

Raft Warfighting Data Model

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Raft Warfighting Data Model (v1)

The Raft Warfighting Data Model (WDM) is a structured data model for tactical command and control. It provides a shared language for capturing the operational picture: what exists in the battlespace, what is being done about it, and why.

The model is designed for explicit interoperability. External references and typed payloads allow WDM records to bridge to other tactical data models, including OMS UCI messages, Cursor on Target (CoT) events, GCCS-J tracks, and others. See INTEROP.md for the adapter pattern and level-of-fidelity tradeoffs.

Ontology alignment with BFO and the Common Core Ontologies (CCO) provides a formal semantic foundation, enabling WDM records to participate in cross-domain knowledge representation and reasoning alongside other DoW and IC ontology-aligned systems.

The Raft Data Platform (RDP) provides the runtime for this model. RDP offers a federated data catalog, eventually-consistent mesh replication, data governance and distribution policies, and related platform services. WDM defines the structure, while RDP handles storage, transport, and access control. Every record carries security markings, provenance, and replication metadata so that data can be trusted, attributed, and shared across classification boundaries and disconnected networks.

Protocol Documentation

Action

An Action represents any directed activity, notification, or structured report shared across the mesh. The same message type can express a fire mission, an operations order, a contact alert, or a status report – the scope and type fields control interpretation. Actions support hierarchical composition (orders containing phases containing tasks), typed dependencies and links to other actions, and typed links to the objects they involve. New use cases are added by defining new scope/type combinations rather than new proto definitions.

Action

A flexible, self-describing record representing any directed activity, notification, or structured report shared across the warfighting mesh.

Action is intentionally general. The `scope` and `type` fields control how the message is interpreted, and producers populate only the fields relevant to their context.

Common patterns:

TASK scope – individual directed activities such as fire missions, ISR collection, movement orders. **ORDER** scope – composite operations and directives with **PHASE** and **TASK** children via the hierarchy fields. **ALERT** scope – time-critical notifications (e.g., contact, CBRN, MEDEVAC 9-line). Populate the `alert` field. **REPORT** scope – structured observations and assessments (e.g., SPOTREP, SALUTE, etc.).

Actions are immutable after creation except for state transitions, progress updates, BDA attachment, and approval chain progression. To change action content, cancel the existing action and create a new one.

Field	Type	Description
id	string	Unique identifier.
security	SecurityMarking	Classification and handling caveats.

Field	Type	Description
name	string	Short name used to refer to the action in displays and reports.
description	string	Detailed description of the action.
type	string	Free-form type identifier that classifies the action within its scope. The combination of scope and type together can determine how consumers interpret the action. Scope provides the broad category, while type refines it. There is no schema-enforced contract on valid values; producers and consumers should agree on a shared vocabulary for their integration context. Use lowercase snake_case by convention (e.g., “fire_mission”, “contact”, “sitrep”). Examples by scope: tasks might use “isr_collection”, “movement”, or “strike”; alerts might use “contact”, “cbrn”, or “medevac_9line”; reports might use “sitrep”, “spotrep”, or “intsum”; orders might use “execution_order” or “planning_order”, etc.
scope	ActionScope	Scope of this action in the planning hierarchy.
ontology	Ontology	Semantic classification and formal ontology alignment.
labels	repeated Action.LabelsEntry	Extensible key-value metadata. Keys should follow a namespaced convention such as “domain.system.field” to avoid collisions.
parent_action_id	string	ID of the parent action that this action is part of. Empty for top-level actions (e.g., a top-level operations order).
child_action_ids	repeated string	IDs of child actions that compose this action. For example, an ORDER-scoped action may have PHASE children, each of which may contain TASK children.
links	repeated ActionLink	Typed links to other actions. Covers both scheduling constraints (e.g., “do not start until action X finishes”) and non-scheduling relationships (e.g., “this action supersedes action Y”).
state	ActionState	Current lifecycle state of the action.
priority	ActionPriority	Execution priority.
progress	ActionProgress	Current execution progress.
requested_by	Principal	Principal that originated the action request.
assigned_to	Principal	Principal responsible for executing the action.
authorized_by	Principal	Principal that approved the action for execution. May differ from the requestor (e.g., fires require commander approval).
intent	Intent	Intent: why this action exists and what good looks like on completion.
kill_chain_phase	F3eadPhase	Current phase of the F3EAD targeting cycle.
target_nomination	TargetNomination	Target nomination data. Populated when the action nominates a target for engagement.
bda	BattleDamageAssessment	Battle damage assessment captured during or after execution.
area_of_operations	SpatialGeometry	Geographic area of operations for this action. Any SpatialGeometry variant is acceptable (polygon for an AO, circle for a target radius, rectangle for a kill box).
route	Route	Planned or actual route followed during action execution.
not_before	google.protobuf.Timestamp	Earliest time at which the action may begin execution.
not_after	google.protobuf.Timestamp	Latest time by which the action must complete.
object_links	repeated ObjectLink	Typed links to objects involved in this action. Each link carries the object’s ID and a type describing its role (e.g., target, asset, or general association).
details	google.protobuf.Struct	Action-specific metadata as loosely-typed structured data. Follow the @type convention with a fully qualified type identifier (e.g., “raft.wdm.v1.ext.FireAction”, “com.acme.IsrCollectionPlan”). Prefer strongly-typed fields over details when available.

Field	Type	Description
external_refs	repeated ExternalReference	References to representations of this action in external systems (e.g., AFATDS fire mission, ISR order, etc.).
attachments	repeated Attachment	File attachments associated with this action. WDM stores pointers, not contents; binary upload happens out of band against the platform object store.
provenance	ProvenanceRecord	Data lineage and source attribution for trust assessment. Required on every publish.
replication	ReplicationMetadata	Mesh replication metadata. Read-only; populated by the platform.
ml_annotations	repeated MachineLearningAnnotation	Machine learning annotations attached to this action (e.g., automated target recommendation, ML-derived priority).
catalog	CatalogReference	Reference to this action's position in the Raft Data Platform catalog (data source, connection, dataset).
alert	AlertData	Alert-specific data.
warfighting_functions	repeated WarfightingFunction	Doctrinal warfighting function(s) this activity is exercising (ADP 3-0 / JP 3-0). Tag every applicable function; an empty list means no doctrinal function is asserted. Activities may routinely span multiple functions.

Action.LabelsEntry

Field	Type	Description
key	string	
value	string	

ActionLink

A typed link from this action to another action.

Covers both scheduling constraints (sequencing between actions) and non-scheduling relationships (causality, supersession, coordination).

Field	Type	Description
action_id	string	ID of the referenced action.
type	ActionLinkType	Classification of the link.

ActionProgress

Execution progress within a action's current state.

Field	Type	Description
phase	string	Execution phase within the current state. Free-form upper snake-case string defined by the client; the server treats the value as opaque. Example: "SHOT", "SPLASH", "ON_STATION".

Field	Type	Description
status_message	string	Human-readable status message describing current progress.
metadata	google.protobuf.Struct	Additional structured progress data. Follows the same @type convention as Action.details.
updated_at	google.protobuf.Timestamp	Server-assigned timestamp recording when this progress was captured. Read-only.

AlertData

Alert-specific fields for scope = ALERT actions.

An alert is a time-critical notification published to the mesh. Most alert data lives on standard Action fields (see the field comment on Action.alert for the mapping). This message captures what is unique to alerts: severity, category, response guidance, and lifecycle signals (all-clear, supersession).

Examples:

Contact – scope=ALERT, type=“contact”, priority=CRITICAL, alert.severity=CRITICAL, alert.category=ALERT_CATEGORY_CONTACT, alert.response_instructions=“QRF RTB to CP ALPHA”, area_of_operations=(point at contact location), object_ids=[“<hostile-contact-id>”].

CBRN – scope=ALERT, type=“cbrn”, priority=CRITICAL, alert.severity=CRITICAL, alert.category=ALERT_CATEGORY_CBRN, alert.response_instructions=“MOPP 4”, area_of_operations=(hazard area polygon).

MEDEVAC 9-line – scope=ALERT, type=“medevac_9line”, priority=HIGH, alert.severity=HIGH, alert.category=ALERT_CATEGORY_MEDEVAC, alert.affected_count=2, area_of_operations=(point at pickup zone).

Blue-on-blue – scope=ALERT, type=“blue_on_blue”, priority=CRITICAL, alert.severity=CRITICAL, alert.category=ALERT_CATEGORY_BLUE_ON_BLUE, object_ids=[“<friendly-unit-a>”, “<friendly-unit-b>”], alert.response_instructions=“CEASE FIRE grid AB1234567890”.

Field	Type	Description
severity	AlertSeverity	Assessed impact severity, independent of handling priority. A routine weather advisory may be LOW severity / LOW priority; a contact report is CRITICAL severity / CRITICAL priority.
category	AlertCategory	Broad alert category. Determines which optional fields are relevant and helps the platform route the alert.
response_instructions	string	What recipients should do in response.
all_clear	bool	True when the condition that triggered the alert has been resolved. Publish a new version of the action with all_clear=true and state=COMPLETED to signal resolution.
supersedes_action_id	string	ID of a previous alert action that this one supersedes. Use when issuing a corrected or updated alert for the same event.
source	AlertSource	Source of the alert (human, sensor, automated system).
affected_count	optional uint32	Number of personnel affected by this alert (e.g., casualties, exposed individuals, isolated personnel).

BattleDamageAssessment

Battle damage assessment captured during or after action execution.

Field	Type	Description
level	BdaLevel	Assessed damage level.
confidence	optional double	Confidence in the damage assessment. Range: 0.0 to 1.0.
methodology	string	Assessment methodology (e.g., “visual from platform”, “imagery review”, “SIGINT change”, “HUMINT report”).
functional_status	FunctionalStatus	Assessed functional status of the target after engagement.
reattack_recommendation	ReattackRecommendation	Whether reattack is recommended.
notes	string	Free-form analytical notes.
assessor	Principal	Principal that conducted the assessment.
assessed_at	google.protobuf.Timestamp	Time at which the assessment was completed.

Intent

A concise, informational expression of the purpose of an action, the desired end state, and any constraints on execution.

Field	Type	Description
purpose	string	Why the action is being executed. Answers “why”.
method	string	The broad scheme for achieving the purpose. Answers “how”.
end_state	string	The desired condition on action completion.
key_actions	repeated string	Operationally critical actions that must happen for the action to succeed. Listed in priority order.
constraints	repeated string	Constraints placed on the execution (time windows, geographic restrictions, weapon releases, collateral damage limits).
restrictions	repeated string	Explicit restrictions on what must not happen (e.g., “no fires within 500m of FLOT”, “no engagement without PID”).

ObjectLink

A typed link from this action to an object, describing the object’s role in the action.

Field	Type	Description
object_id	string	ID of the referenced object.
type	ObjectLinkType	Role this object plays in the action.

Route

A planned or actual route for action execution.

Captures an ordered list of waypoints, along with optional cross reference to a structured polyline geometry for map rendering. Routes are action-specific; general-purpose linear control measures (MSRs, phase lines) belong on a Object with category CONTROL_MEASURE.

Field	Type	Description
kind	RouteKind	Kind of route: planned, actual, or alternate.
waypoints	repeated RouteWaypoint	Ordered waypoints defining the route.
polyline	Polyline	Optional rendered polyline for map display. When populated, its positions should correspond to the waypoint positions.
total_distance_meters	optional double	Total planned distance in meters.
total_duration_seconds	optional double	Planned total duration in seconds.

RouteWaypoint

A single waypoint on a route.

Field	Type	Description
order	uint32	Ordered position of this waypoint (1-indexed).
label	string	Human-readable label (e.g., “IP”, “CP ALPHA”, “TGT”).
position	Position	Geographic position.
planned_time	google.protobuf.Timestamp	Planned arrival time at the waypoint.
planned_speed_mps	optional double	Planned speed over ground in meters per second.
planned_altitude_hae_meters	optional double	Planned altitude at the waypoint (HAE meters).
action	string	Action to be performed at the waypoint.

TargetNomination

Nomination data for a target engagement action.

Field	Type	Description
target_number	string	Target number or identifier issued by the nominating agent.
category	TargetCategory	Category of target (e.g., HPT, HVT, fleeting, planned, dynamic).
desired_effect	DesiredEffect	Desired effect on the target (e.g., destroy, neutralize, suppress, harass, disrupt, degrade).
notes	string	Free-form notes captured during target development.

ActionLinkType

Classification of a link between two actions.

The first four values describe scheduling constraints – how the lifecycle of one action gates another. FINISH_TO_START is by far the most common. The remaining values describe non-scheduling relationships such as causality, replacement, and coordination.

Name	Description
ACTION_LINK_TYPE_UNSPECIFIED	

Name	Description
ACTION_LINK_TYPE_FINISH_TO_START	This action should not start until the referenced action finishes. The most common scheduling link (e.g., “begin the ground assault only after the preparatory fires phase completes”).
ACTION_LINK_TYPE_START_TO_START	This action should start when the referenced action starts. Used for coordinated, concurrent execution (e.g., “begin electronic jamming when the ground assault starts”).
ACTION_LINK_TYPE_FINISH_TO_FINISH	This action should not finish until the referenced action finishes. Used when one action must sustain for the duration of another (e.g., “maintain suppressive fires until the breaching element completes its task”).
ACTION_LINK_TYPE_START_TO_FINISH	This action should finish before the referenced action should start (e.g., “route clearance must finish before the convoy departs”).
ACTION_LINK_TYPE_TRIGGERED_BY	This action was created as a result of the referenced action (e.g., a contact alert triggering a QRF task).
ACTION_LINK_TYPE_SUPERSEDES	This action replaces the referenced action. The referenced action should be treated as obsolete.
ACTION_LINK_TYPE_DERIVED_FROM	This action is based on or informed by the referenced action (e.g., a follow-on strike derived from an ISR collection).
ACTION_LINK_TYPE_COORDINATES_WITH	This action should be deconflicted with the referenced action (e.g., overlapping airspace, shared frequency, adjacent maneuver).

ActionPriority

Action execution priority.

Aligns with military message precedence levels. Higher priority actions should preempt lower priority work.

Name	Description
ACTION_PRIORITY_UNSPECIFIED	
ACTION_PRIORITY_LOW	Routine
ACTION_PRIORITY_MEDIUM	Priority
ACTION_PRIORITY_HIGH	Immediate
ACTION_PRIORITY_CRITICAL	Flash

ActionScope

Scope of an action in the planning hierarchy.

Actions can stand alone or compose into a tree via the parent_action_id and child_action_ids fields. When composed, a DIRECTIVE or ORDER typically sits at the root, PHASE nodes group execution into sequential or parallel stages, and TASK / SUB_TASK leaves represent individual directed activities. Flat actions (e.g., a standalone alert or report) simply omit the hierarchy fields.

Name	Description
ACTION_SCOPE_UNSPECIFIED	
ACTION_SCOPE_DIRECTIVE	High-level strategic guidance or directives.
ACTION_SCOPE_ORDER	Operational order or directive (e.g., execution orders, planning orders, amendments).

Name	Description
ACTION_SCOPE_PLAN	Named campaign or operation plan.
ACTION_SCOPE_PHASE	Temporal or functional phase within an order or plan.
ACTION_SCOPE_TASK	Individual directed activity (e.g., fire mission, ISR collect, patrol).
ACTION_SCOPE_SUB_TASK	Subordinate step within a task.
ACTION_SCOPE_ALERT	Time-critical notification (e.g., contact, CBRN, blue-on-blue, MEDEVAC).
ACTION_SCOPE_REPORT	Structured observation or assessment (e.g., SPOTREP, SALUTE, etc.).

ActionState

Action lifecycle states.

State transitions follow a general flow: DRAFT -> PENDING -> APPROVED -> ASSIGNED -> ACKNOWLEDGED -> PLANNED -> IN_PROGRESS -> COMPLETED

Terminal states (final, cannot be changed): - COMPLETED: Successfully finished - FAILED: Execution failed - CANCELLED: Cancelled (the deletion mechanism for actions) - REJECTED: Refused by assignee

Name	Description
ACTION_STATE_UNSPECIFIED	
ACTION_STATE_DRAFT	Being composed; not yet submitted.
ACTION_STATE_PENDING	Submitted, awaiting approval.
ACTION_STATE_APPROVED	Approved by authority, not yet assigned.
ACTION_STATE_ASSIGNED	Assigned to executing principal.
ACTION_STATE_ACKNOWLEDGED	Executing principal acknowledged receipt of the action.
ACTION_STATE_PLANNED	Executing principal has developed an execution plan.
ACTION_STATE_IN_PROGRESS	Currently being executed.
ACTION_STATE_PAUSED	Execution temporarily halted.
ACTION_STATE_COMPLETED	Successfully completed (terminal).
ACTION_STATE_FAILED	Failed to complete (terminal).
ACTION_STATE_CANCELLED	Cancelled; this is the deletion mechanism for actions (terminal).
ACTION_STATE_REJECTED	Rejected by assignee (terminal).

