REINTERPRETATION OF SPACE IN A NETWORKED COMMUNITY

by

Kat Suejung Park

S.B., Computer Science and Engineering
Minor, Architecture
Massachusetts Institute of Technology, 1996

Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of Master of Architecture at the Massachusetts Institute of Technology
February 2003

[June 2003]

author _____
Department of Architecture
January 17, 2003

certified by _____
William L. Porter
Norman B. and Muriel Leventhal Professor of Architecture and Planning
Thesis Supervisor

certified by _____
William J. Mitchell
Professor of Architecture and Media Arts and Sciences
Dean, School of Architecture and Planning
Thesis Supervisor

accepted by _____
Bill Hubbard, Jr.
Adjunct Associate Professor of Architecture

REINTERPRETATION OF SPACE IN A NETWORKED COMMUNITY

Thesis Readers:

Christopher Edwards
Lecturer in Interactive Design, Yale University
Adjunct Faculty, Institute of Design, Illinois Institue of Technology

Takehiko Nagakura
Associate Professor of Design and Computation

REINTERPRETATION OF SPACE IN A NETWORKED COMMUNITY

Kat Suejung Park

submitted to the Department of Architecture on February 7, 2003
in partial fulfillment of the requirements for the degree of
Master of Architecture at the
Massachusetts Institute of Technology

ABSTRACT

One of the most significant reasons why architects dwell on the design of a space is because we believe that the physical environment will influence social and interpersonal relationships. Recognizing the limitations in the conventional design paradigms, this project brings the focus on the inhabitants' interactive behavior and communication patterns as the main parameter influencing the design of an academic environment. In contemporary academic infrastructure, computer-mediated communication has become an integral method of communication, providing a new platform for exchange of ideas and information. Despite this change, spatial organization and other architectural elements that govern the interactions remain traditional, disconnecting inhabitants from their interaction protocols.

The first section of this thesis expands on the current role played by computer-mediated communication in a networked community. Extending beyond simple exchanges of email or instant messages, the design exercise produces a collaborative online platform which translates the physical community and its existing human interactions into the digital realm, as well as extend the existing spaces and social infrastructure. The influence of the redefined and redistributed spaces on the individuals' identity, perception, and their relationship to the organizational culture becomes the new design variable that initiates an investigation into different notions of space and physical architecture. By illustrating scenarios of user interaction and behavior, this thesis proposes a new model for integration of technology into the physical architecture that can clarify and foster new interactions and new ways to share knowledge and experience in an academic environment.

[Thesis Supervisors]

William L. Porter
Norman B. and Muriel Leventhal Professor of
Architecture and Planning

William J. Mitchell
Professor of Architecture and Media Arts and Sciences
Dean, School of Architecture and Planning

acknowledgements

Professor William Porter for encouragement and insightful guidance throughout the project. I am grateful for your dedication to teaching and your invaluable genius.

Dean William Mitchell for inspiration, direction and unwavering support for the development of this thesis.

Susan Yee for providing the opportunity and generous support to pursue this research, and for being my unofficial advisor for the past three semesters. I am deeply thankful for your insight, motivation, collaboration, and patience.

Brian Clarkson, for the implementation which made this project a reality. Thank you for the technical, intellectual, and motivational support.

Christopher Edwards and Takehiko Nagakura for their time, interest and expertise in their respective fields.

Sophia Lee for moral support, good spirits and archival paper.

My family, for their unconditional faith, patience and support.

Most importantly, I would like to thank my grandmother who has always been the guiding force in my life.

CONTENTS

OVERVIEW

How can we find our way back to such a simple reason for a field whose original validity lies in providing space and shelter for the individual's behavior?

Constance Perin, "With Man In Mind"

A deep interest in methods of knowledge transfer, communication tools and their effect on human interactiive behavior lead me to pursue this topic as a thesis. The physical environment is said to influence social and interpersonal relationships, and conversely, the ways in which people communicate give rise to how they interact and utilize a space.

Properties of environmental elements the designer can affect by manipulating the variables under his control		Illustrative behaviors to be related to variables
size (expansion / contraction)	continuity (connections)	contact and distance behaviors:
density	repetition	getting together with others
volume	relations	isolating self
proportion	information (signs / symbols)	identifying self /group
shape	direction	
order	sound	work behaviors:
sequence	visibility	handling large equipment / small tools
adjacency	apertures	
communication (face-to-face / other)	time	
circulation (people / messages)	rate	concentrating, learning
boundaries (sharp / indistinct)	texture	viewing message / ensemble
intersections	simultaneity	finding route
distance (near / far)	frequency	arriving / departing
variety - uniformity	classification (categorizing)	waiting
exclusion - inclusion	mixture	
distribution (close / dispersed)	permanence	
enclosure		
linkage		

The list above summarizes different environment variables that exist under designer's control

as they have been manipulated toward the acknowledgement and facilitation of various kinds of behaviors [Perin, pg 135]. Today, these direct interpersonal relations face a larger influence from the growing importance of indirect relationships mediated by technology and complex organizational structures. The outcome of such influence and its inevitable interdependence to current behavior settings is prominently shown in education or workplace environments where network connectivity has been integrated into its infrastructure.

The network infrastructure we create in such environment dictates the way information flows among people, and ultimately, the way we work. Therefore, this thesis treats the Internet and network connectivity as tools that matter much more as a supplement to face-to-face community organization and movement activity than as a substitute.

This thesis begins with an analytic view of the existing infrastructure at the MIT architecture department and integrates it with a new design of a interactive interface which will allow the members of the community to contribute their own perception of the learning experience. The intervention proposes a new online environment, incidently exploring how spaces can be altered to reflect the way people communicate and interact in the existing setting.

SONGLINES

Billy Mungie, an Anangu elder, sings a road map to his land in the form of a songline. [photo by David Mclain / aurora]

An interesting communication scenario that lead to the main concept of this design is the Australian Aboriginals' songlines. A songline is a mapped form of a song that is intended to be sung at a specific physical location, representing consecutive events in a myth. Similar to ancient orators who used architecture and natural landscape to help them remember parts of their speeches, these Aboriginals use natural landmarks to remember their ancestors and the journeys which determined their lives. In other words, they are able to embed the necessary information into the physical landscape through these songs.

The events and places in their history and their story of wholeness are all contained in an experiential form of knowledge that can be learned, maintained and passed on by singing, rather than by book learning. The invisible tracks of the ancestors' experience is recognized and passed on to the next generation through this form of communication.

What can be achieved in certain forms of education lies in this method practiced by the Australian Aboriginals. The history is what determines an individual's process of perception, view of the world, and his or her identity and behavior. The core idea driving the user interaction design was that an education is much more valuable and rich if participants can offer their own history and perception into the total learning experience. Compared to an education based heavily on faculty-student interaction, a designer's educational environment can easily embrace the concepts manifested in the songlines since the interaction among the students in studio environment is a significant part of knowledge exchange.

COMMUNITY IN INTERNET

Every birth of new communication medium stirs questions about the social impact the new media will have on the individual mind, the interpersonal relationships between people, and the social institutions that emerge from human relationships. As Howard Rheingold (2000) noted, our technological advances that bring about the growing influence of media don't have to dictate the way our social relations change, but we should strive to understand the way we come to use the technology and consequently influence the changes [Rheingold, pg 348]. It is important to realize that we have the power to steer the direction technologies take and define how we use the new paradigm.

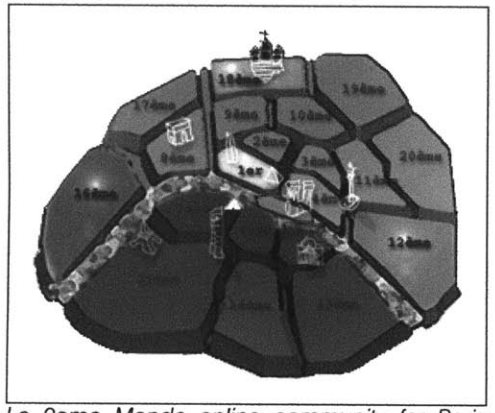
When we were immersed in the novelty of the Internet, we were fascinated with the possibility of interactions that were unfettered by limitations of geography, socio-economic class, gender and race. Indeed, many new "global" communities, markets, and forums have since emerged and flourished. However, despite the presence of the Internet, our old local and limited, brick and stone communities still provide our main means for successful societal living. Recent years have seen a trend towards bringing back the benefits of locality to the Internet, or, more accurately adapting and developing online technology specifically for physical communities.

Through the popularization of the internet, computer-mediated communication has become an integral part of the way people communicate in a working or academic environment. This project is not about making dramatic predictions of transforming the existing community or spaces, but rather, it accepts the internet as an integral communication channel and situates it within a continuing transformation in communication capacities that have shaped our whole modern era. As Calhoun (1998) argued eloquently, it seems clear that the

general tendency is not for the web to counter tendencies to urbanization, nor to empower the poor, weak, and dispersed against the rich, powerful, and well-positioned. Computer-mediated communication does a little of each of these things, but it does a lot to enhance existing power structures [Calhoun, pg 381]. The next section looks at examples of various scenarios that have emerged as a discourse to this new communication medium. In most cases, these examples suggest a change in the way people interact within an environment, both at individual and public sphere, which implies new interpretative models to current spatial representation.

A simulated 3-D world as virtual social space.
[image from http://www.world.com]

Blaxuun Technologies' world.com is one of countless examples of online worlds that allow the user to create their own in which others can participate. Users and groupings are often represented through avatars that can be customized to create and reflect (or hide) the identity of the users, sometimes with ability to gesture and convey emotion. These avatars move through a space which represents the social environment, but without a physical community and physical space, the movement of the avatars and their location at a specific given moment has little spatial meaning.

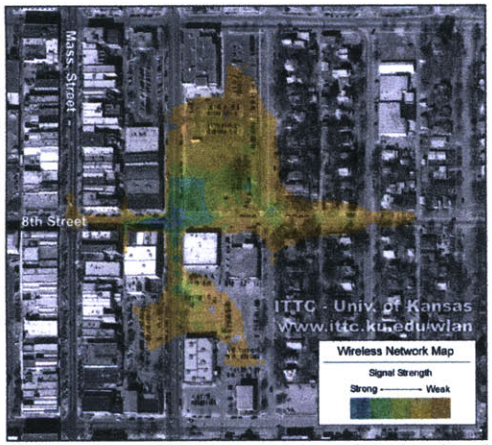


Le 2eme Monde online community for Paris
[image from http://virtuel.cplus.fr]

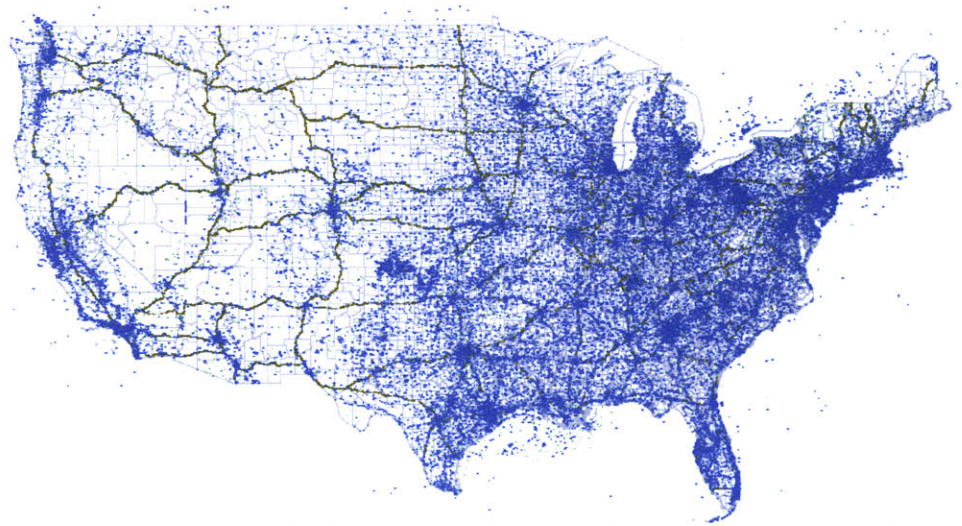
Online communities such as Le 2eme Monde are slightly different in nature as their environmental representations actually do represent a physical space or location. The online world at left is a revisualization based on a 3-D model of Paris. Some of its features are related to the physical location as well, as users can have a virtual experience of selected Paris tourist attractions (i.e. climb the eiffle tower).

