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ARCHIVES COMMITTEE

NATO Strategy for Long Term Preservation of Digital Information

Note by the Archivist

Reference: AC/324-WP(2012)0001-REV2

1. Please find at annex for approval by the Archives Committee the NATO Strategy for Long Term Preservation of Digital Information. The Strategy paper was drafted and reviewed during the two Archives Committee workshops of December 2011 and June 2012 and circulated to the Committee for comments.

2. Comments received to the previous version (at reference) are indicated in bold (see footnote 5) .

3. Unless I hear to the contrary by **14 September 2012** I will take it that the Archives Committee has approved the NATO Strategy for Long Term Preservation of Digital Information at annex.

(Signed)Ineke Deserno

1 Annex

1 Appendix

Original: English

ANNEX 1
AC/324-D(2012)0003

NATO Strategy for Long Term Preservation and Access of Digital Information

Contents

References

a. C-M(2007)0118 NATO Information Management Policy (NIMP)
b. C-M(2008)0113 (INV) The Primary Directive on Information Management (PDIMP)
c. C-M(2011)0043 NATO Records Policy
d. C-M(2009)0021 Policy on the Retention and Disposition of NATO Information
e. C-M(2002)49 Security within the North Atlantic Treaty Organisation (NATO)
f. ISO 14721: 2003 Space Data and Information Transfer Systems - Open Archival Information System — Reference Model
g. ISO 16363:2012 Audit and Certification of Trusted Digital Repositories
h. ISO 13008:2011 Standards for Migration and Conversion

Introduction

This document establishes the NATO strategy for the long-term preservation and access of digital information. The development of this strategy is the first key step needed to address the unique challenges of preserving digital information in the long-term. It builds upon, and supplements, the NATO IM Policy (Reference a), NATO Records Policy (Reference c) and the Policy for Retention and Disposition (Reference d).

This Strategy is published by the Archives Committee and is authorised for public disclosure.

Background

1. Since 1949, the Alliance has been creating and managing records and gradually moving towards electronic formats. The evolving nature and growth of the Alliance, the increasing complexity of NATO business activities and the rapid improvements in information technology have resulted in more and more information being created in digital form, either through converting existing materials to digital form or, increasingly, "born digital", where there is no other format but the digital original.

2. The implications for preserving continued access to important digital materials are already being felt by both Governments, International Organisations and their associated archival institutions, many of which have taken initial steps to meet their responsibility effectively. Ensuring long-term access to this vast range of digital information is a significant and pervasive challenge, particularly for large/long established organisations.

3. The NATO Primary Directive on Information Management (Reference b) states that the NATO Archivist shall ensure long-term preservation and accessibility of information with permanent value and thus the wider NATO Information

Management Community needs to consider how it will implement records and archives management practices which will ensure continued access to important digital records.

4. The key challenges are:

   - Distributed and disjointed data organisation. Information is stored but its metadata and location is not recorded making discovery and use very difficult. This challenge is compounded by information being held in diverse and often disconnected IT systems across several organisations.
   - Media obsolescence. Data can be lost because the media on which it is stored becomes inaccessible, unreadable or is replaced.
   - File format obsolescence. This challenge is a creation of the digital age – key information is held in files that may no longer be readable by future software. As information becomes more complex and integrated this threat is set to increase.

Purpose

5. The purpose of this strategy is to provide overall vision, goals, principles and initial steps for the long-term preservation and access of digital information within NATO to:

   - Enable IM Senior Officials, Information Managers, Archivists and other Communities of Interest (CoIs)[1] to effectively plan and execute their responsibilities for long-term preservation and access of digital information in NATO; and
   - Inform other concerned parties on their expected contributions to and benefits from a coherent approach to long term preservation and access of digital information within NATO[2].

Scope

[1] The NATO information Management Policy (Reference a) states that it is the responsibility of information originators/owners to set the rules for handling the information throughout its lifecycle in line with the relevant policies and procedures, and the responsibility of Information custodians to manage and provide the information under their custodianship in accordance with the rules established by the information owners. This includes retention, and therefore long-term preservation, of this information.

