

# APPLICATION SHARING - A KEY SERVICE FOR A DISTRIBUTED ORGANISATION

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## ABSTRACT

*This paper is a case study of implementation and use of application sharing in a distributed engineering organisation. Technical aspects and requirements to the infrastructure are addressed, but the focus is on how application sharing is conceived by the users, experiences from use and possible implications for organisation of project teams and support services. Possibilities and critical success factors are identified. Barriers and limitations are also identified. Natural dissemination to all employees has been slower than expected. The time and effort needed to implement the service in an organisation should not be underestimated. However, to many of the engineers, application sharing has become an everyday an indispensable service, enabling distributed solving of closely coupled tasks. The author advocates that a distributed organisation can reap the investment in very short time.*

*Keywords, Data conferencing, distributed organisation, case study*

## Introduction

Application sharing is an open and conceptually simple service with a potential for dramatic increase in communication quality. Application sharing is considered an integrated part of an infrastructure for virtual teaming [Line96]. The present paper report experience with application sharing from a Norwegian Engineering company who has started to exploit the possibilities by distributed teams and services. Technical aspects and requirements to the infrastructure are addressed, but the focus is on how application sharing is conceived by the users, experiences from use and possible implications for organisation of project teams and support services.

The basic idea of application sharing is that two (or more) users see the same window and may take control of the application. Many solutions varying in functionality, cost and quality have existed for some time. Today there are [solutions](#) available free or at a very affordable price.

Several products were evaluated and tested during the first half of 1996. In October Microsoft released [NetMeeting](#) as a free add-on to Windows 95. This product met the basic requirements and seemed to be stable and efficient. It was decided to start pilot projects based on MS NetMeeting. The [test program](#) started in March 97. The program addressed three main issues:

**Support for technical discussions:** Pointing and sketching on a drawing or another document often accompanies a technical discussion. To what degree can application sharing replace the physical aids and enable rich technical discussions?

**User support and coaching:** Is it feasible to build a support structure for tools and systems without "on site" support personnel? Does application sharing relax the requirement for co-location of junior and senior personnel?



**Technical aspects:** Robustness and requirements on the workstations. What are the requirements to and the load on the communication infrastructure?

Need for coaching, unexpected barriers, general use patterns and eventual need for or connection to other services like mail, telephone or file transfer was considered as important side issues. We were also curious to see if new and creative ways of using the service emerged.

Concepts and technology are presented in the following section. Next, the research plan and a sequential presentation of important events are given. This information is needed to understand the opportunities and limitations given by a full-scale field experiment [Olson97].

## Concepts and technology

Remote control, Global window, Shared X, Application sharing, Net Conferencing, Data Conferencing or Net Meeting. A lot of words with blurred meaning. There are no clear and exact definitions of the above terms, as the program vendors add and mix functionality and implementation techniques. There are, however, important differences and I will describe core concepts and clarify the meaning of terms used in this paper.

An overview of the two products used in this study, references to similar products and an overview of important conferencing standards and standardisation organisations can be found at the following address: <http://ex.asplanviak.no/applikasjon/ConseptAndTech.htm>

## Terms

**Remote control:** An operator can connect and take full control of a remote computer. He will normally see the screen of the remote computer in a window on his own desktop and can operate the remote computer as if he was directly connected to it.

**Application sharing:** Application sharing is that the window(s) displayed by an application is duplicated or shared to a remote computer. The user sitting in front of the remote computer will see the window as if the application were running on his local computer. Both users can control the application (in turn). Compared to remote control, application sharing need to have more information about the processes running on the host computer. This implies that the application sharing host process has to intercept with the operating system at a lower level. **Data Conferencing:** The term data conferencing or computer conferencing was earlier commonly used [Cole95] about a service or application with core functionality similar to News or threaded discussion. This was probably due to the fact that the first generation GroupWare was very similar to News, and they needed a term to differentiate it from the freely available news service. Today, Data Conferencing, Net Conferencing or Net Meeting are commonly used about real time collaboration services comprising most of the following functions: audio, video, file transfer, chat, document/application sharing, and whiteboard [CNET97].

## Research plan and accomplishment

The need for application sharing as an integrated part of an infrastructure for virtual teaming is argued in [Line96]. In short, the service was seen to meet a need for rich synchronous communication. This view was based on earlier experience with distributed collaboration and demonstrations of tools like [Intel Proshare](#), [Symantec pcANYWHERE](#) and [NEXUS](#). In addition, a research program on application sharing in the Norwegian postal administration was an important information source in this phase [Bergan95], [Hegna95] and [Hegna96].

