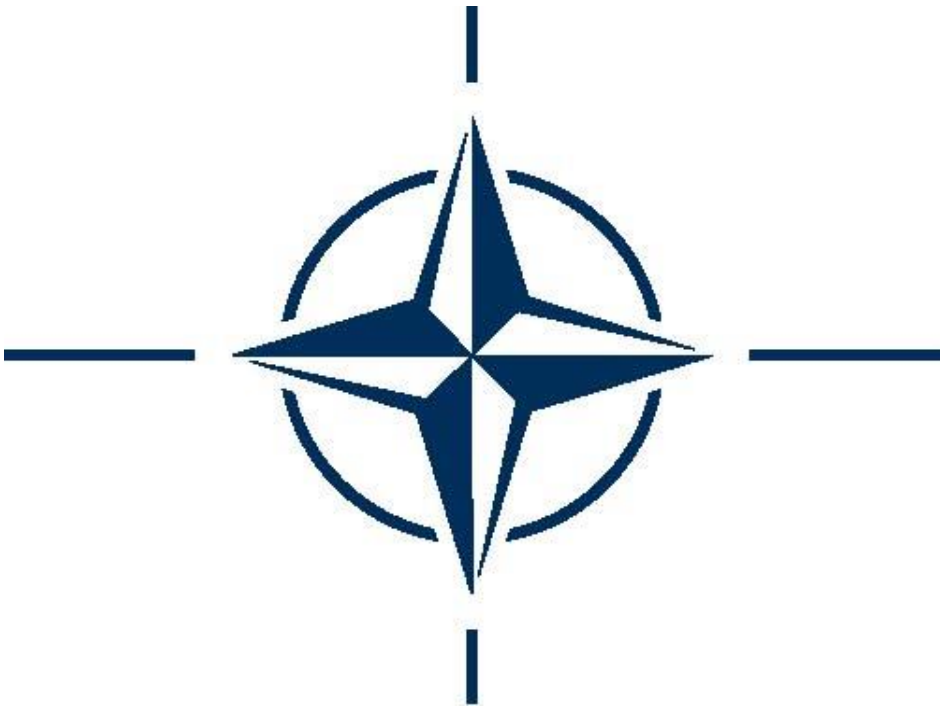
NATO STANDARD

AEDP-4858

RESILIENT FILE DELIVERY PROTOCOL OVER DEGRADED NETWORKS

Edition A, version 1

DATE
RATIFICVATION DRAFT 1



NORTH ATLANTIC TREATY ORGANIZATION

ALLIED ENGINEERING DOCUMENTATION PUBLICATION

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NATO LETTER OF PROMULGATION

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1. The enclosed Allied Engineering Documentation Publication AEDP-4858, Edition A, version 1, RESILIENT FILE DELIVERY PROTOCOL OVER DEGRADED NETWORKS, which has been approved by the nations in the NATO AIR FORCE ARMAMENTS GROUP, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 4858.

2. AEDP-4858, Edition A, version 1, is effective upon receipt.

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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
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

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CHAPTER 1 INTRODUCTION

1.1 AIM

The aim of AEDP 4858 is to promote interoperability in air-to-ground file delivery among North Atlantic Treaty Organization (NATO) systems.

1.2 SCOPE

This document provides a protocol specification and requirements for use in air-to-ground file delivery. The protocol and requirements allow for transfer of files over degraded networks including breaks in connectivity. It also can facilitate the simultaneous reception of files by multiple receivers. It is able to operate over various network topologies ranging from direct ground link to multi-node path satellite link.

The protocol specified in this document applies to air-to-ground file transfers. Other types of transfer, such as air-to-air, are not currently in the scope of this document.

This document does not require use of any specific network or transport protocols, as those are dependent upon the data link used. However, there are conditional requirements when specific other protocols are used.

1.3 TERMS AND DEFINITIONS

1. **File Transfer System**
   Any system, such as an air vehicle or ground control station, capable of performing file transfers over a data link.