AlertCategory

Broad classification of the alert condition.

Name	Description
ALERT_CATEGORY_UNSPECIFIED	
ALERT_CATEGORY_CONTACT	Enemy contact (troops in contact, direct/indirect fire, ambush).
ALERT_CATEGORY_CBRN	Chemical, biological, radiological, or nuclear event.
ALERT_CATEGORY_BLUE_ON_BLUE	Friendly-on-friendly engagement.

Name	Description
ALERT_CATEGORY_MEDEVAC	Medical evacuation request (9-line format).
ALERT_CATEGORY_AIRSPACE_VIOLATION	Unauthorized airspace entry or violation.
ALERT_CATEGORY_LOST_LINK	Loss of communications link to a node or unit.
ALERT_CATEGORY_HOSTILE_FIRE	Hostile fire / indirect fire alert.
ALERT_CATEGORY_IED_UXO	IED or unexploded ordnance detected.
ALERT_CATEGORY_WEATHER	Significant weather impacting operations.
ALERT_CATEGORY_FORCE_PROTECTION	Force protection / base defense alert.
ALERT_CATEGORY_CYBER	Cyber event affecting tactical systems.
ALERT_CATEGORY_EW	Electronic warfare detection (jamming, spoofing).
ALERT_CATEGORY_DOWNED_AIRCRAFT	Downed aircraft.
ALERT_CATEGORY_PERSONNEL_RECOVERY	Personnel recovery (isolated personnel).
ALERT_CATEGORY_OTHER	Catch-all for alert types not covered above.

AlertSeverity

Alert severity – assessed impact of the condition, independent of handling priority.

Name	Description
ALERT_SEVERITY_UNSPECIFIED	
ALERT_SEVERITY_LOW	Informational, no immediate impact.
ALERT_SEVERITY_MODERATE	Localized impact, monitor.
ALERT_SEVERITY_HIGH	Significant impact, action needed.
ALERT_SEVERITY_CRITICAL	Life-threatening or mission-critical.

AlertSource

How the alert was generated.

Name	Description
ALERT_SOURCE_UNSPECIFIED	
ALERT_SOURCE_HUMAN	Manually issued by a warfighter.
ALERT_SOURCE_SENSOR	Automated sensor detection.
ALERT_SOURCE_SYSTEM	Platform-generated (e.g., link loss).
ALERT_SOURCE_FUSED	Multi-source fusion / correlation.

BdaLevel

Physical damage level assessment.

Name	Description
BDA_LEVEL_UNSPECIFIED	
BDA_LEVEL_NO_DAMAGE	
BDA_LEVEL_LIGHT	
BDA_LEVEL_MODERATE	
BDA_LEVEL_SEVERE	
BDA_LEVEL_DESTROYED	

DesiredEffect

Desired effect on a target. Aligned with JP 3-60 effect terms.

Name	Description
DESIRED_EFFECT_UNSPECIFIED	
DESIRED_EFFECT_DESTROY	
DESIRED_EFFECT_NEUTRALIZE	
DESIRED_EFFECT_SUPPRESS	
DESIRED_EFFECT_HARASS	
DESIRED_EFFECT_DISRUPT	
DESIRED_EFFECT_DEGRADE	
DESIRED_EFFECT_DENY	
DESIRED_EFFECT_DECEIVE	
DESIRED_EFFECT_DIVERT	
DESIRED_EFFECT_INFLUENCE	

F3eadPhase

Phase of the F3EAD targeting cycle.

F3EAD is a continuous targeting methodology that couples intelligence (Find, Fix, Exploit, Analyze, Disseminate) with operations (Finish). actions are tagged with their current phase so planners can visualize the kill chain across active actions.

Name	Description
F3EAD_PHASE_UNSPECIFIED	
F3EAD_PHASE_FIND	Locate and identify a target
F3EAD_PHASE_FIX	Maintain continuous track / positive ID
F3EAD_PHASE_FINISH	Engage or otherwise affect the target
F3EAD_PHASE_EXPLOIT	Extract value from site/materiel/persons
F3EAD_PHASE_ANALYZE	Derive intelligence from exploitation
F3EAD_PHASE_DISSEMINATE	Publish products and lessons learned

FunctionalStatus

Functional status of a target after engagement.

Name	Description
FUNCTIONAL_STATUS_UNSPECIFIED	
FUNCTIONAL_STATUS_FULLY_FUNCTIONAL	
FUNCTIONAL_STATUS_DEGRADED	
FUNCTIONAL_STATUS_NON_FUNCTIONAL	
FUNCTIONAL_STATUS_UNKNOWN	

ObjectLinkType

Classification of an object's role in an action.

Name	Description
OBJECT_LINK_TYPE_UNSPECIFIED	
OBJECT_LINK_TYPE_RELATED	General association. The object is related to the action but does not fit a more specific role.
OBJECT_LINK_TYPE_TARGET	The object is the target of the action (the effect recipient).
OBJECT_LINK_TYPE_ASSET	The object is an asset assigned to execute the action (the effect producer – e.g., a firing unit, sensor, or vehicle).

ReattackRecommendation

Reattack recommendation.

Name	Description
REATTACK_RECOMMENDATION_UNSPECIFIED	
REATTACK_RECOMMENDATION_NOT_REQUIRED	
REATTACK_RECOMMENDATION_RECOMMENDED	
REATTACK_RECOMMENDATION_MANDATORY	

RouteKind

Kind of route captured on a action.

Name	Description
ROUTE_KIND_UNSPECIFIED	
ROUTE_KIND_PLANNED	Pre-execution planned route
ROUTE_KIND_ACTUAL	Actual route flown or driven
ROUTE_KIND_ALTERNATE	Alternate or contingency route

TargetCategory

Broad classification of a nominated target.

Name	Description
TARGET_CATEGORY_UNSPECIFIED	
TARGET_CATEGORY_HPT	High Payoff Target: a target whose loss will contribute substantially to the success of the friendly course of action.
TARGET_CATEGORY_HVT	High Value Target: a target the enemy commander requires for the successful completion of the action.
TARGET_CATEGORY_PLANNED	Planned target: identified in advance of execution with time and place known.
TARGET_CATEGORY_DYNAMIC	Dynamic target: identified during execution and engaged within the targeting cycle.
TARGET_CATEGORY_TARGET_OF_- OPPORTUNITY	Target of opportunity: not anticipated, engaged when available.
TARGET_CATEGORY_TIME_- SENSITIVE	Time-sensitive target: requires immediate engagement to preclude loss of opportunity.

Assessment

Assessment

Warfighter's tactical assessment of a warfighting object.

This is ASSESSED affiliation and identity, not ground truth. The actual identity may differ. Drives MIL-STD-2525 symbology, engagement authorization, and rules of engagement application.

Field	Type	Description
affiliation	Affiliation	Affiliation determination: friend, hostile, neutral, unknown, etc.
environment	Environment	Operating environment or domain.
nationality	string	Country of allegiance as ISO 3166-1 alpha-3 (e.g., "USA", "GBR").
confidence_level	optional double	Confidence in this assessment. Range: 0.0 to 1.0.
source_reliability	SourceReliability	NATO standard source reliability rating. Rates the source that provided the information underlying this assessment.
information_credibility	InformationCredibility	NATO standard information credibility rating. Rates the information itself. Combined with source_reliability, yields the standard alphanumeric intelligence rating (e.g., "B2").

Affiliation

Affiliation / standard identity per MIL-STD-2525.

Name	Description
AFFILIATION_UNSPECIFIED	
AFFILIATION_PENDING	Awaiting identification
AFFILIATION_UNKNOWN	Cannot be determined

Name	Description
AFFILIATION_ASSUMED_FRIEND	Assumed friendly (unconfirmed)
AFFILIATION_FRIEND	Positively identified friendly
AFFILIATION_NEUTRAL	Neither friend nor threat
AFFILIATION_SUSPECT	Potentially hostile
AFFILIATION_HOSTILE	Declared hostile per ROE
AFFILIATION_JOKER	Friendly acting as hostile (exercise)
AFFILIATION_FAKER	Hostile acting as friendly (exercise)

Environment

Operating environment or domain.

Name	Description
ENVIRONMENT_UNSPECIFIED	
ENVIRONMENT_SPACE	Exoatmospheric
ENVIRONMENT_HIGH_ALTITUDE	Above 50,000 ft
ENVIRONMENT_MEDIUM_ALTITUDE	10,000 - 50,000 ft
ENVIRONMENT_LOW_ALTITUDE	Below 10,000 ft
ENVIRONMENT_SURFACE	Ground or sea surface
ENVIRONMENT_SUBSURFACE	Underwater
ENVIRONMENT_UNDERGROUND	Tunnels, bunkers

Aviation

AviationInfo

Aviation-domain attributes sourced from ADS-B, flight plans, radar, and Link-16.

Field	Type	Description
aircraft_type	string	Aircraft type designation. Example: "F-35A Lightning II", "C-17A Globemaster III".
icao_type	string	ICAO type designator (e.g., "B738", "F35").
wake_category	WakeCategory	Wake turbulence category.
registration	string	Tail number or registration.
operator	string	Operating unit, command, or organization.
flight_number	string	Callsign or flight number (e.g., "REACH 421", "EVAC 01").
origin	string	Departure airport (ICAO code).
destination	string	Destination airport (ICAO code).
emergency	EmergencyStatus	Emergency status from transponder.
vertical_mode	VerticalMode	Vertical flight mode.

EmergencyStatus

Aircraft emergency status derived from transponder codes.

Name	Description
EMERGENCY_STATUS_UNSPECIFIED	
EMERGENCY_STATUS_NONE	
EMERGENCY_STATUS_GENERAL	Squawk 7700
EMERGENCY_STATUS_MEDICAL	
EMERGENCY_STATUS_FUEL	
EMERGENCY_STATUS_NO_COMM	Squawk 7600
EMERGENCY_STATUS_HIJACK	Squawk 7500

VerticalMode

Aircraft vertical flight mode.

Name	Description
VERTICAL_MODE_UNSPECIFIED	
VERTICAL_MODE_LEVEL	
VERTICAL_MODE_CLIMBING	
VERTICAL_MODE_DESCENDING	

WakeCategory

ICAO wake turbulence category.

Name	Description
WAKE_CATEGORY_UNSPECIFIED	
WAKE_CATEGORY_LIGHT	< 7,000 kg
WAKE_CATEGORY_MEDIUM	7,000 - 136,000 kg
WAKE_CATEGORY_HEAVY	> 136,000 kg
WAKE_CATEGORY_SUPER	C-5M, An-124

CBRN

CbrnInfo

Chemical, biological, radiological, and nuclear hazard data.

Applicable to objects representing CBRN detections, contamination zones, hazard predictions, and NBC reporting events. Pairs with the parent object's geometry or shape to represent the spatial extent of contamination or hazard areas.

Reference: Army FM 3-11 (Chemical, Biological, Radiological, and Nuclear Operations); ATP 3-11.37 (Multi-service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Reconnaissance and Surveillance).

Field	Type	Description
agent_category	CbrnAgentCategory	Broad agent classification.
agent_name	string	Specific agent name or identifier. Examples: “VX”, “GB”, “Cs-137”, “Bacillus anthracis”.
concentration	optional double	Measured concentration at the detection point. Units depend on agent category: chemical in mg/m ³ , radiological in mSv/hr or Bq/m ³ , biological in agent-specific units.
dose_rate_msv_hr	optional double	Dose rate at the detection point in mSv/hr. Primarily for radiological detections.
persistence	CbrnPersistence	Agent persistence classification.
report_type	NbcReportType	NBC report type represented by this object.
detector_type	string	Detector or sensor that produced the reading.
zone_type	CbrnZoneType	Contamination zone classification when the object represents an area.

CbrnAgentCategory

Broad CBRN agent classification.

Name	Description
CBRN_AGENT_CATEGORY_UNSPECIFIED	
CBRN_AGENT_CATEGORY_CHEMICAL_NERVE	G-series, V-series
CBRN_AGENT_CATEGORY_CHEMICAL_BLISTER	Mustard, lewisite
CBRN_AGENT_CATEGORY_CHEMICAL_BLOOD	Cyanide compounds
CBRN_AGENT_CATEGORY_CHEMICAL_CHOKING	Phosgene, chlorine
CBRN_AGENT_CATEGORY_BIOLOGICAL	Bacteria, viruses, toxins
CBRN_AGENT_CATEGORY_RADIOLOGICAL	
CBRN_AGENT_CATEGORY_NUCLEAR	
CBRN_AGENT_CATEGORY_TIC	Toxic industrial chemicals

CbrnPersistence

Agent persistence classification.

Name	Description
CBRN_PERSISTENCY_UNSPECIFIED	
CBRN_PERSISTENCY_PERSISTENT	Hazardous for more than 24 hours
CBRN_PERSISTENCY_NON_PERSISTENT	Dissipates within minutes to hours

CbrnZoneType

Contamination zone classification.

Name	Description
CBRN_ZONE_TYPE_UNSPECIFIED	
CBRN_ZONE_TYPE_IMMEDIATE_HAZARD	Immediately dangerous to life/health
CBRN_ZONE_TYPE_VAPOR_HAZARD	Downwind vapor hazard area
CBRN_ZONE_TYPE_RESIDUAL	Residual contamination requiring monitoring
CBRN_ZONE_TYPE_HOT	Active contamination; full MOPP required
CBRN_ZONE_TYPE_WARM	Decontamination corridor
CBRN_ZONE_TYPE_COLD	Clean support area

NbcReportType

Army NBC report types per FM 3-11.

Name	Description
NBC_REPORT_TYPE_UNSPECIFIED	
NBC_REPORT_TYPE_NBC_1	Initial warning of CBRN attack or hazard.
NBC_REPORT_TYPE_NBC_2	Evaluated CBRN data.
NBC_REPORT_TYPE_NBC_3	Warning of expected contamination.
NBC_REPORT_TYPE_NBC_4	Monitoring and survey results.
NBC_REPORT_TYPE_NBC_5	Area of contamination summary.
NBC_REPORT_TYPE_NBC_6	Detailed CBRN attack information.

Common

Shared types used across Objects and Actions: principals, external references, provenance, replication metadata, machine learning annotations, attachments, and catalog references.

Attachment

A reference to a file associated with a warfighting record.

WDM stores metadata and a URI pointer; the file contents reside in the platform's object store. Binary upload happens out of band (clients write to the object store directly) and this message captures only the resulting metadata needed to locate, integrity check, and lifecycle the blob alongside the record that references it. Examples include imagery, video clips, audio, and documents.

Field	Type	Description
uri	string	URI to the file. Examples: "s3://bucket/bda/target-001.jpg", "s3://rdp/attachments/report-003.pdf".
kind	AttachmentKind	Broad file classification.
content_type	string	MIME type per IANA Media Types registry. Examples: "image/jpeg", "video/mp4", "application/pdf".

Field	Type	Description
captured_at	google.protobuf.Timestamp	When the file was captured or created.
caption	string	Short human-readable caption.
size_bytes	optional uint64	File size in bytes, if known.
content_digest	string	Content digest for integrity verification and deduplication, formatted as “algorithm:hex-encoded-value” (e.g., “sha256:a1b2c3...”). Consumers parse the prefix to determine the hash algorithm.
expiry_time	google.protobuf.Timestamp	Future time at which this attachment expires and is eligible for deletion from the platform object store. Unset means the attachment does not have an explicit expiry and follows the containing record’s lifecycle and retention policy.

CatalogReference

Reference to a record’s position in the Raft Data Platform catalog.

The catalog is hierarchically composed of data sources, connections (configured enablements of a data source), and datasets. Each record that enters the platform originates from a data source, is delivered through a specific connection, and belongs to a dataset.

