

# **Project Management Marries Collaboration – A New Technology for Distributed Project Teams**

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## **Introduction**

For various reasons including globalization, business mergers, the economics of outsourcing, and the number of workers working remotely, we are increasingly collaborating with people we rarely, or never, see face-to-face. As an example, Forrester (2003) predicts that American and European firms will spend 28 percent of their information technology budgets on overseas work in the next two years. The overseas work will be performed by people in different locations, organizations, and time zones, speaking different native languages, as well as having a different cultural outlook.

But our ability to team well in a global resource pool is limited by our ability to manage these resources when working at a distance. In fact, studies show that communication problems are a risk to offshore arrangements. Without constant communications, the work returned from a long-distance project may not be what was expected (InfoWorld, 2004).

Today, new collaborative technologies including online presence, change awareness, instant messaging, discussions, online/offline work, real-time synchronization and visual aids to alert team members of new content – all serve to keep the level of engagement high for distributed project teams.

This paper introduces Groove Virtual Office, a distributed peer-to-peer platform for collaboration, in conjunction with the project management tools from TeamDirection, as an ideal communications and information sharing vehicle for distributed project teams.

## **Characteristics and Challenges of Distributed Teams**

In addition to the same problems faced by co-located project teams, distributed teams have a unique set of challenges. Most of these are related to the lack of effective project management communications, resulting in what are referred to as “awareness deficits” in the academic literature. Research and experience have shown that there are four major factors contributing to these awareness deficits: physical separation, working in separate organizations, time zone differences and misunderstandings related to language and culture (Hayes, 2003).

**Physical separation.** Research has shown that we do not collaborate as often with people who are more than fifty feet away (Allen, 1977). So while we share important project news on a daily basis with those in close proximity, the rest of the team is typically unaware of important changes to objectives or schedule until the weekly project conference call. The further the participants are from the center of decision-making, the less likely they are to be informed.

**Multiple organizations.** People working for different organizations face an important challenge: their ability to collaborate well electronically is often hampered by cross-firewall issues. This is true in professional services, government, the pharmaceutical and biomedical industries, and in many manufacturing sectors such as defense. In these situations, ideas, knowledge and skills from multiple organizations must be brought together to resolve a specific problem. However, those ideas and knowledge are protected from external access by firewalls, making it difficult or impossible for project participants to easily share electronically based information.

**Different Time Zones.** Participants in different time zones have difficulties establishing real-time meetings such as conference calls. There is the inherent problem of one person’s workday ending before their colleague’s day begins, compounded by a lack of awareness of when someone is available to speak in real-time. Often times a distant colleague is working at the office or at home, but other colleagues are not aware of their availability. This prevents issues from being surfaced and resolved quickly, resulting in lost momentum and productivity.

**Language and cultural issues** can hamper verbal communications and lead to misunderstandings and costly mistakes (Damian, 2002). Many times when project participants speak different native languages, they do not converse well in real-time. These people will often not speak in conference calls, foregoing the opportunity to surface issues or present solutions to known issues.

### **Software Tools for Project Management Communications**

A number of tools are currently in use for project management communications, including e-mail, discussion tools, document repositories and portals, instant messaging (IM) and both desktop and web-based project management software. None of these have been sufficiently integrated to provide a fully functional yet easy-to-use user interface for all project participants. In addition to requiring five distinct types of software to get the job done, this is especially problematic for cross-firewall work for the following reasons:

1. Team members in different organizations have typically been issued different tools for a similar purpose such as internal document repositories or instant messaging
2. Many of these tools were not designed to work in a cross-firewall scenario
3. To ensure proper security, IT must be involved in providing access to internal information to outsiders. This may be a lengthy process, or not even possible for some organizations

### **Centralized versus Decentralized Computing Architectures**

Support of distributed teams involves connecting machines together so that they may interact in order to serve a common purpose. Enabling this interaction requires a choice of architecture, either centralized or decentralized. A centralized architecture has information stored on a single or several closely-linked machines. The web server model is a typical example of this configuration wherein many client machines receive information from a single server.

