

VOYAGE DATA / ENGINEERING CASE STUDY

Voyage Data Integrity

One reliable voyage record, even when the reports keep changing

The Propel Group built voyageGRAPH™ to turn scattered and frequently revised voyage reports into a single record that can be checked. AI is used to read the incoming documents; a separate set of fixed rules then builds up the voyage from what the reports say. The record is updated as better information arrives, without losing what was known before or the reason it changed. voyageGRAPH™ is live and available now, with full access through an API for use in your own systems.

GOING DEEPER

AI-assisted document interpretation feeding a deterministic, event-time reconciliation engine, with bitemporal history and full API access.

THE VALUE CASE AT A GLANCE

The problem

Voyage reports arrive late, in many different formats, and often contradict each other. Teams rebuild voyages by hand, and emissions figures are hard to defend.

The value

One reliable record for each voyage, much less manual checking, and emissions figures that can be explained.

Extra value, at little or no extra cost

Through the API, the same record can be used for performance monitoring, commercial analysis and charter-party performance claims. Data-quality checks show which vessels' reports need correcting, so reporting improves at source.

Why Propel

We understand what a statement of fact records and why a canal transit changes a voyage, and we know how to build a record that will stand up to audit.



Concept illustration created for this case study; not a photograph of a customer's vessel.

The latest report is not the whole voyage

Noon reports, bunker reports and statements of fact each cover a different part of the voyage, in different formats. They arrive at different times and are often revised. The voyage itself also changes: a port call, time at anchor, a canal transit or a ship-to-ship transfer can change the meaning of data already received.

Treating every report as final is a poor basis for fleet analysis and emissions reporting. The task is to keep what each report says while building an increasingly accurate account of what actually happened, including the gaps and conflicts that still need resolving.



THE APPROACH

How it works

voyageGRAPH™ treats the voyage record as a conclusion drawn from the reports. It works through the information in the order events happened, not the order the reports arrived. Given the same reports and settings, it always produces the same voyage, whatever order the paperwork came in.

THE OPERATIONAL THREAD

**Reports**

Part of the picture

**Reconcile**

Put in order

**Review**

Gaps and changes

**Finalise**

Agreed voyage record

01

Put every report into a standard format

Each operator and vessel has its own report layouts and labels. voyageGRAPH™ reads them all into one standard format, checks them, and records how confident it is in each value. Templates built up along the way reduce repeated work, and anything missing is recorded as a gap rather than ignored.

GOING DEEPER

AI-assisted extraction into a canonical schema, with validation, field-level confidence and reusable templates.

02

Build up the voyage from the reports

A separate set of fixed rules puts the information in order and works out where each voyage and leg begins and ends. Shipping rules distinguish a cargo port call from other stops. Where the reports are not clear enough to decide, the point is flagged for review instead of being guessed.

GOING DEEPER

A deterministic engine orders evidence in event time and applies domain rules to derive voyage boundaries and legs.

03

Resolve conflicts without losing the history

When reports disagree, set rules decide which source takes priority, and a correction from the operator's own staff always takes precedence. The system records both when something happened and when it was reported. A late statement of fact can therefore correct an earlier noon report, while the earlier figure and its source are kept on record.

GOING DEEPER

Explicit source precedence with operator overrides; bitemporal storage of event time and knowledge time, preserving displaced values and their provenance.

04

Keep every calculation open to checking

Figures such as fuel use and emissions are calculated using stated formulas. Register, timeline and completeness views show the gaps before anyone signs off. The history explains why an earlier version was different, and signing off, and any later correction, follows a controlled process.

GOING DEEPER

Explicit downstream formulas over the reconciled record; a controlled finalisation and post-finalisation correction workflow.



TECHNOLOGY AND TRUST

Black box or glass box?

In a black box system, a final figure can hide how it was reached. voyageGRAPH™ shows how the reports became the agreed record: the source reports, where they disagreed, which source took priority, and every change made.

THE TYPICAL BLACK BOX

Question or data

"Here is the answer"**Evidence:** Only the latest value**Verification:** You have to take the figure on trust**Decision:** A figure with no history**THE PROPEL GLASS BOX****Evidence**

Every report and every revision

Verification

The rules applied and the conflicts resolved

Decision

An agreed record that can be traced and explained

For example, when a late statement of fact changes the time of a port call, both the original report and the reason for the change are kept on record.

