Archaeological Records of Europe: Networked Access

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Final Report

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Education and Culture **Culture 2000**

Final Report of the ARENA Project
Dec 2001- Nov 2004

A project carried out with the support of the Culture 2000 programme of the European Union.

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Project Manager: Dr Jonathan Kenny

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1.   Introduction

This document reports the activity of the ARENA (Archaeological Records of Europe: Networked Access) project, a three-year project carried out with the support of the Culture 2000 programme of the European Union between December 2001 and November 2004.

The aim of the project was to develop a framework capable of protecting and promoting digital cultural archives of European significance relating to archaeology in six partner organisations.

Although the project has come to an end the partnership remains. The partnership brings together co-organisers from Denmark, Iceland, Norway, Poland, Romania and the United Kingdom. Each partner brought to the project particular skills and areas in which they sought to develop capabilities. The participating organisations are:

  o cIMeC, The Institute for Cultural Memory, Romania.
  o Poznań Archaeological Museum, Poland.
  o The Museum Project, Norway.
  o Kultur Ministeriet, the Danish Agency for Cultural Heritage.
  o Fornleifastofnun Íslands, the Institute of Archaeology, Iceland.
  o The Archaeology Data Service, University of York, United Kingdom.

The development of the above framework was achieved through the creation of the ARENA network. In its final year of operation the network has launched a web portal that allows access to and cross searching of important archaeological archives from the partner organisations. The portal makes both summary Sites and Monument data and specific archaeological project archives available.

The significance of the ARENA project needs to be seen in a historical context that reaches back to the late eighties and early nineties when archaeologists and archivists began to consider the potential presented by information technologies to develop a European Information Infrastructure for Cultural Heritage. The development of a network of interested parties grew with regular contact at the Computer Applications in Archaeology conference. The image below was used by Henrik Jarl Hansen to illustrate the idea of a European information network for archaeology at the Computer Applications in Archaeology conference in 1992.

Each year members of the network would hear more of developments at local and national levels and they would discuss the potential for such applications on an international and European level. The need for developing a network to share skills and expertise was recognised. The research potential for sharing archaeological data across national boundaries was recognised. To make the most of the opportunities presented by computer technologies support was required for the network of expertise and for the development of a technical architecture to make archaeological data available from all members of the network.

In 2000 members of the loose network of interested archaeologists came together to make a bid to the European Commission Culture 2000 programme. The bid was successful and the ARENA project was born. The six ARENA partners committed themselves to work on the preservation and dissemination of digital archaeological data. They also developed a portal allowing the simultaneous searching of sites and monuments indices at each partner (covering parts of the UK, Norway, Poland and Romania and the whole of Iceland and Denmark). The history of the ARENA project demonstrates the way in which informal networks can be given impetus through project funding.

The ARENA project met its project objectives and has achieved something of which the partnership is justifiably proud. Over the period of the project the ARENA partnership has been carried out considerable technical test bed work with protocols and standards such as z39.50, OAI, XML and Dublin Core. There has been considerable dissemination activity at local, national and international level. Key deliverables include the launch of the ARENA archives in Vienna in April 2003 and the launch of the ARENA Portal in Lyon in September 2004. The ARENA archives introduced 12 preserved archaeological archives of European significance online for public use. The ARENA Portal allows the interoperable searching of records held at partner organisations across Europe through the same interface.

This report lists the meetings of the ARENA partners and papers and workshops given and organised by ARENA. It also reviews the financial performance of the project.

The report details the work of the partnership in the four areas of ARENA activity stated in the original project plan. Each of these activities drew upon the preservation and dissemination of the ARENA archives and the building of the ARENA portal as a test bed for innovative activity and as a source of inspiration.

- o Organisation of initiatives for exchange of experience and the further training of professionals.

- o Promoting elements of the heritage concerned.

- o The adapted and innovative use of new technologies, to the benefit of participants, users and the general public.

- o Organising research projects, projects to raise the public's awareness and to teach and disseminate knowledge.

The substantial section of this report reviews the work of the ARENA project. The ARENA web site (http://ads.ahds.ac.uk/arena/) also includes papers discussing specific elements of the work. These elements address specific issues that the ARENA project has dealt with that have broad interest for all those seeking to

develop a European Network for access to archaeological aspects of the common European heritage.

In addition to the substantive work carried out by the ARENA partners there are considerable local benefits from the partnership. These are listed in the project report.

In addition to the authoring of this report the ARENA partners have committed themselves to keeping the ARENA portal operating for 5 years from the end off the project. The network will also meet annually at the Computer Applications in Archaeology conference to discuss issues and to look for further collaborative opportunities, aiming to extend the network.

2. ARENA Meetings, Papers, Publications, Roundtables and Workshops.

2.1 Meetings of the ARENA Partners.

During the operation of the ARENA project there have been nine meetings of the partners:

- 2nd April 2002. Held at the Computer Applications in Archaeology (CAA) Conference. Held in Heraklion, Crete, Greece.
- 3rd & 4th June 2002. Hosted by and held at the newly formed Danish National Agency for Cultural Heritage, Copenhagen.
- 25th September 2002. Held at the European Association of Archaeologists (EAA) Conference. Held in Thessaloniki, Greece.
- 21st February 2003. Hosted by and held at held at the Poznan Archaeological Museum, Poland.
- 4th April 2003. Held at the Computer Applications in Archaeology conference in Vienna. Held at the Department of Cultural Affairs in Vienna.
- 9th September 2003. Held at the European Association of Archaeologists (EAA) Conference in St Petersburg. Held in the Museum of the St Petersburg State University.
- 24th February 2004. Hosted by Fornleifastofnun Íslands Institute of Archaeology, Iceland. Held at the Nordic House, Sturlugata 5, 101 Reykjavik.
- 13th April 2004. Held at the Computer Applications in Archaeology conference in Prato Italy. Held at the PIN, Piazza Ciardi, Prato, Italy.
- 8th September 2004. Held at the European Association of Archaeologists (EAA) Conference in Lyon. Held at the *Institut d'Administration des Entreprises de l'Université Jean Moulin in Lyon, 6 cours Albert Thomas 69008 Lyon, France.*

2.2 Papers Given Meetings, Roundtables and Workshops.

During the operation of the ARENA project a great deal of work has gone into disseminating information to and communicating with the archaeological and cultural heritage management community. This has been achieved through a number of meetings, workshops and roundtables:

2.2.1 Conference Papers and Presentations

Conference Paper (April 2002): CAA Conference, Heraklion. Paper given by Dr Jonathan Kenny "Interoperability: European Heritage Infrastructures"? This paper has since been written up for publication as Kenny, J., Kilbride, W.G., and Richards, J.D. (2002) "Enter the ARENA: preservation and access for Europe's archaeological archives".

Conference Paper (May 2002): ECAI Conference, Seoul. Paper given by Dr William Kilbride "Towards a European information architecture for historic environment information resources".

Conference Paper (June 2002): Given to the Danish National Agency for Cultural Heritage. Paper given by Dr Jonathan Kenny "ARENA, Archaeological Records of Europe: Networked Access".

Presentation (Jan 2003) Oscar Aldred presented the ARENA project to the Society of Icelandic Archaeologists. Participation in ARENA has fostered the development of standards in Iceland; see section 4 for further details.

Conference Paper (Feb 2003): "Digital Preservation and ARENA" given by Dr Jonathan Kenny to the staff and invited guests of the Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB) in Amersfoort, The Netherlands.

Conference Paper (April 2003) Dr William Kilbride (ADS) gave a paper at CAA in Vienna entitled: "Preserving Digital Data: The School Report!" This paper summarised the results of the ARENA workshop, bringing the message to a wider audience and ensuring that Dr Kilbride and Dr Jonathan Kenny will be able to publish the proceedings of the workshop as a joint paper.

Conference Paper (April 2003) Dr Jonathan Kenny gave a paper at the Institute of Field Archaeologists conference in Bangor, Wales entitled "Getting on with Culture 2000: The ARENA Experience".

Conference Paper (April 2003) Claus Dam presented the ARENA project in a paper entitled Digitale udgravningsarkiver. (Digital Excavation Archives) at the 3rd biannual conference on GIS for Archaeologists. April 23rd, Jelling, Denmark.

Conference Paper (June 2003) Dr Andrzej Prinke gave a paper at the Vth World Archaeological Congress in Washington D.C. (Session 5 -Advancing Access to Digital Data: Strategies for Preserving Archaeological Digital Records): *"ARENA (Archaeological Records of Europe - Networked Access) – role of the Polish museum"* to be published in a Session's volume.

Conference Paper (April 2004). Claus Henrik Dam (from the Danish National Agency for Cultural Heritage) introduced the ARENA portal development in the "Web Portals and the European Cultural Heritage" session at the CAA conference, Prato, Italy on Wednesday 15th April.

Conference Paper (April 2004). Øyvind Eide, Jon Holmen and Anne Birgitte Høy-Petersen (from the Museum Project in Norway) gave a paper entitled: 'Between the book and the exhibition'. Creating archaeological presentations based on database information' in the "Good practices and experiences of Internet applications to archaeological investigation" session at the CAA conference, Prato, Italy on Friday 17th April.

Conference Session (Sept 2004). To celebrate the launch of the ARENA portal a session was held at the European Association of Archaeologists (EAA) conference in Lyon. The session was entitled, The European Digital Resource in Archaeology: Confronting the Preservation Issue and Opening up the Opportunities. Papers were given by:

- Gerhard Ermischer. (Aschaffenburg State Museum, Germany) "An Overview of Cultural Heritage in the Common European Research Area."

- Henrik Jarl Hansen and Claus Henrik Dam. (Danish National Agency for Cultural Heritage) "Sites and Monuments Data as a common European web resource."

- Oscar Aldred. (The Institute of Archaeology, Iceland)
  "Out with the old in with the new? Online presentation of excavation archives."

- Andrzej Prinke.
  (Poznan Archaeological Museum, Poland)
  "Digitising historic excavation archives."

- Irina Oberlander-Tarnoveanu.
  (cIMeC: Institute for Cultural Memory, Romania)
  "User issues in multilingual presentation of Cultural heritage resources."

- Øyvind Eide.
  (The Museum Project, Oslo University, Norway)
  "Making the Resources Fit: Interconnection of Diverse Archaeological Document Collections."

- Jonathan Kenny.
  (Archaeology Data Service, University of York, UK)
  "The ARENA project: Finding Paths to European Information Infrastructure for Cultural Heritage."

2.2.2 Meetings

The ARENA management board met on nine separate occasions (see 2.1) above. Meetings were also held with other organisations to disseminate information about the network and to promote the objectives of ARENA on a European scale.

Meeting (June 2002): with the Data Services Unit at English Heritage in Swindon. This visit by Jonathan Kenny and Tony Austin allowed ARENA to be introduced to this key unit within the national heritage body in the UK. Issues regarding thesauri were discussed with members of the HEREIN project at the same time.

