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### **NATO Interoperability Standards and Profiles**

**Volume 2**

**Near Term**

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**C3 CCSC NATO Open Systems Working Group**



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## **1. INTRODUCTION**

001. This document has been developed and agreed (AC/322(SC/1-WG/4)N(2010)0002-AS1, 24 Mar 10) by the NATO Open Systems Working Group (NOSWG) under the authority of the NATO Consultation, Command and Control Board (NC3B). Under AC/322-N(2010)0038-AS1, the NATO Consultation, Command and Control Board noted ADatP-34(D) and approved the standards and profiles in Volume 2 as mandatory for use in NATO common funded systems in accordance with the NATO networked C3 Interoperability Policy.

002. Volume 2 of the NISP focuses on interoperability standards and profiles in the near-term or a timeframe of 0 to 2 years into the future. This is the short-term step describing the state-of-the-art of NATO systems today and the framework for new systems actually under procurement or specification. For new systems, it describes the initial step towards the NII.

003. The Combined Communications Electronics Board (CCEB) nations will use NISP Volume 2 Chapter 3, Section 3.2, Section 3.3, Section 3.4, Section 3.5 and Section 3.6 tables to publish the interoperability standards for the CCEB under the provisions of the NATO-CCEB List of Understandings (LoU) detailed in Volume 1 Annex A. For the non-NATO CCEB nations, only a subset of this volume is applicable. For the CCEB, Chapters 1 and 2, Chapter 3 Sections 3.1, 3.2 and 3.3 and Annex A of this volume are background information. Chapter 4 is only applicable to the non NATO CCEB Nations when taking part in NATO lead operations.

### **1.1. SCOPE**

004. The scope of this volume will include:

- Identifying the reference models, standards, profiles, and technologies that are relevant to a service oriented environment, as described in the NATO NNEC Technical Services Strategy,
- Describing the near term Standards, profiles and technologies to support the initial step towards NNEC Technical Services,
- Planning the transition of legacy systems.

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## **2. REFERENCE MODELS: TRANSITION FROM PLATFORM CENTRIC TO SERVICE ORIENTED MODELS**

005. Information technology is undergoing a fundamental shift from platform-oriented computing to network-oriented computing. Platform-oriented computing emerged with the widespread proliferation of personal computers and the global business environment. These factors and related technologies have created the conditions for the emergence of network-oriented computing. This shift from platform to network is what enables the more flexible and more dynamic network-oriented operation. The shift from viewing partners as independent to viewing partners as part of a continuously adapting ecosystem fosters a rich information sharing environment.

006. This shift is most obvious in the explosive growth of the internet, intranets, and extranets. Internet users no doubt will recognize transmission control protocol/internet protocol (TCP/IP), hypertext transfer protocol (HTTP), hypertext markup language (HTML), Web browsers, search engines, and Java<sup>1</sup> Computing. These technologies, combined with high-volume, high-speed data access (enabled by the low-cost laser) and technologies for high-speed data networking (hubs and routers) have led to the emergence of network-oriented computing. Information "content" now can be created, distributed, and easily exploited across the extremely heterogeneous global computing environment. The "power" or "payoff" of network-enabled computing comes from information-intensive interactions between very large numbers of heterogeneous computational nodes in the network, where the network becomes the dynamic information grid established by interconnecting partners participating in a collaborative, coalition environment. At the structural level, network-enabled warfare requires an operational architecture to enable the common processes to be shared by all parties.

007. One of the major drivers for supporting net-enabled operations is Service-Oriented Architectures (SOA). SOA is enterprise architecture that leverages heterogeneity, and thus inherently platform-neutral. It is focused on the composition of Services into flexible processes and is more concerned with the Service interface and above (including composition metadata, security policy, and dynamic binding information), more so than what sits beneath the abstraction of the Service interface. SOA requires a different kind of platform, because runtime execution has different meanings within SOA. SOA enables business users and business process architects to compose Services into processes, and then manage and evolve those processes, in a declarative fashion. Runtime execution of such processes is therefore a metadata-centric operation of a different kind of platform -- a Service-oriented composite application platform.

008. Network-enabled operations are characterized by new concepts of speed of command and self-synchronization.

009. The most important SOA within an enterprise is the one that links all its systems. Existing platforms can be wrapped or extended in order to participate in a wider SOA environment. NATO use of the NISP will provide a template for new systems development, as well as assist in defining the path for existing systems to migrate towards net-enabled operations.

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<sup>1</sup>Registered Trademark of SUN Microsystems, INC.

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## **3. STANDARDS**

### **3.1. INTRODUCTION**

010. This purpose of this chapter is to specify the NISP near term standards. The document organises these standards into five service areas and included service categories:

- Operational Mission/Activities/Tasks
- User Information Services
- Technical Services
  - COI Services
    - Generic COI Services
    - Specific COI Services
  - Information Integration
    - Core Enterprise Services
      - Discovery
        - Service Discovery Services
        - Information Discovery Services
      - Repository
        - Metadata Registry Services
        - Enterprise Directory Services
      - Mediation
        - Composition Services
        - Translation Services
  - Interaction
    - Messaging Services
    - Publish/Subscribe Services
    - Transaction Services

- Collaboration Services
- Infrastructure
- Application Services
- Storage Services
- Communication Services
  - Network and Transport Services
  - Data Link and Connection Services
- Information Assurance
  - SMI Services
  - Confidentiality
  - Encryption
  - Integrity
  - Authentication
  - Detection
  - Transsec
- Service Management and Control

011. This section describes the role and requirements of each service area, and presents all associated standards and profiles in tabular form. The tables refine each service area into one or more service categories, with service components mapping to one or more mandatory, emerging near term or fading categories (see NISP vol. 1). A remarks column provides optional supplementary information on each standard plus CCEB-specific information. The NISP Rationale Document (RD) provides further explanation on why service and standards categories have been selected.

### **3.2. OPERATIONAL MISSION/ACTIVITIES/TASKS**

012. In the military organisations operational missions are generally planned activities that can be viewed in terms of distinct chronological stages of completion which in turn consist of shorter tasks. Operational missions do not involve combat (see combat mission, and can vary in duration from a few hours to several weeks, though usually in peacetime are limited to the working week.

013. This set of services is described in mission related terms to provide consistency with the set of possible NATO missions identified through the NATO Defense Planning process. Each Operational Service is dependent on one or more Information Services.

**3.2.1. List of Standards**

<b>SUBAREA / SERVICE CATEGORY</b>	<b>CAT-EGORY / SUBCAT-EGORY</b>	<b>MANDAT-ORY STAND-ARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>

**3.3. USER INFORMATION SERVICES**

014. These services are hierarchically organised and focused on information: content, management, processes, and standards. Each Information Service is enabled by one or more NNEC Services.

015. These NNEC services represent the technology required to enable the Information Services to make information available to user communities of interest. At the lowest level, NNEC Services are composed of components, processes, management.

**3.3.1. List of Standards**

<b>SUBAREA / SERVICE CATEGORY</b>	<b>CAT-EGORY / SUBCAT-EGORY</b>	<b>MANDAT-ORY STAND-ARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>

**3.4. TECHNICAL SERVICES**

016. Technical services provide fundamental support to service based frameworks both in the form of information integration and communication services, and in the form of COI independent general service building blocks.

017. COI services provide more specialized services in order to give the business more specific business benefits within a "domain" or "area of interest".

018. A COI is a collaborative group of users who have shared goals, interests, missions or business processes that result in information exchange and shared vocabulary.

019. Information services include services that are either made available to all users by the infrastructure, or are mandatory to be provided by all users, by all providers or by all consumers. Information services also include specification of services of general interest that may be voluntarily exchanged by any parties on the network.

020. Actually information services are based only on core enterprise services (CES), but may be extended in the future.

021. Any service based framework, such as the Business Process Infrastructure Framework (BPIF), needs to provide a basic set of services that support and facilitate implementation and deployment of actual business services and processes. Such basic services are usually referred to as Core Enterprise Services.

022. Here we will provide an overview of such CESs in a BPIF context in terms of the way such services are categorized. A few examples of CESs in each category is also provided, but a complete set of well defined core services cannot be provided as it to a large extent will depend on the actual implementation of the BPIF.

023. Core services in a BPIF context are divided into two main categories according to their primary role in the implementation of business services and processes.

### **3.4.1. Basic Infrastructure Services**

024. The first main category of core services, here referred to as Basic Infrastructure Services (BIS), are used to support the infrastructure (BPIF) that support deployment, operation and management of business processes. BIS is further divided into three subcategories according to three of the main aspects of a BPIF.

- Service Selection BIS are concerned with the basic mechanisms for discovery and visibility of services. Typically this encompasses basic service directories with support for syntactic description and lookup of services.
- Management and operation BIS are concerned with various types of management and operation of services and infrastructure. There are at least four subcategories.
  - BIS handling policies, including required security level, conditions for service delivery, availability, quality of service undertakings etc.
  - Security BIS include basic functions for managing information security, and a typical example is a service that keeps track of role and person oriented authorization, distribution of keys, handling of certificates etc.
  - Service Management BIS handle life cycle management of other services, including for example monitoring and configuration.
  - Resource Management BIS are used to manage infrastructure resources and will be highly dependent on infrastructure implementation. A typical example is resource management in a Grid.
  - Network Management BIS are concerned with networking and communication aspects of the infrastructure, and involve for example router configuration.
- Process Composition BIS are concerned with support for business processes.

### **3.4.2. Business Service Enablers**

025. The second of the main core service categories is Business Service Enablers (BSE). While BIS services are concerned with the BPIF infrastructure per se, they are not used a foundation for implementation of business services. This is instead the role of BSE, which provide basic functionality that is shared by many business services independently of Community of Interest (COI).

026. BSE are divided into three main subcategories based on the types of functionality they offer.

- Collaboration BSE support basic exchange of data between services. Examples include message passing (uni- and multicast, email, etc.), distributed file sharing, publication (web pages etc.), and data format conversion.
- Synchronization BSE support synchronization of service and process interaction, and includes for example time services, and event notification.
- Common Information Services (CIS) is the third and last subcategory of BSE. CIS provide COI-independent support for access to general information like maps, glossaries, standards, and document registries.

027. Note: Not all functions in this category are necessarily service oriented in a SOA sense. They are nevertheless important for a network-oriented capability.

028. The third area of the technical services is the communication services. These services provide a transparent, seamless information exchange capability to allow a communication between the various information entities above.

### **3.4.3. List of COI Standards**

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
<b>Generic COI Services</b>				
Meteo				
Map View				
Map Mgmt				
Spatial Geography Visualisation				
<b>Specific COI Services</b>				

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
Communicate and Inform				
<i>Battlespace Mgmt</i>				
<i>Orbat Mgmt</i>				
<i>Overlay Mgmt</i>				
<i>Symbol Mgmt</i>				
<i>Tracking</i>				
		NFFI, STANAG 5527 (study)		<p>Until the development of STANAG 5527 is more stable, document AC/322(SC/5)N(2006)0025 should be used.</p> <p>For CCEB interoperability this standard is not applicable.</p>
<i>Synchronisation</i>				
<i>Distribution</i>				
<i>Notification</i>				
<i>Aggregation</i>				
Collaborate and Plan				
<i>Plan Workspace</i>				
<i>Plan Analysis</i>				
<i>Plan Briefing</i>				
<i>Plan Replay</i>				
<i>Plan Synchronisation</i>				
<i>Plan Collaboration</i>				
<i>Simulation</i>				

<b>SERVICECAT-EGORY / CAT-EGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
<i>Collaboration analysis</i>				
Sense and Respond				
<i>Tasking</i>				
<i>Plan Deviation Monitor</i>				
JCOP				
Logistics Svcs				
<i>Supply Chain Svcs</i>				
		OAGIS 9.0, OAGi		
		PLCS, ISO 10303-239:2005		
		S1000D issue 4, ASD		
	NATO Policy for Systems Life Cycle Mgmt (SLCM), C-M(2005)0108			SLCM is primarily based on AAP 48 and ISO/IEC 15288

**3.4.4. List of Information Integration Standards**

<b>SERVICECAT-EGORY / CAT-EGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
<b>Core Enterprise Services</b>				
Discovery				
<i>Service Discovery Services</i>				
	Universal Description, Discov-	UDDI v3.0, W3C		UDDI 2.0 provides a plat-

