STANDARDS RELATED DOCUMENT

AEP-104.1

RATIFICATION BRIEF

EDITION A VERSION 1

JANUARY 2022

NORTH ATLANTIC TREATY ORGANIZATION

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NATO LETTER OF PROMULGATION

31 January 2022

1. The enclosed Standards Related Document, AEP-104.1, Edition A, Version 1, RATIFICATION BRIEF, which has been approved in conjunction with AEP-104 by the nations in the NATO AIR FORCE ARMEMENTS GROUP (NAFAG), is promulgated herewith.

2. AEP-104.1, Edition A, Version 1 is effective upon receipt.

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

Dimitrios SIGOULAKIS
Major General, GRC (A)
Director, NATO Standardization Office

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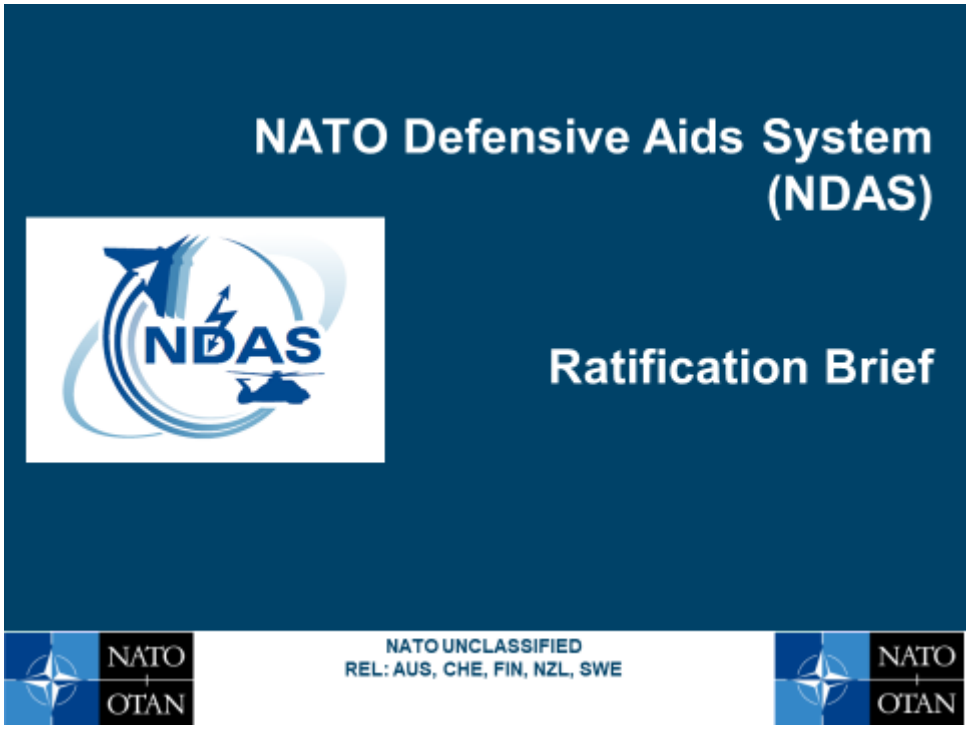
NATO Defensive Aids System
(NDAS)
NDAS
Ratification Brief
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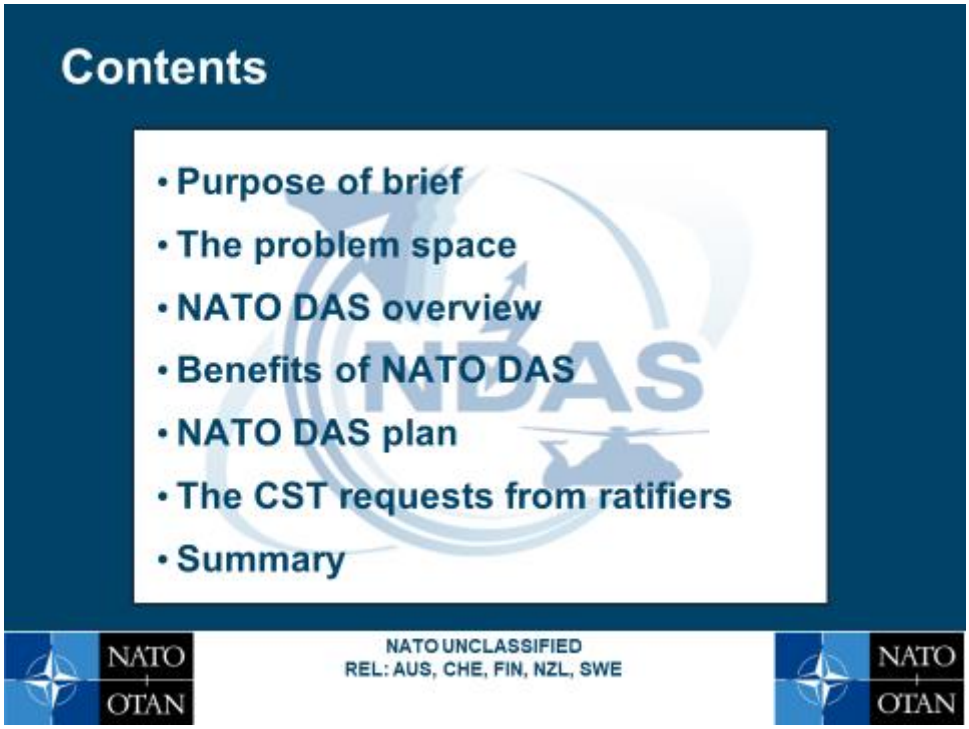
Contents
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• The problem space
• NATO DAS overview
• Benefits of NATO DAS
• NATO DAS plan
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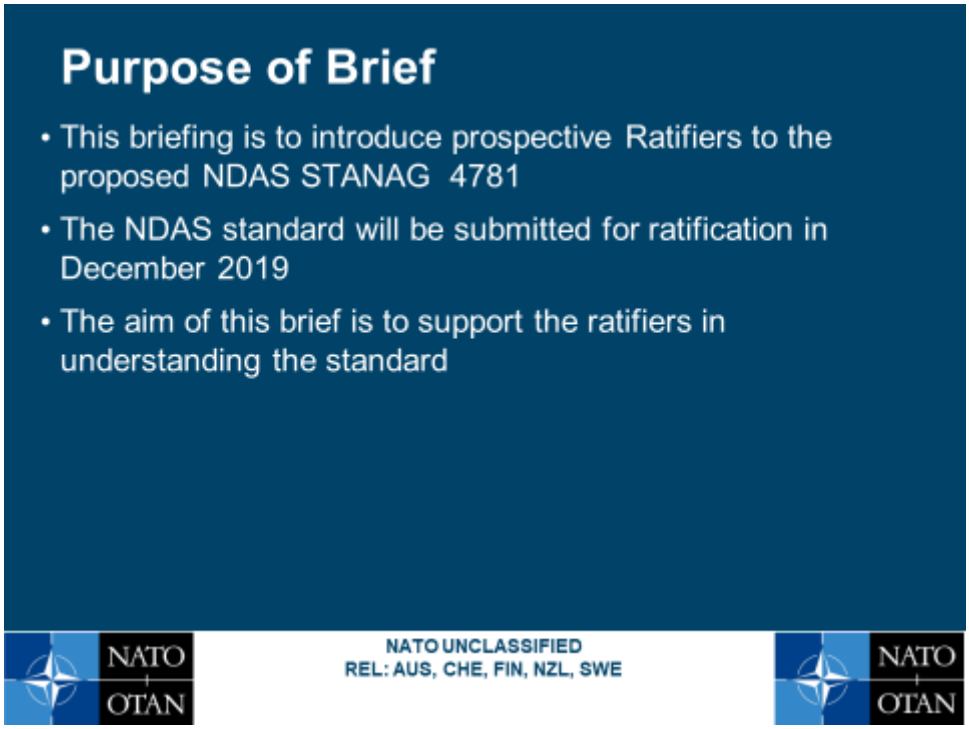
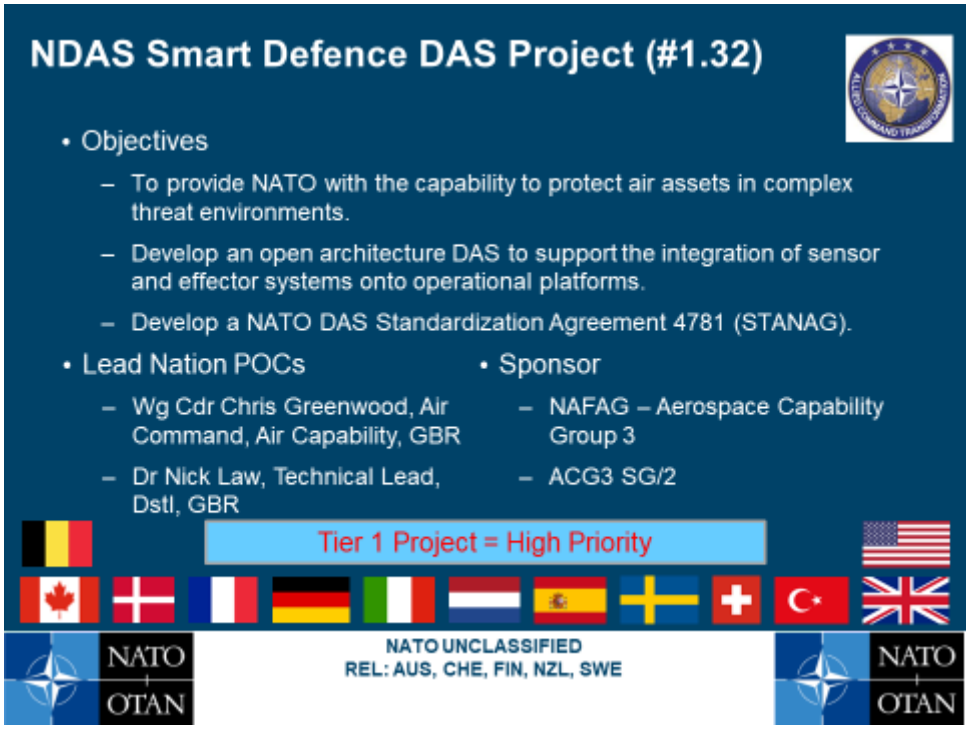
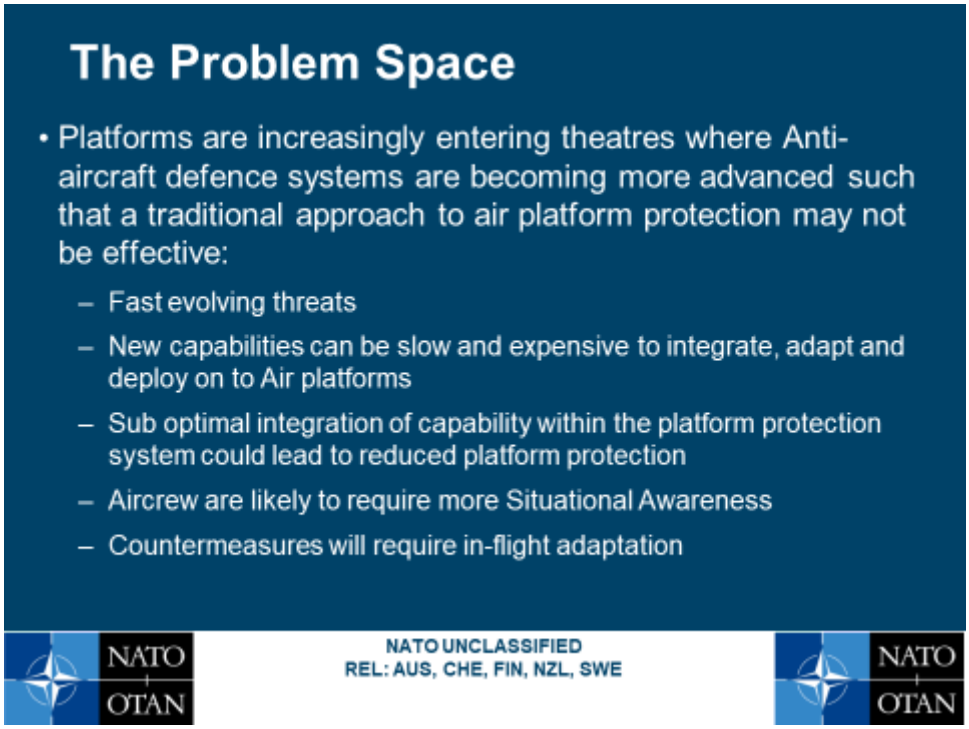


