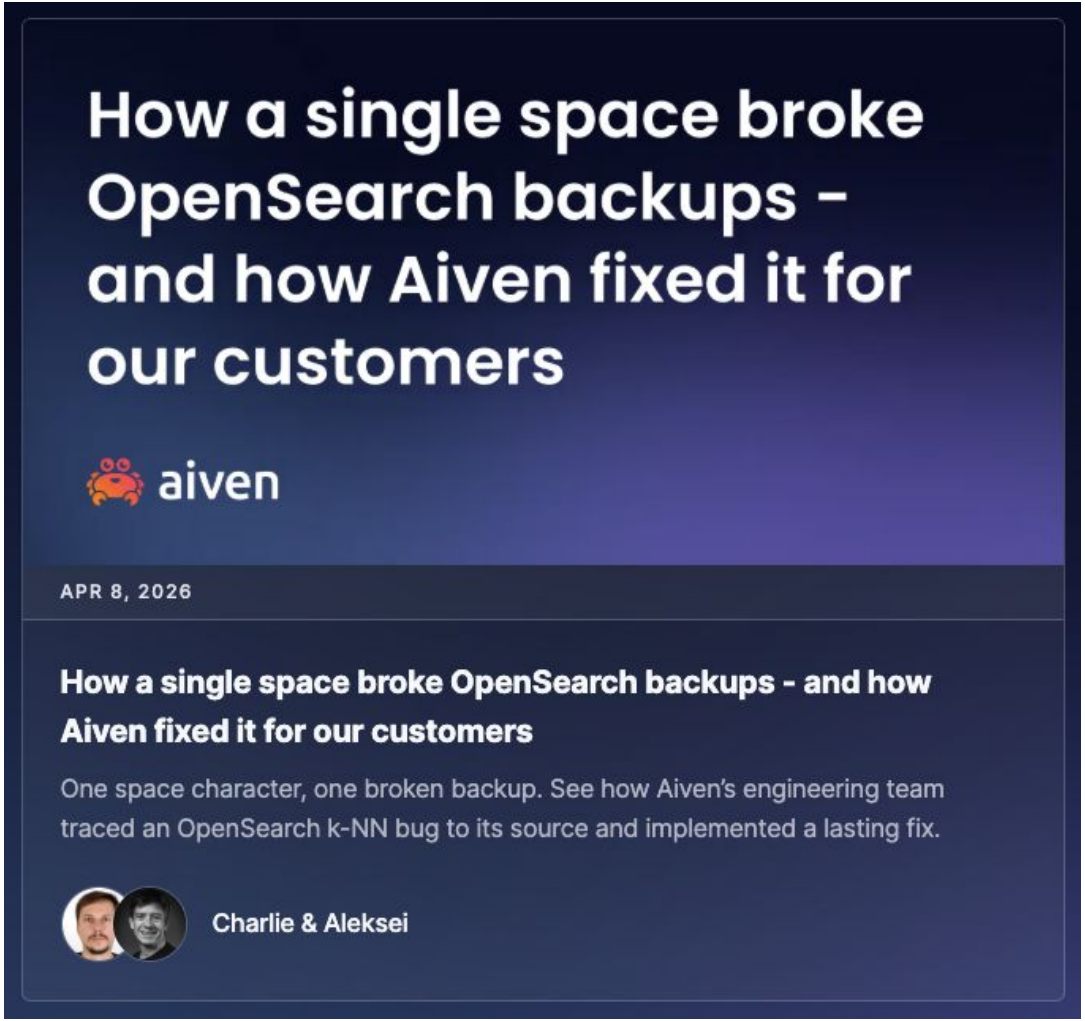
Total Storage: ~35 TB (28,050 GB base + 7,050 GB extra)

Usage & Adoption

Saved Objects: >1,100 (Queries, Dashboards, Visualizations)

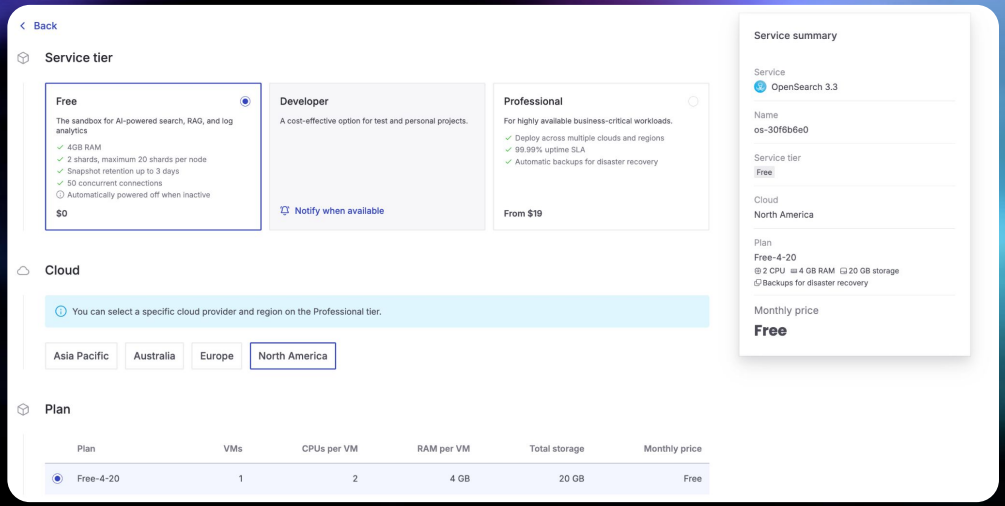
Activity Level: High active use within months

Monitoring: Visualizations for log size per team and data stream overview available



Sharing our findings with the community

We've Launched Free Tier OpenSearch on Aiven!



Free Tier OpenSearch on Aiven

Fully managed, open-source OpenSearch designed for builders, learners, prototypers, and hobbyists.

- Dedicated OpenSearch service with enterprise-grade features.
- Start indexing and searching OpenSearch in seconds.
- Transparent limits.
- Completely free, no credit card required.

Sign up Here: https://aiven.io/free-opensearch

Thank you

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