NATO STANDARD

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SERVICES TO FORWARD FRIENDLY FORCE INFORMATION TO WEAPON DELIVERY ASSETS

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NATO LETTER OF PROMULGATION

23 February 2018

1. The enclosed Allied Data Publication ADatP-37, Edition A, Version 1, SERVICES TO FORWARD FRIENDLY FORCE INFORMATION TO WEAPON DELIVERY ASSETS, which has been approved by the nations in the Consultation, Command, and Control (C3) Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 5528.

2. ADatP-37, Edition A, Version 1, is effective upon receipt.

3.

4. This publication shall be handled in accordance with C-M(2002)60.

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

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RECORD OF SPECIFIC RESERVATIONS

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REFERENCES

Note

When the edition and version are not specified, the following standards refer to the latest promulgated version.

1. AC/322(FFT-AHWG)N(2009)0003-REV1, 20 January 2010
2. AC/322-D(2006)0066, Interim NATO Friendly Force Information (NFFI) Standard for Interoperability of Force Tracking Systems (FTS)
3. ACO 1252.07.01/SHJOS-AK/08- 205237, Joint Concept of Employment for Tactical Data Links
4. STANAG 2019, APP-6, NATO Joint Military Symbolgy
5. STANAG 7149, APP-11, NATO Message Catalogue
6. STANAG 5516, Tactical Data Exchange – Link 16
7. STANAG 5518, Interoperability Standard for Joint Range Extension Application Protocol (JREAP)
8. Internet Engineering Task Force (IETF) Request for Comment (RFC) 2119 Best Current Practice, March 1997
9. AC/322-D(2015)0004, NATO Friendly Force Tracking Reference Architecture, V1
10. STANAG 5524 Edition 2, ADatP-34(H), NATO Interoperability Standards and Profiles Version 8, 04 November 2014
11. STANAG 1241, NATO Standard Identity Description Structure For Tactical Use
12. STANAG 3809, Digital Terrain Elevation Data (DTED) Exchange Format
13. STANAG 4406, Military Message Handling System (MMHS)
14. STANAG 5527, Friendly Force Tracking Systems (FFTS) Interoperability, ADatP-36

CONVENTIONS

1. Terms and Definitions

The key words MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY and OPTIONAL in this standard are to be interpreted as described in IETF RFC 2119 [Ref 8].

2. Business Rules

Business rules define the behaviour the service shall follow when handling received and transmitted messages and when interacting with an operator or with the underlying system (e.g. its sensors' output). The business rules describe the dynamics of the service. The business rules that define the interaction within a specific protocol also define the ways differing protocols are matched to allow unambiguous interpretation of the same information in two different systems.

1. AIM

The aim of this publication is to standardize services for transmitting friendly situational awareness (SA) information from NATO Force Tracking Systems (FTS), Command and Control (C2) systems, and other identification systems, including Combat Identification (CID) systems, to weapon delivery assets and other attack-associated units via tactical data link to reduce the risk of fratricide and collateral damage. This document details the basic technical and operational principles for implementing this capability in the NATO operational environment.

2. SCOPE

Fighting units need relevant, real-time information about their operating area, the targets, potential threats, near-by friendly and neutral forces, and non-combatant personnel and facilities. Rapidly changing battlefield conditions, multiple information sources, and variously equipped units engaged with enemy combatants or tasked to attack enemy targets without proper SA about own or neutral forces result in high risk operations, leading to potential decreased survivability, increased fratricide, and increased collateral damage.

Transmitting situational awareness information to weapon delivery assets is based on operational requirements [Ref 3] from Allied Command Operations (ACO) and captured in the NATO Friendly Force Tracking (FFT) Ground-to-Air Interoperability Functional Requirement (near-term) [Ref 1]. Each of these requirements documents address transmitting situational awareness information of friendly forces. Expansion of FFT capabilities to neutral forces and availability of their tracking data in current operations dictates extension of services to forward situational awareness data to include available neutral tracking data in future operations.

3. INTEROPERABILITY REQUIREMENTS

This standard provides the means to ensure the interoperability of emerging NATO and national capabilities for services to forward positional information of friendly forces to weapon delivery assets to reduce the risk of fratricide and collateral damage. In order to allow transmitting and receiving systems to exchange this vital information, the interfaces and functionality of these services must be clearly defined to ensure interoperability.

This standard also provides requirements for implementation of existing interoperability and data exchange standards, interface protocols, and both business and forwarding rules for collecting and disseminating friendly force information as required. Interoperability and information exchange between friendly force tracking data sources is subject to other standards, such as the interim NATO Friendly Force Information (NFFI) standard [Ref 2] and the emerging FFI MTF standard [Ref 14] for friendly force tracking system interoperability. The FFI MTF standard is described in ratification draft STANAG 5527 and ADatP-36 and the message format incorporated in APP-11, NATO Message Catalogue.

Table 1 Layered Overview of Relevant Specifications

	Interim NFFI (D-Doc) FFT Interoperability			STANAG 5527 ADatP-36 FFT Systems Interoperability	STANAG 5516 Link 16
Data Element Dictionary (DED)	✓			APP-11	✓
Message Structure (MS)	✓			APP-11	✓
Business Rules (BR)	[1]			[2]	✓
Data Bearer / Routing	✓ (IP1, IP2)			✓ (IP1, IP2)	STANAG 5518
Operational Cross Domain (Transmitting to Link 16)	**DED**	**MS**	**Data Bearer**		
	Partially	Not available			

3.1 NFFI-DEF is the xml data definition of the NFFI message in the interim NFFI standard [Ref 2]. It includes the XML schema, and a more detailed description of the definition, including mandatory and optional fields within the message definition. The only mandatory fields are 'datetime' for time of report origination, 'coordinates' for position information, and 'tracksource' for identification elements from the 'positionaldata' section of the NFFI message and are used by the services for track data transmitting. The optional NFFI 'altitude' field, when reported by an entity, shall be maintained in the service database and incorporated into the reported position in the 'altitude' field of the link 16 J3.2 message when reporting air entities and in the 'elevation' field of the Link 16 J3.5 message when reporting land entities.

3.2 FFI-MTF is the XML message text format message for NATO Friendly Force Information (FFI) incorporated into the NATO Message Catalogue (APP-11) that in the future will replace NFFI-DEF. The minimum information elements included are TrackSource with sub-elements TransponderId and System, TrackSecurityLabel with TrackSecurityPolicy, TrackSecurityClassification and TrackSecurityCategory, and TrackPositionalData with Time and Location. Optional information may include other identification such as Link 16 track number, planned locations, and classification.

The interim NFFI standard will remain operational until replaced by FFI MTF. Until the FFI message text format (FFI MTF) has been fully implemented into all FFTS, the NFFI format may be used concurrently for continued interoperability. Information exchange via tactical data links is well described in various current STANAGs. The operational information requirements

[1] AC/322-D(2006)0066, the Interim NATO Friendly Force Information (NFFI) Standard for Interoperability of Force Tracking Systems (FTS) was produced prior to the requirement for business rules. Business rules are implied but are not specifically defined for NFFI.

[2] ADatP-36 includes business rules for interoperability of Force Tracking Systems (FTS) with the FFI MTF message schema in APP-11, NATO Message Catalogue. These business rules apply for exchange of PLI between FTS and with command and control services. Some rules, such as those dealing with timeliness of position data, may not be applicable for this service, which reports only current positions.

relevant to the services are in Table 2. These requirements are taken from the NATO FFT Reference Architecture [Ref 9].

4. GENERAL

The specifications contained in this publication shall govern the automated information exchange relating to transmitting positional information of friendly ground forces to weapon delivery assets by means of these services. All functionalities to forward this information from Force Tracking Systems (FTS), C2 systems and other identification systems to RF Tactical Data Link networks are referred to as “the service” throughout this standard.

The service is not designed to support engagement decisions on targets, but rather enhances SA to support non-engagement decisions whenever the risk of endangering own or neutral forces exists or is unbearable, since the systems supplying positional information may only provide it in near real-time and not all forces are provided an FTS capability.

Neutral forces or entities can also be a factor in making non-engagement decisions, so neutral positional information, when available and operationally relevant, should be forwarded by the service. Transmitting neutral force positional information in addition to friendly force information is described throughout the standard. The service is an independent and flexible open service that can operate either autonomously of any other system or as a module within a FTS, C2, or other identification system.

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Table 2 FFT Operational Information Requirements [Ref 9](NOV-3) - Relevant to the Service

OIR Number	User Statement	Sender	Receiver	Desired Operational Date	Reference	Operational Activity	Transaction Type	Triggering Event	Periodicity	Timeliness
OIR-1	Increase the commanders' situational awareness of the land battle space in order to increase the operational effectiveness of the force; and support identification of own forces to reduce the risk of fratricide and collateral damage.	Ground Friendly Force	National Operational Command	03/07/2009	MMR	FFT 1.1.3 Share Friendly force information with other National capabilities	data	timer	5 min / 800 meters	Up to 10 minutes
OIR-4		National Operational Command	National Operational Command	03/07/2009	MMR	FFT 1.1.3 Share Friendly force information with other National capabilities	data	timer	5 min / 800 meters	Up to 10 minutes
OIR-6	Whenever required and approved by NATO, precise and real-time information of the disposition of own forces within the vicinity of a designated target area must be provided to weapon delivering platforms to reduce the risk that delivery of a weapon will endanger own forces	National Operational Commands	Air C2	03/07/2009	MMR	FFT 1.2.2 Disseminate Friendly Force Information towards different COIs	data	timer	5 min / 800 meters	Up to 10 minutes

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5. ASSUMPTIONS

Available friendly and neutral Position Location Information (PLI) is at a lower or the same security level as the communication network (tactical data link) used to forward the PLI to weapon delivery assets.

6. DOCUMENT FORMAT

The standard contained in this publication has been developed based on the layered approach of the STANAG Transformation Framework (STF), as contained in NATO Interoperability Standards and Profiles Version 7, Volume 5 [Ref 10]. The STF supports increased interoperability and enhanced reusability among information exchange standards. The diagram at Figure 1 illustrates the STF.

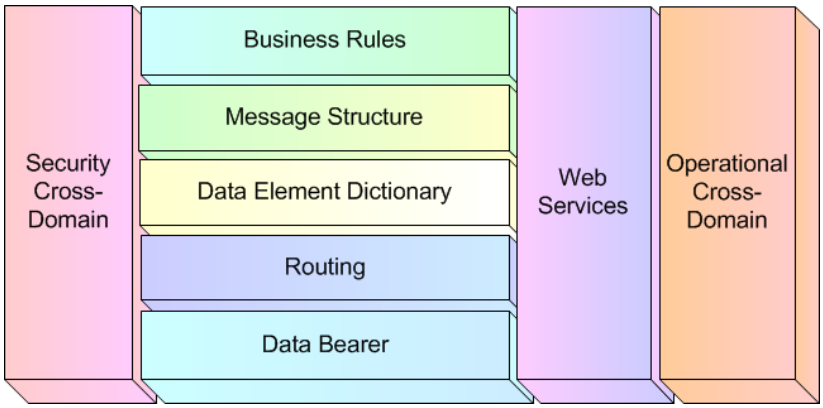

Figure 1 STANAG Transformation Framework Layers

The STF is characterized by:

- multiple independent layers;
- reusability between standards of the same nature;
- the use of layers and layer interfaces to support coherence between standards; and
- a machine-readable representation of the layers.

The different layers of this framework meet the requirements of the NATO Architecture Framework and provide for compatibility with future NATO information exchange capabilities.

Please note, that this publication does not fully meet the STF, as not all parts have been transferred to machine readable representation.

6.1 Annex A – High Level System Description

Annex A describes the service to forward ground positional information to weapon delivery assets and functional operational aspects.

6.2 Annex B – Technical Specification – Data Element Definition and Message Structure

Annex B specifies the data elements with when to use them, how to use them, and processing rules.

6.3 Annex C - Technical Specification – Business Rules

Annex C defines the technical business rules that are to be derived from requirements originated from the operational environment. The business rules complement the other aspects addressed in this document.

6.4 Annex D - Transport Layer

Annex D specifies the relevant service interfaces, interface protocols, i.e. receipt of friendly force information and Link 16 messages used by the service.

6.5 Annex E – Technical Specification – Security Cross-Domain

Annex E describes the information required to forward FFI to weapon delivery assets across security domains.

6.6 Annex F – Technical Specification – Operational Cross-Domain

Annex F describes the operational cross-domain aspects, where FFI is forwarded from different operational domains to Link 16, including:

- FFI in NFFI format
- FFI in FFI MTF format

6.7 Annex G – Minimum Implementation Requirements

Annex G defines minimum required capabilities and minimum implementation.

6.8 Annex H – Lexicon

Annex H contains a list of acronyms and a list of terms and definitions used within this document.

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ANNEX A – HIGH LEVEL SYSTEM DESCRIPTION

A.1. INTRODUCTION

The introduction of an automated information technology-based service to forward positional information of own or neutral forces to weapon delivery assets on demand is pivotal to increasing SA, thereby increasing combat effectiveness and reducing the potential for fratricide and collateral damage.

The service to forward friendly force information utilizes all available information from sources such as Force Tracking Systems, C2 systems and other identification systems, and acts as an intermediary application to forward positional information to the weapon delivery assets by means of available information exchange systems with which the service and the weapon delivery asset can communicate.

Information sources contribute updated information on various target area entities to the service including location of own forces, which maintains an updated database that may be accessed by the means of triggering messages originated by warfighters. The service packages the desired information into message sets that are understood by the system of the user desiring the information.

Assuming the data available to the service is as accurate and complete as possible based on sources of information, the disseminated result of the respective service trigger is an accurate representation of location of friendly entities around a position of interest at a point in time. This result provides the warfighter with increased SA of the immediate area to reduce the risk of fratricide and collateral damage.

A.1.1. Overview

The effective employment of the service is dependent upon effective and coordinated planning for implementation and exploitation of the capability, which must be integrated into the coalition command and control structure and in accordance with the applicable headquarters' processes. Underlying the requirement for effective service management, the ability of the supporting FFT systems and tactical data links (TDL) to feed and distribute friendly PLI information to tactical edge warfighters is imperative. ACO 1252.07.01/SHJOS-AK/08 – 205237, Joint Concept of Employment for Tactical Data Links, dated 8 October 2008, describes how NATO commanders will employ TDLs in a joint multi-Link environment in pursuit of operational objectives. Following the TDL Concept of Employment (CONEMP) will maximize service effectiveness.

