

Refreshment (CPP-030)

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1. Description of the CPP

The TDA replaces the *Information Packages* on a storage medium, copying them to a new medium and discarding the old one at the end of a storage medium's life cycle.

Inputs and outputs

Input(s)	
Data	<i>AIP</i>
Metadata	<i>Storage management information</i>
Documentation / guidance	Storage management policy - Media
Output(s)	
Data	<i>AIP</i>
Metadata	<i>Storage management information</i>
	Record of decommissioning

Definition and scope

Refreshment is the process of anticipating the end of life of a storage medium and copying data to a new storage medium in order to safeguard *AIPs* on viable storage media at all times. It is a vital part of storage life-cycle management, and minimises the risk of data corruption.

A TDA may also decide to refresh a storage medium for various reasons such as:

- Mitigate corruption: Large, media-wide errors or corruption are detected (e.g. a magnetic tape has become unreadable) by CPP-004 (**Data Corruption Management**).
- Mitigate costs and risks: A storage medium (e.g. a server) reaches the end of its life and is no longer being supported by the vendor, potentially resulting in increased support costs or risks of unpatched security vulnerabilities.
- Reduce costs and/or improve efficiency: For example, refreshing storage to take advantage of new generations of data tape and increase read/write speed, or to reduce physical footprint, power consumption etc.

The process of refreshment makes no changes to the *AIPs* themselves but only operates on the storage layer. A TDA may decide to physically replace the medium with an identical medium (e.g. replace an old magnetic tape by a new similar one), or choose a new medium (e.g. replace magnetic tapes with a new generation of tapes or a completely different type of storage medium). During refreshment, all *AIPs* on an old storage medium are copied onto a new storage medium and their fixity is verified. It is important to note that the medium undergoing refreshment is not always the source for replicating the data (e.g. copies on offline storage media or corrupted storage media are typically refreshed from an available storage medium). The old storage medium (including all data on it) then is removed from use and is either destroyed, recycled or repurposed (depending on its type).

A TDA may use a wide range of storage mediums to achieve data replication and storage diversity. Examples of a storage medium include discrete physical media (e.g. data tapes or archival storage discs), storage servers (e.g. online storage provided as NAS, SAN, DAS etc.) or any combination of these (e.g. tiered storage that combines files servers and tape libraries). This is not an exhaustive list. Each copy of a TDA's data can be on a storage medium that consists of software, hardware and media.

The choice of storage types and their longevity is determined by **Risk Mitigation** (CPP-012). The TDA must have a strategy and a plan in place for:

- Managing its storage hardware, software and media
- Defining intervals of regular replacement for different storage
- Procedures for the refreshment of the storage medium before it reaches the end of its life cycle

Process description

Trigger event(s)

Trigger event	CPP-identifier
A storage medium is near the end of its life cycle and must be replaced by a new storage medium	
Detection of corruption or errors in a storage medium	Data Corruption Management (CPP-004)
Potentials for reducing costs or improving efficiency by benefiting from storage medium technologies are identified	

Step-by-step description

No	Supplier	Input	Steps	Output	Customer
1a	CPP-012 (Risk Mitigation)	Storage management policy - Media, flagging a storage medium that must be refreshed	Identify and locate the storage medium to be refreshed	The old storage medium that is to be refreshed	
1b	CPP-004 (Data Corruption Management)	Detection of a faulty storage medium			
1c		Refreshment is identified as a way to reduce costs, increase efficiency, or improve environmental			

		sustainability			
2		<i>Storage management information</i>	List all <i>AIPs</i> on the old storage medium	Inventory of <i>AIPs</i> involved in the refreshment	
3		Storage management policy - Media	Select source medium to copy the <i>AIPs</i> from (can be from storage other than the medium to be replaced)	Authoritative storage medium for replicating/copying the <i>AIPs</i>	
4			Provision of a fresh storage medium that will replace the old one	The fresh storage medium that will replace the old one	
5		Source storage medium of <i>AIPs</i>	For each <i>AIP</i> individually, start the copy process (steps 6 to 10):		
		Fresh storage medium			
		Inventory of <i>AIPs</i> involved in the refreshment			
6			Retrieve the <i>AIP</i> from the source storage medium		
7			Copy the <i>AIP</i> to the fresh storage medium	New copy of <i>AIP</i>	
8		<i>Existing/previous Fixity metadata</i>	Validate the fixity of the <i>AIP</i> on the fresh storage medium	Valid status (9)	<i>Fixity metadata</i>
				Invalid status (go	

