



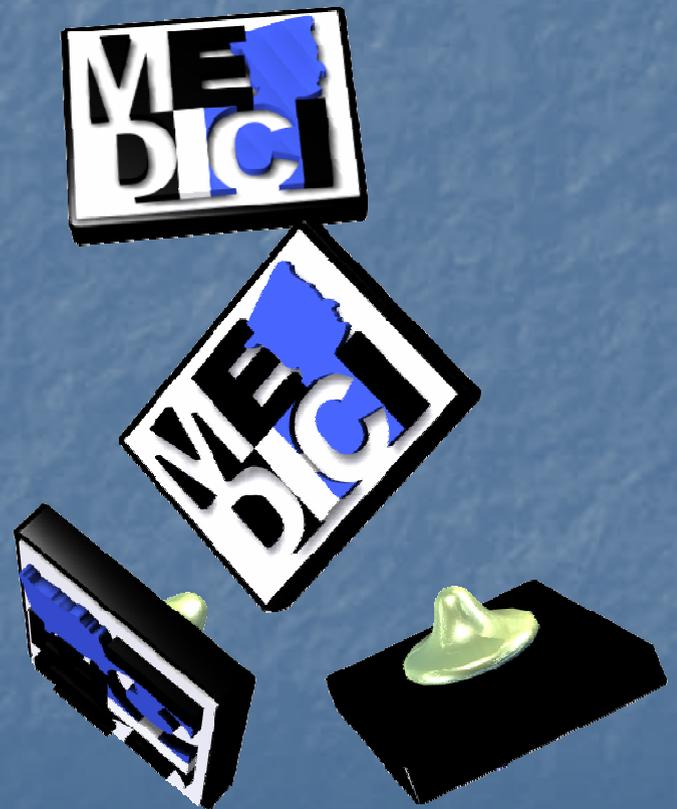
Long Term Preservation of Digital Content



Alfredo M. Ronchi
EC MEDICI Framework Secretariat
alfredo.ronchi@medicif.org events@medicif.org
www.medicif.org

MEDICI Framework

- Promotes the use of ICT & New Tech in the field of culture - education, cultural heritage
- Main actions:
 - Information sharing – web based services
 - Events and initiatives, research projects
 - Education – courses, etc





Lost and to loose

We have already lost....

- Leonardo da Vinci's Battaglia di Anghiari
- Alexandria Library
- Plays of Aeschylus
- Egyptians Papyri
- Paxton's Crisall Palace
- Music records in Edison's format
- Von Karajan's early records
- ...

Endangered species

- Digital archives
- Digital music
- Electronic Art & Installations
- Digital movies and special effects
- Electronic Musical Instruments
- Cars, Motorbikes
- Photo Cameras
- Wristwatches
- Hi Fi Stereo

This subject takes us to consider two aspects, the first is technological obsolescence and the second the 'temporary instinct' of the so-called 'permanent supports'.

“Digital fragility”



- Rapid changes in technology make preservation of digital content a challenge. The biological clock of ICT beats smaller time slices compared to those considered worldwide in the field of cultural heritage.
- Digital formats becomes suddenly obsolete and disappear. An extraordinarily long-lived solution, such as the PC/DOS in great favour for over twenty years, represents a short-lived apparition if compared to the time spent in state owned archives.
- Systems are aging, media on which information is stored are disintegrating - the magnetic technology diskette survives without problems for thousands of hours but not enough to be considered 'permanent' for those aims

Digital Landscape

- Which are the long-term implications if we rely on current digital technology to preserve our cultural memory?
 - Documents
 - Archives
 - Music, Movie
 - Artifacts
 - Heritage / Intangible Heritage
 - Objects & tools
 -
- Long term preservation of digital archives is a issue not only for cultural content but even for e-government and social services.
- Taking into account the huge amount of data to be filed, the amount of time to accomplish with this task and more over the period of time we need to store such information, we have to value objectively a problem up till now widely underestimated and that is the conservation for long periods of time of digital information.



