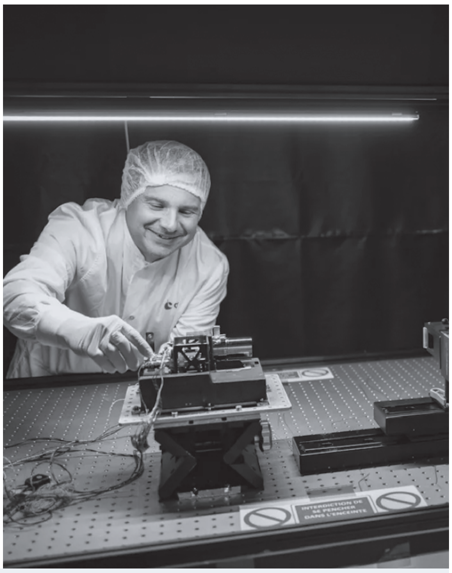
MODERNIZATION | PRODUCT BUILD

CNES

Space Agency

CNES (the French National Space Agency), based at the Toulouse Space Centre, approached gravity9 and MongoDB with a pressing challenge: their REGARDS platform, which manages vast amounts of spatial data, was suffering from operational disruptions due to inefficiencies in its search functionality. Particularly, the reindexing process in Elasticsearch was causing downtime of up to 10 days, directly affecting data availability and costing the agency valuable time and resources.

With their system under strain and a need for a faster, more agile solution, CNES turned to us to explore how MongoDB Atlas Search could streamline their platform, eliminate downtime, and enable a more efficient future for their data management.



POC Technology Stack:

- Backend: Java, Spring Boot
- Database: MongoDB Atlas
- Search: MongoDB Atlas Search
- Scripts: Bash

Our Solution

The key deliverable was a Proof of Concept (PoC) built in just 13 days. This PoC aimed to demonstrate that migrating from Elasticsearch to MongoDB Atlas would resolve the significant pain points caused by reindexing.

By replacing PostgreSQL with MongoDB Atlas as the primary data store and leveraging MongoDB Atlas Search for real-time indexing and search, the PoC eliminated the need for time-consuming reindexing. Notably, it also provided real-time search capabilities without requiring complex data synchronization, offering an immediate improvement in operational efficiency.