Meeting (Sept 2002): EAA Conference, Thessaloniki. Dr Jonathan Kenny was invited to represent ARENA at a roundtable session "New, Integrated Approaches to Cultural Heritage Communication: The TECHNE European Research Network". TECHNE was to become part of the EPOCHE framework 6 Network of excellence. The ARENA partnership has an important role in the development of this network.

Meeting (Jan 2003) with the Go-Geo Project, Colchester, UK. Dr Jonathan Kenny invited to represent ARENA at the public demonstration of the Go-Geo project led by Edina at Edinburgh University.

Meeting (Jan 2003) with KY Lam from Hong Kong Antiquities and Monuments Office. Dr Jonathan Kenny presented the ARENA project to this key international heritage management agency.

Meeting (Feb 2003) to discuss the ARENA project with Bert Hoeve and staff from Rijksdienst voor het Oudheidkundig Bodemonderzoek (ROB) in Amersfoort, The Netherlands. This was an important opportunity to disseminate information about the ARENA project to the national agency responsible for archaeology in Holland.

Meeting (Feb 2003) Dr Jonathan Kenny presented the ARENA project to the archaeology staff from the Adam Mickiewicz University in Poland.

Meeting (May 2003) with Professor Michael Buckland, School of Information Management and Systems, University of California, Berkley. Dr Jonathan Kenny presented and discussed the work of the ARENA project to Professor Buckland, a leading researcher in the interoperable sharing of information.

Meeting (May 2003) with Malcolm Atkin, Victoria Bryant and Neil Lockett from the Worcestershire Historic Environment and Archaeology Service. Dr Jonathan Kenny introduced the ARENA project to the representatives of this forward thinking organisation who are making a number of heritage and archaeology data sets freely available on the Internet.

Meeting (Sept 2003) Dr Jonathan Kenny presented the ARENA project to members of three key organisations in Holland at a meeting held in York. Attending the meeting were; Ronald Wiemer and Mirjam Wiselwey (ROB), Milco Wansleeben (University of Leiden) and Roel Brandt director of the Dutch college of archaeological quality. The meeting was used to discuss issues relating to the creation of a network for digital assets in Dutch archaeology on the ARENA / ADS model.

Meeting (Jan 2004) Dr Julian Richards and Dr Jonathan Kenny held a one day meeting with Jean-Noel Anslijn from the Musee National d'Histoire et d'Art de Luxembourg to discuss standards in documentation for web resources.

Meeting (October 2004). As a result of the ARENA project Milco Wansleeben (University of Leiden) returned to visit the ADS to discuss issues of digital data preservation and access with the express interest to develop an Archaeology Data Service in the Netherlands.

Meeting & Presentation (12th November 2004). Dr William Kilbride (ADS) presented the ARENA portal to the Arts and Humanities Research Board (AHRB) ICT Programme meeting in London.

Meeting & Presentation (19th November 2004). Dr William Kilbride (ADS) presented the ARENA portal to the Arts and Humanities Data Service (AHDS) Policy Group meeting in London.

2.2.3 Seminars, Roundtables, Workshops, Poster and Training sessions and student supervision

Roundtable (Sept 2002): EAA Conference, Thessaloniki. Roundtable organised by ARENA "Towards European Information Architectures for Archaeology". This roundtable brought together eight projects (6 of which are funded by the EU) with an interest in the creation of a European data network for cultural heritage.

Seminar (Sept 2002): Attendance at the ERPANET seminar on XML at Urbino University, Italy. Jonathan Kenny attended this expert seminar to publicise the ARENA project and to participate in debate on the role of the XML mark up language as a preservation strategy.

Training (November 2002): Attendance at the ERPANET course on OAIS, Copenhagen. Dr K. Westcott from the ADS attended this course on behalf of the ARENA project. Dr Westcott was an important member of the ADS technical team working on the ARENA portal utilising OAI protocols.

Workshop (April 2003) the ARENA workshop at CAA in Vienna was entitled "The Preservation ARENA: helping your data survive!" It included papers from each of the

ARENA partners introducing the ARENA archives that demonstrate good practice in digital asset management and good content management.

Poster Session (April 2003) Dr Jonathan Kenny presented the digital asset management and content management of the ARENA project as a poster session at the CAA conference in Vienna.

Workshop (April 2003) Dr Jonathan Kenny was invited by FISH (Forum for Information Standards in Heritage) to organise, chair and contribute to a workshop at the Institute of Field Archaeologists conference in Bangor, Wales. The workshop was entitled "FISHing in the European Sea". The workshop brought together a number of European or International projects to debate standards in heritage. Six presentations were made at the FISH roundtable. Three of these concerned EU funded partnerships; Culture 2000 funds ARENA, Planarch is funded by Interreg IIC and EuroFISH was a proposed 'Network of Excellence' under the latest EU funding strand 'Framework 6'. Two of the presentations concerned projects that are aimed at making information available across national boundaries within the UK; SWISH links Scotland and Wales and Biab links the UK and Ireland. The sixth presentation was made by CIDOC a long running project that proposes a core standard for archaeological and architectural heritage using the conceptual reference model (CRM).

Seminar (May 2003) Dr Jonathan Kenny represented ARENA at a seminar organised by the National e-Science centre entitled "Schemas and Ontologies: Building a Semantic Infrastructure for the GRID and Digital Libraries". This was an important seminar to inform the project on the potential in developing subject based thesauri and ontologies for future interoperability.

Roundtable (Sept 2003) the ARENA roundtable at EAA St Petersburg was entitled; "Deploying digital data: Making the most of digital archives for archaeology".

Roundtable (Sept 2003) Dr Jonathan Kenny was invited to speak at a roundtable session organised by the eRC (European Reference Collections) group. This session relates to the development of a network (inspired by ARENA) for the sharing and public presentation of data relating to archaeological reference collections.

Student Supervision (Oct 2003) Dr Andrzej Prinke provides for consultations to two students of archaeology at Adam Mickiewicz University in Poznan who prepare their MA papers on European projects concerning archaeology; the example of ARENA Project will be extensively applied there.

Student Supervision (Oct 2003) A student from Denmark completed a paper on the ARENA project: Marlene Gjørtz: En kritisk analyse af ARENA-projektets målsætning og relaiseringsforslag (A critical analysis of objectives and implementation of the ARENA project)

Seminar (Oct 2003) Dr Christian-Emile Ore and Dr Jonathan Kenny presented both ARENA and the Museum Project at a seminar organised by the Welsh Museums Council in Swansea, Wales. The seminar was organised for the University Museums of Wales, it was an initiative to demonstrate good practice in networking organisations both technically and through working together. It was a testament to the work of the ARENA partnership that by the end of our second year of operation we are being selected as an example of good practice.

Seminar (Oct 2003) Dr Henrik Jarl Hansen gave a paper at a seminar in Florence entitled Projects on Digital Resources Access and Preservation. The paper was entitled "The future of digital memory and cultural heritage", Firenze, Italy 16-17 October

Seminar (Oct 2003) Dr Henrik Jarl Hansen gave a paper at a seminar in Naples entitled towards an integrated system for the recording, management and presentation of the archaeological heritage. The paper was entitled "Territorial Information systems for the conservation, preservation and management of cultural heritage" Naples, Italy 23-24th October.

Symposium (Nov 2003) Dr Jonathan Kenny represented ARENA at the VAST (Virtual Reality, Archaeology and Cultural Heritage) symposium in Brighton, UK. This was an important opportunity for ARENA to attend an international symposium in a field where the standards and procedures for digital preservation are being developed. The ARENA project was also able to feed into the development of the EPOCH network of excellence under Framework 6. These contacts have been important to the broader networking and dissemination activity of the project.

Seminar (Feb 2004), Held at the Nordic House, Reykjavik, Iceland for the archaeological community of Iceland. This seminar was chaired by Ásgeir Friðgeirsson (member of the Icelandic Parliament) and was entitled: "Online archaeological digital archives: preservation, access and Archaeological Records of Europe: Networked Access (ARENA)". There were five papers in total:

- Digital Preservation and Access: the ADS experience Dr Julian Richards, ADS, UK.

- Working in the ARENA: preservation and access for digital archaeology Dr Jon Kenny, ADS, UK.

- Digital Reincarnation: collecting data for Danish online excavation archives Claus Dam, KUAS, Denmark.

- Between the book and the exhibition. Creating archaeological presentations based on database information Øyvind Eide, Jon Holmen, Gitte Høy-Petersen, University of Oslo, The Museum Project, Norway.

- Expectations and the digital experience: the Icelandic ARENA Oscar Aldred, FSÍ, Iceland.

Visiting Student (February 2004). As a result of the ARENA network Kasia Skrzyñska from the Polish Academy of Sciences was invited to attend a course run by the Archaeology Data Service in Spatial Archaeology.

Poster Session and Rolling PowerPoint (April 2004). At the CAA conference in Prato Italy the ARENA project was publicised by a poster session and a rolling PowerPoint presentation. In addition the ARENA portal was publicised in two papers invited into other sessions (see conference papers above).

Conference Session (September 2004). At the EAA conference in Lyon ARENA held a conference session entitled The European Digital Resource in Archaeology: Confronting the preservation issue and opening up the opportunities. This session will be published in Internet Archaeology and will form part of the ARENA legacy to European Archaeology.

Workshop. The ARENA project investigated the use of XML protocols in making European Digital resources in archaeology interoperable. The result of this work was presented in a workshop session organised by the ARENA network at 9th Archäologie und Computer workshop in Vienna on 9th November 2004. The workshop contained papers from:

- William Kilbride and Jonathan Kenny
  (Archaeology Data Service, UK and ARENA Network)
  "Archivists and Archaeologists: What do we want from XML?"

- Christan-Emil Ore
  (The Museum Project, Norway and ARENA Network)
  "The Museum Project and XML."

- Lief Scheurmann
  (Stuttgart University)
  "The relationship between XML and databases".

- Sandra and David Schloen
  (Chicago University)
  "The XML system for textual and archaeological research"

- Cornelius Steckner
  (FOCAS, Cologne, Germany)
  "Cloning."

- Bernd Weidner
  (Interactive instruments GmbH, Bonn, Germany)
  "XML and Monument Protection."

- Mathius Wilbertz
  Niedersächsisches Landesamt für Denkmalpflege, Hannover, Deutschland
  "XML and the selection of data objects for use."

2.2.5 Press Publicity

The ARENA project has been the subject of a number of press reports resulting from partner's press releases:

Press release in Iceland (Jan 2002): Morgunlaðið (national press in Iceland) ran an article in January 2002 that is available online at:
 http://www.mbl.is/mm/frettir/show_framed_news?cid=1&nid=772694

Press release in UK (June 2002): The York Evening Press (local press in UK) ran a short article in June 2002

Interview (Oct 2003) given by Dr Andrzej Prinke in the leading regional daily "Glos Wielkopolski" highlighting the role of the Poznan Archaeological Museum in European projects (ArchTerra, ARENA and AREA III).

