Collaborative Computing

White Paper: The Enterprise Approach
Executive Summary

A collaborative environment facilitates workgroup computing, optimizes productivity, and fosters innovation by allowing users to share ideas and applications remotely. Many organizations are implementing collaborative computing to expedite research and development, support business decision making, and improve competitive positioning.

Today, collaborative systems are increasingly cost justifiable. Desktop conferencing tools can be as basic as a shared whiteboard or shared application functionality. Such lower-bandwidth collaborative solutions support improved technical collaboration, introduce users to the desktop conferencing paradigm, and can provide a seamless migration path to fuller conferencing capabilities when required.

Offering choices from widely different providers, the current market is segmented into telephony-based solutions, point solutions, and solutions from at least one vendor offering a core architectural approach.

This paper describes the advantages of the architectural approach, discusses the benefits of adopting collaboration-ready systems that support truly distributed applications, and profiles the industry-leading relationship between Digital and InSoft, who jointly offer the Collaborative Computing Program. Based on InSoft’s OpenDVE™ development environment, the Collaborative Computing Program makes Digital’s systems collaboration-ready for technical computing applications.
1 Collaborative Computing

Today, many organizations, from commercial enterprises to government agencies and research institutions, are implementing a collaborative computing and/or videoconferencing environment to:

• Expedite research and development
• Reduce travel expenses
• Support informed, up-to-the-minute business decision making
• Convey high-impact messages
• Maintain their competitive edge

The purpose of this paper is to provide a clear concept of this powerful new environment that is transforming the way people and organizations work together, analyze the current state of the market for collaborative computing, and describe the “enterprise approach” devised jointly by two industry leaders, Digital and InSoft. We will begin with answers to basic questions frequently asked by interested customers.

“What exactly is collaborative computing?”
A collaborative computing environment allows users to share ideas and applications remotely. Collaborative computing consists of four functional components:

• On-line whiteboard
• Application sharing
• Audioconferencing
• Videoconferencing

Among its benefits, a collaborative environment facilitates workgroup computing, optimizes productivity, and fosters innovation:

• Conference members can share graphical material. For instance, they can mark up, highlight, and comment on graphics and image files, ASCII and PostScript® files, notes, financial graphs and charts, CAD, medical, video images, and access to a multiuser text screen for posting comments and data.

• Conference members can share applications. For example, they can remotely view, edit and modify budgets, documents, spreadsheets and more, together in a real-time environment.

At one time, collaborative tools depended entirely on a telecommunications network as the primary transport medium. Now they have become viable over local area networks (LANs). Computer-based desktop conferencing is quickly becoming a tool for collaborative computing as familiar as the telephone.

“Isn’t collaborative computing synonymous with videoconferencing? Doesn’t it necessitate new, high-speed networking technologies?”
While many enterprises will ultimately require high-quality audio/video synchronization, desktop conferencing tools can be as basic as a shared whiteboard or shared application functionality. Such lower-bandwidth collaborative solutions support improved technical collaboration, introduce users to the desktop conferencing paradigm, and can provide a seamless migration path to fuller conferencing capabilities when required.
As a result, collaborative computing is being embraced by the industry as an enhancing technology, providing basic functionality so that users can begin by implementing entry-level capabilities, take advantage of collaborative tools without impacting network performance, and still be able to upgrade clients on the LAN as needed.

The current market offers a variety of choices from widely different providers. To help clarify issues around choosing a provider, this paper will offer an overview of market trends and summarize requirements for enterprise deployment of networked multimedia applications for desktop collaboration.

2 Market Trends

Industry market research reports suggest that the desktop collaboration market will develop in 1995 from an early adopter phase to a viable mainstream solution for enterprise deployment.

Among the factors driving this market transition are the following:

- Availability of full-featured product offerings
- Clearer business case justification for the technology
- Release of software development environments that facilitate “digital convergence” within enabling technologies

Today’s desktop conferencing market is segmented into three distinct technology implementations:

- Telephony-based solutions
- Point solutions
- Architectural approach

2.1. Telephony-based solutions. Offered by many vendors, these products are developed specifically for a telecommunications network (phone lines, long distance services) rather than a computer network, using an ISDN, “plain old telephone system” (POTS), and/or H.320-only approach.