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	ery and Integration (UDDI) v2.0, W3C			form-independent way of describing- and discovering service. For CCEB interoperability UDDI 3.0 is mandatory
		Electronic Business Extensible Markup Language (ebXML) ISO/TS 15000-1:2004, -2:2004, -3:2004, -4:2004, -5:2005		ebXML is a suite of specifications for standardizing XML based business messages to facilitate trading between organisation.
		ebXML Messaging Service v. 2:2002 (OASIS)		
		Resource Description Framework (RDF) (W3C)		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
		Protocol and RDF Query Language (SPARQL) (W3C)		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
		DNS Service Discovery (DNS-SD) (ACT TIDE)		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
<i>Information Discovery Services</i>				



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		Web Ontology Language (OWL), W3C		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
<i>Repository</i>				
	NC3 Repository			Common repository for standard data elements and their related tool for the NATO Corporate Data Model for Data Administration. See also XML.  For CCEB interoperability this standard is partially applicable
<i>Metadata Registry Services</i>				
		NATO Metadata Registry and Repository (NMRR)		For CCEB interoperability this standard is not applicable.
<i>Enterprise Directory Services</i>				
		Common Directory Services and Procedures (ACP 133C)	ACP 133B	Contains schema.ACP 133B contains the upper layer protocol profile down to the requested Transport Service

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	LDAP v3 (IETF RFC 4510:2006, 4511:2006,4512:2006, 4513:2006)			LDAP is an IETF protocol and close to a functional subset of DAP. Many Web-browsers can act as LDAP clients, which is highly desirable.
	LDIF (IETF RFC 2849:2000)			LDIF defines a flexible and almost universally accepted means of exchanging directory information via flat files.
			DSP (ITU-T X.500:2005)	<p>DSP defines X.500 server to server communication, including chaining.</p> <p>For CCEB interoperability this standard is not applicable</p>
			DSIP (ITU-T X.500:2005)	<p>DISP defines X.500 based information shadowing/replication.</p> <p>For CCEB interoperability this standard is not applicable</p>
			DOP (ITU-T X.500:2005)	Contains operational management.

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				For CCEB interoperability this standard is not applicable
Mediation				
	SQL 3 (ISO/IEC 9075(-1 to -14):2008)		Full Level and ISO/IEC 9075:1999 canceled, new Version ISO/IEC 9075(-1 to -14):2008, Parts 1, 2 and 11 encompass the minimum requirements of the language. Other parts define extensions.	
	ODMG 3.0:2000 (ODMG)			
	ODBC 3.8 (MS)			
	JAVA DBC (JDBC)		JDBC separated from ODBC	
	SQL CLI (ISO/IEC 9075-3:2008)			
	DEM Data Replication Mechanism from STANAG 5525 ed. 1:2007			
			NATO Corporate Data Model v2 (ADatP-32)	For CCEB interoperability this standard is partially applicable

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	Spatial Schema ISO 19107:2003, DGI-WG/TSMAD profiles of ISO 19107			<p>ISO 19107 provides conceptual schemas for describing and manipulating the spatial characteristics of geographic features.</p> <p>The DGI-WG/TSMAD profiles are intended to define sub-schemas of ISO 19107 to be used for defining data interchange formats.</p> <p>For CCEB interoperability this standard is emerging</p>
	Rules for application schema ISO 19109:2005			<p>ISO 19109 defines rules for creating and documenting application schemas, including the principles for the definition of features. Required for Geo to ensure consistency of use in the definition and use of the geographic features.</p>

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				For CCEB interoperability this standard is emerging
	Methodology for feature cataloguing ISO 19110:2005			<p>ISO 19110 defines the methodology for cataloguing feature types and specifies how the classification of feature types is organized into a feature catalogue and presented to the user of a set of geographic data.</p> <p>For CCEB interoperability this standard is emerging</p>
	Spatial Referencing by geographic identifiers ISO 19112:2003			<p>ISO 19112 defines the conceptual schema for spatial references based on geographic identifiers. This standard enables gazetteers to be constructed in a consistent manner.</p> <p>For CCEB interoperability this standard is emerging</p>

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	Simple Feature Access, ISO 19125-1:2004 and ISO 19125-2:2004			<p>ISO 19125-1 establishes a common architecture for geographic information (simple feature profile of ISO 19107) and defines terms to use within the architecture. It also standardizes names and geometric definitions for Types for Geometry.</p> <p>ISO 19125-2 specifies and SQL schema that support storage, retrieval, query and update of simple geospatial feature collections via the SQL Call Level Interface (SQL/CLI) and establishes and architecture for the implementation of feature tables.</p> <p>For CCEB interoperability this standard is emerging</p>
	Joint C3 Information Exchange Data Model (JC3IEDM,	Joint C3 Information Exchange Data Model (JC3IEDM,	C2IEDM replaced by JC3IEDM	replaced by C2IEDM re- by JC3IEDM.

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	STANAG 5525 ed.1:2007) for the Land environment	STANAG 5525 ed.1:2007) for the Joint, Maritime and Air environments		For CCEB JC3IEDM is mandatory for all environments.
	WebCGM (Web Computer Graphics Metafile), W3C REC 20011217, 2001		CGM (ISO/IEC 8632:1999) not for new systems	Primarily intended for vector-based images.
	SVG 1.2:2005 (W3C)			The preferred format to visualize maps in the Web browser.
	Mobile SVG Profiles: SVG Tiny and SVG Basic, W3C REC 20030114, 2003			SVG profiles for cellphones and PDAs
		NVG - NATO Vector Graphics Protocol, ACT		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
	JPEG 2000 (ISO/IEC 15444-1:2004, ISO/IEC 15444-2:2004, ISO/IEC 15444-3:2007, including Amd 2:2003, ISO/IEC 15444-4:2004, ISO/IEC 15444-5:2003, ISO/IEC 15444-6:2003,)			JPEG 2000 is the standard used to store raster data (imagery, scanned maps, matrix data) and provides the ability to include spatial referencing information within the standard.  For CCEB interoperability ISO/

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
				IEC 15444-2 Cor. 3 is not applicable.
		JPEG LS (ISO/IEC 14495:2003)		Loss-less and near loss-less compression of continuous tone still images.
			GIF (version 89a) not for new systems	Graphics Interchange Format is intended for the on-line transmission and interchange of raster graphic data.
	PNG 1.0 (RFC 2083:1997)			Portable Network Graphics PNG is intended for the compressed storage of raster images. PNG provides a patent-free replacement for GIF.
	Fax G.3, ITU-T T.4:2003			
	Fax Transmission, ITU-T T.30:2005			
	TDF (STANAG 5000 ed.3:2006)			For CCEB interoperability Secure Telephone Equipment (STE) is used for secure fax. The emerging standard is Secure Communication Interop-



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				erability Protocol (SCIP).
	ADatP-3, CONFOR-METS/Change 4 (STANAG 5500, ed.6:2007), Database Baseline 13.			For CCEB interoperability the standard is MIL-STD 6040 and OTH-T GOLD standards  baseline 14 is actually under construction
	APP-11(B)/STANAG 7149 ed.3:2008 NATO Message Catalogue	APP-11(C)/STANAG 7149 ed.4		APP-11 (STANAG 7149) as the single source for NATO Military Messages for command and control of NATO forces at all levels of the Chain of Command down to and including individual units.  For CCEB interoperability this standard is not applicable
	EDIFACT (ISO 9735:2002)			EDIFACT can be used to transfer business documents such as purchase orders, invoices, and electronic funds transfer informa-

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
				tion. ebXML is a UN standard
	DIGEST V2.0 and DIGEST V2.1, STANAG 7074 ed.2:1998, AgeoP-3 (VMaps, USRP, ASRP)			<p>Source data may be provided in this format for conversion to the neutral database format by the CWS.</p> <p>Note: DGIWG is in the process of restructuring DIGEST based on the ISO 19*** standards. They are generating military specific profiles of the ISO standards. Of particular interest to the Core GIS project are profiles of: Spatial Schema (19107), General Feature Model (19109), Metadata (19115), Portrayal (19117), and FACC Data Dictionary (19126).</p> <p>For CCEB interoperability the mandatory standard is DGIWG Feature Data Directory 2006 and</p>

SERVICECAT- EGORY / CAT- EGORY / SUB- CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				DIGEST v2.1 is fading.
			GML v3.2 (ISO 19136:2007)	<p>This OpenGIS Consortium recommendation standard may be used as the transfer format between the FA providing the published operational data (e.g. COP) and the Core Map Application Server.</p> <p>For CCEB interoperability GML 3.1 is emerging</p>
	DLMS/DTED (STANAG 3809 ed.4:2006)			Digital Terrain Elevation Exchange Format
	DLMS/DFAD1			<p>DLMS/DFAD1 must be used until DIGEST/VMAP 1 covers the whole world.</p> <p>For CCEB interoperability this standard is not applicable</p>
	World Geodetic System (WGS) 84			WGS specifies the set of parameters that define mathematically the shape of the earth

<b>SERVICECAT- EGORY / CAT- EGORY / SUB- CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	Geographic Information - Metadata - ISO 19115:2003			<p>This provides the most comprehensive metadata specification for digital geographic data. This shall be used for the geo metadata which forms the foundation of the Core Geo Catalogue. It is likely that a NATO profile of this standard will have to be produced based on the DGIWG profile.</p> <p>For CCEB interoperability this standard is emerging.</p>
	WECDIS (STANAG 4564 ed.2:2007)			Standard for Warship Electronic Chart Display and Information Systems.
	SEDRIS (ISO/IEC 18023-1:2006)			Environmental data representation and interchange specification
	EDCS (ISO/IEC 18025:2005)			Environmental data coding specification
	SRM (ISO/IEC 18026:2009)			Spatial reference model

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	Geodetic Projections, STANAG 2211 ed.6:2001			
	Additional military Layers for digital geospatial data products (AML), STANAG 7170 ed.1:2003			
				For CCEB interoperability the mandatory standard is MIL-STD 2525B COMMON WARFIGHTING SYMBOLOGY and the emerging standard is MIL-STD 2525C
	Joint Symbology (APP-6(B)/STANAG 2019 ed.5:2008)			For CCEB interoperability this standard is not applicable.
		Portrayal ISO/DIS 19117:2005		Currently in Draft. International Standard specifies the interface to standard symbol sets, not the symbols themselves.
	Symbols on Land Maps, Aeronautical Charts and special Naval			

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	Charts (STANAG 3675 ed.2:2000)			
	IHO S-57, Version 3.1, 2000	IHO S-57, Version 4.0		<p>Standard defined by IHO for digital maritime information. Currently in harmonisation with DIGEST. Access to S-57 data may be required by maritime users.</p> <p>S-57, Version 4.0 should support a greater variety of hydrographic-related digital data sources, products and customers.</p> <p>For CCEB interoperability IHO S-52, S-57, S-61 and S-63 standards are mandatory.</p>
	Web Map Service v.1.3 (OGC 04-024)	ISO 19128:2005 Web Map Service		Used as a means of distributing compiled mapping data between applications.
	Web Feature Service v.1.1 (OGC 04-094)			Used as a means of distributing geo feature (vector) data between applications.