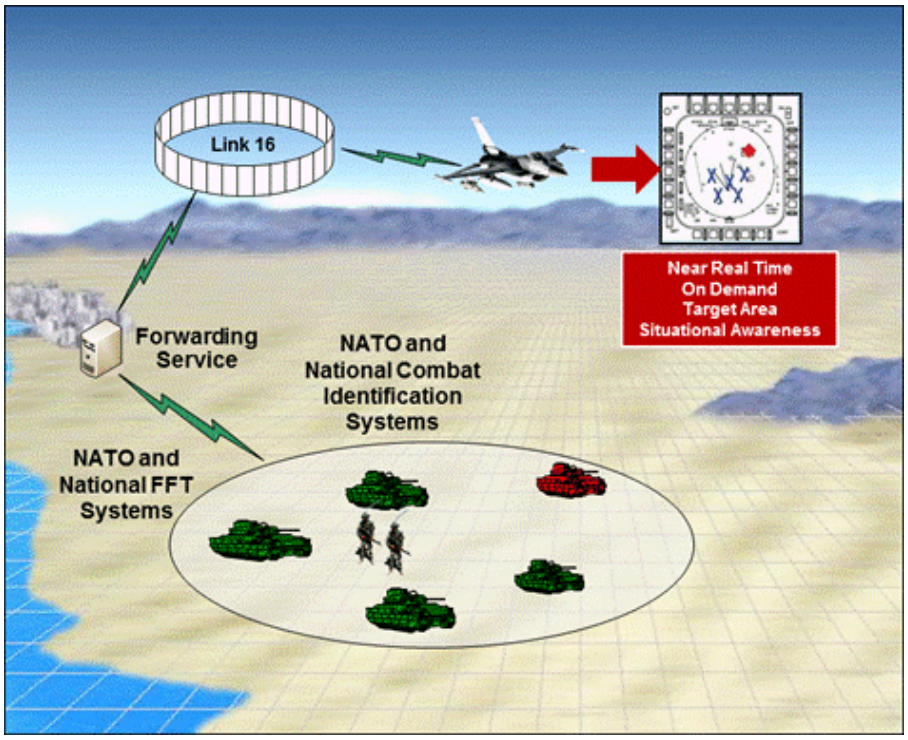


Figure 2 Operational View

A.1.2. Commander's Guidance

The service shall be utilized in accordance with Operational Commanders' direction and guidance in Concept of Operations (CONOPS), CONEMP, Tactics, Techniques, and Procedures (TTP), Theatre Special Instructions (SPINS), and Standard Operating Procedures (SOPs).

A.1.3. Dissemination and Receipt of Positional Information of Friendly Forces

Positional information of own or neutral forces are received by the service from differently-classified or unclassified networks. Trigger-generated response messages will only be disseminated to classified networks.

A.1.4. Reporting Area/Area of Interest

A service will be assigned a specific area for which the requested information will be supplied to a requestor. The assigned area is named the Reporting Area (RA). The Area of Interest (AOI) is the area for which a weapon delivery asset requires information on the disposition of own forces. The AOI is defined as either a default value with a circle with fixed radius around the position of interest (POI) or a variable size, whereby the radius of the AOI must be pre-selected by the service administrator during service configuration.

A.1.5. Service Connectivity

The service requires connectivity to those systems that hold and are able to disseminate positional information of friendly and neutral forces in accordance with the NFFI format and FFI Message Text Format.

The service must be enabled to receive and transmit dedicated Link 16 messages using the Joint Range Extension Application Protocol (JREAP) [Ref 7] by means of connectivity with a Link 16 network.

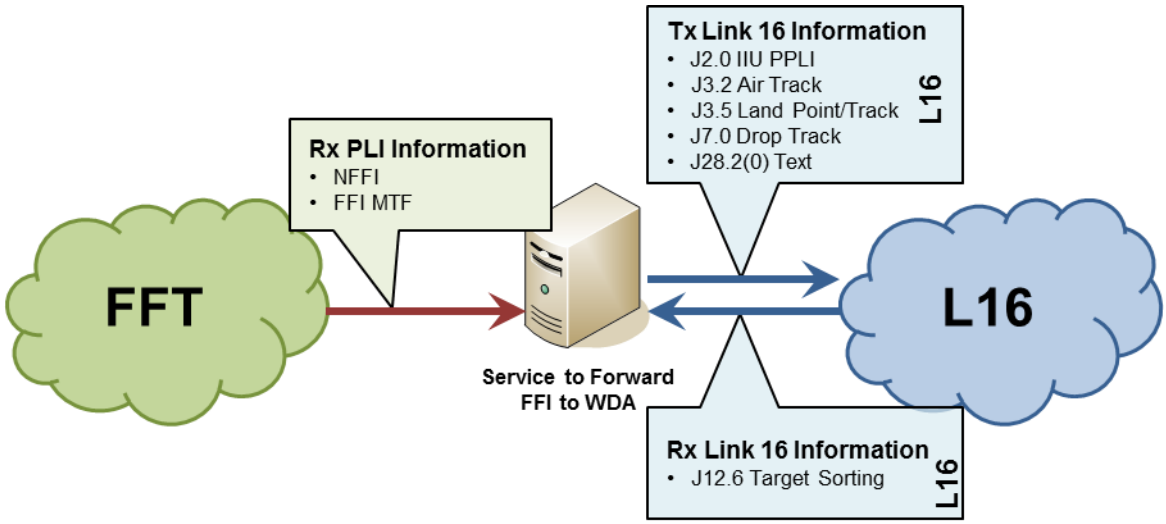


Figure 3 Data Flow During Service Operation

A.2. SERVICE FUNCTIONAL DESCRIPTION

The service shall collect, store, filter PLI data from incoming NFFI and FFI MTF messages, and then generate J-series messages from stored data when triggered by a J12.6 Target Sorting message from a weapon delivery asset. Link 16-equipped weapon delivery assets shall communicate their desire for situational awareness information around a specific location via J12.6 Target Sorting message. The service shall continuously monitor Link 16 for specifically configured J12.6 Target Sorting messages[3] from weapon delivery assets that trigger a response to rapidly determine if friendly PLI is present in the area surrounding the ground position of interest (POI) and forward locations of the closest friendly and neutral forces within the specified area of interest (AOI) to the weapon delivery asset. It shall do this by searching its database for the friendly and neutral positions around the POI, generating J3.2 Air Track/J3.5 Land Track[4] messages for the nearest friendly and neutral air/land locations, and then posting the J3.x messages on Link 16 for display in the weapon delivery asset. The service shall also be capable, when enabled, of automatically sending out a J28.2(0) Text message, when triggered, indicating the number of PLI positions reported within the designated radius of the ground POI (e.g. FRND=4 means four friendly/neutral tracks identified/reported within configured radius of designated POI). Weapon delivery assets may trigger the service as often as desired. When a J12.6 Target Sorting message has triggered the reporting of friendly and neutral positions and J3.x messages have been transmitted, the service shall transmit a J7.0 Track Management (ACT = 0, Drop Track Report) [Ref 6] message for each J3.x after 45 seconds or other time pre-set by the service administrator during service configuration.

[3] As shown in Figure 10 and further defined in J12.6 constraints in Table 11 and Transaction 3 (T3) in Table 12.

[4] J3.5 Land Point/Track messages will be reported by the service with the Point/Track Indicator data element set to value of 1 (PTI = 1) to indicate the message as a Land Track message. From this point, the J3.5 message will be referred to as a Land Track message.

- **BR-TDL Compliance.** The service shall comply with STANAG 5516 (Link 16) and STANAG 5518 (JREAP) rules for exchanging messages with Link 16.

A.3. SYSTEMS AFFECTED

The service can operate from any Link 16 network and the ability to receive a data feed from a source of PLI data. The service may be connected directly to Link 16 via Multifunctional Information Distribution System (MIDS) connection or via a Joint Range Extension (JRE) using the JRE Applications Protocol (JREAP) [Ref 7].

A.3.1. FFT Network Impacts

The service should be included in the FFT network architecture as an FFT Consumer to receive positional information. Service operations have no impact on the FFT network. The service requires no modifications to existing FFT, C2 or other identification systems, nor does it require a change in FFT doctrine.

A.3.2. Aircraft Impacts

The service requires no modifications to existing aircraft systems to transmit J12.6 messages or receive J3.x responses, nor does it require a change in operational doctrine. The service should be implemented so typical combat aircraft target engagement Tactics, Techniques, and Procedures (TTP) would trigger a service response.

A.3.3. Tactical Data Link Impacts

The service will influence the tactical data link network design load. The service is a Command and Control Interface Unit (C2 IU) that performs command and control (C2) functions to report positional information. The service shall be assigned its own JU number and a unique track number block in the OPTASK Link. The service will receive J12.6 Target Sorting messages and, when triggered, transmit J3.2 Air Track and J3.5 Land Track messages in response. The TDL impact is minimized by removing the J3.x reported positions by sending J7.0 Drop Track messages for each reported position 45 seconds (or other preset time) after the respective J3.x messages are first transmitted and by limiting the number of reported tracks and size of the area of interest.

Note. *The service is not a ground track forwarding service, as it does not automatically forward all ground track data to the Link 16 network. Rather, it is a unique trigger and response service to provide enhanced situational awareness to weapon delivery assets when desired.*

A.4. AIR-TO-GROUND OPERATIONS

When an aircraft engages a ground target and transmits a J12.6 message to trigger a response, the service provides the latest reported friendly and neutral positions nearest the target based on stored FFT information. The combat system of the attack aircraft displays the reported friendly ground tracks in the vicinity of the ground target. A representative aircraft display is shown in Figure 4.

Figure 4 Representative aircraft display of PLI

Aircrew may transmit J12.6 Target Sorting messages to trigger the service shortly after initial target coordinate reception in order to get long-range target area SA, then again prior to the final attack run. The long-range SA enables aircrew and Joint Terminal Attack Controller (JTAC)/Forward Air Controller (FAC)/Forward Observer (FO) to discuss differences in displayed friendly force locations prior to aircraft entering the target area.

A.5. SYSTEM FILTER REQUIREMENTS

Filters are used to prevent data from being transmitted or to prevent data from being received into a system's database. Data filters are used to inhibit the flow of certain data on a data link. A data filter that inhibits data from being transmitted on a data link is a transmit filter. A data filter that deletes data received on a data link prior to entry into a JU database is a receive filter. System filtering should not be confused with or used for display filtering that is used to customize data displays. Service filtering is further described in the following annexes.

The J12.6 Target Sorting message is used for many purposes in Link 16 and the service must be able to identify which messages are intended for the purpose of triggering a response from the service.

- **BR-J12.6 Message Filtering 1.** The service shall filter incoming J12.6 Target Sorting messages by JU to filter the weapon delivery assets that may trigger the service (by a pre-configured list of JUs) and ignore J12.6 messages from other JUs.

- **BR-J12.6 Message Filtering 2.** The service shall incorporate filtering by a configurable geographic area that conforms to the Reporting Area.

- **BR-J12.6 Message Filtering 3.** The service shall incorporate filtering by environment of the J12.6 messages to only trigger the service with Environment [Ref 6] of Land (Env = 5), Surface (Env = 3), or No Statement (Env = 0) and ignore J12.6 messages with all other environment values (Space, Air, and Subsurface).

- **BR-J12.6 Message Filtering 4.** The service shall incorporate filtering by a configurable list of J12.6 Status Information Discrete (SID) [Ref 6] values to be used according to specific weapon delivery assets identified by their Track Number.

Weapon delivery assets will continue to retransmit the J12.6 message (with the same Index Number[5]) in accordance with STANAG 5516 at intervals dictated by environment, SID value and network design timeslot allocation until it sends a J12.6 with SID value of 5 to cancel the point of interest or a new point of interest is selected and a new J12.6 message is transmitted with a new Index Number. The Periodic Update Rate (RRN) for J12.6 messages [Ref 6] that are transmitted to trigger the service are:

SID 0 – No Statement	RRN: 7(6 seconds) (See note below)
SID 9 – Mark Point	RRN Not Applicable (Mark Point is transmitted at least twice, 6 seconds apart)
SID 10 – Lock On	RRN: 7(6 seconds) (See note below)

Note. *A periodic update rate at an RRN of 8(3 seconds) shall be utilized for transmission on the NonC^2 JU-to-NonC^2 JU NPG (NPG 19).*

In order to minimize aircraft display clutter and bandwidth used, the service should not respond to retransmitted J12.6 messages with the same Index Number, within a preset time period. This time period is the J12.6 Lockout Period, which shall be preset during service configuration by each JU or block of JUs. During the J12.6 Lockout Period, the service will ignore J12.6s from the same JU with the same Index Number and SID value.

Note. *If a JU transmits a J12.6 Pointer message to trigger the service with Index Number of '0' (No Statement) which is not incremented in subsequent J12.6 Pointer messages, the service will ignore subsequent J12.6 Pointer messages from the same JU during the J12.6 Lockout Period.*

After the J12.6 Lockout Period, the service will process the J12.6 as a new trigger and transmit appropriate response messages (J3.x/J28.2(0)).

- **BR-J12.6 Message Filtering 5.** The service shall incorporate a J12.6 Lockout Period (0 to 511 seconds), configurable during service configuration either globally or optionally by JU or block of JUs.

- **BR-J12.6 Message Filtering 6.** The service shall ignore retransmitted J12.6 messages (same JU, Index Number, Environment, and SID value) during the J12.6 Lockout Period and will process the J12.6 after the J12.6 Lockout Period.

A.6. MULTI-SERVICE OPERATIONS

In the future, the use of more than one instance of the service may be required to receive and distribute Friendly Force Information throughout an operational theatre. When multiple instances of the service are employed in a theatre, management within overlapping areas of

[5] Numeric value of 0 through 63 assigned by the originator to differentiate among Sensor Target Reports

responsibility dictates additional planning and preparation considerations to ensure the services provide the Commanders with synchronized, relevant SA information. These considerations are:

A.6.1. Data Link Network

Multi-service operations require all services to be connected to the same Link 16 network and that each service is assigned its own JU number and track block for reporting in the OPTASK Link.

A.6.2. Response

- **BR-Multi-Service Response 1.** Services will only respond to J12.6 Target Sorting messages that are received with positions of interest inside their assigned Reporting Area (RA) to avoid duplication of reports and unnecessary use of bandwidth.
  - This is achieved by each service performing geographic filtering of J12.6 Target Sorting messages as they are received so that J12.6 messages outside its RA are ignored by the service.
- **BR-Multi-Service Response 2.** Services may be assigned the same RA or overlapping RAs if they are assigned specific reporting times to respond to J12.6 messages to prevent duplication of reports from more than one service.
  - For example, Service 1 will respond from 0800 to 1559 and Service 2 will respond from 1600 to 0759.
- **BR-Multi-Service Response 3.** Optionally, services in multi-service operations may be assigned specific JUs or blocks of JUs to respond to.

A.6.3. Time

All services must be synchronized to share and use a common time reference. Friendly Force Tracking systems and the associated reporting rely on time information in multiple instances. Without proper arrangements for time synchronization there is a risk of losing or misinterpreting vital information.

- **BR-Time-1.** All timestamps shall be based on the Coordinated Universal Time (UTC).
- **BR-Time-2.** Systems that are using GPS derived time shall convert all timestamps to UTC time for the reporting and transmitting of track information and assume that received track information is UTC based and apply the respective conversion to GPS time.