A map of the Interoute i-21 network uses a subway metaphor. [image from http://www.interoute.com]

Others have tried to visualize the medium itself, rather than the participants' involvement or patterns. In the figure at left, a European internet service provider Interoute represents their fibre-optic network, i-21, consisting of eight rings connecting 45 cities in nine countries across 18,000 route kilometers (11,250 cable miles). Moreover, recent spread of wireless networks have lead many companies and research institutions to devote their efforts into locating wireless signals, and objectify the invisible network connectivity. The Wireless Network Visualization Project at University of Kansas uses wireless network data collected from walking and/or driving scans, aerial photography, and interpolation techniques to create detailed network coverage and signal strength maps. Tower Maps publishes readily-leased wireless facilities -- towers, rooftops, water tanks, raw land -- to deploy or fill-in cellular, PCS, paging, LMDS, MMDS and other wireless coverage (shown below).

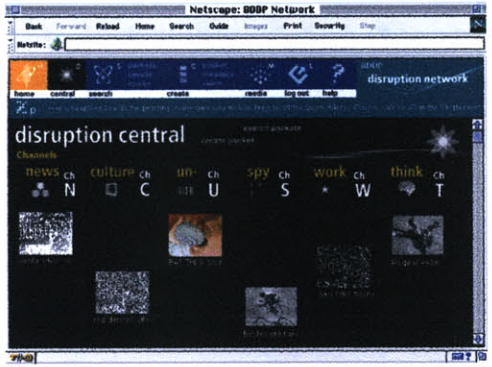


This map shows an interpolated signal strength from a 802.11b access point on aerial photographs. [image from http://www.ittc.ku.edu/wlan]



Map of wireless facilities in the states. [image from http://www.towermaps.com]

SHARED INFORMATION WITHIN A NETWORKED COMMUNITY



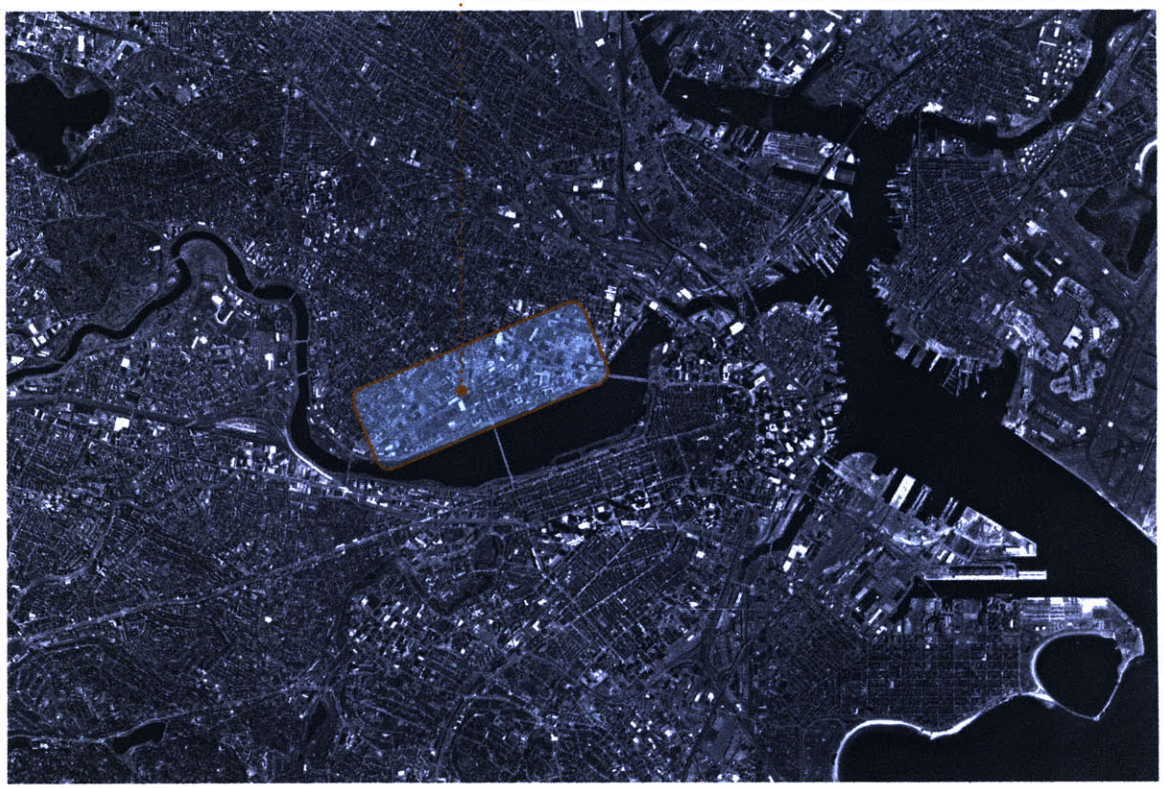
Disruption central is the nerve center of the network where contents published by BDDP employees are advertised.

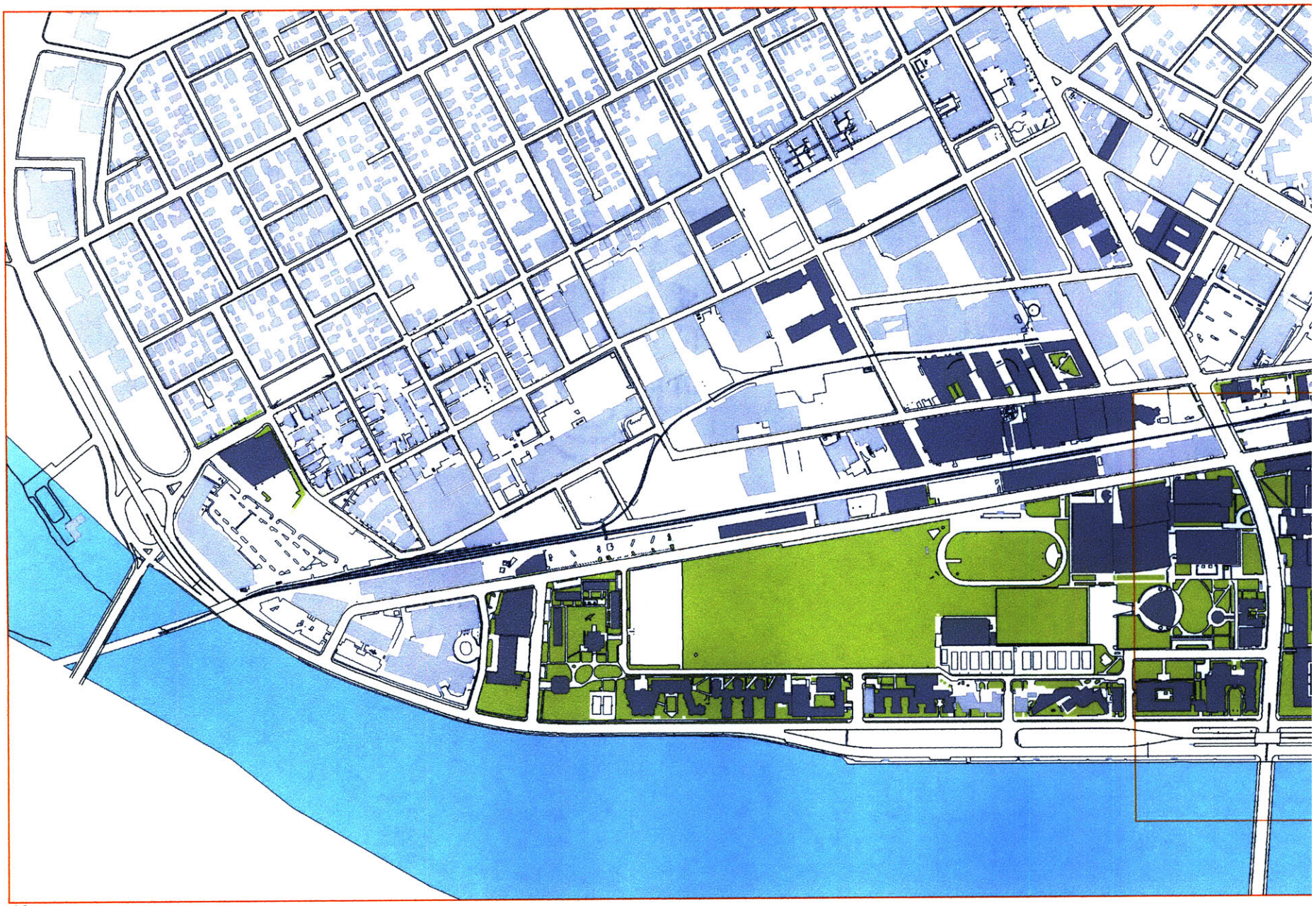
The un-channel is one of many channels that is used to categorize the published content. [both images from http://people.atg.com/demos/bddp]

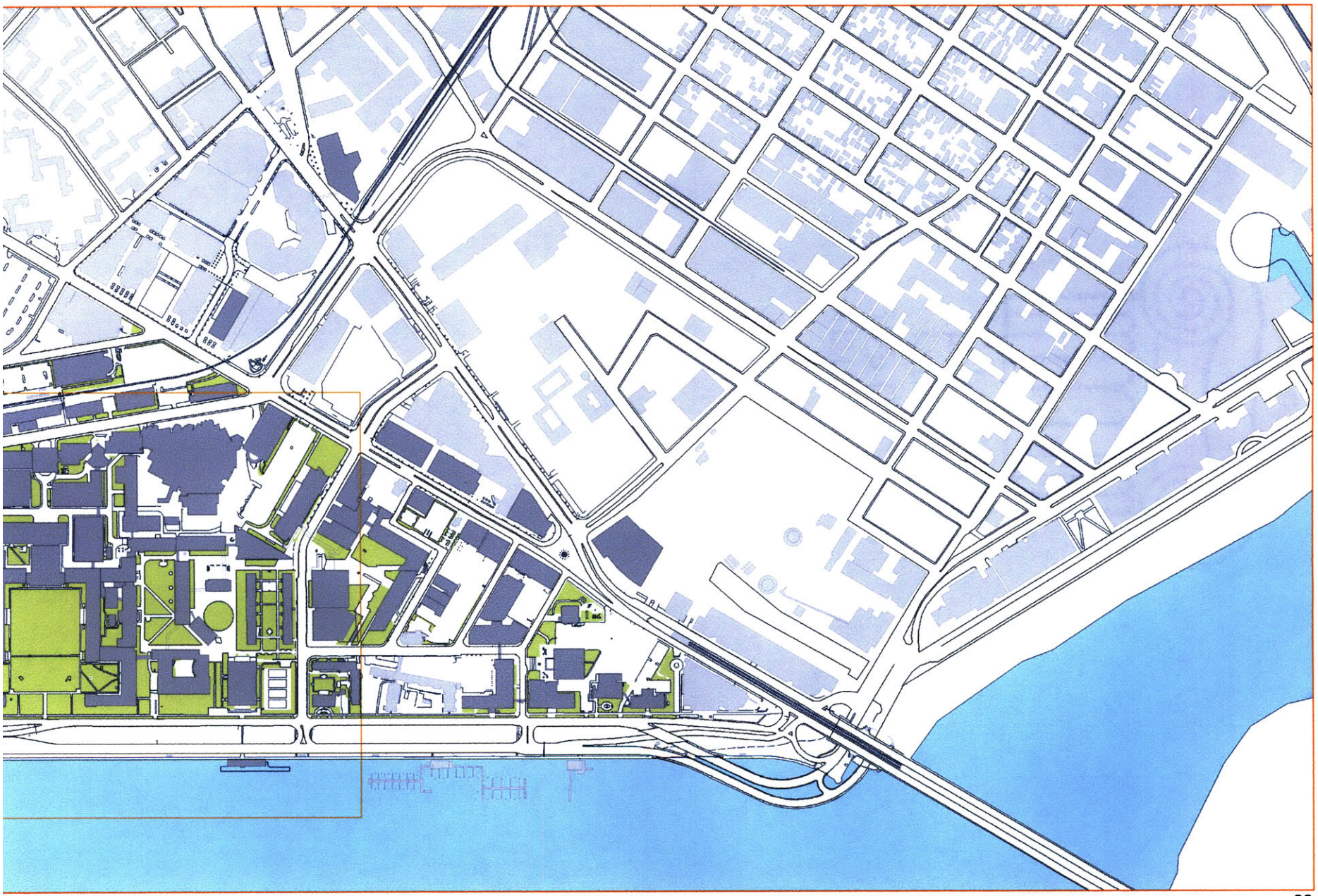
A networked community is a geographically defined community that has the ability to communicate and share information via the additional medium provided by digital network. In many aspects, it is quite different from virtual communities that exist purely through online interaction. Figures at left show the BDDP disruption network which is an intranet application for BDDP, a global advertising network comprised of 81 offices in 42 countries world-wide. Designed to provide a common cultural database which can be accessed from any of the 81 physical offices, the online application became a tool to create a single global entity and culture. It is an example of a "living application," a virtual information space, which is wholly the product of the people who inhabit it [http://people.atg.com/demos/bddp].