A decentralized architecture supports information spread out over many machines. An example is the Domain Name Service (DNS), where a hierarchy of machines is used to resolve the mapping of web domains to Internet Protocol addresses. In a decentralized architecture, there is typically no single person controlling the architecture.

Peer-to-peer (P2P) is a network-based configuration that does not depend on centralized servers and at the same time does not exclude them (Gong, 2001). Usually on a P2P network the clients were originally intended to be primarily client machines, but now can adopt multiple roles. There is usually direct communication between peers, but this is not always the case. For example, MSN Messenger is a server-mediated P2P service wherein users sign in to a server, but then communicate or share files directly.

There are many peer-to-peer protocols available. Examples include:

1. Gnutella (Gnutella.com, 2004): a decentralized environment where users can share files directly with one another.
2. Jabber (Jabber Software Foundation, 2004): a set of streaming XML protocols and technologies that enable any two entities on the Internet to exchange messages, presence, and other structured information in close to real time.
3. JXTA (Project JXTA, 2004): first developed at Sun Microsystems, it's an open, generalized protocol that interoperates with any peer on the network including PCs, servers, and other connected devices
4. Microsoft Windows Peer-to-Peer Networking (Microsoft, 2004) is a developer platform to create peer-to-peer applications for computers running Windows XP
5. Groove Networks' (Groove, 2003) decentralized architecture and synchronization protocols distribute data among member devices

### **Advantages of Peer-to-Peer Computing Configurations**

1. **Scalability.** A network of peers is easily scaled and more reliable than a single server. A single server is subject to a single point of failure or can be a bottleneck in times of high network utilization.
2. **Serverless file sharing.** It permits local resources to be shared directly, without the need for intermediate servers. In client/server networking, content and resources are typically shared from only the center of the network.
3. **Shorter response times.** Retrieving resources from peers in the network can result in shorter delays since data can be retrieved from a site that provides the shortest response time, rather than having to access the central repository that is being accessed for other reasons as well

4. **Redundancy.** The network is more robust when nodes participate and store replicates of data on their own machines. In the case of any machine failure, data can be retrieved from another peer.
5. **Instant teaming.** Use of rapid team-creation techniques such as swarming, which was developed to enable small forces to co-ordinate with each other directly, rather than through a central command post (Rubens, 2003). Alternative collaboration systems which are based on centralized servers are unsuitable for swarming because they are not flexible enough: they require too much time-consuming administration before new members can be added to a team, and admitting people from outside an organization is often impossible.

## Collaborative Project Management

### Architectural Elements

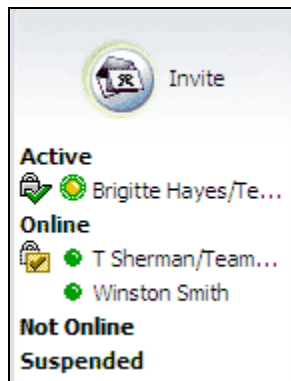
The TeamDirection initiative to build a project management tool in support of distributed teams was based on collective experience that several software functions were essential to support collaboration on project work: the project management tool itself, file sharing, discussions, meetings, and mechanisms for in-the-moment communication such as instant messaging and chat. With most environments, it took five or six separate applications to create this user environment, a scenario we found unworkable for most users, especially those collaborating cross-firewall from within different organizations.

After a comprehensive search of available technologies, including those that are web-based, the Groove Networks platform was chosen as it has the greatest degree of technical integration of software tools for virtual teams currently available commercially. (Note to reader: TeamDirection does not re-sell Groove licenses).

The Groove platform supports a number of key capabilities including presence, offline support, firewall transparency and bandwidth optimization. Other important features are change awareness, encryption and authentication, as well as the ability to add specific tools as needed.

#### Presence

Presence services enable users to log onto the Internet from any location and have their online/offline status available to their contacts and shared space members. Seen in Exhibit 1, team members are listed in a column, with visual cues separating those who are offline versus online and those members active in the current project.