The technical requirements were formulated to:

1. Robust and easy to use.
2. Supported on both win95 and NT
3. Acceptable screen refresh over ISDN (64Kb)
4. Low price pr. seat.

The above requirements are the author's pragmatic formulation of requirements for application sharing to be economic feasible for managers and functionally attractive for engineers. In 1995/96, several products were evaluated and tested. None was found to be close to the above requirements.

The main obstacle was that none of these tools were available for win95 and/or NT. Asplan Viak had migrated to these platforms and hence, no relevant application sharing tool was available at that time. In October 1996, Microsoft released [NetMeeting](#) as a free add-on to Windows 95. A version for NT 4.0 was also announced. This product met the requirements and seemed to be stable and efficient. The author tested the program and some users in AV who had special interest for the application installed it. The product was also demonstrated at some internal group seminars. In January 97 the author wrote a proposal for a test program to the IT committee in AV. In February 97 the author held a seminar for the management in AV. The seminar focused on IT strategy and possibilities enabled by IT in general and Internet in special. Hands on training in use of several communication services, including NetMeeting, were given. The author demonstrated a NetMeeting session with an employee located at another office. Afterwards the group manager and the six managers for the subsidiaries experimented with NetMeeting for about half an hour. They found it appealing, and approved the test program. However, no firm commitment or additional resources were provided.

By this decision, the original intention to investigate a distributed application support organisation, supported by NetMeeting, was taken out of the test program. Natural dissemination of a service entered as a new and interesting research question. The test program started in March 97 with a group of 12 pilot users. An internal Internet locator server was already in place.

NetMeeting 2.0 was released in final version in April 97 and with the release of NT4.0 service pack 3 in May, application sharing was finally supported on NT4.0. By this, the number of pilot users increased to approximately 20.

The number of users is slowly but steadily growing. In October 97, one of the subsidiaries (AVS, The Southern region with 100 employees) decided to include NetMeeting in the standard PC configuration. At the same time it was decided to arrange training for all users. As of November 97, all employees in AVS have some experience with NetMeeting and many are using it on a regular basis.

### **Experiences from implementation and use**

The test program started in March 97 with a group of 12 pilot users. Quantitative data about the use of NetMeeting were collected from log files, and conversations and interviews were held to get the qualitative aspects. The program addresses three main issues:

- Support for technical discussions
- User support and coaching
- Technical aspects

Relevant issues were also considered to be need for coaching, unexpected barriers, general use patterns and eventual need for or connection to other services like mail, telephone or file transfer. We were also curious to see if innovative ways of using the service emerged.

Results that are categorised as [technical aspects](#) are reported in the next chapter. "*Technical discussions*", as well as "*user support and coaching*" have turned out to be important areas of application for this technology. During the analysis of the collected experience data, it was decided to rephrase the term "technical discussions" to "*open cooperation*".

The use experiences is structured in three sections:

**General use experiences:** How is this service used? Use patterns and practises that are not related to a specific area of application.

**Barrier for use:** Discussion of factors that restrain dissemination and use.

**Areas of application:** What it is used for? Work processes and situations in which this service is found to be a useful tool.

## Technical aspects

This section is mainly a presentation and discussion of experiences characterised as technical aspects of the programs and the network. [NetMeeting Resource Kit](#) is an extensive technical documentation of NetMeeting. It has been an important reference for this work.

### Installation and configuration

NetMeeting is downloaded as a "self installing" executable, also optionally included in MS Internet Explorer 4.01. The Configuration Wizard guides the first time user. An information page, explaining basic concepts and answering common questions, was posted on the Intranet [[L97-n1](#)]. Most users managed to install and configure the program on their own.

### Robustness

The general impression is that both NetMeeting and pcANYWHERE are stable and robust programs. Some problems are reported and some conflicts are discovered.

**Conflicts:** If NetMeeting is configured to use audio and video, it occupies these devices and they will not be available to other programs. With a full duplex audio card, one channel can be used by NetMeeting and one is free for other programs. Version 1.0 of NetMeeting conflicted with screen capturing programs like Lotus ScreenCam or Microsoft Camcorder, but the problem disappeared version 2.1. NetMeeting could not receive or initiate a call when pcANYWHERE version 7.5 host service had an active connection. This conflict is resolved with version 8.0 of pcANYWHERE. **General stability:** Stability is not reported as a major problem. Some users say that they have experienced occasional hang or lock situations. If the ISDN connection is disconnected during a NetMeeting session and all ISDN lines are occupied when NetMeeting tries to re-establish the connection, a timeout lock situation may occur. This is the only lock situation that we have been able to reproduce with the released version of NetMeeting 2.0.