THE TECHNOLOGY, IN PLAIN TERMS

WHAT IT DOES

Reading reports

Structured document interpretation

AI reads reports in whatever format they arrive and puts them into one standard structure. Checks and confidence scores show any doubt before the data is added to the record.

Building up the voyage

Deterministic event reconciliation

Fixed rules put the reports in order and apply shipping rules to identify voyages and legs. The same reports always give the same result, so any review can be repeated.

Two dates for every event

Bitemporal records and source precedence

The record keeps both when each event happened and when it was reported. Set priorities and operator corrections allow the record to improve without losing its history.

Stated calculations

Explicit downstream calculation

Every figure uses a stated formula applied to the agreed record. Keeping reading, building and calculating separate makes it easy to find where a discrepancy came from and to test the effect of a correction.

Note: being open here means showing where each figure came from and how the record was built; it does not mean publishing Propel's detailed rules. The AI's confidence in reading a document is one input to review; it never replaces the rules that decide what is accepted.

THE USER EXPERIENCE

Following how the record changes

A fleet user needs to find the voyages that need attention, then look at the reports behind a disputed event. voyageGRAPH™ shows this without anyone having to go looking for it.

A voyage record develops as reports arrive

ILLUSTRATION

REPORTED

First reports

A port call is reported

RECONCILED

Later reports

A conflict over timing needs review

FINALISED

Agreed record

The reports support an agreed sequence

Original report, later revision and sign-off decision are all kept on record

Illustration using fictional records. Not a screenshot of the product.

Master Voyage Register

Compare voyages by status and outstanding issues. It leads straight to the voyages that need review, rather than listing every value as if it were settled.

Lifecycle Event Ledger

Follow the sequence of events and the effect of later information. An earlier report stays in the history even when the agreed version changes.

Emissions and compliance

Missing or inconsistent information is highlighted, and exposure views show where reporting may be at risk. These calculations rely on an agreed and maintained set of regulatory rules.

A stable record needs a clear sign-off policy.

A late report can change the agreed sequence without deleting the earlier version. Because the record keeps both when events happened and when they were reported, a reviewer can see exactly what was known at any past decision. The sign-off policy and rule versions complete the basis for reporting that can be repeated.

JOINING THE DOTS

As shore power becomes normal practice, the same voyage record becomes useful to ports as well. It tells a port when a vessel is likely to arrive and leave, how long similar ships stay alongside, and how much energy they have used at berth before: essential information for planning power and capacity (see Use Case 08, Port energy and capacity planning). Under FuelEU Maritime, whether a call must connect to shore power at all depends on those same arrival and departure times.

BUSINESS VALUE AND INDUSTRIAL RELEVANCE

The value across the fleet

Propel combined AI to read documents with fixed rules to reconcile them and clear screens to review them. The result is a dependable basis for operations and reporting, with every change explained as better information arrives.

FOR ANALYSTS AND OPERATIONS

- **Less time reconciling.**

Reports in any format share one structure, and conflicting reports are shown side by side. Reviewers deal with the exceptions instead of rebuilding every voyage by hand.

- **Corrections handled consistently.**

Late reports and operator corrections update the agreed record while keeping its history, so teams can explain why a figure changed.

- **The right voyages first.**

Registers, timelines and exception views show which voyages need attention, so effort goes where the uncertainty is.

FOR COMPLIANCE, COMMERCIAL AND DATA TEAMS

- **More reliable reporting.**

An agreed, consistent record is a sounder basis for performance and emissions figures, and gaps and assumptions can be checked before anyone relies on them.

- **Works with your systems.**

Full API access allows the agreed record to feed your own reporting, performance and commercial tools.

- **Problems found early.**

Gaps, errors and regulatory exposure across the fleet are identified before they become compliance failures.

Beyond the voyage

Production batches, maintenance histories and logistics movements also depend on partial records that change over time. The same principle applies: reconcile events into a record that can be checked before it is used for decisions. Each industry would need its own definitions, rules and testing.

GETTING STARTED

voyageGRAPH™ is live on AWS and available now, with full API access for your own systems. Propel's Northstar Framework® starts by agreeing the value you need, whether that is more reliable reporting, less manual reconciliation or better commercial information, then works with your team to deliver measurable value within weeks.

Engineering case study, September 2026. voyageGRAPH™ is live on AWS and available now, with full API access. The benefits described are what the system is designed to deliver; no measured results are reported here. thepropelgroup.com/products/voyagegraph