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R2-D2 FLEET OPERATIONS CONSOLE

— Descriptive Overview —

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RECORD OF CHANGES

Version	Date	Summary of Change	Authority
Edition A, Version 1	May 2026	Initial release.	iLab / TaskForce-X

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1 INTRODUCTION

1.1 Purpose

This document provides a concise descriptive overview of the R2-D2 Fleet Operations Console (hereafter “R2-D2”) for personnel being on-boarded into the ecosystem. It explains what each functional area is and where to begin work. It is descriptive only; it is not a status board and contains no live operational figures.

1.2 Scope

This document covers R2-D2’s functional areas, its navigation model, the flow of data through the system, and the means of access. It does not cover installation or system-administration procedures; those are maintained in the in-application handbook (see paragraph 4.8).

1.3 Applicability and Caveats

R2-D2 is employed during TaskForce-X test, calibration, and evaluation sessions. It exercises the STANAG 4817 message set **passively**, for the testing, calibration, and evaluation of unmanned vehicles (UXVs). R2-D2 does **not** task nations, units, or live sensor platforms, and it does not hold tasking authorization. The structure of a NATO ISR collection workflow is borrowed for calibration and bookkeeping purposes only (see paragraph 4.3).

1.4 References

- a. STANAG 4817 / AEP-105 — Coalition CATL High-Information-Bandwidth (HIBW) message set, Draft 3 / Release Candidate 4 (version 0.3.0-rc4).
- b. AJP-5 — Allied Joint Doctrine for the Planning of Operations.
- c. AJP-2 — Allied Joint Doctrine for Intelligence, Counter-Intelligence and Security.
- d. APP-6 — NATO Joint Military Symbolology.

2 SYSTEM OVERVIEW

2.1 General

R2-D2 is a single console for an entire fleet. Behind it operate a set of Node-RED automation instances, a video restreaming service, an intelligence-collection workflow, a relational/timeseries data store, and a set of embedded map and telemetry applications. The console consolidates all of these behind a single uniform resource locator, `r2d2.office.ilab.zone`. From one place an operator can observe fleet health, deploy a flow change, retrieve a camera snapshot, work a collection requirement, view a tactical picture, or consult the registry of nations and equipment. The left sidebar is the index of the system; this document is its legend.

2.2 Data Backbone (STANAG 4817 / HIBW)

All operational data crossing the fleet is carried within a single STANAG 4817 / AEP-105 envelope — the CATL HIBW message set, release 0.3.0-rc4 (reference 1.4.a). The envelope comprises a header and a body, expressed in seven message types:

- a. **NodeDescription** — node identity (“who I am”).
- b. **NodeStatus** — node position and activity (“where I am / what I am doing”).
- c. **TaskAdmin** — assignment, update, or cancellation of a task.
- d. **TaskFeedback** — task progress.
- e. **TaskResult** — task outcome and resulting data products.
- f. **DynamicUpdate** — world-model entities (contacts, tracks, routes).
- g. **Chat** — free-text messaging.

These messages transit an MQTT/Zenoh mesh. The standard — not any single application — is what enables R2-D2 to exchange ISR data in the same language as a coalition system. Node-RED constitutes the *automation* backbone; STANAG 4817 constitutes the *data* backbone that every platform reads from and writes to.

3 GETTING STARTED

3.1 Orientation Pages

Three pages orient the new user before any other activity:

- a. **Overview** (/) — cross-system key performance indicators and health for Node-RED, Restreaming, and the Force, presented on a single screen. This is the primary “is the system healthy?” page.
- b. **Galaxy Map** (/galaxy-map) — a live graph of every product and tool, in which selecting a node navigates directly to it. It is used when the required capability is known but its location is not.
- c. **Droidspeak** (/droidspeak) — the in-application handbook, comprising deep-dive documentation, installation guides, and a live API reference. New personnel should review it before proceeding to the functional areas.

3.2 Navigation

All remaining capabilities are grouped by functional area in the left sidebar. Section 4 describes those areas in order.

4 FUNCTIONAL AREAS

4.1 Node-RED Fleet (Automation Backbone)

The original core of R2-D2: a fleet of Node-RED instances, each executing deployed *flows* (the automation graphs on which Node-RED is built).

- a. **Fleet** — grid and table views of every instance, with health at a glance.
- b. **Instances** — management and configuration of a single instance.
- c. **Flows** — browsing and deployment of flows across instances.
- d. **Registry** — the authoritative source (`registry.yaml`): serial numbers, hardware identifiers, heartbeats, Helm deployment values, and per-instance metadata.

When this layer is healthy, the backbone on which the remainder of the fleet depends is sound.

4.2 Restreaming (Camera Feeds and Video Walls)

Ingests camera feeds (RTSP, RTMP, SRT, HLS, and others) and routes them to display walls.