### Resources

NetMeeting and pcANYWHERE shows very different patterns of resource use. The reported memory and CPU use has been measured by use of the Task Manager in Windows NT.

pcANYWHERE host process uses 1.5 Mb memory when idle and 4 Mb during an active connection. pcANYWHERE is CPU intensive when running in host mode. It consumes between 40 and 50 % of the CPU of a 75 MHz Pentium. (800x600 resolution and 256 colours). This figure drops to approximately 10% on a 200Mhz Pentium Pro.

NetMeeting uses initially between 4 and 6 MB of memory, dependent on the available amount of memory. During a normal application sharing session, NetMeeting is not CPU intensive and the effect on the performance of the host computer is not noticeable. The techniques used to achieve this low performance impact on the host computer are described in chapter 10 of [NetMeeting Resource Kit](#). Resources used by audio and video are discussed in the next section

#### Quality - response and interactivity

The usefulness of a communication channel or service is greatly affected by the quality of the channel. Application sharing, Audio and Video have very different quality measures and puts different demands on the workstations and the network. Program architecture, protocols, workstation performance, bandwidth and latency are important factors. In brief, the conclusion from Chapter 10 - Network Bandwidth Considerations, of [NetMeeting Resource Kit](#) is that 64K bandwidth is sufficient for normal application sharing, audio and medium quality video. The experience from the present case study underpins this conclusion.

The following results are based on experiences from users who have used the service in a normal production environment. The WAN in Asplan Viak is a mix of 64K Frame Relay and ISDN lines. The total load on the central node in this network during a normal day is shown in the figure below.

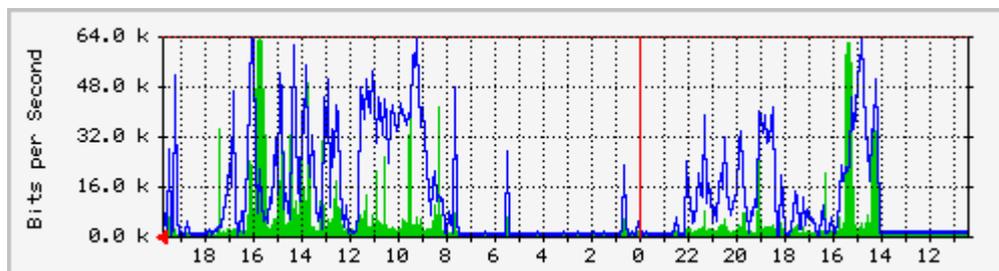


Figure 1: Total use of WAN lines (5minutes average, blue=out,green=in)

**Application sharing:** Despite the uneven basic net load as shown above, slow response or screen refresh is not reported as a problem, except in a very few situations. It is easy to create a situation where 64K is not sufficient bandwidth (animated graphics or highly interactive user interface). The users understand and accept these limitations, which are not considered important in normal use. The only critical issue during normal use is a problem in controlling a software crosshair cursor (normally used by CAD applications). The problem persist even with a LAN connection, and is probably a question of protocol and latency.

**Audio:** The audio features of NetMeeting have been extensively tested and used in actual meetings. The audio quality is acceptable with standard sound cards and microphones. A connection between two PC's with MMX processors enhances the audio quality and reduces latency. The latency is nevertheless felt unpleasant, and a separate telephone connection is normally preferred. Microsoft claims that they have achieved a significant reduction in delay with DirectX version 5.

*Microsoft testing of a typical audio scenario in NetMeeting 2.0 showed an average delay of 590 milliseconds end-to-end; with NetMeeting 2.1 and DirectSound,*

Microsoft found that this same audio scenario resulted in an average delay of 160 milliseconds end-to-end. [[NetMeeting Resource Kit](#), version 2.1]

This is close to the acceptance criteria of 100 ms used as a rule of thumb by the telephone industry [[Cheshire96](#)].

**Video:** Videoconferences have been tested but not used and evaluated in actual meetings. The comments given by the users during the tests indicate that they regard this more as an interesting toy rather than a useful communication tool.