A.6.4. Position Location Information (PLI)

- **BR-PLI-1.** Services may receive reported PLI from multiple sources in multiple security domains for friendly and neutral forces within the operational theatre, specifically within their assigned Reporting Area (RA).
- **BR-PLI-2.** Services shall be able to receive PLI in the NFFI and FFI MTF formats.

- **BR-PLI-3.** Services shall be able to report PLI data that is outside their assigned Reporting Area (RA), but is within the maximum distance from the area boundary, which equals the maximum distance of the preset radius up to which the service shall be able to report friendly PLI from the target (see Figure 5).

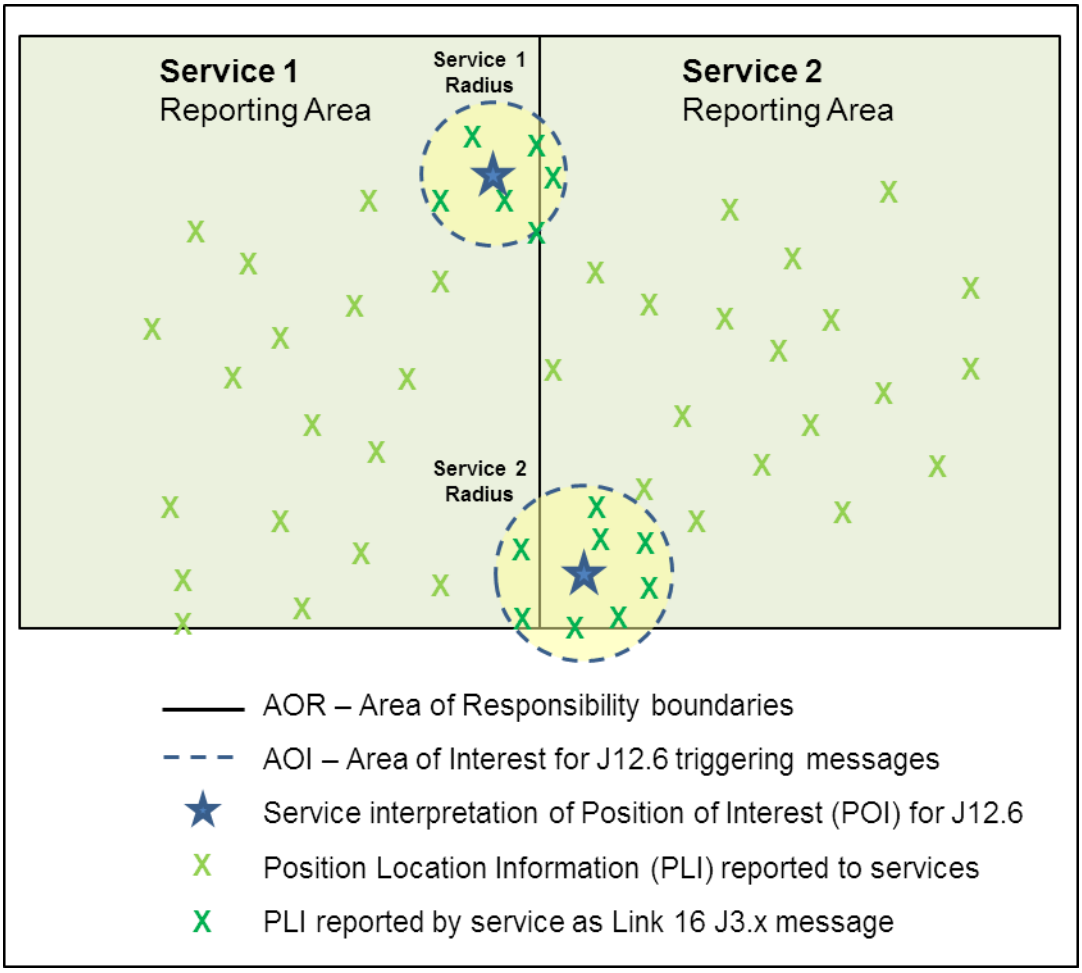


Figure 5 Services processing requests requiring data from neighbouring Reporting Area boundaries

A.6.5. Multi-Service Coordination

Multi-service operations must be coordinated and directed by the appropriate level of command that has authority to direct timely changes or modifications to service reporting or processing requirements for all services in an Area of Responsibility.

A.7. HIGH-LEVEL BUSINESS RULES

Business rules for the service define the interactions between the service, the sources of FFT data, and Link 16. The Interim NFFI [Ref 2] and FFI MTF [Ref 14] standards define the data elements, message structure and rules for interoperability of force tracking systems. The Link 16 standard [Ref 6] defines the data elements, message structure for all J-series messages, and business (transmit and receive) rules for the Link 16 tactical data link. The service uses standard messages from the NFFI/FFI MTF standards for receipt of PLI data

forwarded from a single or multiple FFT systems. The service uses a small subset of the entire Link 16 J-series message set from STANAG 5516 [Ref 6] for remaining active on Link 16, receipt of triggering messages, reporting friendly and neutral ground and air positions, and dropping reported tracks.

A.7.1. Service as Command and Control Interface Unit (C2 IU)

- **BR-Functional-1 C2 IU-1.** The service is an Interface Unit (IU) connected to Link 16 via an STANAG 5518 [Ref 7]-capable system.

- **BR-Functional-1 C2 IU-2.** The service shall perform C2 functions as a C2 IU with Reporting Responsibility (R^2) in reporting friendly and neutral positional information.

Note. *The service will hold Reporting Responsibility (R^2) for tracks that it transmits to Link 16.*

A.7.2. Link 16 Monitoring

- **BR-Functional-2 J-Series Messages.** The service shall monitor the Link 16 network for receipt of J12.6 Target Sorting messages.

A.7.3. Service Trigger

The service provides weapon delivery assets the capability to trigger the service and receive responses. Aircrews transmit a J12.6 Target Sorting message to trigger the service (Figure 6) and receive J3.2 Air Track, J3.5 Land Track, and J28.2(0) Text messages in response (Figure 7) from the service.

- **BR-Functional-3 Service Trigger 1.** The sequence of trigger and response for SA information from the service will be initiated by receipt of a J12.6 Target Sorting message (i.e., sequence is triggered by the weapon delivery decision maker to receive the nearest friendly or neutral positions to a position of interest from the service).

- **BR-Functional-4 Service Trigger 2.** The service will recognize the position indicated by the J12.6 Target Sorting message and use this for the application to find reported friendly or neutral positions within a pre-set radius.

- **BR-Functional-5 Service Trigger 3.** The specific J12.6 Target Sorting message to be used to trigger the service and how each potential weapon delivery asset sends it must be defined in the service CONEMP, Tactics, Techniques, and Procedures (TTP), or Theatre Special Instructions (SPINS) for each implementation of the service. For example, an A-10C shall transmit a J12.6 SID 10 / Lock-On / New Sensor Report with Environment of Land (Env = 5) or Surface (Env = 3) on Network Participation Group (NPG) = 9 / 19.

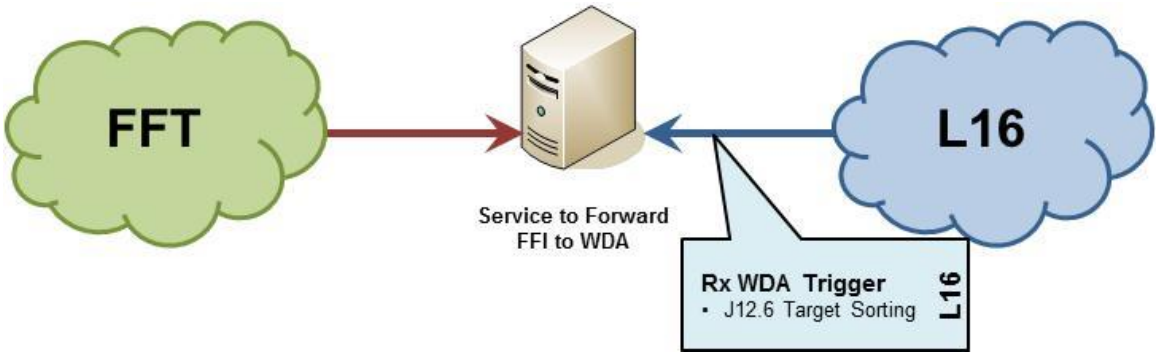


Figure 6 Service Trigger

A.7.4. Service Response

The service uses Link 16 airborne networks via a JREAP connection to publish PLI of friendly or neutral forces to weapon delivering assets when triggered by receipt of a J12.6 Target Sorting message. The response to the trigger is provided by the service with J3.2 Air Track and J3.5 Land Track messages to forward the closest pre-set number of relevant friendly and neutral air/ground positions within a pre-set distance from the position of interest indicated in the J12.6 message as defined above. The service may provide a response when no friendly positions are within the AOI in order for the weapon delivery asset to be assured that the J12.6 Target Sorting trigger message was received.

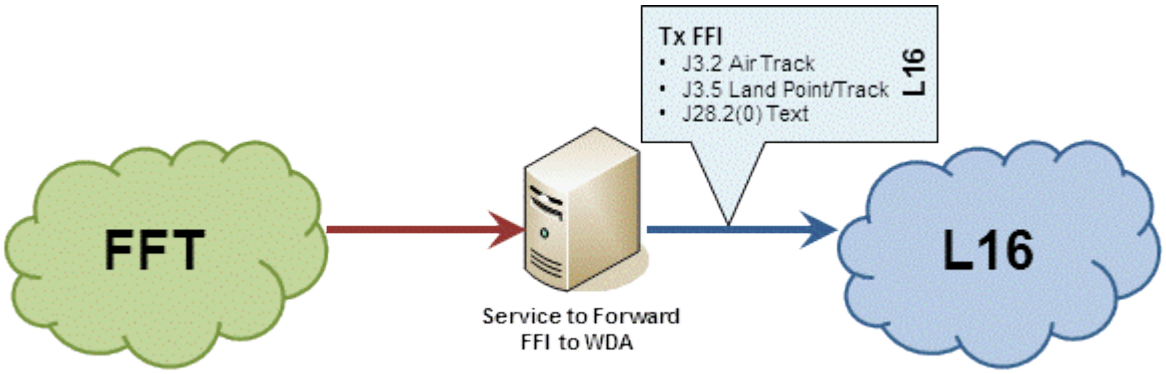


Figure 7 Transmit Relevant PLI to Weapon Delivery Asset

- **BR-Functional-6 Service Response 1.** The service shall respond to receipt of a J12.6 Target Sorting message with J3.5 Land Track Messages and optionally with J3.2 Air Track Messages that are transmitted to the link reporting the location of friendly and neutral units within the AOI.

- **BR-Functional-7 Service Response 2.** The service may incorporate an optional capability to transmit a J28.2(0) No PLI Response text message to notify the weapon delivery asset that the triggering message was received and processed, and that no friendly or neutral positions were found in the system. If implemented by a service, the capability should be addressed in doctrine when fielded for an operation, including in published CONOPS, CONEMP, TTP, SOPs, and Special Instructions (SPINS).

- **BR-Functional-8 Service Response 3.** The service shall generate J3.5 Land Track (Friend, Identity = 3 or Neutral, Identity = 4) and optionally J3.2 Air Track (Friend, Identity = 3 or Neutral, Identity = 4) messages from PLI in its database and local settings to report friendly and neutral positions in the vicinity of a point of interest indicated in the J12.6 Target Sorting message sent by the weapon delivery asset to trigger a response from the service.

- **BR-Functional-9 Service Response 4.** The service, as a minimum, shall respond once to each J12.6 Target Sorting message sent to trigger a response from the service with the appropriate number of J3.2 and J3.5 messages when relevant friendly or neutral positions are identified within the area of interest. The J3.x messages shall be retransmitted in accordance with STANAG 5516 at the normal track update interval until J7.0 Drop Track messages are sent for the reported Track Numbers.

- **BR-Functional-10 Service Response 5.** When the service has identified PLI to be reported that it has previously sent to Link 16 and the J3.x track has not yet been dropped, the service will retransmit the J3.x track with the same track number, and apply the preselected drop-track time period for that retransmission.

- **BR-Functional-11 Service Response 6.** The service shall be capable, when enabled, of automatically sending out a J28.2(0) Text message indicating the number of PLI positions reported within the designated radius of the ground POI in the format FRND=NN where NN is the number of PLI reported. For example, FRND=4 means four friendly/neutral tracks identified/reported within configured radius of designated POI. Optionally, the service may be capable of providing additional information in the J28.2(0), such as indicating the distance to the nearest friendly/neutral track (e.g., “FRND=3 DIST=153” means three friendly/neutral tracks identified/reported within the configured radius of the designated POI and the distance to nearest Friendly/Neutral PLI is 153 meters.). If a service is capable of adding additional information to the J28.2(0), the content of the message shall be configurable during service configuration by JU or block of JUs as operationally agreed.

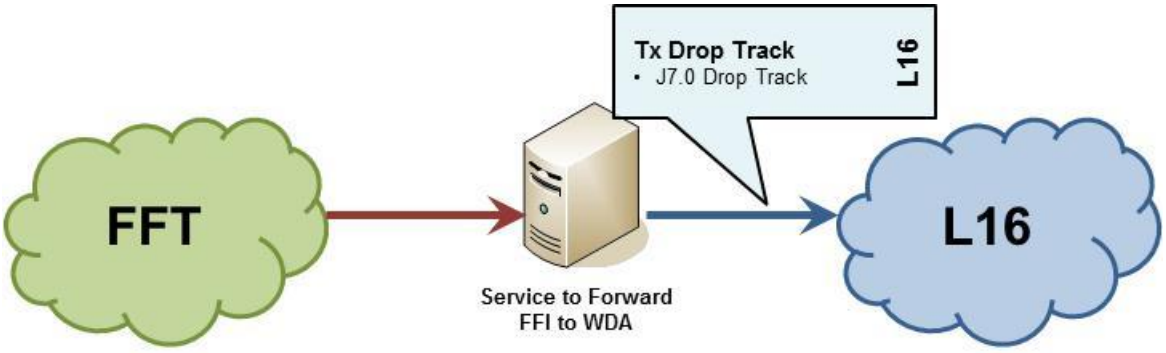
- **BR-Functional-12 Service Response 7.** Optionally, the service may be capable of sending a “No PLI Response” by sending a J28.2(0) Text message with text of “NO REPORT” to inform the J12.6 originator that the triggering message was received and processed but that no PLI is reported in the area of interest.

Note. *The ‘No PLI Response’ setting is independent of the ‘Text Message Enable’ setting such that if ‘No PLI Response’ is set to YES, the J28.2(0) NO REPORT messaged will be transmitted regardless of the setting of ‘Text Message Enable’.*

- **BR-Functional-13 Service Response 8.** The J28.2(0) Text message, when enabled, shall be addressed to the originator of the J12.6 triggering message in TRACK NUMBER, ADDRESSEE data field.

- **BR-Functional-14 Service Response 9.** The J28.2(0) Text message, when enabled, shall be transmitted only once for each J12.6 trigger message processed after filtering.

