

An International Showcase for DL Library Research: 1994 - 2004

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Abstract

After nearly ten years of research in digital libraries since the first major government sponsored initiative (DLI-1) launched in the U.S., the public is beginning to see the many fruits of the collective accomplishments worldwide. To mark the historical milestone and help develop and invigorate its future research activities, this paper discusses the concept of an international DL showcase, modeled after the very successful I-Way experiment, which was focused on high performance computing and networking research in conjunction with the Supercomputing Conference in 1995. A rough outline of the goals, strategic plans, and implementation details is described. Potential benefits for such an event are also discussed.

1. Motivation

Innovation in technology, testbeds, and tools development marks some of the major accomplishments for the first decade of digital library research. As an emerging field, this is a normal and expected path of growth. The road ahead, however, requires a broader and better connection to all other aspects of society if DL is to become a viable discipline sustainable not only technologically but also socially, politically, and economically. In a way, the field is at a crossroads of two conflicting paths, one pointing to continued excitement and growth; the other leading to insignificance and even possible extinction. Nowhere is this dilemma more telling than the stories reported at the recent ASIST conference held in Philadelphia in 2002. There we heard how two equally credible DL programs faced two completely different outcomes: one being eliminated from the university (state) funding, and the other thriving on a successful operation and management, complete with a business model. There is a lesson learned from this. The society (and the funding agencies consequently) clearly demands more tangible evidence when it comes to continued support for DL research. How we meet that demand depends not only on continued success in our research but also on how well we tell the public about our accomplishments that might benefit the society.

In the mid 1990s, high performance computing and network research faced a similar challenge. After many years of steady funding, despite the excitement of supercomputers and the Internet, many in Congress and the society failed to provide adequate support for the research that's needed to allow the U.S. to maintain its

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leadership in information technology. The research community rose to the occasion. With the support of NSF and other agencies, a team of researchers came up with a vision and conceived a plan to tell their stories of success and relevance. The result was a highly successful national showcase of the high performance computing/networking projects demonstrated at the Supercomputing Conference 95: I-way 95 [3], as the project was known, built a super high speed network by interconnecting existing agency networks (vBNS, DoE, and others) and brought it to the San Diego Convention Center for SC95. It created a software environment and infrastructure that allowed the best and most advanced scientific applications to be demonstrated on site. The showcase was so successful that the demos continued to be shown to the public after the conference for an extended period of time. There is no question in my mind that I-Way95 directly or indirectly contributed to the surge of federal support of IT later on as we experience at this juncture. More importantly, in pushing the state of the art in the demo projects for the showcase, it challenged the research community to the next level of ideas and opportunities. A new set of research directions and agenda were born. Recently, among the best efforts made in behalf of DL research is the publication of PITAC (President's Information Technology Advisory Committee) DL Panel of an influential report, "Digital Libraries: Universal Access to Human Knowledge [4]. That too helped the public, funding agencies, and the Congress better understand why high performance computing and content technology was important. The recent Information Technology Research programs were built upon this momentum and the rest is of course history.

DL research needs a similar forum, environment, and logistic support to demonstrate its technical accomplishments and its relevance to the society. Our focus, of course, is on e-contents, software environment, and applications. In the following sections, we discuss several elements of a possible blueprint for a DL showcase that can demonstrate the technological and societal benefits we know DLs can bring.

2. Goals

As in the case of I-Way95, the overall goal of the International DL Showcase is to demonstrate to the public the existing capabilities of DLs and their future potentials and benefits to economic and societal applications. We can break that down to three interrelated goals:

- To develop experiments that demonstrate DL concepts, technologies, and applications running on high-speed networks such as the academic Internet (e.g., Internet2);
- To create and implement DL software/middleware that can serve as the future foundation for delivering e-contents across a variety of computing platforms, communications channels, application domains, and cultural boundaries;
- To develop and demonstrate visionary concepts for future DL research and its potential benefits to various industries and the society in general.