Main approaches & “formats”

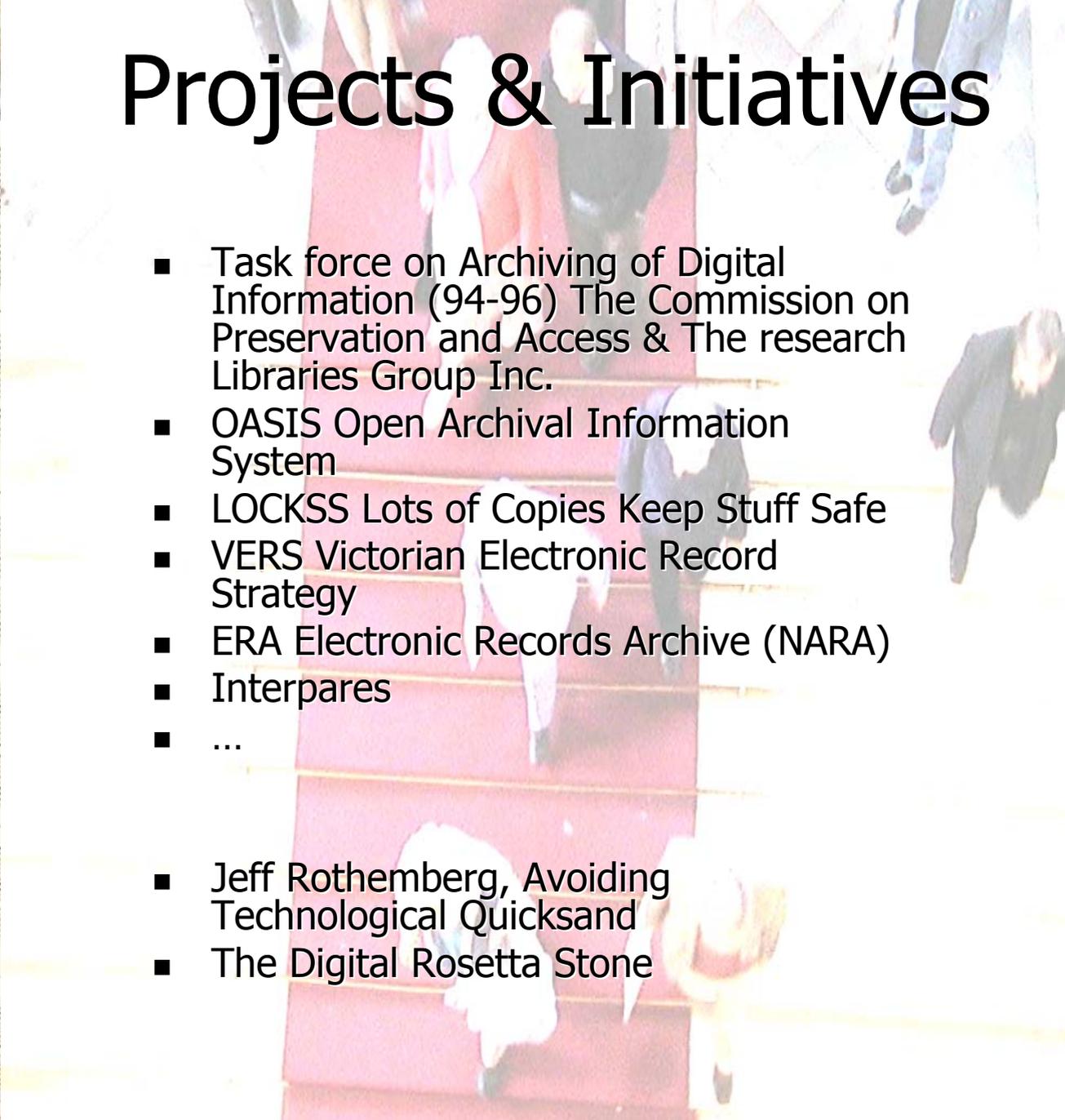
- Refreshing
 - Printing microfilming
 - Multiple Instances (copies)
 - System Preservation
 - Emulation
 - Migration
 - Standardisation
 - Encapsulation
 -
- Plain text (for a long time the essence of interoperability and long term format;
 - Text with specific formats and functions (such as camera ready pages, spreadsheets, database import/export formats)
 - Multi/hypermedia content (images, movies, sounds in different formats, links, refs);
 - Technical Sketches, 3D models (vector graphics, interactive scenarios);
 - Content deeply merged with specific applications (archives, data base, , video games, custom applications);
 - Interactive installations, virtual enhanced reality applications, etc
 - Future applications involving a higher interaction with users and heterogeneous distributed data structure.