In order to ease the ratification process - provide a clear understanding of what is included within Edition A of the STANAG



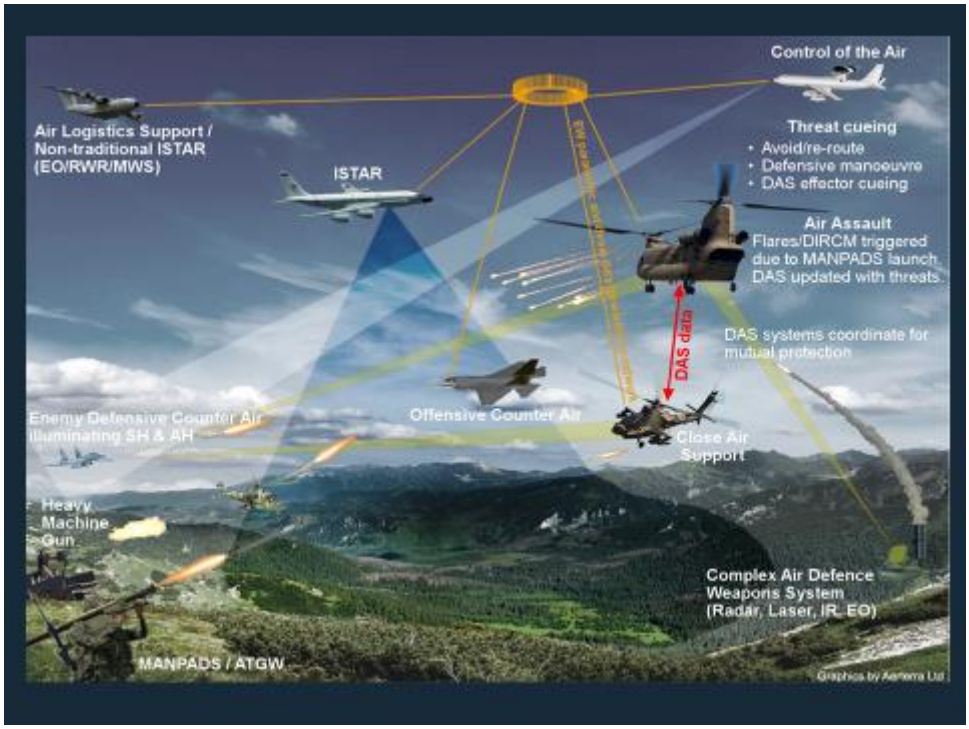
NDAS is an enabling element of an integrated DAS architecture which when combined with DAS sensors and effectors will support enhancements in platform protection in an increasingly contested and congested spectral environment.
Whilst Edition A is about platform self-protection, the intention is to have sensed data more accessible to other platforms in subsequent work effort on the standard.
The STANAG is managed by the Custodian Support Team under Aerospace Capability Group 3 Sub-group 2 (ACG3 SG/2).