**Exhibit 1**

Presence awareness enhances productivity because team members know when to start a conversation to bring someone's attention to an issue or try to resolve it on the spot. They no longer waste time and money leaving telephone messages or sending email – they start the conversation when their colleague is available to have the conversation.

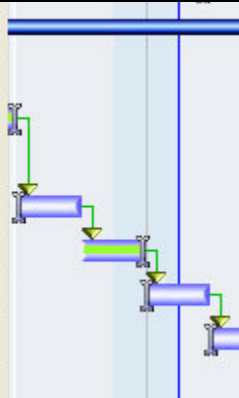
### Cross-firewall Collaboration

Relay Services allow communication between two client machines when peer-to-peer communication is not possible. For example, if two users are behind firewalls that will not allow inbound connections, all communication that occurs must be done through the Hosted Relay Service via the Internet. This process occurs transparently to users, who simply invite colleagues without regard for whether they reside within or outside of their own organization's network. This is a significant benefit for projects involving Professional Services, which are inherently cross-firewall.

### Change Awareness

Change awareness allows users to save time by only looking where information is new or different. New or changed information within any of the tools causes the Tool tab to include an Unread marker. Project participants are therefore aware of changes as soon as these occur. Unread markers are used in all tools – a response to a discussion topic, change in meeting agenda, an updated document, or a task marked complete – any of these or other changes will cause an unread marker to appear next to the changed object, making it obvious where to look first. Seen in Exhibit 2, Unread markers in the leftmost column flag new or changed information.

	16		<input type="checkbox"/>	Key Technologies Investigation	Unassigned	
	17			Tree View Component / Infragi...	Zhou Ying	
	18			Event/Email Tool	Zhou Ying	
	19			Report Tool	Zhou Ying	
	20			Installation Tool	Zhou Ying	
	21			Editor Tool	Zhou Ying	
	22			Discussion Creation Tool	Zhou Ying	
	23			Printing Tool	Zhou Ying	
	24			database interoperability tools	Samuel Zhu	



**Exhibit 2**

### Offline Support

Today's mobile or knowledge worker needs to be productive even when disconnected to the network. Peer-to-peer applications run locally on the desktop, so when users disconnect, they continue to work with local data. Two users may continue to exchange information in a shared space, even though they are not online simultaneously. For example, if one user is located in New York and another in Tokyo, it is unlikely they will be online at the same time. The Relay Service allows the New York user to make changes in a shared project space and go offline. When the Tokyo user comes online, that user's device will fetch the shared space changes from the Relay Service. Unread markers flag new or changed information for the user's attention.

### Security

For cross-firewall work, security must be always on, but also non-intrusive such that users do not reject the application. As an example, Groove encrypts all content on disk and over the network using 192-bit encryption. This encryption cannot be circumvented by users. Users create a passphrase – a collection of words - to encrypt their account and shared spaces. Should a user lose a laptop or allow someone else access to their desktop, shared space content is still protected since it cannot be decrypted without the passphrase.

## Multiple Computers

Many information-intensive workers today use multiple computers: potentially a desktop and laptop at work, a home office workstation, plus one or more machines at customer or client sites. To support this, licensing must permit the software to be loaded on multiple machines for the same user account. This, in combination with the automatic synchronization of workspaces, allows a user to move between various machines without any need to manually transfer data. As an example, Groove Networks allows its software to be loaded on up to five machines for the same user.

## Tools

Every project is different and may require different tools for its workers. Examples include CAD viewers for engineers and architects and Document Review tools for sales teams working on proposals collaboratively. The ideal project management application provides users with control over the functionality of a space. This is rarely available in commercially available products, where integration is often time-consuming and expensive. The Groove Networks architecture however was designed to allow tools to be added on an ad hoc basis. When a project member decides that the shared space needs additional functionality, it can be added on the fly from a list of available tools.