Projects & Initiatives

- Task force on Archiving of Digital Information (94-96) The Commission on Preservation and Access & The research Libraries Group Inc.
- OASIS Open Archival Information System
- LOCKSS Lots of Copies Keep Stuff Safe
- VERS Victorian Electronic Record Strategy
- ERA Electronic Records Archive (NARA)
- Interpares
- ...

- Jeff Rothemberg, Avoiding Technological Quicksand
- The Digital Rosetta Stone





“Long term preservation of digital content”

- Alfredo Ronchi
MEDICI Framework
- Michele Banfo
Imation
- Bruce Barkstrom
NASA
- Raymond Lorie (*)
Research Staff Member, Computer Languages
IBM Laboratories Almaden
- Shinji Matsumoto
Director of New Technology for Culture
UNESCO
- Eric J Miller
W3C - OCLC
- Seamus Ross
The University of Glasgow - Hatii – ERPANET
- Susumu Sawai
Manager Gakujoken
- Georges Mihaes
Coordinator EC Bricks, member UNESCO
Intangible Heritage Task force
- Kenneth Thibodeau
Electronic Records Archives (ERA)
Program Management Office - NARA
- Lynn Thiesmeyer
Coordinator of the Mekhong Region
Net Online Archive, Keio University

Reference sources

1 Digital CULt RePort "Technological landscapes for tomorrow's cultural heritage: Unlocking the value of cultural heritage", Luxembourg: Office of Publications of the European Communities, January 2002 - ISBN 828-6265-8 - <http://www.salzburgresearch.at/fbi/digital>

2 Alan R. Heminger, Steven B. Robertson, "The digital rosetta stone: a model for maintaining - long-term access to static digital documents", Communications of the Association for Information Systems, volume 3 article 2 National Research Council (1995) Study on the Long-term Retention of Selected Scientific and Technical Records of the Federal Government Working Papers. Washington, DC: National Academy Press.

3 Maria Guercio, "La conservazione a lungo termine dei documenti elettronici: normativa italiana e progetti internazionali", proceedings <http://www.unipd.it/ammi/archivio/3conferenza/3%20Conf%20-%20Mariella%20Guercio>

4 Jeff Rothenberg, Avoiding Technological Quicksand: Finding a Viable Technical Foundation for Digital Preservation, Council of Library and Information Resources, 1998

5 Rothenberg J. Ensuring the longevity of digital documents. Scientific American. 1995; 272(1):24-9

6 Granger S. Emulation as a digital preservation strategy. D-Lib Magazine, October 2000. <http://www.dlib.org/dlib/october00/granger/10granger.html>. Accessed April 19, 2002

7 Wheately P. Migration - a CAMILEON discussion paper. 2001. <http://www.ariadne.ac.uk/issue29/camileon/>. Accessed April 19, 2002

8 Raymond A. Lorie, Long term preservation of digital information, Proceedings of the first ACM/IEEE-CS joint conference on Digital Libraries, p.346-352, January 2001, Roanoke, Virginia, United States

9 Lynch C. Canonicalization: A fundamental tool to facilitate preservation and management of digital information. D-Lib Magazine, September 1999. <http://www.dlib.org/dlib/september00/lynch/lynch.html>. Accessed April 19, 2002

10 Reich V, Rosenthal DSH. LOCKSS: A permanent web publishing and access system. D-Lib Magazine, June 2001. <http://www.dlib.org/dlib/june01/06reich/reich.html>. Accessed April 19, 2002

11 Consultative Committee for Space Data Systems- Reference Model for an Open Archival Information System (OAIS) July 2001. http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html. Accessed April 19, 2002