				back to 6)		
9			Record the fixity for the new <i>AIP</i> copy	<i>Fixity metadata</i>		
10			Update the storage location for the new <i>AIP</i> copy	<i>Storage management information</i>		
11		Inventory of <i>AIPs</i> involved in the refreshment	Check that all <i>AIPs</i> in the inventory have been successfully copied	Confirm completeness of the copy process (12)		
				Error (go back to copy process loop)		
12			Update information about the fresh storage medium (e.g. <i>File</i> locations, media identifiers) and mark the old medium and its contents as ready for deletion/decommissioning	<i>Storage management information</i>		
13			Create a preservation event for the refreshment	<i>Provenance metadata</i>		
14		Old storage medium that has been refreshed	Ensure data security and that confidentiality is not compromised by making sure that data on the old storage medium is properly deleted			
15			Decommission the old storage medium	Record of decommissioning		

Rationale(s)¹ and worst case(s)

Rationale	Impact of inaction or failure of the process
Manage the storage infrastructure life cycle	<p>Storage medium deteriorates/ degrades/ becomes faulty over time, which increases the risk of data corruption.</p> <p>Storage medium is no longer supported by the vendor, which increases risks to data due to lack of maintenance or unpatched security vulnerabilities.</p>
Have multiple copies of data on multiple viable storage media	In cases of data corruption or destruction, recovery depends on having other intact copies
The TDA should achieve sustainability	Using old or obsolete storage media results in higher costs, lower operational efficiency, or higher environmental impact (compared to latest storage medium technologies).
Open source storage solutions	Vendor lock-in in storage solutions pose a risk of a strong dependency to an external partner.

2. Dependencies and relationships with other CPPs

Dependencies

CPP-ID	CPP-Title	Relationship description
CPP-012	Risk Mitigation	The strategy for data storage and storage infrastructure management is defined in a storage management policy which is based on a TDAs risk assessment and mitigation.

Other relations

Relation	CPP-ID	CPP-Title	Relationship description
Not to be confused with	CPP-011	Replication	Replication creates new parallel copies of individual A/Ps, refreshment creates new

¹ Term derived from PREMIS.

			copies that replace the old ones. Moreover, CPP-011 aims for redundancy on an IP level, whereas Refreshment operates on a storage medium level.
Affinity with	CPP-002	Checksum Validation	All new <i>AIP</i> copies must have their checksum validated to verify that the process was successful. The checksum validation is more mechanical in its nature in Refreshment, only aiming at verification of the copy process. In contrast to CPP-002, it does not have to negotiate with producers or examine the results.

3. Links to frameworks

Certification

Certification framework	Term used in framework to refer to the CPP	Section
CTS Link	“procedures for handling and monitoring deterioration of storage media”	R14 Storage & Integrity
Nestor Seal Link	“selection of suitable storage media, redundancy, refreshing, media migration”	C15 Integrity: Functions of the archival storage
ISO 16363 Link	“refreshing, migration”	5.1.1.5 The repository shall have defined processes for storage media and/or hardware change (e.g., refreshing, migration)

Other frameworks and reference documents

Reference Document	Term used in framework to refer to the process	Section
OAIS Link	Replace Media Refreshment	4.2.3.4 5.2.4.2
PREMIS Link	Replication, Media Migration, Media Refreshment	Glossary

4. Reference implementations

Publicly available documentation

Institution	Organisation type	Language	Hyperlink
TIB – Leibniz Information Centre for Science and Technology and University Library, Germany	National library	English	https://wiki.tib.eu/confluence/spaces/lza/pages/93608373/Archival+Storage#ArchivalStorage-Mediamigration
	Non-commercial digital preservation service		
	Research infrastructure		
	Research performing organisation		
CSC – IT Center for Science Ltd., Finland	Non-commercial digital preservation service	English	https://urn.fi/urn:nbn:fi-fe2023062157386 (section 3.2.4)
		Finnish	https://urn.fi/urn:nbn:fi-fe2024051731943 (Annex 3, section 2.1.1)