- **BR-Functional-15 Track Removal from Link 16.** When a J12.6 message has triggered the reporting of friendly or neutral positions and J3.x messages have been transmitted, the service shall transmit a J7.0 Track Management (ACT = 0, Drop Track Report) [Ref 6] message for each Track Number position reported by J3.x 45 seconds or other time pre-set by the service administrator after the initial J3.x message is sent as shown in



- Figure 8.

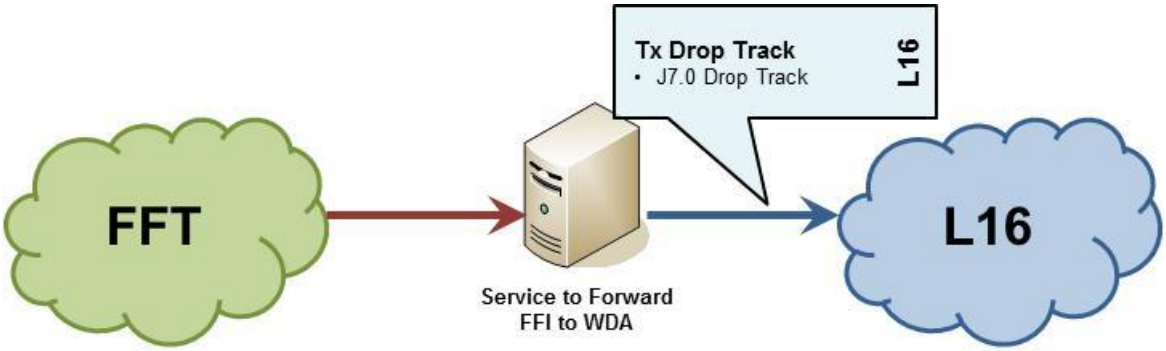


Figure 8 J7.0 Drop Track Message After 45 Seconds

ANNEX B – TECHNICAL SPECIFICATION – DATA ELEMENT DEFINITION AND MESSAGE STRUCTURE

The entire data element and message structure set used to fulfill the FFI to WDA is specified in several STANAGs as reported below.

B.1. LINK 16

The service only uses a small subset of the entire Link 16 message set defined in STANAG 5516 shown in the following tables.

- **BR-J-Series Messages.** Receipt and Transmission rules in STANAG 5516 for the Link 16 messages used by the service shall be followed.

Table 3 Link 16 - STANAG 5516

Message Number	Message Name
J2.x	Precise Participant Location and Identification (PPLI) Message
J3.2	Air Track
J3.5	Land Track
J7.0	Drop Track Report
J12.6	Target Sorting Message
J28.2(0)	Text Message

B.1.1. Link 16 Messages Received

Table 4 Sub-set of Link 16 Message Set for Service Reception

Reception of Link 16 Messages			
Message Number	**Title**	**Message Purpose [Ref 6]**	**Service Purpose[6]**
J12.6	Target Sorting	a) Enable non-C^2 JUs to exchange targets and targeting information among themselves, b) pass sensor data to C^2 JUs and among non-C^2 JUs, c) pass non-C^2 JU engagement status information between non-C^2 JUs and from non-C^2 JUs to C^2 JUs, and d) provide control among non-C^2 JUs.	Trigger the service sequence to search database and report friendly positions around point of interest

[6] Details are in Annex C.

B.1.2. Link 16 Messages Transmitted

Table 5 Sub-set of Link 16 Message Set for Service Transmission

Transmission of Link 16 Messages [Ref 6]			
Message Number	**Title**	**Message Purpose**	**Service Purpose**
J2.x	Precise Participant Location and Identification (PPLI)	Report active status of JU	Report service position to Link 16 as an Indirect Interface Unit and maintain service in active status on link
J3.2	Air Track	Exchange tactical surveillance information on friendly/neutral air tracks	Transmit generated FFT tracks of friendly/neutral forces to weapon delivery assets
J3.5	Land Track	Exchange tactically significant information that has been derived from electromagnetic sources and to report friendly/neutral land tracks	Transmit generated FFT tracks of friendly/neutral forces to weapon delivery assets
J7.0	Track Management (ACT=0, Drop Track)	Used to transmit information necessary to effect management actions on tracks being reported within the interface	Drop the transmitted J3.2 and J3.5 tracks
J28.2(0)	Text	Used to convey alphanumeric text information via datalink	Report via text message the number of PLI messages reported Provide 'No PLI Response' to weapon delivery asset

B.2. JOINT RANGE EXTENSION APPLICATION PROTOCOL (JREAP)

Table 6 JREAP - STANAG 5518

Message Name
JREAP Application Header message
JREAP J-Series message
JREAP J-Series message Word
Management message subheader format
Echo Message
Common Time Reference message
Round-Trip Time Delay Message
J-Series Acknowledgment (Application) Message
Terminate Link

B.3. FRIENDLY FORCE INFORMATION MESSAGE TEXT FORMAT (FFI MTF)

Table 7 FFI MTF - ADatP-36 STANAG 5527

Message Name
FFI (as specified in APP-11(D)(1))

B.4. NATO FRIENDLY FORCE INFORMATION (NFFI)

Table 8 NFFI - AC/322-D(2006)0066

Message Name
NFFI

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ANNEX C – TECHNICAL SPECIFICATION – BUSINESS RULES

C.1. CONFIGURATION

Initial implementation dictates business rules for service set up and configuration that must be followed.

C.1.1. Reporting Area

- **BR-Config-1 Reporting Area.** The service shall be assigned a geographic Reporting Area for which it is responsible to respond to weapon delivery asset queries.

C.1.2. Determine Service Position

- **BR-Config-2 Service Position-1.** The position of the service must be known for inclusion in the J2.x self-report of service position and active status, either from a connected Global Positioning System (GPS) service or from manual input.

- **BR-Config-3 Service Position-2.** The service shall be capable of manual input of its location (latitude and longitude) for inclusion in the transmitted J2.x message self-report.

C.1.3. Service as Command and Control Interface Unit (C2 IU)

- **BR-Config-4 Service as C2 IU.** The service shall be assigned a JU number in OPTASKLINK as a Command and Control Interface Unit (C2 IU) to perform C2 functions and report friendly and neutral positional information.

C.1.4. Track Block Assignment for the Service

Operational network constraints limit the number of Track Numbers (TNs) available. TN allocation for each of many thousands of PLI-reporting units reporting is impractical. The service can operate with a limited number of TNs by recycling TNs as required to provide situational awareness to aircrews on demand. The service could potentially post (in a single 12-second Link 16 time frame) a number of J3.2 and J3.5 messages equal to five times (5x) the number of Link 16 capable weapon delivery assets enabled to trigger the service at one time.

- **BR-Config-5 Track Block Assignment-1.** The service shall be assigned a block of Track Numbers large enough to accommodate the number of potential J3.x messages the service can post at one time plus a buffer.

- **BR-Config-6 Track Block Assignment-2.** The service shall reuse Track Numbers from the block in the order in which they were released for reuse (oldest first) in accordance with STANAG 5516.

- To avoid non-availability of assigned Track Numbers, the service should request a larger track block, to be assigned by the Link 16 authority.

- **BR-Config-7 Track Block Assignment-3.** The service shall not maintain a permanent TN mapping to Transponder Identification/URN so a small track block can be allocated.

C.1.5. JUs Allowed to Trigger the Service

- **BR-Config-8 Weapon Delivery Assets.** The service shall incorporate a list, by JU, of weapon delivery assets that are allowed to trigger the service.

C.1.6. Status Information Discrete (SID) Values

- **BR-Config-9 SID Values List.** The service shall incorporate a list of J12.6 Status Information Discrete (SID) [Ref 6] values to be used according to specific weapon delivery assets allowed to trigger the service identified by their JU number.

C.1.7. Radius of Query Area of Interest (AOI)

The radius of the AOI may be variable but must be pre-set by the service administrator in accordance with operational tasking.

- **BR-Config-10 Area of Interest Radius 1.** The AOI around a point of interest shall be predetermined and the radius of the circle around the designated point pre-set in the service configuration. The radius may be set differently for different weapon delivery assets identified by the JU number, or a single value for the service.

- **BR-Config-11 Area of Interest Radius 2.** The default radius value of 1 km shall be used.

C.1.8. Number of PLI to Be Reported Per Trigger

The number of friendly and neutral positions in the AOI sent as J3.x messages in response to being triggered by a J12.6 Target Sorting message may be a fixed number in the service, such as the five closest, or may be configurable by the service administrator. If configurable, it may be set differently for different weapon delivery assets identified by the JU number, or a single value for the service.

- **BR-Config-12 Number of PLI in Service Response.** If not a fixed value in the service, the number of friendly or neutral positions in the AOI sent as J3.x messages in response to a J12.6 Target Sorting message shall be pre-set by the service administrator in accordance with operational tasking.

C.1.9. Link 16 display duration of tracks

The length of time a reported J3.x position remains on Link 16 prior to transmission of the J7.0 Drop Track message may be a fixed time or may be configurable (default of 45 seconds). J3.x messages shall be transmitted in accordance with STANAG 5516 at the normal track update interval until the J7.0 Drop Track messages are sent.

- **BR-Config-13 Time Period of Response.** If not a fixed value in the service, the length of time between transmission of the J3.x response and transmission of the J7.0 Drop Track shall be pre-set by the service administrator in accordance with operational tasking.

C.1.10. Emergency Indicator

The Emergency Indicator in J3.x messages is used to indicate whether or not a unit or track has an emergency. Any non-simulated track or nonC2 IU with an Emergency Indicator set to 1 (Emergency Status) shall not be filtered [Ref 6].

- **BR-Config-14 Emergency Indicator.** The service shall be capable of allowing the operator to independently set the J3.5/J3.2 Emergency Indicator to a value of '1 ' (Emergency Status) by JU of originator of the J12.6 triggering message.

C.1.11. Force Tell Indicator

The Force Tell Indicator in J3.x messages causes track/point data to be forced through controllable receive data filters in weapon delivery assets. Any non-simulated track or nonC2 IU with a Force Tell Indicator set to 1 (Force Tell Status) shall not be filtered (Ref 6].

- **BR-Config-15 Force Tell Indicator.** The service shall be capable of allowing the operator to independently set the J3.5/J3.2 Force Tell Indicator to a value of '1' (Force Tell Status) by JU of originator of the J12.6 triggering message.

C.1.12. Track Quality

Track Quality is a measure of the reliability of the horizontal positional information of a reported Air or Land track determined by the unit reporting the track. The service should compute Track Quality (TQ) in accordance with STANAG 5516 if reported information is available to support the computation. This information may include NFFI Coordinate Accuracy or FFI MTF Horizontal Accuracy and Track Speed. Some weapon delivery assets may not process or display tracks with TQ = 0.

- **BR-Track Quality 1.** To insure display of relevant tracks in all weapon delivery assets, the minimum Track Quality should be a value of 1 (TQ=1).

- **BR-Track Quality 2.** If reported information does not enable computation of Track Quality, the default Track Quality value should be 9[7] (TQ=9).

C.1.13. J28.2(0) Text Message Enable

The service shall be capable of sending out a J28.2(0) Text message, when triggered by a J12.6 triggering message, to indicate the number of PLI positions are being reported by J3.x in a text message sent to the weapon delivery asset. During system configuration, the operator shall enable or disable transmission of the J28.2(0) Text message by the JU (or block of JUs) of the originator of the J12.6 triggering message.

[7] An entity that reports its position every 5 minutes or 800 meters of travel (see Table 2) would have traveled less than 800 meters since its last reported position with a resulting Track Quality of 9.

- **BR-Config-16 J28.2(0) Text Message 1.** The service shall be capable of allowing the operator to independently enable/disable transmission of the J28.2(0) globally or optionally by JU or block of JUs of the originator of the J12.6 triggering message.

- **BR-Config-17 J28.2(0) Text Message 2.** Sending of the J28.2(0) Text message shall be enabled/disabled by the service operator during service configuration either globally or by JU or block of JUs of J12.6 message originator.

- **BR-Config-18 J28.2(0) Text Message 3.** The J28.2(0) Text message shall be addressed only to the originator of the J12.6 triggering message in TRACK NUMBER, ADDRESSEE data field.

- **BR-Config-19 J28.2(0) Text Message 4.** The J28.2(0) Text message, when enabled, shall be transmitted after the J3.x responses only once for each J12.6 message processed.

- **BR-Config-20 J28.2(0) Text Message 5.** The J28.2(0) Text message shall be formatted (FRND=0, FRND=1, FRND=2, FRND=3, FRND=4 . . . FRND=NN) to report number of PLI reported in response to a J12.6 triggering message.

- **BR-Config-21 J28.2(0) Text Message 6.** The J28.2(0) Text message with additional information shall be formatted to report number of PLI reported and additional text information following the number (FRND=NN XXXX=NNN). For example, if the J28.2(0) optionally contains the distance in meters to nearest friendly/neutral position, the J28.2(0) Text message shall be formatted (FRND=NN DIST=NNN) to report number of PLI reported and distance to nearest PLI in response to J12.6 triggering message.

C.1.14. J28.2(0) 'No PLI Response' Message Enable

The service may optionally be capable of sending out a J28.2(0) Text message of "NO REPORT" to indicate when a J12.6 triggering message was received and processed, but that no J3.x messages are sent when no friendly or neutral positions are identified within the area of interest. The "No PLI Response" provides positive indication to the triggering weapon delivery asset that no PLI is reported in response to the J12.6. During system configuration, the operator shall enable or disable transmission of the J28.2(0) 'No PLI Response' message either globally or by the JU (or block of JUs) of the originator of the J12.6 triggering message.

- **BR-Config-22 J28.2(0) 'No PLI Response' Message 1.** The service shall be capable of allowing the operator to independently enable/disable transmission of the J28.2(0) 'No PLI Response' message globally or optionally by JU or block of JUs of the originator of the J12.6 triggering message.

- **BR-Config-23 J28.2(0) 'No PLI Response' Message 2.** Sending of the J28.2(0) 'No PLI Response' message shall be enabled/disabled by the service operator during service configuration either globally or by JU or block of JUs of J12.6 message originator.

- **BR-Config-24 J28.2(0) 'No PLI Response' Message 3.** The J28.2(0) 'No PLI Response' message shall be addressed only to the originator of the J12.6 triggering message in TRACK NUMBER, ADDRESSEE data field.

- **BR-Config-25 J28.2(0) 'No PLI Response' Message 4.** The J28.2(0) 'No PLI Response' message, when enabled, shall be transmitted only once for each J12.6 message processed.

- **BR-Config-26 J28.2(0) 'No PLI Response' Message 5.** The J28.2(0) 'No PLI Response' message shall be formatted (NO REPORT) to indicate that no PLI is reported in response to a J12.6 triggering message.

C.1.15. Default Values

Configuration values and settings used in initialization of the service will be determined by the operational community and stated in doctrine documents (e.g., standard operating procedures (SOP), tactics, techniques, and procedures (TTP), concept of operations (CONOPS) or concept of employment (CONEMP)) specific to an operational theatre. As stated herein, service values are global configuration settings (minimum implementation) and optionally, some values are configurable by triggering JU or block of JUs (such as a specific aircraft type). Representative default values for configurable service settings are indicated in Table 9.