12 Lavoie B. Meeting the challenges of digital preservation: The OAIS reference model. OCLC Newsletter January/February 2000; 26-30

13 Attributes of a trusted digital repository: Meeting the needs of research resources. An RLG-OCLC report. Draft for public comment. August 2001. <http://www.rlg.org/longterm/attributes01.pdf>. Accessed April 19, 2002

14 OCLC/RLG working group on preservation metadata: A recommendation for content information. October 2001. <http://www.oclc.org/research/pmwg/contentinformation.pdf>. Accessed April 19, 2002

15 Research Library Group (RLG) - RLG REACH element set for shared description of museum objects. 1998. <http://www.rlg.org/reach.elements.html>. Accessed April 19, 2002

16 National Library of Australia. Preservation metadata for digital collections. 1999. <http://www.nla.gov.au/preserve/pmeta.html>. Accessed April 19, 2002

17 Networked European Deposit Library (NEDLIB). Metadata for long term preservation. July 2000. <http://www.kb.nl/coop/nedlib/results/preservationmetadata.pdf>. Accessed April 19, 2002

18 Granger S. Emulation as a digital preservation strategy. DLib Magazine, October 2000. <http://www.dlib.org/dlib/october00/granger/10granger.html>.

19 Wheately P. Migration - a CAMILEON discussion paper. 2001. <http://www.ariadne.ac.uk/issue29/camileon/>.

20 Lorie RA. Long term preservation of digital information. Joint Conference on Digital Libraries, 2001; 346-52.

21 Lynch C. Canonicalization: A fundamental tool to facilitate preservation and management of digital information. D-Lib Magazine, September 1999. <http://www.dlib.org/dlib/september00/lynch/lynch.html>.

22 Reich V, Rosenthal DSH. LOCKSS: A permanent web publishing and access system. D-Lib Magazine, June 2001. <http://www.dlib.org/dlib/june01/06reich/reich.html>.

23 Consultative Committee for Space Data Systems- Reference Model for an Open Archival Information System (OAIS) July 2001. http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html.

24 Lavoie B. Meeting the challenges of digital preservation: The OAIS reference model. OCLC Newsletter January/February 2000; 26-30.

25 Attributes of a trusted digital repository: Meeting the needs of research resources. An RLG-OCLC report. Draft for public comment. August 2001. <http://www.rlg.org/longterm/attributes01.pdf>

26 OCLC/RLG working group on preservation metadata: A recommendation for content information. October 2001. <http://www.oclc.org/research/pmwg/contentinformation.pdf>.

27 Research Library Group (RLG) - RLG REACH element set for shared description of museum objects. 1998. <http://www.rlg.org/reach.elements.html>.

28 National Library of Australia. Preservation metadata for digital collections. 1999. <http://www.nla.gov.au/preserve/pmeta.html>.

29 Networked European Deposit Library (NEDLIB). Metadata for long term preservation. July 2000. <http://www.kb.nl/coop/nedlib/results/preservationmetadata.pdf>.

30 Preserving Digital Information, Report of the Task Force on Archiving of Digital Information, May 1996. <http://ftp.rlg.org/pub/archif/final-report.pdf>

31 The Australian Government Locator Service (AGLS) Manual for Users, Version 1.1, National Archives of Australia and Office for Government Online, August 1999. http://www.naa.gov.au/govserv/aals/AGLS_User_Manual

32 Bearman, D., Sochats, K., Metadata Requirements for Evidence, University of Pittsburgh, <http://www.lis.pitt.edu/~nhprc/BACaric.html>

33 Bearman, D., Reality and Chimeras in the Preservation of Electronic Records, D-Lib Magazine, Vol 5 No 4, April 1999, <http://www.dlib.org/dlib/april99/bearman04bearman.html>

34 Reference Model for an Open Archival Information System (OAIS), Consultative Committee for Space Data Systems, CCSDS 650.0-W-4.0, White Book, September 17, 1998. http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html

35 Waugh, A., Wilkinson, R., Hillis, B., & Dell'oro, J., Preserving Digital Information Forever, CSIRO CMIS Technical Report (forthcoming).