Popular Article (Oct 2003) by Dr Andrzej Prinke in the leading regional daily "Glos Wielkopolski" (weekend edition) on the Internet gallery of 220 pre-war photos from the famous Biskupin excavations (1934-1939), executed as a part of the ARENA Project.

2.3 Published Papers

Kenny, J., and Wilbride, W.G. 2002. "Networked Access to Digital Archaeological Archives in the European ARENA" in the CSA Newsletter: Computer Technologies for Archaeologists & Architectural Historians. Vol XV No 2. Fall 2002.

Hansen, H. J. and Dam, C. 2002. "On-line management of cultural heritage cartography. An introduction to the Danish experience", in L. García Sanjuán and D.W. Wheatley (eds) Mapping the Future of the Past, p129-137.

Kilbride, W.G. 2002. "Mapping the Heritage Information landscape: Interoperability and Geo-Spatial Description in the Management of Europe's Historic Environment", in L. García Sanjuán and D.W. Wheatley (eds) Mapping the Future of the Past, p115-128.

Kenny,J. 2002. "Enter the ARENA ..." in *ADS Archaeology Data Service NEWS* issue 12 autumn 2002.
Online at: http://ads.ahds.ac.uk/newsletter/issue12/arena.html (last checked Dec 2004).

Kenny, J, and W.G. Kilbride. 2003. "Europe's Digital Inheritance: ARENA archives launched " in *CSA Newsletter* Vol. XV1, No. 1 - Spring, 2003.
Online at: http://csanet.org/newsletter/spring03/nls0302.html (last checked Dec 2004).

Kenny, J, and W.G. Kilbride. 2003. "Europe's Digital Inheritance: ARENA archives launched " in *CSA Newsletter* Vol. XV1, No. 1 - Spring, 2003.
Online at: http://csanet.org/newsletter/spring03/nls0302.html (Last checked Dec 2004).

Kenny, J., W.G. Kilbride and J.D. Richards. 2003. "Enter the ARENA: preservation and access for Europe's archaeological archives" in M. Doerr and A. Sarris (eds), *Computer Applications and Quantitative Methods in Archaeology 2002,* Archive of Monuments and Publications, Hellenic Ministry of Culture, p 349-353

Kenny, J. 2003. "FISH at Bangor: FISHing in a European Sea" in *The Archaeologist*, Summer 2003 Number 49, p14.

Kenny, J. 2003. "European Archaeology Archives: ARENA launches major new data sets" in *ADS Archaeology Data Service NEWS* issue 13 spring / summer 2003.
Online at: http://ads.ahds.ac.uk/newsletter/issue13/arena.html (last checked Dec 2004).

Kenny, J. 2003. "Networks of Excellence and the Excellence of Networks" in *ADS Archaeology Data Service NEWS* issue 14 autumn 2003.
Online at: http://ads.ahds.ac.uk/newsletter/issue14/networks.html (last checked Dec 2004).

Richards, J.D. 2003. "Digital Preservation and Access" in *European Journal of Archaeology* vol 5 no 3, 343-366.

Kenny, J., W.G. Kilbride, O. Aldred, C.H. Dam, 2004. "Deploying digital data: Making the most of digital archives for archaeology" in *The European Archaeologist* no 20, Winter 2003/2004, 16-19.

Kenny, J. and W.G. Kilbride. 2004. "Europe's electronic inheritance: The ARENA project and digital preservation in European archaeology" in K.F. Ausserer, W. Borner, M. Goriany and L. Karlhuber-Vockl (eds), *Enter the Past: The E-way into the Four Dimensions of Cultural Heritage, Computer Applications and Quantitative Methods in Archaeology 2003,* BAR International Series 1227, p130-133.

Oberlander-Tarnoveanu, I. 2004. "Access to Romanian Archaeological Archives" in *ADS Archaeology Data Service NEWS* issue 15 spring 2004.
Online at: http://ads.ahds.ac.uk/newsletter/issue15/romanian.html (last checked Dec 2004).

Kenny, J. 2004. "ARENA: Opening a Portal for Europe" in *ADS Archaeology Data Service NEWS* issue 16 autumn 2004.
Online at: http://ads.ahds.ac.uk/newsletter/issue16/arenalaunch.html (last checked Dec 2004).

Kilbride, W.G. 2004. "The Danube in Prehistory in the Digital Age: Towards a Common Information Environment for Archaeology" in *Archeologia e Calcolatori*, 15, 2004, p129-144.

Prinke, A. Forthcoming. Article in the bulletin of the Heritage Protection Service for Poznan Province ("Wielkopolski Biuletyn Konserwatorski") on participation of Poznan Archaeological Museum in European projects (ArchTerra, ARENA and AREA III).

Prinke, A. and J. Kenny. Forthcoming. "ARENA (Archaeological Records of Europe - Networked Access); role of the Polish museum" in edited volume from World Archaeological Congress 2003.

Kenny, J. and J. D. Richards. "The European Digital Resource in Archaeology: Confronting the preservation issue and opening up the opportunities" in *Internet Archaeology* 18.

Ermischer, G. Forthcoming. "An Overview of Cultural Heritage in the Common European Research Area" in *Internet Archaeology* 18.

Hansen, H.J. and K. H. Dam. Forthcoming. "Sites and Monuments Data as a common European web resource" in *Internet Archaeology* 18.

Aldred, O. Forthcoming. "Out with the old in with the new? Online presentation of excavation archives" in *Internet Archaeology* 18.

Prinke, A. Forthcoming. "Digitising historic excavation archives" in *Internet Archaeology* 18.

Oberlander-Tarnoveanu, I. Forthcoming. "User issues in multilingual presentation of Cultural heritage resources" in *Internet Archaeology* 18.

Eide, Ø. Forthcoming. "Making the Resources Fit: Interconnection of Diverse Archaeological Document Collections" in *Internet Archaeology* 18.
Kenny, J. Forthcoming. "The ARENA project: Finding Paths to European Information Infrastructure for Cultural Heritage" editorial in *Internet Archaeology* 18.

3. The Financial Operation of ARENA

3.1 Introduction
This section of the report relates to the financial reporting form submitted with the report to the Commission at the end of operation of the second year.

The overall expenditure of the operation of the ARENA project was €996,400.83, this was an €8,137.17 under-spend on the original budget. As this is only a 1% variance on the original budget despite the early difficulties we had with the project making a slow start (see Year 1 and Year 2 interim reports).

3.2 Staff
Staff costs for the ARENA project amounted to €815,434.95. This is an under-spend of €14,623.05, well within the tolerances allowed by the Commission.

3.3 General Expenditure
The expenditure for this category is €41,320.72, an under-spend of €2,629.28 also within the tolerances allowed by the Commission.

3.4 Travel and Subsistence Costs
The costs incurred in the implementation of the project amounted to €110,494.76, an over-spend of €9,514.76 which is within the tolerances allowed by the Commission.

3.5 Costs in Connection with Conferences and Seminars
Spending under this heading came to €24,783.21, an under-spend of €266.99, which is within the tolerances allowed by the Commission.

3.6 Miscellaneous Costs
These costs amounted to €4,367.39, an under-spend of €132.61, which is within the tolerances allowed by the Commission.

4. The Work

4.1 Introduction
This section reports the detailed activity of the project throughout its operation. Work on all four of the ARENA areas of activity made exceptional progress:

- Workshops, roundtables and conference sessions were all successful.
- The preservation and multilingual presentation of archives was completed at all partners representing an important legacy for European archaeology both in terms of preservation and access.
- The Innovative use of metadata to index archaeological excavation archives has been designed and is outlined in this report.
- The development of the ARENA portal, allowing users to search partners' sites and monuments data has been completed and is available through the ARENA website at http://ads.ahds.ac.uk/arena/search/

The work of the ARENA project has left a number of legacies to European Cultural Heritage:

- The need to preserve and make accessible digital archives in archaeology has been widely promoted on a European scale.
- The activity necessary to preserve such data has been demonstrated for all to see at the six partner organisations.
- An interoperable portal for searching archaeological sites and monuments data has been successfully introduced and is receiving tens of thousands of "hits" every month. In a survey carried out in early 2005 users of heritage web sites based in the UK were asked which resources they used. From a sample of 741 responses 148 (20%) used the ARENA portal and other resources. This figure demonstrates a high usage of a resource that is only in its infancy and demonstrates the importance of building on the work of the ARENA network.
- In addition to the deliverables promised at the out set of the project the ARENA project has developed a network of organisations with similar interests that continues to co operate after the end of the project.

4.2 Organisation of initiatives for exchange of experience and the further training of professionals.
The ARENA partners recognised at the project design phase that there was an urgent need to raise awareness of the fragility of digital data and to promote the actions which secure its long-term future amongst all European countries. The central activity intended to confront these issues were:

- o Partners sharing and extending expertise and experience.

- o To disseminate expertise and experience gained through the project to a wider European audience.

- o To develop and promote standards in archive formats, metadata and communications protocols.

- o To identify areas were there is a need for Guides to Good Practice, to translate existing guides where required and to develop future projects to create and promote new guides.

4.2.1 Sharing expertise amongst the partners.

The nine management meetings of the ARENA project were important opportunities for the sharing of expertise amongst the partners. These allowed the specific discussion of issues relating to the work required to preserve and present key archives on line and to develop the ARENA portal. Examples of such activity are:

- o The ARENA partners selected a variety of archive types for preservation and presentation. These included excavation archives, historical archives, documentary archives, photographic archives and publications. This broad range of archive types has allowed the partners to discuss issues concerning areas in which their organisations do not have wide experience.
- o The ARENA partners have shared skill and expertise on issues of publication and copyright.
- o The development of the map interface for the ARENA portal ensured that partners worked with spatial interfaces and understood the data standards required to disseminate data this way. In particular the ARENA portal interface demonstrates approaches that do not require extensive GIS skills and utilise open source software applications.
- o The development of the ARENA portal allowed the partners to exchange skills and expertise in the z39.50 and OAI protocols. In particular how to set up data to be searched by a z39.50 portal or how to create an OAI repository. This has included visits by technical staff to see how other partners operate.
- o The experience of the some partners in the development of multilingual tools has informed the approach of the whole group to these important issues. This is reflected in the paper contributed to the publication of the work of ARENA in Internet Archaeology, edition 18, due for publication in the summer of 2005.
- o The data mapping and metadata indexing activities of the partners have led to extensive discussions of the application of the Dublin Core standard on a European scale. This is particularly true for the translation of meaning for the Dublin Core elements.
- o The ADS has been able to use the skills developed working on local portal projects (HEIRPORT and the CIE demonstrator) to the benefit of all ARENA partners.