All are point-to-point, proprietary offerings. They can communicate only between designated points, are tied to one specific desktop computer platform, and support only one compression algorithm.

Because they do not connect to the customer’s computer network, telephony-based offerings can be prohibitive for enterprise deployment in terms of infrastructure cost and return on investment.

2.2. Point solutions offered by systems manufacturers or third-party developers are applications that, although network-based, are proprietary in terms of supported platforms and video boards. Like telephony-based solutions, they are tied to one specific platform and support only one compression algorithm.

These inherent architectural limitations preclude the timely support of emerging standards, networks and video algorithms, hindering the customer’s ability to integrate new technology into a changing environment.
2.3. Architectural approach. Next-generation desktop conferencing applications, which embrace more real-time collaborative features to support enterprise-wide workgroup computing, are being built today on an open Application Programmer Interface (API) development environment.

Advantages of the Architectural Approach

Only a highly standards-compliant solution based on a core software architecture will support multiplatform conferencing, network interoperability, and video compression independence. Such an architectural approach facilitates rapid implementation of newly established standards and technologies, and supports interoperability with installed products.

These real-world applications will support transparent multiplatform communications, seamless network and telephony connectivity, and multialgorithm video interoperability.

• These critical features are required for desktop conferencing users to make the transition from early adoption to mainstream enterprise deployment.

• They are also critical to the resolution of enterprise deployment issues, including asset protection, business and technical analysis, infrastructure planning, and technical implementation.

3 Enterprise Requirements

Truly Distributed Applications

In a distributed application, the software runs on multiple CPUs on the network. As a result, the only traffic sent across the network is the data that needs to be shared by the application and not, for example, keyboard and mouse controls. (In the application sharing model, these GUI elements are captured in real time and replicated on participating desktops, which can degrade performance with added users.)

Advantages of Distributed Applications vs. Application Sharing

For high efficiency, enterprises will want to adopt collaboration-ready systems that support truly distributed applications, as opposed to application sharing. It is important to understand the technical distinction between these two concepts.

A truly distributed approach runs on all of the endpoints in any sharing session. As a result, users gain a number of critical advantages:

• Robustness. Any one endpoint can terminate while the session continues without that member. Also, in robust distributed applications, the user can rejoin the session and be updated to its current state.

• Efficient network performance. A truly distributed application runs on all the endpoints of the session. All operations and GUI updates are performed locally on all endpoints.

• Groupware environment. Multiple whiteboard users can use different tools simultaneously and can share data without compromising security.

• Flexible file sharing. Users can control access to files during a collaborative session.

• Familiarity. Users can retain their existing windowing environment.

• Heterogeneous support. Allows interoperability between cross-platform applications.
Drawbacks of Application Sharing

In contrast, the technical inadequacies of networked application sharing result in significant drawbacks:

• Single point of failure. Failure of the single sharing CPU terminates the entire sharing session.

• Performance degradation. Application sharing takes advantage of the CPU power of the sharing device only. As new users are added to a session, the sharing CPU must update all GUIs, and performance will degrade rapidly.

• Serious limitations as a result of single-user applications doing double duty as groupware. For example, when a raster-based editor is used in place of a robust whiteboard, control and customization of the tools inhibit productivity.

• Inefficient use of network resources. Image loads or screen captures are distributed to the remote systems via uncompressed bitmaps, an intensive load on the network.

• File access and data security problems. A remote user cannot control access to files during a collaborative session using a shared application, because only files on the sharing CPU are accessible by the application running on it. On the other hand, data security is compromised if a sharing user allows all other members access to his or her data files.

• Hardware-specific applications cannot be shared since they need to directly access local hardware for performance reasons, circumventing the normal windowing system calls.

• All receivers’ shared windows look identical to the original sharing window, because only window events from the sharing system can be duplicated.