## Application Elements

The main elements of the user interface are shown in Exhibit 3. All communications and information are in context of a specific project. The user moves between tools using the Tool tabs. The instant messaging tool is accessed by right-clicking on one or more of the participants' names seen on the left. Seen below, an instant message is being sent while reviewing the project schedule. Both text and audio chat are available and a text chat is also seen in progress. In order to maximize available screen space, the Chat pane may be hidden when not in use.

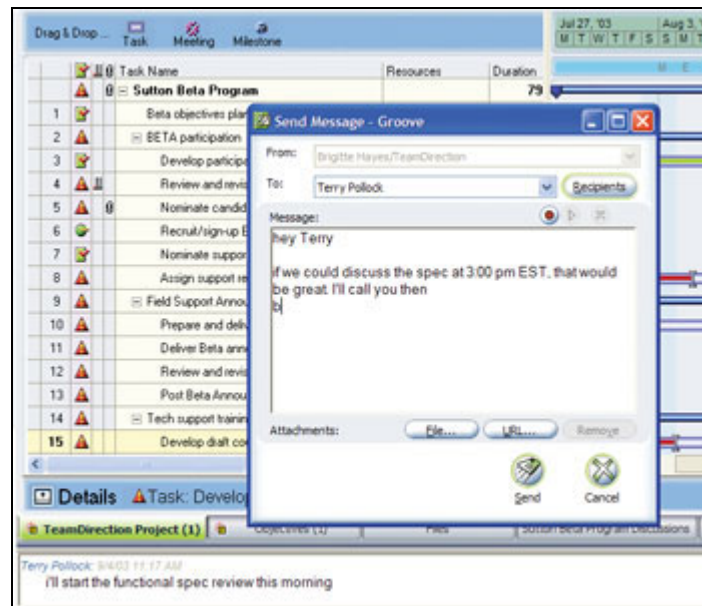


Exhibit 3

## Discussions

For non-synchronous communications, a Discussion tool, seen in Exhibit 4, is ideal. It is possible to have more than one discussion in a workspace, one each for different types of discussion, such as business versus technical. To lend focus to a particular issue, a discussion topic may be linked directly to a project task.

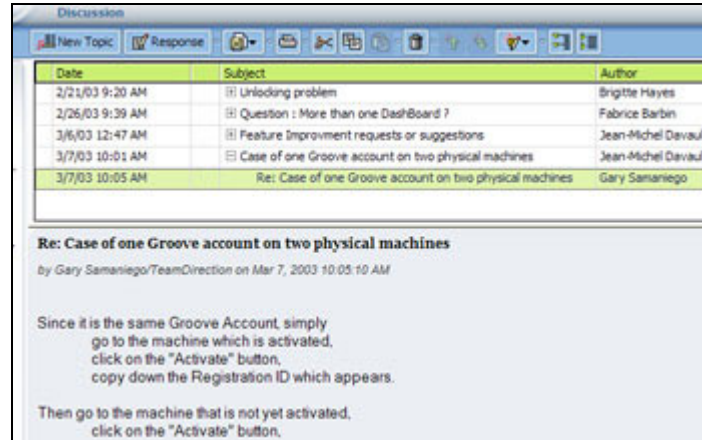


Exhibit 4

## Files

The Files tool, seen in Exhibit 5, serves as a repository for important project files, including standards and specifications, drawings, and other information critical to the level of understanding gained by team members. Files may be linked directly to tasks, such as in the case of specifications for a software development project. In the Project tool, the existence of file attachments is indicated by a paperclip to the left of the task, as seen in Exhibit 2.