The internet is most empowering when it adds to the capacities of people organized outside it, not when an attempt is made to substitute "virtual community" for the real thing. "More sober analysts remind us that like other technologies, the Internet mainly makes it easier for us to do some things we were already doing and allows those with the resources to do some things they already wanted to do."[Calhoun, 382] This thesis is unlike many other research projects that began under the new wave of communication technology in that it begins with an existing physical community and then studies the role of computers and other media of communication within the framework defined by the community. It attempts to provide a new interactive channel for people already linked by residence or engagement in a common organizational framework. Therefore, to depict a networked local community defined by a physical location, all 3 views mentioned in the preceding examples are necessary -- a representation of the existing network infrastructure, a representation of the participants within the network, and a representation of the information created and published by the participating members of the community.

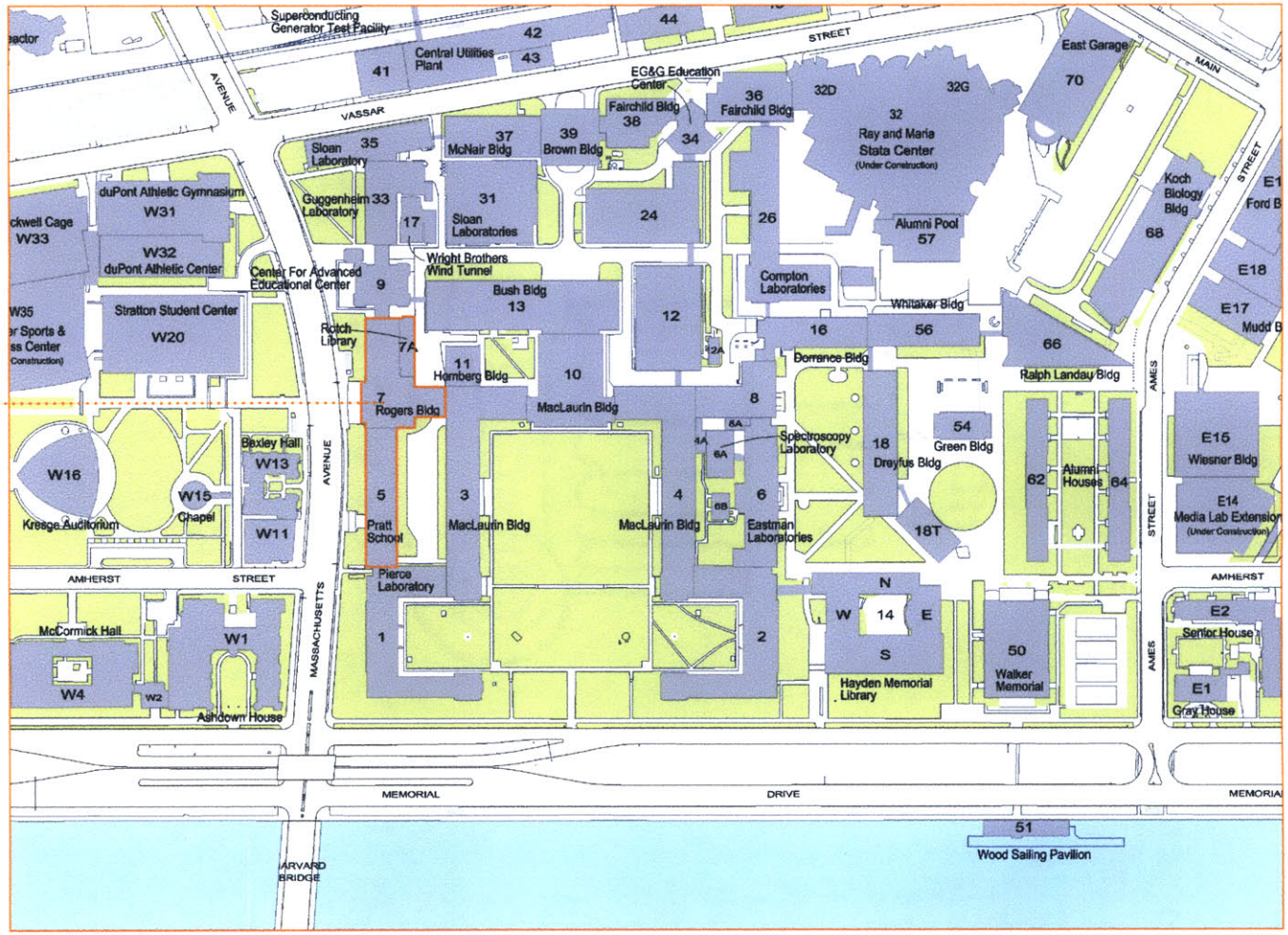
Massachusetts Institute of Technology, Cambridge, MA







Department of Architecture



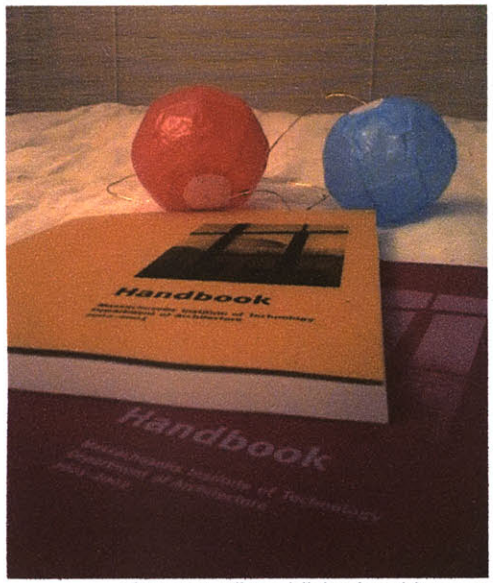
PROGRAM ORGANIZATION

Occupying a key public location defined by the main circulation node near Massachusetts avenue, the architecture department is one of 36 departments at MIT. It includes approximately 200 resident graduate students and approximately 60 teaching faculty and academic staff. Within the graduate department, the various degrees and programs divide the students according to their curriculum. M.Arch students are often segregated according to their year of residency or level due to strict curriculum requirements. In addition, the department is subject to a high turn over rate as every year new students enter and old students graduate, which contributes to even deeper segregration between students of different levels.

Program	number of students
Master of Architecture (M.Arch.)	89
Master of Science in Architecture Studies (S.M.Arch.)	51
Master of Science in Building Technology (S.M.B.T.)	8
Master of Science in Visual Studies (S.M.Vis.S.)	4
Resident Ph. D.	41
Special, non-degree	5

source: MIT Reports to the President, 2001-2002.
[http://web.mit.edu/communications/pres01/01.students.html]

STUDENT PROFILE EXCHANGE AS BASIS FOR INTERACTION

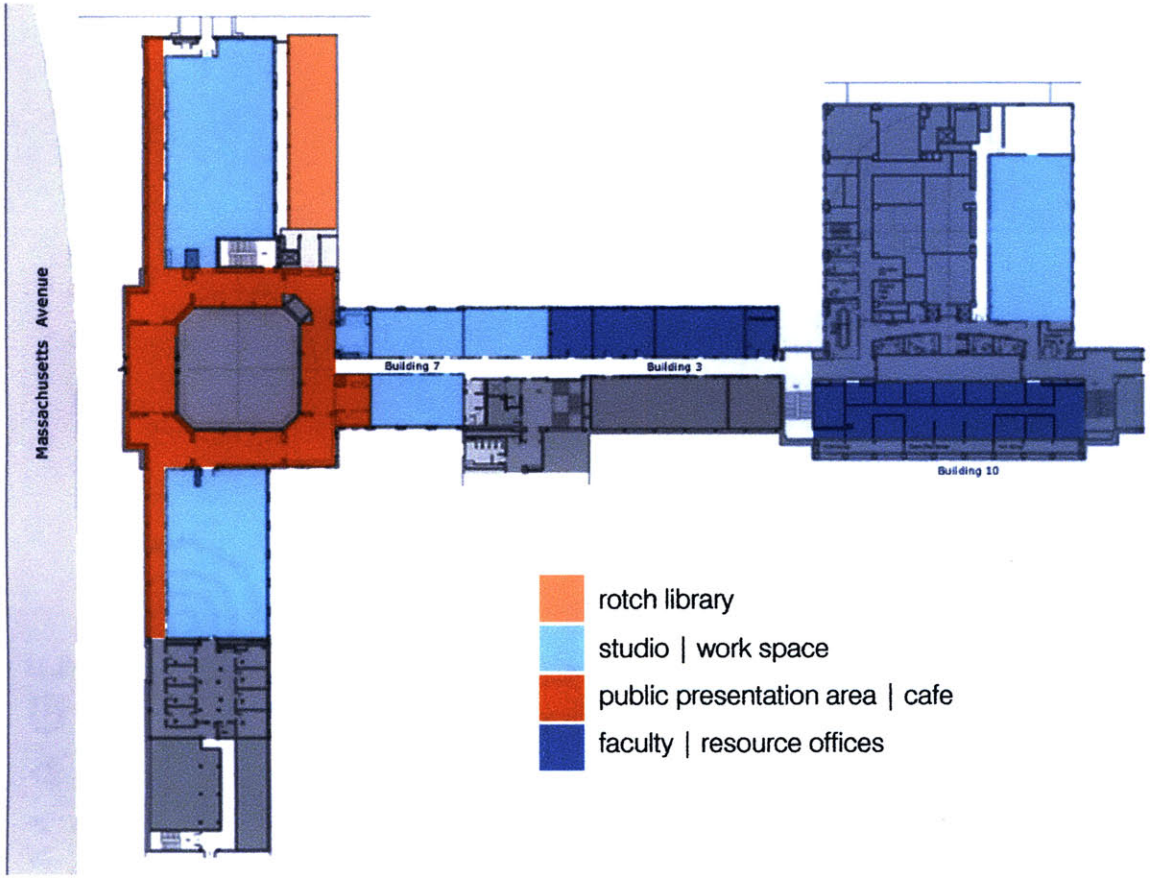


The annually published architecture department Handbook.

Compared to other research-oriented programs in the department, the M.Arch program is geared more towards obtaining skills. Therefore, students can benefit tremendously from more interaction with those in different levels.

Students come from a wide variety of educational and cultural backgrounds, ideally nurturing each other with their varying interests and expertise within and outside of the architectural field. They currently obtain a glimpse of such background information by referring to the profile descriptions that are prepared by the incoming students at the beginning of the academic year in the department's Handbook. Access to this information is not limited to the newly entering students, as other students also refer to the handbook for updated information about the curriculum, resources and facilities, as well as introduction to the new faces. In an environment that values such background diversity, the annually published handbook is an inadequate method for students to find profile introduction. Furthermore, students in architecture design typically spend numerous hours in studio environments, where skills gained from interacting with other students become as valuable and as common as those learned from professors. However, the knowledge exchange between students of different levels or different design studios are often limited, as they rarely find each other in the same class or studio.

