III. Organizational Roles

This section describes the nature of each organization's participation in the project, as well as our overall management plan. We start by listing the participating institutions, describing their roles, personnel involved, main tasks of interest, and proposed cost sharing. We then discuss our management plan. Additional details concerning the matching funds and tasks to be performed can be found in the letters of intent to participate enclosed in Section IV.

III.A Participants

Association for Computing Machinery (ACM). As the premier publisher of computer science journals, ACM will provide a very valuable collection. Beyond this, ACM is keenly interested in Digital Libraries, and will work with us to investigate how collections like its can be best made available to users, how the entire publishing process can be made electronic, and how users should pay for services. They will provide testing of our concepts with a broad base of users in the computing field.

Role: Perform research on the economic issues of Digital Libraries; participate in the design and evaluation of the testbed and its services.

Organization PI: Bernard Rous.

Other Investigators: Gerald Murray, Carol Meyer, Mark Mandelbaum.

Matching funds: Salaries and associated expenses.

Bell Communications Research (Bellcore). Bellcore provides research, engineering services to Bell local telephone companies (Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, Southwestern Bell, and USWest). Bellcore is actively involved in the implementation of the national information superhighway, and will represent the telecommunications and information delivery perspective in our consortium.

Role: Participate in the design and development of the Information Bus infrastructure, and in our research on information finding.

Organization PI: Amit Sheth.

Other Investigators: Leon Shklar, Satish Thatte.

Matching funds: Salaries and associated expenses.

Dialog. Dialog is one of the major information vendors, with over 400 repositories and over 150,000 customers. Our goal is not just to provide access to Dialog's data, but also to allow Dialog customers to access our testbed. Researchers at Dialog will provide important expertise in commercial services and efficient search and access mechanisms.

Role: Participate in evaluation of testbed, mechanisms for safeguarding intellectual property and for charging.

Organization PI: Michael Barbarino.

Matching funds: Access to Dialog's information.

Enterprise Integration Technology (EIT). EIT is a start-up company formed to commercialize data integration and network access technologies. They were recently awarded an ARPA

Technology Reinvestment Program grant for 8 million dollars, to develop the Smart Valley CommerceNet. The goal of this project is to develop the infrastructure for electronic commerce. The research agenda's of EIT and this proposal overlap on a number of issues (information access, financial mechanisms), so we plan to work closely together. CommerceNet will also provide a body of information and users for us.

Role: Participate in the implementation and evaluation of the testbed and its services, especially the interface clients.

Organization PI: Jay M. Tenenbaum.

Other Investigator: Steven Harari, Glenn Kramer.

Matching Funds: Salaries and associated expenses; software.

Hewlett Packard Laboratories. As one of the major equipment manufactures, Hewlett Packard is committed to developing technologies that can support a Digital Library. HP Laboratories will work with us on the development of library protocols, searching services, and personal information assistants. They will also contribute equipment for our effort.

Role: Participate in the research on information finding and agents.

Organization PI: Umesh Dayal.

Matching Funds: Equipment.

Interconnect Technologies Corporation (ITC). ITC is a start-up recently formed (with encouragement form NASA) by NASA scientists to commercialize information access technologies. They will bring to our project expertise in accessing scientific collections, such as the NASA Global Change Master Directory and corresponding satellite images, and the NASA Office of Standards and Technology database.

Role: Facilitate access to NASA information sources; participate in the design and the evaluation of the testbed.

Organization PI: Michael Raugh.

Interval Research Corporation. Interval is a new research laboratory which is explicitly looking towards the potentials for computer and communication systems of ten years from now. There is a strong emphasis on networked information of all kinds, including video and audio, which will become much more ubiquitous on the networks in the ten year time frame. They will support and provide research that will help us create concepts and mechanisms that will be extensible to the content of future on-line libraries.

Role: Participate in the design of the Information Bus, as well as in the research on agents and interface clients.

Organization PI: Sean White.

Other Investigator: David Liddle.

Matching Funds: Cash.