- a. **HoloVids** — a snapshot grid and live video wall of all feeds, with real-time online/offline status.
- b. **Holoprojector** — composition of feeds into saved *Views* (a layout and its bound feeds) for broadcast to consoles and kiosks.

Configuration for this area (encoder defaults, grid layouts) resides under Settings (see paragraph 4.7).

4.3 Imp Intel (UXV Calibration and Evaluation)

R2-D2’s passive testing, calibration, and evaluation workspace for unmanned vehicles during TaskForce-X sessions. It adopts the structure of a NATO ISR collection workflow, and the STANAG 4817 message set beneath it, but is **not** a live operational tasking system (reference paragraph 1.3).

Following a session, these views are used to fine-tune each UXV’s baseline readings — measuring each platform’s bias and variability against known-accuracy references as a function of range — so that its

measurements may later be correlated and fused into the Common Operating Picture. The fusion itself is performed by Medusa (see paragraph 4.4.h); Imp Intel is the calibration and bookkeeping front end that supplies it. The collection-planning surfaces are:

- a. **Imp Intel** (home) — the TCPED rolling window, collection requirements, rack-and-stack, and MOE/MOP effectiveness measures.
- b. **ICP** — the Intelligence Collection Plan: PIRs, SIRs, and EEIs.
- c. **IR Queue** — a parallel queue of standalone Information Requirements.
- d. **RFIs** — Requests For Information: outbound asks and inbound answers.
- e. **CRLs** — Collection Requirement Lists, bundling requirements for a session.
- f. **Scoring** — the rack-and-stack weights that prioritise requirements, with a live preview against the current queue.
- g. **Templates** — the import/export catalog that maps records across formats.

The acronyms above trace to NATO planning doctrine (references 1.4.b and 1.4.c) and are defined at Annex A. Here they frame a calibration exercise on friendly UXVs, not a live tasking order.

4.4 The Force (Telemetry and Situational Awareness)

Externally hosted operational applications, embedded within R2-D2 so that the operator need not leave the console.

- a. **Force Sense** — read-only health of the Kubernetes cluster and the R2-D2 stack: controllers, workers, storage volumes, and pods.
- b. **Force Visions** — replay of past UXV history: recorded sessions, runs, and views, played back for review of what each platform did and observed.
- c. **Holocron** — a baseline viewer for the STANAG 4817 data carried on the broker. It is used to confirm the operational baseline and to validate messages on the bus *prior* to their reaching the COP — a pre-COP integration check that published data is correct, complete, and well-formed.
- d. **COP** — the Common Operating Picture (built on SitaWare): a unified view aggregating tracks, layers, and sensor data.
- e. **Probe** — robot/machine introspection: ROS2 streams, Foxglove panels, and real-time joint/frame data.
- f. **HoloNet** — an MQTT topic explorer for reading and writing messages on the bus.
- g. **The Alliance** — the registry of unmanned vehicles (ground, air, surface, subsurface), keyed by the call-sign aliases used by operators.
- h. **Medusa** — *planned; not yet implemented*. The contact-fusion engine. It will ingest the UXV measurements gathered and calibrated in Imp Intel, perform correlation and fusion (weighting each reading by the variance learned during calibration), and publish unified contacts to the COP over the MQTT backbone.

The brokers carrying this telemetry (designated **Rift Gates**, implemented on TBMQ) are reached under Settings (paragraph 4.7).

4.5 Temple Archives (Data Layer)

Durable storage and the shared reference catalogs from which the remainder of the application reads.

- a. **Farsight Feeds** — an open-source-intelligence (OSINT) intelligence programming interface (API) providing data to in excess of 75 data sources for COP use (Disturbances, Events, CUI, vessel categorization, and related layers).

- b. **Feed Sync** — the worker that bridges REST feeds onto the MQTT bus.
- c. **4817 Link** — the STANAG 4817 endpoint for the 4817 documentation, API, verification, validation, and integration.
- d. **Reference Data** — the cross-application catalogs (countries, regions, airfields, target categories, equipment, emitters) on which Imp Intel and other areas depend.

4.6 The Republic (Nations and Inventory)

The coalition layer: the participating nations and the equipment they field.

- a. **Member Nations** — allied nations with flags, country codes, domains, and points of contact.
- b. **ShopKeepers** — the vehicle vendor catalog (make and model).
- c. **Holdings** — each nation's unmanned-vehicle inventory.
- d. **Platforms & Buildouts** — the platforms and sensor fit-outs (airframes, EO/IR, radar) behind those holdings.