• Cross-platform application sharing is virtually impossible, since additional interpreting software that understands all windowing system calls is required on every endpoint.

“Why are there so few truly distributed applications?”

Customers frequently ask this question, considering that distributed applications are a superior approach. The answer is that few software development firms today can leverage expertise in all the complicated technical areas necessary to write distributed applications, such as network programming, conference management, data distribution, and protocol establishment.

By providing a uniform API for all widely used computing environments, the architectural approach to desktop conferencing will support rapid development of next-generation conferencing applications.

In this context, the concluding sections of this paper discuss the industry-leading position of the only developer offering an architecture-based solution — InSoft, Inc. — and describe the relationship between InSoft and Digital.
Collaborative systems are facilitating research and development, helping reduce time-to-market, and improving communication in many fields where users share ideas and information despite geographic distance, including:

**Science and Research**
Increasingly, scientists and researchers from widely dispersed laboratories and institutions work together on critical projects. Using collaborative systems, scientists and researchers can exchange information, compare graphical data and discuss theories to obtain and quickly disseminate higher-quality research results.

**CAD/CAM (Computer-aided Design and Manufacturing) ECAD/MCAD (Electrical and Mechanical Computer-aided Design)**
For users of design, engineering and manufacturing applications, collaborative systems offer both operational and project-specific benefits that help improve productivity, teamwork, and cost-effectiveness. Timely, efficient exchange, discussion and revision of complex designs, assemblies and systems bring enhanced productivity and improved project management.

With the flexibility to hold on-line conference sessions during rapidly evolving, time-critical projects, despite geographic distance, work teams collaborate more cost-effectively, to reduce design ambiguities, to reduce time-to-completion and, ultimately, increase productivity while reducing its time-to-market.

**Geographic Information Systems**
Governments, utilities, environmental agencies and other organizations need to share accurate, consistent, timely geographic data to reach critical decisions.

These users rely on Geographic Information Systems (GIS), which essentially turn databases of tabular data into versatile, comprehensible maps of geographic information. The use of GIS makes land-based data accessible not only to specialized mapping functions but to management, financial, project planning, scientific and engineering functions throughout an organization.

Collaborative systems used in conjunction with GIS support greatly improved decision making about vital property mapping functions, environmental impact assessments, efficient service delivery, and effective growth management planning.
5 Choosing a Provider

As with any emerging technology, key questions must be answered to evaluate a provider of collaboration-ready systems.

• Does the solution support multiplatform client/server environments?

• Are multimedia and groupware functionality strongly supported? For conferencing applications, there should be a strong emphasis on the collaborative workgroup capabilities within the multimedia and groupware modules. An essential feature is the ability to share and edit applications across remote displays in real time with other conference members. A shared whiteboard, writeboard and text tools are also important.

• Will conferencing applications run efficiently over your existing LAN?

• Does the solution support current standards? Is the solution flexible enough to incorporate additional standards as they become available? The base software architecture should conform to all published industry standards and be portable to support evolving standards.

• Does it provide network interoperability? The capability to conference or distribute digital video between ATM, Frame Relay, ASDN and SMDS keeps your options open and reduces the risk of network incompatibilities.

• Does it provide software compression?

Software compression provides increased flexibility, optimizing frame rates to provide acceptable video quality while minimizing bandwidth. This allows users without assistive hardware to participate in the conferencing environment. When on-board hardware compression is available, most applications will take advantage of it. A combination of hardware and software compression tools based on system type and application support provides the user with the optimal overall compression solution.

• Is it easy to use? A highly graphical, point-and-click interface is essential to a conferencing environment that is intuitive, natural and productive.

• Does it require a video board? With software decompression, a client should not require a video board to view video, providing the software is installed on that workstation.

• How many remote locations can be conferenced? Traditional dedicated room-based systems can only videoconference between two points. Your desktop solution should incorporate multipoint capability, enabling several sites to be networked at once into a conference.