Table 9 Default Configuration Settings

Trigger/ Response	Settings	Value	Rationale
Trigger	J12.6 Originator JU	List of JUs authorized to trigger service	Service filter J12.6 messages from extra JUs
	J12.6 Reporting Area	Geographic area to respond to J12.6	Service filter J12.6 messages from outside geographic reporting area
	J12.6 Environment	Land (Env=5), Surface (Env=3), and No Statement (Env = 0)	Service filter J12.6 messages from other environments
	J12.6 SID	0, 9, 10	Service filter J12.6 messages with other settings
Response	Area of Interest (AOI) Radius	1000 meters	Operationally set relevant AOI
	Maximum PLI Age	600 seconds	Operationally set maximum age
	Number of PLI to report	5	Operationally determine to reduce aircraft display clutter and provide most relevant data
	Drop Track Timer	45 seconds	Drop reported tracks prior to STANAG 5516 retransmission time
	J12.6 Lockout Period	45 seconds	Prevent response to repeated/retransmitted J12.6 messages
	Text Message (J28.2(0)) Enable	NO[8]	Only transmit J28.2(0) if operationally desired by WDA
	Transmit Text Message (J28.2(0)) with DISTANCE (Optional capability)	NO	Only transmit J28.2(0) with DISTANCE if operationally desired by WDA

[8] When 'Text Message Enable' is NO, do not transmit J28.2(0) to report the number of J3.x messages transmitted.

Trigger/ Response	Settings	Value	Rationale
	Transmit "No PLI Response" J28.2(0) (Optional capability)	NO[9]	Only transmit "No PLI Response" J28.2(0) if operationally desired by WDA
	J3.2 Emergency Indicator	0 (No Statement)	Emergency Indicator not set unless PLI ALERT status indicates it or operationally directed
	J3.2 Force Tell Indicator	1 (Force Tell Status)	Force Tell Indicator set unless operationally directed otherwise
	J3.2 Track Quality	9	If reported information does not enable computation of Track Quality
	J3.2 Passive/Active Sensor	0 (Passive)	Fixed Value
	J3.5 Emergency Indicator	0 (No Statement)	Emergency Indicator not set unless PLI ALERT status indicates it or operationally directed
	J3.5 Force Tell Indicator	1 (Force Tell Status)	Force Tell Indicator set unless operationally directed otherwise
	J3.5 Track Quality	9	If reported information does not enable computation of Track Quality
	J3.5 Passive/Active Sensor	0 (Passive)	Fixed Value

C.2. SERVICE TRANSACTIONS

C.2.1. Transaction Flow

The following figures depict the basic transaction flow (Figure 9) and the specific process steps for the service (Figure 10) for FFT information receipt, data processing, service query/trigger, and response to a query. Tables 10 through 12 detail the specifics of the transactions and the business rules that apply.

[9] When 'No PLI Response' is YES, transmit J28.2(0) with 'NO REPORT' if no PLI is found in the area of interest and no J3.x messages are transmitted.

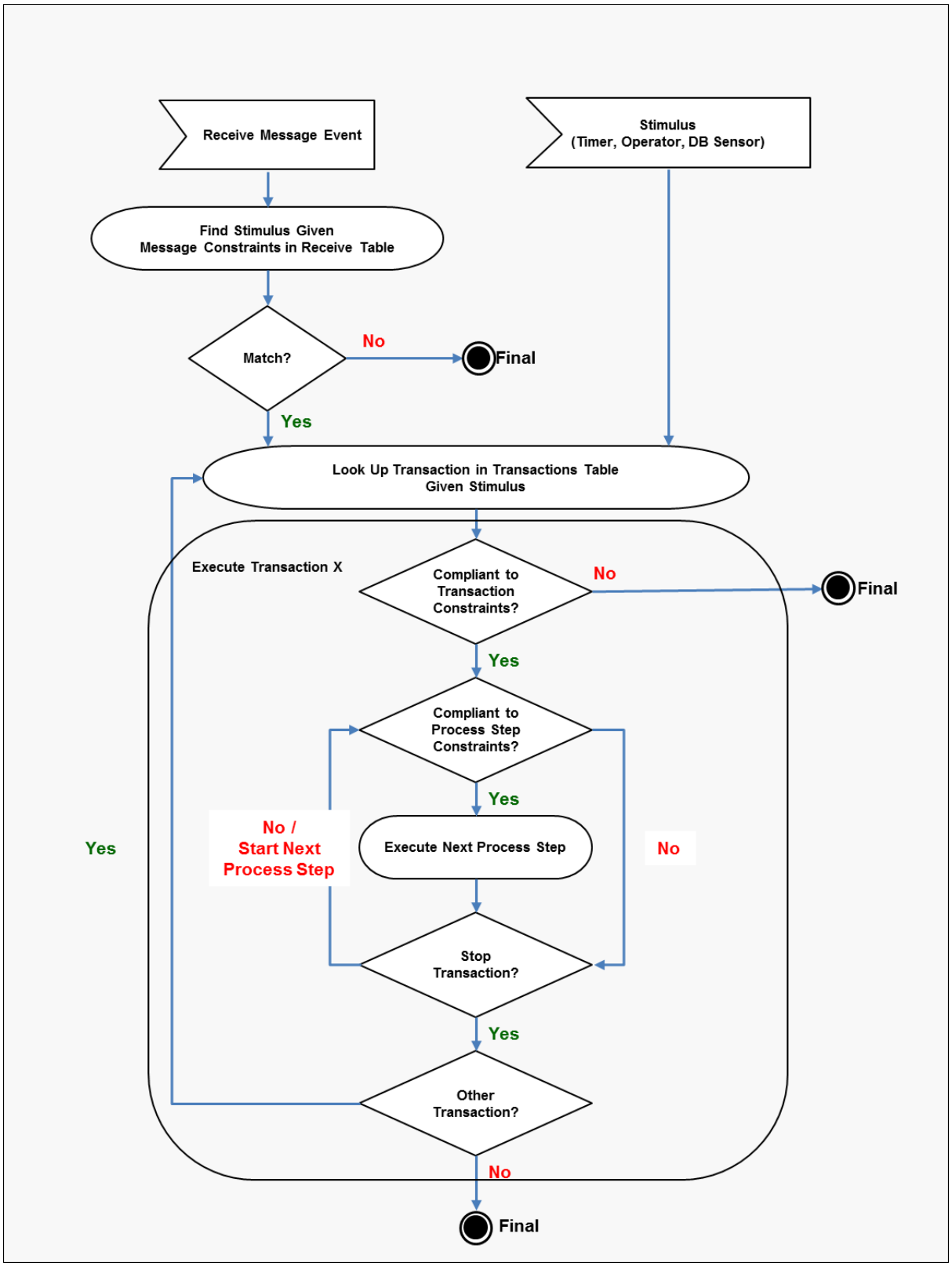

Figure 9 Basic Transaction Flow (UML Activity Diagram)

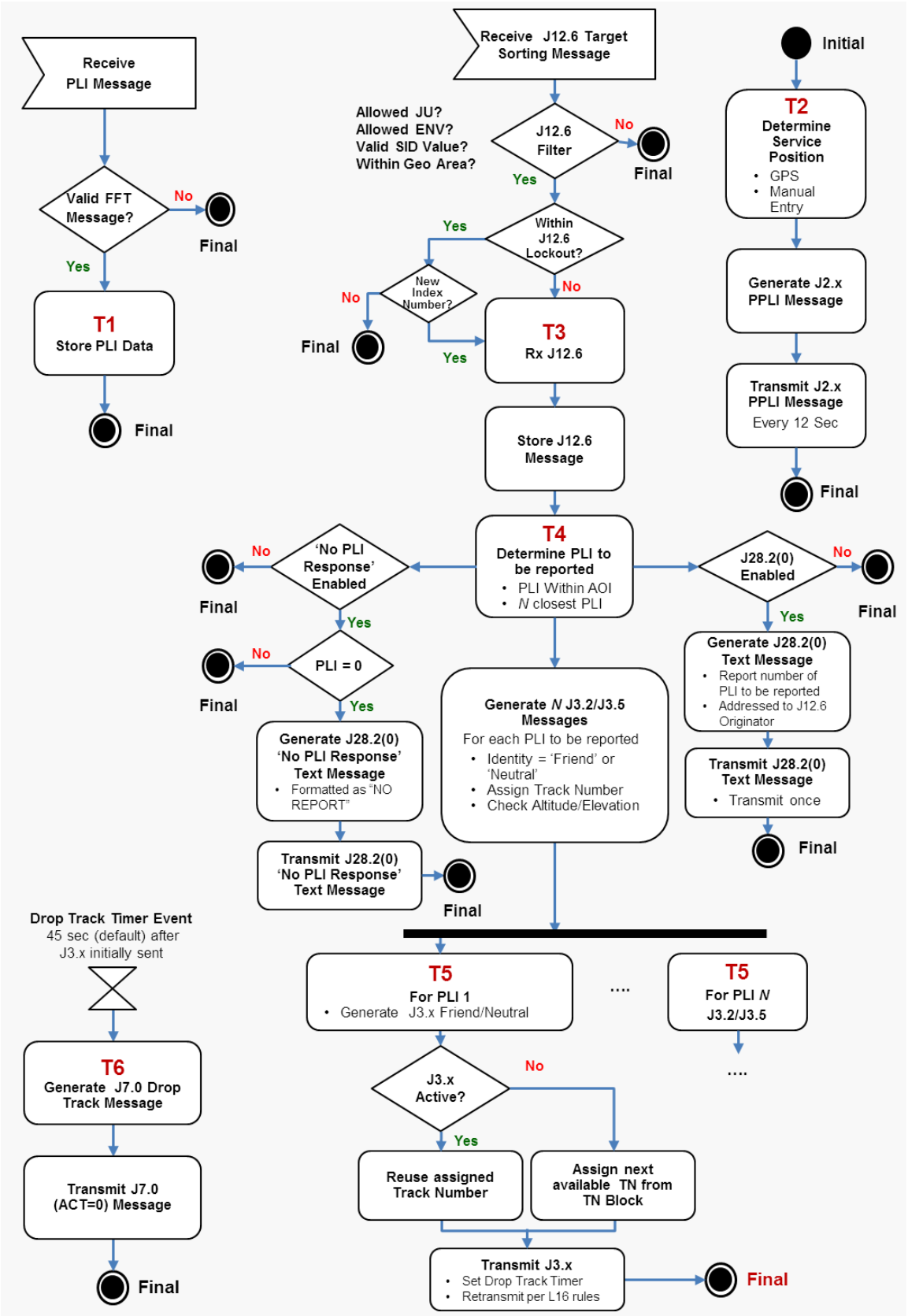

Figure 10 Service Specific Transaction Flow and Process Steps (UML Activity Diagram)

C.2.2. Receive Table

Table 10 details the different types of messages that are received by the service, including position report messages received from various PLI producing systems and the service triggering message received from Link 16.

Table 10 Receive Table

Message	Message Received Constraints	Stimulus
FFT (NFFI)	XML Message Header *Message Type* = 0	Receive NFFI message with PLI
	Message format (NFFI) valid	
	Minimum data fields included	
	Symbol Battle Dimension = 'G' or 'A'	
FFT (FFI MTF)	XML Message Header *Message Type* = 1	Receive FFI MTF message with PLI
	Message ID (MSGID) = FFI	
	Message format (FFI) valid	
	Minimum data fields included	
	Symbol Battle Dimension = 'G' or 'A'	
Link 16 J12.6	Environment = "Land" (Environment = 5, Land) or "Surface" (Environment = 3, Surface (Maritime)) or "No Statement" (Environment = 0, No Statement) Origin of Index Number = "0" (Message Originator's Index Number)	Receive WDA J12.6 Target Sorting message

C.2.3. Service Transactions

Table 11 identifies the service transactions included in message receipt, data processing, and message transmission.

Table 11 Service Transactions

Transaction ID	Transaction Stimulus	Transaction Stimulus Description	Transaction Constraints	Stimulus Type
T1	Receive NFFI message with PLI	Receive PLI message		Receive
	Receive FFI MTF message with PLI	Receive PLI message		Receive

Transaction ID	Transaction Stimulus	Transaction Stimulus Description	Transaction Constraints	Stimulus Type
T2	Transmit Service position to Link 16	Report Service position to Link 16 via J2.x Precise Participant Location and Identification (PPLI) every 12 seconds		Time
T3	Receive WDA J12.6 Target Sorting message	Receive J12.6 Target Sorting message	ENV = Land, Surface or No Statement	Receive
			JU = listed JUs authorized to request service	
			SID value = Expected SID for JU	
			J12.6 location within geographic area of interest	
			"Index Number" is not the same as previous message from JU or J12.6 Lockout has expired	
T4	Generate response	Generate J3.x messages		Call
T5	Transmit response	Transmit J3.x messages		Call
T6	Transmit Drop Track	45 seconds (or other pre-set time) after J3.x transmitted	Transmit J7.0 for each J3.x	Time

C.2.4. Process Steps

Table 12 details the data processing steps performed by the service for each service transaction, with linkage to the relevant business rules and constraints on the process steps.

Table 12 Process Steps

Transaction	Step ID	Name	Description	Process Steps Constraints
T1	**PS1**	Delete fields	Delete invalid optional fields and process message as specified in the interim standard for NFFI, Annex A and ADatP-36, Annex C for FFI MTF.	
	PS2	Delete message	Delete message	If timestamp is same or older as an already processed message
	PS3	Store PLI	Store position report information in database.	

Transaction	Step ID	Name	Description	Process Steps Constraints
T2	**PS1**	Determine Service position	Derive position from GPS	
			Manually input position	No GPS position is available
	PS2	Generate J2.x PPLI message with service position	Generate J2.x Precise Participant Location and Identification (PPLI) message per STANAG 5516	
	PS3	Transmit J2.x PPLI message	Transmit J2.x every 12 seconds [Ref 6].	
T3	**PS1**	Receive J12.6 Target Sorting message		
	PS2	Store J12.6 Target Sorting message	Store J12.6 Target Sorting message initial word (J12.6I) from each WDA (by JU number).	Only when the following criteria are met: • Environment = Land, Surface, or No Statement • JU authorized to trigger service • SID value expected for JU or originator • Within geographic area of interest • Index Number (IN) is different from previous J12.6 if within the pre-set J12.6 Lockout Period • If outside the pre-set J12.6 Lockout Period (Lockout Period has expired)
	PS3	Determine Area of Interest	Determine J12.6 center point (latitude and longitude) and radius of Area of Interest. Use pre-set radius value by JU if present. If not, use 'default' radius for service.	
	PS4	Start Transaction T4 (Generate Response)	Trigger service to produce response to WDA	
T4	**PS1**	Search database for PLI within AOI	Search database to identify all PLI that are within radius of AOI. Determine the distance of identified PLI to the center point of the AOI.	