2. **Protocol Data Unit (PDU)**
   A single unit of information transmitted between file transfer systems across a network.

3. **User Datagram Protocol (UDP)**
   A communication protocol defined in RFC 768 for transporting information between systems over an Internet Protocol network.

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CHAPTER 2 REQUIREMENTS

2.1 PROTOCOL

File transfer systems shall comply with CCSDS File Delivery Protocol (CFDP) Recommended Standard CCSDS 727.0-B-5.

See the following URL: **https://public.ccsds.org/Pubs/727x0b5.pdf**

2.2 ADDITIONAL REQUIREMENTS

Where file transfer systems use STANAG 4586/AEP-84 Standard Interfaces of Unmanned Aircraft (UA) Control System (UCS) for NATO UA Interoperability, they shall use their STANAG 4586/AEP-84 ID as their CFDP Entity ID.

File transfer systems shall include a Cyclic Redundancy Check (CRC) in each PDU in accordance with Section 4.1.1 of the CFDP Standard.

While transferring over a UDP network, the sending system shall transmit one PDU per UDP packet.

2.3 CFDP MODES

CFDP can be run in two different modes. These modes are called “classes” in the CFDP literature.

Class 1 is a mode where no packets are sent from the receiver of the file to the sender of the file. Packets in a class 1 transfer are one-way only. Sometimes this is also referred to as a transfer with no “back-channel”, meaning there is no return path back to the sender. Class 1 transfers should happen over multicast addresses, so the receiver address does not have to be known in advance. Even if it is known, in some cases there may be multiple receivers, so it is easier to always send class 1 over multicast.

Class 2 is a mode where there are packets flowing both directions during the file transfer. These transfers allow the receiver to notify the sender of missed packets so the sender can re-send the missed packets. Transfers generally happen much faster in class 2 mode because the sender does not have to send extra data, whether it is needed or not, to allow the receiver to possibly reconstruct lost packets.

This document will cover four use cases as examples of when the two classes of file transfer should be used.

2.4 USE CASES

2.4.1 Single Air Vehicle (AV), Single Control Station (CS)

This is the simple case of an AV transferring a file to a CS where the CS is willing and able to transmit back to the AV. In this case, a class 2 transfer should be employed. This will result in the fastest file transfer and the most efficient use of bandwidth.

2.4.2 Single AV, Single Silent CS in Receive (Rx) Only

There may be a reason for a CS to maintain radio silence. For instance, the CS may not want to reveal its position. In a situation like this, the AV would have a time and location in its flight plan where it would transmit the file. Hostile forces would only be able to assume that a CS is somewhere within radio range, but that is all. Multiple locations and times could be added to the mission plan to increase the safety of ground troops. In this case, a class 1 transfer should be employed. While the transfer will take a little longer, the ground station will not have to transmit and possible reveal its location.

2.4.3 Single AV, One CS With Two-Way Communication, One Silent CS in Rx Only

In this use case the mission likely should use a class 2 transfer for faster delivery of the file. The CS with two-way comms will be able to request retransmits for lost packets. If the silent CS misses the same packets because of the same RF interference, the file transfer will succeed to both CS. If the silent CS does not get the file, maybe the other CS can transfer it over ground communications links. If it is imperative that both CS receive the file two CS's cannot communicate with each other, a class 1 transfer would be better.

2.4.4 Single AV, Multiple CS With Two-Way Communication

Multiple CS's can participate a class 1 transfer using two-way communications for the file transfer provided the transfer is happening over a multicast address. Any retransmit requested by any of the receivers will cause a retransmit to all the receivers. While this is slower than a transmit to a single receiver, it is still likely to be more efficient that using a class 1 transfer.

Another option to consider in this use case is for the sender to initiate multiple, separate class 2 transfers, one to each receiver. This uses more bandwidth on the downlink but might be useful if the sender finds that one CS is experiencing far more interference than another and getting the file to any ground station will be sufficient. This would allow the sender to terminate the slower connections when the fastest one finishes.

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