• Is it scalable and modular? Some users may require only the collaborative tools and audio, but not video support. Others may use only videoconferencing. By selecting a solution that offers scalability, you can provide a seamless upgrade path as your user requirements grow and change. A modular solution in which each product is based on a core software architecture provides investment protection and ensures a consistent, single-source of support.
6 The Digital/InSoft Solution: An Enterprise Approach

Today, an architectural solution is available for developers and end users, providing the basis for an enterprise approach to collaborative computing.

Two industry leaders, Digital Equipment Corporation, a leader in networking, and InSoft, a world leader in collaborative computing, have teamed up to offer the advantages of an architectural, standards-based collaborative solution with the power, performance and scalability of systems from Digital.

Digital and InSoft jointly developed the Collaborative Computing Program, making Digital’s Alpha systems collaboration-ready for technical computing applications. The Collaborative Computing Program lets software developers create truly distributed applications.

The Digital Difference: Scalability, Performance, Flexibility
The common PCI bus architecture that is a feature of Digital’s systems means that users of the Collaborative Computing Program benefit from a migration path from desktop PCs to Digital’s high-performance AlphaStation systems. Digital is an acknowledged leader in PCI technology, providing high performance at low cost.

Digital’s workstation family, including both TURBOchannel and PCI-based systems, offers the performance and flexibility that deliver on the promise of collaborative computing.

Software compression and decompression as well as color dithering algorithms benefit from industry-leading Alpha performance, producing high quality and faster displays.

Digital’s 64-bit Alpha architecture, high clock speeds, and high-speed networking capabilities ensure that the throughput needed in distributed application environments is available to all users.

The InSoft Advantage: Architectural Approach
InSoft is the worldwide leader in multiplatform, interoperable collaboration and desktop conferencing solutions for enterprise deployment.

InSoft is the only vendor using a core software architecture that supports multiplatform conferencing, network interoperability, and video compression independence. InSoft’s proven architecture facilitates rapid implementation of newly established standards, network and video technologies, while supporting interoperability with installed products.
Analyst Comments
Industry analysts have awarded high marks to InSoft, a pioneer of collaborative computing technology:

“InSoft has impressed us as the only open systems conferencing company simultaneously supporting and integrating more standards than any other vendor — at the platform, network and video board levels.” — Robert Mirani, Analyst, The Yankee Group

“InSoft, an emerging desktop conferencing leader… has quietly carved out a strong position in the workstation-based desktop conferencing market… and a very mature version of code for the now emerging PC markets…This is a fundamental differentiator for the firm…[The architecture] is robust, well thought out and should appeal to a wide spectrum of developers.” — Al Lill, Vice President, Enterprise Network Strategies, The Gartner Group

Standards Support
The InSoft architecture, Digital Video Everywhere (DVE), is the most standards-compliant solution available, allowing desktop conferences, applications, and digital video to be distributed across TCP/IP networks, Ethernet, ATM, Frame Relay, ISDN and SMDS.

DVE includes an API development framework, OpenDVE, that allows corporate and third-party application developers and system integrators to customize applications with built-in collaborative conferencing features.

Applications developed using OpenDVE can be collaboration, conferencing and video enabled. They can also provide a common interface across all platforms and InSoft-developed applications such as Communique!™, the company’s award-winning collaboration and conferencing system.

With the Collaborative Computing Program from Digital and InSoft, collaborative and conferencing systems are finally cost justifiable. Users will benefit from significant cost reduction and time savings in their mission-critical applications, as well as from investment protection.
Application Sharing and Distributed Applications
Both terms refer to the sharing of one or more applications across the network by a group of participating PCs, enabling workgroup members to collaborate. A distributed application runs on multiple CPUs on the network; the only traffic sent across the network is the data that needs to be shared by the application, not keyboard and mouse controls. In application sharing, these GUI elements are captured in real time and replicated on the participating PCs. These concepts are discussed in detail in Section 3, “Enterprise Requirements.”