SCI 260; Defensive Aids Systems (DAS) / Aircraft Survivability Equipment (ASE) contribute to survivability by providing self-protection capabilities to the warfighter, the platform and the mission. The problem is that it takes too long and costs too much to upgrade and maintain these systems through life. Furthermore, DAS / ASE systems traditionally employ proprietary closed communication links between sub-systems.
Open interfaces support industrial strategies by enabling faster integration of novel and niche technical capabilities from small and medium enterprises as well as large organisations.
NIAG SG 185; Study provided an industry assessment of candidate defensive aids system (DAS) open architectures.
NIAG SG 211; Provide industry feedback and guidance to proposed solutions for the key ‘NDAS implementation challenges’ of :Off-boarding of DAS information (interchange of data between DAS and other platforms, and/or off-platform users such as troops on the ground), Security requirements and means to comply (on-board and off-board), Certification and accreditation for a dynamic DAS in a complex threat environment and Exportability.

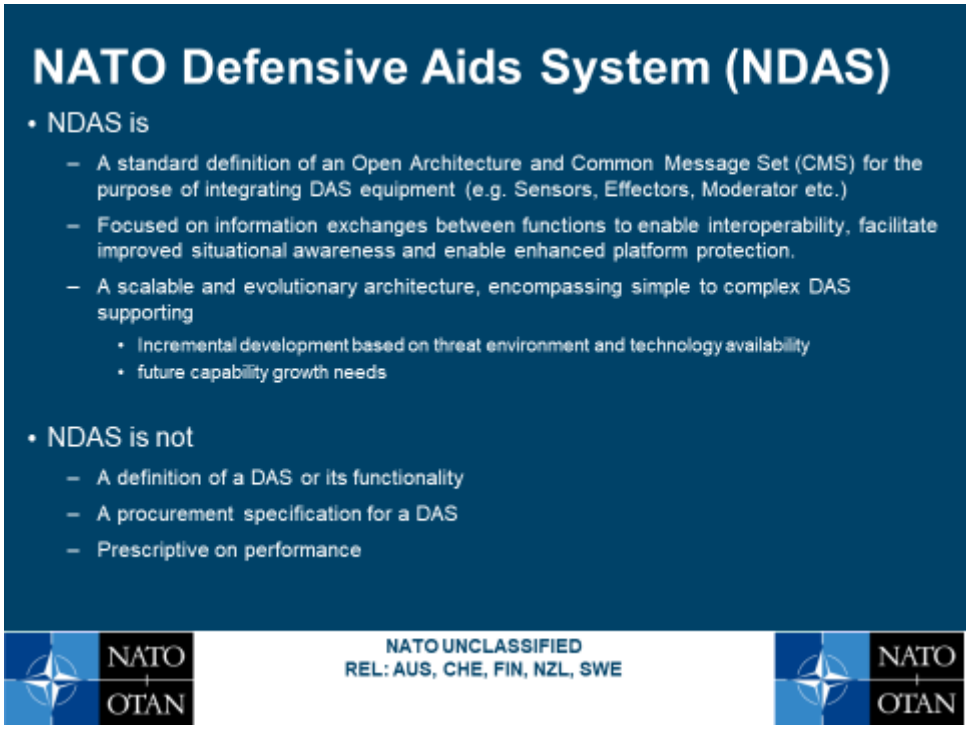


Information could be tied up within supplier's IP which restricts the level of integration capability; or ties-in integrators to particular solutions.
Easier to integrate new capability into an open system.

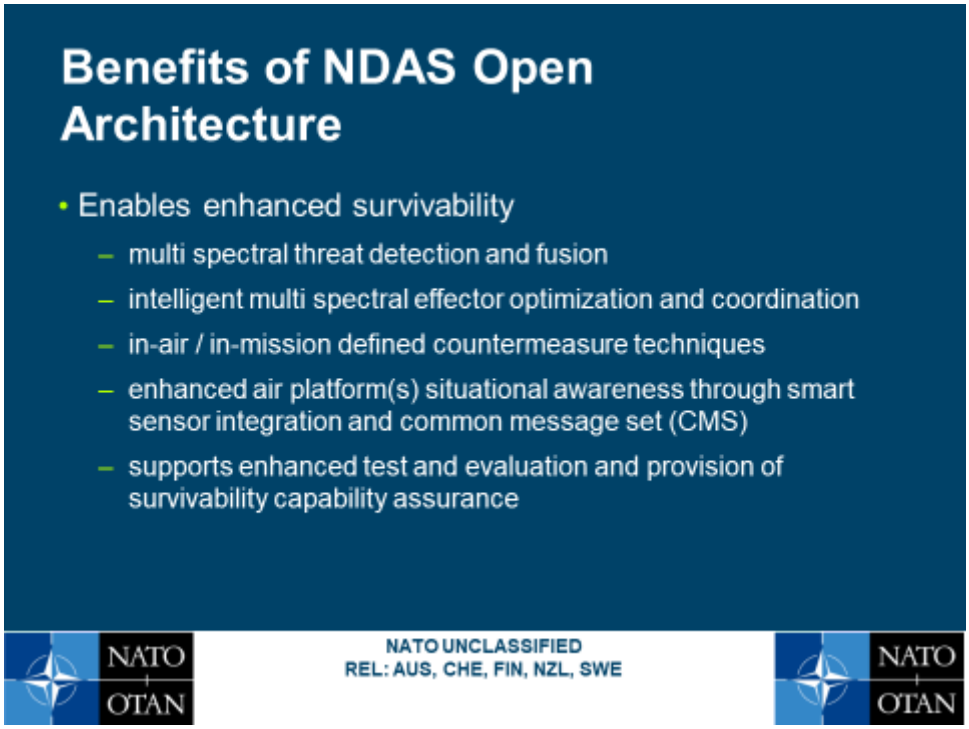
Adversary RADAR Systems, SAMS and MANPADS are becoming increasingly more complex and integrated.