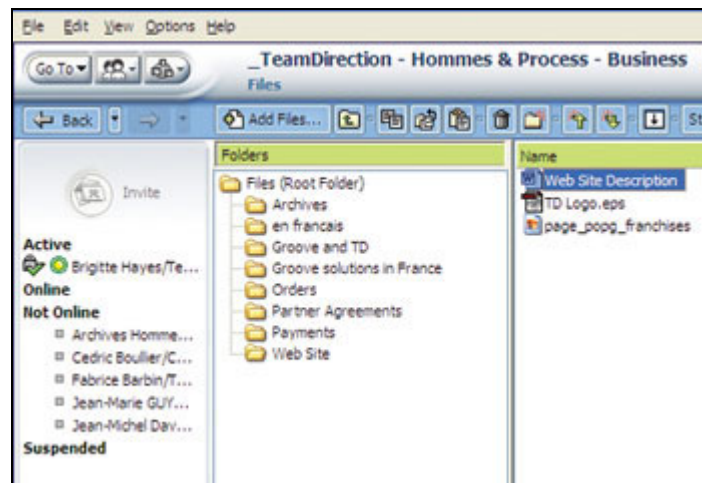


Exhibit 5

## Meetings

A Meetings tool allows teams to manage important group events, broadcast meeting agendas and the action items stemming from the meetings. Team members schedule, plan, record, and collaboratively run meetings relevant to their project. Meetings are made more effective through the use of the following features:

- Profile – Basic information such as date, time and location
- Participants – records attendees and can be updated in real time
- Agenda – every participant can contribute to, review, and prepare before the meeting
- Minutes – can easily be added and keeps a record of the meeting for all participants
- Actions – can be assigned, recorded, continuously tracked, and are visible to all participants

There are many other tools available for specific functions such as a shared team Calendar, Document Review and a Sketchpad. In the case of Groove Networks, partner tools exist as well to suit specific industry needs such as review of medical images or architectural designs.

## Sample Applications

### Example 1: Kevrenn International

Kevrenn International, based in Brittany, France, is a provider of translation and localization services for the computer industry. Services include translation, language engineering, desktop publishing, and user-interface validation for many European and several Asian languages. It maintains a world-wide network of in-country translators and language experts.

Business challenges that the firm sought to address included:

1. Administration of a few large and many small concurrent projects with common resources
2. Management of project teams that include both in-house and external members from different countries
3. Collaboration with members across different time-zones and speaking different languages
4. Simplification of the workflow and task assignments between translation, engineering and other members
5. Limited IT resources

Kevrenn's solution consisted of deploying Groove as well as TeamDirection Project and Dashboard (seen in Exhibit 6) for managing multiple small projects in separate Groove workspaces. Project managers use the Dashboard tool to monitor the progress of all concurrent projects and to assign tasks as needed. Groove spaces are used for sharing project information and guidelines.

The screenshot displays the Groove Dashboard interface, divided into two main sections: 'Tâches et échéances' (Tasks and Deadlines) and 'Réunions' (Meetings).

**Tâches et échéances:** This section shows a list of tasks with columns for 'Etat' (Status), 'Priorité' (Priority), 'Projet' (Project), 'Nom' (Name), '%', 'Début' (Start), and 'Fin' (End). The tasks are as follows:

Etat	Priorité	Projet	Nom	%	Début	Fin
Dans les tsm. 3 - Normale	3	KIR International	Implémentation / rapport	50	26/01/2004	29/01/2004
En retard 3 - Normale	3	KIR International	Traduction et édition	45	21/01/2004	26/01/2004
Dans les tsm. 3 - Normale	3	KIR International	Site web	0	23/01/2004	26/01/2004
Dans les tsm. 3 - Normale	3	KIR International	Adaptation des illustrations	60	21/01/2004	27/01/2004
En retard 3 - Normale	3	KIR International	Traduction et édition	60	19/01/2004	23/01/2004
Dans les tsm. 3 - Normale	3	KIR International	FAQ	100	26/01/2004	27/01/2004
En retard 2 - Importante	2	Computech Software	Final Testing	93	04/11/2003	24/11/2003

**Réunions:** This section shows a list of meetings with columns for 'Objet' (Subject), 'Coordinateur' (Coordinator), 'Date et heure' (Date and Time), and 'Durée' (Duration). The meetings are as follows:

Objet	Coordinateur	Date et heure	Durée
Nouvelle réunion	Non affectée	01/11/2003 06:00:00	60 minutes
Réunion d'information	Gestion de projets	06/01/2004 08:00:00	60 minutes
Mise en place de la procédure	Gestion de projets	06/01/2004 08:00:00	60 minutes

Exhibit 6

Results:

- Groove firewall transparency allows direct communication with mobile employees and external team members without implementation of any new IT infrastructure
- A consolidated view of all current projects for project managers, saving time and preventing resource over-allocation.
- The simple and intuitive interface allows each team member to retrieve task assignments and update task status easily and without any necessity for training
- Translators now log their notes and queries directly into the Discussion tool.
- All important information is shared. Documents are maintained in the Files tool rather than email for improved version control
- Members can retrieve information and contribute to the project at any time, including outside Kevrenn's regular business hours.

### **Example 2: Hexalog SA**

Profile: AARDEX LTD develops products that measure, analyze and facilitate patient compliance with prescribed drug regimens in clinical trials and medical practices. Hexalog SA is a software company with responsibility for all software development for AARDEX. In addition, Hexalog hosts data collection servers that monitor and record patients' intake of prescribed medication.

Business Challenges:

1. The team members were geographically distributed across Europe, a sales team in the United States, and a chemical manufacturer in Japan.
2. The medical research, software support and sales teams needed to improve their communications, especially for member task assignments and availability.
3. Requirement for cross-firewall collaboration, with minimally two companies on each project, often more.
4. The team members speak different native languages.

Technical Solution: The Hexalog IT Director made the Groove Workspace/TeamDirection Project tools available on an internal network, as well as through downloading from the Internet.

Results:

1. The IT Director created the first project space and invited others to join. By virtue of accepting the invitation, both the software and the project contents are downloaded to the team members' computers. This negated the necessity to be physically present to install software, eliminating travel costs and allowing deployment to proceed rapidly.
2. Because the software has both a project scheduling tool and built-in communications vehicles such as IM, chat and discussions, project management communications increased and improved immediately.
3. Since the software uses a standard HTTP port for all communications, it was simple to exchange information through the firewalls of the various organizations. The always-on but non-intrusive 192-bit encryption and authentication allowed decision-makers to have confidence in the security of the data. Since no central server is being used, the data cannot be compromised through an attack on a shared web server.
4. While the team members speak different native languages and use various Windows versions that support these, English is used for information-sharing. Using the Discussion tool, ideas can be presented for review and commented on after thoughtful consideration.

## Summary

Recent software developments have made projects that span organizations and geographies much more feasible and engaging. The following table summarizes the findings of this author based on practical applications of this technology in European and North American sites.

	<b>Characteristic</b>	<b>Resulting Challenges</b>	<b>How Technology Helps</b>
<b>1</b>	Physical separation	1.0 Lack of collaboration: 1.1 No sense of “team” 1.2 Disengagement from objectives  2.0 Various awareness deficits: 2.1 Availability of team members 2.2 New or changed information 2.3 Project status 2.4 Day-to-day activity 2.5 Process	Gives project a digital home Participation is by invitation only Objectives are clearly visible  Presence awareness Shared calendar Unread markers Shared and visible project plan Process documented in digital form
<b>2</b>	Multiple organizations	3.0 Inability to access stored information easily due to cross-firewall	Cross-firewall capability Always-on but non-intrusive cross-firewall authentication Encryption
<b>3</b>	Different time zones	4.0 Inability to surface and resolve issues quickly through ad hoc discussion	Extends the hours of overlap Presence awareness Synchronous/asynchronous discussion
<b>4</b>	Different languages/culture	5.0 Mistakes and missed opportunities 5.1 Mistakes due to poor comprehension 5.2 Lack of discussion due to reluctance to speak foreign language 5.3 Lack of problem recognition or solution adoption due to different cultural perspective	Written communications  Asynchronous discussion  ** No technical solution for cultural differences – depends on social skills of project manager

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