ATM
Asynchronous Transfer Mode is a network switching technology providing the high bandwidth necessary to transfer full-motion video along with bit-intensive sound and graphics files. Today’s ATM networks send data more than 15 times faster than conventional office networks based on Ethernet. Demand is increasing for ATM networks as corporations accelerate their reliance on client/server computing. Widely accepted as the next generation international standard for LANs and WANs, ATM promises to deliver performance improvements of up to 100 times those of traditional LANs across wide area network geographies, far more cost-effectively than previous technologies.

Audioconferencing
A collaborative technique that involves live, two-way interactive audio among many users; in a virtual meeting, participants can hear each others’ comments.

Compression/Decompression
Compression essentially squeezes data to gain improved network transmission time, by representing redundant information (repeating characters or words, noncritical frames of video, or elements of still pictures) with symbols, tokens or code occupying less space. Decompression techniques unsqueeze the data at the receiving end.

Frame Relay
A popular public fast-packet switching network, offered by most public carriers for LAN interconnection and WAN connections. Digital developed the Frame Relay specification in conjunction with StrataCom and Northern Telecom.

Groupware
The use of applications by multiple simultaneous users. Basic examples are e-mail and centralized network scheduling programs. Groupware lets people on a network interact and collaborate on projects, enabling them to contribute, for example, graphics, text, and spreadsheet data into a single document. Groupware can also enable desktop conferencing and videoconferencing (see these entries below).

GUI
A graphical user interface displays menus and icons to facilitate actions by the user, who can either point and click with a mouse or use the keyboard.

H.320
Latest specification of Px64, an industry videoconferencing standard which defines multipoint videoconferencing (simultaneous videoconferencing at multiple locations) and associated requirements.
**ISDN**
A telephone and telecommunication technology that integrates data, voice and video signals into a digital (as opposed to analog) telephone line. ISDN (Integrated Services Digital Network) is used to link remote users to LANs and for some LAN-to-LAN connections. ISDN provides a way to create international networks, supports fax traffic, and provides a link to fast packet public networks.

**SMDS**
Switched Multimegabit Data Service is a switching technology that provides the ability to extend LANs in a metropolitan area, offered as a service by Local Exchange Carriers and providing customers with connection options that accommodate changing business needs.

**TCP/IP**
Transport Control Protocol/Interface Program or Transmission Control Protocol/Internet Protocol; a widely used communication protocol implemented in the UNIX environment and on the Internet, allowing communication among independent multivendor systems. Most client software supports TCP/IP.

**Telephony**
Telephone technology, in which sound is converted into electrical signals, transmitted (by wire or wireless) to a receiving location, and reconverted to sound. Telephony-based collaborative solutions are developed for a telecommunications network as distinct from a computer network.

**Videoconferencing/Desktop Conferencing**
Videoconferencing and desktop conferencing are collaborative tools that provide a way for users at remote locations to hold meetings over computer networks. With the advent of high-overhead technologies including multimedia, videoconferencing, and document imaging, techniques for compressing data, voice, and video have become critical for efficient transmission and storage. (One second of uncompressed full motion video can consume about 10 MB of disk space.)

In video transmission, devices known as codecs (coder/decoders) are used for compression and decompression. Videoconferencing techniques involve broadcasting live, two-way interactive video among many users. Unlike prerecorded video, real-time interactive video requires transmission of high volumes of data with no delay.

In videoconferencing, the screen can have multiple windows, allowing participants not only to view and listen to one another, but also to see and share drawings, charts, spreadsheets, or other collaborative information via a shared whiteboard or other computer-based applications.

Videoconferencing must be distinguished from “desktop conferencing,” used where actual video is not required. In desktop conferencing, users can share collaborative tools as basic as a shared whiteboard or shared application functionality.

**Whiteboard**
1. The hard surface provided in a physical meeting room for participants to write on with markers.

2. Electronic whiteboard: a conferencing tool shared by participants during a conferencing session on which they can concurrently display and edit graphics and images, brainstorm with pen and board, and type or draw notes. Users can also selectively send whiteboard files to individual participants.
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EC-Z4280-10