The figure depicts an operational view of operating within a complex Air Defence environment. Coalition forces face advanced surface to air missiles, MANPADS and hostile small calibre fire. Air Defence could consist of targeting achieved from the combination of multiple spectrums, e.g. RF, Laser, IR & EO. In this context, NDAS can be used to share track data from all on platform sensors of detected threat systems for the purpose of determining a collated survivability strategy. Furthermore, situational awareness to platform, crew and potentially sharing information with external mission participant / ISTAR could be provided.



NATO Defensive Aids Systems (NDAS) is a Smart Defence Project led by the UK to respond to evolving threats and provide capability to protect NATO Air Platforms. As threats evolve, current standalone federated Defensive Aids Systems (DAS) will not be able to effectively defeat future complex threats but will require the intelligent integration of all on-board DAS sub-systems. NDAS has developed an open architecture capable of integrating sensors and effectors. The integrated system will manage information from multiple sensors, prioritise threats and provide the appropriate countermeasure response. This endeavour has resulted in the development of an Open Systems Architecture NATO Standardisation Agreement (STANAG), which will enable survivability upgrade solutions to be integrated in a more effective, agile and cost-effective way through-life. This will also ensure improved interoperability with NATO Allies through a standardised approach. There have been over 50 organisations across Governments and Industry who have contributed to the STANAG which was delivered to NATO for ratification in December 2019, with planned publication in December 2020 after ratification.


