PTAB Test Audit Report for

National Space Science Data Center

(NSSDC)

Prepared by

Primary Trustworthy Digital Repository

Authorisation Body

(PTAB)

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1 Introduction

In the first half of 2011, while in the last stages of preparation of the ISO/DIS 16363 *Space data and information transfer systems – Requirements for Audit and Certification of Trustworthy Digital Repositories* (also known as *CCSDS 652.0-M-1*) and ISO/DIS 16919 *Space data and information transfer systems - Requirements for bodies providing audit and certification of candidate trustworthy digital repositories* (also known as *CCSDS 652.1-M-1*), the Primary Trustworthy Digital Repository Authorisation Body (PTAB) conducted test audits for six repository sites.

At the culmination of this activity in June/July 2011, PTAB representatives constituting Test Audit Teams visited three sites in Europe and three sites in the USA. Seven reports were written: one for each of the visited repositories, and a general background document.

The test audits were designed to help refine the audit process and not to produce actual certification of the repositories. Although the aim was to follow proper audit procedures, this was not always possible due to time and resource constraints for the test audits.

Correspondence about any of these reports should be addressed to the PTAB Secretariat ptab-secretariat@iso16363.org).

2   NSSDC Site Summary

This report describes the results of the initial PTAB study and the PTAB Test Audit Team visit to the National Space Science Data Center (NSSDC), located at the NASA Goddard Space Flight Center in Greenbelt, Maryland, on 23-24 June 2011.

2.1   Site History and Background

The National Space Science Data Center is NASA's permanent archive for space science mission data. Almost all data of interest to NSSDC now originates from electronic (i.e. digital) sources such as telemetry or space mission payloads. Consequently, the NSSDC operates on this data as a digital repository in the sense intended by ISO 16363. NSSDC also maintains a significant legacy archive of non-digital materials. The non-digital portions of the Archives are generally supported by a digital metadata system.

2.2   Types of Data and Data Storage Media

NSSDC is the long-term archive for Space Science data, stored on a wide range of storage media that have been used over the past 40 years. Permanent digital data is stored on everything from 7 and 9 track tapes, to optical platters, through current technology disks and data cartridges.

2.3   Specific Areas To Be Audited

All departments of the NSSDC Organization participated in the PTAB review, but most of the time was spent reviewing current digital processes.

2.4   Exclusions

There are a significant number of analogue legacy data holdings within NSSDC. These however, were not deemed relevant to the ISO/DIS 16363 based review. Some analogue data does represent PDI (metadata) for digital materials and it is managed as part of the digital repository holdings.

2.5   Designated Communities

Generally each data collection is managed as a data resource for scientists or upper level college students concerned with the scientific domain covered by that collection. In most cases the data are also available to the general public, although that public is not seen by NSSDC as the target audience for most collections. Documentation is intended to be adequate for the target scientist, but may not be so for the general public.

3 NSSDC Self Audit Review

In advance of the site visit, the PTAB, operating as a committee of the whole, reviewed the self-audit spreadsheet submitted by NSSDC. That review resulted in a list of topics which are summarized below as candidate subjects for the discussions during the ensuing site visit.

3.1 Organizational Infrastructure

1) While we were provided with some documents in advance, we had no opportunity to follow the document tree because we were not able to access the primary documentation repository: Calypso.

2) There is no permanent endowment to ensure continuous funding of the archives and the intention is to hand over to NARA. In the event funding for the program is permanently discontinued, NSSDC may intend to transfer the collections to NARA.

3.2 Digital Object Management

1) NSSDC frequently referred to maintaining usability of the archived contents, but we were unable to identify where usability was defined.

2) The process for converting SIPs to AIPs and the corollary mapping history between them was unclear. To clarify the ingestion process, the PTAB Test Audit Team felt that they needed to see what actions are recorded and what are not.

3) The components of archive objects (particularly, SIPs and AIPs) seem to be scattered among several storage subsystems, and it was not clear that all of the information relevant to an AIP could be easily or accurately brought together if the need arose to hand on responsibility.

3.3 Infrastructure and Security Risk Management

1) There was a need to understand how organizational, technological, preservation and financial risks are identified and characterized, and how they are managed or mitigated.

2) The NSSDC policy of moving AIPs to media independent format might risk loss of representation information. It was unclear that this activity improved or enhanced preservation of the AIP. Such risks should be documented and acknowledged in the migration histories together with the mitigation options available.