Transaction	Step ID	Name	Description	Process Steps Constraints
	PS2	Identify PLI to be reported	Use pre-set maximum number of PLI to report (x) if present. If not present, use 'default' value for maximum number of PLI to report. • PLI with age less than value pre-set during service configuration for different reporting entities identified by TransID or URN may be used for service reporting • Ignore stored PLI that is older than value pre-set during service configuration for different reporting entities identified by TransID or URN	
	PS3	Generate J3.x messages	Use maximum number to report (x) to determine the x PLI closest to the center point of the AOI to be reported. Generate J3.2 Air Track (Friend, Identity = 3 or Neutral, Identity = 4) or J3.5 Land Track (Friend, Identity = 3 or Neutral, Identity = 4) message for each friendly or neutral PLI to report with positional information from database.	
	PS3a	Track Number (TN)	Assign TN to J3.x Track from track block designated by OPTASK Link. Use TN from assigned track block list sequentially. When last TN is used, revert to first TN in the list. • The Reference Track Number in the J3.x message shall be set to the TN assigned by the service from its assigned track block for reporting PLI.	
	PS3b	Altitude/Elevation	If 'altitude' was reported other than '0' meters above Mean Sea Level (MSL) in NFFI or FFI MTF report, the service shall report actual altitude for air tracks and elevation for land tracks (above MSL, in 25 foot increments) as 'Altitude' in the J3.2 message and as 'Elevation' in the J3.5 message as generated from the database.	
	PS3c	Timestamp	Incorporate the PLI reported timestamp (date and time) of received PLI data in generated J3.2 Air Track and J3.5 Land Track messages where the timestamp indicates the time of the reported position rather than the time the message was forwarded.	
	PS4	Start transaction T5	The service may start transaction T5 (to update the active J3.x for PLI). See Annex G: Minimum Implementation Requirements.	If there is an active J3.x for PLI
	PS5	Start Transaction T5 (Transmit Response)	Start a Transaction T5, for every PLI to be reported	

Transaction	Step ID	Name	Description	Process Steps Constraints
	PS6	Generate J28.2(0) message	When enabled for the JU of J12.6, generate a J28.2(0) Text message indicating the number of PLI positions reported within the designated radius of the land or surface POI (e.g. FRND=4 means four friendly/neutral tracks identified/reported within configured radius of designated POI, FRND=0 indicates no friendly/neutral tracks were identified/reported). J28.2(0) shall be addressed only to the originator of the J12.6 triggering message in TRACK NUMBER, ADDRESSEE data field.	• Transmit of J28.2(0) is enabled either globally or for JU of J12.6 originator • J28.2(0) shall be transmitted only once for each J12.6 trigger message processed after filtering.
	PS7	Generate J28.2(0) 'No PLI Response' message	When enabled to send the 'No PLI Response' message and no PLI is identified in T4 PS2 for reporting, generate a J28.2(0) Text message formatted as "NO REPORT". J28.2(0) 'No PLI Response' shall be addressed only to the originator of the J12.6 triggering message in TRACK NUMBER, ADDRESSEE data field.	• Transmit of J28.2(0) 'No PLI Response' is enabled either globally or for JU of J12.6 originator • No PLI is identified in T4 PS2 for reporting by the service • J28.2(0) shall be transmitted only once for each J12.6 trigger message processed after filtering
T5	**PS1**	Transmit response	Transmit J3.x message for response. Transmitted message shall comply with STANAG 5516. If there is an active J3.x track for the PLI, the service will transmit the track with the active Track Number. The service shall transmit the J3.x messages once and retransmit in accordance with STANAG 5516 until dropped by J7.0 Drop Track message.	
	PS2	Transmit J28.2(0) Text Message	When enabled, automatically transmit a J28.2(0) Text message generated in T4. J28.2(0) is only transmitted to the originator of the triggering J12.6 message. J28.2(0) is only transmitted once for each J12.6 trigger message.	Transmit of J28.2(0) is enabled either globally or for JU of J12.6 originator
	PS3	Transmit J28.2(0) 'No PLI Response' message	When enabled, automatically transmit a J28.2(0) 'No PLI Response' message generated in T4. J28.2(0) 'No PLI Response' message is only transmitted to the originator of the triggering J12.6 message. J28.2(0) 'No PLI Response' message is only transmitted once for each J12.6 trigger message.	Transmit of J28.2(0) is enabled either globally or for JU of J12.6 originator
	PS1	Trigger Drop Timer Event	Initiate Drop Track Event for each J3.2/J3.5 45 seconds (or other pre-set time) after J3.x was transmitted	
T6	**PS2**	Generate J7.0 Drop Track	Generate a J7.0 Track Management (ACT = 0) Drop Track Report for each J3.x transmitted for a specific trigger	

Transaction	Step ID	Name	Description	Process Steps Constraints
	PS3	Transmit J7.0 Drop Track	Transmit J7.0 Track Management (ACT = 0) Drop Track Report once for each J3.x sent [Ref 6]. Transmitted J7.0 shall comply with STANAG 5516.	

C.2.5. Transmitted Messages

The service will transmit the following messages in accordance with Link 16 and related standards.

- J2.x Message. A J2.x Precise Participant Location and Identification (PPLI) message is sent to maintain the service as an active participant in Link 16 and to report service position. The J2.x basic message (J2.xI and J2.xE0 words) shall be transmitted periodically at a RRN of 6 (12 seconds, 8-20 second interval) or, when specified, at the access rate in the time slot assignment. The J2.x message shall not be filtered when the Emergency Indicator or the Force Tell Indicator fields are set to value 1.

- J3.2 Message. A J3.2 Air Track message shall be sent to report positions of air platforms with identity [Ref 11] of “Friend” or “Neutral”.

- J3.5 Message. A J3.5 Land Track message shall be sent to report positions of land platforms with identity [Ref 11] of “Friend” or “Neutral”.

- J28.2(0) Message. When enabled, a J28.2(0) Text message shall be sent for each J12.6 triggering message that is processed by the service to inform the originator of the number of PLI reports are transmitted via J3.x in response to the service trigger. The J28.2 shall be addressed to the J12.6 originator and only transmitted once.

  If the optional capability to transmit J28.2(0) with Distance is enabled, a J28.2(0) Text message shall be sent to inform the originator of the number of PLI reports are transmitted via J3.x in response to the service trigger with the distance to the PLI closest to the J12.6 point of interest. The J28.2 shall be addressed to the J12.6 originator and only transmitted once.

  If the optional “No PLI Response’ capability is enabled, a J28.2(0) Text message shall be sent to inform the J12.6 originator that the triggering message has been received and processed but no PLI is reported. This provides positive indication of receipt of the J12.6 message but does not report FRND=0 to avoid possible misunderstanding that there are no friendlies in the area of interest. The J28.2(0) is addressed to the J12.6 originator and only transmitted once.

- J7.0 Message. A J7.0 Track Management (ACT = 0) Drop Track Report shall be sent for each J3.x sent 45 seconds or other time pre-set by the service administrator after the initial report was transmitted. The J7.0 Track Management (ACT=0) Drop Track Report message shall only be transmitted one time.

C.3. SUPPLEMENTARY REQUIREMENTS

C.3.1. Minimum PLI

- **BR-Supplementary-1 Minimum Information-1.** As a minimum, the service shall receive, interpret, and store PLI data (i.e., position and identification) defined in the mandatory elements of the NFFI [Ref 2] and/or FFI MTF [Ref 5] message format discussed in paragraph 3.

- **BR-Supplementary-2 Minimum Information-2**. The service shall receive, interpret, and store the optional “altitude” element/field of the NFFI and/or FFI MTF message when received.

C.3.2. PLI Data Filtering

- **BR-Supplementary-3 Data Filtering-1.** The service shall be capable of filtering PLI data by geographic area, transponder identification (TransID) or by Unit Reference Number (URN).

- **BR-Supplementary-4 Data Filtering-2.** The service shall be able to be configured to ignore time-late PLI from its database after a preset time (Maximum PLI Age). This capability may be selectable for each unit or a block of reporting units (TransID or URN) to enable reporting of fixed locations with longer reporting frequency.

C.3.3. Minimum Response Performance

The time-critical nature of WDA requests for information dictate that the service provide rapid responses to each triggering message, within a matter of seconds.

- **BR-Supplementary-5 Minimum Performance.** The service shall respond to each J12.6 Target Sorting message within 5 seconds of receipt.

C.3.4. Link 16 Network Participation Group (NPG)

The time-slots for a Link 16 network are normally distributed over the separate Network Participation Groups (NPG), which are functionally oriented groups of Link 16 users. As the service is designed to respond to queries from weapon delivery assets for SA of a specific point, its connection to Link 16 via an STANAG 5518 conforming system must be configured to transmit and receive on the appropriate NPGs.

- **BR-Supplementary-6 Link 16 Network Participation Group (NPG)-1.** The service shall be capable of transmitting to self-report as a J2.x PPLI on NPG 6 (PPLI-B). If the service is connected to a JRE Processor, the latter will convert the J2.x into a J2.0 Indirect Interface Unit (IIU) PPLI and transmit on NPG 7 (Surveillance).

- **BR-Supplementary-7 Link 16 Network Participation Group (NPG)-2.** In order to monitor the appropriate NPGs for receipt of triggering J12.6 Target Sorting messages, the service shall be capable of receiving on NPG 9 (Control) and NPG 19 (NATO Non-C2 to Non-C2; Fighter-to-Fighter Channel).

- **BR-Supplementary-8 Link 16 Network Participation Group (NPG)-3.** The Service shall be capable of concurrently supporting any NPG 9 (Control) and NPG 19 (Non-C2 JU to Non-C2 JU A) sub-net channels used within the connected Link 16 network(s).

C.3.5. J3.2 Air Track and J3.5 Land Track Messages

- **BR-Supplementary-9 J3.x Message 1.** The J3.x message generated by the service must be compliant with STANAG 5516.

- **BR-Supplementary-10 J3.x Message 2.** The service shall customize J3.x responses according to user configuration settings so specific weapon delivery platforms, as identified by their Track Number, are able to receive and display the unit positions in their cockpit. Different aircraft/aircraft versions may require differently formatted J3.x messages to display them.

- **BR-Supplementary-11 J3.x Message 3.** The service shall report actual altitude for air tracks and elevation for ground tracks if PLI data value for altitude/elevation was other than zero. In order to properly position J3.5 symbols in aircraft 3D displays when a ground position is reported as zero elevation or without elevation/altitude data, the service shall reference a digital terrain elevation resource (e.g., Digital Terrain Elevation Data [Ref 12] – DTED) to determine accurate elevation at that location and populate the elevation field in the generated J3.5 message with the sourced elevation value.

Note. *When the optional capability to reference a digital terrain elevation resource is implemented, the service will be triggered to reference the digital terrain elevation resource when elevation is reported as zero because some PLI sources may report an empty altitude/elevation field with a value of zero and the probability of an exact elevation value of zero is extremely low.*

C.3.6. Aircraft Display Symbols

PLI reported by J3.x messages use platform/activity or specific type data elements to indicate to the triggering weapon delivery asset the appropriate symbol to display reported friendly and neutral entities. The appropriate codes for these data elements will be determined in further testing with aircraft operational flight programs (OFP) to consider weapon delivery asset-specific display filtering and priorities to ensure PLI will properly display in the triggering weapon delivery asset when received.

- **BR-Supplementary-12 J3.2 Message.** The service must be capable of setting the Air Specific Type Indicator (default value = 0, Air Activity Being Reported) and Air Specific Type (default value = 0, No Statement) data elements to be transmitted in the J3.2 message. The value of the Air Specific Type data element shall be in line with Table 13, but can be overridden by JU or block of JUs of the J12.6 triggering message originator.

Note. *The Air Specific Type Indicator data element of the J3.2 Air Track message may have values of 0 (Air Activity Being Reported) or 1 (Air Specific Type Being Reported) and the Air Specific Type data element may have values of 0 (No Statement) to 4095.*

- **BR-Supplementary-13 J3.5 Message.** The service must be capable of setting the Land Specific Type Indicator and Land Specific Type data elements to be transmitted in the J3.5 message. The value of the Land Specific Type data element shall be in line with Table 13, but can be overridden by JU or block of JUs of the J12.6 triggering message originator.

Note. *The Land Specific Type Indicator data element of the J3.5 Land Track message may have values of 0 (Land Activity Being Reported) or 1 (Land Specific Type Being Reported) and the Land Specific Type data element may have values of 0 (No Statement) to 4095.*

C.3.7. Prevent Data Looping

- **BR-Supplementary-14 Data Looping.** In multi-service operations, when services are sharing information between them, the services will avoid creating PLI data looping.

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ANNEX D – TECHNICAL SPECIFICATION – DATA BEARER AND ROUTING LAYERS

D.1. OVERVIEW

The service is a network enabled system which leverages the capabilities of multiple friendly force tracking systems and associated command and control (C2) and SA systems. It combines friendly force tracking data from multiple sensor networks to provide relevant target area SA to the weapons engagement decision maker. As a smart intermediary service between the friendly position information and the weapon delivery platform, various interfaces are required between the data sources, the service, and the receiving platforms.

The minimum interoperability requirements for the service are to receive PLI and triggering messages and forward position information via:

- NATO Friendly Force Information (NFFI) [Ref 2]
- FFI Message Text Format (FFI MTF) [Ref 14]
- Link 16 J-series messages [Ref 6]

Minimum interface requirements for the service are:

- NFFI IP1 (for NFFI and FFI MTF) [Ref 2, Annex D, paragraph 1]
- JREAP, Appendix C (for Link 16) [Ref 7]

Optional interfaces for the service are:

- IP Multicast [Ref 13]
- NFFI IP2 (for NFFI and FFI MTF) [Ref 2, Annex D, paragraph 2]
- NFFI SIP3 (for NFFI and FFI MTF) [Ref 14, Annex E]

Additional interfaces with other data and communication formats may be developed for national implementations, specific operational implementations, and for future developments.

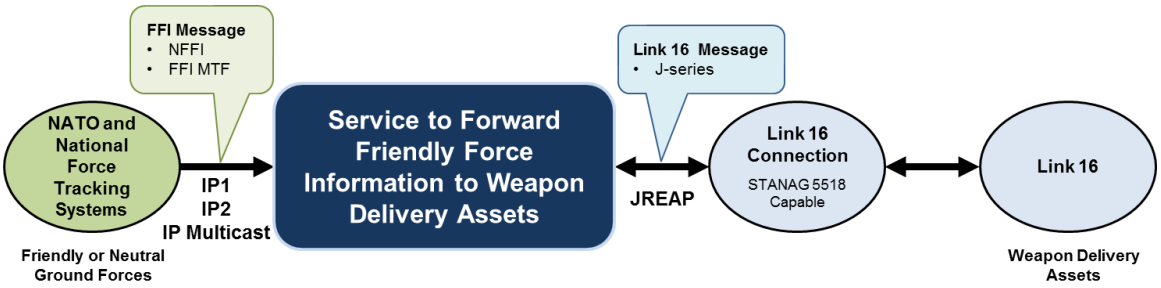

Figure 11 NATO Systems View (NSV)-1 System Interface Description

D.2. NATO FRIENDLY FORCE INFORMATION INTERFACE PROTOCOLS

D.2.1. NFFI and FFI MTF IP1 (Transmission Control Protocol/Internet Protocol – TCP/IP)

Two-way unicast reliable push. Data is pushed from the data provider to the data consumer, using a reliable transport layer protocol. Within IP1, the XML-Body is preceded by a binary header.