Benefits of NDAS Open Architecture
• Enables enhanced survivability
– multi spectral threat detection and fusion
– intelligent multi spectral effector optimization and coordination
– in-air / in-mission defined countermeasure techniques
– enhanced air platform(s) situational awareness through smart sensor integration and common message set (CMS)
– supports enhanced test and evaluation and provision of survivability capability assurance
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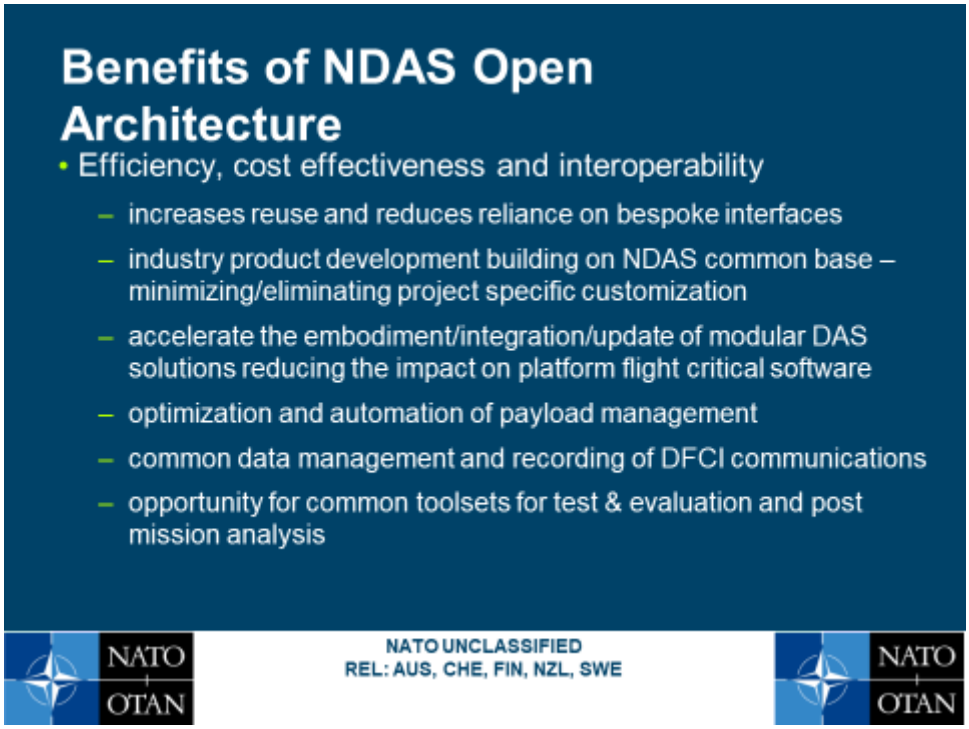
Benefits of NDAS Open Architecture
• Efficiency, cost effectiveness and interoperability
– increases reuse and reduces reliance on bespoke interfaces
– industry product development building on NDAS common base – minimizing/eliminating project specific customization
– accelerate the embodiment/integration/update of modular DAS solutions reducing the impact on platform flight critical software
– optimization and automation of payload management
– common data management and recording of DFCI communications
– opportunity for common toolsets for test & evaluation and post mission analysis
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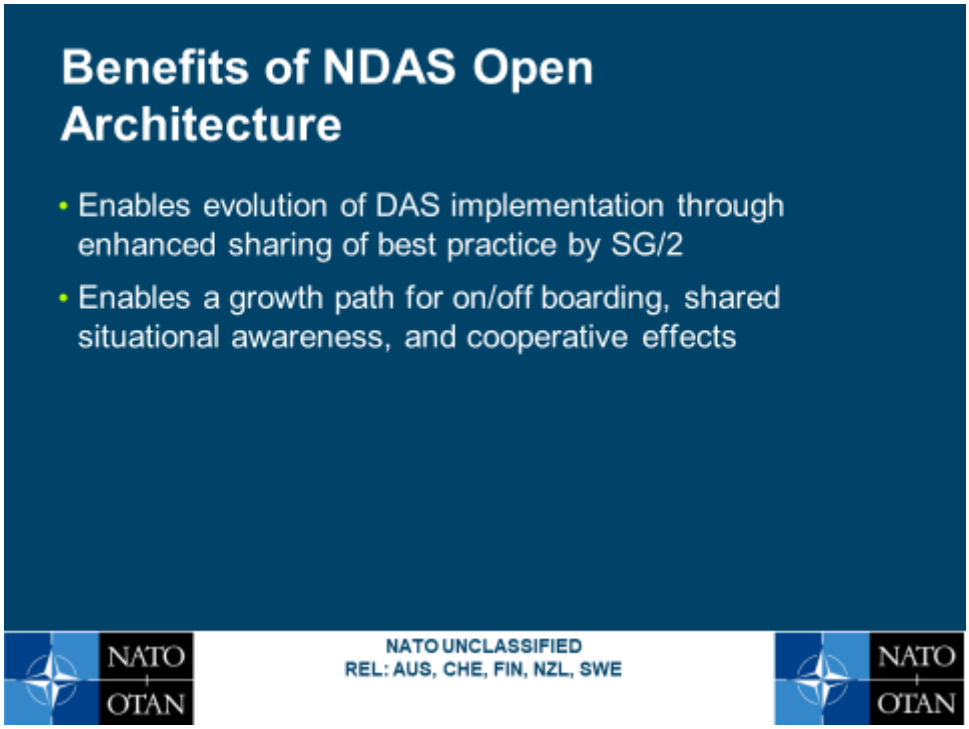
Benefits of NDAS Open Architecture
• Enables evolution of DAS implementation through enhanced sharing of best practice by SG/2
• Enables a growth path for on/off boarding, shared situational awareness, and cooperative effects
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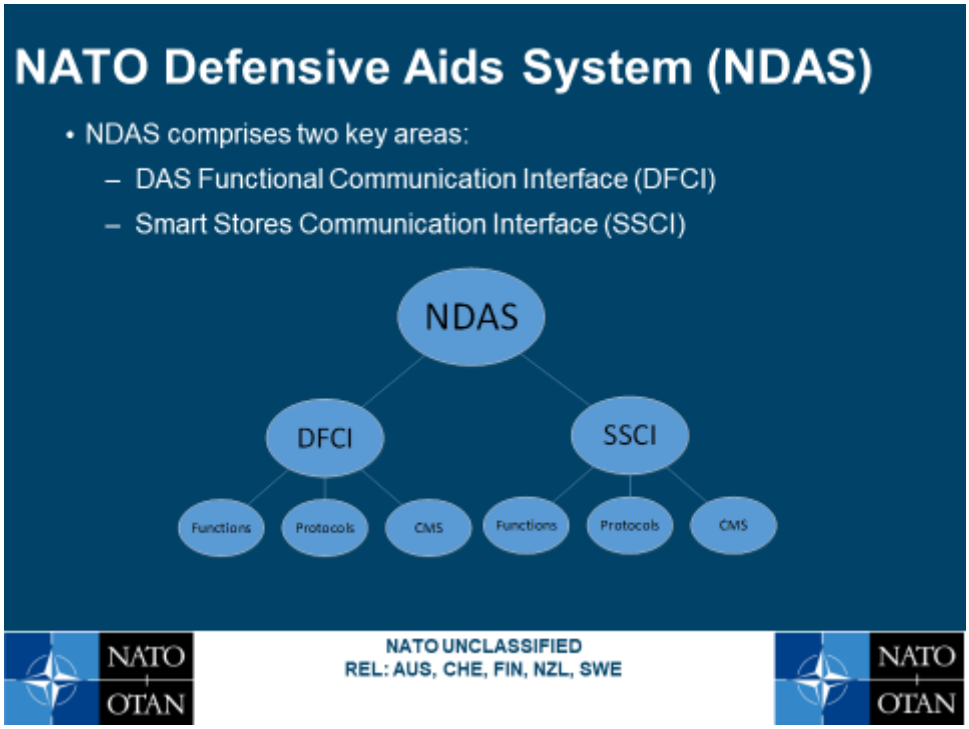
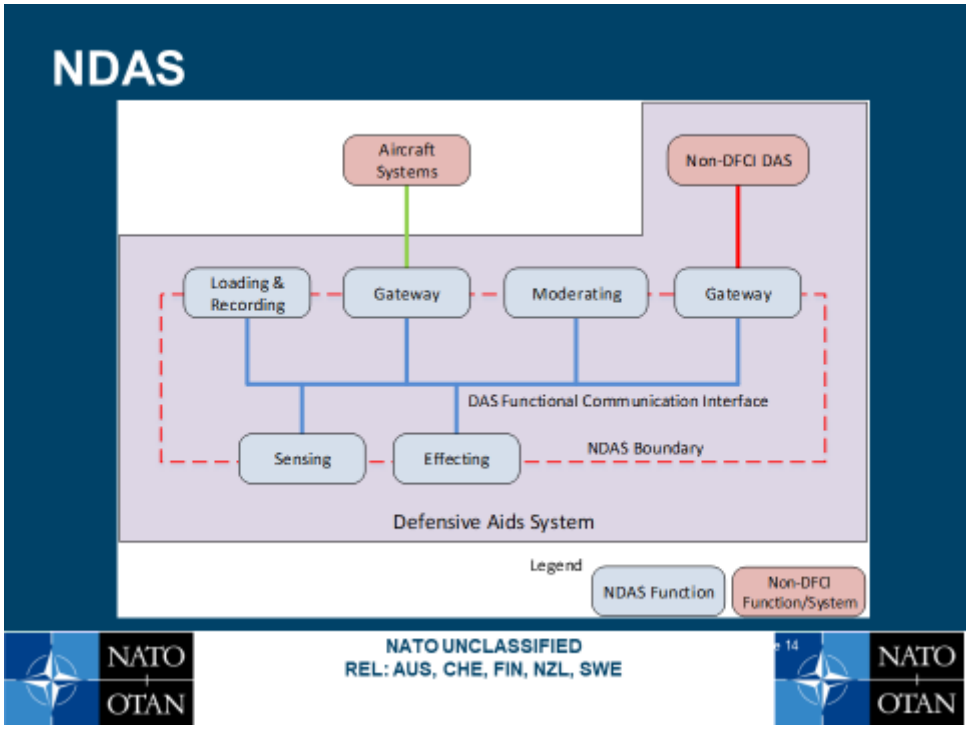
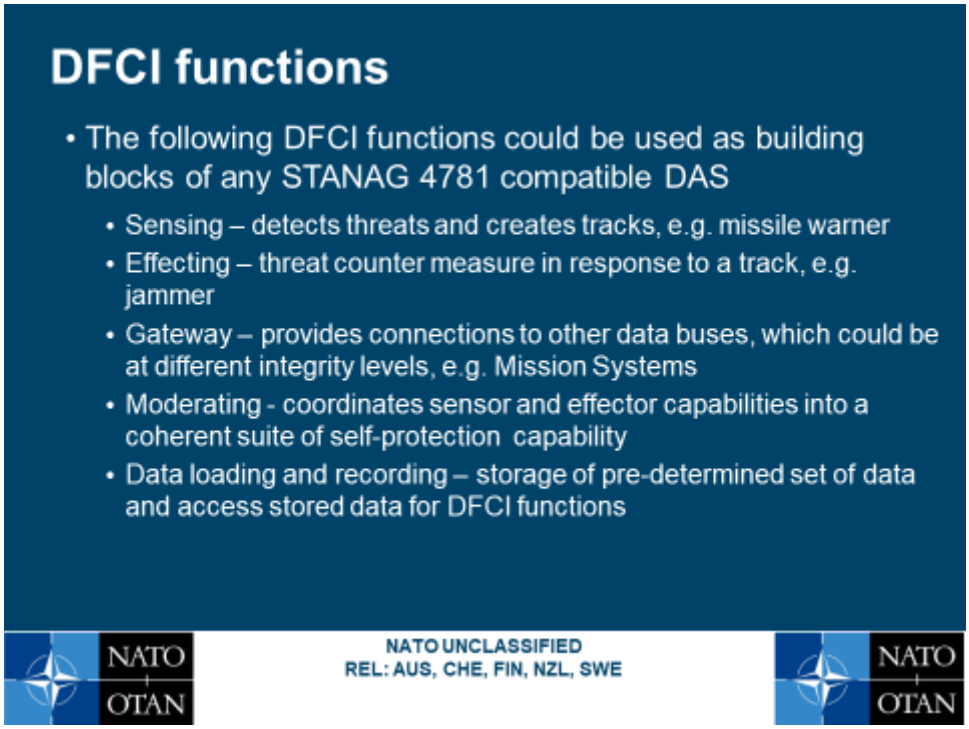