[2] Heads of civil and military bodies should ensure that the Strategy is adopted and provide the necessary resources for its implementation.

6. This Strategy applies to all NATO civil and military bodies and NATO Operations who create and maintain digital information of permanent value.

Vision

7. To ensure the long-term preservation of, and access to, all digital information of permanent value held in NATO civil and military bodies and NATO Operations[3].

Goals

8. Within 5 years:
   - A preservation policy framework will be in place to ensure continued access to NATO digital information of permanent value for the appropriate communities of interest.
   - A long term digital preservation capability will be funded and implemented, providing:
     - A preservation planning mechanism to define, evaluate, and execute preservation plans.
     - Preservation characterisation services to allow for the automatic analysis of digital objects to establish significant properties
     - A preservation action mechanism providing the necessary services for rendering digital objects and retaining the identified significant properties
     - A preservation watch mechanism to monitor and provide advance warning of the need for further preservation action.
     - A testbed providing evidence-base for the objective evaluation of different protocols, tools, services and preservation plans
   - All of the NATO Archives digital holdings will reside in a secure digital repository.

9. The NATO Archives Community, under the lead of the Archives Committee, will champion the development, operation and maintenance (in perpetuity) of a NATO capability for the long term preservation and access of digital information. This includes securing the resources required to achieve the required the necessary level of capability.

10. These goals will be achieved by:
    - Drawing on current International and Open Standards to establish an archival system to preserve the NATO Archives digital holdings within a Trusted Digital Repository (TDR), such as:

[3] and/or those which have already been transferred to the NATO Archives.

  - The Open Archival information System (OAIS) Reference Model, ISO 14721: 2003 (Reference f).
  - The Audit and Certification of Trusted Digital Repositories, ISO 16363:2012 (Reference g)
  - PREMIS[4] Metadata Definitions
  - Standards for Migration and Conversion, ISO 13008:2011 (Reference h)
- Embedding knowledge and experience of digital preservation issues within policy and practice used by those creating and managing NATO information.
- Implementing and contributing to digital preservation best practices.
- Working collaboratively across the entire NATO Archives Community and with other key players in digital preservation.
- Ensuring accessibility of digital holdings for all relevant CoIs, adhering to NATO Security Policy (Reference e) to adequately protect the information consistent with its classification.

Principles

11. The following principles will be applied:

- **Sustainability** - Consider not just the short and medium term, but also the genuine long term implications and costs when making decisions on preservation actions.
- **Economise and maximise the use of resources**. Use and reuse of information and existing tools where they are fit for purpose. Where feasible, work within existing organisations and structures to incorporate preservation functions and actions into existing processes and draw upon open community developments in digital preservation techniques and tools.
- **Open Collaboration** - Share experience with and learn from others through collaboration with the NATO community and with other key players in digital preservation.
- **Standardisation throughout the Information Lifecycle** - Focus on the application of standards and best practice for the creation and preservation of digital content throughout its lifecycle, to reduce the frequency and complexity of digital preservation actions.
- **Prioritisation** - Prioritise and perform preservation activities with appropriate timeliness relative to the information being preserved and operational needs.

[4] Library of Congress Preservation Metadata Maintenance Activity

- **Flexibility of Approach** - Pursue a range of active and passive digital preservation methodologies (not limited to) data (de)normalisation/cleansing/standardisation, digital information migration, technology emulation and technology preservation to ensure that:
  - Preservation is flexible, cost effective and appropriate.
  - The risk of preservation strategy failure in the long term is mitigated.
- **Continuous Improvement** - Apply lessons learned from the preservation of older materials to ensure our preservation of current materials is effective, despite an uncertain technological future.