SPATIAL ORGANIZATION

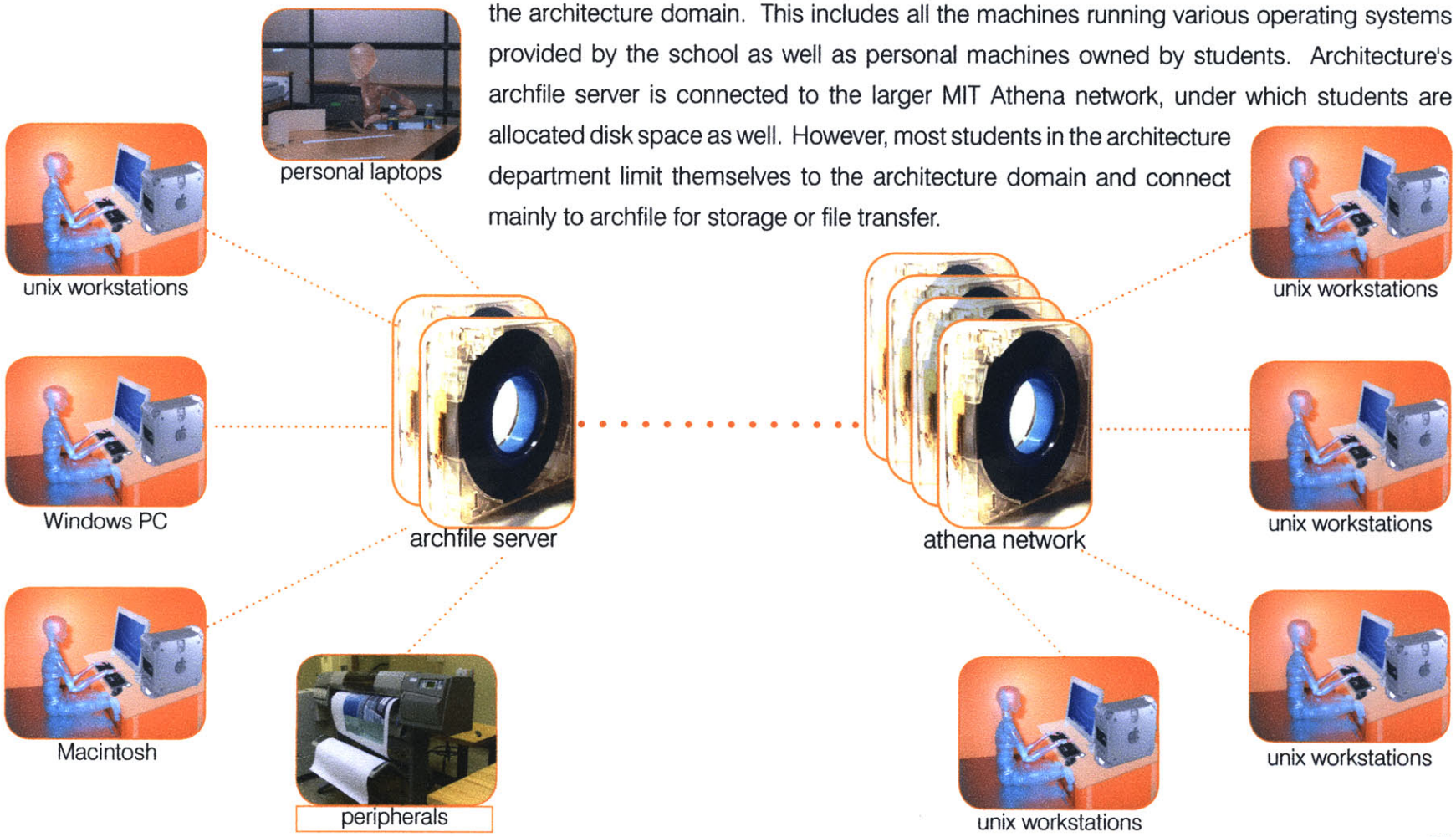


Student, faculty and staff activities are concentrated in the areas depicted on the floor plan in the figure at left. The learning environment for students in the architecture deparment includes a network of common spaces surrounded by studios and classrooms. The common space holds a cafe that is open to the public, where meetings of various nature (i.e. student-faculty, project groups, visitors lunch, etc.) take place. Presentations and critiques are often held this common space or abutting hallways.

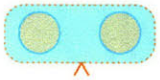
Students spend most of their non-class hours in their studio spaces, which are spread out throughout several disconnected locations. All rooms and studios are locked due to their public setting and are accessible only by members of the architecture department. However, most of the walls between studios and common space or hallways are glass, which give visual acess to the activities in the studio spaces.

NETWORK INFRASTRUCTURE

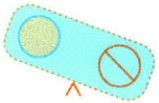
Aside from the spatial organization, network infrastructure is another major factor that determines work behaviors. Each student is allocated a block of storage space on the main architecture server(archfile), which is accessible from any of the machines connected to the architecture domain. This includes all the machines running various operating systems provided by the school as well as personal machines owned by students. Architecture's archfile server is connected to the larger MIT Athena network, under which students are allocated disk space as well. However, most students in the architecture department limit themselves to the architecture domain and connect mainly to archfile for storage or file transfer.



same space
same level
same studio



same space
same level
different studio



same space
different level
different studio

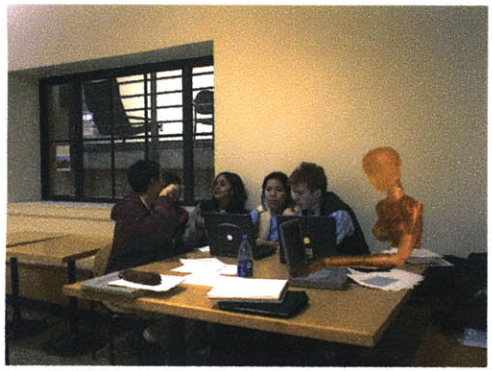
DESKTOP

Personal studio spaces are essential to design students since much of their production still requires working with physical materials. Regardless of the machine type, all students access the network server for their storage space as well as other public folders for group projects or file transfers. Whether a student works with one's own desktop from his designated studio space or use a shared machine provided in studios or computer rooms, the network access is inevitably associated with a very specific physical location. This setting is arguably best as support for individual work, often associated with privacy. Therefore, in many cases, the student's dependency to the central server in terms of data access or interaction is minimal. It also begins to suggest that students who work on desktops are more likely to have close interactions with those in same design studio, same level, or with others who are in the same space even if they were not initially connected by level or studio choice.

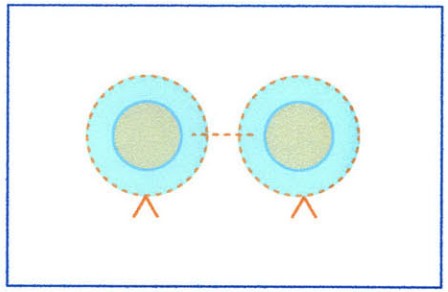
PORTABLE COMPUTING

A student works alone on a common table, away from his designated studio space.

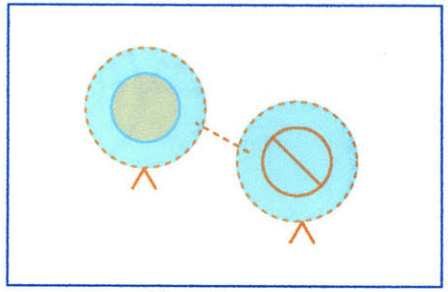
With the introduction of wireless connections around the department, the past several years have seen dramatic changes in the way students work individually or in groups. Wireless hubs brought students with laptops out of their private locations into common spaces. The cafe became a popular place to work on a computer rendering or hold group project meetings -- even those requiring computing power and network connection. Mobility had freed many students from a specific physical location, and their dependence on the information repository in the network server machines were now through wireless connection. Mobile computing initiated new movement patterns among students, supporting collaborative work within or outside of studio space (drop-in, unplanned or scheduled). It began to break down some of the segregation imposed by studio levels and spatial seperation, affecting the following types of social ties.



Students working on a group project in the dome cafe area.



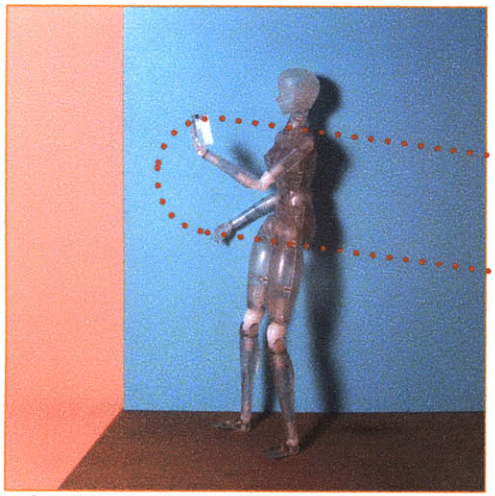
different space
same level
different studio



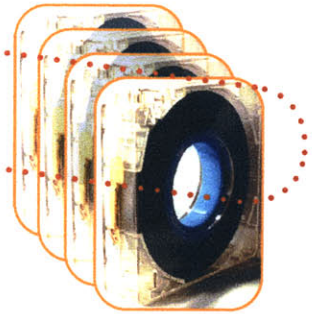
different space
different level
different studio

PDA | MOBILE PHONES

Although the current infrastructure does not allow students to carry on work-related tasks on PDAs or mobile phones, these tools are extensions of the computing power we have mentioned so far, and deserve discussion along the same train of thought. These devices are compact machines with limited functionality, where access to network is possible through other tools such as mobile phones.

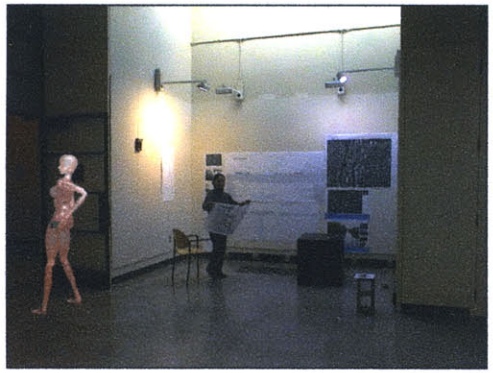


Computing device gets smaller, dependence to network access becomes greater.



In this scenario, since students carry less data in the device itself, the trend is to rely heavily on the network server for content and data; and consequently, become more dependent on the server. Obviously, as more data is stored on the server-side, network connectivity also becomes more valuable. Work patterns supported by these tools are remotely collaborative, as heavy content remains in a single location. Essentially, such patterns suggest ubiquitous computing, where people can access their data or necessary information from anywhere.

TRACKING IDENTITY



Accessing data in an individual's brain.

Neck plug downloads data into the body. [images from Mamoru Oshii's "Ghost in the Shell"]

It is not surprising that certain aspects of ubiquitous computing has already been implemented in the current environment at MIT. For instance, architecture students gain access to department-specific rooms by swiping their MIT ID card, which also gives access to all information about the student during his/her career at MIT. The ID card encapsulates all profile and identity information of its owner. By swiping our ID to gain access to certain rooms or to make certain purchases, we are giving away certain pieces of information, such as types of purchases or our physical location at the time. As students to the institute, we give up this information and choose to accept this method for the convenience it provides. People realize that they are not dealing with telemarketers and trust that the information is not used for other purposes. As people's dependency on technology increase, the information we store and access from a simple swipe of a card will also increase. Certain privacy settings or customized profile information such as how they choose to interact with fellow students or professors can also be something the environment is aware of -- and react to -- when the presence of the student is detected. In general, department-specific information can be stored on the server, so that they can be delivered to the student according to individual preferences and needs when they are in the vicinity. Access to data of this nature happens through identity -- no longer through a computing tool.

It is worth pausing at this moment and describe certain possibilities the current trajectory might lead us. At first, the role of an ID card will become extinct. One's identity will be established without any physical devices and data transactions can happen at a generic kiosk, as well as at a personal machine. In distant future, the data (personal or shared) itself can invade the human body so that computing devices are no longer necessary, as long as a ubiquitous network access is available.

EXISTING COMMUNICATION SETTINGS

The lasercutter is an example of many tools whose profile and availability can benefit from being networked.

The location-specific plotter is trying to be monitored without location.