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				For CCEB interoperability this standard is emerging
	Web Coverage Service v.1.0 (OGC 03-065r6)			Used as a means of distributing geo coverages (raster) data between applications.  For CCEB interoperability this standard is emerging
		GML in JPEG 2000 for Geographic Imagery (GMLJP2) (OGC 05-047r)		This evolving OGC standard describes minimally required GML definition for georeferencing images and gives guidelines for augmenting that definition to address the additional encoding of metadata, features, annotations, styles, coordinate reference systems, and units of measure for data encoded in JP2K
		OGC Web Terrain Service and OGC Web3DService		Used as a means to perform Web Service based Terrain analysis

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				and communicate terrain data to clients
		OGC - ISO 19115:2003/ ISO 19119:2005 Application Profile for CSW 2.0		Describes the organisation and implementation of Catalogue Services based on the ISO 19115 / ISO 19119 Application Profile
		Web Registry Service v.0.0.2 (OGC Ref. 01-024r1)		Used as a means of publishing and finding geo services.
		Catalog Interface v.1.1.1 (OGC Ref. 02-087r3 )		Used as a means of discovering geo metadata.
			Computer Graphics Interface (CGI ISO/IEC 9636:1991)	For CCEB interoperability this standard is not applicable
	OpenGL v2.0:2004		OpenGL v1.5:2003	For CCEB interoperability this standard is not applicable
	Unified Modeling Language (UML) v2.0:2003 (OMG)			For CCEB interoperability this standard is not applicable
	Codes for the representation of Currencies and Funds (ISO 4217:2008)			
	Letters for Geographic Entities,	Letters for Geographic Entities,		For CCEB interoperability the country codes



<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	STANAG 1059, ed.8:2004	STANAG 1059, ed.9		standard is ISO 3166 trigraphs except for military messaging - see CCEB COMAG Policy On Security Labelling
	ECMA Script Language Specification (ECMA 262)			Scripting required for enhanced Web pages  For CCEB interoperability this standard is not applicable
	Zip			Implementations of zip (e.g. Winzip) also includes gzip (RFC 1952:1996) and tar/compress
			7-bit Coded Character-set for Info Exchange (ASCII) (ISO/IEC 646:1991)	
			8-bit Single-Byte Coded Graphic Char Sets (ISO/IEC 8859-1-6,8-10:1999; 7:2003)	
	Universal Multiple Octet Coded Char Set (UCS) - Part 1 (ISO/IEC 10646:2003)			

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	NATO Standard Bar Code Symbolology (STANAG 4329 ed.2:2004)	NATO Standard Bar Code Symbolology (STANAG 4329 ed.3)		STANAG 4329 is a cover STANAG of ISO 16388:1999 - Bar code symbolology specifications - Code 39.
	Bar code symbolology specification - Code 128 (ISO/IEC 15417:2007), Bar code print quality test specification -Linear symbols (ISO/IEC 15416:2000)			
	Representation of Dates and Times (ISO 8601:2004)			
	UUENCODE (UNIX 98), MIME (IETF RFC 2045:1996 updated by 2184:1997, 2231:1997, 5335:2008; 2046:1996 updated by 3676:2004, 3798:2004, 5147:2008; 2047:1996 updated by 2184:1997, 2231:1997, 5338:2008; 4288:2005,	S/MIME (IETF RFC 3850:2004, 3851:2004) ESS (RFC 2045:1996)		Base64 is included in RFC 2045:1996

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	4289:2005; 2049:1996)			
<i>Composition Services</i>				
<i>Translation Services</i>				
Interaction				
<i>Messaging Services</i>				
	Military Messaging (STANAG 4406 Ed.2)		Use of PCT within STANAG 4406 is fading	Used for Formal Messaging. STANAG 4406 contains the upper layer protocol profile down to the requested Transport Service.  For CCEB interoperability the mandatory standard is ACP123A.
	Enhanced Security Services (ESS) for S/MIME, STANAG 4631 Ed.1			STANAG 4631 contains an additional S/MIME profile for MMM-HS (in addition to PCT)  For CCEB interoperability the mandatory standard is ACP123A.
			X.400:1993 deleted for informal messaging, as no concrete require-	

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
			ment from MMH-SWG	
			Interoperability of telebriefing systems (STANAG 5059) deleted	
			Interoperability standards for telebriefing systems (STANAG 4339) deleted	
	SMTP (IETF RFCs 1870:1995, 1985:1996, 2034:1996, 2920:2000, 3207:2002, 3461:2003 updated by 3798:2004, 3885:2004, 4954:2007, 5321:2008)			Used for interpersonal messaging (email)
	POP3 (IETF RFC 1939:1996 updated by 1957:1996, 2449:1998)			For CCEB interoperability this standard is not applicable
	IMAP4 (IETF RFC 3501:2003 updated by 4466:2006, 4469:2006, 4551:2006, 5032:2007, 5182:2008)			For CCEB interoperability this standard is not applicable

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		Interim Implementation Guide for ACP 123/STANAG 4406 Messaging Services between Nations (ACP 145)		Provides gateway between ACP 123A messaging services.  For CCEB interoperability this standard is mandatory
<i>Publish/Subscribe Services</i>				
<i>Transaction Services</i>				
<i>Collaboration Services</i>				
		XMPP (IETF RFC 3920:2004 - 3923:2004)		For CCEB interoperability this standard is mandatory
	Packet-based Multimedia Comms System (ITU-T H.323:2006)			
		Session Initialisation Protocol (SIP) (IETF RFC 3261:2002)		
	Multinational Videoconferencing Services (ACP 220:2003)			
	Narrow-band visual telephone systems and terminal equipm-			

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	ment (ITU-T H.320:2004)			
	Media Gateway Control Protocol v3(ITU-T H.248.1:2005)			Protocol for managing the multimedia gateways between circuit switched and packet switched networks.
	ITU Multi-point still image and Annotation Conference Protocol Spec (ITU-T T.120:2007), T.126:2007 (Reference to T.122 - T.125)			
	Data Protocols for Multimedia Conferencing (ITU-T T.120:2007, T.128:2008)			
Infrastructure				
		Distributed Computing Environment (DCE) v1.1:1997 (OSF)		
		Open Network Computing (ONC) 1.1 (The Open Group)		
		DCE RPC v1.1 (The Open Group)		

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
		Remote Procedure Call (MS-RPC) (MS)		As part of MS Windows 2000 Interfaces
	X Window (see UI Svc)			
		DCE DFS v1.1		
		X/Open Network File System (XNFS) 3W (The Open Group)		Includes RFC 1094:1989 (NFS 89) and RFC 1813:1995 (NFS95)
		Server Message Block (MS-SMB) (MS)		As part of MS Windows 2000
		DCE DTS v1.1		DCE DTS uses TPI (Time Provider Interface) to access other distributed time services (such as NTP as mentioned under Comms Service).
		CORBA/IIOP 2.2		
			MS-DCOM	As part of MS Windows 2000 Interfaces; DCOM only in local environment, not for outside.
	Standardised Information technology Protocols for Distributed Interactive Simulation (DIS)		STANAG 4482 should be migrated to IEEE Std 1278:1998	For CCEB interoperability the mandatory standard is IEEE Std 1278.1a:1998

<b>SERVICECAT- EGORY / CAT- EGORY / SUB- CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	(STANAG 4482 ed.1:1995)			STANAG 4482 should also be mi- grated to IEEE Std 1278:1998
		Modeling and Simulation High Level Architec- ture (HLA) (IEEE 1516:2000)		For CCEB in- teroperability this standard is man- datory
<i>Application Ser- vices</i>				
	FTP (IETF STD 9:1985,IETF RFC 0959:1985 updated by RFC 2228:1997, 2640:1999, 2773:2000, 3659:2007)			
		FTP Extensions for IPv6 and NATs (IETF RFC 2428:1998)		
	Telnet (IETF STD 8:1983, IETF RFC 0854:1983 up- dated by RFC 5198:2008, 0855:1983)			
	Network News Transfer Protocol NNTP (IETF RFC 3977:2006)			
	Network Time Protocol (NTP) (RFC 1305:1992)			



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
			MPEG-1 (ISO/IEC 11172:1993)	
	MPEG-2 (ISO/IEC 13818:2000)			
	MPEG-4 (ISO/IEC 14496:2004)			Encoding standard for video conferencing
	Compact Disc File System (CDFS) (ISO 9660:1988)			For physical media distribution (CD)
	Pulse Code Modulation (PCM) (ISO/IEC 11172-3:1993, ITU-T G.711:1988)			PCM used for audio in ISDN Systems
	Differential PCM (ITU-T G.726:1990)			
			Delta-Modulation DM, EUROCOM D/0	
	GSM-Modulation (GSM 06.10, GSM 06.20)			Used for mobile phones
		Voice Coding Algorithm (STANAG 4444 ed.1).		Used for HF voice communications as defined in STANAG 4444.
			Linear Predictive Coding-10 (STANAG 4198 ed.1:1984)	
	Code Excited Linear Prediction			CELP is used military aircraft

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	coding (CELP) (FS 1016:1991)			voice communications in narrow band UHF networks. CELP has higher throughput than LPC-10, but a lower range.
	Mixed Excitation Linear Predictive coding (MELPe) (STANAG 4591 Ed.1)			MELPe is used for HF voice communications in narrow band systems.
			STANAG 4421 deleted as it is cancelled by NATO	
	Parameters and Coding Standards for 800 bps. Digital Speech Encoder/Decoder (STANAG 4479 ed.1:2002)			For CCEB interoperability this standard is not applicable
	SIMPLE (STANAG 5602 ed.2)	SIMPLE (STANAG 5602 ed.3)		SIMPLE provides specifications to interconnect ground rigs of all types for TDL interoperability testing
	Nato Secondary Imagery Format (NSIF), STANAG 4545 ed 1.:1998			NSIF establishes the format for exchange of electronic secondary imagery
	BIIF (ISO 12087-5:1998)			

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	NSILI (STANAG 4559 ed.2:2007)			NSILI provides interoperability between NATO nations reconnaissance databases and product libraries
	NADS (STANAG 4575 ed.3:2009)			NADS defines an interface for advanced digital storage systems.
	GMTIF (STANAG 4607 ed.2:2007)			GMTIF defines a ground moving target indicator format.
	DMIS (STANAG 4609 ed.2:2007)			DMIS defines a digital motion imagery standard.  For CCEB interoperability this standard is not applicable.
	NPIF (STANAG 7023 ed.3:2004)	NPIF (STANAG 7023 ed.4)		NPIF establishes a standard data format and a standard transport architecture for the transfer of reconnaissance and surveillance imagery and associated auxiliary
	AR-TRI (STANAG 7024 ed.2:2001)			AR-TRI establishes the physical format for the exchange of mag-

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				netic tape cartridges
	Exchange of Imagery (STANAG 3764 ed.6:2008)			
	Implementing JPEG 2000 in NITFS/BIIF/NSIF (SC24 ISO Registered Profile)			This profile defines the limits of the international standard that can be used within NITF 2.1.
	Link-11 (STANAG 5511 ed.6:2008, M-Series)	Link-11 (STANAG 5511 ed.7, M-Series)		For further guidance refer to the Bi-SC Data Link Migration Strategy, November 2000.  For CCEB interoperability the standard is MIL-STD 6011C
	Link-16 (STANAG 5516 ed.4:2008, J-Series)	Link-16 (STANAG 5516 ed.5, J-Series)		For CCEB interoperability the mandatory standard is MIL-STD 6016C Change 1 and the emerging standard is MIL-STD 6016D
	Link-22 (STANAG 5522 ed.2:2008, J-Series)	Link-22 (STANAG 5522 ed.3, J-Series)		
			Link-14 (STANAG 5514 ed.2:2002)	The Link-14 is a legacy system that most NATO nations have no

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				intention to implement in new platforms other than interfacing data link buffers and have ceased to use or maintain. Therefore considered fading
	PDF-Format 1.4		Formets deleted in NCSP v.6	Portable document presentation format, realised in Adobe product versions 5 and 6. Used in Minerva system at NATO HQ  For CCEB interoperability the primary standard is Adobe Postscript (level I and II)/Encapsulated Postscript (EPS), and the secondary standard is Adobe PDF
	Rich Text Format (RTF)			Basic document interchange format
	ASCII Text, ISO 646:1991			For constrained environments
	UTF-8 (IETF RFC 3629:2003)			Universal Text Format
	Document Object Model (DOM) Level 3		Document Object Model (DOM) Level 2	Basic Document Object Model .