Preparing for Digital Preservation

12. The NATO Archives Community, under the lead of the Archives Committee, will work with relevant stakeholders[5] to develop and enforce approval processes to ensure digitised materials are created with due consideration for their long term preservation and access by:

    - Engaging with information producers and Communities of Interest to minimise risks at the earliest opportunity.
    - Collaborating with key players on the development of means to handle complex and emerging data types and standards, e.g.:
      - Embedded objects (i.e. documents embedded within an email)
      - Linked content (i.e. hyperlinked references for a source document)
      - Geographic Information Systems (GIS)
      - Dynamic and Time Sensitive Sources (e.g. Common Operating Picture; Portal Content)
      - Information with limited lifespan (web content)
    - Ensuring that measures applied are applicable to staff throughout the Peacetime Structures and in Operations.

13. Digital material acquired and maintained in NATO Archives will have been identified as having permanent value and requiring long term preservation. However, it is accepted that:

[5] E.g. NATO Archives Committee, NATO C3 Board, NATO IM Authority, **NATO PKI Management Authority (NPMA),** Bi-Strategic Commands, New NATO Agencies responsible for capability development, acquisition and support (I.e. NATO Communications and information Agency, NATO Support Agency and NATO Acquisition Agency).

- As the collection process will be widely distributed and fragmented there will be multiple decision points for the assessment of the long-term value of the digital information.
- The NATO Archives Community will collect more information than will eventually be preserved in the long-term.

14. The NATO Archives Community will consider the implications for the complete lifecycle of digital materials at the point of their acquisition.

15. Digital information will be assessed and may be maintained in the NATO Archives with a lower level of confidence of successful preservation due to practical considerations, prioritisation and financial or organisational constraints. Clear responsibilities will be assigned for decision making for such prioritisation.

Enabling digital preservation

16. The NATO Archives Community, under the lead of the Archives Committee, will:

- Develop policy and guidance to enable effective preservation infrastructure to be implemented.
- Ensure digital preservation issues are considered throughout the lifecycle of NATO Information.
- Establish and execute a comprehensive communications plan to ensure coherence, coordination and buy-in across the NATO Archives Community and throughout NATO as a whole.
- Develop and apply a suitable risk management framework so that digital materials may be assessed and prioritised to allow for maintenance in the NATO Archives with a lower level of confidence of successful preservation in the long term.

Implementing digital preservation

17. The NATO Archives Community will define the initial requirements for digital preservation initially utilising the common language provided by the OAIS Reference Model (Reference f) as the basis for the capability. The primary components are as follows:
    a. Preservation Planning – services and functions for monitoring the OIAS environment and ensuring that content remains accessible to the designated CoIs;
    b. Ingest – services and functions that accept and process incoming digital information ready for storage;

c. Data Management - services and functions for populating, maintaining and accessing a wide variety of digital information;
d. Archival Storage – services and functions used for the storage and retrieval of the digital information;
e. Access - services and functions which make the archival information holdings and related services visible to consumers;
f. Administration – services and functions needed to control the operation of the other OAIS functions.

18. Specific implementation guidance is provided in greater detail in Appendix A

Definitions

Access	Usability of records/archives in accord with archival, legal and physical requirements regarding archival description, access dates and preservation. All archival measures ensuring the accessibility to the records/archives
Active Preservation[6]	The continued accessibility of electronic records over time by actively intervening in how records are stored and managed. Active preservation involves ”moving” the digital object into a new storage environment, which may depend on new technologies that were not in existence when the object was originally created and used.
Born Digital [7]	Digital materials which are not intended to have an analogue equivalent, either as the originating source or as a result of conversion to analogue form.
Cleansing	A process performed in data migration to improve data quality, eliminate redundant or obsolete information, and match the requirements of the new system.
Data Standardisation[7]	The transformation of various types of holdings by converting digital records into a smaller, more manageable number of standard formats. The carefully selected standards formats have to preserve the intellectual content and the specific key properties of digital objects.
Digital Information Migration[6]	A means of overcoming technological obsolescence by transferring digital resources from one hardware/software generation to the next. The purpose of migration is to preserve the intellectual content and the specific key properties of digital objects and to retain the ability for clients to retrieve, display, and otherwise use them in the face of constantly changing technology.
Digital Object[7]	An object composed of a set of bit sequences.
Digital Preservation[6]	The totality of processes and operations involved in the stabilization and protection of digital objects against damage or deterioration and in the treatment of damaged or deteriorated digital objects