Much of department related communication already utilizes the existing network connectivity and relies purely on email. Department wide announcements of varying degrees of importance (application deadlines to left-over food) disseminate from the headquarter, students make targeted or general annnouncements about certain locations or shared tools. On certain occasions, email is the quickest and surest way to distribute information to the targeted audience, but in many scenarios, it fails. The following screenshot of a student's inbox highlights the messages students have sent trying to control the plotter queue during finals week. They are asking the entire student body to refrain from sending plots at the instant they send the message. In reality, it is seldom guaranteed that all students will check their inbox and receive the plea at the instant it is sent.

INBOX | Compose | Folders | Options | Search | Directory | Help | Logout — Open Folder: INBOX

INBOX — Page 2 of 14 — 21 to 40 of 264 Messages

Select: | Mark as: | 2 | Move | Copy | Messages to

Delete | Undelete | Sort By Thread — Purge Deleted

	Date	From	Subject	Size
	12/17/02	Meredith Atkinson	Ozark please don't send	1kb
	12/17/02	Joy C. Y. Hou	and the sale goes on	1kb
	12/17/02	amanda dickson	AND MORE FOR SALE!	1kb
	12/17/02	scyphers@MIT.EDU	Everything must go	1kb
	12/17/02	To: wlporter@mit.edu	REMINDER: THESIS REVIEW 12/18 2:30PM at 3-405	1kb
	12/17/02	Christine Gaspar	you can print to ozark again	920
	12/17/02	Christine Gaspar	do not print to ozark	996
	12/16/02	To: kat@mit.edu	[No Subject]	2kb
	12/16/02	amanda dickson	cancellation!	2kb
	12/16/02	Tom Fitzgerald	Re: Fwd: Fwd: "OwNaGe.Inc" breakin activity on stu...	2kb
	12/16/02	adam griff	thesis sale!	1kb
	12/16/02	Lizzzard74@aol.com	honeycomb	2kb
	12/16/02	taylort@MIT.EDU	ozark	1kb
	12/16/02	Melissa Kearns	FOOD	1kb
	12/16/02	Annette Horne-Williams	Registration Day Help Needed	2kb
	12/16/02	Anne Hunter	Lemelson-MIT Webmaster!	3kb
	12/16/02	Deborah Rosencrans	Pelli on Bilbao at the BPL!	18kb
	12/16/02	Jose Luis Arguello	AKPIA Fellowship	54kb
	12/16/02	bluskky	Re: reading glasses	1kb
	12/16/02	Gmfricke9@aol.com	Thesis Group Contact Sheet	2kb

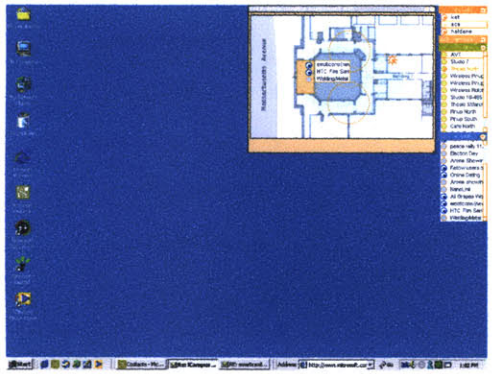
Legend: New | Seen | Answered | Important | Deleted

Delete | Undelete | Sort By Thread — Purge Deleted

Select: | Mark as: | 2 | Move | Copy | Messages to

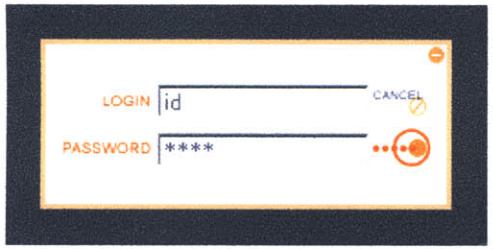
Hence, messages that are too time-sensitive (those that need attention immediately or within a day) or location-specific need a more ubiquitous interface.

STUDIOBRIDGE [information exchange in a networked community]



In this design exercise, a new communication platform was developed to provide a more effective interface for the students to exchange information. By considering the existing conditions and their limitations, studioBridge was designed to map existing relationships and foster new interactions. This section describes existing and affected user interactions due to the intervention introduced by the communication tool, as well as the ideas in the design of the interface itself.

IDENTITY

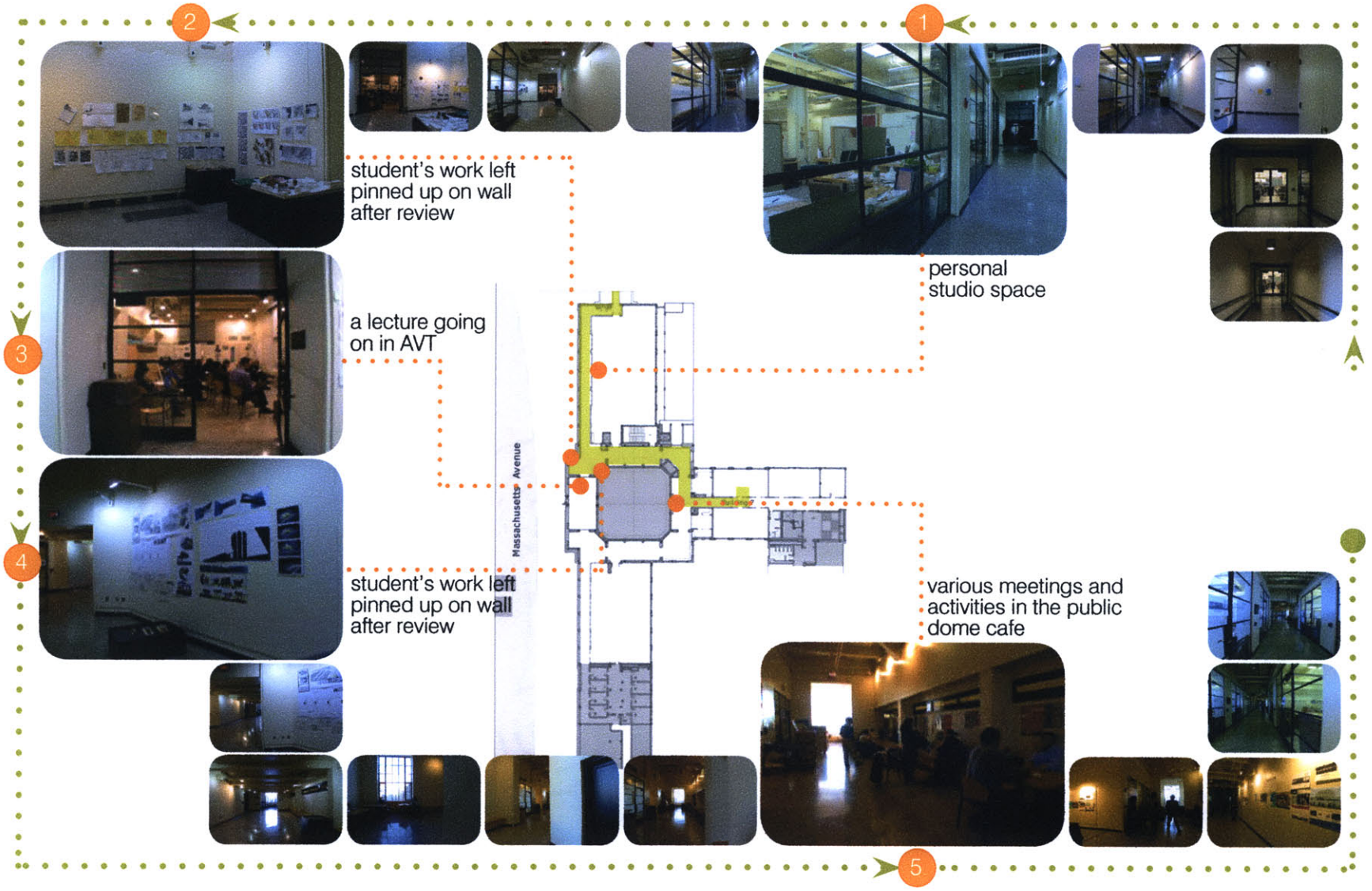


Students run this community-support environment as a client application on their laptops and desktop PCs while they are in the architecture department. Each user makes connection with the studioBridge server by providing an id and password. The userid is the same as the students' username on the architecture network or the MIT Athena network, and students do not have the ability to create multiple identities. Again, this project does not deal with the possibility of anonymous identities through mediated interactions -- the communication platform is purely an extension of the identities already existing in an open academic environment such as MIT.

PRIVACY IN AN OPEN ACADEMIC ENVIRONMENT

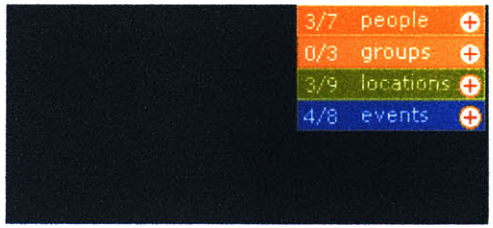
Ethan Katsh defines privacy as the power to control what others can come to know about you. In any environmental setting, people gain knowledge about others either through monitoring or searching (or by reports relying on the results of monitoring and searching). Monitored part of one's life is daily activities that are visible or noticeable to others and that others can respond to, if response is appropriate. The searchable is the part of one's life that leaves, or is, a record [lessig, pg 143]. This would often include things one owns -- in our case, a student's models or other objects in his studio space becomes a record of his life at MIT, at least for one semester.

The following scenario draws a student's arrival to the architecture department area on a typical day. As this student begins from north side (building 9) and makes his way to his thesis studio, we observe what is considered monitorable activity around the department. It illustrates that the distinction between monitored and searchable activity is not always clear, mainly due to the nature of the environment that exists in the MIT architecture department -- open, visually accessible through glass walls. For instance, a student's studio space with working models or drawings is always monitorable by other students, and for those with spaces adjacent to the corridor [view 1], it is visible by the public as well. Public corridors serve as presentation spaces, and since work is often left pinned up [view 2,4], it is hardly exclusively-searchable. In other words, in an open academic environment such as this, the part of one's life that might seem searchable is often monitorable.

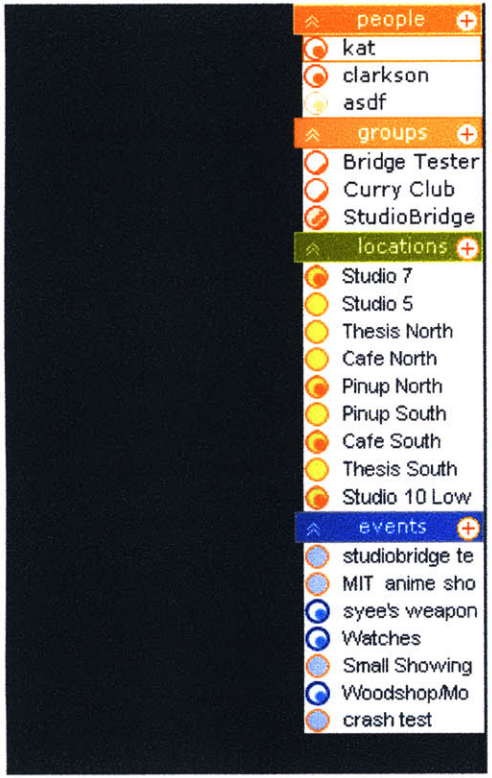

2
1
student's work left pinned up on wall after review
personal studio space
3
a lecture going on in AVT
Massachusetts Avenue
4
student's work left pinned up on wall after review
various meetings and activities in the public dome cafe
5

An academic design community benefits from the openness in the environment and we have seen that MIT community has already made some searchable activities monitorable. Physical spaces or other architectural interventions often pose constraints on others' ability to monitor and search one's activities. These constraints change in the digital realm since technology provides the efficiency and power to monitor transactions that human eyes could not detect, or imperfect human memories could not recall.

In the current network infrastructure, students already have complete read-access to each other's data stored on the network server archfile. The new communication platform and surrounding spaces proposed in this section are designed to make certain behaviors or activities monitorable, or to necessitate a search to find a specific information. In the new environment, students publish tidbits of information -- creating monitorable data (events) that shifts existing privacy settings as well as information exchange protocols. A fellow student's monitorable data might include his location, interests, or projects he has published into the system. Locations or physical spaces are provided with the ability to accrue history, which enables them to be searched via people or events. Therefore, this platform provides its users with a new view of their existing environment -- a view defined by a network of information packets, organized into categories of people, groups and locations.