4.2.2 Disseminating expertise and experience gained through the project to a wider European audience.

There are three key dissemination functions carried out by the ARENA partners:

a) Conference activity.
b) Meetings with other organisations.
c) Publicity.

Section 2.2 above (entitled papers given, meetings, roundtables and workshops) lists the wide variety of dissemination routes employed by the ARENA network. The role of the workshops and roundtables were the most high profile and allowed the partners to focus on specific topics. ARENA held:

- Three EAA conference sessions / roundtables (Thessaloniki, St Petersburg and Lyon).

- Three workshops at the CAA conference in Vienna, the Institute of Field Archaeologists (IFA) in Bangor (UK) and the 9th Archäologie und Computer workshop in Vienna.
- One seminar at the Nordic House, Reykjavik, Iceland for the archaeological community of Iceland. This seminar was chaired by Ásgeir Friðgeirsson (member of the Icelandic Parliament).
- Two poster sessions at CAA conferences at Prato and Vienna.
- The ARENA partnership also presented a strategically selected set of papers in sessions throughout the CAA Prato conference. This was a highly successful approach allowing the ARENA network to get its message across to a much wider audience than sessions or roundtables can achieve.

Detail of the key ARENA network dissemination activity is given below:

CAA 2001: Heraklion
The first announcement of the ARENA network was made at the Computer Applications in Archaeology (CAA). This was made by a paper given by Dr Jonathan Kenny entitled: "Interoperability: European Heritage Infrastructures"? This paper publihed as Kenny, J., W.G. Kilbride and J.D. Richards. 2003. "Enter the ARENA: preservation and access for Europe's archaeological archives" in M. Doerr and A. Sarris (eds), *Computer Applications and Quantitative Methods in Archaeology 2002,* Archive of Monuments and Publications, Hellenic Ministry of Culture, p 349-353

EAA 2001: Thessaloniki
The Thessaloniki roundtable was entitled "Towards European Information Architectures for Archaeology". The session considered the very idea of a European wide data architecture or network, seeking to answer a specific question:

"How do we move from disparate projects towards a European Information Architecture for Archaeology that achieves interoperability for knowledge sharing?"

The following European projects took part in the roundtable:

ARENA (Archaeological Resources of Europe: Networked Access): Julian Richards and Jon Kenny
AREA (Archives of European Archaeology): Nathan Schlanger and Alexandra Alexandri
ERPANET (Electronic Resource Preservation and Access Network): Niklaus Buetikofer
HEREIN and HEREIN2 (European HERitagE Network) Irina Oberländer-Tarnoveanu
ArchTerra (Extending the European Archaeology Web over Bulgaria, Romania and Poland): Martin van Leusen and Andrzej Prinke
CHIOS (the CIDOC Conceptual Reference Model planned standard): Martin Doerr
Pathways to Cultural Landscapes: Gerhard Ermischer
TECHNE (European Cultural Communication Network) Franco Niccolucci

All of the participants considered that making archaeological archives searchable across national boundaries was a goal with considerable advantages both in terms of the preservation of this fragile resource and for access to data for a number of user groups. The roundtable brought together projects all seek to achieve interoperability for knowledge sharing in different ways but the consensus was that the way forward lay in drawing the work of projects such as ours together under larger and more influential projects like those proposed by the 6th Framework.

This was a well-attended roundtable that allowed considerable networking between EU supported projects that all work towards a similar goal in different ways. The subject allowed ARENA to disseminate knowledge at the same time as making an impact in its first roundtable session.

Following the ARENA workshop at Thessaloniki the project attracted a great deal of interest, particularly from the National Board of Antiquities in Finland and the State Service for the Archaeological Heritage in the Netherlands. Such interest led the ARENA project to develop relations with other parties as part of its dissemination activity. Such relations were mutually beneficial and led to the discussion of further international collaboration on archives of cultural significance, particularly reference collections of moveable heritage and historical archives. This collaboration resulted in the bid to Culture 2000 for the ARTeFACT project. Sadly this collaboration was not funded.

CAA 2003: Vienna
The workshop at CAA 2003 was entitled 'The Preservation ARENA: helping your data survive!' The workshop confronted the vulnerability of digital archives. Within archaeology there has been an increasing awareness that this vulnerable data is as much part of the primary site archive as the artefacts and paper records that have traditionally found their way into museum stores. The key to good preservation of digital data is to plan ahead, creating and documenting archives to meet standards, allowing safe storage, later use and proper management in the future.

The objective of the workshop was to highlight and discuss best practice in preservation issues, both in practical and theoretical terms. In particular the workshop allowed organisations that have been working on preservation issues to outline their experiences and to discuss how they dealt with them. The workshop also allowed for discussion papers to highlight particular preservation issues. The core of the presentations was the ARENA partnership that discussed their particular experiences.

A session paper given by Dr William Kilbride (ADS) supplemented the workshop, it was entitled 'Preserving Digital Data: The School Report!' The session paper allowed the ARENA message to be taken to a wider audience within the conference and also ensured that the results of the workshop would be published. A poster display and leaflet highlighting the archives presented by the ARENA partners was also produced for the conference.

EAA 2003: St Petersburg
The ARENA roundtable at EAA in September was entitled; "Deploying digital data: Making the most of digital archives for archaeology". This session built on the experiences of the ARENA partners in preserving and making publicly available the ARENA archives. The ARENA roundtable dealt with access to archaeological data. The real value in digital archaeological data is its reuse. Digital data can be made available in a number of ways, CD-Rom for example, but by far the most flexible is through the Internet. By demonstrating the use of digital archaeological data as a research tool the roundtable confronted a number of questions that are key to the value of the ARENA network: User evaluation, researching different audiences, case studies in using data, research culture, managing expectation and the fundamental question what do we mean by data?

This roundtable session was published by the European Association of Archaeologists as; Kenny, J., W.G. Kilbride, O. Aldred, C.H. Dam, 2004. "Deploying

digital data: Making the most of digital archives for archaeology" in *The European Archaeologist* no 20, Winter 2003/2004, 16-19.

CAA 2004: Prato

Despite the success to the ARENA sessions / roundtables and workshops at conferences throughout Europe there was a concern that only those with a prior interest were attending. At CAA in Prato the network decided to contribute papers to other sessions in the conference and to hold and staff a poster session to attract discussion.

The following papers were given:

Conference Paper (April 2004). Claus Henrik Dam (from the Danish National Agency for Cultural Heritage) introduced the ARENA portal development in the "Web Portals and the European Cultural Heritage" session at the CAA conference, Prato, Italy on Wednesday 15th April.

Conference Paper (April 2004). Øyvind Eide, Jon Holmen and Anne Birgitte Høy-Petersen (from the Museum Project in Norway) gave a paper entitled: 'Between the book and the exhibition'. Creating archaeological presentations based on database information' in the "Good practices and experiences of Internet applications to archaeological investigation" session at the CAA conference, Prato, Italy on Friday 17th April.

Whilst these papers were given in other sessions Dr Jonathan Kenny staffed the ARENA poster session and presented an ARENA rolling PowerPoint.

EAA 2004: Lyon

The most important session held by the ARENA project included the launch of the ARENA portal. This session was entitled:

The European Digital Resource in Archaeology: Confronting the Preservation Issue and Opening up the Opportunities.

The session highlighted the fact that constantly evolving digital technologies and software present European archaeology with both a problem and an opportunity. The problem is one faced by heritage managers and archivists; there is a growing need for active preservation and management for digital data. A survey of the state of museum archaeological archives in the UK (the Swain report) published in 1998 noted that most museums do not have the correct technology to store, access and curate in the long term the computer files that archaeologists were creating. In fact Swain observed, the digital components of excavation records were not being sent to the museums at all. The same was echoed in another survey in the UK entitled *strategies for digital data* published in 1999, the digital archives simply remained on the computing hardware in the archaeologist's office, or saved onto a disc in a file or desk drawer. For archaeologists in the 90s the concepts of data asset and content management was a million miles away, the printed version of a report for the client was seen as the end result.

With the problems come two key opportunities for European archaeology and cultural heritage management:

1. Digital data resources feed into archaeological research and consequently into cultural components of the common European research area.
2. With the development of robust tools for working with the pool of digital archaeological data comes the enormous potential of Pan European

archaeological data for the heritage manager faced with a variety of decisions.

3. The same data can be made available in a number of ways through carefully devised data architectures. This means that digital data can be made available for use for schools, higher education and for life long learning amongst all European citizens.

Over recent years a number of projects have been funded by the European Union to address specific issues that have to be addressed to realise the opportunities presented by digital archaeological resources. Many of the speakers in this session have worked on such projects (Arch Terra, HEREIN, AREA, Pathways to Cultural Landscapes and CIDOC (funded by the UN)). The session is organised by one such project the ARENA network, supported by the Culture 2000 programme. ARENA has addressed the problems inherent in the preservation of digital archives of international importance the project has also demonstrated considerable success in providing innovative access to resources.

ARENA has also made innovative use of information technologies to demonstrate for the first time in archaeology a working portal allowing simultaneous searching of sites and monuments data across six European databases, all using different languages. Such cross border searching has important implications for European archaeological research so often constrained by contemporary national borders.

The papers in the final ARENA network session addressed different aspects of the path towards a European network for the preservation of and access to digital archaeological resources. The session as a whole demonstrated that given the right support the ideals outlined above can be achieved.

The papers, listed in section 2.2.3, will be published through Internet Archaeology (http://intarch.ac.uk/). This online journal is the most appropriate outlet for the ARENA network message and will complete the dissemination action of the project.

9th Archäologie und Computer workshop, 2004: Vienna
As the ARENA network investigated the use of XML protocols in making European Digital resources in archaeology interoperable the whole issue was addressed by a workshop organised by ARENA. The papers are listed in section 2.2.4 above. The invitation to the ARENA network to address these issues reflects the status of the project and its dissemination strategy. This was also an excellent opportunity to disseminate the ARENA network at an annual conference concerning computing in archaeology attended by a different (German speaking and eastern European) audience from CAA.

Dissemination: Conclusions
The conference sessions organised by ARENA were not of course the only means by which the work of the project was disseminated. Section 2.2 above demonstrates the number of papers that have been given at conferences of international or national importance by staff from the partners.

Much of the work carried out by the ARENA project has been published. These publications are listed in section 2.3 above.

It is a demonstration of the positive dissemination activity of the ARENA project in Europe that we have been involved in a number of meetings to discuss best practice in developing other networks. These networks have been both on a national level and on a European scale. The Society of Icelandic Archaeologists has used ARENA

as an example of good practice; partly as a result of ARENA in Iceland a committee has been formed on behalf of the Society of Icelandic Archaeologists to review and provide guidelines for data standards in particular for digital archives, especially for excavations, but this extends also to the survey programme. ARENA partners were also contacted by representatives from a number of key archaeological organisations in Holland to discuss the development of a national network for digital archaeological data. The Museums Council for Wales also asked Dr Jonathan Kenny to present the ARENA project to representatives from the Welsh University Museums. On a European level all ARENA partners are involved in the Framework 6 Network of Excellence, EPOCH and in further applications for funds under the Culture 2000 programme.