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	Office XP formats		Office 2000 formats: Office XP	Of- fice200-formats Not to be used for new systems.  Pertains to the in- terchange formats of MS Word, Ex- cel and Power- Point, irrespect- ive of the ac- tual MS Office version or gener- al office automa- tion package be- ing used.
	OpenDocument ISO/IEC 26300:2006			Formerly pub- lished as OASIS standard.
	HTML 4.01 (RFC 2854:2000)			
	XHTML 1.0:2002 (W3C)			XHTML is spe- cified in XML
	SGML (ISO 8879:1986)			For high value complex docu- ments
<i>Storage Services</i>				
<i>Web Services</i>				
	HTTP v. 1.1 (IETF RFC 2616:1999 up- dated by RFC 2817:2000), URL (RFC 4248:2005, 4266:2005), URI (RFC 3986:2005)			

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	HTTPS (IETF RFC 2818:2000)			
		Web Services Business Process Execution Language (WSBPEL) v.2:2007, OASIS		
		Web Service Choreography Interface (WSCI) v.1:2002		
		Business Process Management Language (BPML) v.0.4		
		Open Services Infrastructure (OpenSiS) v.1.9.5.6, OpenSIS		
		Java Enterprise Edition 1.4 Specification (J2EE 1.4), (JCP:2002)		
		Java Remote Method Invocation (JRMI), (JCP)		
		DSML v2.0:2001, OASIS		DSML provides a Directory Access via a Web interface
		NATO TIDE Information Discovery (Request-Response), ACT		Part of TIDE specification at ACT. For CCEB interoperability this

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				standard is not applicable.
		NATO TIDE Information Discovery (Subscribe-Publish), ACT		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
		WSDL v1.1:2001, W3C		For CCEB interoperability WSDL v1.1 is mandatory
	XML 1.0 2nd ed:2003, W3C	XML 1.0 3rd ed:2004, W3C		Where semantic tags are required, the NC3 Repository serves as an XML registry (see Data Management).
		XLink 1.0:2001, W3C		XLink is used to point to resources from XML documents.
		XPointer 1.0:2001, W3C		XPointer is used to identify XML fragment inside any given XML documents.
		Relax NG (ISO/IEC 19757-2:2008)		Relax NG may be a replacement for XML schema languages.
	XML Base:2001, W3C			
	XML Infoset:2001, W3C			



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	XSL Association:1999, W3C			
	Namespaces in XML (xml-names-19990114:1999)			
	Extensible Stylesheet Language Transformation (XSLT) 1.0:1999			
	Extensible Stylesheet Language (XSL) 1.0:2001			
	XML Schema, Part 0-2:2001			
	Wireless Markup Language (WML) 2.0:2001			WML to be used with Wireless Application Protocol (WAP) for constrained environments
		Efficient XML Interchange Format (EXI) v1.0		Efficient implementations of XML in the tactical environment
		XML Path Language (XPath) v2.0:2003, W3C		For CCEB interoperability this standard is mandatory
	WS-I Web Service Basic Profile, v1.1:2nd ed. 2006	WS-I Web Service Basic Profile, v1.2:3rd ed. 2007		For CCEB interoperability this profile is mandatory
	Simple Object Access Protocol	Simple Object Access Protocol		Could be used in support of the

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	v1.1 (SOAP), W3C	v1.2 (SOAP), W3C		Geo Web Services.
		WS-I Simple SOAP Binding Profile v1.0:2004		For CCEB interoperability this profile is mandatory
		WS-I Attachments Profile v1.0:2nd ed. 2006		For CCEB interoperability this profile is mandatory
<i>Device Independent Console</i>				
	X Window System 11 R6.6		X Window System 11 R5	<p>The R6.6 release addresses a portion of the backlog of bug reports since Release 6.5.1 patch 1, along with additional fixes from the Xfree86 community.</p> <p>R5 should not be used for future systems.</p> <p>For CCEB interoperability this standard is not applicable</p>
	Win 32 APIs			<p>As part of MS Windows 2000 Interfaces</p> <p>For CCEB interoperability this standard is not applicable</p>

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	CDE 2.1		CDE 1.0	<p>Common Desktop Environment is the UNIX Windows Desktop equivalent.</p> <p>For CCEB interoperability this standard is not applicable</p>
	Motif/CDE Style Guide Rev 2.1		Motif Style Guide Rev 1.2	<p>Toolkit specific style guides</p> <p>For CCEB interoperability this standard is not applicable</p>
	MS Windows Interface Guidelines for Software Design			<p>Toolkit specific style guides. As part of MS Windows 2000 Interfaces.</p> <p>For CCEB interoperability this standard is not applicable</p>
	Motif 2.1		Motif 1.2	<p>For CCEB interoperability this standard is not applicable</p>
			US DoD HCI Style Guide Version 4.0 Dec 2000 not for use in new systems	<p>For CCEB interoperability this standard is not applicable</p>
			UK Army CIS Style Guide V 2.0	<p>For CCEB interoperability this</p>

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			not for use in new systems	standard is not applicable
<i>Content Mgmt</i>				
		Semantics of Business Vocabulary and Business Rules, Vers. 1.0 (SBVR); OMG 2008		

### **3.4.5. List of Communications Standards**

<b>SERVICECAT- EGORY / CAT- EGORY / SUB- CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
<b>Network and Transport Ser- vices</b>				
	DNS (IETF STD 13:1987, RFC 1034:1987 and RFC 1035:1987 updated by RFC 1101:1989, 1183:1990, updated by 5395:2008; 1706:1994, 1876:1996, 1982:1996, 1995:1996, 1996:1996, 2136:1997, 2181:1997, updated by 5452:2009; 2308:1998, 2845:2000,			Bind version 9 or later should be used.

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	2931:2000, 3007:2000, 3226:2004, 3425:2002, 3597:2004, 3645:2003, 4033:2005, 4034:2005, 4035:2005, 4343:2006, 4470:2006, 4592:2006)			
		mDNS (IETF Draft draft-cheshire-dn-sext-multicastdns-06.txt)		Part of TIDE specification at ACT. For CCEB interoperability this standard is not applicable.
		IPSec Material in DNS (RFC 4025:2005)		
				NACOSA Operating Instructions A-03-06 deals with the TCP/IP environment and A-03-07 deals with the OSI environment. Both are due for rewrite.
	Assigned Numbers (RFC 3232:2002)			
	IPv4 (STD 5, RFC 791:1981, 792:1981, 894:1984, 919:1984,	IPv6 (RFC 1981:1996, 2375:1998, 2460:1998, 2464:1998,		Note: Category of RFC 2375:1998 is 'Informal'

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	922:1984, 950:1985 up- dated by RFC 1112:1989, 2474:1998, 2507:1999, 2508:1999, 3168:2001, 3260:2002, 3376:2002, 4604:2006, 4884:2007)	2467:1998, 2470:1998, 2491:1999, 2492:1999, 2497:1999, 2526:1999, 2529:1999, 2590:1999, 2710:1999 up- dated by 3590:2003, 2711:1999, 2894:2000, 3056:2001, 3111:2001, 3122:2001, 3146:2001, 3306:2002, 3307:2002, 3483:2003, 3510:2003, 3544:2003, 3587:2003, 3595:2003, 3697:2004, 3736:2004, 3810:2004, 3879:2004, 3956:2004, 4001:2005, 4007:2005, 4213:2005, 4291:2006, 4311:2005, 4338:2006, 4489:2006, 4443:2006, 4489:2006, 4604:2006, 4861:2007,		

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		4862:2007, 4884:2007, 4941:2007, 5095:2007, 5494:2009)		
		IGMP v.3 (RFC 3376:2002 updated by 4604:2006)		RFC 3367:2002 obsoleted 2236:1997 updates RFC 1112:1989 and is widely implemented, RFC 3376:2002 obsoleted RFC 2236:1997
	Host requirements (STD 3, IETF RFC 1122:1989 updated by 2474:1998, 2181:1997, 3168:2001, 3260:2002, 4033:2005, 4034:2005, 4035:2005, 4343:2006, 4379:2006, 4470:2009, 5452:2009, 5462:2009)			
			Bootstrap Protocol, BOOTP (RFC 951:1985 updated by RFC 1542:1993, 2132:1997, 3442:2002,	Will be overtaken by the richer DHCP. BOOTP is still available in older implementations and is ex-

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
			3942:2004, 4361:2006, 4833:2007, 5494:2009)	pected to phase out.
			Clarifications and Extensions for the Bootstrap Protocol (RFC 1542:1993)	
		DHCP for IPv6 (RFC 3315:2003 updated by 4361:2006, 5494:2009)	DHCP Options and BOOTP Vendor Extensions not to be used in new systems	
		Dual Stack IPv6 mobility support (RFC 5555:2009)		
		IPv6 Prefix Options for DHCPv6 (RFC 3633:2003)		
		DNS Configuration Options for DHCPv6 (RFC 3646:2003)		
		NIS-Options for DHCPv6 (RFC 3898:2004)		
	Dynamic Host Configuration Protocol, DHCP (RFC 2131:1997 updated by RFC 3396:2002, 4361:2006, 5494:2009)			
	Differentiated Services Field			DiffServ re-defines use of



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	(RFC 2474:1998 updated by 3168:2001, 3260:2002)			former TOS field; first, but not sufficient RFC to differentiate traffic classes. RFC for DiffServ still missing. Applicable to both IPv4 and IPv6
	Requirements for IPv4 routers (RFC 1812:1995 updated by 2644:1999)			
	Open Shortest Path First (OSPFv2) (RFC 2328:1998)	OSPF for IPv6 (RFC 5340:2008)		Suitable for LANs as well as WANs (including tactical networks) with sufficient bandwidth
	Router Internet Protocol (RIP v2) (IETF STD 56/RFC 2453:1998 updated by 4822:2007)	RIPng for IPv6 (RFC 2080:1997)		
	Border Gateway Protocol (BGP4) (RFC 4271:2006)	Multiprotocol Extensions for BGP-4 (RFC 4760:2007); Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing (RFC 2545:1999)		

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
		BGMP (RFC 3913:2004)		
	Application of BGP-4 (RFC 1772:1995)			
	Protocol Independent Multicast Sparse Mode(PIM-SM) (RFC 4601:2006, updated by 5059:2008)			PIM-SM is implemented by the router market leaders.
		Protocol Independent Multicasting Dense Mode(PIM-DM) (RFC 3973:2005)		PIM-DM is included as a second concept for tactical networks
		Generic Routing Encapsulation (GRE) (RFC 4023:2005, updated by 5332:2008)		GRE is included as a general routing encapsulation mechanism
	Traditional IP Network Address Translator (RFC 3022:2001)			
		Stateless IP/ICMP Translation Algorithm (SIIT) (RFC 2765:2000)		
		Generic Packet Tunneling in IPv6 (RFC 2473:1998)		This RFC is a generic tunnel mechanism, which can be applied for several protocols.

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	Router Internet Protocol (RIP v2) MIB extension (RFC 1724:1994)		To be used only in static networks.	To be used in static networks. See also System Management.
	Classless Inter Domain Routing (CIDR) (RFC 4632:2006)			CIDR is only valid for IPv4
	Mobile IPv4 (RFC 3344:2002 updated by 4721:2007)	Mobile IPv6 (RFC 3775:2004)		
		Mobile IPv6 Fast Handovers (RFC 5568:2009)		
		IPSec and Mobile IPv6 (RFC 3776:2004 updated by 4877:2007)		
		Policy-based Network Management - General (RFC 1104:1989, 2753:2000, 3198:2001, 3334:2002)		
		Policy-based Network Management - DiffServ (RFC 2963:2000, 2998:2000, 3086:2001, 3260:2002, 3287:2002, 3289:2002, 3290:2002,		

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		3308:2002, 3496:2003)		
		Policy-based Network Management - IntServ (RFC 2205:1997 updated by 2750:2000, 3936:2004, 4495:2006, 2206 - 2210:1997, 2380:1998, 2382:1998, 2430:1998, 2490:1999, 2745 - 2746:2000, 2747:2000 updated by 3097:2001, 2749:2000, 2750:2000, 2755:2000, 2814:2000, 2872:2000, 2961:2001, up-dated by 5063:2007; 2996:2000, 3097:2001, 3175:2001, up-dated by 5350:2008; 3181:2001, 3182:2001, 3209:2001 up-dated by 3936:2004, 4874:2007; 3210:2001, 3468:2003,		

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		3473:2003 updated by 4003:2005; 3474:2003, 3476:2003, 3477:2003 4201:2005, 4783:2006, 4873:2007, 4874:2007, 5250:2008, 5420:2009		
	Point to Point Protocol (PPP) Internet Protocol Control Protocol (IPCP) (RFC 1332:1992 updated by 3241:2002, 4815:2007)			To allow packet switched services over circuit switched interconnections.
	Link Control Protocol (LCP) extensions (RFC 1570:1994 updated by 2484:1999)			Addition to LLC1 (see Link Layer).
	Point to Point Protocol (PPP) (STD 51, RFC 1661:1994 updated by 2153:1997; 1662:1994, updated by 5342:2008)	IPv6 over PPP (RFC 5072:2007, 5172:2008)		
	PPP Challenge Handshake Authentication Pro-			Used in routers

<b>SERVICECAT- EGORY / CAT- EGORY / SUB- CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	toocol (CHAP) (RFC 1994:1996 updated by 2484:1999)			
	PPP Multilink (MP) (RFC 1990:1996)			Allows for ag- gregation of bandwidth via multiple simul- taneous data link connections
	Virtual Router Redundancy Pro- tocol (VRRP), IETF RFC 3768:2004			
	Winsock 2 (Revi- sion 2.2)			
			Transport Service (ISO 8072:1996)de- leted in NCSP v.6	
	TCP (IETF STD 7:1981, RFC 0793:1981 up- dated by RFC 1122:1989, 3168:2001)			
	UDP (IETF STD 6:1980, RFC 0768:1980)			
	OSI transport svc over TCP/IP (RFC 2126:1997)			Includes the ISO Transport Pro- tocol
Mixed DISA standards				