Once the user makes connection by logging in, the environment displays several different levels of detail about people, locations and events; and as a result, offers different levels of interaction for the user. The image at left shows the interface at its lightest -- a small toolbar on the desktop -- where it is peripheral to the user's main activity. Without providing anything specific, it suggests activity levels related to people, groups, locations or events that the user cares about. The particular user in the figure has 7 people on his people list, 3 of whom are currently present. Similarly, the user monitors 9 locations throughout the department, and 3

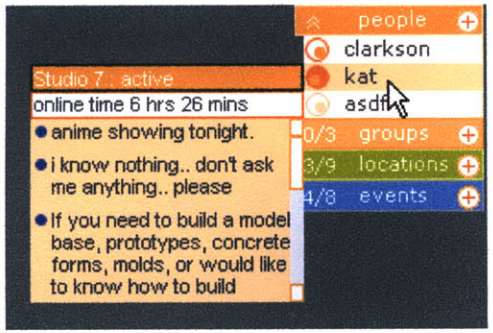


of them indicate some sort of activity.

Each category of information expands to display an itemized list at the next level of detail. The system can be configured to provide each user a customized list of people, locations, groups and events to monitor. The expanded view of the toolbar itemizes each element of the list. The figure shows that this particular user has chosen to monitor seven people, two of whom are online and active, where user 'asdf' is somewhere in the system idle.

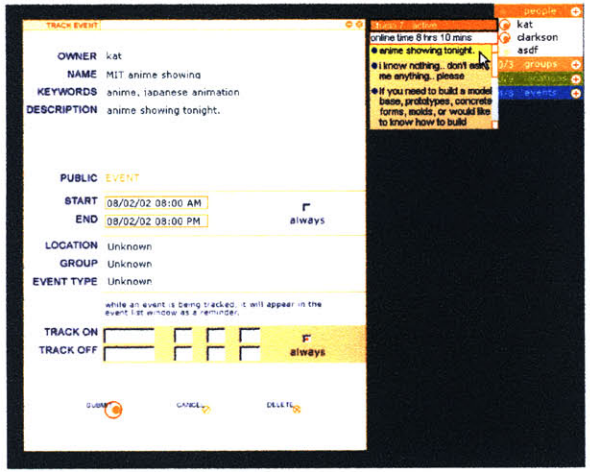
The interface communicates the state of people, events, and locations without requiring the users to divert their attention from their main task. As a general rule, a conscious effort was made to minimize the interaction required to use studioBridge in order to ensure that the system augments activities rather than replaces them. For example, the view easily toggles between list mode and edit mode so that the list of people one chooses to monitor can be modified without many layers of interaction with the interface.

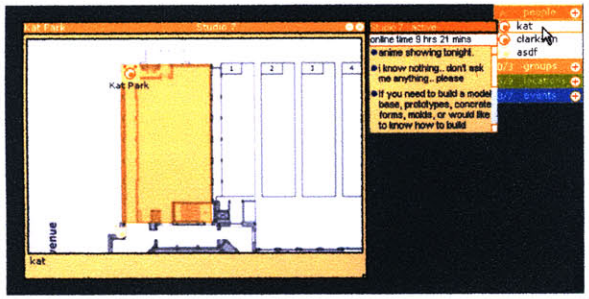
PEOPLE AS INFORMATION FILTERS



Moving the mouse over an individual's name in the people monitor list displays more detailed information: the person's activity status, how long he has been idle as well as his current location. Besides the basic information about the buddy's activity status or availability, the mouseover pop-up lists the events that the buddy has subscribed to. In other words, a user sees what is in his friend's event list, which can imply what his friend might be doing or is interested in. Information such as this is disseminated in a completely controlled manner since users are always in control of what they want to publish about themselves on studioBridge.

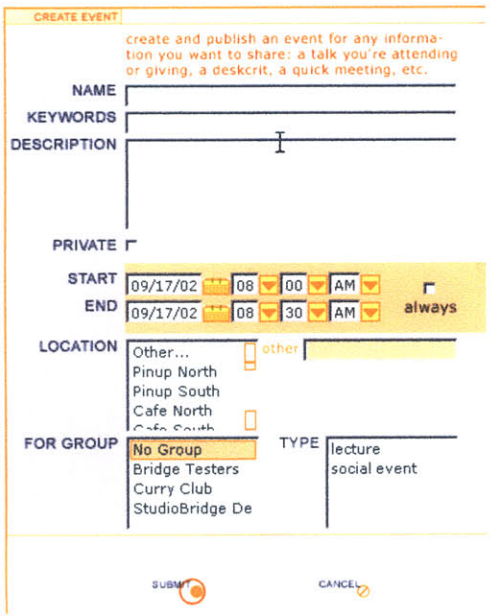
A user in the system exists by publishing his ideas and interests.

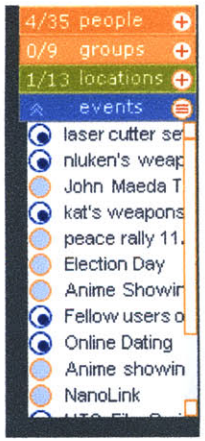


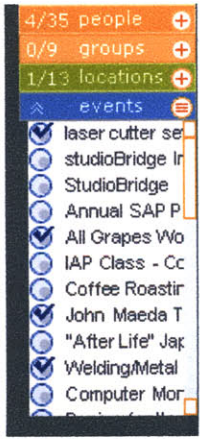


Publishing one's interest as event objects causes users in the system to be connected to each other through events, as the events they share with each other begin to define another level of interaction. While browsing the events that friends have subscribed to via the mouseover windows, a user can click on any event to receive a detailed profile of the event and optionally subscribe to the event himself. This feature allows users to filter information (published events) through social context. Event interaction will be covered in more detail in the next section.

The people monitor list can be used as information source for location of the buddies as well as their detailed profile. Clicking on the name of an individual on the list opens up a floor plan-view of the hallways, studios, classrooms and other spaces used by the architecture department, focused on a pre-defined area the user is located in. Since viewing of the map places the user at a high interaction level, the system begins to offer information about other users in his vicinity. The map draws all users who are currently online, including non-buddies, if they happen to be near the area being focused. The view on the next page shows a faint image of an idle buddy (asdf) directly below the studio 7 area, whose identity is revealed on mouseover. A user can also initiate an instant message session with a person in their monitor list.





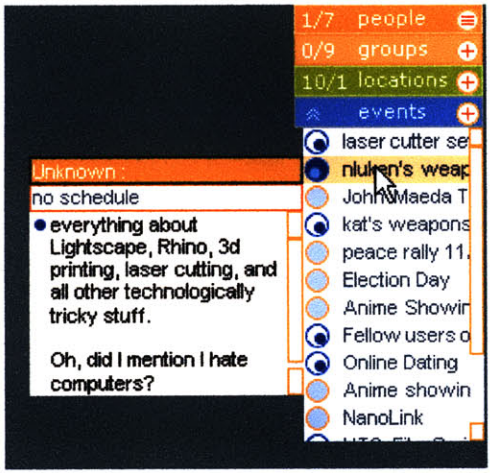


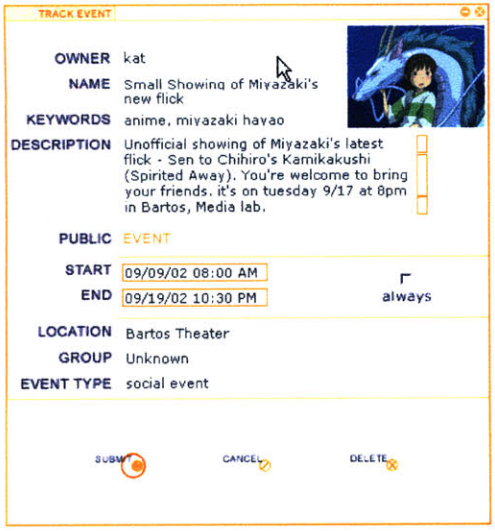
EVENTS [ACTIVATING COMMUNICATION]

Events are the most important way that social capital is represented in this communication platform. A user can create an event object for anything on his agenda. Profile information, such as what studio the student might be taking or what his thesis topic might be, is information that an individual "carries" everywhere. By publishing these tidbits of interest, one can choose to augment their presence within the community.

Events can be published for the entire community of users or targeted for a specific group of users. Targeted events are private events for a group of specified users, which is conceptually much like an invitation or an announcement. Only the specified users will be notified of the event, after which the recipients have the choice of monitoring the event or not. For instance, if a user would like to have a few of their friends attend his pending studio review but does not wish it to be announced to the entire community, the user can create a private event for this occasion. The friends will see the event on their list of events to choose from, and depending on whether or not their circumstances permit, they can choose to monitor the event and attend the review session.

The left view shows the monitor view of a user's customized event list, and the view at right shows a list of all events available to this user. The user chooses the events to monitor (i.e. subscribes to events) by clicking on the particular event. On many levels, the event list behaves quite similarly to the people list. When the list is expanded, the user sees the status of the events in the list. Events can be given a start time and end time upon creation;





therefore, they are only active during a specified life cycle, unless created to have no expiration date.

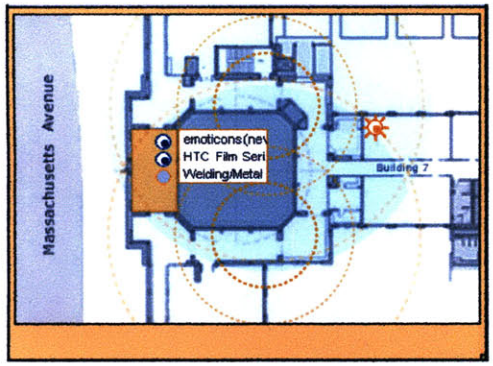
The event list is also a method to keep a history of interactions. Since the event objects are designed to remain in the system even after they have ended, the user can choose to keep them in his event list for the purposes of leaving a record of what went on during the semester. The "John Maeda Lecture" event which is third on the monitored list at left is displayed inactive, which either means that it has already taken place and have expired, or that it has not reached their start time yet.

Events are monitored starting from the moment a user chooses to monitor it, regardless of their activity status. The event titled "nluken's weapons" is a profile information the user nluken has chosen to publish. To facilitate exchange of skills in the department, users can publish tidbits about themselves (for example, computer monitor or a laptop TA on duty) as events. These events are different in that they live forever in the system without a deactivation date. On mouseover, more detailed information about the event is displayed. The detailed information that appears here is a description the author gives at creation (or afterwards via an edit form). Thus as always, it is completely up to the author how much information he chooses to make public.

Clicking on an event in the list opens a complete profile of the event in a separate window. If the user is the author of this event, then the profile window is also an edit form allowing him to make changes and republish. The interaction defined in this window is similar to the track event window retrieved by clicking on an event in a buddy mouseover pop-up, as mentioned in the previous section. The difference is that when the user views the event profile from his own event list, it is always the case that he is already subscribed to the event. This is not

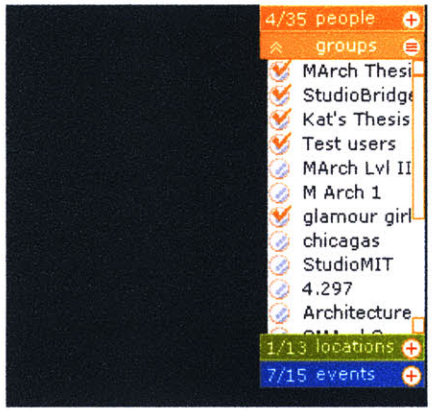
always true for an event profile from a friend's event list.

Much like a person in the system, an event is associated with a specific location, profile, and an activity status. The event object behaves like a user in the system which outsource other information elements once you chance upon an event. During subscription, information such as other users that have subscribed to the event or who is attending the event is displayed, which consequently suggests ideas about a general group of people who might be interested in a particular type of event. This creates a type of social tie defined by a common interest in or involvement with an event. Thus, an event would lead to certain information about users, and it would also imply information about a particular place such as how a place is being used by the current community.