O'Reilly and Associates. O'Reilly is one of the first publishers to look towards the Internet as a major venue for publication. They have initiated the first commercial Internet magazine (the *Global Network Navigator*) and are preparing a program of on-line books to begin this year. As a publisher of some of the most popular titles in computing, they have a body of materials that is highly relevant to our user community. They also have been doing work on developing more capable browsers (in particular, the Viola browser for the World-Wide Web) and will collaborate with us on using these as the basis for advanced interfaces that take advantage of the new kinds of descriptive information about information objects that will be provided by our research.

Role: Provide access to materials it publishes; participate in the design of the Information Bus and interface clients.

Organization PI: Richard Peck.

Other Investigators: Dale Dougherty.

Matching Funds: Cash, access to materials, salaries, software.

NASA Ames Artificial Intelligence Group. NASA Ames has one of the major national AI research groups, involved in many research areas that impact Digital Libraries, for instance, developing systems for on-line and interactive documentation and training. The group will work with us, both as users of the proposed testbed system, as well as doing research on adaptive techniques for information retrieval, in the general context of software agents.

Role: Performing research on agents; participating as users of the testbed.

Organization PI: Nathalie Mathe.

NASA Ames Library. Over 2,000 government and contract scientists and engineers work at the world famous NASA Ames Research Center. Their Library will work with us to make out testbed system available to their scientists. At the same time, they will cooperate with us in integrating mechanisms such as the NASA Access Mechanism (NAM) into our system.

Role: Providing a user community; participating in evaluation of the testbed.

Organization PI: Mary Walsh.

Stanford Computer Science Department (CSD). Researchers have extensive experience in key computer science areas that impact Digital Libraries: Artificial Intelligence, Database Management Systems, and Human Computer Interaction. As all other organizations listed here, members are both consumers and producers of computing literature, and will play these roles in our project. In particular, the CSD is already participating in the CNRI Technical Reports Project, to make available Computer Science reports. This will provide an important collection, as well as some experience in the basic problems of Digital Libraries.

Role: Coordinating overall project, implementing testbed, carrying out research in all areas.

Principal Investigators: Hector Garcia-Molina, Yoav Shoham, Terry Winograd.

Stanford Libraries. The Stanford University Libraries will contribute their digital collections available through the Folio System. They will also tie us into another very significant user community, that of 12,000 students and 1,400 faculty. Furthermore, the Libraries have important experience in delivering and exchanging digital information, campus-wide as well as to/from other universities.

Role: Providing access to Stanford Library resources and materials; participating in testbed evaluation; providing a user community.

Organization PI: Rebecca Lasher.

Other investigator: Vicky Reich.

WAIS Inc. The Wide Area Information system is a highly successful network access mechanism to public information that makes use of text searching to provide uniform access to wide varieties of material, from newspaper stories to weather maps. Recently, WAIS Inc. was formed to commercialize the original concept. WAIS Inc. will contribute their software and technology to our project, and represents another possible path to commercialization of ideas developed as part of our project.

Role: Help in accessing WAIS collections on the Internet; participate in the evaluation of the testbed.

Organization PI: Brewster Kahle.

Matching Funds: WAIS software.

Xerox Palo Alto Research Center (PARC). Xerox PARC is a world-renowned research laboratory that pioneered many of today's technologies, such as the personal computer and the Ethernet. They have expertise in many key areas, including document management, distributed systems, human computer interaction, and information retrieval. Their researchers will work closely with us on almost all the topics covered by this proposal, including the implementation of our testbed system.

Role: Implementation of testbed; carrying out research in most areas.

Organization PI: Larry Masinter.

Other Investigators: William Janssen, Ramana Rao, Doug Terry.

Matching Funds: Salaries and associated expenses; software.

III.B Participation Matrix

To summarize the roles and interests of the participants, we present below a matrix of tasks and organizations. It is clearly difficult to break up all the work we have described in Section II into independent tasks, since it is all closely interrelated. Similarly, given the varied interests and ample expertise of all involved, we expect there to be many more interactions that the ones listed in the matrix. In spite of these shortcomings, our division of work into tasks and the participation matrix may help in visualizing the complete project and the interests of the participants.