3) There were several documents that we felt might significantly ease the evidentiary burden required of NSSDC for an actual audit. These included but were not limited to the NSSDC Operations SOP, the Disaster Recovery Plan, Strategic Plan, and one or more Technology reports.

4 Site Visit Results

The NSSDC Test Audit was completed in mid-June, 2011. At the end of the two-day visit to NSSDC, the PTAB Test Audit Team met with NSSDC leadership and staff and presented the PTAB Test Audit Team's findings and initial conclusions about the readiness of NSSDC to be audited and certified as a Trustworthy Digital Repository. Those findings, with some augmenting comments are reproduced here.

The PTAB Test Audit Team reviewed the documentary evidence submitted by NSSDC and, coupled with the information gained from our interviews with NSSDC employees and contractors, reached the following broad conclusions. With minor revisions, these are as presented at the end of the Site Visit.

4.1 General Observations

- NSSDC has a dedicated, knowledgeable staff
- NSSDC is a world leader in the development and use of digital preservation standards, including in particular, those ISO standards that are most germane to these Test Audits.
- Application of these standards at NSSDC is somewhat uneven, but that situation is understandable, given the youth of the standards.
- NSSDC Staff displays a strong desire and a commitment to improving and automating operating procedures
- The overall architecture and procedures of the NSSDC are well thought out and competently executed.
- The NSSDC is well-positioned to gain future accreditation as a trustworthy digital repository.

4.2 PTAB Audit Team Findings

The NSSDC Test Audit revealed that the repository was well-positioned to undergo an actual ISO 16363 Audit at such time as that document has itself become a full international standard, and when the requisite audit machinery is in place to perform full inspections and award certificates of ISO 16363 compliance.

Findings shown below are the results of post-visit analysis of the full body of data collected. These findings were not presented in this form at the final meeting. They directly relate specific metrics of ISO 16363 to information collected during the NSSDC Test Audit.

4.2.1 Issues from ISO 16363 Metrics

Metric 3.3.1 THE REPOSITORY SHALL HAVE DEFINED ITS DESIGNATED COMMUNITY AND ASSOCIATED KNOWLEDGE BASE(S) AND SHALL HAVE THESE DEFINITIONS APPROPRIATELY ACCESSIBLE.

- The PTAB Test Audit Team interpretation of this metric during the NSSDC Test Audit was that it required evidence that there was a defined Designated Community for each AIP.
- The metric was not satisfied. There were no records or documentary evidence presented to describe any Designated Community, nor any AIP associations with any Designated Community.

Metric 3.3.2 THE REPOSITORY SHALL HAVE PRESERVATION POLICIES IN PLACE TO ENSURE ITS PRESERVATION STRATEGIC PLAN WILL BE MET.

- The metric was not satisfied. Documentation of Preservation Policy, associated workflows and operating procedures was incomplete and out of date.

Metric 4.1.6 THE REPOSITORY SHALL OBTAIN SUFFICIENT CONTROL OVER THE DIGITAL OBJECTS TO PRESERVE THEM.

- This metric was not satisfied. Particularly as regards the Planetary Data System (PDS) holdings, there was no clearly documented policy or agreement to show that NSSDC was managing the holdings with a view toward long term preservation and usage. It is quite possible that the PDS holdings were not intended to be managed in accordance with ISO 16363. If that is so, then their separate status should be clearly delineated and their fonds excluded from formal ISO 16363 audits.

Metric 4.1.7 THE REPOSITORY SHALL PROVIDE THE PRODUCER/DEPOSITOR WITH APPROPRIATE RESPONSES AT AGREED POINTS DURING THE INGEST PROCESSES.

- This metric was not satisfied. The ingest process as described did not clearly show at what point a submitter was told: "NSSDC has completed the ingest and has assumed full stewardship of the data submitted.

Metric 4.2.5.2 THE REPOSITORY SHALL HAVE TOOLS OR METHODS TO DETERMINE WHAT REPRESENTATION INFORMATION IS NECESSARY TO MAKE EACH DATA OBJECT UNDERSTANDABLE TO THE DESIGNATED COMMUNITY.

- This metric was not satisfied. In our discussions, we perceived that NSSDCs view of their designated communities was ambiguous. Consequently, there were few indications that representation information was being organized to support the long term use and understanding of the AIPs. While a great deal of representation information, and indeed, metadata in general is being collected, there appear to be few opportunities within NSSDC for explicit review of those ancillary data in light of changes in long-term preservation needs of one or more Designated Communities.