The implementation that was released for testing during fall semester of 2002 did not include this event subscription feature. The first and foremost hurdle was the level of accuracy one can obtain about a user's location in the current software. Without the ability to track the location of a user at least to a confined area, it was difficult to incorporate the location-specific features of the event (or any other part of the system) into the design. However, location-sensing is necessary in order to maintain the link between physical location in the real world spaces of the architecture department and the represented spaces in the digital realm.

GROUP FORMATION AND AWARENESS



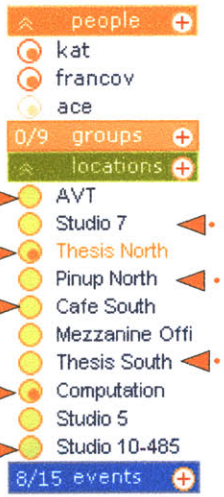
The ability for people to form spontaneous groups is another feature of the system. Groups can be open to the public or in cases such as a class or studio group, subscription can be limited to specific users. Users are also allowed to create groups that are completely private, which are visible to only its members. In such cases, the groups' existence is hidden to non-members.

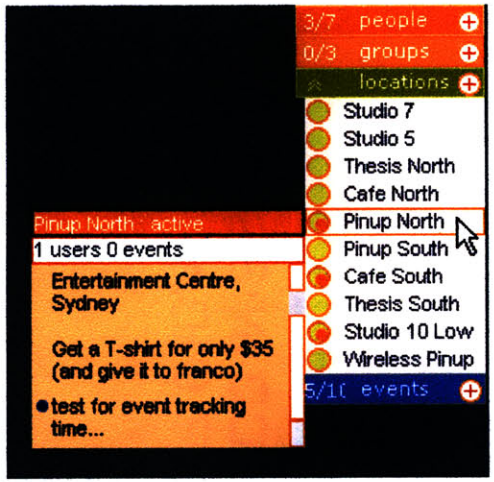
Therefore, when a user browses through the list of available groups in the edit mode at left, the groups that are hidden from this particular user are not displayed in this list. When a user attempts to subscribe to a private group, a group profile window appears with contact information to obtain subscription permission directly from the group owner. Mouseover on all visible groups shows the activity status of the group as well as any events that are associated with the group.

In monitor mode, mouseover displays the group's member usernames and their individual online states as well. This is the only time in the system where users who are logged-off are represented. In addition, the group's assembly status is displayed -- the system determines that if any of the members are in the group's discussion space, the group is considered to be "meeting" and therefore active. With further interaction in the monitor list(single click), a detailed profile of the group is also accessible, which allows the user to remove himself from the group.

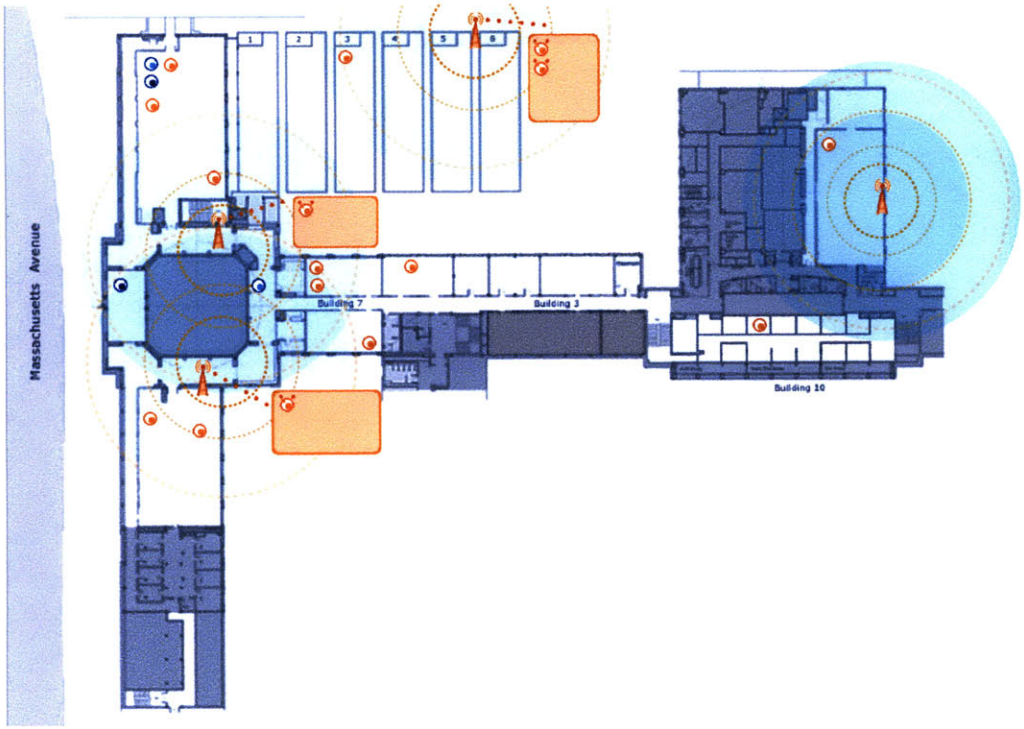
LOCATION-DEPENDENT INTERACTIONS

Spatial configurations often pose constraints that become interaction barriers. The segregation that hinders optimal inter-level interaction patterns is also dependent on the physical location of the student work spaces, which are spread out in disconnected locations. The new networked environment allows users to monitor the spaces in the architecture department by selecting the desired areas from a pre-defined list of locations. People already relate to these spaces by associating certain rooms or spaces with certain people or certain events -- corridors for reviews or pinups, a particular studio for a close friend, etc -- which corresponds to the way locations exist online.

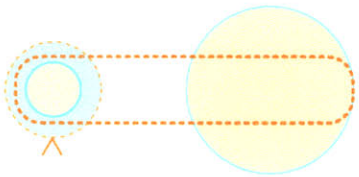


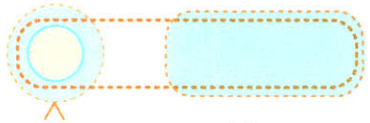


The system allows the user to select the spaces that are relevant to the user and browse through them for people or events. Mouseover on a location in the location monitor list displays the number of users in the location, as well as a list of active events that are associated with the location, allowing people and event related information to be filtered by a physical space. A location is considered to be active if it contains either a user or an active event.



Clicking on a location opens up the plan-view map, focused on that particular location. User can easily move from one location to the next by clicking the location items on the list. Due to the lack of accuracy in the software which predicts the location of the wireless users in the current version, wireless users connected to the environment are associated with a hub-location which is abstractly represented near its corresponding hub.





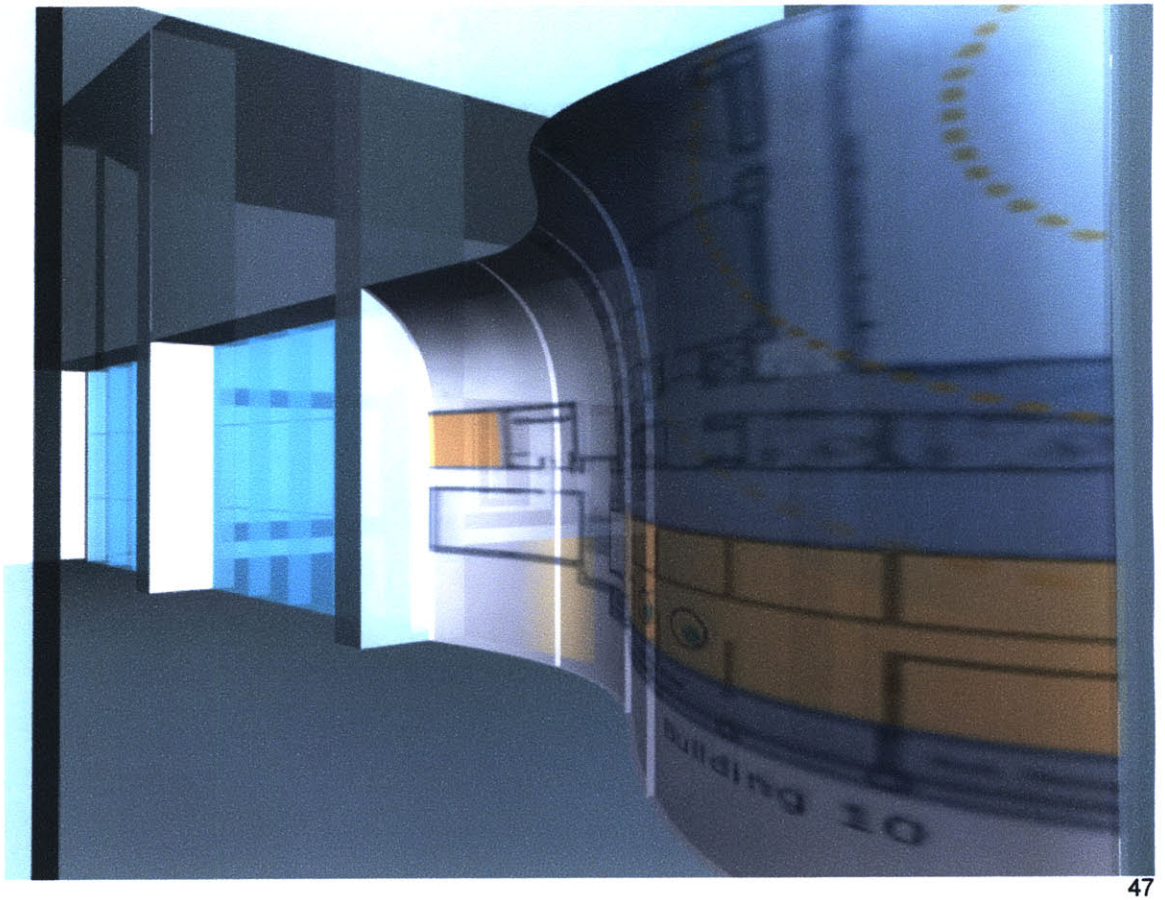
A networked environment provides opportunities for interactions and behavioral settings that were not possible in a traditional environment. Therefore, what is affected is not only the students' relationships to each other, but also to the larger public who occupy the new space. As the students' work is often displayed for the public through the glass walls or pin-up spaces in the corridors, same interaction is supported online. The corridors become what they already are: peripheral spaces that augment and visually extend the activities that take place inside the studio. The physical spaces and walls are also an essential part of the networked environment. When a user drops files into the location map in studioBridge, the files are displayed in the physical location corresponding to the file destination.

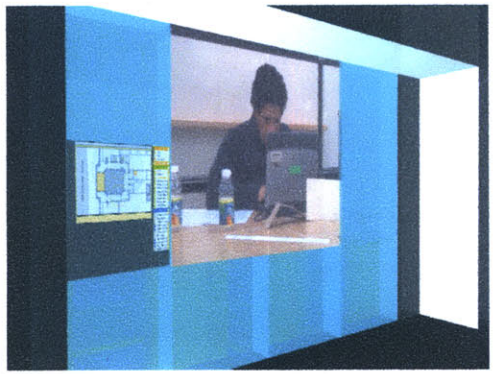
Rotating display of student works

Kiosk stations in physical spaces give access to the networked environment and provide a view of the past. present, and future events associated with a location.

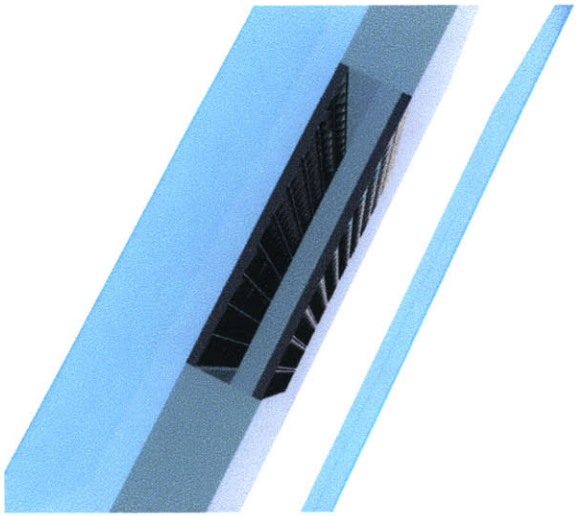
Display of the networked version of department map informs public events and their locations

This action is an example of a student with direct control of the published information which requires user input. However, surfaces in public nodes, such as the area immediately adjacent to the circulation, can be dedicated to casual displays of files in a designated public space in the archfile server. They also function as paperless displays that advertise department related announcements. The online system becomes a way to provide a casual gallery space for the students' work and incidently, inform the public the various activities around the department.