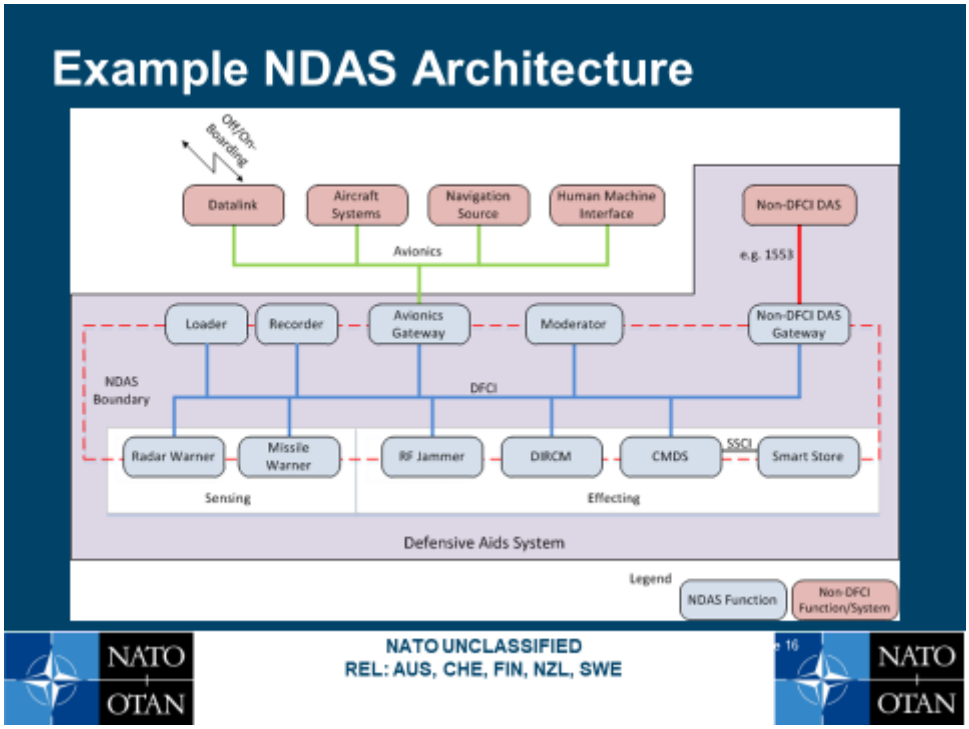
NDAS is the approach taken by NATO and industry to standardize the interfaces, protocols and message set for platform integration. The NDAS Overview figure illustrates the document structure and the relationship between the DFCI and the SSCI. The DAS architecture is the fundamental enabler for improving aircraft survivability through the interoperability of subsystems as well as ease of integration of new capabilities (functions) into existing NDAS implementations on military platforms.



The NDAS architecture allows for an evolutionary approach. Platform safety critical interfaces are ‘firewalled’ through a high integrity platform gateway. This enables more rapid and cost effective DAS upgrades.



These are the functional groups currently covered by the DFCI. It is highly likely that new functions will fit into these groupings, however, if this is not the case then additional messages could be added to a subsequent edition.
Depending upon the implementation, it is possible to load legacy equipment via the DFCI and associated gateway or use legacy support equipment, e.g. loaders.



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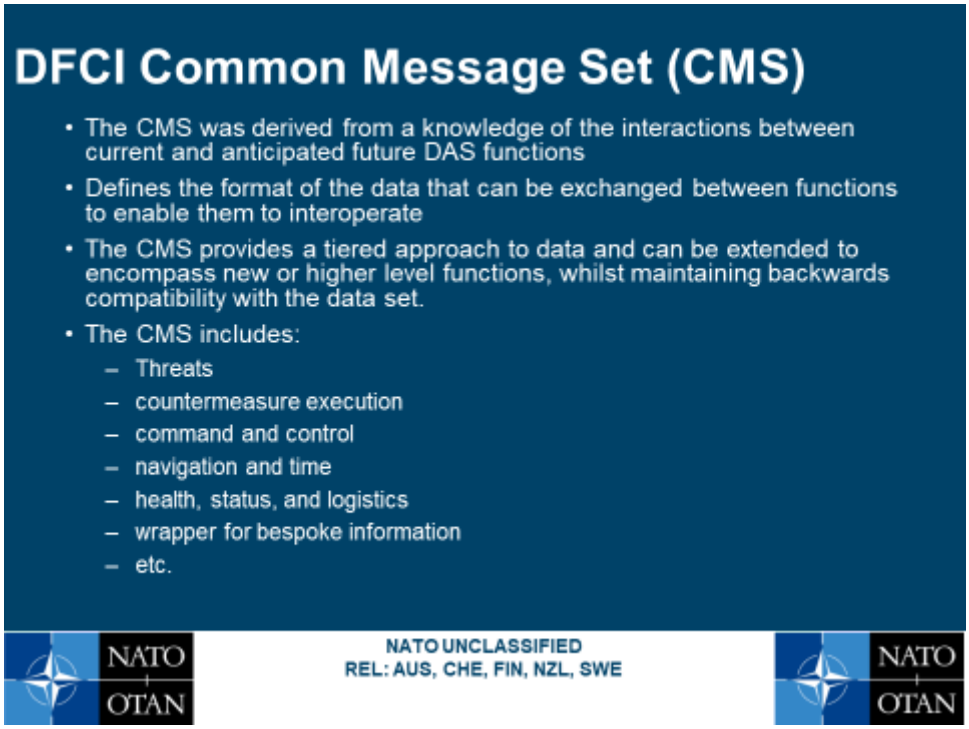
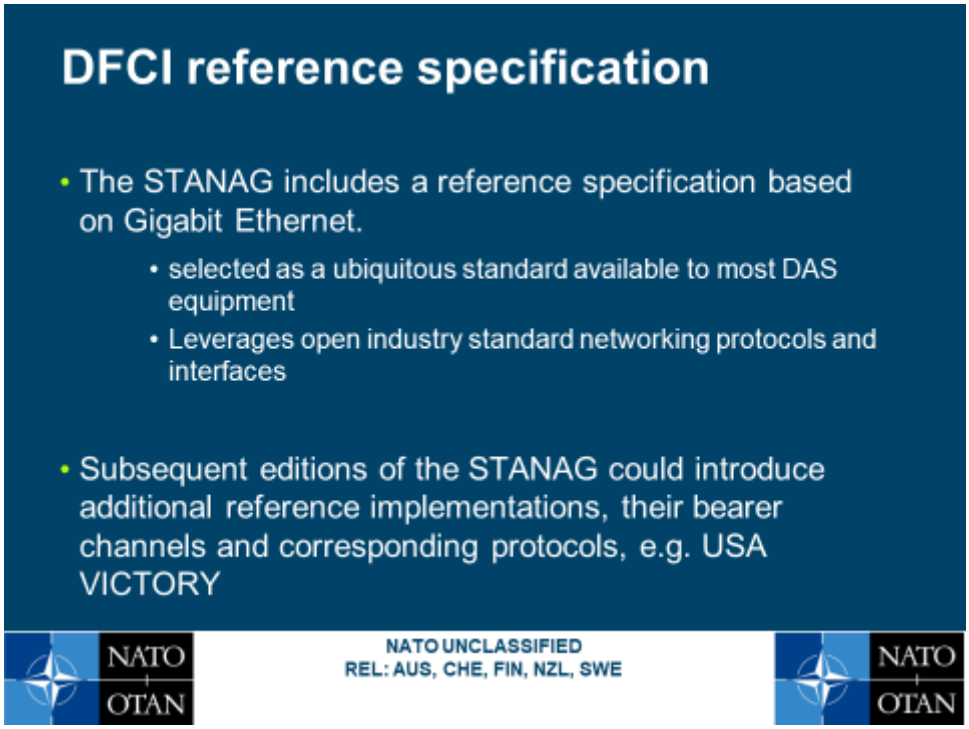
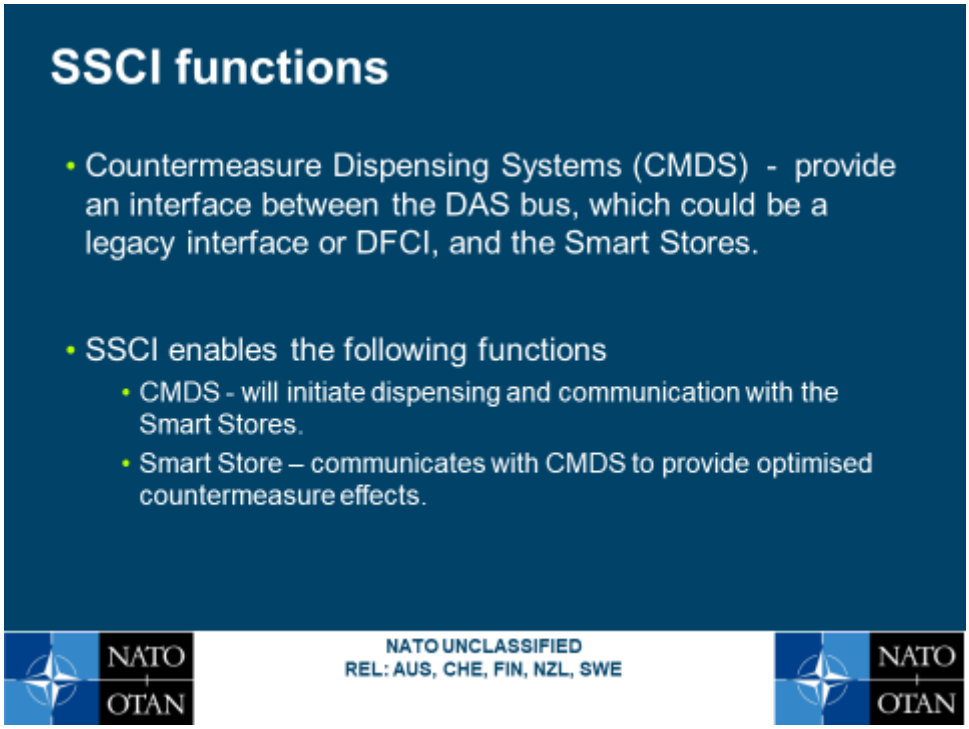