METRIC 4.3.2 THE REPOSITORY SHALL HAVE MECHANISMS IN PLACE FOR MONITORING ITS PRESERVATION ENVIRONMENT.

> METRIC 4.3.2.1 THE REPOSITORY SHALL HAVE MECHANISMS IN PLACE FOR MONITORING AND NOTIFICATION WHEN REPRESENTATION INFORMATION IS INADEQUATE FOR THE DESIGNATED COMMUNITY TO UNDERSTAND THE DATA HOLDINGS.

> - This metric was not satisfied. The NSSDC has a great deal of data that is dependent on obsolete technology to access that data.

Metric 5.1.1 THE REPOSITORY SHALL IDENTIFY AND MANAGE THE RISKS TO ITS PRESERVATION OPERATIONS AND GOALS ASSOCIATED WITH SYSTEM INFRASTRUCTURE.

- This metric was not satisfied. No evidence was presented or described to indicate that NSSDC had a Risk Management plan or associated Risk register or mitigation tracking procedures.

Metric 5.2.4 THE REPOSITORY SHALL HAVE SUITABLE WRITTEN DISASTER PREPAREDNESS AND RECOVERY PLAN(S), INCLUDING AT LEAST ONE OFF-SITE BACKUP OF ALL PRESERVED INFORMATION TOGETHER WITH AN OFFSITE COPY OF THE RECOVERY PLAN(S).

- This metric was not satisfied. While there was clear evidence of an implemented backup procedure for the computer systems and their data content, we were not presented evidence that a recovery plan was in place or tested. Moreover, we found no evidence that there were any practical measures available to recover any complete AIP, including all relevant provenance, representation and usability data, as a single conceptual entity. Without such a capability, the actual validity of a recovered archival object (which includes all relevant metadata) would be clouded in the uncertainty introduced by an ad hoc procedure.

4.2.2 Miscellaneous Additional Observations

In keeping with the spirit and intent of ISO 17021 and ISO 16919, this report makes no recommendations as to how NSSDC might address the enumerated findings in the preceding section. However, in advance of an 'official' Audit, the PTAB offers the following suggestions to help NSSDC better prepare for a full formal audit.

- Although NSSDC staff were some of the developers of OAIS, nevertheless other NSSDC staff should become more familiar with the terminology of ISO 16363 and underlying ISO 14721 (OAIS) standards.
- NSSDC should improve on and cultivate mutual awareness of their Designated Communities. Aspects of this might include providing a process to ensure that the Representation Information is adequate for the Designated Communities, and instituting regular reviews of the Data Description Packages (DDPs) and the Representation Info Networks to ensure that they continue to be adequate for the Designated Communit(y/ies)
- NSSDC should create and explicitly codify their preservation policy, and complete a fully documented Preservation Plan including, for example, details of migration, verification of Representation Information, and strategy for Technology Watch and related impact analyses.
- NSSDC should ensure that there is adequate documentation to allow the transfer of the complete AIPs e.g. the tar files plus the referenced Representation Information and PDI as part of the Disaster Recovery procedures. The NSSDC should complete the Disaster Recovery Plan in a form adequate for an outside agency to perform a recovery without the assistance of NSSDC incumbent personnel. The Disaster Recovery Plan must itself be readily available to any person or organization authorized to perform the recovery.
- The NSSDC should consider instituting an Organizational policy governing risk management, including a Risk management plan and an Organizational Risk Register with mitigation schedules and tracking.

4.3 Feedback from NSSDC Staff

Additionally, we received some feedback from NSSDC about the conduct of the Test Audit and the comportment of the PTAB Test Audit Team itself.

- The process was of value to NSSDC in that it helped to identify focus areas for improvements in current procedures.

- The initial findings and conclusions from Day 2 of the site visit were accepted for immediate follow up at NSSDC.

- The NSSDC expressed concern that some of the members of the visiting team were not completely neutral, insofar as they themselves were closely associated with or affiliated with other archiving and space science related organizations, including some which had cooperating arrangements with NSSDC itself. NSSDC was aware of those conflicts and did agree to their participation since this was only a test audit and provided training for the audit team. Of course in a real audit the selection of the audit team would take these factors into account.