Catalog identifiers are scoped to a specific RDP node. A dataset identifier on one node does not necessarily refer to the same dataset on another node unless the catalog has been explicitly federated between them. Consumers that resolve catalog references across the mesh must first confirm federation status for the scope node; absent federation, the identifiers should be treated as opaque foreign references.

An empty string for any identifier indicates that the field is not applicable or not known for this record.

Field	Type	Description
data_source_id	string	Identifier of the data source in the catalog (the upstream provider). Examples: “af-weather”, “aistream”.
connection_id	string	Identifier of the connection (configured enablement) that delivered this record. A single data source may have multiple connections (different regions, credentials, or feeds). Examples: “aistream-prod-us”, “af-weather-conus”.
dataset_id	string	Identifier of the dataset the record belongs to. Examples: “ais-tracks-se-us”, “weather-florida”, “intel-reports-indopacom”.

ExternalReference

A reference to a record or object held in an external data model or system of record.

Provides a uniform way to link a Raft warfighting record to its representation in another data model (e.g., GCCS-J ETF track, JREAP track, CoT event, OMS UCI message, etc.) without hard-coding one field per integration target. Consumers use `type_url` to decide how to interpret the payload, and `external_id + source_system` to resolve the record in its home system.

ExternalReference is one of WDM’s mechanisms for transporting arbitrary data across the mesh within the WDM envelope.

As a guideline: use `external_refs` when the data has a known protobuf type or needs to reference a specific external system, details for small untyped payloads, and attachments for anything too large to replicate inline.

Field	Type	Description
type_url	string	Fully qualified type identifier for the referenced record. Follows google.protobuf.Any type URL convention when the referenced object is a protobuf message (e.g., “type.googleapis.com/full.type.name”). For non-protobuf external models, a reverse-DNS identifier is acceptable (e.g., “mil.gccsj.ETF”, “mil.atak.CoTEvent”, “mil.jreap.Track”).
external_id	string	Identifier of the referenced record in its originating system. Opaque to WDM; meaning is defined by the source system.
source_system	string	Name of the originating system or data model holding the record. Example: “gccs-pacom”, “jreap-link-16”.
payload	google.protobuf.Any	Optional in-line copy of the referenced record. When present, carries the serialized payload so downstream consumers can operate on the external record without a follow-up fetch. The message type must match type_url when the payload is a protobuf message. Leave unset when the reference is a pointer only.
captured_at	google.protobuf.Timestamp	Timestamp at which the external record was captured, fetched, or mirrored into this reference. Distinct from the underlying record’s own update time, which lives inside the payload.
label	string	Optional human-readable label for the reference. Useful when a record has multiple external references and an operator needs context at a glance.

MachineLearningAnnotation

Machine learning annotation for a warfighting record.

When a record is produced or modified by an ML component (classifier, detector, tracker, foundation model), this message captures the model identity, inference metadata, and human review state so downstream consumers can audit the chain of automated decisions, apply trust policies, and route records through human-in-the-loop review workflows.

A record can carry multiple annotations (e.g., a detection with a classifier confidence plus a separate fusion model confidence).

Reference: DoD Responsible AI Strategy (2022); NIST AI RMF 1.0 (January 2023).

Field	Type	Description
model_id	string	Stable identifier for the model that produced this annotation. Examples: “yolo-v8-aircraft-detector”, “bert-intel-extractor”, “acme-fusion-v4”.
model_version	string	Model version string. Convention is producer-defined; semantic versioning is recommended.
provider	string	Provider or owner of the model. Examples: “raft”, “openai”, “anthropic”, “dia”, “in-house”.
confidence	optional double	Confidence score produced by the model for this annotation. Range: 0.0 to 1.0. Interpretation is model-specific; prefer calibrated probabilities when available.
inferred_at	google.protobuf.Timestamp	Wall-clock time at which the model produced this annotation.
rationale	string	Short natural-language rationale or explanation emitted by the model. Optional and model-specific; may be empty when the model does not produce rationales.

Field	Type	Description
input_ref	ExternalReference	Reference to stored model inputs (feature vector, raw imagery, intermediate activations) for downstream explainability. Opaque to the warfighting model; consumers resolve it in the AI platform.
output_ref	ExternalReference	Reference to stored model outputs (prediction artifacts, saliency maps, class probabilities) for downstream explainability.
review_status	ReviewStatus	Human review state for this annotation. Drives human-in-the-loop workflows for records that require operator approval before downstream action.
reviewer	Principal	Principal that reviewed the annotation (if any). Populated once review_status leaves the PENDING state.
reviewed_at	google.protobuf.Timestamp	Wall-clock time at which the human review was completed.
review_notes	string	Optional reviewer notes captured during review.

Principal

A person, unit, or system that can originate, authorize, execute, review, or approve warfighting records.

Principals are the subjects of provenance, approval chains, assignment, and audit trails. A single principal can appear in multiple roles on the same record (e.g., the same operator who requests a fire mission also approves it).

Field	Type	Description
id	string	Unique identifier of the principal. Format is defined by the issuing authority (UUID, DoDAAC, UIC, user account name, service account ID, etc.).
type	PrincipalType	Kind of principal this identifier represents.
display_name	string	Optional human-readable display name. Example: “SGT Smith, J.”, “1-87 IN”, “fires-planner-svc”.
role	string	Optional role the principal is acting in for this record. Free-form; examples: “FDO”, “FSO”, “PLAN_APPROVER”.

ProvenanceRecord

Data lineage and source attribution for a warfighting record.

ProvenanceRecord is attached to every record in the Raft WDM and carries the information needed to assess trust, reconstruct lineage, and make informed fusion or approval decisions.

Modeled loosely on W3C PROV-DM, with additions for multi-step transformation chains, upstream source linking, and collection method classification. Intentionally compact enough to be attached cheaply to every record.

Reference: W3C PROV-DM (<https://www.w3.org/TR/prov-dm/>).

Field	Type	Description
id	string	Unique identifier for this provenance record. Stable across re-publications so consumers can deduplicate and chain records.
name	string	Human-readable name of the operational source that produced or last updated this record. Examples: “USS Roosevelt CIC”, “SIGINT Station Alpha”, “UAV-042 EO/IR”, “25th ID G2”.
description	string	Additional context about the source or collection method. May include sensor mode, collection geometry, analyst notes, or workflow step description.
updated_at	google.protobuf.Timestamp	Timestamp when this information was produced or last updated at the source. Distinct from any message transaction time.
producer	string	Identifier of the technical component that emitted or last transformed this record. Distinct from name, which identifies the operational source, <code>producer</code> identifies the service, algorithm, model, plugin, or client application that handled the record immediately before publication. Convention: be as precise as possible. Examples: - “my-tracker-v1.2” - “fusion-algo-v3.1” - “yolo-v8-object-detection” - “acme-c2-client-2026.1”
collection_method	CollectionMethod	Method used to obtain or derive this record.
source_reliability	SourceReliability	Source reliability rating per US Army FM 2-22.3. Rates the track record of the source, independent of any specific piece of information.
information_credibility	InformationCredibility	Information credibility rating per US Army FM 2-22.3. Rates the information itself, independent of source reliability. Combined with <code>source_reliability</code> , yields the standard alphanumeric intelligence rating (e.g., “B2”).
parents	repeated ProvenanceRecord	Provenance records of upstream transformations that produced this record. Enables lineage reconstruction across multi-step derivation chains (sensor -> tracker -> fusion -> assessment). Each entry is an independent <code>ProvenanceRecord</code> ; callers may either embed full records or include stub records carrying only <code>id</code> and let consumers resolve the remainder.
agent	Principal	Agent responsible for this record. Identifies the person, software agent, organization, or object that bears responsibility for the record. Distinct from <code>producer</code> , which names the technical component that emitted the record; <code>agent</code> names who the record is attributed to.
request_id	string	Server-generated UUID for this specific publish/update request. Read-only; populated by the platform.
source_node_id	string	UUID of the Raft Data Platform node that first received this request. Read-only; populated by the platform.

ReplicationMetadata

Mesh replication metadata for a warfighting record.

Captures where a record originated, which node delivered it to the current receiver, how it should propagate through the mesh, and how conflicts should be resolved. Replication metadata lets downstream consumers reason about record provenance and replication policy across disconnected and intermittently connected enclaves (DDIL).

This message captures what is knowable on each receiver, e.g., where the record originated, which node delivered it most recently, and when it was accepted

locally.

Server-populated on publication and receipt; clients should treat this as read-only.

Field	Type	Description
origin_node_id	string	UUID of the node where this record was first created. Stable across replication; does not change as the record propagates through the mesh.
received_from_node_id	string	UUID of the node that delivered this record to the current receiver.
received_at	google.protobuf.Timestamp	Wall-clock time at which the current receiver accepted this record.
scope	ReplicationScope	How broadly this record replicates through the mesh.
conflict_resolution	ConflictResolution	Conflict resolution policy applied when reconciling concurrent updates to the same record across the mesh.
reconciliation_policy_id	string	Identifier of the reconciliation policy that produced the currently visible state of this record. Allows downstream consumers to understand why a particular version won a merge.

AttachmentKind

Broad classification of an attachment.

Name	Description
ATTACHMENT_KIND_UNSPECIFIED	
ATTACHMENT_KIND_IMAGERY	Still imagery (e.g., NITF, JPEG, PNG, GeoTIFF).
ATTACHMENT_KIND_FMV	Full-motion video (e.g., MPEG-TS, H.264/H.265).
ATTACHMENT_KIND_DOCUMENT	Documents and reports (e.g., PDF, DOCX, plain text).
ATTACHMENT_KIND_AUDIO	Audio recordings (e.g., WAV, MP3, FLAC).
ATTACHMENT_KIND_DATA	Structured data (e.g., logs, telemetry, CSV).
ATTACHMENT_KIND_JSON	JSON payloads (e.g., configuration, analytics).
ATTACHMENT_KIND_GEOSPATIAL	Geospatial data (e.g., KML/KMZ, Shapefile, MBTiles).
ATTACHMENT_KIND_MESSAGE	Serialized C2 messages (e.g., VMF, Link-16 J-series).
ATTACHMENT_KIND_ARCHIVE	Compressed bundles (e.g., ZIP, TAR, 7z).
ATTACHMENT_KIND_ML_MODEL	Machine-learning model artifacts (e.g., ONNX, TensorRT).
ATTACHMENT_KIND_BINARY	Opaque binary blobs (e.g., software, raw sensor dumps, proprietary formats).

CollectionMethod

How a record was obtained or derived.

Intended as a coarse classification for filtering and trust scoring. Finer-grained detail should live in ProvenanceRecord.description or in ML annotations.

Name	Description
COLLECTION_METHOD_-UNSPECIFIED	
COLLECTION_METHOD_SENSOR	Direct sensor measurement (e.g., radar, EO/IR, SIGINT, AIS, ADS-B).
COLLECTION_METHOD_HUMAN	Human analyst assessment, authoring, or annotation.
COLLECTION_METHOD_RULE	Automated rule-based processing (e.g., deterministic correlator, format converter, policy filter, etc.).
COLLECTION_METHOD_-STATISTICAL	Statistical or probabilistic processing (e.g., tracker, estimator).
COLLECTION_METHOD_ML_MODEL	Machine learning model inference.
COLLECTION_METHOD_FUSION	Multi-source fusion that combines inputs of different provenance.
COLLECTION_METHOD_IMPORT	Imported from an upstream external system of record.
COLLECTION_METHOD_SIMULATION	Computer-generated simulation output.

ConflictResolution

Policy applied when reconciling concurrent updates to the same record across the mesh.

Name	Description
CONFLICT_RESOLUTION_-UNSPECIFIED	
CONFLICT_RESOLUTION_LWW	Last writer wins.
CONFLICT_RESOLUTION_-PRIORITY_RULES	Source priority rules (e.g., manual > ML > automated > sensor raw) resolve the winner.
CONFLICT_RESOLUTION_CUSTOM	A custom reconciliation policy decides the winner. See ReplicationMetadata.reconciliation_policy_id for the policy identifier.

InformationCredibility

Information credibility rating per US Army FM 2-22.3. Rates the information itself based on corroboration, consistency, and plausibility, independent of source reliability.

Name	Description
INFORMATION_CREDIBILITY_UNSPECIFIED	
INFORMATION_CREDIBILITY_1	Confirmed by other sources.
INFORMATION_CREDIBILITY_2	Probably true.
INFORMATION_CREDIBILITY_3	Possibly true.
INFORMATION_CREDIBILITY_4	Doubtful.
INFORMATION_CREDIBILITY_5	Improbable.
INFORMATION_CREDIBILITY_6	Truth cannot be judged.

PrincipalType

Broad classification of principals.

Name	Description
PRINCIPAL_TYPE_UNSPECIFIED	
PRINCIPAL_TYPE_OBJECT	A tracked warfighting object (unit, platform, crew) acting as a principal.
PRINCIPAL_TYPE_SYSTEM	A software service, agent, or automated component.
PRINCIPAL_TYPE_USER	A human user account.
PRINCIPAL_TYPE_ORGANIZATION	A formal organization (command, directorate, coalition partner) acting as a principal without a direct object or user mapping.

PriorityTier

QoS priority tier used by the mesh for replication and routing decisions.

Name	Description
PRIORITY_TIER_UNSPECIFIED	
PRIORITY_TIER_LOW	
PRIORITY_TIER_MEDIUM	
PRIORITY_TIER_HIGH	
PRIORITY_TIER_CRITICAL	

ReplicationScope

How broadly a record should be replicated through the mesh.

Name	Description
REPLICATION_SCOPE_UNSPECIFIED	
REPLICATION_SCOPE_NODE_LOCAL	Record stays on the originating node and is never propagated.
REPLICATION_SCOPE_MESH_WIDE	Record replicates across all nodes in the current mesh.
REPLICATION_SCOPE_CROSS_DOMAIN	Record is eligible for replication across security or coalition domain boundaries, subject to cross-domain policy enforcement.

ReviewStatus

Human-in-the-loop review status for an ML annotation.

Name	Description
REVIEW_STATUS_UNSPECIFIED	

Name	Description
REVIEW_STATUS_NOT_REQUIRED	Annotation has not been submitted for review. Either review is not required for this record or the workflow has not yet queued it.
REVIEW_STATUS_PENDING	Annotation is queued and awaiting human review.
REVIEW_STATUS_APPROVED	Reviewer confirmed the annotation; downstream consumers may treat it as authoritative.
REVIEW_STATUS_REJECTED	Reviewer rejected the annotation; consumers should not rely on its output for targeting or engagement decisions.
REVIEW_STATUS_AMENDED	Reviewer modified the annotation during review. The annotation now reflects the corrected values; the original is preserved in provenance history.

SourceReliability

Source reliability rating per US Army FM 2-22.3. Rates the track record of the source, independent of any specific piece of information.

Name	Description
SOURCE_RELIABILITY_UNSPECIFIED	
SOURCE_RELIABILITY_A	Completely reliable.
SOURCE_RELIABILITY_B	Usually reliable.
SOURCE_RELIABILITY_C	Fairly reliable.
SOURCE_RELIABILITY_D	Not usually reliable.
SOURCE_RELIABILITY_E	Unreliable.
SOURCE_RELIABILITY_F	Reliability cannot be judged.

Comms

CommsInfo

Communications and data link status for platforms.

Tracks which radio nets and tactical data links an object participates in and their operational status. Supports C2 planning (knowing which units are reachable on which nets) and network situational awareness.

Reference: Army FM 6-02 (Signal Support to Operations); ACP 190 (NATO Guide to Frequency Planning).

Field	Type	Description
radios	repeated Radio	Radio systems carried by this object.

Radio

A single radio set and its current operating state.

Field	Type	Description
nomenclature	string	Radio model or nomenclature. Examples: “AN/PRC-117G”, “AN/VRC-110”, “JTIDS”.
frequency_hz	optional double	Current operating frequency in Hz.
net_id	string	Net identifier the radio is tuned to. Examples: “BN CMD”, “BDE OPS”, “DIV FIRES”.
state	RadioState	Current operating state.

RadioState

Operating state of a radio set. LISTENING_SILENCE corresponds to Army EMCON conditions per ACP 190 and FM 6-02.