[6] Preserving Electronic Records Training in Electronic Records Management – Module 4, International Records Management Trust, Version no. 1/2009. www.irmt.org

[7] The Long-Term Preservation of Digital Information; White Paper; Tessella Plc.; www.tessella.com

	Digital Preservation Refers to the series of managed activities necessary to ensure continued access to digital materials for as long as necessary. Digital preservation refers to all of the actions required to maintain access to digital materials beyond the limits of media failure or technological change.
File Format Obsolescence[8]	Information is held in files formats that may no longer be readable by future software.
Long-term preservation[7]	The totality of processes and operations involved in the stabilization and protection of digital objects against damage or deterioration. The goal is to ensure continued access to digital objects or at least to the information contained in them, indefinitely. Continued access to digital materials, or at least to the information contained in them, indefinitely.
Media Obsolescence[69]	Data can be lost because the media on which it is stored becomes inaccessible, unreadable or is replaced.
Metadata	Structured information that describes, explains, locates and otherwise makes it easier to retrieve and use an information resource. Metadata facilitates the association of records within the context of broader business activities and functions. The structure consists of “elements”, each of which will contain “values”. The values relate to the resource itself, there may be controls over what the actual values can be.
NATO Archives Community	The Community of Interest encompassing the NATO Archives, IM Senior Officials, Information Managers, Archivists and Historians of all NATO civil and military bodies responsible for the management and long term preservation of Records of permanent value for NATO.
Passive Preservation[6]	The process of ensuring continuing integrity of, and controlled access to, digital objects along with their associated metadata. Essentially, passive preservation aims to “keep” the original digital object intact without changing the technologies used to store or process it.
Reformatting[7]	Copying information content from one storage medium to a different storage medium (media reformatting) or converting from one file format to a different file format (file re-formatting).
Refreshing[7]	Copying information content from one storage media to

[8] The Long-Term Preservation of Digital Information; White Paper; Tessella Plc; www.tessella.com

[9] Digital Preservation Handbook, Digital Preservation Coalition

	the same storage media.
Technology Emulation7,10	A means of overcoming technological obsolescence of hardware and software by developing techniques for imitating obsolete systems on future generations of computers. It aims at (re)creating an environment in which the digital object can be rendered in its authentic form.
Technology Preservation11 ("Technology Museum")	The maintenance of hardware and software baselines to allow for the recreation of the original environment required to render the digital object in its original form.

[10] ISO 14721: 2003 Space data and information transfer systems - Open archival information system — Reference model.

[11] Digital preservation Management: Implementing Short-Term Strategies for Long-Term Solutions, Inter-University Consortium for Political and Social Research (ICPSR), [http://www.dpworkshop.org/dpm-eng/terminology/strategies.html]

Long Term Digital Preservation - Implementation Guidance

Preservation of the NATO Digital Information of Permanent Value will be achieved by:

- Storing multiple copies of each digital object in Trusted Digital Repositories in different physical locations and utilising backups and integrity checking to ensure that no data is lost due to media decay, or catastrophe.
- Characterising and validating each digital object in order to determine requirements for its preservation.
- Recording metadata about each digital object and allocating unique, persistent identifiers to ensure that no objects will be lost.
- Developing and executing preservation plans.
- Implementing a comprehensive technology watch mechanism to provide warning of the need to take preservation action.
- Developing or acquiring tools to perform preservation actions on digital objects to ensure they can continue to be used and understood (e.g. data migration/standardisation; emulation; migration; preservation).