What is implied in these goals is that we want the world, including government, industry, and the general public, to be better educated in DL as a discipline, its potentials

and benefits to them. As a byproduct, we envision that this exercise will also improve the dialog among the DL researchers themselves, between academe and industry, and across the cultural and geographical boundaries. Such interactions invariably will help build a better roadmap for DL's future.

3. Implementation Details

The proposed International DL Showcase may be held in one of two possible settings. One is to hold the showcase in conjunction with an international conference/symposium somewhere in or outside of the United States. A second possibility is to build the showcase as a separate, independent event with international collaboration and sponsorship. In any case, it would take roughly two years of preparation for the possibility of having the showcase to be held in the summer or fall of 2005. This is more or less a decade after the initial funding the DLI phase 1 projects begun in the fall of 1994.

3.1 Sponsorship

At least 3 types of sponsors should be solicited for their support of this project. The first is the U.S. Government, including NSF and several other agencies with IT **R&D** responsibilities, especially the co-sponsors of the DLI initiatives – Darpa, NASA, NLM, etc. The second is the international community, including the counterparts of the U.S. government for those countries collaborating with the U.S. on DL projects – Japan, Taiwan, China, Singapore, UK, Germany, etc. Finally, the private sector, which includes the industry and various foundations (e.g., the Mellon Foundation) that have been supporters of DL efforts, can play a key role in this in behalf of the general public.

3.2 Advisory/Steering Committee

NSF should consider convening a committee to oversee the design, planning, and eventually the execution of this showcase project. Those serving on the committee could be drawn from the following:

- Appropriate NSF officers
- Agency representatives, e.g., current DLI-2 co-sponsors
- Representatives from the research community, e.g., DLI –1, –2 and other digital library projects
- Representatives from the international communities – e.g., DLI and IDLP collaborators and others active in DL research across regional boundaries
- Private sector representatives, including those from industries, libraries, and others

Initially, the committee should be serving in an advisory capacity, small enough to make quick recommendations and decisions. Later, when the project concept and plan have been crystallized, the committee may be expanded to facilitate better implementation and oversight of the project.

3.3 Technical Considerations

Conceptually, the proposed DL Showcase is similar to that for I-Way 95. There are important differences in technical details, however. We can highlight the similarities and differences in two areas that in combination constitute the infrastructure backbone of these events.

a. Computing and Networking Facilities

Architecturally, I-Way 95 extended the existing networks at the time by interconnecting many research networks and brought it to the Conference Site in San Diego for demonstration. That took a lot of work and resources. But since the importance of high performance networking technologies was part of the demonstration, the effort was essential and proved to be a key to the successful outcome. In the case of the proposed DL Showcase, the purpose is to demonstrate e-content based technologies and applications at the Internet scale (as opposed to the Internet technology itself), the use of existing networking infrastructure, such as Internet2 (Abilene), may be sufficient. Still, there is the major challenge of where and how to bring that level of capability to the point of demonstration for a wide range of experiments that would illustrate and extend the potential for simultaneous services and, possibly, from geographically remote locations.

A second issue is the range of communication modalities. Contrary to I-Way 95, the DL showcase will most likely need to have a networking infrastructure that accommodates both wired and wireless communications. A third issue is the range of computing platforms, from large data servers to small information appliances, including mobile phones and PDAs. The use of these diverse platforms needs to be accommodated in the demonstration.

b. Software and Applications Issues

Since the purpose of the DL Showcase is to demonstrate how DL research has addressed, and can continue to address, content-based technologies and applications, the collection and/or development of a set of comprehensive “DL Middleware” could be considered a key consideration for this event. Such DL middleware, for lack of a better term, must collectively provide a variety of e-content management capabilities and services across different computing platforms and communications channels. Examples for demonstration that may require such capabilities include those experiments that

- Address multimedia data beyond the traditional library resources and functions – text, audio, video, etc.; indexing, searching, streaming, analysis, summarization, interpretation, etc.
- Create interactive environments of knowledge creation, use, and discovery beyond the traditional uses of libraries for access to books and other resource materials.