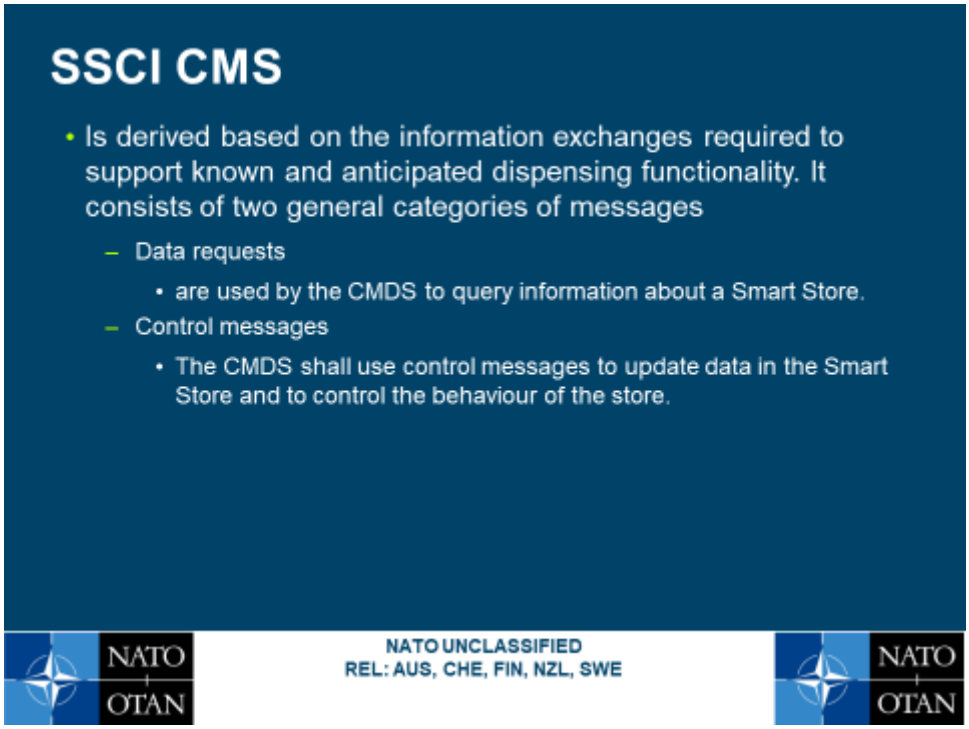
The extent of the coverage of messages have been developed by an industry team of ASE capability providers. It is believed that the included message content should cover any DAS use case implementation.



Protocols used are open standards RFCs (Request For Comment) as defined by the IETF (Internet Engineering Task Force), for example RFC 768 - UDP (User Datagram Protocol). The CMS was derived based on the information exchanges required to support known and anticipated DAS interactions.



A traditional store will not respond to or be affected by the SSCI nor will the SSCI impact the stores normal operation.