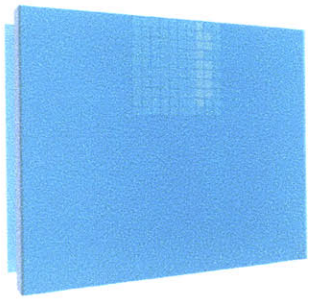


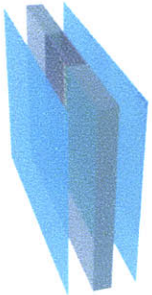


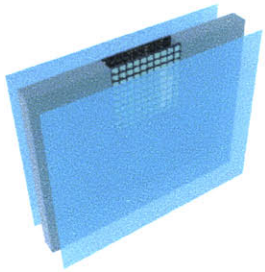
To narrow the gap existing in the disconnected physical spaces and the distance posed by conversations that take place through the medium, the wall needs to be more than a display space. A modular wall system allows controlled views of locations and users participating on the network, similar to how students in certain spaces are already visible to anyone passing by.

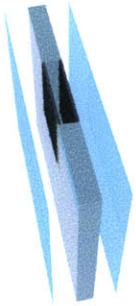


Mirrored pixels are controlled by the server, whose angles are calculated to provide direct visual access to a student in a different location. User input such as privacy settings at a given moment requires a direct or remote user interface to the wall. The tangibility of a wall as a privacy barrier is kept.



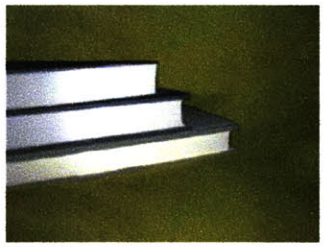






Bipolar glass panes function as display surfaces as well as enable the server or the end user to control visual access on the fly.

ACTIVITY LOGS



Knowledge exchanges that occur in online spaces are different from other mediated interactions in their ability to accumulate history. Even as they remain unorganized, the history of information persists even after the participants have left the space, enabling the next occupant -- perhaps a student 5 years junior -- to easily recapture any information one chose to publish into the networked environment.

```
SELECT *
FROM sbEvent
WHERE (OwnerId = 1)
```

2:Data in Table 'sbEvent' in 'test5' on 'STUDIOMIT6'

```
SELECT *
FROM sbEvent
WHERE (OwnerId = 1)
```

EventId	EventName	Description	OwnerId	GroupId	LocationId	OtherLocation	CategoryId	CreatedTime	StartTime	EndTime	Eternal	Keywords	Private
[redacted]	laser cutter settings	1/32" cut 80-8	1	-1	-1		-1	10/21/2002 9:59:3	10/21/2002 8:00:0	10/21/2002 8:30:0	1	laser	0
123	studioBridge Introduction Meeting	As part of the Depa	1	-1	-3	Stella Room	-1	10/21/2002 10:48:	10/21/2002 6:30:0	10/22/2002 8:00:0	0	studioBridge	0
125	Annual SAP Phonathon	help raise scholarst	1	-1	-3	10-105	-1	10/22/2002 2:59:4	10/22/2002 8:00:0	10/30/2002 8:30:0	0	alum, free dinner, r	0
132	Welding/Metal Working demo	Wed, 10/23 at 12:(	1	-1	-3	N51-160	-1	10/22/2002 3:40:3	10/14/2002 8:00:0	10/23/2002 12:30:	0	woodshop, metal	0
140	Anime showing #9	Nov. 1, friday start	1	-1	-3	6-120	-1	10/29/2002 5:54:2	11/1/2002 7:00:00	11/1/2002 11:30:0	0	anime	0
144	peace rally 11/3	peace rally in Bostc	1	-1	-3	Boston Common	-1	10/30/2002 12:11:	10/30/2002 8:00:0	11/3/2002 6:30:00	0		0
145	NanoLink	"Come to this huge	1	-1	-3	Walker Memorial	2	11/1/2002 12:59:5	11/1/2002 8:00:00	11/1/2002 7:00:00	0		0
146	Fellow users on studioBridge	salwa .salwa ale	1	-1	-1		-1	11/2/2002 7:03:15	11/2/2002 8:00:00	11/2/2002 8:30:00	1		0
148	Online Dating Decision Making	Participants neede	1	-1	-1		-1	11/3/2002 4:27:21	11/3/2002 8:00:00	11/3/2002 8:30:00	1		0
154	kat's weapons	alright, alright, her	1	-1	-1		-1	11/4/2002 12:30:4	11/4/2002 12:22:0	11/4/2002 12:22:0	1		0
158	Anime Showing #10	Friday, Nov 8 7pm	1	-1	-3	6-120	-1	11/5/2002 9:28:30	11/5/2002 8:00:00	11/8/2002 11:30:0	0		0

Event creation is stored in the studioBridge server and can be retreived with a number of different queries. Filtering events through social context or being able to search for keywords activate communication and information flow in the department. One is able to locate people in the department who are associated with particular types of interests.

The online communication tool and its networked environment in this project was designed to organize the knowledge bank into a format that is monitorable, searchable, and inheritable. As described in previous sections, information users input into the system directly accumulates in the form of events in the online realm. Since studioBridge is a client-server system, it is also a simple matter to monitor certain activities and log them in a

secure and private manner on the server computer. With a search interface, accumulated data can provide non-observational profile information such as associations of particular events with particular people. The nature of logging depends on whether the activity pertains to a user, event, group, or location since all of these objects can generate activity.

The following tables lists the various activity instances that are currently capable of being logged. The time and parameters of each logged item are also recorded in the log.

USER ACTIVITY	EVENT ACTIVITY	GROUP ACTIVITY	LOCATION ACTIVITY
becomes idle	becomes active	online discussion begins	becomes active due to event or user presence
becomes active after being idle	expires	online discussion ends	
sets his status to away			
moves to a new location			
adds a group, event, or buddy			
modifies a group or event			
joins a group or event			
joins a discussion			
sends an instant message			

ANALYSIS

Through data collection and subsequent analysis of empirical data, this project can answer specific questions regarding the effect of this environment on social networks in the existing community. Constraints and limitations that originally produced the design ideas of this online environment can be tested and become the basis for fomulating a model in the new academic settings. For instance, surveys and logged activities can measure if the current barriers in level-dependent or location-dependent clusters have been permeated, or if the changed notion of walls and proximity affects group formations or existing social ties. A paper written for the class "Social Networks in Cyberspace" examines these analytical methods for evaluating the effects of studioBridge on the MIT architecture community. A PDF version of the paper is available at [http://www.katpark.com] for reference.

06 CONCLUSION

SOCIAL CAPITAL AND COMMUNITY AWARENESS

Glass walls, bulletin boards, crowded hallways, and cafes are examples of artifacts in a building that contribute to the occupant's awareness of each other. This awareness is a type of interaction that doesn't necessarily require any direct contact but helps people grow their sense of community and functions as an important nonverbal communication medium.

In a networked community, this awareness is not propagated only in physical space, but current work settings exhibit that it extends into online communication. The design proposed in this project has the potential to be a powerful contributor to community awareness through its real-time portrayal of where people are, what they are interested in, what events they are organizing or attending, and what they know. Instead of filtering out information like a search engine does for the Internet, studioBridge is based on a magnifying-glass concept for presenting information so that peripherally relevant objects (online users and events) are still visible to the user.

FUTURE WORKS

Due to time and resource constraints, there were several aspects of the design that still remain to be explored. In the current design, the concept of an event is all-encompassing, where it tries to represent several different types of information in one simplified manner. An option to separate the events of differing nature should be explored. They might be purely representational to provide a visual sorting method for the user reading the map, or they can behave differently, introducing a new set of rules.

Similar to most environments that require a mediated interface for user interaction, this project was designed to repeat the design-deploy-and-redesign cycle. During the thesis semester, the application was deployed to 34 students who had volunteered to participate. Therefore, it remained under the constraints of available and implementable technology at the time. At the time of implementation, location of wireless network cards could not be pointed to a specific room, which is why the design adapted the concept of "hub-locations". However, location technology is improving at a tremendous rate -- even now, Ekahau claims a software product that can locate client devices with up to 1 meter average accuracy, supporting all Wi-Fi access points [http://www.ekahau.com].

This suggests new ways of visualuzaing the representation of the existing space online.

CLOSING REMARKS

Interactive patterns in academic or work settings have embraced computer-mediated communication to a point where design constraints for either physical architecture or online interaction can no longer stand on its own. In a networked community, physical spaces and its organization needs to be integrated with an organized online environment to offer an effective setting for modern work patterns. Contemporary architecture includes this network of nervous system as well as the skeletal structure and mechanical system. We are at a time when being wireless is starting to become the norm for many interactions -- the invention of ability to connect to various network with any gadget one can imagine is no longer new. What is interesting is that while this ability had freed objects or people from being bound to a specific physical location, many people are focusing their efforts on tracking the location-free devices. We are now trying to bring them back into a physical space and give them a location. Communication and interactions -- online or purely physical in nature -- are inseparable from physical architecture.

07 BIBLIOGRAPHY

Calhoun, Craig. "Community Without Propinquity Revisited: Communications Technology and the Transformation of the Urban Public Sphere," Sociological Inquiry 68(3), 1998. pg. 373-379.

M. Granovetter. "The strength of weak ties," American Journal of Sociology, 78(6), 1973. pg. 1360-1380.

Hampton, Keith N. "Living the Wired Life in the Wired Suburb: Netville, Globalization and Civil Society. Doctoral dissertation," Department of Sociology, University of Toronto, 2001.

Katz, James, Ronald Rice, and Philip Aspden. "The Internet, 1995-2000: Access, Civic Involvement, and Social Interaction," American Behavioral Scientist 45(3), 2001. pg. 404-419.

Kraut, Robert, Sara Kiesler, Bonka Boneva, Jonathon Cummings, Vicki Helgesonb, and Anne Crawford. "Internet Paradox Revisited," Journal of Social Issues, 2001. Forthcoming.

Lessig, Lawrence. Code and Other Laws of Cyberspace, New York, NY: Basic Books, 1999.

Matei Sorin, and Sandra Ball-Rokeach. "Real and Virtual Social Ties: Connections in the Everyday Lives of Seven Ethnic Neighborhoods," American Behavioral Scientist 45(3), 2001. pg. 550-564

Mitchell, William J. The Reconfigured Eye : Visual Truth in the Post-photographic Era, Cambridge, MA: MIT Press, 1992.

Mitchell, William J. E-topia: urban Life, Jim – But Not As We Know It, Cambridge, MA: MIT Press, 1999.

Perin, Constance. With Man in Mind: an Interdisciplinary Prospectus for Environmental Design, Cambridge, MA: MIT Press, 1970.

Putnam, Robert, D. "The strange disappearance of civic America," American Prospect, 24, 1997. pg. 34-48.

Rheingold, Howard. The Virtual Community: Homesteading on the Electronic Frontier (revised edition), Cambridge, MA: MIT Press, 2000.

Schoggen, Phil. Behavior Settings: A Revision and Extension of Roger G. Barker's Ecological Psychology, Stanford, CA: Stanford University Press, 1989.

Viegas, Fernanda. "Chat Circles," Computer-Human Interaction '99. Seattle, WA, 1999.

Wellman, Barry, Anabel Quan, James Witte, & Keith Hampton. "Does the Internet Increase, Decrease, or Supplement Social Capital?" Social Networks, Participation, and Community Commitment. American Behavioral Scientist 45(3), 2001. pg. 436-455.

Wellman, Barry. "Physical Place and Cyber Place: The Rise of Personalized Networking," International Journal of Urban and Regional Research 25(2), 2001. pg. 227-252

all images are by the author
unless otherwise noted

"we're all connected..." -lain