Dissemination on a local scale has also been important; the ARENA project has been of great interest to professional organisations such as the IFA in the UK. It has also been of continued interest to local newspapers reaching a very different and important public.

4.2.3 Develop and promote standards in archive formats, metadata and communications protocols.

The promotion of standards has been a core part of the ARENA message delivered in conference sessions, papers and published word. In particular the ARENA project has used the Dublin Core data standard in its data preservation and presentation activities. Dublin Core compatibility has been a key part of the creation of metadata in the preservation activity.

This activity is best illustrated by the development of the excavation archiving tool developed by the ARENA network, the Layered Dublin Core Metadata tool (LDCM). Dublin Core (DC) metadata is used by the ARENA portal to describe individual Sites and Monuments in its searchable index. The idea of layered metadata is an extension of this concept of using DC to create an index. In the case of the LDCM the index sits in an "Interpretive Layer" linked the basic DC "Project Layer" providing a description of an archive itself and an "Archive Layer" made up with file level DC metadata describing specific elements within the archive (See the design layout in Figure 1). The use of layers to understand the indexing qualities of Dublin Core does not reflect the actual nature of the underlying database, which is flat.

The index in the "Interpretive Layer" is the key to the concept. "Project Layer" and file level ("Archive Layer") metadata records are commonly used in archiving excavation data. The "Interpretive Layer" index creates a deeper or extended metadata that describes interpretations or ideas. The creation of metadata for concepts or ideas (interpretations of archaeological data) has its roots in the early work of CIDOC and MIDAS. It also has similarities to the proposed Academia Sinica Computing Centre (ASCC) use of Dublin Core metadata that proposes five types of data around which metadata is built (objects, time, place, concepts and people). The theory behind linking data to interpretation is also dealt with in depth by Jean-Claude Gardin in his work at C.N.R.S. in Paris.

An index of interpretations and ideas requires the active extraction of interpretive statements from publications or particular sections of an archive. These interpretations are given their own DC metadata record. The DC_Subject element allows these interpretations to be assigned to thematic terms held in a controlled vocabulary. In this case the themes are drawn from the MIDAS Thesaurus of Monument Types (TMT) and a set of six archaeological investigation types. This use of DC_Subject allows the index to be searched thematically as well as by period.

Layered Dublin Core metadata uses the DC_Relation and DC_Source fields to act as connections between the Layers, particularly for the "Interpretive Layer". The "Interpretive Layer" statements are linked to the evidence (held in the "Archive Layer") cited in the excavation report.

The elements within the data structure are all related to Dublin Core elements, which allows the database to comply with standards in archiving digital data and can for example be mapped into other systems of data structure such as the CIDOC Conceptual Reference Model.

In the ARENA network design the data is searchable under theme or period, matching the approach taken in the ARENA network portal.

Dublin Core is a key standard to the interoperable working of the ARENA portal. Although it utilises z39.50 and OAI protocols to facilitate interoperable searching the mapping process for each partner was a central activity, it is here that ARENA ensured the whole network mapped to a standard. Each field at the top level of each database, in six different languages, has had to be mapped onto the Dublin Core standard.

4.2.4 To identify areas were there is a need for Guides to Good Practice, to translate existing guides where required and to develop future projects to create and promote new guides.

With the adoption of the ADS guides to good practice, one of the guides has been translated to Romanian and made available on licence from the ADS.

4.3 Promoting elements of the heritage concerned.
This activity of the ARENA project had three main objectives:

- o To allow the partners to develop and share expertise in the protection and promotion of digital archives.

- o To promote this expertise amongst other European agencies.

- o To promote scholarly and public access to selected digital archive data sets and archaeological texts of international significance.

By making the key archives below available through the ARENA web site the partners have met the above objectives. In the process of making archives available the ARENA partners have had to deal with a number of data preservation issues. The technical aspects of the above work are now complete at all partners. At the CAA 2003 conference in Vienna ARENA held a workshop on the actual process of archive preservation. The workshop drew on the experiences of the ARENA partners in preparing the archives and makes an important contribution the promotion of digital archive preservation on a European scale.

The following section sets out the archives contributed. They can be accessed via the ARENA web site http://ads.ahds.ac.uk/arena/archindex.cfm with summaries in six European Languages.

4.3.1 Dankirke, Denmark

Dankirke is an Iron Age site located in the south-western part of Jutland, Denmark close to the North Sea. It was found as a result of the search for the Viking Age settlement of Ribe and was excavated during the years 1965-1970. The finds cover a period from around the 2nd century BC up until late 8th century AD; they represent a remarkable inventory especially from the late Roman and the Migration period. Dankirke is a small site and only partly excavated. Both the rich finds inventory and house plans from the period were remarkable when excavated in the 60s. The situation has changed since then and Dankirke has lost some of its importance. This loss of importance make it all the more essential to present the finds and documentation of the site, since it has never been fully published.

So far only approximately 3000-sq. m. of Dankirke has been excavated divided in two areas of investigation Dankirke Øst (East) and Dankirke Vest (West). In the eastern area only one house was excavated (house I) as well as pronounced layers in the area northeast to the house, where there were also many pits and postholes. During the excavation some of these postholes were thought to belong to a construction (house II). In the western area five houses was excavated in part or in total as well as four wells. The houses VIII, IV, III, VII and V (Va and Vb) represent in chronological order the site from pre-roman Iron Age to the Migration period.

Rich and varied finds were located during the excavations, not least from the House V, from where many metal artefacts and types of glass were discovered. The combination of finds has led to the description of Dankirke as a site of prosperity, a rich farm as well as a centre of trade.

4.3.2 Hjelm, Denmark

Marsk Stig (one of the most prominent men in Denmark in the late 13th century) was outlawed in 1297 for the murder in 1286 of king Erik Klipping. Stig fled with his men to the small (less than one sq. km.) island of Hjelm in 1290, where they set to work to fortify the island with three castles: Fyrbakken in the centre of the island, Kastelsbakken on a headland out on the coastal slope towards the west, and Skådebakken on the east side of the island. When the outlaws took over Hjelm they brought with them some captive moneyers with the intention of undermining the Danish economy with large amounts of counterfeit coins. In 1306 the king attacked the island and burned down all three fortifications.

The purpose of the investigations in 1999 and 2000 was to ascertain, whether the three fortifications were in fact from this period, and to locate the site of the coin production. During the excavations trenches were dug at two of the three fortifications, which were found to date from the late 13th century, and three separate locations for coin production were also found. Large quantities of copper pieces represent all stages in the coin-production process: Scrap metal, casting waste, newly cast and hammered-out bars, and cut square pieces which were cold-forged into blanks, as well as finished coins.

Excavation plans, a finds database, excavation reports and elevation data of the entire island are among the data made available in this online archive.

4.3.3 Vorbasse, Denmark

Excavations at the village of Vorbasse between 1974 and 1987 covered an area of about 1 sq.km established a settlement continuity from the time of Christ to the present day. Most of the excavated area covered the settlements from the Iron Age, Viking Period and Early Middle Ages. In the early phases, three settlements existed

in the area at the same time, but around 400 AD this was reduced to two, each consisting of 4-6 individual farms.

400 years later at the beginning of the Viking Period these settlements merged into one village with 6 large farms. Each of the farms can be followed through the following centuries, well into the 12th century. At the middle of the Viking Period, a marked increase in area for all 6 farms occurs.

The data from the Viking Period from Vorbasse forms the documentation in the excavation archive, as the production of digital material from the other phases of the excavation is not yet complete. The material available for download consists mainly of descriptions of individual buildings and several sets of excavation plans. There is also a list of finds.

4.3.4 Hofstaðir, Iceland
The skáli or longhouse at Hofstaðir in Mývatn, NE Iceland, was originally excavated by Daniel Bruun in 1908, with further investigations in 1965 by Olaf Olsen. These excavations were carried out to investigate the Viking hof or pagan temple site suggested by the place-name and historical narratives. Since 1991 the Institute of Archaeology, Iceland (FSÍ) has conducted archaeological investigations focused on the Viking longhouse and immediate areas, using the most recent intrusive and non-intrusive methods. The excavations revealed sunken featured buildings, attached and detached ancillary buildings, and related external deposits. There has also been evaluation of the medieval to early modern farm mound, as well as substantial excavation around the medieval chapel and cemetery. The digital archive from the archaeological investigations from Hofstaðir include a portion of the data from the FSÍ investigations, with downloadable files of the site plans, databases, interim reports, topographic survey and geophysics are available in a variety of dissemination file formats.

4.3.5 Egge, Norway
On a massive end moraine at the far end of the Trondheim fjord in the middle part of Norway we find the two farms of Egge and Hegge. They are situated on the top of a hill, which gives them optimal possibilities of control of both the surrounding land and sea area. On the fields of these two farms there have been settlements for the past 3-4000 years. In fact, the first Stone Age settlement discovered in Norway was found here. However, Egge and Hegge are best known for their great burial grounds from the Iron and Viking Ages, which unfortunately are dramatically reduced today. Luckily Egge has always attracted a lot of attention as a result of the mention of the farm in the sagas. As a consequence of the saga connections documentation recording the registration of sites and excavations at Egge were begun as early as 200 years ago and where added to at regular intervals since. Initially the area included some 75 burial sites, of which only approximately 30 are preserved today.

There are a number of sites in the Egge landscape. On the top of the hill the sites show two concentrations of mounds from the late Iron and Viking Ages and one of stone covered burial circles from the late Iron Age. One last group of sites from the late Iron and Viking Ages, which is represented by mounds and various stone formations, is located partly on the top of the hill and partly on the field below, close to the shoreline of the time.

Even in the Migration Age and the Merovingian period Egge was an important farm, it represents one of the most prominent chieftain farms of the Viking Age in the middle

part of Norway. In the sagas Egge is mentioned more frequently than most recognizable farms in the tales of the Viking Age.

4.3.6 The Archaeological Repertory of Romania: Archive Digitisation Project

The Institute of Archaeology, 'Vasile Pârvan', in Bucharest started the documentation for the Archaeological Repertory of Romania (RAR) half a century ago (in 1949 - 1950). The project had the ambition to record unpublished field surveys and any mention of archaeological discovery in the known literature back to the 18th century. The activity stopped in 1956 due to lack of funding. It resulted in an important collection of paper cards bound together in files, arranged topographically by regions, districts and localities, according to the administrative organisation of the time. The result was a rather heterogeneous collection of information. The paper archive has never been published, although scholars working for archaeological repertories in various territories have consulted the archive during their preliminary documentation.