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
Data Link and Connection Service				
External Networks				
			X.25 (1996, Cor.1:1998)	
		Tactical Communications Post 2000, Draft STANAGs 4637ed1:2009, 4639ed1:2009, 4640ed1:2009, 4643ed1:2009 4644ed1:2009, 4645ed1:2009, 4646ed1:2009, 4647ed1:2009		
	ISDN: ITU-T G, I Series			ISDN Telephony
			ITU-T E, P, Q, V Series	
			ITU-T V.90:1998	
			ITU-T V.42:2002 Corrigendum 1:2003	
			User Network Interface - UNI v4.0 (af-sig-0061.000)	
			Private Network - Network Interface - PNNI v1 (af-pnni-0055.000)	
			LAN Emulation over ATM -	For CCEB interoperability this

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
			LANE v2.0 (af-lane-0084.000, af-lane-0112.000)	standard is not applicable.
	Standards for Data Forwarding between Tactical Data Systems employing Link-11/11B and Link-16 (STANAG 5616 ed.4:2008)	Standards for Data Forwarding between Tactical Data Systems employing Link-11/11B and Link-16 (STANAG 5616 ed.5)		Gateway between Link-11 and Link-16.  For CCEB interoperability the mandatory standard is MIL-STD 6020
	Link 11 STANAG 5511 ed.6:2008	Link 11 STANAG 5511 ed.7		Communications part for Link-11  For CCEB interoperability the standard is MIL-STD 6011C
	STANAG 4175 ed.3:2001	STANAG 4175 ed.4		Communications part for Link-16
	STANAG 7085 ed.2:2004 (IDL for Imaging Systems)			STANAG 7085 provides the interoperability standards for 3 classes of imagery DL used for primary imagery data transmission.
	STANAG 4586 ed.2:2007			STANAG 4586 facilitates communication between a UCS and different UAVs and their payloads as well as multiple C4I users.



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
Tactical Area Comms				
		Maritime Tactical Wide Area Networking		For CCEB interoperability the mandatory standard is ACP 200: Maritime Tactical Wide Area Networking
	Routing and Directory for tactical Systems, STANAG 4214 ed.2:2005			
		Gateway Multichannel Cable Link (Optical), STANAG 4290 ed.1 (RD)		
	Enhanced Digital Strategic Tactical Gateway (ED-STG) (STANAG 4578 ed. 2:2009)		STANAG 4249 replaced by the more fundamental STANAG 4206. STANAG 4206 not to be used for new systems.	STANAG is currently under review for a new edition. For CCEB interoperability this standard is not applicable.
	NATO Multichannel tactical digital Gateway (STANAG 4206: Ed.3:1999)			The overlapping area between STANAG 4206 and STANAG 4578 has to be resolved by SC/6.  For CCEB interoperability this standard is not applicable

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	The NATO Military Communications Directory System, STANAG 5046 ed.3			
		Interconnection of IPv4 Networks at Mission Secret and Unclassified Security Levels, STANAG 5067 ed.1 (RD)		
Transmission				
	FDDI, ISO 9314:1989			For CCEB interoperability this standard is not applicable.
		STANAG 4444 ed.1 (Slow hop ECCM)		HF standard for Link-22.  For CCEB interoperability this STANAG is mandatory.
		JREAP, MIL-STD 3011		
	ISO/IEC 8802-3:2000 (CSMA/CD)			
				For CCEB interoperability the mandatory standard is Interoperability and Performance Standard for SAT-

<b>SERVICECAT-EGORY / CAT-EGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
				COM (MIL-STD 188-164).
				For CCEB interoperability the mandatory standard is MIL-STD-188-181B
				For CCEB interoperability the mandatory standard is Interoperability Standard for 5-Khz UHF DAMA Terminal Waveform MIL-STD-188-182A
				For CCEB interoperability the mandatory standard is DoD Interface Standard, Interoperability of UHF MILSAT-COM DAMA Control System MIL-STD-188-185
				For CCEB interoperability the mandatory standard is Interoperability and Performance Standards for C-Band, X-Band, and Ku-Band SHF Satellite Communications Earth Terminals, 13

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				Jan 1995 MIL-STD-188-164
				For CCEB interoperability the mandatory standard is Interoperability and Performance Standards for SHF Satellite Communications PSK Modems (Frequency Division Multiple Access (FDMA) Operations), 13 January 1995, with Notice of Change 1, 9 September 1998, MIL-STD-188-165
		ECM-resistant digital traffic exchange between tactical satellite communications terminals (STANAG 4271 ed.1)		For CCEB interoperability this standard is not applicable
	ACP 190 (B)			
	ACP 190 (B) NATO Suppl 1A			Spectrum Supportability Request/Comment is a two-way commitment between the (host)nation owning the system and each nation

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				<p>hosting the system:</p> <ul style="list-style-type: none"> <li>- it is a prerequisite for the procuring nation/agency to operate SDEs in a host nation.</li> <li>- host nations granting support to a SDE is expected to assign frequencies when requested.</li> </ul> <p>Failure to follow this process will have very negative long-term impacts:</p> <ul style="list-style-type: none"> <li>- an ever growing risk of interference between own systems.</li> <li>- the ever-increasing pressure from the commercial sector: having an accurate view of military use of spectrum is an essential precondition to be able to defend it against civil encroachment.</li> </ul>

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
				For CCEB interoperability this standard is not applicable.
	ACP 190 (B) NATO Suppl 2			For CCEB interoperability this standard is not applicable
	SMADEF XML Rel.1.2.2	SMADEF XML Rel.1.2.3		For CCEB interoperability Rel.1.2.3 is mandatory
				For CCEB interoperability the mandatory standard is Equipment Technical Design Standards for Common Long Haul/Tactical Radio Communications in the LF Band and Lower Frequency Bands MIL STD 188-140A
				For CCEB interoperability the mandatory standard is Digital Line-of-Sight (LOS) Microwave Radio Equipment, 7 May 1987 MIL STD 188-145

<b>SERVICECAT-EGORY / CAT-EGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	MIDS terminals STANAG 4175 ed. 3:2001	MIDS terminals STANAG 4175 ed. 4		
			Single serial line interface (RS-232)	
			Multi-point seri- al line (RS-422/ RS-423)	
	Serial binary data exchange at DTE and DCE (RS-530)			
	Generic specific- ation for optical wave-guide fibers (EIA 4920000: 1997)			
VLF				
	VLF and LF Broadcast OOK Systems, STANAG 5030ed.4			
HF				
	Conditions for in- teroperability of 2400 BPS / HF (STANAG 4197 ed.1:1984)			(QSTAG 1108)
	Technical stand- ards for single channel HF ra- dio equipment, STANAG 4203 ed.3:2007			For CCEB in- teroperability the mandatory stand- ard is MIL STD 188-141A

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	Characteristics of 1200/2400/ 3600 bps single tone modulators/demodulators for HF Radio links (STANAG 4285 ed.1:1989)			For CCEB interoperability the mandatory standard is MIL-STD-188-110A
	Non-Hopping Serial TONE HF Radio, STANAG 4415 ed.1:1999			
		HF Radios STANAG 4444 ed.1		
	Minimum Standards for Naval Shore-to-Ship Broadcast Systems, STANAG 4481 ed.1			
	Automatic Radio Control System for HF Links STANAG 4538 ed.1:2009			
	Non-hopping HF Communications Waveforms STANAG 4539 ed.1:2006			
	Profile for HF radio data communications (STANAG 5066 ed.2:2008)			
VHF				



SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	Technical standards for single channel VHF radio equipment STANAG 4204 ed.3:2008			For CCEB interoperability the mandatory standard is MIL STD 188-242
	Communication between Single Channel and Frequency Hopping Radios in VHF, STANAG 4292 ed.2:1987			
	Non-secure Voice Interoperability for VHF Radios, STANAG 4448 ed.1:2006			
	Secure Voice and Data Interface for VHF Radios, STANAG 4449 ed.1:2006			
UHF				
	Technical standards for single channel UHF radio equipment STANAG 4205 ed.3:2005			For CCEB interoperability the mandatory standard is MIL STD 188-243
			UHF Radios STANAG 4246 ed.2:1987	For CCEB interoperability this standard is not applicable
	STANAG 4372 ed.3:2008 (Saturn)			UHF standard for Link-22, but can also carry Link-11 and

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
				Link-16 messages.
UHF SATCOM				
	Interoperability Standard for 25 kHz UHF/TDMA/DAMA terminal Waveform STANAG 4231 ed.4:2004			STANAG 4231 ed.4 is identical with MILSTD-188-183B.  For CCEB interoperability the mandatory standard is MILSTD-188-183D
				For CCEB interoperability the mandatory standard is Interoperability and Performance Standard for the Data Control Waveform MILSTD-188-184
		UHF MILSATCOM interoperability standards for paging receiver (Draft) (STANAG 4492 ed. 1)		For CCEB interoperability this standard is not applicable
SHF SATCOM				
	Super High Frequency (SHF) Military Satellite (MILSATCOM) jam-resistant modem			For CCEB interoperability this standard is not applicable

<b>SERVICECATEGORY / CATEGORY / SUB-CATEGORY</b>	<b>MANDATORY STANDARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
	(STANAG 4376 ed.1:1998)			
	Overall Super High Frequency (SHF) Military Satellite Communications (MILSATCOM) interoperability standards (STANAG 4484 ed.2:2003)			For CCEB interoperability this standard is not applicable
	SHF MILSATCOM Non-EPM modem for services conforming to class-A of STANAG 4484 (STANAG 4485 ed.1:2002)			For CCEB interoperability this standard is not applicable
	Super High Frequency (SHF) Military Satellite Communications (MILSATCOM) Frequency Division Multiple Access (FDMA) Non-EPM modem for services conforming to class-B of STANAG 4484 (STANAG 4486 ed.2:2002)			For CCEB interoperability this standard is not applicable
	Super High Frequency (SHF) Medium Data Rate (MDR)	Super High Frequency (SHF) Medium Data Rate (MDR)		For CCEB interoperability this standard is not applicable

SERVICECATEGORY / CATEGORY / SUB-CATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
	Military Satellite COMMunications (MILSATCOM) jam-resistant modem interoperability standards (STANAG 4606 ed.1:2009)	Military Satellite COMMunications (MILSATCOM) jam-resistant modem interoperability standards (STANAG 4606 ed.2)		
		Interoperability standard for Satellite Broadcast Services (SBS) (Draft) (STANAG 4622 ed.1 RD2)		For CCEB interoperability this standard is not applicable
EHF SATCOM				
	Digital interoperability between EHF Tactical Satellite Communications Terminals (STANAG 4233 ed.1:1998)			For CCEB interoperability the mandatory standard is MIL-STD-1582D
	EHF MIL SATCOM interoperability standards for medium data rate services STANAG 4522 ed.1:2006			For CCEB interoperability the mandatory standard is MIL-STD-188-136
QoS				
			DoD Guide to selecting computerbased multimedia standards, technologies, products and	

SERVICECATEGORY / CATEGORY / SUBCATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
			practices deleted in NCSP v.6	

### **3.5. INFORMATION ASSURANCE**

#### **3.5.1. List of Standards**

SUBAREA / SERVICE CATEGORY	CATEGORY / SUBCATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		Common Criteria (ISO/IEC 15408-1to-3:2005)			Procedural document dealing with the evaluation criteria for IT security.
		Physical characteristics (ISO/IEC 7810:2003)			
		Integrated circuit(s) with electrical contacts (ISO/IEC 7816:2006)			
		Interface between the card aware applications and cards, PC/SC Specs. 1.0			
		Card-resistance applications, JAVACard			
		Contactless cards (ISO/			

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
		IEC 14443:2008)			
SMI Service					
			Security Assertion Markup Language, SAML v1.1 (OASIS)		For CCEB interoperability the Security Assertion Markup Language (SAML) v1.1 is mandatory and SAML 2.0 is emerging
			XKMS (W3C)		
					See General Security Key Management and Distribution.  For CCEB interoperability the mandatory standard is ACP145 (Gateway-to-Gateway Messaging Protocols) and X.500 (based on CMI authentication framework)
Confidentiality					
		S/MIME with Encrypted Security Service (ESS) (IETF RFCs		ACP120 replaced by ACP145	Messaging System independent encapsulation syntax supporting signa-