D.2.2. NFFI and FFI MTF IP2 (User Datagram Protocol – UDP)

One-way unreliable push. Data is pushed from the data provider to the data consumer with a non-reliable transport layer protocol used. Within IP2, the XML-Body is preceded by a binary header.

D.2.3. NFFI and FFI MTF SIP3 (Service Interoperability Profile 3)

Web Services message exchange protocol that specifies a set of Simple Object Access Protocol (SOAP) Web Services.

D.3. FRIENDLY FORCE INFORMATION RECEIPT

- **BR-Transport-1 PLI Receipt**. The service shall receive positional information from a single or multiple data sources in NFFI or FFI MTF format via either NFFI IP1 or NFFI IP2.

- **BR-Transport-2 Common Entity Identification.** A common PLI entity identification reference (e.g., transponder identification (TransID) or unit reference number (URN)) should be used and should also be mapped within the service to provide requesters/users amplifying PLI identification data.

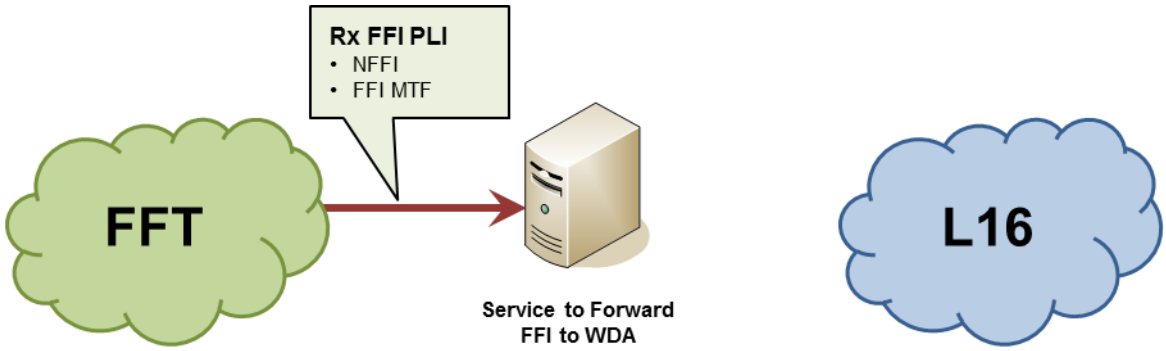

Figure 12 Receipt of PLI from FFT Sources

D.4. INTERFACE COMPLIANCE

- **BR-Transport-3 Interface-1.** The LINK 16 interface shall be compliant with the STANAG 5516 and STANAG 5518.

- **BR-Transport-4 Interface-2.** The NFFI interfaces shall be compliant with the AC/322-D(2006)0066 standard.

- **BR-Transport-5 Interface-3.** The FFI MTF interfaces shall be compliant with the ADatP-36 standard.

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ANNEX E – TECHNICAL SPECIFICATION – SECURITY CROSS DOMAIN

E.1. MULTI-NATIONAL SECURITY

Multi-national security concerns and actions to permit or provide this information must be coordinated and approved by Coalition forces.

E.2. SECURITY CROSS DOMAIN

One-way guards should be considered to release only PLI data approved for release by National authorities before it is forwarded to the service.

Transmitting PLI data to the service may be in conjunction with PLI data sharing in the Friendly Force Tracking (FFT) architecture or PLI may be forwarded to the service independently.

E.3. SECURITY ASSUMPTION

It is assumed that available friendly PLI is at a lower or the same security level as the communication network used to forward the PLI to the service and is releasable to the tactical data link domain of the weapon delivery assets.

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ANNEX F – TECHNICAL SPECIFICATION – OPERATIONAL CROSS DOMAIN

F.1. APP-6 SYMBOL CODE MAPPING TO J-MESSAGE

Friendly and neutral entity position reports received by the service that include an APP-6 symbol code may use that information to provide further identifying information in the Air/Land Platform, Specific Type, and Activity fields of the appropriate J-message. The addition of this information may not affect the way the tracks are displayed by the weapon delivery asset. Table 13 provides default mapping of the most likely used symbol codes for FFT position reporting for air and land entities to the appropriate fields in the J3.2 or J3.5 messages. Default mapping may be overridden in implementation if required to ensure information is displayed in a specific aircraft Operational Flight Program (OFP). The generic 'blue dot' friendly land entity with symbol code of SFGP---------- is mapped as 'No Statement' in the J3.5 Land Platform, Land Specific Type, and Land Activity fields. The generic 'blue dot' friendly air entity with symbol code of SFAP---------- is mapped as 'No Statement' in the J3.2 Air Platform, Air Specific Type, and Air Activity fields.

- **BR-Symbol Mapping-1.** Friendly or Neutral positions reported with symbol code battle dimension of ground (G) shall be reported by the service with a J3.5 message.

- **BR-Symbol Mapping-2.** Friendly or Neutral positions reported with symbol code battle dimension of air (A) shall be reported by the service with a J3.2 message.

Table 13 APP-6 Symbol Code Mapping to J-Message

APP-6(A) or APP-6(B) SIDC			APP-6(C)							
Battle Dim Position 3	**Function ID Position 5-10**	**Size / Mob Position 11-12**	**Equivalent SIDC (Digit 11-18)**	**Symbol Description**	**1797/004 Land Platform**	**810/001 Land Specific Type**	**1798/004 Land Activity**	**1797/001 Air Platform**	**804/001 Air Specific Type**	**1798/001 Air Activity**
G	------	**	10031000[10]	Ground Track	0 = No Statement	0 – No Statement	0 - No Statement			

[10] Proposed for inclusion in APP-6(D).

APP-6(A) or APP-6(B) SIDC			APP-6(C)							
Battle Dim Position 3	**Function ID Position 5-10**	**Size / Mob Position 11-12**	**Equivalent SIDC (Digit 11-18)**	**Symbol Description**	**1797/004 Land Platform**	**810/001 Land Specific Type**	**1798/004 Land Activity**	**1797/001 Air Platform**	**804/001 Air Specific Type**	**1798/001 Air Activity**
G	U-----	**	No equivalent listed	Ground Track, Unit	1 = Troop Concentration/Unit	0 – No Statement	0 - No Statement			
G	U-----	-E	No equivalent listed	Ground Track, Unit	1 = Troop Concentration/Unit	70 - Company	0 - No Statement			
G	U-----	-D	No equivalent listed	Ground Track, Unit	1 = Troop Concentration/Unit	71 - Platoon	0 - No Statement			
G	EVC---	**	22000000	Ground Vehicle, Civilian Vehicle	13 = Convoy	152 - Convoy	0 - No Statement			
G	EVA---	**	23000000	Ground Vehicle, Armoured	14 = Combat Vehicle	0 – No Statement	0 - No Statement			
G	UU----	**	14020000	Combat Support	15 = Combat Support Vehicle	0 – No Statement	0 - No Statement			
G	EVUL--	**	No equivalent listed	Limited Cross-Country Truck	0 = No Statement	86 - Light Truck	0 - No Statement			
G	EVUX--	**	No equivalent listed	Cross-Country Truck	0 = No Statement	87 - Medium Truck	0 - No Statement			
G	EVUS--	**	25060000	Semi	0 = No Statement	88 - Heavy Truck	0 - No Statement			
G	EV----	**	22000000	Ground Vehicle	16 = Vehicle, Other	0 – No Statement	0 - No Statement			
G	EVAT--	**	23080000	Tank	17 = Tank	0 – No Statement	0 - No Statement			
G	EVATH-	**	23080300	Tank Heavy	17 = Tank	80 - Main Battle Tank	0 - No Statement			
G	EVATM-	**	23080200	Tank Medium	17 = Tank	81 - Medium Tank	0 - No Statement			
G	EVATL-	**	23080100	Tank Light	17 = Tank	82 - Light Tank	0 - No Statement			
G	EVST--	**	26010000	Train Locomotive	18 = Train	83 - Train	0 - No Statement			
G	UCA---	**	12050000	Armor	51 = Armor Unit	0 – No Statement	0 - No Statement			
G	UCRV--	**	12130000	Reconnaissance Cavalry	52 = Cavalry Unit	0 – No Statement	0 - No Statement			
G	UCE---	**	14070000	Engineer	53 = Engineer Unit	0 – No Statement	0 - No Statement			
A	------	**	10030100[11]	Air Track				0 - No Statement	0 - No Statement	0 - No Statement
A	MFF---	**	11010400	Fighter				1 - Fighter	0 - No Statement	0 - No Statement

[11] Proposed for inclusion in APP-6(D).

APP-6(A) or APP-6(B) SIDC			APP-6(C)							
Battle Dim Position 3	Function ID Position 5-10	Size / Mob Position 11-12	Equivalent SIDC (Digit 11-18)	Symbol Description	1797/004 Land Platform	810/001 Land Specific Type	1798/004 Land Activity	1797/001 Air Platform	804/001 Air Specific Type	1798/001 Air Activity
A	MFA---	**	11010200	Attack/Strike				3 - Attack	0 - No Statement	0 - No Statement
A	MFB---	**	11010300	Bomber				4 - Bomber	0 - No Statement	0 - No Statement
A	MFR---	**	11011100	Reconnaissance				5 - Reconnaissance	0 - No Statement	0 - No Statement
A	MFK---	**	11010900	Tanker				6 - Tanker	0 - No Statement	0 - No Statement
A	MFC---	**	11010700	Cargo Airlift (Transport)				10 - Transport	0 - No Statement	0 - No Statement
A	MFD---	**	11011500	Fixed Wing Airborne Command Post				11 - Airborne Command Post (ACP)	0 - No Statement	0 - No Statement
A	MFP---	**	11011000	Patrol				34 - Patrol	0 - No Statement	0 - No Statement
A	MFH---	**	11012000	Combat Search And Rescue (CSAR)				18 - Search And Rescue (SAR)	0 - No Statement	0 - No Statement
A	MFQ--- MHQ---	**	11030000	Drone (RPV/UAV)				20 - Remotely Piloted Vehicle (RPV)	0 - No Statement	0 - No Statement
A	C-----	**	12000000	Civil Aircraft				23 - Civil, General	0 - No Statement	0 - No Statement
A	MH----	**	11020000	Rotary Wing				27 - Helicopter (Helo)	0 - No Statement	0 - No Statement
A	MHA---	**	11020001	Rotary Wing Attack				28 - Attack Helicopter	0 - No Statement	0 - No Statement
A	MHU---	**	11020070	Rotary Wing Utility				32 - Transport Helicopter	0 - No Statement	0 - No Statement
A	MHC---	**	11020003	Rotary Wing Cargo Airlift (Transport)				32 - Transport Helicopter	0 - No Statement	0 - No Statement
A	MF----	**	11010000	Fixed Wing				35 - Miscellaneous Fixed Wing	0 - No Statement	0 - No Statement
A	MFO---	**	11010100	Fixed Wing Medevac				35 - Miscellaneous Fixed Wing	0 - No Statement	26 - Medical Evacuation

Table Notes:

1. Current symbol code mapping is based on APP-6(A) and APP-6(B) or other standards with 15-character Symbol ID code formats. APP-6(C) symbol codes are included for cases when positions are reported with 30-character Symbol ID code formats (last 10 digits optional).

2. Code Scheme, symbol code position 1 (APP-6(B)), will always have a value of 'S' (Warfighting).
3. Affiliation, symbol code position 2 (APP-6(B)), will have a value of either 'F' (Friend) or 'N' (Neutral). Standard Identity, digit 4 (APP-6(C)) will have a value of either '2' (Friend) or '4' (Neutral).
4. Status, symbol code position 4 (APP-6(B)), will always have a value of 'P' (Present). Status, symbol code digit 7, will always have a value of '0' (Present).
5. Country Code, symbol code position 13 and 14 (APP-6(B)), will identify the country with which a symbol is associated but is not relevant to mapping to Link 16.
6. Order of Battle, symbol code position 15 (APP-6(B)), provides additional information about the role of a symbol in the Battlespace, but is not relevant to mapping to Link 16.
7. An asterisk (*) indicates a position that is defined by the user based on specific symbol circumstances. A dash (-) indicates that no information is provided in the position.

F.2. TRANSMITTING NFFI MESSAGE DATA TO LINK 16 J3.2 MESSAGE

Mapping of NFFI data elements to Link 16 J3.2 Air Track message fields is shown in Table 14. The mandatory NFFI fields alone are not sufficient to complete the J3.2 message for transmission.

Table 14 Transmitting NFFI Message Data to Link 16 J3.2 Air Track Message

Link 16	NFFI	
Field	**Section**	**Element**
376/007 Identity (J3.2I)	identificationData	Unit Symbol (Affiliation)
376/001 Identity amplifying descriptor (J3.2I)		
1797/001 Air Platform (J3.2C1)	identificationData	Unit Symbol (see Table 13)
1798/001 Air Activity (J3.2C1)	identificationData	Unit Symbol (see Table 13)
804/001 Air Specific Type (J3.2C1)	identificationData	Unit Symbol (see Table 13)
355/002 Emergency Indicator (J3.2I)	identificationData	alert The value is TRUE if the device is in the emergency state.
769/002 Track Number, Reference (J3.2I)[12]	positionalData	trackSource.sourceSystem
	positionalData	trackSource.transponderId
365/033 Altitude, 25 ft (J3.2I)	positionalData	coordinates.altitude – Altitude in meters above mean sea level. Conversion from meters to 25-foot increments required.
280/001 Track Quality (J3.2I)	positionalData	coordinates.latitude : accuracy attribute coordinates.longitude : accuracy attribute Speed dateTime
281/014 Latitude, 0.0051 MINUTE (J3.2E0)	positionalData	coordinates.latitude Conversion from decimal degrees to 0.0051 Minute increments required.
282/014 Longitude, 0.0051 MINUTE (J3.2E0)	positionalData	coordinates.longitude Conversion from decimal degrees to 0.0051 Minute increments required.
371/015 Course (J3.2E0)	positionalData	Bearing
367/018 Speed (J3.2E0)	positionalData	Speed (kilometres per hour) Conversion from KPH to data miles per hour required.
797/004 Minute (J3.2C1)	positionalData	dateTime
792/001 Hour (J3.2C1)		

F.3. TRANSMITTING FFI MTF MESSAGE DATA TO LINK 16 J3.2 MESSAGE

Mapping of FFI MTF data elements to Link 16 J3.2 Air Track message fields is shown in Table 15.