Name	Description
RADIO_STATE_UNSPECIFIED	
RADIO_STATE_OPERATING	
RADIO_STATE_DEGRADED	
RADIO_STATE_INOPERABLE	
RADIO_STATE_LISTENING_SILENCE	

Correlation

Correlation and disassociation of warfighting objects representing the same real-world thing.

Grounded in standard multi-sensor data fusion and entity resolution concepts, e.g., the JDL Data Fusion Model (Level 1 Object Refinement), NATO STANAG 4676 (AEDP-4676), etc.

CorrelationState

Correlation state linking a warfighting object to a correlation.

A correlation is the set of objects that represent the same real-world thing. The correlation is implicit and exists because objects share the same correlation_id. Each object carries its own correlation_id and role; there are no cross-object references.

Managed externally; any value provided on a direct object write is ignored.

Field	Type	Description
correlation_id	string	Identifier for the correlation this object belongs to.
role	CorrelationRole	This object’s role within the correlation.
origin	CorrelationOrigin	Whether the correlation was initiated manually, automatically, by a rule, statistically, by an ML model, or imported from upstream.
scope	ReplicationScope	How broadly this correlation replicates through the mesh.
provenance	ProvenanceRecord	Source attribution for the correlation decision.
confidence	optional float	Confidence in the correlation decision. Range: 0.0 to 1.0. Interpretation depends on the producer. Consumers should treat an unset value as “unknown” rather than zero.

Disassociation

Record of an explicit disassociation between this object and another.

Disassociation records serve as an audit trail and as a guard against automated re-association of pairs that operators have explicitly separated.

Field	Type	Description
object_id	string	Identifier of the other object that was disassociated from this one.
correlation_id	string	Correlation this disassociation occurred in. Disambiguates when an object has been in multiple correlations over time.
origin	CorrelationOrigin	Whether the disassociation was manual or automated.
scope	ReplicationScope	How broadly this disassociation replicates through the mesh.
provenance	ProvenanceRecord	Source attribution for the disassociation decision.

CorrelationOrigin

Origin of a correlation or disassociation decision.

Use the most specific value available. AUTOMATED is a catch-all for automated decisions whose flavor is unknown or not worth distinguishing. The specific producer (algorithm or model name and version) should be identified in ProvenanceRecord.producer.

Name	Description
CORRELATION_ORIGIN_-UNSPECIFIED	
CORRELATION_ORIGIN_MANUAL	Operator-initiated.
CORRELATION_ORIGIN_-AUTOMATED	Automated, flavor unspecified.
CORRELATION_ORIGIN_RULE_-BASED	Deterministic rule or hard correlator. Corresponds to hard association in fusion literature.
CORRELATION_ORIGIN_-STATISTICAL	Probabilistic or statistical tracker (e.g., JPDA, MHT, Bayesian association).
CORRELATION_ORIGIN_ML_MODEL	Learned model (neural network, gradient-boosted classifier, foundation model). Surfaced as a distinct origin to support auditing of decisions made by learned components.
CORRELATION_ORIGIN_EXTERNAL	Correlation imported from an upstream system that already performed the association.

CorrelationRole

Role of an object within a correlation.

Name	Description
CORRELATION_ROLE_UNSPECIFIED	

Name	Description
CORRELATION_ROLE_REPRESENTATIVE	The object that represents the correlation. May be a canonical source record selected as authoritative, or a fused synthetic track combining multiple sources. The origin and producer attribution indicate which. Ideally one representative per correlation; temporary duplicates are tolerated during disconnected operations.
CORRELATION_ROLE_MEMBER	Another object in the correlation. Retains its original source data.

EW

ElectronicWarfareInfo

Electronic warfare effects data.

Complements SignalInfo (which models signal characteristics for SIGINT and ELINT) by capturing EW effects: jamming, spoofing, and denial. Applicable to objects representing jammers, EW targets, and decoys. Use the parent object's geometry for affected area and SignalInfo for the signal characteristics of the jamming emission.

Reference: JP 3-13.1 (Electronic Warfare); Army FM 3-12 (Cyberspace and Electronic Warfare Operations).

Field	Type	Description
role	EwRole	Role of this object in the EW engagement.
jamming_technique	JammingTechnique	Jamming technique employed.
affected_frequency_min_hz	optional double	Low end of the affected frequency range in Hz.
affected_frequency_max_hz	optional double	High end of the affected frequency range in Hz.
effective_radiated_power_watts	optional double	Effective radiated power of the jamming signal in watts.
effect_status	EwEffectStatus	Current effect status.
target_object_ids	repeated string	Identifiers of the warfighting objects currently affected by this EW system.

EwEffectStatus

Current status of an EW effect.

Name	Description
EW_EFFECT_STATUS_UNSPECIFIED	
EW_EFFECT_STATUS_ACTIVE	
EW_EFFECT_STATUS_STANDBY	
EW_EFFECT_STATUS_CEASED	

EwRole

EW engagement role.

Name	Description
EW_ROLE_UNSPECIFIED	
EW_ROLE_JAMMER	Electronic attack platform
EW_ROLE_TARGET	Object being jammed or affected
EW_ROLE_DECOY	Emitting deceptive signals
EW_ROLE_SENSOR	Electronic support / passive detection

JammingTechnique

Jamming technique classification.

Name	Description
JAMMING_TECHNIQUE_UNSPECIFIED	
JAMMING_TECHNIQUE_NOISE	Broadband noise jamming
JAMMING_TECHNIQUE_DECEPTIVE	False-target / gate pull-off
JAMMING_TECHNIQUE_SPOT	Concentrated on a single frequency
JAMMING_TECHNIQUE_BARRAGE	Wide frequency band simultaneously
JAMMING_TECHNIQUE_SWEEP	Rapidly sweeps across frequency
JAMMING_TECHNIQUE_REPEATER	Receives and retransmits enemy signals
JAMMING_TECHNIQUE_SPOOFING	GPS or signal spoofing

Ground

GroundInfo

Ground-domain attributes for vehicles, dismounts, and ground equipment.

Field	Type	Description
platform_type	string	Platform type designation. Examples: “T-72B3”, “HMMWV”, “dismount”.
movement	MovementStatus	Current movement state.
terrain	TerrainType	Terrain classification at the object’s location.
cover	CoverStatus	Cover and concealment status.

CoverStatus

Cover and concealment status.

Name	Description
COVER_STATUS_UNSPECIFIED	
COVER_STATUS_EXPOSED	

Name	Description
COVER_STATUS_PARTIAL	
COVER_STATUS_CONCEALED	
COVER_STATUS_DUG_IN	

MovementStatus

Ground movement state.

Name	Description
MOVEMENT_STATUS_UNSPECIFIED	
MOVEMENT_STATUS_STATIONARY	
MOVEMENT_STATUS_MOVING	
MOVEMENT_STATUS_HALTED	

TerrainType

Terrain classification at an object's location.

Name	Description
TERRAIN_TYPE_UNSPECIFIED	
TERRAIN_TYPE_URBAN	
TERRAIN_TYPE_RURAL	
TERRAIN_TYPE_FOREST	
TERRAIN_TYPE_DESERT	
TERRAIN_TYPE_MOUNTAIN	

Identity

Identity

External system identifier for a warfighting object.

Enables correlation across systems by carrying the source system name and the identifier issued by that system. Common pairings include AIS MMSI, ADS-B Mode-S, Link-16 track numbers, DoDAAC, and UIC.

Field	Type	Description
system	string	Source system name. Example: "ais", "adsb", "link16", "gccs-j".
identifier	string	Identifier value issued by that system.

Field	Type	Description
origin_type	IdentityOriginType	How this identifier was obtained. Used as an authority signal when the same real-world object carries multiple identifiers from different sources (e.g., track numbers propagating between platforms in a data link environment).

OperationalFlags

Operational flags used to segregate live, simulated, and exercise data as well as to advertise actionability.

Field	Type	Description
is_simulated	bool	True if the object is computer-generated rather than derived from live sensors.
is_exercise	bool	True if the object participates in an exercise (real or simulated).
is_actionable	bool	True if the object can receive warfighting actions.

IdentityOriginType

How an Identity was obtained.

In multi-platform environments, the same object can carry track numbers issued by several sources with different authority. This enum makes the authority signal explicit so correlation logic can decide which identifier is canonical when duplicates exist.

Name	Description
IDENTITY_ORIGIN_TYPE_-UNSPECIFIED	
IDENTITY_ORIGIN_TYPE_LOCAL	Assigned by the local producer or reporting unit. Authoritative for that producer.
IDENTITY_ORIGIN_TYPE_COPIED	Copied from an upstream source. Not locally authoritative; should reconcile back to the originator's LOCAL or to a COORDINATED identifier.
IDENTITY_ORIGIN_TYPE_-COORDINATED	Issued by a designated coordinator that resolves conflicting reports from multiple sensors into a single canonical identifier (e.g., Force Over-the-Horizon Track Coordinator, AWACS, joint data link manager, coalition fusion hub).
IDENTITY_ORIGIN_TYPE_-BROADCAST	Assigned by a broadcast system rather than by a specific producer (e.g., Position Location Reporting System).
IDENTITY_ORIGIN_TYPE_-REGENERATED	Reconstructed after a loss of continuity (e.g., the original track was lost and a new identifier was generated to resume tracking).

Maritime

MaritimeInfo

Maritime-domain attributes sourced primarily from AIS, radar, and naval C2 systems.

Reference: ITU-R M.1371 (AIS)

Field	Type	Description
vessel_type	VesselType	Vessel classification.
imo_number	string	IMO ship identification number (7 digits).
mmsi	string	Maritime Mobile Service Identity (9 digits).
maritime_callsign	string	Radio callsign.
flag_state	string	Flag state (ISO 3166-1 alpha-3).
destination	string	Destination port or area.
pennant_number	string	Pennant or hull number for naval vessels (e.g., “DDG-51”, “CVN-68”).
nav_status	NavigationStatus	AIS navigation status.
draft_meters	optional double	Current draft in meters.
cargo_type	string	Cargo type description.
sconum	string	Ship Control Number per US Navy SCONUM convention.

NavigationStatus

AIS navigation status codes.

Name	Description
NAVIGATION_STATUS_UNSPECIFIED	
NAVIGATION_STATUS_UNDERWAY	
NAVIGATION_STATUS_AT_ANCHOR	
NAVIGATION_STATUS_MOORED	
NAVIGATION_STATUS_NOT_UNDER_COMMAND	
NAVIGATION_STATUS_RESTRICTED	
NAVIGATION_STATUS_AGROUND	
NAVIGATION_STATUS_FISHING	

VesselType

Vessel classification aligned with AIS vessel type codes.

Name	Description
VESSEL_TYPE_UNSPECIFIED	
VESSEL_TYPE_CARGO	
VESSEL_TYPE_TANKER	
VESSEL_TYPE_PASSENGER	
VESSEL_TYPE_FISHING	
VESSEL_TYPE_MILITARY	
VESSEL_TYPE_TUG	
VESSEL_TYPE_RECREATIONAL	
VESSEL_TYPE_SAR	

Object

Core warfighting representation of a tracked object in the battlespace.

An Object is anything with identity that the force needs to track: platforms, units, facilities, equipment, personnel, events, control measures, signals, and more.

Object

Core warfighting representation of a tracked object in the battlespace.

An Object is anything with identity that the force needs to track: platforms, units, facilities, equipment, personnel, events, control measures, signals, and more.

Flexible Field Model

Most fields are optional - populate only what is relevant for the specific object being represented. This flexibility allows modeling diverse object types without requiring separate message definitions for each category.

Different object types naturally use different field subsets. For example: - Maritime vessel: location, motion, maritime info, identities (MMSI), dimensions. - Aircraft: location, motion, aviation info, identities (Mode-S), assessment. - Ground vehicle: location, motion, ground info, assessment, labels. - Facility: location, dimensions, assessment (no motion). - Person: location, assessment (minimal fields). - Control measure: shape, assessment, labels (no motion or dimensions). - Etc.

Required vs Optional Fields

Minimally required for all objects: - `id`: unique identifier (generated if not provided). - `provenance.updated_at`: when this data was last modified.

Commonly populated but optional: - `name`: human-readable identifier. - `location.position`: geographic coordinates. - `assessment`: tactical assessment (affiliation, environment).

Domain-specific (populate as applicable): - `type_info.maritime`: ships, boats, submarines. - `type_info.aviation`: aircraft, helicopters, UAVs. - `type_info.ground`: vehicles, dismounts, equipment. - `type_info.orbital`: satellites, space objects. - `type_info.signal`: SIGINT/ELINT emissions. - Etc.

Field Population Guidelines

1. Populate what you know, and omit unknown or irrelevant fields.
2. Do not invent data. Empty or default values can mislead consumers.
3. Use the `type_info` discriminator and populate the domain-specific section that applies.
4. Provenance is critical: always include source and timestamp.
5. Assessment provides warfighting context. Affiliation and environment are needed for tactical decision-making.

Field	Type	Description
<code>id</code>	string	Unique identifier (UUID).

Field	Type	Description
security	SecurityMarking	Classification and handling caveats.
name	string	Short name used to refer to this object in displays and reports.
description	string	Human-readable description or operator remarks.
identities	repeated Identity	External identifiers from source systems (MMSI, Mode-S address, Link-16 track number, vehicle bumper number, etc.).
labels	repeated Object.LabelsEntry	Extensible key-value metadata. Keys should follow a namespaced convention such as “domain.system.field” to avoid collisions.
ontology	Ontology	Semantic classification and formal ontology alignment.
flags	OperationalFlags	Operational flags used for data segregation (simulation, exercise, actionable).
type_info	TypeInfo	Domain-specific attributes. Populate the component that matches the operational domain of the object.
location	SpatialLocation	Geographic position, orientation, and uncertainty.
motion	Motion	Velocity and acceleration in the local ENU frame.
shape	SpatialGeometry	Structured geometric shape for non-point objects (boundaries, coverage areas, routes, sensor footprints).
orbital_motion	OrbitalMotion	Keplerian orbital elements for space objects.
state_vector	StateVector	Cartesian state vector for high-precision orbital propagation.
track_info	TrackInfo	Track quality and measurement metadata.
status	ObjectStatus	Current lifecycle status of this object.
ttl	google.protobuf.Timestamp	Time at which the object expires and is removed from the active picture. Unset means the object does not have an expiration time. Enforced by the platform.
persist	bool	When true, the object never auto-expires regardless of <code>ttl</code> .
priority	PriorityTier	QoS priority tier assigned by the platform. Used by the mesh for routing and replication prioritization. Read-only; any client-provided value is ignored.
assessment	Assessment	Warfighter’s tactical assessment of this object.
dimensions	PhysicalDimensions	Physical size and mass (length, width, height, weight).
targeting	TargetingInfo	Targeting and threat assessment data.
symbology	Symbology	Military symbology representation per MIL-STD-2525C/D.
transponder_codes	TransponderCodes	IFF/transponder interrogation codes.
sensors	repeated Sensor	Sensors mounted on this object.
expendables	Expendables	Fuel, ordnance, guns, and endurance carried by the object.
attachments	repeated Attachment	File attachments (imagery, full-motion video, documents, audio, telemetry). Stores pointers, not contents.
details	google.protobuf.Struct	Object-specific metadata as loosely-typed structured data. Use this field for integration data that does not yet have a strongly-typed warfighting field. Follow the <code>@type</code> convention for discriminating between structured payload types: set an “@type” property whose value is a fully qualified type identifier (e.g., “raft.wdm.v1.ext.FireUnit”, “com.acme.CustomSensorData”). Consumers without the matching schema can still inspect fields generically. Prefer strongly-typed fields (<code>type_info</code> , <code>sensors</code> , <code>symbology</code>) and <code>ExternalReference</code> payloads over <code>details</code> whenever possible.
external_refs	repeated ExternalReference	References to representations of this object in external data models (e.g., Trax OMNI message, GCCS-J ETF track, CoT event, JREAP track).