The table below summarises the need for bandwidth and the importance of latency.

| <b>Channel</b> | <b>Bandwidth</b>  | <b>Latency</b>  |
|----------------|---|---|
| <b>Data</b>    | 64K acceptable for most applications.   | Minor importance for normal applications. Important for highly interactive graphical user interfaces. |
| <b>Audio</b>   | 8K sufficient for conversation.<br>40K for CD quality. [ <a href="#">Cheshire96</a> ]   | Decisive. 100ms as maximum round trip delay are a rule of thumb. [ <a href="#">Cheshire96</a> ]       |
| <b>Video</b>   | 64K sufficient for medium quality and small pictures.<br>6x64K are a de facto norm for good quality videoconferences. [ <a href="#">Swane95</a> ] | Minor importance.   |

## Firewall

To enable NetMeeting conference across the firewall, a primary TCP connection must pass through the firewall on several assigned ports. If you want to have audio- and/or videoconferences, secondary TCP and User Datagram Protocol connections must pass through the firewall on dynamically assigned ports. The resulting holes might raise security issues for some corporations and not all firewalls allow this type of configuration.

## General use experiences

In the following, use patterns and practises that are not related to a specific area of application are discussed. Some practical recommendations, based on early experiences are given in an information page, "Five minutes on application sharing" [[L97-n1](#)], that was posted on the Intranet.

### Use of directory server

During the first months, only a few of the pilot users where regularly connected to the directory server, three to five in average. The main reasons were:

Most of the pilot users had notebook computers running Windows 95, and experienced NetMeeting error messages when booting off-line. Hence they removed NetMeeting from the Start-Up folder, and often forgot to connect manually when on-line. (This problem has been resolved in version 2.1 of NetMeeting).

Several of the offices where connected by ISDN. NetMeeting regularly refreshes the directory information (configured to one hour in AV), which was regarded an extra and unnecessary communication costs.

Several users reported that the other applications needed all the available resources, especially memory. Of this reason they did not want to start NetMeeting without the intention of actively use it. See [technical aspects, resources](#).

NetMeeting are now installed on several desktop computers with sufficient memory resources and many of the users choose to start the program automatically. As of November 1997, the average number of users registered on the internal ILS is between 25 and 30. Most of the users with notebook computers still start the program only when they intend to use it.

### Connection practise

Two modes of connection are preferred. This is “by appointment” and “ad hoc during a telephone call”.

**By appointment:** This mode is used when a specific task is to be solved with assistance of NetMeeting. The agreement is made by phone or e-mail. "*We schedule a net meeting for this tomorrow morning*". It is then common that the person who has taken the initiative, calls and then establish a NetMeeting session.

**Ad hoc during a telephone call:** This mode of connection occurs when an issue is raised during a telephone call. Frequent users of NetMeeting mostly report this form. These users have low barriers for use and they have included NetMeeting in their repertoire of work processes.

Casual connection is rarely observed. Both the above mentioned habits, and the fact that telephone is the dominant audio connection during a session, inhibit the casual connection. Other factors mentioned are the risk of interrupting a telephone call and that not all users have sound cards. One user, who travels a lot among the offices, says that some of his colleagues have found that a direct NetMeeting call is a convenient way of locating him. See [Future prospects](#).

## Barriers for use

Several factors contribute to the rather slow acceptance of NetMeeting, compared to expectations based on possibilities and potentials.

### Installed base

Several of the pilot users have pointed to this as a main course for the relatively low use frequency.

*By several occasions I have thought that it would have been convenient to use NetMeeting. But then the other part has not installed it or can not use it, and then I don't bother..*

Dissemination is not that important for the "heavy" users, where a group has a substantial need for internal communication. In these cases, the extra work by installing, configuring and coaching the liaison is marginal, compared to the potential gain.

### Competence

Competence is the next step above installed base. Installed software does not help if the user does not know it is there, or is unfamiliar with using it.

*Do you have NetMeeting ?*

*No, what's that ? – There will probably be no meeting.*

*Yes, I think so, but I haven't used it. – If you are not stressed for time and otherwise in a good mood, then maybe you will try a session.*

*Yes, I connect and show you the drawing....*

Both the connection log files and the interviews indicated that a normal user must have some experience and be quite comfortable with the concept before he initiates his first meeting.

Most of the pilot users managed to install, configure and learn how to use the program. The Intranet page [Five minutes about Application sharing](#) and some initial sessions with other pilot users was sufficient to gain necessary competence. The normal user in Asplan Viak expects to have the program installed and configured. Normally, people seem to be comfortable with the concept and the basic techniques after a short introduction and a couple of training sessions. Many users express their first session as exiting, fun and maybe a bit scary.