Table 15 Transmitting FFI MTF Message Data to Link 16 to J3.2 Air Track Message

Link 16	FFI MTF	
Field	**Section**	**Element**
769/002 Track Number, Reference (J3.2I)[13]	TRKSRC (Track Source)	Transponder ID
		System

[12] The service will assign track numbers to reported entities as described in paragraph C.1.4.
[13] The service will assign track numbers to reported entities as described in paragraph C.1.4.

	TRKID (Track Identification)	Other ID DATA LINK TRACK NUMBER - Enter "TDL:" followed by the 4 or 5 character data link track number, for example: "TDL:2A021", which is an alphanumeric. ***Note.*** *It is unlikely that FFI MTF 'Data Link Track Number' is associated with a fixed Link 16 Track Number for service application.*
376/007 Identity (J3.2I) 376/001 Identity amplifying descriptor (J3.2I)	TRKID (Track Identification)	Unit Symbol (Affiliation)
1797/001 Air Platform (J3.2C1)	identificationData	Unit Symbol (see Table 13)
1798/001 Air Activity (J3.2C1)	identificationData	Unit Symbol (see Table 13)
804/001 Air Specific Type (J3.2C1)	identificationData	Unit Symbol (see Table 13)
355/002 Emergency Indicator (J3.2I)	OPERSTAT (Operational Status)	Alert ('YES' or 'NO')
365/033 Altitude, 25 ft (J3.2I)	TRKPOS (Track Positional Data)	Altitude – Altitude in meters above mean sea level. Conversion from meters to 25-foot increments required.
280/001 Track Quality (J3.2I)	TRKPOS (Track Positional Data)	Horizontal accuracy – location accuracy in meters Speed TIME
281/014 Latitude, 0.0051 MINUTE (J3.2E0) 282/014 Longitude, 0.0051 MINUTE (J3.2E0)	TRKPOS (Track Positional Data)	Location (Lat/Long) 1. LATITUDE, DEGREES 2. LATITUDE, MINUTES, 0-4 DECIMAL PLACES 3. LATITUDINAL HEMISPHERE 4. HYPHEN 5. LONGITUDE, DEGREES 6. LONGITUDE, MINUTES, 0-4 DECIMAL PLACES 7. LONGITUDINAL HEMISPHERE Conversion from Degrees, Minutes, and Hemisphere to 0.0051 Minute increments required
797/004 Minute (J3.2C1)	TRKPOS (Track Positional Data)	TIME Conversion from Time in universal time (UTC) in standard ISO 8601 format, for example: "20100920T174500Z"
792/001 Hour (J3.2C1)	TRKPOS (Track Positional Data)	TIME Conversion from Time in universal time (UTC) in standard ISO 8601 format, for example: "20100920T174500Z"
371/015 Course (J3.2E0)	TRKMOV (Track Movement Data)	Bearing
367/018 Speed (J3.2E0)	TRKMOV (Track Movement Data)	Speed Conversion from reported 'UNIT OF SPEED VELOCITY MEASUREMENT' (KPH, MPH, KTS, or MPS) to data miles per hour required.

F.4. TRANSMITTING NFFI MESSAGE DATA TO LINK 16 J3.5 MESSAGE

Mapping of NFFI data elements to Link 16 J3.5 Land Track message fields is shown in Table 16. The mandatory NFFI fields alone are not sufficient to complete the J3.5 message for transmission.

Table 16 Transmitting NFFI Message Data to Link 16 J3.5 Land Track Message

Link 16	NFFI	
Field	**Section**	**Element**
769/002 Track Number, Reference (J3.5I)[14]	positionalData	trackSource.sourceSystem
		trackSource.transponderId
281/014 Latitude, 0.0051 Minute (J3.5E0)[15] 281/002 Latitude, LSBS (J3.5C3)	positionalData	coordinates.latitude
282/014 Longitude, 0.0051 Minute (J3.5E0)**Error! Bookmark not defined.** 282/002 Longitude, LSBS (J3.5C3)	positionalData	coordinates.longitude
1612/001 Elevation, 25 FT (J3.5I) 1612/003 Elevation, LSBS (J3.5C3)	positionalData	coordinates.altitude Altitude in meters above mean sea level.
371/015 Course (J3.5E0)	positionalData	Bearing
367/018 Speed (J3.5E0)	positionalData	Speed (kilometres per hour) Conversion from KPH to data miles per hour required.
355/002 Emergency indicator (J3.5I)	deviceSpecificData	alert - The value is TRUE if the device is in the emergency state.
386/013 Strength (J3.5I)	operStatusData	Strength
280/001 Track Quality (J3.5I)	positionalData	coordinates.latitude : accuracy attribute coordinates.longitude : accuracy attribute Speed dateTime
376/007 Identity (J3.5I) 376/001 Identity Amplifying Descriptor (J3.5I)	IdentificationData	Unit Symbol (Affiliation)
267/001 Land Activity	IdentificationData	Unit Symbol (Table 13)
810/001 Land Specific Type (J3.5C1)	IdentificationData	Unit Symbol (Table 13)
1797/004 Land Platform (J3.5C1)	IdentificationData	Unit Symbol (Table 13)

F.5. TRANSMITTING FFI MTF MESSAGE DATA TO LINK 16 J3.5 MESSAGE

Mapping of FFI MTF data elements to Link 16 J3.5 Land Track message fields is shown in Table 17.

[14] The service will assign track numbers to reported entities as described in paragraph C.1.4.
[15] Round this value down when the LSBS field is available, otherwise round to the nearest whole number (.5 being rounded up)

Table 17 Transmitting FFI MTF Message Data to Link 16 J3.5 Land Track Message

Link 16	FFI MTF	
Field	**Section**	**Element**
769/002 Track Number, Reference (J3.5I)[16]	TRKSRC (Track Source)	Transponder ID
		System
	TRKID (Track Identification)	Other ID DATA LINK TRACK NUMBER - Enter "TDL:" followed by the 4 or 5 character data link track number, for example: "TDL:2A021".which is an alphanumeric. ***Note.*** *It is unlikely that FFI MTF 'Data Link Track Number' is associated with a fixed Link 16 Track Number for service application.*
355/002 Emergency indicator (J3.5I)	OPERSTAT (Operational Status)	Alert ('YES' or 'NO')
386/013 Strength (J3.5I)	OPERSTAT (Operational Status)	Strength
1612/001 Elevation, 25 FT (J3.5I) 1612/003 Elevation, LSBS (J3.5C3)	TRKPOS (Track Positional Data)	Altitude – Altitude in meters above mean sea level.
280/001 Track Quality (J3.5I)	TRKPOS (Track Positional Data)	Horizontal accuracy – location accuracy in meters Speed TIME
376/007 Identity (J3.5I) 376/001 Identity Amplifying Descriptor (J3.5I)	TRKID (Track Identification)	Unit Symbol (Affiliation)
810/001 Land Specific Type (J3.5C1)	IdentificationData	Unit Symbol (see Table 13)
1797/004 Land Platform (J3.5C1)	IdentificationData	Unit Symbol (see Table 13)
1798/004 Land Activity (J3.5C1)	IdentificationData	Unit Symbol (see Table 13)
281/014 Latitude, 0.0051 Minute (J3.5E0)[17] 281/002 Latitude, LSBS (J3.5C3) 282/014 Longitude, 0.0051 Minute (J3.5E0) [18] 282/002 Longitude, LSBS (J3.5C3)	TRK POS (Track Positional Data)	Location (Lat/Long) 1. LATITUDE, DEGREES 2. LATITUDE, MINUTES, 0-4 DECIMAL PLACES 3. LATITUDINAL HEMISPHERE 4. HYPHEN 5. LONGITUDE, DEGREES 6. LONGITUDE, MINUTES, 0-4 DECIMAL PLACES 7. LONGITUDINAL HEMISPHERE
371/015 Course (J3.5E0)	TRKMOV (Track Movement Data)	Bearing
367/018 Speed (J3.5E0)	TRKMOV (Track Movement Data)	Speed Conversion from reported 'UNIT OF SPEED VELOCITY MEASUREMENT' (KPH, MPH, KTS, or MPS) to data miles per hour required.

[16] The service will assign track numbers to reported entities as described in paragraph C.1.4.
[17] Round this value down when the LSBS field is available, otherwise round to the nearest whole number (.5 being rounded up)

ANNEX G – TECHNICAL SPECIFICATION – MINIMUM IMPLEMENTATION

G.1. REQUIRED MINIMUM CAPABILITIES

Minimum service implementation includes the following capabilities that must be implemented:

- Transmit Friendly ground tracks (J3.5)
- Transmit Neutral ground tracks (J3.5)
- NFFI/FFI MTF input for position location information (PLI)
- IP1 interface for NFFI/FFI MTF
- Capability to reference a digital terrain elevation resource (e.g., Digital Terrain Elevation Data – DTED) to determine elevation at a location when a ground position is reported as zero elevation or without elevation/altitude data and populate the elevation field in the generated J3.5 message with the sourced elevation value.
- Configurable capability to transmit J28.2(0) Response (i.e., FRND=NN) with number of reported PLI
- Global setting of configurable items
  - Number of PLI reported (Default = 5)
  - Area of Interest Radius (Default = 1000m)
  - J3.x Emergency Indicator (Default = '0' No Statement)
  - J3.x Force Tell Indicator (Default = '1' Force Tell Status)
  - J3.5 Point/Track Indicator (Default = 1 [Track])
  - Transmit J28.2(0) Text Message Enable (YES/NO, Default = NO)
  - Maximum PLI Age (Default = 600 seconds)
  - Drop Track Timer (Default = 45 seconds)
  - J12.6 Lockout Period (Default = 45 seconds)

Additional capabilities that may be implemented by the service:

- Transmit Friendly and Neutral air tracks (J3.2)
- Additional interfaces input of position location information (PLI)
- Additional interfaces for IP2/SIP3 interface for NFFI/FFI MTF
- Additional interfaces with other data and communication formats
- Transmit J28.2(0) 'No PLI Response' message configurable (YES/NO)

- Transmit J28.2(0) Long Response (i.e., FRND=NN DIST=NNN)

- Configurable item setting by JU or block of JUs (by platform)

  – Number of PLI reported (Default = 5)
  – Area of Interest Radius (Default = 1000m)
  – J3.x Emergency Indicator (Default = '0' No Statement)
  – J3.x Force Tell Indicator (Default = '1' Force Tell Status)
  – Transmit J28.2(0) Text Message Enable (YES/NO, Default = NO)
  – Transmit J28.2(0) 'No PLI Response' Message (YES/NO, Default = NO) *(New capability – in fixed format of NO REPORT)*
  – Transmit J28.2(0) Long Message (FRND=NN DIST=NNN)(YES/NO, Default = NO)

G.2. LINK 16 IMPLEMENTATION

The service is required to implement Link 16 as specified in STANAG 5516, Appendix A.

G.3. JREAP FOR LINK 16 IMPLEMENTATION

The service is required to implement JREAP messages as specified in STANAG 5518, Appendix E, Table E.6.3-1:

Table 18 Minimum JREAP Messages

JREAP Message Name
JREAP J-Series message
Echo Message
Common Time Reference message
Round-Trip Time Delay Message
J-Series Acknowledgment (Application) Message
Terminate Link

ANNEX H – LEXICON

H.1. ACRONYMS AND ABBREVIATIONS

ACO	Allied Command Operations
AAP	Allied Administrative Publication
ADatP	Allied Data Publication
AJP	Allied Joint Publication
AOI	Area of Interest
APP	Allied Procedural Publication
ATP	Allied Tactical Publication
BR	Business Rules
C2	Command and Control
CID	Combat Identification
COI	Community of Interest
CONEMP	Concept of Employment
CONOPS	Concept of Operations
DFI	Data Field Identifier (Link 16)
DIST	Distance, in meters, to the nearest reported PLI
DTED	Digital Terrain Elevation Data
DUI	Data Use Identifier (Link 16)
FAC	Forward Air Controller
FFI	Friendly Force Information
FFI-IP	FFI Interface Protocols
FFT	Friendly Force Tracking
FFTS	Friendly Force Tracking System
FO	Forward Observer
FTS	Force Tracking Systems
ID	Identification
I/O	Input/Output
IP	Internet Protocol
IP1	Interface Protocol 1
IP2	Interface Protocol 2
JRE	Joint Range Extension
JREAP	Joint Range Extension Application Protocol
JTAC	Joint Terminal Attack Controller
MTF	Message Text Format
NATO	North Atlantic Treaty Organization

NA	Not Applicable
NFFI	NATO Friendly Force Information
NPG	Network Participation Group
NSO	NATO Standardization Office
PLI	Position Location Information
POI	Position of Interest
PTI	Point/Track Indicator
R^2	Reporting Responsibility
RA	Reporting Area
RRN	Recurrence Rate Number
SA	Situational Awareness
SOAP	Simple Object Access Protocol
SOP	Standard Operating Procedure
SPINS	Special Instructions
STANAG	Standardization Agreement
STF	STANAG Transformation Framework
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TDL	Tactical Data Link
TTP	Tactics, Techniques and Procedures
UDP	User Datagram Protocol
UML	Unified Modelling Language
URN	Unit Reference Number
UTC	Universal Time Coordinated
UTF	Unicode Transformation Format
WDA	Weapon Delivery Asset
XML	eXtensible Markup Language

H.2. TERMS AND DEFINITIONS

Area of interest (AOI). The area for which a weapon delivery asset requires information on the disposition of own forces.

Friendly force information (FFI). Information provided by a Friendly Force Tracking System (FFTS) that tracks unit position with accuracy and automatically reports unit position and status information to the chain of command in near real time. (ADatP-36)

Friendly force tracking system (FFTS). A system that generates own positions with high accuracy and automatically report these positions and, where implemented, additional status information to the chain of command. FFTS may be a standalone system or fielded as an inherent functionality within a battle management or command and control system. (ADatP-36)

Friendly force information message text format (FFI MTF). An ADatP-3 compliant message format to exchange positional and operational information of friendly forces. (ADatP-36)

Mapping. The translation of information from one standard to another, applying applicable business rules.

Message text formats (MTF). Message formats that adhere to ADatP-3. (AAP-15)

Message. Any thought or idea expressed briefly in a plain, coded, or secret language, prepared in a form suitable for transmission by any means of communication. (AAP-06)

Minimum implementation. *The statement of minimum data exchange requirements that must be implemented by National systems participating on the Link 16 interface to ensure a minimum level of interoperability at the operator level. This is defined in terms of requirements that must be met at seven different levels: functional, related function, message, related message, word, data element, and data item. (STANAG 5516)*

Reporting area (RA). The area assigned to the service for which it will respond to appropriate J12.6 trigger messages.

Security marking. A marking is human understandable, formatted text that is applied to printed or displayed information, and that represents restrictions on the handling or dissemination of that information, as required by a security policy. See AC/322-D(2004)0022 (INV).

Security policy. In the context of information exchange, a security policy is a set of rules for protecting information against unauthorized disclosure while maintaining authorized access, and preventing loss or unauthorized modification. See AC/322-D(2004)0022 (INV).

ADatP-37(A)(1)