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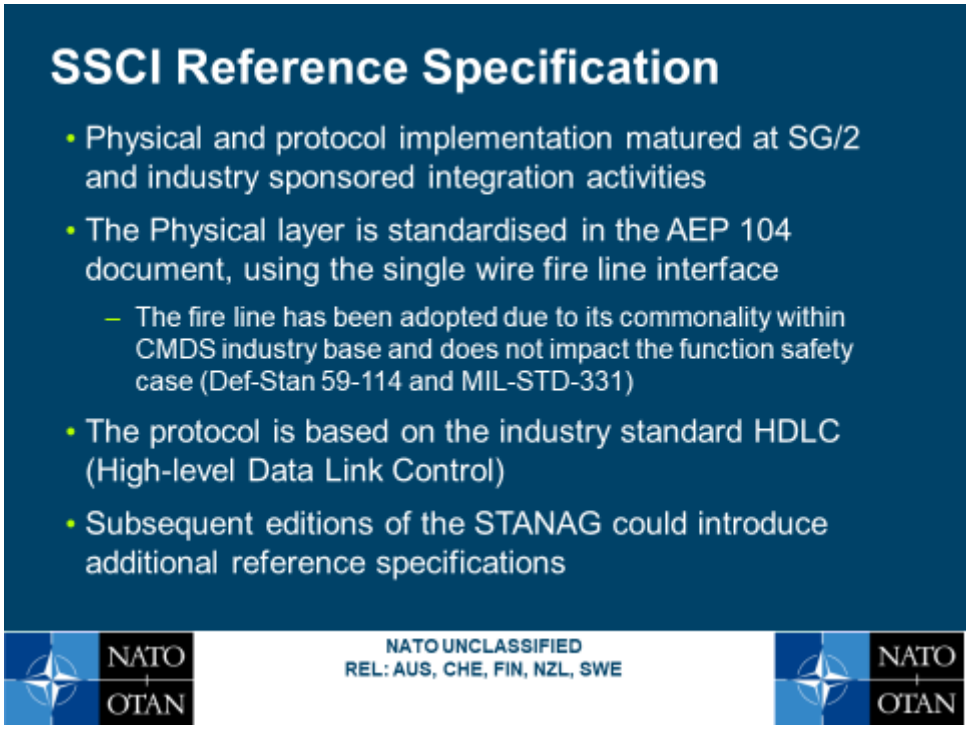
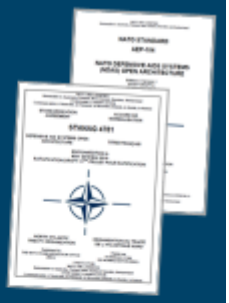


Unlike the DFCI, the SSCI defines both the physical layer interface and protocol within AEP-104, e.g. it defines message content and the electrical interface. This is because there is no current open industry standard for the existing store fire line interface known to the CST.

STANAG Documentation



- The NDAS STANAG comprises a top-level document (STANAG 4781) that refers out to a detailed Allied Engineering Publication (AEP-104)
- The STANAG comprises of architecture descriptions and reference implementations
  - The reference specifications for the first issue of the STANAG determines an Ethernet bearer for DFCI and single wire interface for the SSCI
  - The standard is agnostic of physical interface, and other physical interface are supported through additional issues of reference specification within the STANAG

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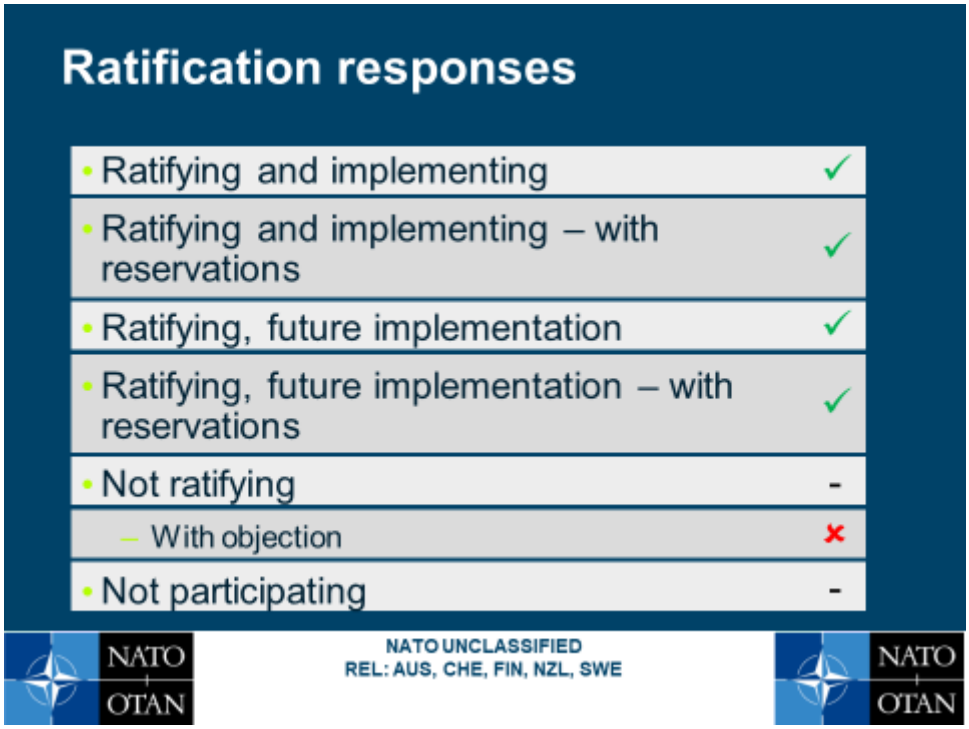
Can alter promulgation criteria prior to submission for ratification. It is difficult to alter the specified nations once the STANAG has been submitted for ratification.



Any of the top four ‘ratifying’ responses count as ratification.
‘Not ratifying’ and ‘Not participating’ do not count as ratification, but do not stop proceedings.
“Not ratifying with objections” will halt the ratification process.
All the specified nations in the promulgation criteria have to ratify (i.e. any of the top four responses above) for the STANAG to become officially ratified.
Or a majority of NATO nations (15) need to ratify.
Once ratified then the STANAG can be officially promulgated.


Topics under consideration for future editions
• Analysis of SG/2 scenarios and vignettes will inform further NDAS development, including requirements delivered through collaboration with other domains and standards
– On/off boarding
• ISTAR communications
• Collaborative DAS communications between multiple platforms
– Enhancement of HMI, e.g. Situational Awareness and cueing
– Data integrity and security
• Explore alignment with complementary standards, e.g. FACE and VICTORY
• Introduction of additional DFCI reference implementations, their bearer channels and corresponding protocols
• SSCI – additional reference implementations with a very low latency and significantly higher data rates to enable future classes of expendables
• Compatibility - methods and tools
• Redundancy and Reversionary behaviour
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CST Support
• Please contact us if you:
– have questions on the STANAG
– require clarification on the STANAG
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Summary
• The threat to NATO platforms is increasing and becoming complex
• NATO SG2 has created the open NDAS STANAG 4781
– It is an enabler for multiple benefits, including platform protection and survivability, by providing the means for advanced functionality to interoperate across common infrastructures
– Covering both a DAS functional communication interface and a smart stores communication interface definition
• Future editions scoping has started
– On/off boarding
– High speed/low latency SSCI
– Adding security into the architectural design is also important
• Exploitation has started
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Acronyms

Acronym	Meaning
ACG3	Aerospace Capability Group 3
AEP	Allied Engineering Publication
AH	Attack Helicoptor
ATGW	Anti Tank Guided Weapon
CMDS	Countermeasures Dispensing System
CMS	Common Message Set
DAS	Defensive Aids System
DFCI	DAS Functional Communications Interface
DSTL	Defence Science Technology Laboratory
EO	Electro-optic
HDLC	High-Level Data Link Control
HQ	Headquarters
IR	Infrared
ISTAR	Intelligence Surveillance, Targeting, Acquisition and Reconnaissance
MANPAD	Man Portable Air Defence

Acronym	Meaning
NAFAG	NATO Airforce Armaments Group
NATO	North Atlantic Treaty Organisation
NDAS	NATO DAS
NIAG	NATO Industry Advisory Group
POC	Point of Contact
SCI	System Concepts and Integration
SG	Sub-Group
SH	Support Helicopter
SSCI	Smart Stores Communications Interface
UDP	User Datagram Protocol

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