The connection procedure in NetMeeting is based on an Internet security assessment. Connect-Share-Collaborate, accompanied by security warnings. This procedure is not compatible with the actual collaborative setting. The warnings are considered as noise and contribute to a mild alienation towards the technology. It should be possible to configure automatic collaboration based on trusted partners or trusted (Intranet) zones. [\[Line97\]](#)

### Robustness

Stability is crucial for daily use. A service has to be considered as stable and robust before it is deliberately used in stressed situations [\[Line96\]](#). Stability is not reported as a general problem. Some system lockup situations and some "lost connections" are reported. Two users said that they experienced so many problems that they stopped using the service.

*It was always some type of trouble. Each time we spent a lot of time to connect. Now we have forgotten that the possibility exists.*

The actual problems are now solved and the two users have taken up their use of NetMeeting. See [Technical aspects, Robustness](#).

### New way of working

Application sharing is a new dimension to digitally supported interplay. The service adds possibilities for richer synchronous communication. At the same time, it is an open service with few guides to when and how to use it. It takes time and positive experience before a person in a concrete communication situation, links this situation to the use of a new tool. It takes even more time and experience before the service is consciously or unconsciously considered when new projects are planned and teams are put together.

We are accustomed to meetings and telephone meetings. A new service, positioned somewhere in between these alternatives must prove its usefulness and find its position. See [Areas of application, Open cooperation](#).

### Other aspects

*Notes use is driven by a number of subtle factors [\[Olson97\]](#)*

Recent years research on CSCW and GroupWare implementation has pointed to several organisational and human aspects that that influence adoption of new technology [\[Cole95\]](#), [\[Orlikowski95\]](#), [\[Olson97\]](#). I will briefly point to and comment some issues. These issues are not closer investigated.

**Leadership:** Several studies [Cole95], [Orlikowski95] points to the importance of leadership. For the present case study, the attitude from the management was positive but not active. With few exceptions, the managers are not active users of the service.

**Technological image:** Even if application sharing is conceptually simple and easy to use, it still has an aura of advanced technology. In many situations and relations, it takes a little extra to dare to propose to use the service.

**External pressure:** If a technology penetrates another marked segment (like the home marked) or if the company is a late adapter of a technology, there will be an external pressure to deploy the technology. Currently there exists no such pressure regarding application sharing and data conferencing. Microsoft and Intel are actively marketing NetMeeting and Intel Videophone towards the home marked (the so-called Grandma phone). A penetration in this marked may lead to a familiarisation of the technology and may in turn lead to a pressure to deploy the technology in business.

## Areas of application

*What are the typical work situations where application sharing are found to be of use?*

The above question is answered in the following by a presentation of the typical use situations found in AV. Before the test period, it was expected that most of the use would fall into the following categories:

- Support for technical discussions
- User support and coaching

During the analysis of the collected experience data, it was decided to rephrase the term “*Technical discussion*” to “*open cooperation*”. *Technical discussion* was found to be too narrow. The reported situations that was not covered by the specialised categories, was best described as *open cooperation*.

Most of the use falls into the above categories, however demonstrations, courses and the more unbound “for fun” contributes to the total picture.

### Support and coaching

Two main forms for support are reported. “Setup and configuration” and “program use support”.

**Setup and configuration:** pcANYWHERE has been used extensively for remote installation of programs, configuration and management, especially of servers. After NetMeeting was included in the standard computer configuration in AVS, a new practise has evolved. When new computers are purchased or existing computers are redistributed, they are configured as far as possible by the IT responsible at the main office. He then ships the computer to its new user. The final configuration is then performed through a NetMeeting session. The user on the remote computer is instructed to do the necessary connect and share operations. The IT responsible points to an important side effect by this procedure:

*In addition to be able to do the final configuration in accordance with the local environment, these sessions often develop into a brief course where I can give some instructions and clarify eventual misunderstandings.*

**Program use support:** Three users have reported extensive use of NetMeeting in program support situations. The IT subsidiary in AV (AVIT) develops a 3D terrain model application (<http://gemini.asplanviak.no>). This application can be quite complicated to use and most of

the customers have telephone support. The support responsible for this application in AVIT and two users of the application in AV decided to use NetMeeting for support situations. They have found it very efficient. AVIT is currently considering how they can offer this solution to external customers. These experiences underpin the statement that application sharing enables high quality distributed support for most applications.

#### Open cooperation

*I don't use it daily, but it's really useful in some situations. We use it for simple tasks, such as the pricing of a tender, discussion of a schedule or the outline of a report.*

The above quote is good description of the typical use categorised as "Open cooperation". By "Open cooperation" it is meant that the service is used to enhance the communication in a general cooperative situation. Office-, Project planning- and CAD applications are the most common applications to share.