36 Weibel, S., Kunze, J., Lagöze, C., Wolfe, M., Dublin Core Metadata for Resource Discovery, RFC 2413, September 1998. <http://ftp.isi.edu/in-notes/rfc2413.txt>

37 Duranti, L., Eastwood, K., The preservation of the Integrity of Electronic Records, <http://slais.ubc.ca/users/duranti/into.html>

38 Hedstrom, M., Migration Strategies (Draft). Prepared for Experts Committee on Software Obsolescence and Migration (1996), May 1997. <http://www.sis.pitt.edu/~cerar/ito-docs/Mig-Strat.doc>

39 Keeping Electronic Records (Policy for Electronic Recordkeeping in the Commonwealth Government), National Archives of Australia, <http://www.naa.gov.au/govserv/techpub/electrecd/keemngER.html>

40 Recordkeeping Metadata Standard for Commonwealth Agencies, National Archives of Australia, Version 1.0, May 1999, <http://www.naa.gov.au/govserv/TECHPUB/rkms/intro.htm>

41 Functional Requirements for Evidence in Recordkeeping, University of Pittsburgh, School of Information Sciences, <http://www.lis.pitt.edu/~nhprc/>

42 Keeping Electronic Records Forever, Records Management Vision Development, prepared by Ernst & Young Public for Record Office Victoria, 1996. <http://home.vicnet.net.au/~provic/vers/kearf.htm>

43 Victorian Electronic Record Strategy, Final Report, Public Record Office Victoria, 1998, ISBN 0-7311 5520-3, <http://home.vicnet.net.au/~provic/vers/final.htm>

44 Management of Electronic Records, Public Record Office Standard (PROS) 99/007, <http://www.prov.vic.gov.au/vers>

45 Yergeau F., UTF-8, a transformation format of ISO 10646, RFC 2279, January 1998, <http://ftp.isi.edu/in-notes/rfc2279.txt>

46 Rothenberg, J., Ensuring the Longevity of Digital Documents, Scientific American, January 1995, p24-29

47 Rothenberg, J., Avoiding Technological Quicksand: Finding a Viable Technical Foundation for Digital Preservation, January 1999, Council on Library and Information Resources, ISBN 1-887334-63-7, <http://www.clir.org/pubs/reports>

48 Documenting the Future (Policy and Strategies for Electronic Recordkeeping in the New South Wales Public Sector), State Records New South Wales, 1995, ISBN 07310 5038 X, <http://www.records.nsw.gov.au/publicsector/erf/dfj/fofcont.htm>

49 Extensible Markup Language (XML) 1.0, W3C, 1998, <http://www.w3.org/TR/R&C.xml>

50 Resource Description Framework (RDF) Model and Syntax Specification, W3C, 1999, <http://www.w3.org/TR/RFC-rdf-syntax/>

51 Levy, D., Heroic Measures: Reflections on the Possibility and Purpose of Digital Preservation, Proceedings of the third ACM conference on Digital Libraries, Pittsburgh, 1998, p152-161

52 The Universal Preservation Format: Background and Fundamentals, Sixth DELOS Workshop: Preservation of Digital Information, Tomar, 1998, <http://www.ercim.org/publication/ws.proceedings/DELOS5/upf.pdf>

53 Australian Standard on Records Management, AS4390-1996, Standards Australia, ISBN 0-7337-0306-2

On Line References

<http://www.interpares.org> (InterPARES project)

<http://www.ispo.cec.be/ida> (Moreq project)

<http://jtc.fhu.disa.mil/recmg/> (Standard 5015.2 "Design Criteria Standard For Electronic Records Management Software Applications" US Department of Defense)

<http://ccsds.org/RP9905/RP9905.html> (OAIS standard)

<http://sds.edu/NARA>

http://www.archives.gov/electronic_records_archives/ (18th Annual Preservation Conference Preservation Reformatting: Digital Technology vs. Analog Technology)

Follow Ups

- We ask for additional contributions
- A full report will be available on line at www.medicif.org
- WG under the UNESCO umbrella ?



References

EC MEDICI
Framework
Secretariat

alfredo.ronchi@medicif.org
events@medicif.org

www.medicif.org