Work on RAR archive digitisation project started in 2001, following a co-operation agreement between the Institute of Cultural Memory and the Institute of Archaeology. The project aims to critically extract the basic information (location, site type, period, and bibliographic reference) from the manuscripts into a database, and scanning the originals for digital archiving. The data model was decided by a working group, which led to the design of a database application (Access 2000) to meet the aims of the project. The Institute of Archaeology is responsible for cataloguing, and CIMEC is responsible for the database maintenance, scanning of the original cards, image processing, and inscribing them on CD-ROMs. At least one copy is stored in each location. At present there are over 5,500 records in the RAR database (5,522 site records, 4,621 localities, 1,769 assemblies, 831 complexes, 6,970 finds, 14,954 bibliographic references) and 3,000 cards are scanned, which represent some 40% of the archive.

4.3.7 The Chronicle of the Archaeological Researches in Romania (1983 - 2002)

The Chronicle of the Archaeological Researches in Romania is a national database initiated by the Directorate of Archaeology, the Ministry of Culture and Religious Affairs and is designed and maintained by the Institute for Cultural Memory in order to provide information about the archaeological excavations in Romania during the last two decades.

The database contains 2,000 archaeological reports of the excavations undertaken during 1983 and 2001 in Romania in 703 archaeological sites. The following information is provided for each excavation: location of the site (locality, commune, county), type of site, period, excavation team (persons and institutions), and a brief report on the finds and excavation techniques. Information is updated yearly according to the data send by the authors of the researches. The reports are accompanied by more than 1,500 illustrations and are ordered alphabetically by the name of the sites and the administrative location.

The information is indexed on various criteria:

- o the year of research
- o the chronological index (historic periods from Palaeolithic to Modern times)
- o the index of type of monuments
- o the index of the institutions involved in the researches
- o the index of the persons who have been members of the research staff

All the indexes are in Romanian and English. About 25% of the reports have abstracts in foreign languages (English and French), sent by the authors, together with references and bibliographical notes.

4.3.8 Cottam, United Kingdom.

The presence of Anglian and Anglo-Scandinavian settlements at Cottam B, East Yorkshire, was first indicated in 1987 by numerous finds of copper alloy coins, dress pins and strap ends by metal detector users. Archaeological fieldwork revealed an enclosure of the eighth-ninth centuries AD, containing traces of a small number of post-built halls. In the late ninth century this settlement was then abandoned, a process which led to the incorporation of a human female skull in a domestic rubbish pit. A new enclosed settlement was laid out nearby, which was occupied briefly in the early tenth century. It is argued that the Anglian settlement may have been part of a royal multiple estate but that as a result of estate reorganisation after the Scandinavian settlement it developed into an independent manor. Cottam is the first so-called 'productive site' in the environs of York to be the subject of archaeological investigations. The results suggest that it was a prosperous but not exceptional site, and that the primary activity was farming, with limited evidence for trade or manufacture. This work also prompts a reassessment of the typology of crop mark enclosures and a re-examination of the large number of undated enclosures in the area. Should you wish to learn more about using the Cottam archive you may wish to visit the Cottam section of the PATOIS project created by the ADS to demonstrate the use of on line archives. This can be found at:
http://ads.ahds.ac.uk/project/patois/module2/cottam1.html

4.3.9 Danebury, Hampshire, United Kingdom

Danebury, in the county of Hampshire, is an Iron Age fort situated on a hill rising to a height of 143 m above sea level, between 45 and 60 m above the surrounding level of the gently undulating chalk plain of Wessex. The site has been the scene of a major programme of excavation that began in 1969 under the direction of Prof Barry Cunliffe and was completed in 1978. This is one of the most thoroughly investigated examples of an Iron Age hill fort in the United Kingdom. Volumes 1 (excavation: the site) and 2 (excavation: the finds) of the extensive publication are now available in digital format as part of the CBA research reports collection to be found on the Archaeology Data Service website. This collection of digital archives provides a detailed resource that supplements the publication of this internationally renowned excavation site.

4.3.10 Ager Tarraconensis, Spain

The Ager Tarraconensis archive represents data from a survey conducted between 1985 and 1990 in the territory of Tarragona in Spain. The survey used field-walking techniques to investigate the development of the classical landscape in the hinterland of Tarraco, the Roman provincial capital of Hispania Citerior (Tarraconensis). The survey demonstrated that the analysis of pottery scatters could make a positive contribution to a study of the relationship between Tarragona and its hinterland in antiquity. The evidence showed that the Roman landscape was heavily populated and densely exploited and also showed a predominance of smaller farmsteads over villas.

4.3.11 Kowalewko, Poland

The cemetery in Kowalewko is one of the most important archaeological discoveries in Poland in recent years because of the possibility of ascertaining its original boundaries. It has also yielded new evidence for the study of the Wielbark Culture in

Great Poland. Among the 496 graves of phases B1b to C1a one can find almost all the known forms of burial of the Wielbark Culture. The furnishing of those graves consists mainly of dress accessories and ornaments while at the same time weapons and specialist tools were not deposited in them. The grave goods from Kowalewko confirm that the community using the cemetery maintained contacts with the Elbian circle and the Danish islands, observable especially in the details (pyramids, 8-shaped forms etc.) and composition of dress. It was presumably from these areas that imports from the 'Slovak-Danish' and 'Danish' waves reached Kowalewko.

4.3.12 Biskupin Images, Poland

Biskupin is one of the most celebrated archaeological sites in Poland. The site is located some 90km to the north east of Poznan. in Poland. The site was first noted in 1933 on a marshy peninsular projecting into Lake Biskupin. It soon became apparent that the site was incredibly well preserved and represented a prehistoric (Iron Age) fortified settlement. Excavations began in 1934 led by Józef Kostrzewski and examined 2,500 square meters, revealing substantial fortifications and streets of some 104 to 106 houses. The houses had a uniform floor space and appear to have had one common roof to each row. Excavation at Biskupin continued through the war and finished in 1974. The images available for download here were taken at the height of the excavations in the 1930s. At this time the fame of Biskupin spread throughout Poland and beyond.

4.4 The adapted and innovative use of new technologies, to the benefit of the participants, users and the general public.

The preservation and presentation of archives has made use of the Cold Fusion data base system to allow the same interface to be viewed in six different languages. This development of the interface was also adopted for the ARENA portal.

The Portal demonstrates the use of z39.50 and OAI protocols in the same interface, using XML to move data to be presented to the user. The innovative use of these communications protocols in the same portal demonstrates interoperability between data sets managed by different organisations with different computing infrastructure and resources.

4.5 Organising research projects, projects to raise the public's awareness and to teach and disseminate knowledge.

The delivery of the ARENA portal used several initiatives to investigate innovative approaches data sharing and discovery. These are summarised in section 4.4 above (technologies) and section 4.6 below (metadata standards). The dissemination of the results of these approaches formed the basis of the concluding ARENA workshop held in Lyon in September 2004 and the subsequent publication in Internet Archaeology, edition 18, due for publication in summer 2005.

An ARENA website has been created to disseminate information about the ARENA project, the results of workshops and information about the technologies being used. The ARENA web site is found at http://ads.ahds.ac.uk/arena/.

4.6 Metadata Standards.

The ARENA partners, following presentations by Dr Julian Richards and Tony Austin from the ADS, discussed Metadata standards and agreed to comply with the Dublin Core standard.

As noted in section 4.2.3 above a tool for indexing excavation archives has been designed, the Layered Dublin Core Metadata tool (LDCM). This innovative use of

Dublin Core metadata standards to show how layered metadata can be used to index archives allows the linking of interpretive aspects of each archive and the evidence used to generate the interpretation. Thus a thematic search can be carried out allowing for evidence-based use of the interpretive elements of individual archives. The tool also has the potential to allow searching across many archives.
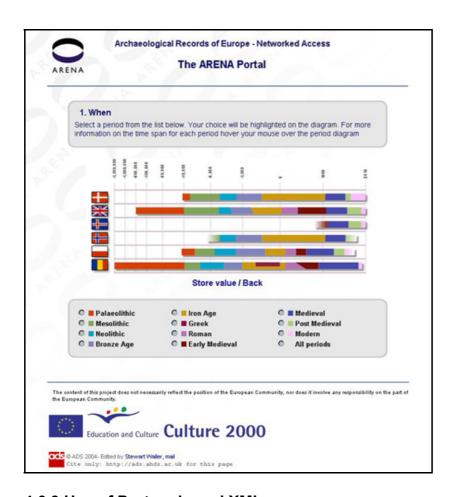
Also noted in section 4.2.3 above is the vital and central role that the Dublin Core standard plays in allowing interoperable searching. Each database (in 6 languages) must be mapped to the Dublin Core standards to allow the z39.50 and OAI protocols to search the correct fields returning useful information that relates to the search parameters chosen.

4.6.2 Multilingual Thesauri.

To enable a cross-searchable portal the ARENA project investigated the use of multilingual elements in the search interface. The front end of the portal utilises the Cold Fusion based system developed for the archives to provide multilingual access in the first place. This has been applied to the search interface itself allowing the portal to be accessed in six different languages and searches to be made according to period and archaeological theme. This is a key area of research for the project that has been developed to meet the needs of the portal.

ARENA has fixed a top set of themes to allow each partner organisation to map its thesauri of terms into a common thematic block. This can be seen as the first stage in a much larger project that will have to be undertaken at a subject by subject level to eventually create a thesaurus or ontology of terms for the whole of Europe. This objective is long term and requires more resources than any one project like ARENA can muster.

ARENA has mapped the extensive period terminology of each partner nation onto a single set of 11 ARENA periods. Each of these periods may contain a number of local sub periods but the top level has been agreed as an ARENA standard for period terms. A screen shot below shows the ARENA periods as part of the portal search facility.

4.6.3 Use of Protocols and XML.

The ARENA project has used Z39.50 and OAI protocols to enable interoperability. This has been important area of technical investigation and innovation, as it demonstrates the practical use of both technologies in the delivery of material through the same portal. Such experience is particularly beneficial to the development of a framework for a European Archaeological Archives, drawing on the advantages of Z technology for those organisations large enough to manage the technology whilst allowing smaller organisations to participate using OAI.

4.6.4 The Creation of a framework for European Archaeological Archives web based portal.

The ARENA web-based portal was completed in 2004 and launched at the European Association of Archaeologists conference at Lyon. The portal can be accessed through the ARENA website at http://ads.ahds.ac.uk/arena/search/

It is clear that the experiences of the partners on the path to this goal will be of great interest to many other projects and organisations that are currently working towards a Europe wide network for archaeological archives. This interest is reflected in the popularity of ARENA sessions at conference and at the meetings to which we have been invited.

The Front Page to the ARENA portal

Detail of the ARENA portal is set out below:

4.6.4.1 Usage

Simple Search:

The primary interface for searching the ARENA archives has been built upon a multi-lingual '*When*, *What* and *Where*' paradigm. Upon choosing a language, the user is presented with the ARENA '*dashboard*'. From here, one can navigate through the various sub-sections of the portal.