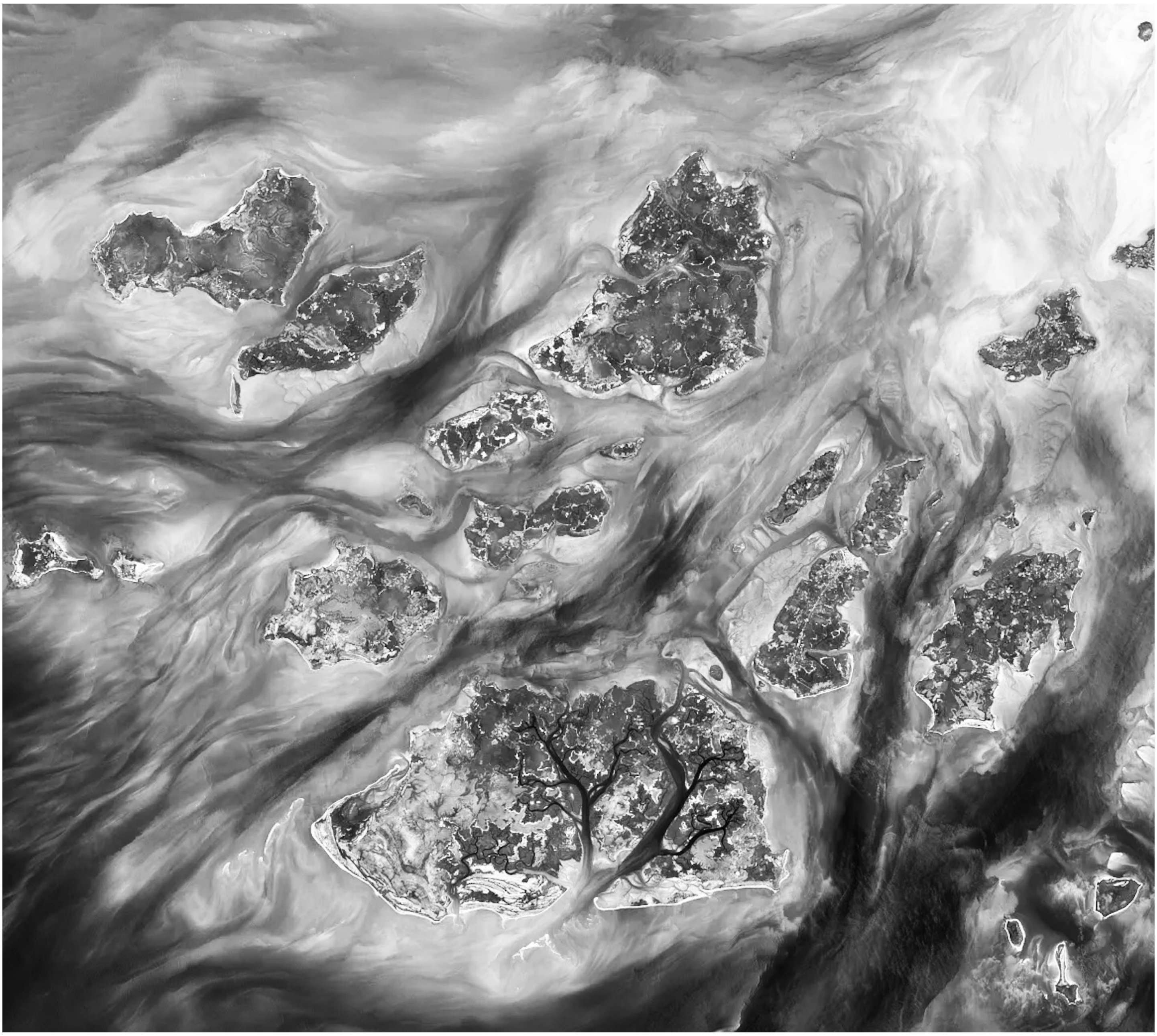
The PoC was tested using over 21 million data records from the SPOT World Heritage (SWH) program, allowing us to replicate the actual workload and test the search performance. This real-world dataset proved that MongoDB Atlas Search could handle large-scale queries while maintaining high availability.

Our Approach

To address CNES's challenges with Elasticsearch and the lengthy reindexing process, we adopted an agile approach to deliver a Proof of Concept (PoC) that would provide immediate insights into how MongoDB Atlas Search could streamline their data management and search processes.

Instead of directly modifying the complex REGARDS platform codebase, we created a standalone application to simulate the core functionality of the system, focusing on the search component. This PoC was designed to mirror the REGARDS platform's REST API, which supports searches using Lucene Query Syntax and geo-based queries, while utilizing MongoDB Atlas Search as the underlying search engine.

A critical part of our approach was to use real-world data from the SWH program, which contains over 21 million records. This large dataset replicated the actual workload CNES was facing, enabling us to rigorously test MongoDB Atlas search's ability to handle complex queries while avoiding the performance bottlenecks caused by Elasticsearch's reindexing.



Our Solution

To ensure the test was as close to real-world conditions as possible, we implemented a Time-Based Pagination method to retrieve the data, which allowed us to bypass the limitations of Elasticsearch's offset-based pagination. This change ensured that MongoDB Atlas could handle large datasets efficiently, without introducing errors.

By focusing on a rapid, standalone PoC that used authentic SWH data, we were able to validate MongoDB Atlas Search's effectiveness in eliminating reindexing downtime, addressing scalability issues, and supporting the full range of search capabilities that REGARDS required, without the complexity of a full system re-platforming at this stage.

Subsequent Outcomes

The PoC successfully demonstrated that MongoDB Atlas Search could eliminate the downtime caused by reindexing. When we simulated a model change and triggered a reindexing process, the results were striking. The reindexing of 21 million records was completed in just 50 minutes, compared to the current 10 days using Elasticsearch.

Furthermore, throughout the reindexing, the performance of ongoing search queries remained unaffected, showcasing MongoDB Atlas's ability to handle high-volume operations without causing operational disruptions. This rapid outcome provided CNES with the clarity and confidence they needed to assess their next steps forward.

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