

UNIFIED SIGNAL OBJECT

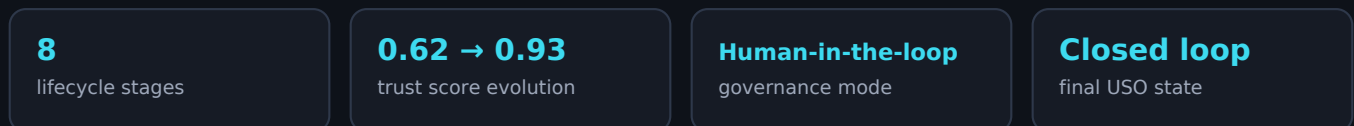
USO Walkthrough

Event → Governed Intelligence → Outcome

This document follows one concrete operational event through the UFIS coordination layer: a severe-rainfall forecast enters as an ordinary vendor record, is normalised into a Unified Signal Object, is trust-scored and governed, is related to the assets and schedules it can affect, drives a prediction and a governed recommendation, is acted upon under explicit authority, and returns to the architecture as an outcome-feedback event that re-weights the next comparable signal.



The loop closes. Every outcome becomes a new governed signal.



WHAT A UNIFIED SIGNAL OBJECT IS

A USO is the atomic unit of coordinated intelligence. It carries the value itself together with its origin, time, geography, domain classification, trust and confidence scores, governance and retention policy, resolved relationships to operational entities, and the lineage of every service that has touched it. Because meaning and governance travel with the signal, any downstream model, application or partner can act on it without re-interpreting a vendor-specific record.

The worked example, stage by stage

Each stage below shows the operational event, what the architecture does, and the attributes added to the Unified Signal Object at that point. Attributes accumulate — the object at stage 8 carries everything added before it.

01 Raw event arrives

L0 · CONNECTION FABRIC

Meteorological service publishes a severe-rainfall forecast for the Pilbara operating region.

A connector at Layer 0 receives the source payload. At this point it is an ordinary vendor record — a number, a place and a time. It carries no trust weighting, no relationships and no governance classification.

```
source.payload  rain_mm_24h = 84
source.region   "PIL-NW-04"
source.issued   2026-08-04T21:00Z
```

STATE: INBOUND TRUST: 0.00 GOVERNANCE: UNCLASSIFIED

02 Normalised into a USO

L4 · DATA + CONTEXT FOUNDATION

The payload is converted into a Unified Signal Object.

Time is normalised, location is resolved to a geographic footprint with confidence bounds, the domain is classified and provenance is recorded. The value now travels as a structured intelligence object rather than a vendor-specific record.

```
uso.id          USO-2026-08-04-1174
uso.domain      weather.precipitation
uso.value       84 mm / 24h
uso.origin      BOM · forecast API
uso.geo         -22.41, 118.72 ±4km
```

STATE: NEW TRUST: 0.62 GOVERNANCE: INTERNAL

03 Trust, provenance and governance applied

L1 · SECURITY + GOVERNANCE

The USO is scored and classified before any intelligence service may act on it.

Historical accuracy of the source, sensor agreement and issuing authority produce a trust score. A governance classification and sharing policy are attached, determining which participants and which downstream services may consume the signal.

```
uso.trust       0.91 (source history)
uso.confidence   0.87
uso.governance   operational · shareable
uso.retention    7y · audited
```

STATE: VALIDATED TRUST: 0.91 GOVERNANCE: OPERATIONAL

04 Relationships resolved

L4 · DATA + CONTEXT FOUNDATION

The rainfall USO is linked to the assets and operations it can affect.

Haul-road segments, pit drainage capacity, active benches, crusher feed schedules and the rail-to-port export window are all represented as entities. The relationship engine attaches the affected set to the signal.

```
rel.haul_roads  HR-07, HR-09 (grade >4%)      rel.assets  12 haul trucks · 2 excavators
rel.schedule    rail slot RP-2211
```

STATE: RELATED TRUST: 0.91 GOVERNANCE: OPERATIONAL

05 Coherence and prediction

L5 · AI / ANALYTICS ENGINE

The architecture forecasts the operational consequence, not just the weather.