Field	Type	Description
relationships	repeated Relationship	Directed relationships to other objects in the operational picture. Distinct from correlation (which links objects representing the same real-world thing). Relationships link distinct objects with operational, organizational, or functional connections, e.g., C2 authority, sensor-to-target, support, etc.
provenance	ProvenanceRecord	Data lineage and source attribution for trust assessment. Required on every publish; producers must populate at minimum <code>provenance.updated_at</code> .
replication	ReplicationMetadata	Mesh replication metadata. Read-only; populated by the platform.
ml_annotations	repeated MachineLearningAnnotation	Machine learning annotations attached to this object. Each entry documents a model, its inference, and any human review state.
correlation	CorrelationState	Correlation state linking this object to a correlation. A correlation is a set of objects representing the same real-world thing. Read-only on this message; managed via the dedicated correlation service.
disassociations	repeated Disassociation	Disassociation records for objects explicitly excluded from correlation with this one. Read-only on this message; managed via the correlation service.
catalog	CatalogReference	Reference to this object's position in the Raft Data Platform catalog (data source, connection, dataset).
effective_from	google.protobuf.Timestamp	Declarative activation time for planned or scheduled objects (e.g., a control measure that takes effect at H-hour, an attachment that begins at a future time). Informational only – the platform does not withhold the object from consumers before this time. Consumers should choose how to handle objects whose <code>effective_from</code> lies in the future.
warfighting_functions	repeated WarfightingFunction	Doctrinal warfighting function(s) this object is organized or equipped to support (ADP 3-0 / JP 3-0). Tag every applicable function; an empty list means no doctrinal function is asserted.

Object.LabelsEntry

Field	Type	Description
key	string	
value	string	

TypeInfo

Domain-specific attributes wrapped as a discriminated component.

Populate only the component that matches the operational domain of the object. Multiple components may be populated for objects that span domains (e.g., an air defense radar has both ground position and signal characteristics).

Field	Type	Description
maritime	MaritimeInfo	
aviation	AviationInfo	

Field	Type	Description
ground	GroundInfo	
orbital	OrbitalInfo	
signal	SignalInfo	
cbrn	CbrnInfo	
weather	WeatherInfo	
ew	ElectronicWarfareInfo	
comms	CommsInfo	
platform_status	PlatformStatus	
organization	OrganizationInfo	

ObjectStatus

Lifecycle status of a warfighting object.

Objects start in ACTIVE. Use INACTIVE to retain an object for historical reference without active tracking, and DELETED to remove it from the picture.

Name	Description
OBJECT_STATUS_UNSPECIFIED	
OBJECT_STATUS_ACTIVE	
OBJECT_STATUS_INACTIVE	
OBJECT_STATUS_DELETED	

Ontology

Semantic classification and formal ontology alignment (BFO/CCO) for both Objects and Actions.

Ontology

Semantic classification and formal ontology alignment for a warfighting record (Object or Action).

Combines an operational category, a human-readable type name, and extensible ontology references (URIs or CURIEs) for interoperability with systems that operate at the ontology level. Supports DNI and DIA guidance for BFO and CCO alignment without requiring schema changes when new ontologies are adopted.

Format for refs: prefix:LocalName or full URI. Common prefixes: bfo: <http://purl.obolibrary.org/obo/> cco: <http://www.ontologyrepository.com/CommonCoreOntologies/>

Object examples: category: CATEGORY_PLATFORM type: “F-35A Lightning II” refs: [“bfo:Object”, “cco:Aircraft”]

Action examples: category: CATEGORY_PLANNED_ACT type: “fire_mission” refs: [“bfo:Process”, “cco:ActOfWeaponUse”]

Reference: Basic Formal Ontology (BFO); Common Core Ontologies (CCO).

Field	Type	Description
category type	OntologyCategory string	Broad operational category grounded in BFO/CCO. Human-readable type name or designator. For Objects this is typically a platform designation or unit type (e.g., “F-35A Lightning II”, “Infantry Battalion”). For Actions this may mirror the type field or provide a more formal name (e.g., “Close Air Support”, “CBRN Warning”).
refs	repeated string	Formal ontology type references (URIs or CURIEs). Maps this record to external ontologies such as BFO, CCO, DICO, or domain-specific vocabularies. Consumers that do not use ontologies can ignore this field.

OntologyCategory

Operational category for a warfighting record, grounded in BFO/CCO upper ontology.

Each value maps to BFO (Basic Formal Ontology) and CCO (Common Core Ontologies) classes to ensure semantic interoperability across DOD, IC, and allied systems.

BFO Continuant vs Occurrent: - Object-oriented categories (PLATFORM through ORGANIZATION) are mostly Continuants (exist fully at any point in time). - Action-oriented categories (PLANNED_ACT through COMMUNICATION) and EVENT/SIGNAL are Occurrents (unfold over time).

Name	Description
ONTOLOGY_CATEGORY_UNSPECIFIED	
ONTOLOGY_CATEGORY_PLATFORM	Individual vehicle, vessel, aircraft, or spacecraft. BFO: bfo:Object
ONTOLOGY_CATEGORY_UNIT	Military or organizational unit. BFO: bfo:ObjectAggregate
ONTOLOGY_CATEGORY_PERSON	Individual human being. BFO: bfo:Object
ONTOLOGY_CATEGORY_FACILITY	Fixed structure or installation. BFO: bfo:Object
ONTOLOGY_CATEGORY_EQUIPMENT	Non-self-propelled system or device. BFO: bfo:Object
ONTOLOGY_CATEGORY_MUNITION	Weapon or munition in flight. BFO: bfo:Object
ONTOLOGY_CATEGORY_GROUP	Ad-hoc collection treated as single operational object. BFO: bfo:ObjectAggregate
ONTOLOGY_CATEGORY_CONTROL_MEASURE	Tactical graphic or control measure. BFO: bfo:Site
ONTOLOGY_CATEGORY_INFRASTRUCTURE	Linear or distributed physical infrastructure. BFO: bfo:Object
ONTOLOGY_CATEGORY_GEOPOLITICAL	Geopolitical entity or territory. BFO: bfo:Site
ONTOLOGY_CATEGORY_NATURAL_FEATURE	Natural geographic feature. BFO: bfo:Site
ONTOLOGY_CATEGORY_ORGANIZATION	Non-military organization or network. BFO: bfo:ObjectAggregate
ONTOLOGY_CATEGORY_EVENT	Transient occurrence at a location/time. BFO: bfo:Process
ONTOLOGY_CATEGORY_SIGNAL	Electromagnetic emission or signal. BFO: bfo:Process
ONTOLOGY_CATEGORY_PLANNED_ACT	A deliberate act prescribed by a directive or plan. BFO: bfo:Process
ONTOLOGY_CATEGORY_OBSERVATION	An act of acquiring information via sensors or observers. BFO: bfo:Process
ONTOLOGY_CATEGORY_COMMUNICATION	An act of transferring information between agents. BFO: bfo:Process
ONTOLOGY_CATEGORY_MILITARY_OPERATION	An act employing military force to achieve a desired result. BFO: bfo:Process
ONTOLOGY_CATEGORY_WEAPON_EMPLOYMENT	An act of employing a weapon against a target. BFO: bfo:Process
ONTOLOGY_CATEGORY_MOVEMENT	An act of changing the location of an object or force. BFO: bfo:Process
ONTOLOGY_CATEGORY_RECONNAISSANCE	An act of gathering intelligence or conducting reconnaissance. BFO: bfo:Process
ONTOLOGY_CATEGORY_PLANNING	An act of formulating a plan to achieve an objective. BFO: bfo:Process

Name	Description
ONTOLOGY_CATEGORY_REPORTING	An act of giving a detailed account or assessment. BFO: bfo:Process

Orbital

OrbitalInfo

Orbital object catalog and operator metadata for space objects.

Field	Type	Description
object_id	string	On-orbit object identifier (e.g., satellite number).
sat_cat	string	Satellite catalog number.
object_type	string	Object type classification (active satellite, inactive satellite, debris, natural object).
operator	string	Current operator of the object.
origin	string	Country or organization of origin.
launch_date	google.protobuf.Timestamp	Launch date.

OrbitalMotion

Keplerian orbital elements. Fields generally match a Two-Line Element (TLE) set.

Field	Type	Description
epoch	google.protobuf.Timestamp	Epoch of this kinematic measurement.
mean_mot_dot	double	First derivative of mean motion.
mean_mot_ddot	double	Second derivative of mean motion.
b_star	double	Drag and radiation pressure coefficient.
inclination	double	Orbital inclination in degrees. 0 = equatorial, 90 = polar, >90 = retrograde. Range: 0.0 to 180.0.
raan	double	Right Ascension of Ascending Node in degrees. Range: 0.0 to 360.0.
eccentricity	double	Orbital eccentricity, dimensionless. 0 = circular, approaching 1 = highly elliptical.
arg_perigee	double	Argument of perigee in degrees. Range: 0.0 to 360.0.
mean_anomaly	double	Mean anomaly in degrees at epoch. Range: 0.0 to 360.0.
rev_num	double	Revolution number at epoch.

StateVector

Cartesian state vector for high-precision orbital propagation.

Field	Type	Description
epoch	google.protobuf.Timestamp	Epoch of this state vector.

Field	Type	Description
reference_frame	string	Reference frame identifier (e.g., “J2000”, “ICRF”).
position_km	Vector3	Position in kilometers in the given reference frame.
velocity_kmps	Vector3	Velocity in kilometers per second.
acceleration_kmps2	Vector3	Acceleration in kilometers per second squared.

Organization

CasualtySummary

Personnel casualty summary for a unit.

Field	Type	Description
kia	optional uint32	Killed in action.
wia	optional uint32	Wounded in action.
mia	optional uint32	Missing in action.
dnbi	optional uint32	Disease and non-battle injury.

OrganizationInfo

Military unit organization and hierarchy.

Applicable to objects with ontology category UNIT. Provides service affiliation, service-specific hierarchy level, branch, and identification data needed to represent joint and coalition order of battle.

Each service organizes differently; the hierarchy oneof carries the service-appropriate unit level. Populate the variant matching the service field. Structural relationships between units (OPCON, TACON, attached) are expressed elsewhere, not as fields on this message.

Field	Type	Description
service	Service	Parent service or organization.
land_echelon	LandEchelon	
naval_formation	NavalFormation	
air_echelon	AirEchelon	
joint_formation	JointFormation	
branch	Branch	Branch or functional area. Primarily an Army/Marine ground-force classification; Navy and Air Force use different classification systems and may leave this unspecified.
uic	string	Unit Identification Code or service equivalent. Army and Marines use UIC; Navy uses SNDL UIC; Air Force uses PAS.
strength_authorized	optional uint32	Authorized strength per MTOE or TDA.
strength_assigned	optional uint32	Assigned strength (currently assigned personnel).
strength_available	optional uint32	Present-for-duty strength (available for operations).
casualties	CasualtySummary	Casualty summary. The standard PERSTAT breakdown for force-level SA.

Field	Type	Description
combat_status	CombatStatus	Overall combat effectiveness assessment. Distinct from casualties; answers “can this unit still fight?”

AirEchelon

Air Force and Space Force unit hierarchy.

Name	Description
AIR_ECHELON_UNSPECIFIED	
AIR_ECHELON_ELEMENT	
AIR_ECHELON_FLIGHT	
AIR_ECHELON_SQUADRON	
AIR_ECHELON_GROUP	
AIR_ECHELON_WING	
AIR_ECHELON_DELTA	Space Force Delta
AIR_ECHELON_NUMBERED_AIR_FORCE	
AIR_ECHELON_MAJOR_COMMAND	

Branch

Military branch or functional area (Army and Marine Corps).

Army classification per DA PAM 600-3. Marines use similar categories via MCO 1000.8. Navy and Air Force use different classification systems and should leave Branch unspecified.

Name	Description
BRANCH_UNSPECIFIED	
BRANCH_INFANTRY	
BRANCH_ARMOR	
BRANCH_ARTILLERY	
BRANCH_ENGINEER	
BRANCH_SIGNAL	
BRANCH_AVIATION	
BRANCH_LOGISTICS	
BRANCH_MEDICAL	
BRANCH_MILITARY_INTELLIGENCE	
BRANCH_MILITARY_POLICE	
BRANCH_CYBER	
BRANCH_AIR_DEFENSE	
BRANCH_SPECIAL_OPERATIONS	
BRANCH_CHEMICAL	

Name	Description
BRANCH_CIVIL_AFFAIRS	

CombatStatus

Combat effectiveness assessment for a unit.

Summarizes the unit's ability to execute its assigned missions, integrating casualty state, equipment losses, and morale. Typically assessed by the unit commander and reported up the chain.

Name	Description
COMBAT_STATUS_UNSPECIFIED	
COMBAT_STATUS_OPERATIONAL	Unit is fully operational and can execute assigned missions.
COMBAT_STATUS_DEGRADED	Unit is operational but has taken losses or is degraded in capability.
COMBAT_STATUS_DAMAGED	Unit has taken significant damage but retains some combat capability.
COMBAT_STATUS_COMBAT_- INEFFECTIVE	Unit is unable to effectively execute combat missions. Requires reconstitution before returning to operations.
COMBAT_STATUS_DESTROYED	Unit is destroyed. No longer a viable combat formation.

JointFormation

Joint or combined organizational formations.

Name	Description
JOINT_FORMATION_UNSPECIFIED	
JOINT_FORMATION_JOINT_TASK_FORCE	
JOINT_FORMATION_COMBINED_JOINT_TASK_FORCE	
JOINT_FORMATION_FUNCTIONAL_COMPONENT_COMMAND	
JOINT_FORMATION_SUBORDINATE_UNIFIED_COMMAND	
JOINT_FORMATION_COMBATANT_COMMAND	

LandEchelon

Land forces (Army and Marine ground units) unit echelon.

Name	Description
LAND_ECHELON_UNSPECIFIED	
LAND_ECHELON_TEAM	Fire team, crew
LAND_ECHELON_SQUAD	
LAND_ECHELON_SECTION	

Name	Description
LAND_ECHELON_PLATOON	Company, battery, troop Battalion, squadron
LAND_ECHELON_COMPANY	
LAND_ECHELON_BATTALION	
LAND_ECHELON_REGIMENT	
LAND_ECHELON_BRIGADE	
LAND_ECHELON_DIVISION	
LAND_ECHELON_CORPS	
LAND_ECHELON_FIELD_ARMY	
LAND_ECHELON_ARMY_GROUP	
LAND_ECHELON_THEATER_ARMY	Marine Expeditionary Unit Marine Expeditionary Brigade Marine Expeditionary Force
LAND_ECHELON_MEU	
LAND_ECHELON_MEB	
LAND_ECHELON_MEF	

NavalFormation

Naval task organization or administrative formation.

Name	Description
NAVAL_FORMATION_UNSPECIFIED	Single vessel or submarine
NAVAL_FORMATION_UNIT	
NAVAL_FORMATION_DIVISION	
NAVAL_FORMATION_SQUADRON	
NAVAL_FORMATION_TASK_ELEMENT	
NAVAL_FORMATION_TASK_UNIT	
NAVAL_FORMATION_TASK_GROUP	
NAVAL_FORMATION_TASK_FORCE	
NAVAL_FORMATION_CARRIER_STRIKE_GROUP	
NAVAL_FORMATION_EXPEDITIONARY_STRIKE_GROUP	
NAVAL_FORMATION_AMPHIBIOUS_READY_GROUP	
NAVAL_FORMATION_CARRIER_AIR_WING	
NAVAL_FORMATION_FLEET	

Service

Service or parent organization of a military unit.

Name	Description
SERVICE_UNSPECIFIED	
SERVICE_ARMY	
SERVICE_NAVY	

Name	Description
SERVICE_AIR_FORCE	
SERVICE_MARINE_CORPS	
SERVICE_SPACE_FORCE	
SERVICE_COAST_GUARD	
SERVICE_JOINT	Joint task force, combatant command
SERVICE_COALITION	NATO or multinational formation

Platform

Endurance

Computed endurance based on current consumption rate.

Reported by the object's controller, which knows the actual consumption profile (loiter vs transit vs combat). External observers cannot derive this from fuel quantity alone.

Field	Type	Description
duration_seconds	optional double	Total endurance duration from full capacity at current consumption rate, in seconds.
duration_end	google.protobuf.Timestamp	Absolute time at which endurance is exhausted at current consumption rate.
percent	optional double	Endurance remaining as a percentage (0 to 100).

Expendables

Fuel, ordnance, gun ammunition, and endurance state.

Domain-agnostic: applicable to aircraft, ground vehicles, ships, and any other object that carries fuel, munitions, or guns.

Field	Type	Description
fuel	repeated FuelState	Current fuel state. Multiple entries for platforms with more than one fuel type (e.g., JP-8 plus diesel on a naval vessel).
ordnance	repeated Ordnance	Expendable ordnance carried by the object. Covers weapons, countermeasures, and other deployable stores (sonobuoys, flares).
guns	repeated GunState	Onboard gun ammunition state. Multiple entries for platforms with more than one gun system.
endurance	Endurance	Computed endurance at current consumption rate.