The normal session is relatively short, between 15 and 30 minutes, where a report, a spreadsheet or a drawing are shared and discussed.

Most of the meetings involve only two computers, but frequently more persons. Conferences including three or more computers are more awkward since a parallel telephone conference has to be arranged.

Collaborative report writing are done jointly in a NetMeeting in the initial phase where the outline are established and the tasks are divided, and in the final phase where all parts are put together and the final decisions and formulations are made.

Drawings are not shared for "collaborative drawing" and they are rarely shared in the initial phase. Some have found it convenient to use application sharing for final review of a drawing. The most common use is however to share a drawing for clarification of a detail or to simplify the communication when discussing technical solutions.

*The symbol libraries used at the different offices had evolved local variants. SF and I were assigned the task of synchronizing them. I made a proposal and we shared the symbol sheet. Pointed and clicked around the sheet.... "That valve should have a diagonal line" ... It was very easy.*

Some of the early pilot users have, after eight months of experience; started to use NetMeeting for long sessions that directly supplants physical meetings.

*In connection with the preparation of a bid for a new treatment plant in Trondheim, we had planned that FAH should travel from Kristiansand so that we could sit together with a representative from Reinertsen (a collaborating company in Trondheim) to study and price the bid. In the event, FAH and I spent hours in a net meeting and went through the bid there. We found out that this was just as effective because we were both able to see the same things yet were able to concentrate more than if we had been sitting around a table. The representative from Reinertsen joined us for the final stages and went through the bid with us during the net meeting. SF - [Line98].*

These users report that they, after this initial event, have used the service for several similar events. They are enthusiastic and say that it would have been hard or impossible to work as close as they do without this service. This experience indicates a relatively long familiarisation period before the service can be expected to be fully exploited, at least when the introduction is based on natural dissemination. On the other hand, it also illustrates that

application sharing significantly enhances the possibilities for some type of closely coupled work.

## Future prospects

Audio is undoubtedly the most important channel for synchronous communication. Audio is the natural way to initialise and establish a connection. A data channel or a video channel are of little interest without the audio channel. This reason, a logical integration of application sharing and the primary audio channel is important. This integration would allow an application to be shared in a split of a second just to underpin a point or to clarify a detail. Today, integrated solutions with adequate audio quality are implemented in the "ATM domain" and in the (digital) "telephone domain" [Swane97]. The technology are also relatively close to achieve the required quality in the "Data communication domain" (see [Technical aspects, Quality - response and interactivity](#)). An interesting short-term solution is a logical integration of telephone and application sharing. A lot of development is currently done under the Computer Telephony Integration (CTI) umbrella and solutions that include application sharing already exist [Whitecap97].

The technology is close to a level of maturity where it can be included as a ubiquitous and natural part of a company infrastructure. Integration of application sharing and the primary audio channel is considered to be the single most important enabler of this scenario.

## Conclusions

**Technological status:** The applications tested in this survey (NetMeeting and pcANYWHERE) are mature and stable. Stability is dependent on a properly configured and managed workstation and network. A wide area network with 64K capacity and moderate average load is sufficient for normal use with sharing of most applications. Heavy graphical applications, animations and interactive user interface calls for higher bandwidths and lower latency. A standard sound card provides acceptable audio quality but the latency is too high for normal conversation. Use of Intel MMX technology and the latest Windows sound drivers (DirectX 5) reduce the latency to a level near to the acceptable. The author agrees that application sharing is close to a level where it can become a ubiquitous and natural part of the communication infrastructure. Integration with the primary audio channel, which today is telephone, is seen as the most important enabler for such application of the service.

**Dissemination of new technology:** The dissemination of the service to new user groups has been considerably slower than expected. The finding that "natural dissemination" is likely to be considerably slower than expected (by people who know the technology and the opportunities) are confirmed by several studies on introduction of new technology [Orlikowsky95], [Cole95].

**Use patterns needs time to evolve:** Even users who have passed the initial barriers need time to take full consequence of the service. It took eight months before the pilot users in AV dared to substitute a scheduled and important physical meeting by a net meeting.

The present case study shows that application sharing is useful for support of closely coupled work. For several of the users in AV, it has become an indispensable and natural part of the process of working together over distance. The time and effort needed to implement the service in an organisation should not be underestimated. The author advocates that a distributed organisation can reap the investment in very short time.

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