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
		3850:2004, 3851:2004)			<p>ture and confidentiality functions based on DSA.</p> <p>For CCEB interoperability the standard is S/MIME Version 3 ESS, application layer data confidentiality or link level encryption</p>
		Military Mes-saging (STANAG 4406 Ed.2)		ACP120 replaced by ACP145	<p>This includes PCT (protected content type). PCT may be used for protection of data objects in systems.</p> <p>For CCEB interoperability the mandatory standard is ACP145 (Gateway-to-Gateway Messaging Protocols)</p>
			ITU-T X.411:1999		
Encryption					
		TLS v1.2 (IETF RFC 5246:2008)		SSL excluded in NCSP v.6	Used as a transport layer security protocol.
			XML Encryp-tion (W3C)		

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
		Key Wrap Ad- vanced En- cryption Standard 128 (AES 128, NIST FIPS 197)	Key Wrap Ad- vanced En- cryption Standard 256 (AES 256, NIST FIPS 197)		<p>PKI compon- ents and applic- ations should utilise AES for key wrap func- tions.</p> <p>AES 256 should be utilized post 2008 for Root CA and Sub CA PKI compon- ents together with SHA-384 and 512. End entities can still utilize AES 128 together with SHA-256.</p> <p>For CCEB in- teroperability the AES stand- ard is emerging.</p>
Integrity					
		IP ESP (RFC 2406:1998)			Encapsulating Security Pay- load (ESP) may support integ- rity and authen- tication depend- ing on the use of algorithms
		Digital Sig- nature Al- gorithm 1024 (DSA-1024, NIST FIPS 186-2 with	Elliptic Curve Digital Signa- ture Algorithm (ECDSA 384, NIST FIPS 186-2 with	Digital Signature Algorithm (original version)	Authentication and integrity algorithm for End Entities as mandated by the interoper-



SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
		Change Notice 1, Oct 2001)	Change Notice 1, Oct 2001)	not for new systems	<p>ability protocol PCT for implementing digital signatures for a NATO Public Key Infrastructure (PKI) in the NATO messaging system. ECDSA 384 is planned for post 2008. Guidance is provided in AC/322-D(2004)0035.</p> <p>For CCEB interoperability the Digital Signature Algorithm (DSA) NIST FIPS 186-2 is mandatory. DSA FIPS 186-2 can be used in NATO for verification purposes only.</p>
		RSA 2048 (PKCS#1 v2.1 RSA Cryptography Standard, RSA Laboratories, June 2002)	Elliptic Curve Digital Signature Algorithm (ECDSA 384, NIST FIPS 186-2 with Change Notice 1, Oct 2001)		Authentication and integrity algorithm for Sub CA and other PKI components (such as Key Recovery Agents) as mandated by the interoperability protocol

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
					<p>PCT for implementing digital signatures for a NATO Public Key Infrastructure (PKI) in the NATO messaging system. ECDSA 384 is planned for post 2008. Guidance is provided in AC/322-D(2004)0035.</p> <p>For CCEB interoperability the Digital Signature Algorithm (DSA) NIST FIPS 186-2 is mandatory.</p>
		<p>Secure Hash Algorithm 256 (SHA-256, NIST FIPS 180-2 with Change Notice 1, Feb 2004)</p>	<p>Secure Hash Algorithm 384 (SHA-384, NIST FIPS 180-2 with Change Notice 1, Feb 2004)</p>	<p>Secure Hash Algorithm (SHA-1), NIST FIPS 180-1 replaced by SHA-256</p>	<p>Hash algorithm to accompany the DSA and RSA for use in NMS. SHA-384 is planned for post 2008. Guidance is provided in AC/322-D(2004)0035.</p> <p>For CCEB interoperability the standard is SHA-1, NIST FIPS 180-1</p>

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
					is mandatory. SHA-1 can be used in NATO for verification purposes only.
Authentication					
		Radius, IETF RFC 2865:2000 updated by RFC 2868:2000, 3575:2003, 5080:2007	Radius and IPv6, IETF RFC 3162:2001		
			Single sign on (SSO, the Open Group)		
		Dir Authentication Framework (ITU-T X.509 v3, ISO 9594:2001)			
		Identification of Issuers (ISO 7812:2007)			
			XML Signature (W3C)		
			XACML v2.0 (OASIS)		
Detection					
Transsec					

### **3.6. SERVICE MANAGEMENT AND CONTROL**

<b>SUBAREA / SERVICE CATEGORY</b>	<b>CAT-EGORY / SUBCAT-EGORY</b>	<b>MANDAT-ORY STAND-ARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
Mgmt Info Publisher					
Mgmt Info Subscriber					
Mgmt Info Collector					
Mgmt Info Provider					
Asset Mgmt					
User Mgmt					
System Mgmt					
		SNMPv3 Applications (IETF RFC 3413:2002)		SNMPv1 (IETF Std 15) not for new systems	SNMPv3 is considered emerging because of current lack of agreement on the concept of operations for distributed management  For CCEB interoperability this standard is not applicable
		Message Processing and Dispatching for the SNMP (RFC 3412:2002 updated by 5590:2009)			For CCEB interoperability this standard is not applicable
		User-based Security Model			For CCEB interoperability

SUBAREA / SERVICE CATEGORY	CATEGORY / SUBCATEGORY	MANDATORY STANDARDS	EMERGING NEAR TERM	FADING	Remarks
		(USM) for SNMPv3 (RFC 3414:2002 updated by 5590:2009)			this standard is not applicable
		View-based Access Control Model (VACM) for the SNMP (RFC 3415:2002)			For CCEB interoperability this standard is not applicable
		Structure of Mgt Info (IETF Std 16:1990, IETF RFC 1155:1990 and 1212:1991)			For CCEB interoperability this standard is not applicable
		Architecture for SNMP Mgt Frameworks (RFC 3411:2002 updated by 5343:2008, 5590:2009)			For CCEB interoperability this standard is not applicable
		MIB II (IETF Std 17:1991, RFC 1213:1991 updated by 4293:2006, 4022:2005, 4113:2005)			For CCEB interoperability this standard is not applicable
			IPv6 MIB (IETF RFC 4293:2006)		For CCEB interoperability

<b>SUBAREA / SERVICE CATEGORY</b>	<b>CAT-EGORY / SUBCAT-EGORY</b>	<b>MANDAT-ORY STAND-ARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
					this standard is not applicable
			ICMPv6 MIB (IETF RFC 4293:2006)		For CCEB interoperability this standard is not applicable
			Multicast Group Membership Discovery MIB (IETF RFC 5519:2009)		For CCEB interoperability this standard is not applicable
			IPv6 MIB for TCP (IETF RFC 4022:2005)		For CCEB interoperability this standard is not applicable
			IPv6 MIB for UDP (IETF RFC 4113:2005)		For CCEB interoperability this standard is not applicable
		Host Resources MIB (IETF RFC 2790:2000)			For CCEB interoperability this standard is not applicable
		Defs of Mgt Objects for the Ethernet-like Interface types (IETF RFC 2666:1999, 3635:2003, 3638:2003)			For CCEB interoperability this standard is not applicable
		RMON MIB v. 1 (RFC 2819:2000)	RMON 2 MIB (RFC 4502:2006)		For CCEB interoperability this standard is not applicable

SUBAREA / SERVICE CATEGORY	CAT-EGORY / SUBCAT-EGORY	MANDAT-ORY STAND-ARDS	EMERGING NEAR TERM	FADING	Remarks
		OSPF MIB v.2 (RFC 4750:1995)			For CCEB interoperability this standard is not applicable
		RIP-2 MIB (RFC 1724:1994)			For CCEB interoperability this standard is not applicable
					In addition same standards as within LAN Management for SNMP can be used Quad C used for management of coalition WANs
			Common Information Model (CIM)	CMIS (ISO 9595:1998) deleted in NISP v.1	For CCEB interoperability this standard is not applicable
				CMIP (ISO/IEC 9596-1:1998) deleted in NISP v.1	Primarily used for Telecom Management
				CMIP PICS (ISO/IEC 9596-2:1993) deleted in NISP v.1	
				GDMO (ISO/IEC 10165-4:1992)	

<b>SUBAREA / SERVICE CATEGORY</b>	<b>CAT-EGORY / SUBCAT-EGORY</b>	<b>MANDAT-ORY STAND-ARDS</b>	<b>EMERGING NEAR TERM</b>	<b>FADING</b>	<b>Remarks</b>
				deleted in NISP v.1	



## **4. INTEROPERABILITY PROFILES**

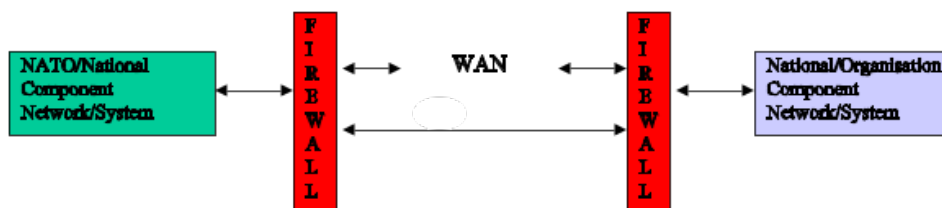
### **4.1. MINIMUM INTEROPERABILITY PROFILE**

029. NATO, through its interoperability directive, has recognised that widespread interoperability is a key component in achieving effective and efficient operations. In many of the operations world-wide in which NATO nations are engaged, they participate together with a wide variety of other organisations on the ground. Such organisations include coalition partners from non-NATO nations, Non-Governmental Organisation (NGOs - e.g. Aid Agencies) and industrial partners. It is clear that the overall military and humanitarian objectives of an operation could usefully be supported if a basic level of system interoperability existed to enhanced the exchange of information.

030. To support the goal of widespread interoperability this section defines a minimum profile of services and standards that are sufficient to provide a useful level of interoperability. This profile uses only those services and standards that are already part of the NISP, however it presents them as a simple and easy to follow, yet comprehensive protocol and service stack.

#### **4.1.1. Architectural Assumptions**

031. This document assumes that all participants are using IP v4 packet-switched, routed networks (at least at the boundaries to their networks) and that interoperability will be supported through tightly controlled boundaries between component networks and systems; these may be connected directly or via a third-party WAN (see Figure 4.1 below). A limited set of services will be supported at the boundary, these requiring server-to-server interactions only. Each nation/organisation will be responsible for the security of information exchanged.



**Figure 4.1. NATO to National Connectivity**

032. Users will attach and authenticate to their local system/network. Information will only be shared using the limited set of services provided. It is also assumed that the information to be exchanged will predominantly be unclassified.

### **4.1.2. Shared Services**

033. The complete set of shared services will be a combination of the user-level services supported across the boundary and the infrastructure services necessary to deliver them. The user-level services that realistically can be shared are:

- Voice
- Mail
- FAX
- C2 information
- E-mail with attachments
- Web publishing/access
- News (Usenet)
- File transfer
- VTC
- Instant Messaging

034. To implement these services in a network enabled environment, the following must also be defined:

- NNEC Application Services
- COI Services
- NNEC Core Enterprise Services
- Network and Information Infrastructure Services

### **4.1.3. Minimum Architecture**

035. The following table defines the service areas, classes and standards that make up the minimum architecture. They represent a subset of the NISP.

<b>Service Area</b>	<b>Class</b>	<b>Mandatory Standard</b>	<b>Comments</b>
<b>NNEC Application Services</b>			
<b>COI Services</b>			

Service Area	Class	Mandatory Standard	Comments
NNEC Core Enterprise Services			
	Messaging	SMTP (RFC 1870:1995, 2821:2001, 5321:2008)	
	Application	FTP (IETF STD 9, RFC 959:1985 updated by 2228:1997, 2640:1999, 2773:2000, 3659:2007)	
		HTTP v1.1 (RFC 2616:1999 updated by 2817:2000), URL (RFC 4248:2005, 4266:2005), URI (RFC 3938:2005)	
		Network News Transfer Protocol NNTP (RFC 3977:2006)	
		MPEG-1 (ISO 11172:1993)	
		MPEG-2 (ISO 13818:2000)	
		MP3 (MPEG1 - Layer 3)	The audio compression format used in MPEG1
	Translator	7-bit Coded Character-set for Info Exchange (ASCII) (ISO 646:1991)	
		8-bit Single-Byte Coded Graphic Char Sets (ISO/IEC 8859-1-4-9:98/98/99)	
		Universal Multiple Octet Coded Char Set (UCS) - Part 1 (ISO 10646-1:2003)	
		Representation of Dates and Times (ISO 8601:2004)	
	Data encoding	UUENCODE (UNIX 98), MIME (RFC 2045:1996 updated by 2231:1997, 5335:2008: 2046:1996, updated by 3676:2004, 3798:2004, 5147:2008, 5337:2008; 2047:1996, updated by	Base64 is used by some email products to encode attachments. It is part of the MIME std.