FuelState

Current fuel state for a single fuel type.

Field	Type	Description
fuel_type	string	Fuel type designation (e.g., “JP-8”, “F-76”, “AVGAS”).
quantity_kg	optional double	Current fuel quantity in kilograms.
capacity_kg	optional double	Maximum fuel capacity in kilograms.

GunState

Onboard gun ammunition state.

Field	Type	Description
system	string	Gun system identifier (e.g., “M61A2”, “GAU-8/A”, “Mk 45 Mod 4”).
round_type	string	Type of rounds loaded (e.g., “20MM PGU-28”, “30MM PGU-13 HEI”).
rounds_remaining	uint32	Rounds remaining.

Ordnance

A single expendable ordnance type.

Field	Type	Description
type	string	Designator (e.g., “AIM-120C”, “MJU-27”, “SSQ-62”).
name	string	Human-readable name (e.g., “AMRAAM”, “Flare”, “Sonobuoy”).
quantity	uint32	Number of units currently carried.

PlatformStatus

Platform operational status: readiness, subsystem state, power, and notices.

Reports the operational condition of a platform and its subsystems. Applicable to friendly force objects where readiness is operationally relevant.

Field	Type	Description
readiness	Readiness	Top-level platform readiness assessment (capability).
alert_posture	AlertPosture	Current alert posture (responsiveness). Orthogonal to readiness: a platform may be fully mission capable but on extended alert (e.g., in maintenance), or partially mission capable but on immediate alert.
link_state	LinkState	Data link state.
power	repeated PowerPlant	Power plants installed on this platform. Multiple entries for platforms with more than one power source.
subsystems	repeated SubsystemStatus	Per-subsystem operational state.
notices	repeated StatusNotice	Active status notices (faults, cautions, advisories).

PowerPlant

An installed power plant on a platform.

Platforms commonly have multiple power plants (main battery, auxiliary generator, shore power, APU). Each is reported independently so consumers can tell which plant is operational and which is the current primary.

Field	Type	Description
plant_id	string	Identifier for this power plant, unique within the object.
kind	PowerPlantKind	Kind of power plant.
charge_percent	optional double	Remaining capacity as a percentage (0 to 100).
output_voltage	optional double	Measured output voltage in volts.
runtime_remaining_seconds	optional double	Estimated runtime remaining at current draw in seconds.
supplying	optional bool	Whether this plant is currently supplying load.

StatusNotice

A platform-level status notice (fault, caution, advisory).

Severity follows ICAO Annex 4 / FAA Order 7110.65 cockpit Warning/Caution/Advisory conventions.

Field	Type	Description
notice_id	string	Notice identifier (system-defined code).
summary	string	Short human-readable summary.
severity	NoticeSeverity	Notice severity per ICAO Annex 4 WCA convention.
raised_at	google.protobuf.Timestamp	Time the notice was raised.

SubsystemStatus

State of a single platform subsystem.

A subsystem is a named functional element of the platform: engine, GPS, turret, radar, fire control, etc. The specific set of subsystems is platform-specific.

Field	Type	Description
subsystem_id	string	Identifier for this subsystem, unique within the object.
label	string	Human-readable name (e.g., “Engine”, “GPS”, “Fire Control”).
state	SubsystemState	Current operational state.
detail	string	Diagnostic or status message from the subsystem.

AlertPosture

Platform alert posture (responsiveness).

Describes how quickly the platform can begin executing its mission from its current state. Aligned with US Army REDCON levels and common aviation alert categories (5-minute alert, 15-minute alert, etc.).

Name	Description
ALERT_POSTURE_UNSPECIFIED	
ALERT_POSTURE_IMMEDIATE	Ready to execute immediately (seconds to minutes). Corresponds to REDCON-1 / 5-minute alert.
ALERT_POSTURE_SHORT_NOTICE	Ready within approximately 15 minutes. Corresponds to REDCON-2 / 15-minute alert.
ALERT_POSTURE_MODERATE_-NOTICE	Ready within approximately 1 hour. Corresponds to REDCON-3.
ALERT_POSTURE_EXTENDED	Requires significant preparation time (multiple hours). Corresponds to REDCON-4.
ALERT_POSTURE_STAND_DOWN	Not currently on alert (e.g., stood down for maintenance, training, or rest).

LinkState

State of a platform's data link to its command authority or mesh.

Name	Description
LINK_STATE_UNSPECIFIED	
LINK_STATE_UP	
LINK_STATE_DOWN	
LINK_STATE_INTERMITTENT	

NoticeSeverity

Status notice severity per ICAO Annex 4 and FAA Order 7110.65.

Name	Description
NOTICE_SEVERITY_UNSPECIFIED	
NOTICE_SEVERITY_ADVISORY	
NOTICE_SEVERITY_CAUTION	
NOTICE_SEVERITY_WARNING	

PowerPlantKind

Kind of power plant.

Name	Description
POWER_PLANT_KIND_UNSPECIFIED	
POWER_PLANT_KIND_BATTERY	
POWER_PLANT_KIND_GENERATOR	

Name	Description
POWER_PLANT_KIND_VEHICLE_BUS	
POWER_PLANT_KIND_SOLAR	
POWER_PLANT_KIND_SHORE	External / shore / ground power
POWER_PLANT_KIND_APU	Auxiliary power unit

Readiness

Platform readiness assessment (capability).

Name	Description
READINESS_UNSPECIFIED	
READINESS_FMC	Fully Mission Capable
READINESS_PMC	Partially Mission Capable
READINESS_NMC	Not Mission Capable

SubsystemState

Operational state of a platform subsystem.

Name	Description
SUBSYSTEM_STATE_UNSPECIFIED	
SUBSYSTEM_STATE_NOMINAL	
SUBSYSTEM_STATE_DEGRADED	
SUBSYSTEM_STATE_FAULT	
SUBSYSTEM_STATE_OFFLINE	
SUBSYSTEM_STATE_STANDBY	

Relationship

Typed, directed relationships between objects: C2 authority, organizational hierarchy, sensor/engagement links, support, and compositional groupings.

Relationship

A typed, directed link between this object and another.

Relationships are directional: this object is the “subject” and the related object is the “object.” For example, if object A has a relationship with type COMMANDS pointing to object B, the semantics are “A commands B.”

Bidirectional relationships are represented by each side carrying complementary types (e.g., A carries COMMANDS -> B, B carries COMMANDED_BY -> A). The system does not enforce bidirectional consistency automatically; producers are responsible for keeping both sides in sync. This is deliberate: in a DDIL scenario, automatic enforcement creates distributed consistency problems.

Distinct from correlation, which links objects representing the same real-world thing. Relationships link distinct objects that have operational, organizational, or functional connections.

Examples: - Brigade OPCON over a battalion. - Sensor tracking a target. - Fire unit supporting a maneuver unit. - Weapon-target pairing during engagement.

Field	Type	Description
object_id	string	Object ID of the related object.
relationship_id	string	Unique identifier for this relationship instance. Allows targeted updates and removals when an object has multiple relationships of the same type to different objects.
type	RelationshipType	Classification of this relationship.
effective_time	google.protobuf.Timestamp	When this relationship became effective.
remarks	string	Free-form remarks providing context, conditions, or authority for this relationship.

RelationshipType

Classification of a directed relationship between two objects.

Name	Description
RELATIONSHIP_TYPE_UNSPECIFIED	
RELATIONSHIP_TYPE_COMMANDS	This object exercises command authority over the related object.
RELATIONSHIP_TYPE_- COMMANDED_BY	This object is commanded by the related object.
RELATIONSHIP_TYPE_OPCON_TO	Operational control. The related object has directive authority over this object for specific operations, but not administrative or logistics authority.
RELATIONSHIP_TYPE_TACON_TO	Tactical control. The related object has local direction and control over movements or maneuvers of this object.
RELATIONSHIP_TYPE_ADCON_TO	Administrative control. The related object has authority over administrative and logistics matters for this object.
RELATIONSHIP_TYPE_ATTACHED_- TO	This object is attached to the related object's organization. Attached units are temporarily placed under another unit's C2 for the duration of the attachment.
RELATIONSHIP_TYPE_PARENT_- UNIT	This object is the parent unit of the related object in the organizational hierarchy (ORBAT).
RELATIONSHIP_TYPE_- SUBORDINATE_TO	This object is a subordinate (child) of the related object in the organizational hierarchy.
RELATIONSHIP_TYPE_MEMBER_OF	This object is a member of the group represented by the related object. Used for ad-hoc groupings, task forces, and composite organizations.
RELATIONSHIP_TYPE_TRACKS	This object's sensor is actively tracking the related object.
RELATIONSHIP_TYPE_TRACKED_BY	This object is being tracked by the related object's sensor.
RELATIONSHIP_TYPE_ENGAGES	This object (weapon/fire unit) is engaged against the related object (target). Covers weapon-target pairing during the engagement lifecycle.
RELATIONSHIP_TYPE_ENGAGED_BY	This object is being engaged by the related object.
RELATIONSHIP_TYPE_DESIGNATES	This object provides targeting data for the related object (e.g., a forward observer designating for a fire unit).
RELATIONSHIP_TYPE_SUPPORTS	This object has a direct support relationship to the related object. The supported unit has priority of the supporting unit's fires/assets.
RELATIONSHIP_TYPE_SUPPORTED_- BY	This object is supported by the related object.

Name	Description
RELATIONSHIP_TYPE_REINFORCES	This object is reinforcing the related object. Similar to direct support but the reinforcing unit retains its existing support mission as well.
RELATIONSHIP_TYPE - COLLOCATED_WITH	This object is collocated with the related object.
RELATIONSHIP_TYPE_CONTAINS	This object contains the related object. Models arbitrary compositional hierarchies, groupings, and collections.
RELATIONSHIP_TYPE_CONTAINED_BY	This object is contained by the related object.
RELATIONSHIP_TYPE_FUSED_FROM	This object was created by fusing the related objects. Distinct from correlation (which links separate objects representing the same real-world thing); fusion produces a single synthetic object from multiple inputs.
RELATIONSHIP_TYPE_AMPLIFIES	This object provides supplementary detail about the related object (e.g., an intelligence product elaborating on a track).
RELATIONSHIP_TYPE_REPORTING_RESPONSIBILITY	This object has reporting responsibility for the related object. Distinct from TRACKS (active sensor contact) and COMMANDS (authority).

Security

Security markings and classification handling for warfighting records.

SecurityComponents

Structured decomposition of an ISM classification marking.

Field	Type	Description
classification	string	Overall classification level (e.g., UNCLASSIFIED, CONFIDENTIAL, SECRET, TOP SECRET).
owner_producer	repeated string	Originating owner/producer country or organization trigraphs. Example: ["USA"], ["USA", "GBR"].
dissemination_controls	repeated string	Dissemination control markings (e.g., NOFORN, REL TO).
releasable_to	repeated string	Authorized release recipients (e.g., ["FVEY"], ["USA", "GBR", "AUS"]).
sci_controls	repeated string	Sensitive Compartmented Information controls.
sap_controls	repeated string	Special Access Program controls.
non_ic_markings	repeated string	Non-IC markings used outside the IC.
program_nicknames	repeated string	Program nicknames associated with this marking.
fgi_source_open	repeated string	Foreign government information source identifiers (open).
fgi_source_protected	repeated string	Foreign government information source identifiers (protected).

SecurityMarking

Normalized classification marking for a warfighting record.

Carries both a raw human-readable marking string and a structured decomposition of its components. Compatible with information security marking (ISM) format used across the intelligence community (IC) for ISM metadata.

Field	Type	Description
raw	string	Raw ISM marking string as displayed on the source document or message header. Example: “TOP SECRET//SI/TK//NOFORN”.
components	SecurityComponents	Decomposed structured components of the marking.

Sensor

Sensor

A sensor mounted on a warfighting object.

Groups one or more fields of view under a named, typed sensor. Examples: “search radar”, “spherical sonar array”, “EO turret”.

Field	Type	Description
name	string	Human-readable name for the sensor.
modality	SensorModality	Sensor modality classification (e.g., EO, IR, SAR, RADAR, SONAR).
type	string	Free-form sensor type or model designation (e.g., “AN/APG-81”, “Mk 92 Mod 6”). Use for producer-specific details that do not fit a standard modality.
coverage	repeated SensorCoverage	Coverage volumes for this sensor.

SensorCoverage

A 3D coverage volume for a sensor.

Describes the volume the sensor observes as an angular cone (or pyramid for asymmetric coverage) with optional range bounds. Optionally includes a pre-computed 2D ground projection so consumers without terrain data can render the footprint directly.

Field	Type	Description
type	CoverageType	Coverage behavior (fixed, roving, cued).
look_orientation	Orientation	Boresight direction in the object’s body frame. Consumers may compose this with the parent object’s <code>location.orientation</code> to derive absolute look direction.
horizontal_fov_degrees	optional double	Total horizontal (azimuth) angular extent in degrees.
vertical_fov_degrees	optional double	Total vertical (elevation) angular extent in degrees.
min_range_meters	optional double	Minimum useful range in meters.
max_range_meters	optional double	Maximum useful range in meters.
ground_footprint	Polygon	Pre-computed 2D projection of the coverage volume onto terrain.

CoverageType

Coverage behavior classification.

Aligned with NATO STANAG 4676 (AEDP-4676).

Name	Description
COVERAGE_TYPE_UNSPECIFIED	
COVERAGE_TYPE_FIXED	Stationary coverage pointed at a fixed area.
COVERAGE_TYPE_ROVING	Scanning or roving coverage that sweeps across an area.
COVERAGE_TYPE_CUED	Coverage directed by an external cue (e.g., tip from another sensor, operator designation, or automated cueing system).

SensorModality

Sensor modality classification.

Describes the physical phenomenon the sensor measures. Aligned with NATO STANAG 4676 (AEDP-4676).

Name	Description
SENSOR_MODALITY_UNSPECIFIED	
SENSOR_MODALITY_EO	Electro-optical (visible-light imagery).
SENSOR_MODALITY_IR	Infrared / thermal imagery.
SENSOR_MODALITY_SAR	Synthetic-aperture radar.
SENSOR_MODALITY_RADAR	Generic search or track radar.
SENSOR_MODALITY_MTI	Moving target indicator (ground or dismount MTI).
SENSOR_MODALITY_SONAR	Active or passive sonar.
SENSOR_MODALITY_LIDAR	LIDAR / laser range finder.
SENSOR_MODALITY_SIGINT	Signals intelligence (general SIGINT collection).
SENSOR_MODALITY_ELINT	Electronic intelligence (radar / emitter-focused SIGINT).
SENSOR_MODALITY_COMINT	Communications intelligence (comms-focused SIGINT).
SENSOR_MODALITY_MASINT	Measurement and signature intelligence.
SENSOR_MODALITY_MSI	Multispectral imagery.
SENSOR_MODALITY_HSI	Hyperspectral imagery.
SENSOR_MODALITY_ACOUSTIC	Acoustic (non-sonar, e.g., gunshot detection).
SENSOR_MODALITY_SEISMIC	Seismic.
SENSOR_MODALITY_MAGNETIC	Magnetic / magnetometry.
SENSOR_MODALITY_CBRN	Chemical, biological, radiological, or nuclear detection.
SENSOR_MODALITY_HUMAN	Human observation (human intelligence).
SENSOR_MODALITY_OTHER	Sensor modality not covered by the values above.

Signal

EmitterNotation

Emitter notation identification.

Field	Type	Description
notation	string	ELNOT or CENOT identifier string.

Field	Type	Description
confidence	optional double	Confidence that the identification is correct. Range: 0.0 to 1.0.
type	EmitterNotationType	Classification system of this notation.

LineOfBearing

Direction measurement toward a signal source.

Field	Type	Description
azimuth_degrees	optional double	Azimuth in degrees from true north. Range: 0.0 to 360.0.
azimuth_sigma_degrees	optional double	Azimuth uncertainty (1 sigma) in degrees.
elevation_degrees	optional double	Elevation angle in degrees from the horizontal plane. Positive values indicate above the horizon. Range: -90.0 to 90.0.
elevation_sigma_degrees	optional double	Elevation uncertainty (1 sigma) in degrees.
distance_meters	optional double	Estimated distance to the signal source in meters.
distance_sigma_meters	optional double	Distance uncertainty (1 sigma) in meters.