The dashboard is a dynamic interface, which displays updated information as and when various selections have been made.

The three option boxes provide access to, and status information, about the current When, What and Where selections. Below these, a search-status box displays a summary of expected results based on the current selections.

If the current selections are expected to produce more than 5,000 hits, the Search button is disabled and a message is presented to the user prompting to narrow the search by specifying either When, What or Where etc.
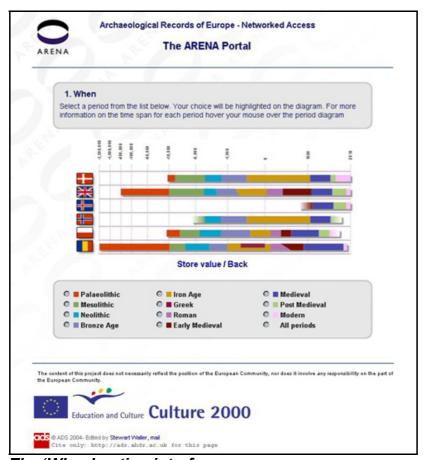
Once a valid search query has been constructed, the user can perform the search by clicking the search button. Alternatively, there are further links to clear the current search selections, access the help screens, or use the advanced search interface.

Switching Locale:

The six flags in the top-right corner of the dashboard screen provide a mechanism to change the language used throughout the ARENA portal. This acts in the same fashion as choosing an initial language from the welcome screen. However, all stored query information is retained and the user is again brought back to the dashboard – albeit rendered in the chosen language.

The When, What and Where functions as well as the advanced search facility are described on the following pages:

4.6.4.2 When

The 'When' option interface

The 'When' option provides a means to refine the search query by archaeological period. The use of a timeline provides a graphical means to achieve this. However, as archaeological periods are not consistent among the various partner countries, a timeline for each has been provided, enabling the user to see how the different archaeological periods interrelate.

The user can make a selection by either: clicking the relevant section of a timeline; or clicking one of the radio buttons located beneath. Once a selection has been made, the query can be updated by clicking the 'Store value' link.

Upon storing a value, the user is taken back to the dashboard to either: perform a search using the updated query; or continue to further refine the query by either 'What' or 'When' options. Alternatively, the user can click the 'Back' link to return to the dashboard without updating the query.
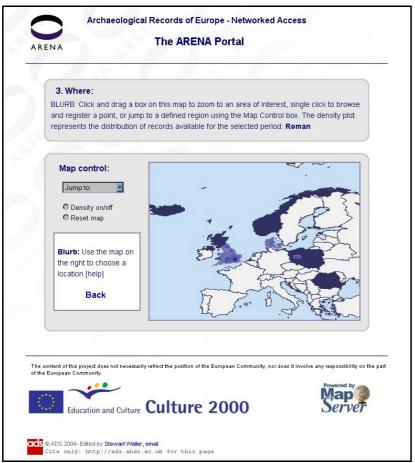
4.6.4.3 What

The 'What' option interface

The 'What' option allows the user to refine the query by monument/site type. These definitions have been taken from the eighteen root class-definitions - as described in the Thesaurus of Monument Types (RCHME and English Heritage).

Upon clicking a list item, the relevant definition is displayed in the information box on the right hand side of the screen.

In a similar fashion to the When option, the user can store the chosen value by clicking the 'Store Value' link.

4.6.4.4 Where

The 'Where' option interface

The ARENA portal makes use of an open source web-GIS interface to allow the user to select 'Where' coordinates by using map navigation.

Clicking the mouse **once** anywhere on the map will select a single point and re-centre the map around the chosen point. A red crosshair will indicate the exact position. Upon selection, the information box to the left of the map will display the chosen coordinates and again, provide the user with the option to 'Store Value' and append the query.

However, the user may need to select a more precise location than is attainable with the initial view. To achieve this, one can zoom into the map by performing a '**click-hold-drag**' mouse action to draw a bounding box around the desired area. Upon release of the mouse button, the map will redraw itself centred and scaled to the updated bounding coordinates. This action can be repeated until the zoom level reaches a 'street-map' level. To zoom out, one can either: make use of the 'Back' button on the browser to step back through previous views; or click the 'reset' link to rescale and re-centre the map to the initial view.
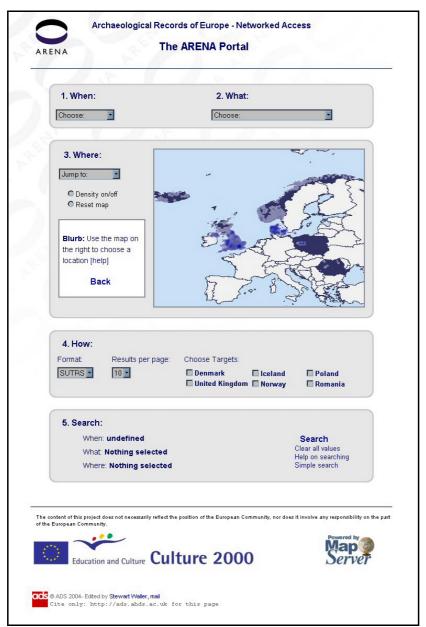
To pan around the map, the user can perform multiple single clicks to re-centre the map without zooming.

To jump to partner specific regions, a drop down list has been created that contains stored coordinates for the relevant countries. Choosing from this list will re-centre the map around the selected country from which point one can either: zoom; pan; or click and store a new coordinate.

Once a selection has been stored and the query updated, the final search query will be configured to perform a search of records that lie within (?) km of the chosen location.

The user can also view density plots representing records relevant to the chosen 'When' period. If no 'When' period has been chosen – the density plot represents records covering all periods. This density layer can be turned on/off by clicking on the 'Density on/off' link.

4.6.4.5 Advanced Search

The Advanced Search interface

The 'Advanced Search' interface can be accessed from the initial dashboard screen by clicking the 'Advanced search' link. Aside from combining the 'When', 'What' and 'Where' option screens, the user can now specify 'How' the search is to be conducted.

4.6.4.6 How

The 'How' section contains options for the choice of specific targets, number of results per page and formatting of the result set.

The 'Format' option provides the user with a drop down selection list containing XML, SUTRS or GRS1 elements. The default format has been set to SUTRS – simple unstructured text record syntax. This allows for easy reading by the user. However, if

the user requires a result set which may be further manipulated, the choice of XML formatting might be more appropriate.

The 'Results per page' option can be used to define the number of records shown per page on the results screen.

If the user has used the map interface to select a coordinate, the 'Choose Target' checkboxes will be automatically handled by the application - ie: if the coordinate is cantered in the UK, the United Kingdom checkbox will be automatically ticked and the remaining checkboxes will be greyed out. However, if no coordinate has been pre-selected, the user can choose which target databases will be searched by ticking the relevant checkboxes.

The 'Search' section acts in the same way as with the simple search interface – that is to say it is dynamically updated as and when various options have been chosen by the user. Clicking the 'Search' link will thus perform a search query based on the values displayed in this section.

4.6.4.7 Technical

The following tables describe the directory structure and various files used throughout the Arena portal:

ColdFusion directory structure:

/export/home/web/ads/arena/search			
This folder contains the majority of ColdFusion files that make up the ARENA Portal framework:			
Filename	**Description**	**Uses**	**Used By**
arena.css	The CSS style sheet		
Application.cfm	Application file controlling the session variables logon etc. This files is used by everything in that it is read before the parsing of the requested file. It checks that the person has logged in etc.		
header.cfm	The header page - shows different options according to the access level		
index.cfm	This is the main application file containing all the logic for processing selections etc.		
lang.cfm	This file is called on the initial welcome screen. It displays the initial language choice.		
lists.cfm	This is the main language file. It contains all key phrases used throughout the system with translations into the six partner languages.		
mailSJWaller.html	Just a footer include for sjw143		

mapserv.css	Stylesheet for mapserver generated pages as these render slightly different than pages produced by ColdFusion ☹
oldbrowser.html	This page is displayed if the browser does not meet the specific requirements – namely Javascript enabled and supporting the W3C DOM model.
OnRequestEnd.cfm	This file is automatically read at the end of each page request - it ends what the Application.cfm file begins.
Period.cfm	This file is responsible for rendering the 'When' section.
place.cfm	This file is responsible for rendering the initial 'Where' section before the user is directed to the mapserver output.
Popup.js	JavaScript file for popup messages
portal.css	Stylesheet for main ColdFusion area
Results.css	Stylesheet for results page
setcoords.cfm	This file translates the output coordinates from the Mapserver into ColdFusion variables and re-establishes the session
Theme.cfm	This file is responsible for rendering the 'What' section.
wait.js	This file is a slightly modified version of popup.js to display the various Please Wait messages

./images

This folder contains the various images used throughout the ColdFusion portal application

./tmp

This folder contains the temporary files created by mapserver. It is cleaned daily.

./mapserver

This folder contains all information for the Mapserver sections of Arena – see table below for directory and file information.

MapServer directory structure:

/export/home/web/ads/arena/search/mapserver

Contains map files and html (.cfm) templates for producing the mapserver generated pages ← change the .cfm templates to html at some stage because they are not going through ColdFusion – but being generated by MapServer

Filename	Description	Uses	Used By
advanced.cfm	The html page for producing the markup for the advanced		

	mapserver interface
advanced.map	The map file for the advanced mapserver interface
arena-proj.cfm	The html page for producing the markup for the simple mapserver interface
arena-proj.map	The map file for the simple mapserver interface

./data

Contains shape files for density plots ← these shape files will be moved to shapes folder – but dbf files and Arena map needs adjusting first

./data/bart_lambert

Contains the tiff files for the map data ← Arena should really be using the shared bart data – again dbf files and shape files need adjusting first

./data/shapes

Contains the shape files for the various layers in the Arena map file

./data/tiff

Contains the tiff files for the density plots

./fonts

Contains fonts for use with mapserver

./graphics

This directory contains various images for display on the mapserver generated page

./src

Contains source files for building mapserver and related components

./symbols

The symbols directory contains various symbols for use with mapserver

MapServer specific information:

The use of MapServer, an open source web-GIS package, has been used to enable map-based browsing for the 'Where' option. There are several important notes to be made regarding this:

Variables:

MapServer has no support for ColdFusion. It is primarily a standalone CGI application. This makes it difficult to share session variables with the rest of the ARENA portal application. All data manipulation has therefore been handled using JavaScript.