<b>Service Area</b>	<b>Class</b>	<b>Mandatory Standard</b>	<b>Comments</b>
		2231:1997; 2049:1996, 4288:2005, 4289:2005)	
	Mediation	Scalable Vector Graphics (SVG) 1.1 20030114, W3C	
		JPEG (ISO 10918:1994)	
		PNG vers. 1.0 (RFC 2083:1997)	
		XML 1.0 3rd ed:2004, W3C	
		HTML 4.01 (RFC 2854:2000)	
		PDF (Adobe Specification 5.1)	
		Rich Text Format (RTF)	
		Comma Separated Variable (CSV)	For spreadsheets
		Zip	
<b>Network and Information Infrastructure Services</b>			
	Directory	DNS (IETF STD 13, RFC 1034:1987+1035:1987 updated by 1101:1989, 1183:1990, 1706:1994, 1876:1996, 1982:1996, 1995:1996, 1996:1996, 2136:1997, 2181:1997, 2308:1998, 2845:2000, 2931:2000, 3007:2000, 3425:2002, 3597:2003, 3645:2003, 4033:2005, 4034:2005, updated by 4470:2006; 4035:2005, updated by 4470:2006; 4566:2006, 4592:2006, 5395:2008, 5452:2009)	
	<b>Transport</b>	TCP (IETF STD 7, RFC 793:1981 updated by 1122:1989, 3168:2001)	
		UDP (IETF STD 6, RFC 768:1980)	

Service Area	Class	Mandatory Standard	Comments
	<b>Network</b>	IPv4 (STD 5, RFC 791:1981, 792:1981, 894:1984, 919:1984, 922:1984, 1112:1989 updated by RFC 950:1985, 2474:1998, 3168:2001, 3260:2002, 3376:2002, 4604:2006, 4884:2007)	Boundary/advertised addresses must be valid public addresses (i.e. no private addresses to be routed across boundary)
		Border Gateway Protocol (BGP4) (RFC 4271:2006)	

**Table 4.1. NISP Lite**

## **4.2. X-TMS-SMTP PROFILE**

036. The following table defines military header fields to be used for SMTP messages that are gatewayed across military mail environment boundaries.

037. It specifies "X-messages" based upon RFC 2821, section "3.8.1 Header Field in Gatewaying". The profile specifies for each header field the name and possible values of the body.

038. The abbreviation TMS means Tactical Messaging System. The first column indicates an indication of the message property that will actually be represented by a X-TMS-SMTP field. The second and third columns specify the field names and the allowed values of the field bodies. All SMTP field values must be in uppercase

TMS message property	Field name	Field body
Subject	Subject	The Subject is a normal message property, no additional mapping is required.
Handling Name	X-TMS-HANDLING	Handling Name(s): <ul style="list-style-type: none"> <li>• NO HANDLING</li> <li>• EYES ONLY</li> </ul>
Classification Group + Detail	X-TMS-CLASSIFICATION	The field value will be the combination of Classification Group Displayname + Classification Detail in uppercase.  Example: NATO SECRET
TMSStatus	X-TMS-STATUS	<ul style="list-style-type: none"> <li>• NEW MESSAGE</li> </ul>

<b>TMS message property</b>	<b>Field name</b>	<b>Field body</b>
		<ul style="list-style-type: none"> <li>• UNTREATED</li> <li>• IN PROCESS</li> <li>• HANDLED</li> </ul>
Mission	X-TMS-MISSIONTYPE	Type of the mission. Typical values: <ul style="list-style-type: none"> <li>• OPERATION</li> <li>• EXERCISE</li> <li>• PROJECT</li> </ul>
	X-TMS-MISSIONTITLE	Name of the Mission
	X-TMS-MISSIONDETAILS	<p>Details of the mission. Typical values:</p> <ul style="list-style-type: none"> <li>• UMPIRE</li> <li>• DISTAFF</li> <li>• CONTROL</li> <li>• NO MISSION DETAILS (default)</li> </ul> <p>Note: This field is only used when the Mission type is set to EXERCISE.</p>
Play	X-TMS-PLAY	<p>This field contains either:</p> <p>PLAY or NO PLAY</p> <p>Note: This field is only used when the Mission type is set to EXERCISE.</p>
UserDTG	X-TMS-USERDTG	The UserDTG element contains the DTG-formatted value entered by the user on the TMS Client or automatically set by the system (TMS).

<b>TMS message property</b>	<b>Field name</b>	<b>Field body</b>
Destinations	TO: (message data)	This is the complete list of action destinations, the SMTP session RCPT TO will dictate for which recipients the system must deliver the message to.  Syntax according to RFC 2822.
	CC: (message data)	This is the complete list of info destinations, the SMTP session RCPT TO will dictate for which recipients the system must deliver the message to.  Syntax according to RFC 2822.
SICs	X-TMS-SICS	List of SIC elements (separated by semicolon) selected by the user as applicable to the current message.
Precedences	X-TMS-ACTIONPRECEDENCE	Possible values:  <ul style="list-style-type: none"> <li>• FLASH</li> <li>• PRIORITY</li> <li>• IMMEDIATE</li> <li>• ROUTINE</li> </ul>
	X-TMS-INFOPRECEDENCE	Possible values:  <ul style="list-style-type: none"> <li>• FLASH</li> <li>• PRIORITY</li> <li>• IMMEDIATE</li> <li>• ROUTINE</li> </ul>
Related MessageID	X-TMS-RELATEDMESSAGEID	Used to relate TMS-, SMTP- and DSN messages

**Table 4.2. X-TMS-SMTP Profile**

### **4.3. TACOMS PROFILE**

039. The TACOMS Profile will be updated in the next edition of ADatP-34.



## **A. TECHNOLOGIES**

040. This annex describes the technologies that are projected to be available today or in the near term period which will enable the transformation towards the NII.

### **A.1. DATA STRATEGY**

#### **A.1.1. Data Management Strategy**

041. Reference: TBD

#### **A.1.2. JC3IEDM**

042. The JC3IEDM is a merger of both the LC2IEDM (Land C2 IEDM, developed by the Multilateral Interoperability Programme (MIP)) and the NATO Reference Data Model, which was developed by a predecessor of the DMSWG. The JC3IEDM is published under cover of STANAG 5525.

043. Since DMSWG is responsible for Data Administration not only for the JC3IEDM but also for any other Standard Information Exchange Mechanisms (Adat-P3 messages, Tactical Data Links, XML technologies, etc.) within NATO, it will also register and manage both the Standard Data Elements and the Information Exchange Requirements (IER) used in the development process of any of those mechanisms. DMSWG will as well publish Directive and Guidance documents for Data Administration in NATO.

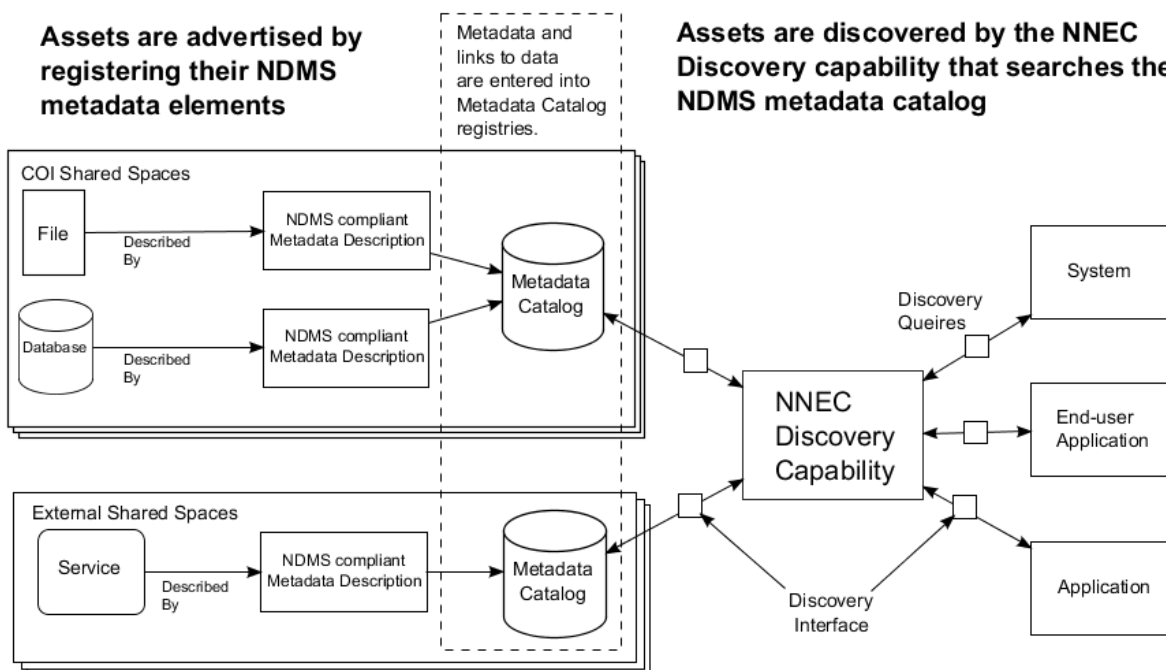
044. As main tools for the Data Administration process, DMSWG has been tasked to develop and maintain both the NATO Metadata Registry and the NATO XML Registry. The objective is to implement them both with COTS products, in a single system called NATO Metadata Registry and Repository, which would integrate both functionalities. A version of the NATO XML Registry is currently posted under the DoD XML Registry.

#### **A.1.3. NATO Discovery Metadata Specification (NDMS)**

045. The NDMS defines discovery metadata elements for resources posted to NATO shared spaces. "Discovery" is the ability to locate data assets through a consistent and flexible search method. The NDMS specifies a set of information fields that are to be used to describe any data or service asset that is made known to NATO, and it serves as a reference for developers, system architects, and engineers by identifying a minimum set of metadata elements in support of Discovery Services. Whilst discovery of data assets is the primary use of the NDMS it is also important to note that widespread use of the metadata elements will also improve documents record management in general. The NDMS will be employed consistently throughout the organization but it is not intended or necessary for it to displace other specifications that offer different semantics.

046. To support data asset discovery, NATO has developed the NDMS as the common set of descriptive metadata elements that are to be associated with each data asset that is made visible

to the enterprise discovery capability. Metadata is often defined as being "data that describes and defines other data". Data assets available in the enterprise must be described with metadata, using the elements defined in this document to permit discovery through the enterprise discovery capability. The NDMS defines a minimum set of elements that must be used to describe data assets made visible to the enterprise. Users and system agents acting on their behalf that search the enterprise will discover data assets that have been tagged and entered into catalogues or repositories that respond to search queries specified in terms of NDMS entries as depicted in the NDMS Usage Conceptual Diagram in Figure A.1.



**Figure A.1. NDMS Usage Conceptual Diagram**

047. The elements specified in the NDMS are designed to be platform, language, and implementation independent. This allows system developers to generate and retain discovery metadata using any implementation approaches, including using COTS products. As future enterprise discovery interface specifications are defined, programs should have the appropriate discovery metadata available for their data assets and will only be required to format this metadata in accordance with the interface specifications.

**A.1.4. Extensible Markup Language (XML)**

048. The Extensible Markup Language (XML) is a simple, very flexible text format, much like HTML, used to structure, store and to send information. XML was designed to describe data and to focus on what data is. XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere.

049. Role of XML in the Web Services model is lies within communication. When one application talks to another to perform a web service, the application doing the talking must package the message it is sending in a format that is understandable by the listening application. XML is the format of the message content in this communication process.

050. The Extensible Markup Language tags provide information about a document's components. The Uniform Resource Identifiers contained in the XML tags expand the concept of Uniform Resource Locators (URLs) by adding IDs for objects, concepts and values that are not dependent on location.

## **A.2. INFORMATION MODELLING**

051. The ability to share information is a key factor for military success. As such, NATO and National Information Systems have to provide the means for information exchange in all mission types. The basic resource for all information systems is data, which, through the right interpretation, becomes information, and knowledge in turn. As NNEC is considered the core theme for C3 systems within NATO transformation, a fundamental requirement is to work in the most effective manner through semantic interoperability at the data level for NATO/national C3 systems. The expanding missions of NATO involve consultation based on the sharing of information. Alliance members and partners are engaged in collective decision-making, with each nation retaining sovereignty and responsibility for its own decisions and taking action only on the basis of unanimity. In this environment, it is critically important that the Alliance members and partners have access to all shared information at the same time and that both the consultation process and the decisions taken are adequately documented. Information modelling and information management initiatives must be formalized throughout the NATO Enterprise to leverage the collective assets of NATO and national systems in support of information operations.

