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GEANT and Grids for E-Culture, Art History and Museum Studies

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1. The Community

There are three basic communities, namely, 1) cultural organizations (museums, libraries and archives), which have content and for which they provide basic context; 2) research institutions, which provide context and communication for the content along with some software and 3) industry, which provides hardware and software for context and communication, and provides ways of exploiting content.

2. Synergies with other Research User Communities

There are communities concerned with conservation and restoration of cultural objects, monuments, sites and landscapes that would benefit from better access to the content of other cultural institutions as well as the context of research institutions and conversely. The content of cultural organizations, especially with respect to historical film, video, television music and documentaries on festivals has profound potentials for e-creativity including those covered by the artnouveau TN and ultimately e-entertainment (cf. Cybernarium). There are important synergies if the results of these research communities can affect application areas such as e-learning and e-tourism.

3. General Importance of Computing and Networks in Application Area

The creation of high-level digital surrogates of cultural objects (paintings, rare books) means that they can be studied in detail without threat to the original. Using techniques such as stereo-lithography one can simulate intervention on unique objects in order that these surrogates can inform decisions re: conservation, preservation, and restoration. These surrogates can also be in the form of three-dimensional virtual environments for reconstructions of buildings and sites, which can then be used for the creative industries (e.g. television), e-entertainment, e-tourism and e-learning. Virtual reconstructions of cities can be used to trace historical change and test hypotheses concerning economic, social and other history. A new concept of Virtual Heritage Centres (VHCs) proposed by

Maurizio Forte (CNR-ITABC) can serve as a prototype to link and integrate these communities.

4. Geographical Coverage

Some of the most advanced cases are in Europe. The UNESCO Virtual Heritage Network reminds us that this phenomenon is world-wide. It is recommended that a relatively small network of VHCs should include the following:

France	EU U. of Culture (Strasbourg); MSH (Nanterre), C2RMF (Paris), Laval
Germany	Fraunhofer (St Augustin); Universität zu Köln; Cybernarium (Darmstadt);
Greece	FHW (Athens)
Italy	U. di Bologna (re:NUME); CINECA; Scuola Normale (Pisa); Rome (Sapienza and CNR-ITABC)
Netherlands	CWI and SARA (Amsterdam); Koninklijke Bibliothek (Hague)
Norway	Intermedia (Oslo)
Sweden	Interactive Institute (Umea)
Spain	U.Complutense (Madrid), U. SEK (Segovia); U. Zaragoza
UK	Oxford University; Edinburgh University

5. Case Studies

With respect to books, Oxford's Text Archive is a leader in Europe. Quantitatively, the Library of Congress is scanning the Gutenberg Bible at 767 MB per page (i.e. ½ terabyte for one book). In conservation and restoration of paintings the CRISATEL and SCULPTEUR projects with single images of 30 GB per painting at the Centre de Recherche et Restauration des Musées de France (C2RMF, Louvre) are indicative of the frontiers. Re: restoration, in addition to C2RMF there is the important work of the MOLART project (Amsterdam). With respect to reconstructions of rooms there is the work on Pompeii in conjunction with Bologna, the Italian supercomputer (CINECA) and RAI. With respect to reconstructions of cities the work on NUovo Museo Elettronico (NUME, Bologna) is fundamental. Also significant are Segovia and Zaragoza.. For new environments there is important work at the Interactive Institutes (e.g. Umea, Oslo) and at Edinburgh (cf. COVEN and LIVE EoI).

How GEANT Can Change Activities and Ways of Working, Nature of Research GEANT makes it possible to share for the first time high-level images of cultural objects. If cultural organizations and conservators can share detailed information this can improve conservation and restoration of unique objects and also enrich our understanding thereof. GEANT enables sharing of virtual reconstructions of sites, cities and cultural landscapes (now over 5 terabytes each). If linked through virtual studios these reconstructions can be used for new forms of digital television, digital film production and e-entertainment. If linked with e-tourism, they can provide new orientation for prospective and on-site tourists. If applied to e-learning they can transform the educational experience: instead of just reading about an historical ruin, this can become an immersive experience and one can study various changes over time. If linked with collaborative workspaces, this can

lead to new educational models, which combine personal and collaborative dimensions in immersive contexts. In addition to important economic consequences, such sharing also has social consequences by contributing to Europe's changing awareness of itself.

6. How Grids Can Change Ways of Working

The enormous computational requirements of sharing millions of images when each is 20MB-30GB or thousands of reconstructions when each is between 200MB and 10 Terabytes require development of new layered solutions, where tasks can be shared and whereby subsets can be made available for this with lesser connectivity. Grids offer engines and services that actively process the content to tailor it exactly to user requirements. Needed is a new model of the Internet whereby users gain access to the materials appropriate for the connectivity they have at hand while at the same time learning about where there are nearby access points which can provide full access. Here the concepts of Digital Autonomous Cultural Objects (DACOs, Thaller, Cologne) and multilingual mapping (cf. *Accès Multilingue au Patrimoine*) may prove useful.