4.7 Settings (Configuration)

A single location for the configuration of every area, offering both a guided interface and a raw-YAML “advanced” view. Panels are grouped by area:

- a. **Fleet** — Node-RED instance preferences and defaults.
- b. **Restreaming / FFmpeg** — encoder defaults, transport, and feed handling.
- c. **Layout Management** — the video-wall grid layouts used by HoloVids and HoloProjector.
- d. **Holocron** — connection and display options for the 4817 baseline viewer.
- e. **COP** — SitaWare Common Operating Picture integration settings.
- f. **Ships** — UXV/platform display and call-sign options.
- g. **Temple Archives** — feed sources, synchronisation cadence, and reference-data options.
- h. **The Republic** — member-nation, vendor, and inventory catalog settings.
- i. **Rift Gates** (TBMQ) — an embedded broker console for the MQTT message brokers.
- j. **Zabbix** — an embedded infrastructure-monitoring console.

4.8 Droidspeak (Handbook)

R2-D2's own documentation, presented within R2-D2.

- a. **Overview / Docs** — an end-to-end description of the platform, with a deep-dive page per area.
- b. **API Reference** — every endpoint the dashboard exposes, rendered as an interactive reference that may be exercised against the running fleet.
- c. **Install Guides** — the production Kubernetes path and a single-node option.
- d. **Architecture** — runtime topology and the planned authentication migration.

5 DATA FLOW

The end-to-end flow of operational data is as follows:

- a. UXV and sensor-platform readings are published as STANAG 4817 messages onto the broker (Rift Gates).
- b. Holocron reads the bus to verify and validate the operational baseline before any data is trusted downstream.

- c. Medusa (planned) correlates and fuses the validated readings into unified contacts.
- d. The unified contacts are published to the Common Operating Picture (COP).

In summary: **brokers** → **baseline check** → **fusion** → **operating picture**.

6 ACCESS AND AUTHENTICATION

R2-D2 is protected by a single sign-on. Once authenticated, all authorized areas — including the embedded Force applications — operate within the user's session. A redirection to a login page indicates an expired session; the user should authenticate again and return to the page in use.

7 SCOPE AND AUTHORITY (REITERATION)

For the avoidance of doubt: R2-D2 is a test, calibration, and evaluation console used during TaskForce-X sessions. It exercises STANAG 4817 passively. It does **not** task nations, units, or live sensor platforms, and it holds no tasking authorization. All ISR-collection terminology is employed for calibration and bookkeeping purposes only.

ANNEX A — GLOSSARY AND NOMENCLATURE

A.1 Nomenclature

The dashboard employs a thematic vocabulary. The vocabulary is internal, but it is load-bearing: route paths and table names use it. Each term maps to a plain concept as follows.

Term	Meaning
R2-D2	the console itself (this dashboard)
The Force	live telemetry and situational-awareness apps, embedded in-app
Holocron	a 4817 broker baseline viewer; verifies data before the COP
HoloNet	an MQTT topic browser
Holoprojector	a video wall; arranges feeds into projection layouts
HoloVids	the camera-feed grid and live video wall
Rift Gates	the MQTT message brokers (TBMQ) linking fleets and field units
Probe	robot/machine introspection (ROS2 / Foxglove)
Force Sense	a read-only Kubernetes cluster and stack health view
Force Visions	replay of past UXV history (recorded sessions and views)
The Alliance	the unmanned-vehicle (UXV) fleet registry
Imp Intel	passive UXV calibration and evaluation (not live tasking)
Medusa	the contact-fusion engine (planned)
TaskForce-X	test and evaluation sessions; UXV runs and capture, not live ops
Temple Archives	the data archive: feeds, reference catalogs, schemas
The Republic	member nations and their equipment inventory
ShopKeepers	the vendor / make-and-model catalog
Galaxy Map	a clickable network graph of every tool in R2-D2
Droidspeak	the in-app handbook: docs, install guides, live API reference
HIBW / 4817	STANAG 4817 / AEP-105 CATL HIBW; the ISR data wire standard

A.2 Abbreviations

Abbreviation	Expansion
AEP	Allied Engineering Publication
AJP	Allied Joint Publication
API	Application Programming Interface
APP	Allied Procedural Publication
COP	Common Operating Picture
CR	Collection Requirement
CRL	Collection Requirement List
CUI	Controlled Unclassified Information
EEI	Essential Element of Information
EO/IR	Electro-Optical / Infrared
HIBW	High-Information-Bandwidth
HLS	HTTP Live Streaming
ICP	Intelligence Collection Plan
IR	Information Requirement
ISR	Intelligence, Surveillance, and Reconnaissance
MOE / MOP	Measure of Effectiveness / Measure of Performance
MQTT	Message Queuing Telemetry Transport
OSINT	Open-Source Intelligence
PIR	Priority Intelligence Requirement
RFI	Request For Information
ROS2	Robot Operating System 2
RTMP / RTSP	Real-Time Messaging / Streaming Protocol
SIR	Specific Information Requirement
SRT	Secure Reliable Transport
TCPED	Tasking, Collection, Processing, Exploitation, Dissemination
UXV	Unmanned Vehicle (any domain)
YAML	YAML Ain't Markup Language