To pass the array of translated terms (as defined in the *lists.cfm* file) to the MapServer CGI application, the use of the <CFWDDX> ColdFusion tag was needed:

```
<CFSET Request = StructNew()>
        <CFSET Request["Periods"] = Periods>
        <CFSET Request["Themes"] = Themes>
```

```
        <CFSET Request["Countries"] = Country>

<CFWDDX
        INPUT ="#Request#"
        OUTPUT="MyWDDXPacket"
        ACTION="CFML2WDDX">

<CFWDDX
        INPUT="#MyWDDXPacket#"
        OUTPUT="DynamicJSCode"
        ACTION="WDDX2JS"
        TOPLEVELVARIABLE="MyJSVariable">
```

This action is initialized from the index.cfm page, creating a JavaScript structure containing the Period, Themes and Country terms as defined in lists.cfm. The CFML2WDDX action creates a virtual WDDX Packet, whereupon the WDDX2JS action has been called to convert this packet into a JavaScript structure. The dynamic JavaScript code is then passed to the MapServer CGI application using a form along with the rest of the session variables:

```
        <form method="post" action="/cgi-bin/mapserv.cgi" name="whereForm"
ID="whereForm">
```

MapServer Structure:

MapServer relies on two files to produce the html mark-up and map: These are **arena-proj.cfm** and **arena-proj.map** for the simple interface, and **advanced.cfm** and **advanced.map** for the advanced interface.

The **.map** file declares the MapServer specific parameters such as layers, extents and data-types etc.

The **.cfm** file contains the html mark-up and JavaScript functions to render the page and send request/response actions to the CGI application. Again, all session variables are passed to and from the CGI application using form variables.

To enable dynamic features, such as the click-hold-drag bounding box, JavaScript was again the only solution. Where possible, this has been written to comply with the various DOM standards employed by recent browsers such as IE, Netscape and Mozilla. However, various issues have been noticed in some versions of less supported browsers such as Opera.

Density Layers:

The density layers are basically shape files based around tiff images. The tiff images can be created using ArcView or ArcGIS using the 'calculate density' spatial extensions. These tiff images have then be sliced/tiled to alleviate the amount of data that needs to be analysed for a specific area.

For the purpose of this project a 'rainbow effect' colour map was used to represent various levels of density. However, so long as each layer uses the same settings, anything could be used.

Note: There is no legend to decode what the various colours represent. However, this ~*should*~ be added at some stage. The reason for this is because for political reasons: The ADS has a very high number of records compared to various other partner sources. If we were to use the same gradient for each country – then various countries would not have any records showing up at all even though they do have a few. This is the nature of density plots. For this reason, the gradient was customized to display an aesthetically pleasing/even spread across the whole Arena area per period.

The only way around this would be to create separate density plots with specific legends/scales for each period for each country. However, there was not enough time to do this given the Arena project timeframe. This could well be looked into in the future.

MapServer Dependencies:

MapServer relies on the following dependencies to function properly:

- **gd library**
- **gdal library**
- **proj.4**
- **libpng**
- **libtiff**

These have been built and installed on mnemoyne as required. See the links below for instructions on how to do this.

Links:

http://mapserver.gis.umn.edu/doc.html
Guides on installing and configuring MapServer.

http://www.remotesensing.org/proj/
Guides on installing and configuring PROJ.4 library – needed for re-projection functionality.

http://www.remotesensing.org/gdal/
Guides on installing and configuring the GDAL library. This is a graphics library with various features specific to GIS/remote sensing.

5. Benefits to individual partners of participating in the ARENA project.

The ARENA partners have reported a number of internal activities and general benefits from participation in the project.

5.1 The Institute for Archaeology (FSI) in Iceland.

The FSI set itself up as a part of the ARENA project by initiating a programme of work to enhance the digital environment at the FSI, along with a increasing awareness of documentation, data standards and preservation of digital data. The FSI has also developed of links with other European countries involved in similar areas of work and fostering the exchange of ideas and experiences in digital data management through ARENA meetings. This has led to participation in other European networks such as the EPOCH network of excellence under framework 6, the Pathways to Cultural Landscapes project under Culture 2000 and the recent eRC bid to the Culture 2000.

The FSI has achieved specific changes since joining ARENA: There is a greater awareness of digital data issues as a result of the ARENA project from the dissemination of knowledge through workshops for FSI staff. an Information Network of linking resources has been developed from a situation where sources of information were previously dispersed. Enhancement of data collection and data entry into databases has been achieved, encouraged by the need to document and use data standards. A much greater integration of data management in all aspects of the FSI's work from site preparation to final publication has been achieved.

Following a presentation of ARENA in Jan 2003 to the Society of Icelandic Archaeologists and partly as a result of ARENA a committee has been formed on behalf of the Society of Icelandic Archaeologists to review and provide guidelines for data standards in Iceland; in particular for digital archives, especially for excavations, also extending to the Icelandic survey programme.

5.2 The Danish Agency for Cultural Heritage.

The Cultural Heritage Agency is a new construct and participation in ARENA has had an important role to play at the local level. One of its aims is to bring together all of the national heritage and art databases under one roof. This includes information on works of art, buildings worthy of preservation, protected sites and monuments still visible in the landscape today, prehistoric sites not visible on the surface and artefacts from historic periods. These are all stored in databases developed independently by different institutions and therefore on a variety of technical platforms and also in very different database structures.

The aims of the ARENA project are very similar to the present situation of the Danish Agency for Cultural heritage. The goal is that national databases on different technical platforms and with very diverse data structures can be accessed through one interface with the search results being transparent to the user, i.e. it not being obvious, that the search is distributed and actually queries a number of different databases before an answer is provided.

Because the common goal of ARENA is establishing a framework for a pan-European gateway to heritage information the project allows the Agency to develop experience extremely relevant to the present developments in heritage database development in Denmark. In particular the use of the DC metadata standard, XML and Z39.50 technologies, all areas where the Agency's experience is limited.

The ARENA project has also provided a pilot project for things to be implemented in the near future. Participation in the publication on the web of ARENA excavation archives has provided the Danish Heritage Agency with valuable experience in the preparation and dissemination of digital primary documentation from archaeological excavations. To provide such a service to the Danish museums has been in the pipeline for the last few years, and preparing the three Danish archives for the ARENA project has served as a valuable pilot project for a national excavation archive service.

5.2 Archaeology Data Service (ADS) in the United Kingdom.

The participation of the ADS in the ARENA project has had considerable local benefits. Many of these are in the research role of the organisation as set out below. In addition to these benefits however, the ADS has benefited from being part of a network. This network has brought different benefits from the experience of the partner organisations and has spread further than that to include a broad community of organisations across Europe that interact through programmes such as Culture 2000. The role of the ADS has become central to a number of meetings and project proposals that allow us to promote data archiving and dissemination standards across Europe.

Participation in the ARENA project has allowed the ADS to undertake test-bed research in specific areas of activity:

- o The innovative use of Dublin Core metadata standards in archiving and presenting archaeological excavation records.

- o The combination of OAI and Z39.50 technologies as a hybrid system to facilitate interoperability between organisations with varying technical and financial resources.

Preparation of archives for use in the ARENA project have required the ADS to confront issues regarding the use of non standardised terms that frequently appear in index archives created before national standards were introduced.

Collaborative work with both ARENA partners and the non-participating 'outer circle' of contacts has raised the profile of the ADS and at the same time raised the awareness of the ADS of European issues. This is reflected in the ADS participation in development work on further projects of European significance.

One of the benefits of the test bed and research nature of the ARENA project has been the development of skills amongst the management and technical staff within the organisation, skills that can be disseminated through the ARENA workshops and roundtables as the project progresses.

The practical nature of the ARENA project not only allows for the dissemination of expertise but also the physical archiving of material of international importance. In the case of the ADS archive this is particularly true of the Danebury archive, a data set of

European significance that may not have been conserved without the activity of the ARENA project.

5.3 The Museum Project in Norway

Participation in the ARENA project has allowed the Museum Project to raise its profile outside Norway. This is important as the project demonstrates its successes in developing common database systems for the management of collections for all the Norwegian university museums. It is also important to the Museum project that they have been able to make their expertise more widely useful to other partners in ARENA and to the wider archival community through the ARENA workshops.

The preparation of archives for use in the ARENA project has allowed the Museum project to consider particular issues faced in a multi national project, particularly translation of terms and periods as well as the use of grid references in developing map based searching.

Working on the ARENA archives from Egge has allowed the Museum Project to work on a GIS based public access interface for the extensive documentary archive for which it is responsible.

5.4 cIMeC, the Institute for Cultural Memory in Romania

cIMeC has benefited greatly in the early stages of the operation of ARENA by the preparation of archives for the portal. This includes the digital presentation of huge archives such as the Inventory of the National Museum of Antiquities. The importance of standards in creating such digital archives has led cIMeC to translating the ADS Guide to Good practice for Excavation and Fieldwork for use in Romania.

Stimulated by the ARENA project and the archives that have been preserved and presented cIMeC has developed its on line resources making a wide variety of Romanian archaeological data available. It has been possible to carry out extensive work on archives and the mapping required for the portal at cIMeC through the ARENA project employing 14 staff at different times in assistance functions.

5.5 The Poznań Archaeological Museum in Poland

The initial operation of the ARENA project has allowed the museum to work on the preservation of key archives that have recently been published in hard copy. They have also allowed the development of the use of the AZP (sites and monuments register) as a resource available on a multi national scale.

The archives presented by the Poznan Archaeological Museum have raised interesting issues for the ARENA project as a whole, particularly online publication. At the local level the digital preservation of the Kowalewko publication and the extensive image collection from Biskupin have been both a learning process and a key activity in preserving vital records. The Biskupin images can now be seen in the same place for the first time since the second world war.

6. Summary and Conclusions.

Despite the slow start to operations whilst staff was hired the ARENA project made a successful beginning to its activities. The second year of activity for ARENA was exceptionally busy as the partners pushed forward to get the project back on time. The final year of operation saw the culmination of the project and many long held dreams of interoperability in European archaeology with the launch of the ARENA portal.

The operation of ARENA had a number of highlights:

o   Nine meetings of the ARENA partnership allowed for the management of the project and for the exchange of understanding and training in the sharing of archaeological data and the archiving and dissemination of important European resources.

o   Key archives have been identified, preserved and made publicly accessible.

o   Dissemination activity continued throughout the project at a number of meetings, conferences and workshops. This will culminate in the publication of a set of papers inspired by the ARENA experience in Internet Archaeology, edition 18, due for publication in the summer of 2005.

o   The practical development of the ARENA portal was accomplished allowing cross-national searching of archaeological sites data by period and theme. The portal will be kept open for 5 years following the closure of the project.

The above summary of the activity of the ARENA project intentionally brief and the detail can be found in the body of this document. It should be emphasised however, that the strategic benefits of the project have been in the network development, the technical test bed activity and in the innovative and appropriate use of freely available protocols and standards, in particular z39.50, OAI, XML and Dublin Core. The practical aspects of the ARENA project also mean that tangible results are now demonstrated as part of the ARENA web site.

The undersigned declare that this report is a true and accurate account of the operation of the ARENA project in its first year.

…………………………………………………………   Dr Julian Richards.
Principal Investigator.

…………………………………………………………   Dr Jonathan Kenny.
Project Manager.