ScanBehavior

Scanning behavior of a signal source.

Field	Type	Description
scan_type	ScanType	Scan pattern type.
scan_period_seconds	optional double	Scan period in seconds.

SignalInfo

Signal-domain attributes for SIGINT and ELINT entities.

Core fields (frequency, RSSI, line of bearing) support basic signal representation. Extended fields (SNR, pulse characteristics, scan behavior, emitter notations, agile frequency range) support ELINT classification and EW-to-fires candidate scoring.

Supports standard ELINT emitter notation and communications emitter notation conventions.

Field	Type	Description
frequency_hz	optional double	Center frequency in Hz.
rss_i_dbm	optional double	Received signal strength in dBm.
line_of_bearing	LineOfBearing	Direction to the signal source.
snr_db	optional double	Signal-to-noise ratio in dB.
pulse_width_seconds	optional double	Pulse width in seconds.
pri_seconds	optional double	Pulse repetition interval in seconds.

Field	Type	Description
bandwidth_hz	optional double	Signal bandwidth in Hz.
emitter_notations	repeated EmitterNotation	Emitter notation identifiers with classification confidence.
scan	ScanBehavior	Scanning behavior of the signal source.
modulation	SignalModulation	Modulation type.
frequency_min_hz	optional double	Minimum frequency in Hz for agile or hopping emitters.
frequency_max_hz	optional double	Maximum frequency in Hz for agile or hopping emitters.

EmitterNotationType

Emitter notation classification system.

Name	Description
EMITTER_NOTATION_TYPE_UNSPECIFIED	
EMITTER_NOTATION_TYPE_ELNOT	Electronic Intelligence Notation. Non-communications emitters such as radars, navigation aids, and EW systems.
EMITTER_NOTATION_TYPE_CENOT	Communications Emitter Notation. Communications emitters such as radios, data links, and satellite uplinks.

ScanType

Radar or emitter scan pattern type.

Name	Description
SCAN_TYPE_UNSPECIFIED	
SCAN_TYPE_CIRCULAR	
SCAN_TYPE_SECTOR	
SCAN_TYPE_CONICAL	
SCAN_TYPE_RASTER	
SCAN_TYPE_AGILE_BEAM	
SCAN_TYPE_NON_SCANNING	
SCAN_TYPE_IRREGULAR	

SignalModulation

Signal modulation type.

Name	Description
SIGNAL_MODULATION_UNSPECIFIED	
SIGNAL_MODULATION_PULSE	
SIGNAL_MODULATION_CW	

Name	Description
SIGNAL_MODULATION_CHIRP	
SIGNAL_MODULATION_FREQUENCY_HOPPED	
SIGNAL_MODULATION_PHASE_CODED	

Spatial

Spatial primitives: positions, geometries, motion, and orientation.

Circle

A circle defined by a center point and radius.

No GeoJSON equivalent but widely used in military applications.

Examples: engagement area, weapon effects radius, sensor range ring, circular error probable (CEP).

Field	Type	Description
center	Position	Center position of the circle.
radius_meters	double	Radius in meters.
height_meters	double	Optional extrusion height in meters. When non-zero creates a cylinder.

CovarianceMatrix3

Upper triangle of a symmetric 3x3 covariance matrix.

[xx xy xz] [yy yz] [zz]

Field	Type	Description
xx	double	
xy	double	
xz	double	
yy	double	
yz	double	
zz	double	

Ellipse

An ellipse defined by center, semi-axes, and orientation.

For a circle, set semi_major_axis_meters == semi_minor_axis_meters. Not GeoJSON compatible.

Examples: positional uncertainty ellipse, radar coverage footprint, communications coverage area.

Field	Type	Description
center	Position	Center position of the ellipse.
semi_major_axis_meters	double	Semi-major axis length in meters.
semi_minor_axis_meters	double	Semi-minor axis length in meters.
orientation_degrees	double	Orientation of the semi-major axis in degrees clockwise from true north. Range: 0.0 to 180.0.
height_meters	double	Optional extrusion height in meters.

ErrorEllipse

Uncertainty expressed as an error ellipse, without requiring conversion to a covariance matrix.

Field	Type	Description
semi_major_axis_meters	optional double	Semi-major axis length in meters.
semi_minor_axis_meters	optional double	Semi-minor axis length in meters.
orientation_degrees	optional double	Orientation of the semi-major axis in degrees clockwise from true north. Range: 0.0 to 180.0.
confidence	optional double	Probability that the true value lies within the ellipse. Range: 0.0 to 1.0.

LinearRing

A closed ring of positions forming a polygon boundary.

The first and last positions must be identical to close the ring. Must contain at least 4 positions (3 distinct vertices + closing point).

Winding order follows GeoJSON convention: - Exterior rings: counter-clockwise. - Interior rings (holes): clockwise.

Field	Type	Description
positions	repeated Position	Ordered positions forming the closed ring.

Motion

Velocity and acceleration in the local East-North-Up (ENU) frame.

ENU is a local tangent plane coordinate system: East: positive toward geographic east. North: positive toward geographic north. Up: positive away from Earth center.

Field	Type	Description
velocity_enu_mps	Vector3	Velocity components in meters per second. x=East, y=North, z=Up.
acceleration_enu_mps2	Vector3	Acceleration components in m/s ² . Non-zero values indicate active maneuvering.
speed_mps	optional double	Horizontal speed over ground in meters per second.

Field	Type	Description
velocity_covariance	CovarianceMatrix3	Velocity covariance in the local ENU frame (m/s) ² . Upper triangle of the 3x3 symmetric covariance matrix.

Orientation

Orientation (attitude) in 3D space using Tait-Bryan Euler angles. Order: yaw (heading) -> pitch -> roll.

Field	Type	Description
heading_degrees	optional double	Heading (yaw) in degrees from true north, clockwise. Range: 0.0 to 360.0.
pitch_degrees	optional double	Pitch angle in degrees. Positive is nose or bow up. Range: -90.0 to +90.0.
roll_degrees	optional double	Roll angle in degrees. Positive is right wing or starboard down. Range: -180.0 to +180.0.

Point

A single geographic point.

GeoJSON equivalent: Point. See <https://datatracker.ietf.org/doc/html/rfc7946#section-3.1.2>

Examples: observation post, waypoint, point target.

Field	Type	Description
position	Position	Geographic position of the point.

Polygon

A closed polygon defined by an exterior ring and optional interior holes.

GeoJSON equivalent: Polygon (only canonical representations accepted). See <https://datatracker.ietf.org/doc/html/rfc7946#section-3.1.6>

Follows the right-hand rule: exterior rings are counter-clockwise, interior rings (holes) are clockwise.

Examples: area of operations (AO), engagement area, named area of interest (NAI), restricted operations zone (ROZ).

Field	Type	Description
rings	repeated LinearRing	Rings defining the polygon boundary. rings[0]: exterior boundary (required). rings[1..N]: interior holes (optional).
height_meters	double	Optional uniform height above base positions to extrude in meters. Creates a prism from the 2D polygon. When 0/unset, polygon is 2D. Strictly GeoJSON-compatible polygons will not have this set.

Polyline

An ordered sequence of positions forming a line or path.

GeoJSON equivalent: LineString. See <https://datatracker.ietf.org/doc/html/rfc7946#section-3.1.4>

Must contain at least 2 positions.

Examples: route, main supply route (MSR), phase line, flight path.

Field	Type	Description
positions	repeated Position	Ordered sequence of positions defining the line.

Position

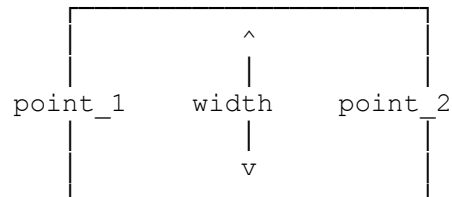
Geographic position in WGS-84 coordinates with multiple altitude references for interoperability across domains.

Field	Type	Description
latitude_degrees	double	WGS-84 geodetic latitude in decimal degrees. Range: -90.0 to +90.0.
longitude_degrees	double	WGS-84 geodetic longitude in decimal degrees. Range: -180.0 to +180.0.
altitude_hae_meters	optional double	Height Above Ellipsoid in meters. Positive above, negative below. Preferred for precision applications.
altitude_agl_meters	optional double	Altitude Above Ground Level in meters. Requires a terrain elevation database.
altitude_msl_meters	optional double	Mean Sea Level altitude in meters. Common in aviation.
depth_meters	optional double	Depth below the surface in meters, for subsurface operations. Positive values indicate depth.
mgrs	string	Military Grid Reference System coordinate (e.g., “4QFJ 12345 67890” – 10-digit, 1 m precision).

Rectangle

A rectangle defined by two centerline points and a width.

The two points define the centerline (long axis) of the rectangle. The width extends perpendicular to that line on both sides. Orientation is implicit from the bearing of point_1 to point_2.



Structurally guarantees a valid rectangle. No GeoJSON equivalent but widely used in military applications.

Examples: kill box, fire support area, restricted fire area (RFA), no-fire area (NFA), free-fire area (FFA).

Field	Type	Description
point_1	Position	First endpoint of the centerline.
point_2	Position	Second endpoint of the centerline.
width_meters	double	Total width in meters, extending perpendicular to the centerline.
height_meters	double	Optional extrusion height in meters.

SpatialGeometry

Structured geometric shape for spatial representation.

Use for boundaries, coverage areas, routes, sensor footprints, and other non-point geometries.

Exactly one shape type must be set. The shape defines spatial extent: boundaries, coverage areas, routes, sensor footprints, and other non-point geometries.

For simple points, use `location` instead.

GeoJSON (RFC 7946) compatibility: - Point, Polyline, and Polygon map directly to GeoJSON Point, LineString, and Polygon types. - Circle, Ellipse, and Rectangle have no GeoJSON equivalent but are common in military and geospatial applications.

Field	Type	Description
point	Point	Single geographic point.
polyline	Polyline	Ordered sequence of positions forming a line.
polygon	Polygon	Closed area defined by one or more rings (exterior boundary + holes).
circle	Circle	Circle defined by center point and radius.
ellipse	Ellipse	Ellipse defined by center, semi-axes, and orientation.
rectangle	Rectangle	Rectangle defined by two centerline points and a width.

SpatialLocation

Geographic position, orientation, and uncertainty of a warfighting object.

Combines where the object is (position) with how it is oriented (attitude), plus uncertainty covariance and error ellipse. Position uses the WGS-84 datum with multiple altitude representations to support different operational contexts (e.g., aviation, subsurface, terrain following, space).

Field	Type	Description
position	Position	Geographic position (latitude, longitude, altitude).
orientation	Orientation	Orientation in 3D space (heading, pitch, roll).
position_covariance	CovarianceMatrix3	Position covariance in the local ENU frame (meters ²). Upper triangle of the 3x3 symmetric covariance matrix.

Field	Type	Description
position_error_ellipse	ErrorEllipse	Source-reported positional error ellipse. Center is implied by position.
position_source	PositionSource	How the position was derived. Consumers use this to weight the position during fusion or to flag stale/estimated fixes.

Vector3

Generic 3D vector in the applicable reference frame.

Field	Type	Description
x	double	
y	double	
z	double	

PositionSource

How a geographic position was derived.

Informs fusion logic and consumer trust: a GPS fix is typically more reliable than an INS dead-reckoned position, which is more reliable than an extrapolation from a last-known location.

Name	Description
POSITION_SOURCE_UNSPECIFIED	
POSITION_SOURCE_GNSS	Derived from a GNSS receiver.
POSITION_SOURCE_INS	Derived from an inertial navigation system.
POSITION_SOURCE_RADAR	Derived from radar returns.
POSITION_SOURCE_OPTICAL	Derived from optical or infrared imagery / tracking.
POSITION_SOURCE_ACOUSTIC	Derived from an acoustic sensor (e.g., sonar, hydrophone, gunshot localization).
POSITION_SOURCE_SIGNAL	Derived from signal-based geolocation (e.g., RF direction finding, time-difference-of-arrival, cell tower).
POSITION_SOURCE_CALCULATED	Computed or estimated from available data (e.g., extrapolation, triangulation, correlation, ML inference).
POSITION_SOURCE_LAST_KNOWN	Last-known position; the object's current location is unknown and this value reflects the most recent observation.
POSITION_SOURCE_MANUAL	Manually entered by an operator.
POSITION_SOURCE_SIMULATED	Simulated position (e.g., training, exercise, test).
POSITION_SOURCE_MENSURATED	Measured from a georectified image by an operator (e.g., clicking a feature on imagery). Distinct from OPTICAL, which covers automated optical/IR tracking.
POSITION_SOURCE_ESTIMATED	Human estimate without formal computation (e.g., eyeballed from a map). Lower trust than CALCULATED.
POSITION_SOURCE_TRANSCRIBED	Captured from a voice report, radio call, or narrative (e.g., a spotter calling in a grid reference). Different trust profile than direct sensor data.
POSITION_SOURCE_MAYDAY	Emergency beacon or distress signal position (e.g., 9-1-1, MAYDAY).

Symbology

SidcModifiers

Typed MIL-STD-2525C symbol modifier fields.

Each field corresponds to a modifier defined in MIL-STD-2525C, Appendix A, Table XIV. The field comment includes the 2525C modifier letter code in parentheses. All fields are optional; populate only what is known and relevant.

Reference: MIL-STD-2525C, Appendix A, Table XIV.

Field	Type	Description
quantity	int32	(C) Quantity of equipment or personnel represented by the symbol.
reinforced_reduced	string	(F) Reinforced or reduced status. Values: “R” (reinforced), “D” (reduced), “RD” (reinforced and reduced).
staff_comments	string	(G) Staff comments. Free-form text annotation (max 20 chars per spec).
additional_info	string	(H) Additional information. Free-form text (max 20 chars per spec).
additional_info_2	string	(H1) Additional information, second line.
additional_info_3	string	(H2) Additional information, third line.
evaluation_rating	string	(J) Evaluation rating. Reliability and credibility indicator (2-character code per US Army FM 2-22.3).
combat_effectiveness	string	(K) Combat effectiveness. Unit readiness or installation capability indicator (max 5 chars per spec).
signature_equipment	string	(L) Signature equipment. Detectable electronic signature.
higher_formation	string	(M) Higher formation. Parent unit or higher echelon designation (max 21 chars per spec).
iff_sif	string	(P) IFF/SIF identification mode and code (max 5 chars per spec).
direction_of_movement	double	(Q) Direction of movement in degrees from true north (0.0-360.0).
sigint_mobility	string	(R2) SIGINT mobility indicator code.
unique_designation	string	(T) Unique designation. Primary identifier for the symbol (max 21 chars per spec).
unique_designation_2	string	(T1) Unique designation, second line.
type	string	(V) Type of equipment. Platform or equipment descriptor (max 24 chars per spec).
effective_time	google.protobuf.Timestamp	(W) Date-time group for effective time. Stored as a structured timestamp; render as DTG for display.
expiration_time	google.protobuf.Timestamp	(W1) Date-time group for expiration time. Stored as a structured timestamp; render as DTG for display.
altitude_depth	repeated double	(X) Altitude or depth values in meters. Supports multiple values for multi-point tactical graphics.
location	string	(Y) Location in any desired display format (max 19 chars per spec). Typically DMS, MGRS, or other coordinate representation.
speed	SpeedModifier	(Z) Speed of the symbol. Structured as value + unit for clarity.
special_c2_headquarters	string	(AA) Special C2 headquarters designation.
platform_type	string	(AD) Platform type. ELNOT or CENOT notation for SIGINT symbols.
equipment_teardown_time	double	(AE) Equipment teardown time in minutes.
common_identifier	string	(AF) Common identifier. Common name for the equipment (e.g., “Hawk” for a Hawk SAM system).

Field	Type	Description
distance	repeated double	(AM) Distance in meters. Supports multiple values for radius, length, width of tactical graphics.
azimuth	repeated double	(AN) Azimuth values in degrees from true north. Supports multiple values for tactical graphics with multiple orientation parameters.
engagement_bar	string	(AO) Engagement bar. Target engagement status indicator.

SpeedModifier

Speed with explicit unit of measure.

Used for the MIL-STD-2525C speed modifier (Z) where the unit system may vary by operational context.