052. Information management is the handling of information acquired by one or many disparate sources in a way that optimizes access by all who have a share in that information or a right to that information. Information modelling establishes a conceptual schema that defines how the managed elements in an information environment are represented as a common set of objects and relationships between them. This allows multiple parties to exchange management information about these managed elements. Additionally, it provides means to actively control and manage these elements. By using a common model of information, management software can be written once and work with many implementations of the common model without complex and costly conversion operations or loss of information.

053. Appropriate Information management will enable:

- Awareness -- Products identified by metadata (keywords) and cataloged with a common schema providing a simple yet integrated query search for the right information (product);
- Access -- with information tags to define privileges; and,
- Delivery -- Assured delivery of the information product over the right network and to the right location.

054. This integrated approach to information modelling leverages the concepts of Net Centricity throughout all information resource providers and consumers in a coalition operation. Key components of this strategy include a dissemination capability, with associated management services, that directs end-to-end information flows throughout the NII in accordance with command policy. The NISP will contribute to the core technical model for systems designers to develop new platforms capable of the intensive compilation, cataloguing, caching, distribution, and retrieval of data necessary to provide the life cycle information management and necessary information sharing across NATO members.

## **A.3. NETWORK INFRASTRUCTURE**

### **A.3.1. Background**

055. With the NATO Network Enabled Capability Feasibility Study (NNEC FS) a new concept of ensuring service interoperability was introduced that complements and reuses the architectural views. This concept dubbed the Interoperability Performance Parameters (IPP), inspired by the US developed concept of Key Performance Parameters (KPP), forces the system architects and designers to specify a wider context of their capabilities sufficient to allow secure service interoperability in a Federation of Systems (FOS). The interfaces at which interoperability between separate infrastructure capabilities is to be managed are called the Service Interoperability Points (SIOP).

056. The principle is that an individual capability needs to work seamlessly with and within a FOS. The infrastructure services in a FOS and the international interoperability interfaces are described in the context of the total C4ISR systems architecture, often referred to as the Overarching Architecture (OAA).

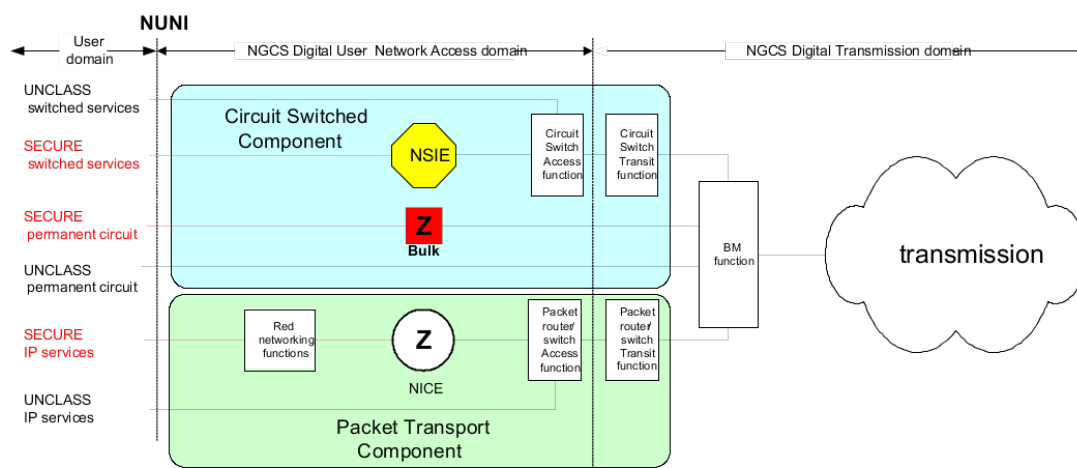
057. This section describes the NATO General-Purpose Segment Communication System (NGCS) Reference Architecture (RA). NGCS is part of the NII, representing the NATO owned capability. It provides the communication services and associated management and security services. Also it describes the timeframe for NGCS up to 2014, first implementations are in progress.

058. The major change to classical network infrastructures is the coherence and interoperability of infrastructure capabilities brought by different coalition partners that needs to be achieved. In the NNEC FS the concept of a Maturity Model was introduced to describe, qualify and quantify the different levels of infrastructure capability. Increasing levels of maturity are characterised by enhanced sets of services, performances, and support, including advances in the associated Doctrine, Organisation, Training, Materials, Personnel, Leadership, Facilities (DOTM-LPF) spectrum.

059. Interoperability of separate infrastructure capabilities is managed by the earlier mentioned concept of IPP. The IPP allows a more comprehensive description and specification of those parameters that are essential for providing scalable end-to-end services over combined infrastructure capabilities.

### A.3.2. NGCS 2007 Target Architecture

060. A reference model of the baseline network infrastructure for NGCS RA is depicted in Figure A.2. This architecture is described in the NGCS RA ed1. At the time of writing the NSIE and the NATO IP Cryptographic Equipment / Secure Access Router(NICE/SAR) had not been fielded, but the implementation projects were in progress. The Bandwidth Manager Function (BMF) had been fielded.



**Figure A.2. NGCS Digital User-Network Access Reference Configuration**

### A.3.3. Communications & Networking

#### A.3.3.1. Internet Protocol Version 4 (IPv4)

061. Internet Protocol Version 4 (IPv4) is currently the dominant network layer protocol used in the communication between networked devices. IPv4 is a data-oriented protocol to be used on a packet switched inter-network (e.g., Ethernet). It is a best effort protocol in that it doesn't guarantee delivery. It doesn't make any guarantees on the correctness of the data; it may result in duplicated packets and/or packets out-of-order. All of these things are addressed by an upper layer protocol (e.g. UDP).

### **A.3.4. Construction of a robust IP-network infrastructure**

062. Operational relevant service availability should be one of the main design criteria and operational evaluation criteria for the NGCS. Despite the migration of users onto a single network and the introduction of significant additional complexity, e.g. QoS, the service availability has to be improved. Service availability and performance are exponents of infrastructure, organization, human aspects and others. The assessment of operational service readiness and performance is a structural activity required in the NGCS product life-cycle management. It should give input to transformational processes and for the development of Target Architectures (TA) that underpin infrastructure investment projects.

#### **A.3.4.1. NGCS Overview**

063. The NATO General Purpose Communications System (NGCS) has a Circuit Switched Component (CSC) and a Packet Transport Component (PTC). The services offered are presented at the NGCS User Network Interface (NUNI). The NGCS user-network access domain incorporates functions for user access of circuit switched functions and packet transport functions. The circuit switched component provides on-demand switched access and also access to semi-permanent circuits. Both can be provided either in secure or non-secure modes. The packet transport component provides for both secure and non-secure IP access services.

064. A secure service offered by the network at the NUNI provides for interconnection within a single security domain. If telecommunication services are required for a second security domain, this is implemented by installation of another cryptographic device - e.g. NATO Secure ISDN Equipment (NSIE) offering bulk encryption or NATO IP Cryptographic Equipment (NICE) (with the associated RED networking functions). In order to provide greater throughput, more than one instance of this might exist for a single security domain.

065. In mid-term, a complete migration to a fully IP based network is planned for the NGCS.

#### **A.3.4.2. Definition and implementation of a QoS architecture**

066. In the public standardization bodies, e.g. IETF, ITU, ETSI, ANSI, many initiatives are ongoing regarding the specification of a global QoS architecture in support of network convergence. Likewise many government organizations are doing the same.

067. The operation and control of QoS enabled IP-services requires many new Operation and Support Systems as well as a thorough reassessment of the management organization.

068. The complexity and the novelty of IP QoS warrant a step-by-step introduction. The entities affected by the introduction are:

- The end-user;
- The applications;

- The infrastructure;
- The OSS/BSS;
- The policies;
- The third party providers, e.g. SP, NDN;

069. The introduction should follow the developments in the commercial sector, and each successive introduction step in NATO should be done when the technology is stable and mature. Nevertheless NATO may want to implement additional functionality like additional CoS to implement MLPP, but this always be based on an underlying commercial standard based QoS architecture. Eventually the QoS architecture must take account of the requirements in military tactical radio networks and future QoS enabled MANETs. It is envisaged however that commercial standards for wireless MANETs will be developed among others by the ZigBee Alliance

070. The model of spiral development should be applied. Each step is first tested in the laboratory (applications, infrastructure and OSS/BSS), evaluated against user requirements, operational issues, architectural principles, before it is gradually rolled out in the operational network.

071. Business cases for network convergence are becoming increasingly viable. As more and more services are uniquely available on IP and standardization for IP based service support is becoming mature, it becomes more cost effective to migrate an existing infrastructure based on TDM and IP bearers to a single IP-bearer service system. However, network convergence does not come for free. Following items and activities are required:

- Specification of a comprehensive set of Classes of Service (CoS) for the ultimate network, which can be initially collapsed to a basic set and further expanded with each implementation step.
- Definition of application mapping to telecommunications services (the CoS).
- Specification of CoS handling in the network
- NATO policy with the objective to have uniform QoS handling in the multinational network.
- Supporting management and control systems (NGOSS compliant) that need to be integrated in the total SLM complex.
- Proof of concept testing.

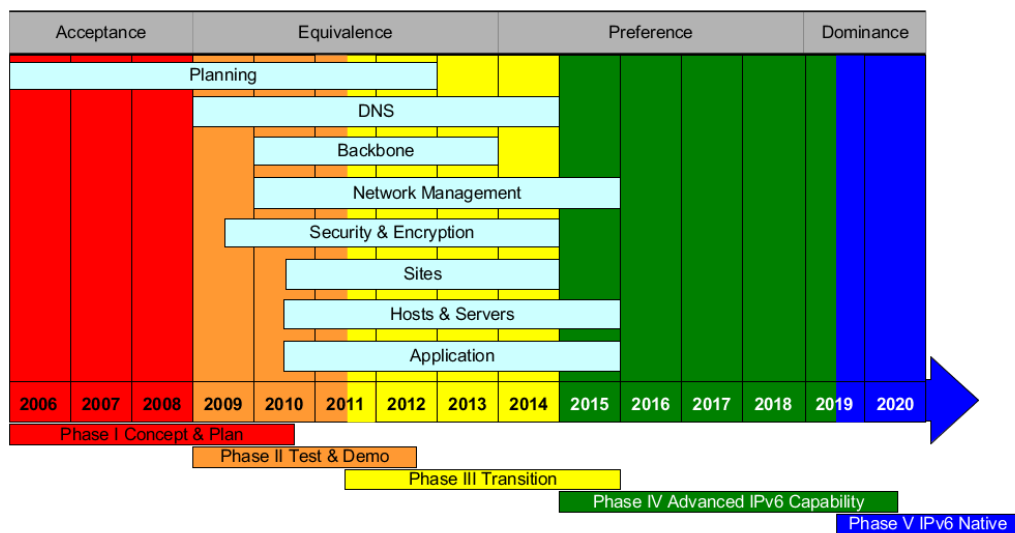
#### **A.3.4.3. The migration of applications onto an IP-bearer**

072. All the applications that are often traditionally carried on the CSC, i.e. telephony, switched VTC, leased line (for real-time data, for bandwidth pipe) need to be adapted so that they can also perform on an IP-bearer. Most of the applications require an QoS enabled IP infrastructure. In addition the connection oriented application services require call signalling, DNS, directory (for

the gatekeeper) and resource reservation functionality. This infrastructure should be provided as a common core functionality for all application services requiring it. Target architectures for VoIP (SVoIP and VoSIP) and VTCoIP therefore need to be coordinated. For interoperability purposes NATO needs to standardize the signalling at the respective Service Interoperability Points.

### A.3.4.4. Transition to IPv6

073. IPv6 is an enabler for establishing coalition wide connectivity in a network enabled NII. The transition strategy of the NATO CIS to IPv6 is described in [TN1088]<sup>1</sup> from which the top-level roadmap is repeated here in Figure A.3.



**Figure A.3. Roadmap to IPv6**

<sup>1</sup>Derived from Technical Note 1088: NATO IPv6 Transition Plan, Preliminary Version, NC3A, June 2006



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