The list of major project tasks is as follows:

- Testbed related tasks:
  TB-IMP: Testbed implementation,
  TB-EVL: Testbed evaluation (e.g., performance) of protocols and services,
  TB-EXP: Experiments involving end-users and their needs.

- Development of models and the Information Bus:
  MI-DES: Design of object models, protocols, and Information Bus,
  MI-TRA: Developing translation mechanisms.

- Design and implementation of interface clients:
  IC-VIS: Visualization of information,
  IC-NAV: Navigation through information,
  IC-ORG: Organizing and adding value to information.

- Design and implementation of information finding services:
  IF-FIN: Design and implementation of Information Finding service,
  IF-EVE: Processing large-scale, eventual searches.

- Study of Economic-related issues:
  EP-PRO: Protection and detection mechanisms,
  EP-FIN: Study financial mechanisms and models,
  EP-EVL: Evaluation of customer needs.

- Design and implementation of agents:
  AG-PRO: Design of Information Bus specific agent programming language,
  AG-ENG: Design and Implementation of agent engine,
  AG-PIA: Design and implementation of personal information assistant.

Next we present the task-organization matrix, where each "X" means that the organization will be involved in carrying out the task.

								NASA			Stanford			
	ACM	Bellcore	Dialog	EIT	HP	ITC	Interval	AI	Lib	O'Reilly	CSD	Lib	WAIS	Xerox
TB-IMP	X			X		X					X			X
TB-EVL		X		X		X					X	X	X	X
TB-EXP	X	X	X					X	X	X	X	X		X
MI-DES	X	X		X			X			X	X	X		X
MI-TRA		X		X		X				X	X			X
IC-VIS							X				X			X
IC-NAV				X						X	X			
IC-ORG				X			X			X	X			X
IF-FIN		X			X						X			X
IF-EVE		X									X			X
EP-PRO	X		X								X			
EP-FIN	X			X							X			
EP-EVL	X		X								X	X		
AG-PRO					X		X	X			X			
AG-ENG					X		X	X			X			
AG-PIA							X	X			X			

III.C Management Plan

Given the scope of this project and the number and diversity of participants, it is critical to have a strong yet flexible management plan. Our plan is for the project to be manged by an Overall Principal Investigator (PI), Hector Garcia-Molina. At each participating institution there will be a local PI, overseeing research and experimentation there. This will be the main point of contact with the Overall Project PI. In addition, a full time staff member will be hired at Stanford to be Testbed Manager. His or her responsibility will be the experimental testbed, and access to the various information sources. The Testbed Manager will report to the Overall Project PI.

The PIs and other participants will be organized into four concentric circles of participation:

- *The Executive Committee* will consist of the three Stanford investigators plus two PIs from the partner institutions, one representing the research perspective, the other the user perspective. The two non-Stanford CSD members will be selected by the Advisory Board. The Executive Committee will meet as needed to make decisions concerning the functioning of the project.

- *The Advisory Board* will consist of the Stanford investigators plus the PI from each of the participating institutions. It will meet quarterly to review the project progress and decide on directions and priorities. The Executive Committee will consult the Advisory Board electronically in between these meetings to keep them informed and seek advice.

- *Working Groups* will generally consist of 3 to 5 people, usually from more than one site, working on a specific aspect of the project (a service, a specific protocol area, an interface, etc.) They will be constituted at group meetings, and will function on a schedule that suits their research activities. We anticipate a certain amount of local travel and a good deal of work over the network. In the time line we have shown four separate working group periods. We anticipate that at the end of each of these periods there will be a review of the current working group structure and rearrangements as needed. Of course informal changes will be made as needed at any time during the project.

- *The Project Group* will include all of the active participants, including students and researchers being supported on the grant at other institutions. This group will meet monthly for a research seminar, and once or twice yearly (see circles on the schedule) for a two day offsite meeting at which the working groups will present their work and there will be general discussion of directions and plans. We have planned two meetings the first year, to develop the initial plans, and an additional one near the end of the final year, for review, evaluation, and future planning. This is shown in the Timeline figure in Section II.C.4.