- Address information access, delivery, and presentation issues at the Internet scale, across a number of parameters, such as speed, data storage, and connectivity, and distributed environments.
- Address knowledge access, creation, use, and discovery issues across different scientific domains and society applications, such as life learning, health care, etc.
- Address e-content delivery and use across cultural and geographical borders, e.g., multiple languages, etc.
- Establish linkage to the paradigm shift in computing and data management, such as the availability of Grid infrastructure for DL research and applications.
- Address issues in DL “middleware” that provides the software environment for smooth delivery of information services across different knowledge resources, computing platforms, types of networks, transmission media and storage configurations.
- Address research and management issues of large-scale DL projects, including those that cross disciplines, social, cultural or national boundaries.

3.4 Logistical Considerations

If the concept of having an international DL Showcase is approved, the following is a possible timetable outlining the milestones that need to be established for the event to occur roughly in two years.

Sep 2003	NSF convenes an Advisory/Steering Committee
Dec 2003	<ol style="list-style-type: none"> 1. Committee completes drafting a strategic plan for the DL Showcase 2. NSF and Committee secure sponsorship from other U.S. agencies, private sectors and international organizations
Jan 2004	<ol style="list-style-type: none"> 1. NSF approves the DL Showcase Project 2. International sponsors approve the Project 3. Steering Committee approves the final execution plan
Jun 2004	Completes preparation of DL Showcase, including selection of demonstrations, development of experimental facilities
Fall 2005	Showcase Event
2005 -	<ol style="list-style-type: none"> 1. Post-showcase demonstrations/promotion at local sites 2. Begin implementing the new research agenda in conjunction with other DL or IT initiatives or programs

3.5 Candidate List of Possible Demonstrations

All of those who've been engaged in DL research and development are candidates for participating in the Showcase. They include:

- Projects funded by the Federal government such as those in DLI phase 1 and 2 and extensions, particularly the IDLP projects
- Government agencies that have developed DL based on the latest DL research and IT technologies
- DL projects funded by non-government sources
- International DL projects with or without formal collaborative arrangements with the U.S.
- DL project funded by local resources – state, city, etc.
- General IT R&D projects that have a focus on dealing with large-scale e-contents over computing, network, and human organizational infrastructures.
- Any combination or team partnership formed from among the above groups or organizations

4. Conclusions

This paper discussed the concept of an international showcase for digital libraries research in the past decade. Motivated by the need to make better connections between what has been accomplished in research and the benefits DL can bring to the society, this proposed showcase can also serve as a forum for steering the community to develop a roadmap for future research. A brief conceptual design for this showcase has been presented, including some of technical, logistical, and managerial details. They are provided here for initiating the design process, not as fixed blueprint for action. While the need for and potential benefits from such a project may be obvious to many, much more work is needed before this concept can become a reality, namely, be endorsed and supported by all those with a stake in DL's future. Among the efforts important to help put together the sponsorships for making the showcase possible are:

- Coordination with other NSF programs with a possible interest (and stake) in DL's future. These include the e-government program, networking research program, supercomputing centers program, programs in education and human resources programs, etc.
- Coordination with other DLI-2 sponsors, including DARPA, NASA, NLM, etc. and with other R&D agencies which can potentially benefit from such an event.
- Coordination with the many DL and DL related programs supported by the counterparts of the U.S. government agencies in various parts of the world. These include, for example, the e-Japan program of Japan [5], the e-Contents program of the European Commission [6], the governments of UK, Germany, Taiwan, Singapore, and the US-China Million Book Digital Library Project, to name a few.

The window in which we can come up with an effective mechanism to let the world know of our DL's accomplishments/potentials before the opportunity slips away is relatively small. Therefore, the time for action is NOW.

References

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