Coherence across the related entities is re-measured, and predictive models estimate haul-road trafficability, downtime exposure and export-chain readiness under the forecast conditions.

```
coherence.delta  -0.18 (degrading)      predict.haul_road  HR-07 impassable +9h
predict.downtime  6-11h exposure        predict.export     rail slot at risk
```

STATE: ANALYSED TRUST: 0.91 GOVERNANCE: OPERATIONAL

06 Governed recommendation

L1 · SECURITY + GOVERNANCE

A recommendation is produced under explicit authority conditions.

The recommendation is bound to a decision owner, an authority threshold and an audit record. Actions above the automation threshold are routed for human review rather than executed autonomously.

```
rec.action  pre-position pumps · reroute HR-09      rec.authority  Site Controller approval
rec.mode    human-in-the-loop                      rec.audit     AUD-88412
```

STATE: GOVERNED TRUST: 0.91 GOVERNANCE: OPERATIONAL · APPROVAL REQUIRED

07 Delivered and acted upon

L7 · PRESENTATION + ACTION

The intelligence reaches the people and systems that can act.

The site controller sees the condition and the recommended response in an operational workspace; the maintenance and logistics systems receive the corresponding instructions through the coordination fabric. Approval is recorded.

```
action.approved  21:14Z · Site Controller      action.dispatch  CMMS work orders ×3
action.logistics  rail slot renegotiated
```

STATE: ACTIONED TRUST: 0.91 GOVERNANCE: OPERATIONAL · APPROVED

08 Outcome feedback event

L0 · UNIFIED COORDINATION FABRIC

What actually happened returns to the architecture as a new signal.

The observed outcome is itself captured as a Unified Signal Object and routed back through the fabric. It updates the source trust score, scores the model's forecast accuracy and becomes part of the operational memory used to weight the next comparable signal.

```
outcome.observed  HR-07 closed 7h (pred. 9h)           outcome.downtime_avoided  recorded · attributed
feedback.model_score  +0.04 accuracy                   feedback.source_trust  0.91 → 0.93
```

STATE: CLOSED-LOOP TRUST: 0.93 GOVERNANCE: OPERATIONAL · ARCHIVED

The outcome feedback loop

The stage that separates a coordination layer from a dashboard is the last one. In conventional enterprise software the decision is the end of the pipeline. In UFIS the observed outcome is captured as a new Unified Signal Object and routed back through the Layer 0 coordination fabric, where it updates source trust, scores model accuracy, and becomes part of the operational memory used to weight the next comparable signal.

01 Governed intelligence

Prediction and recommendation issued under explicit authority, with a named decision owner and an audit record.

02 Action executed

Approved instructions written back to enterprise, maintenance and logistics systems through the fabric.

03 Outcome observed

What actually happened is measured against what was predicted, and attributed to the originating signal.

04 Feedback USO created

The outcome is itself a governed Unified Signal Object with full lineage back to the triggering event.

05 Trust re-weighted

Source trust moves 0.91 → 0.93; model accuracy score improves by 0.04.

06 Next signal improves

The following comparable forecast is evaluated against a better-calibrated operational memory.

WHY THIS MATTERS

Without a governed feedback event, every prediction is a one-way assertion: nothing in the system learns whether it was right, and trust in the source never changes. The feedback USO closes that loop inside the architecture rather than inside a single application, so improvement compounds across every model, participant and industry module connected to the coordination layer.

THE COORDINATION PRINCIPLE

**Data becomes signal. Signal becomes governed intelligence.
Outcome becomes signal again.**

UFIS is the subject of a patent application. Patent-pending status does not confer enforceable rights until and unless a patent is granted. No statement in this document should be read as a representation that a patent has been granted. Figures shown in the worked example are illustrative and do not represent achieved results.