Field	Type	Description
value	double	Numeric speed value.
unit	string	Unit of measure (e.g., “kt”, “km/h”, “m/s”, “mph”).

Symbology

Typed military symbology representation supporting MIL-STD-2525C/D.

Provides both a raw SIDC string for interoperability and a decomposed, typed modifier structure for programmatic access. Consumers should prefer the typed modifiers when available; the raw side field serves as a canonical interchange format.

Example (2525C friendly ground mechanized infantry): symbology { side: “SFGPUCIZ-*****” version: SIDC_VERSION_2525C modifiers { unique_designation: “1-87 IN” higher_formation: “3BCT” combat_effectiveness: “GREEN” } }

Field	Type	Description
side	string	Raw Symbol Identification Code (SIDC) string. For 2525C: 15-character alphanumeric code. For 2525D: 20-character numeric code.
version	SidcVersion	Version of the symbology standard this SIDC conforms to.
modifiers	SidcModifiers	Typed 2525C modifier fields. Provides structured access to all standard symbol modifiers with appropriate data types for each field.

SidcVersion

Version of the MIL-STD-2525 symbology standard.

Name	Description
SIDC_VERSION_UNSPECIFIED	Version not specified or unknown.
SIDC_VERSION_2525C	MIL-STD-2525C (15-character alphanumeric SIDC).

Name	Description
SIDC_VERSION_2525D	MIL-STD-2525D (20-character numeric SIDC).
SIDC_VERSION_CUSTOM	Custom or non-standard symbology format.

Targeting

PhysicalDimensions

Physical size and mass of a warfighting object. Supports recognition, classification, and logistics planning.

Field	Type	Description
length_meters	optional double	Overall length (bow to stern, nose to tail) in meters.
width_meters	optional double	Overall width (beam for ships, wingspan for aircraft) in meters.
height_meters	optional double	Overall height (keel to mast, wheels to tail) in meters.
weight_kg	optional double	Mass in kilograms (displacement for ships, MTOW for aircraft).

TargetingInfo

Targeting and threat assessment data.

Field	Type	Description
is_hvt	optional bool	Designated as a High Value Target.
threat_level	ThreatLevel	Assessed threat severity.
weapons	repeated WeaponSystem	Weapon systems carried or assessed on this object. Consumers combine weapon max_range_meters with the object's position to derive threat rings – no stored geometry needed.
air_defense_class	AirDefenseClass	Air defense system classification. Unset for non-AD objects.
threat_posture	ThreatPosture	Current operational posture of a threat (e.g., searching, tracking, engaging). Distinct from threat_level – posture describes what the threat is doing right now; threat_level describes its overall severity.

WeaponSystem

A weapon system carried by or assessed on an object.

Examples: { designation: “SA-15”, category: “SAM”, max_range_meters: 12000, max_altitude_meters: 6000, quantity: 4 } { designation: “AK-47”, category: “small_arms”, max_range_meters: 400, quantity: 30 } { designation: “Mk 45 Mod 4”, category: “naval_gun”, max_range_meters: 37000, quantity: 1 }

Field	Type	Description
designation	string	Weapon designator (e.g., “SA-15”, “AIM-120C”, “RPG-7”).
category	string	Broad weapon category. Free-form but conventional values are recommended: “SAM”, “AAA”, “MANPADS”, “ATGM”, “SSM”, “ASM”, “naval_gun”, “small_arms”, “mortar”, “artillery”, “rocket”.
max_range_meters	optional double	Maximum effective range in meters.
min_range_meters	optional double	Minimum engagement range in meters (dead zone).
max_altitude_meters	optional double	Maximum engagement altitude in meters (HAE). Relevant for AD systems; defines the ceiling of the engagement envelope.
quantity	optional uint32	Number of launchers, tubes, or systems of this type.

AirDefenseClass

Air defense system classification by engagement range.

Name	Description
AIR_DEFENSE_CLASS_UNSPECIFIED	
AIR_DEFENSE_CLASS_MANPADS	Man-portable (Stinger, Igla). Range < 6 km.
AIR_DEFENSE_CLASS_SHORAD	Short-range (SA-15, Avenger, Gepard). Range 6-15 km.
AIR_DEFENSE_CLASS_MRSAM	Medium-range (SA-11, NASAMS, Patriot PAC-2). Range 15-100 km.
AIR_DEFENSE_CLASS_LRSAM	Long-range (S-300, S-400, Patriot PAC-3). Range 100-400 km.
AIR_DEFENSE_CLASS_STRATEGIC	Strategic / ballistic missile defense (THAAD, S-500).

ThreatLevel

Assessed threat severity level.

Name	Description
THREAT_LEVEL_UNSPECIFIED	
THREAT_LEVEL_NONE	
THREAT_LEVEL_LOW	
THREAT_LEVEL_MEDIUM	
THREAT_LEVEL_HIGH	
THREAT_LEVEL_CRITICAL	

ThreatPosture

Current operational posture of a threat.

Describes what a hostile object is currently doing in the engagement cycle. Used for self-defense and maneuver decisions (e.g., “this SAM is tracking us, take evasive action”).

Name	Description
THREAT_POSTURE_UNSPECIFIED	
THREAT_POSTURE_SEARCHING	Searching for targets. No specific object acquired.
THREAT_POSTURE_TRACKING	Actively tracking a target.
THREAT_POSTURE_READY_TO_ENGAGE	Target locked; weapon systems ready to engage.
THREAT_POSTURE_ENGAGING	Currently engaging a target (weapons released or fired).
THREAT_POSTURE_ENGAGED	Engagement has concluded.
THREAT_POSTURE_INACTIVE	Non-operational posture (e.g., shut down, displacing, hiding).

Track

TrackInfo

Track quality and measurement metadata.

Captures how an object's position was derived and how much consumers should trust it. Distinct from Assessment, which carries the warfighter's identity and affiliation judgement.

Field	Type	Description
sensor_hits	optional uint32	Number of sensor detections contributing to this track.
last_measurement_time	google.protobuf.Timestamp	Timestamp of the most recent sensor measurement contributing to this track. Distinct from provenance.updated_at (publish time).
radar_cross_section_dbsm	optional double	Radar cross section in dBsm. Aids classification and indicates detectability.
object_count	optional uint32	Estimated number of physical objects represented by this track (e.g., a convoy or flight of aircraft tracked as one track).
track_quality	optional uint32	Track quality score. Higher values indicate more confident position estimates.
evidence_type	EvidenceType	Whether the track is based on direct observation of the object or on indirect signs of it (e.g., a vehicle inferred from dust, a vessel inferred from its wake).

EvidenceType

Nature of the evidence supporting a track.

Name	Description
EVIDENCE_TYPE_UNSPECIFIED	
EVIDENCE_TYPE_DIRECT	The detection is of the object itself.
EVIDENCE_TYPE_CIRCUMSTANTIAL	The object itself could not be detected, but signs of it were (e.g., wake, dust plume, tire tracks, shadow).

Transponder

Mode5

Mode 5 interrogation data.

Field	Type	Description
response	IFFResponse	Interrogation response status.
code	optional uint32	Mode 5 code.
platform_id	optional uint32	Platform identification number.

TransponderCodes

IFF and transponder interrogation codes. Applicable to air, surface, and ground objects with transponders.

Field	Type	Description
mode_1	optional uint32	Mode 1 code (military mission code, 5 bits).
mode_2	optional uint32	Mode 2 code (military unit code, 12 bits).
mode_3a	optional uint32	Mode 3/A code (ATC-assigned, 12-bit octal).
mode_4_response	IFFResponse	Mode 4 interrogation response.
mode_5	Mode5	Mode 5 interrogation response and codes.
mode_s_address	optional uint32	Mode S ICAO address (24 bits).

IFFResponse

IFF interrogation response status.

Name	Description
IFF_RESPONSE_UNSPECIFIED	
IFF_RESPONSE_CORRECT	
IFF_RESPONSE_INCORRECT	
IFF_RESPONSE_NO_RESPONSE	

Warfighting_function

Doctrinal warfighting / joint function classification.

WarfightingFunction

Doctrinal warfighting function (Army) / joint function (joint force) classification.

Per ADP 3-0 (Army) and JP 3-0 (joint), a warfighting / joint function is “a group of tasks and systems united by a common purpose that commanders use to accomplish missions and training objectives.” The two doctrines align on the same seven functions: Command and Control, Movement and Maneuver, Intelligence, Fires, Sustainment, Protection, and Information. This enum captures both readings under a single set of values and is suitable for Army, joint, and coalition use.

On `Object`, this classifies the function(s) the object is organized or equipped to support (capability/role). For example, an artillery battalion or a HIMARS launcher tags `FIRES`; a SIGINT site tags `INTELLIGENCE`; a forward arming and refueling point tags `SUSTAINMENT`.

On Action, this classifies the function(s) the activity is exercising (purpose/employment). For example, a fire mission tags FIRES; an ISR collection tags INTELLIGENCE; a deception operation tags INFORMATION.

Activities and capabilities routinely span functions. For example, an attack aviation strike touches MOVEMENT_AND_MANEUVER and FIRES; CEMA touches INFORMATION and FIRES; a counter-UAS engagement touches PROTECTION and FIRES. Tag every applicable function.

This classification is orthogonal to Branch on OrganizationInfo: Branch describes what a unit is by training (Infantry, Signal, Engineer, ...); WarfightingFunction describes what it is organized to do or what an activity is doing.

Reference: ADP 3-0 (Operations); JP 3-0 (Joint Campaigns and Operations).

Name	Description
WARFIGHTING_FUNCTION_-UNSPECIFIED	
WARFIGHTING_FUNCTION_-COMMAND_AND_CONTROL	Command and Control: the related tasks and a system that enable commanders to exercise authority and direction to accomplish missions.
WARFIGHTING_FUNCTION_-MOVEMENT_AND_MANEUVER	Movement and Maneuver: the related tasks and systems that move and employ forces to achieve a position of relative advantage with respect to the enemy.
WARFIGHTING_FUNCTION_-INTELLIGENCE	Intelligence: the related tasks and systems that facilitate understanding the enemy, terrain, weather, civil considerations, and other significant aspects of the operational environment.
WARFIGHTING_FUNCTION_FIRES	Fires: the related tasks and systems that create and converge effects in all domains against the threat to enable actions across the range of military operations.
WARFIGHTING_FUNCTION_-PROTECTION	Protection: the related tasks, systems, and methods that prevent or mitigate detection, threat effects, and hazards to preserve the force, deny the enemy freedom of action, and enable commanders to apply combat power.
WARFIGHTING_FUNCTION_-SUSTAINMENT	Sustainment: the related tasks and systems that provide support and services to enable freedom of action, extend operational reach, and prolong endurance.
WARFIGHTING_FUNCTION_-INFORMATION	Information: the related tasks and systems that create and preserve friendly information and leverage information and the inherent informational aspects of military activities to achieve the commander's objectives.

Weather

WeatherInfo

Weather observation or meteorological hazard data.

Applicable to objects representing weather stations (point observations), weather hazard zones (polygon entities for storms, icing, dust), and meteorological observations. Weather objects use the parent object's geometry for spatial extent and motion for storm track movement.

Field	Type	Description
wind_speed_mps	optional double	Wind speed in meters per second.
wind_direction_degrees	optional double	Wind direction in degrees true, as the direction the wind is coming FROM. Range: 0.0 to 360.0.
wind_gust_mps	optional double	Wind gust speed in meters per second.
visibility_meters	optional double	Prevailing visibility in meters.

Field	Type	Description
visibility_restriction	VisibilityRestriction	Visibility restriction type, if any.
ceiling_meters_agl	optional double	Cloud ceiling height in meters AGL.
cloud_coverage	CloudCoverage	Cloud coverage classification.
precipitation_type	PrecipitationType	Precipitation type.
precipitation_intensity	PrecipitationIntensity	Precipitation intensity.
temperature_celsius	optional double	Air temperature in degrees Celsius.
dew_point_celsius	optional double	Dew point temperature in degrees Celsius.
pressure_hpa	optional double	Barometric pressure in hectopascals (millibars).
moon_illumination_percent	optional double	Moon illumination as a percentage (0 to 100).
bmnt	google.protobuf.Timestamp	Begin Morning Nautical Twilight. First usable light for ground operations.
eent	google.protobuf.Timestamp	End Evening Nautical Twilight. Last usable light for ground operations.

CloudCoverage

Cloud coverage classification per aviation standard.

Name	Description
CLOUD_COVERAGE_UNSPECIFIED	
CLOUD_COVERAGE_CLR	Clear (0/8)
CLOUD_COVERAGE_FEW	Few (1/8 - 2/8)
CLOUD_COVERAGE_SCT	Scattered (3/8 - 4/8)
CLOUD_COVERAGE_BKN	Broken (5/8 - 7/8)
CLOUD_COVERAGE_OVC	Overcast (8/8)
CLOUD_COVERAGE_SKY_OBSCURED	Surface-based obscuration

PrecipitationIntensity

Precipitation intensity.

Name	Description
PRECIPITATION_INTENSITY_UNSPECIFIED	
PRECIPITATION_INTENSITY_LIGHT	
PRECIPITATION_INTENSITY_MODERATE	
PRECIPITATION_INTENSITY_HEAVY	

PrecipitationType

Precipitation type.

Name	Description
PRECIPITATION_TYPE_UNSPECIFIED	
PRECIPITATION_TYPE_NONE	
PRECIPITATION_TYPE_RAIN	
PRECIPITATION_TYPE_SNOW	
PRECIPITATION_TYPE_SLEET	
PRECIPITATION_TYPE_HAIL	
PRECIPITATION_TYPE_FREEZING_RAIN	

VisibilityRestriction

Visibility restriction category.

Name	Description
VISIBILITY_RESTRICTION_UNSPECIFIED	
VISIBILITY_RESTRICTION_FOG	
VISIBILITY_RESTRICTION_RAIN	
VISIBILITY_RESTRICTION_SNOW	
VISIBILITY_RESTRICTION_DUST	
VISIBILITY_RESTRICTION_SMOKE	
VISIBILITY_RESTRICTION_HAZE	
VISIBILITY_RESTRICTION_MIST	

Scalar Value Types

.proto Type	Notes	C++	Java	Python	Go	C#	PHP	Ruby
double		double	double	float	float64	double	float	Float
float		float	float	float	float32	float	float	Float
int32	Uses variable-length encoding. Inefficient for encoding negative numbers – if your field is likely to have negative values, use sint32 instead.	int32	int	int	int32	int	integer	Bignum or Fixnum (as required)

.proto Type	Notes	C++	Java	Python	Go	C#	PHP	Ruby
int64	Uses variable-length encoding. Inefficient for encoding negative numbers – if your field is likely to have negative values, use sint64 instead.	int64	long	int/long	int64	long	integer/string	Bignum
uint32	Uses variable-length encoding.	uint32	int	int/long	uint32	uint	integer	Bignum or Fixnum (as required)
uint64	Uses variable-length encoding.	uint64	long	int/long	uint64	ulong	integer/string	Bignum or Fixnum (as required)
sint32	Uses variable-length encoding. Signed int value. These more efficiently encode negative numbers than regular int32s.	int32	int	int	int32	int	integer	Bignum or Fixnum (as required)
sint64	Uses variable-length encoding. Signed int value. These more efficiently encode negative numbers than regular int64s.	int64	long	int/long	int64	long	integer/string	Bignum
fixed32	Always four bytes. More efficient than uint32 if values are often greater than 2^{28} .	uint32	int	int	uint32	uint	integer	Bignum or Fixnum (as required)
fixed64	Always eight bytes. More efficient than uint64 if values are often greater than 2^{56} .	uint64	long	int/long	uint64	ulong	integer/string	Bignum

.proto Type	Notes	C++	Java	Python	Go	C#	PHP	Ruby
sfixed32	Always four bytes.	int32	int	int	int32	int	integer	Bignum or Fixnum (as required)
sfixed64	Always eight bytes.	int64	long	int/long	int64	long	integer/string	Bignum
bool		bool	boolean	boolean	bool	bool	boolean	TrueClass/FalseClass
string	A string must always contain UTF-8 encoded or 7-bit ASCII text.	string	String	str/unicode	string	string	string	String (UTF-8)
bytes	May contain any arbitrary sequence of bytes.	string	ByteString	str	[]byte	ByteString	string	String (ASCII-8BIT)