# Marinas Logistics Data Warehouse & CDC Sync

SECTOR: Maritime & Port Logistics | TIMELINE: 8 Weeks Deployment | IMPACT: 35% Cost Savings & <0.5s

| DAILY COORDINATES | QUERY LATENCY | INFRA ROI | DATA PLANE |
|---|---|---|---|
| **1.2M+ Ingests** | **45s -> <0.5s** | **35% Savings** | **BigQuery + CDC** |

## 01 // OPERATIONAL BOTTLENECK & EXPOSURE

Regional seaport databases operated in isolated transactional silos without Change Data Capture (CDC). Querying live container vessel coordinates and customs manifests triggered 45-second lock spikes, delaying berth scheduling, customs clearance checks, and multi-depot freight handoffs.

## 02 // SYSTEM ARCHITECTURE TOPOLOGY




INVARIANT: ZERO-DATA-LOSS STREAMING // ENCRYPTED mTLS TRANSPORT // AUDIT VERIFIED

## 03 // ENGINEERING EXECUTION & DATA PLANE

### 1. Continuous WAL Change Data Capture (CDC)

Deployed lightweight Debezium connectors reading PostgreSQL Write-Ahead Logs at regional ports, eliminating expensive batch table scans and streaming row-level deltas over mTLS.

### 2. Partitioned BigQuery Warehouse & Airflow Reconciliation

Structured clustered geo-temporal partitions in Google Cloud BigQuery orchestrated by Airflow DAGs, consolidating vessel telemetry, port clearance timestamps, and bills of lading under a 500ms SLA.

### 3. FinOps Autoscaling & Slot Reservation

Replaced static over-provisioned compute instances with serverless query slot autoscaling, reducing monthly cloud compute expenditure by 35% while handling 1.2M+ daily coordinate events.

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