

NASA Team Collaboration Pilot

Enabling NASA's Virtual Teams

Steve Prahst, NASA Glenn Research Center

Background

Most NASA projects and work activities are accomplished by teams of people. These teams are often geographically distributed – across NASA centers and NASA external partners, both domestic and international. NASA “virtual” teams are stressed by the challenge of getting team work done – across geographic boundaries and time zones. To get distributed work done, teams rely on established methods - travel, telephones, Video Teleconferencing (NASA VITS), and email. Time is our most critical resource – and team members are hindered by the overhead of travel and the difficulties of coordinating work across their virtual teams. Modern, Internet based team collaboration tools offer the potential to dramatically improve the ability of virtual teams to get distributed work done.

To establish corporate collaborative capabilities, the NASA CIO designated this responsibility to the Principal Center for Workgroup Hardware and Software at Glenn Research Center. Through the leadership of the NASA Chief Information Officer, the group at Glenn Research Center (GRC) researched standards to enable NASA workgroups. GRC later participated in the CIO sponsored planning activity called eNASA. eNASA focused on enabling NASA communities via Internet based services. Enabling NASA virtual teams via collaborative technologies was one of the pillars of the eNASA plan. These studies - guided by industry best practices and market realities – concluded that corporate standards based services could improve the performance of NASA virtual teams. An agency pilot of team collaboration tools was considered a next step to prove the theory.

Team Collaboration – Making the Case

NASA virtual teams clearly need improved methods of working together. We define Team Collaboration as the active process of a team working together towards a common goal. For example, a team working together to meet the milestones and goals of a NASA program or project. Or, a team may be working on a cross cutting capability or recommendation. Generally, the team is developing some type of “product” together. Many NASA teams are getting by with travel, telephones, VITS, and email. Some teams have deployed more modern collaboration tools, such as document management systems, teamware or team spaces, data conferencing, instant messaging, and fully integrated collaborative systems. These tools have been applied tactically by NASA projects, programs, communities of interest, and centers. New NASA teams sometimes piggyback on an existing system or choose to deploy something on their own. This state of affairs, while flexible, has led to the following consequences:

- Many NASA teams rely on commonly available lowest denominator services (email, telephone, VITS, and travel)
- Modern collaborative products and services are deployed in a duplicative and fragmented fashion

This report is a preprint of an article submitted to a journal for publication. Because of changes that may be made before formal publication, this preprint is made available with the understanding that it will not be cited or reproduced without the permission of the author.

not
new to
CAS / NY
SERB
-PW

- New NASA projects and teams must take precious project startup time to assess, select, learn, and possibly deploy collaborative technology to meet their needs
- NASA people must learn new collaborative technology when moving between projects
- As an Agency, we do not have a modern corporate language for collaboration

The last point is a key one for knowledge management. A modern corporate language for collaboration can significantly increase the richness of communication and the ability to share knowledge in the NASA environment – with our many programs and projects spread across our ten field centers, headquarters, and vast number of external partners. While usability and intuitiveness of collaborative technology is improving, there is still a good deal of expertise and familiarity that people acquire through repeated use. Since NASA has no corporate collaborative technology, this “people” expertise and familiarity is fragmented across projects and groups. In addition, since different technology is being used – data and functional interoperability are impaired – resulting in another form of resistance to knowledge sharing and collaboration across NASA. A key figure in the development of networks, Bob Metcalf, states that “the value of a network is proportional to the square of the number of participants.” The more people we have participating via a common language, the more value can be realized. By moving NASA towards a common “network” or language for collaboration, the agency can create value per Metcalf’s law. A common base of collaborative technology along with agency wide adoption can realize this value at NASA.

Giving collaborative technology to a large number of people is just part of the solution. To really make them “participants”, we need to transition teams and people to new ways of working – enabled by collaborative technology. It is one thing to provide technology to large numbers of people – it is another thing to have large numbers of people productively using the collaborative technology together. Standard tools with an intuitive feature set is fundamental to enabling collaboration, but additional energy and thought to the adoption process is essential.

As part of the eNASA planning activity, we benchmarked companies that were considered leaders in the area of applying collaborative tools. We talked to representatives of General Electric, Boeing, Cisco, and Ford about business objectives and strategies in the collaborative space. The most important point we learned was that these best practice companies were all following a corporate strategy for collaboration and deploying common tools across their respective companies. In addition, these companies understand that, enabling corporate collaboration requires more than deploying common technology. A concerted effort at corporate adoption, emphasizing team facilitation, common process definition, training, executive support, marketing, and technical support – is a necessary ingredient to achieve success. As a result of this benchmarking process, our team incorporated a number of these strategies.

Ultimately, team collaboration at NASA will be realized by real working commercial products and services – that exist today. Based on NASA requirements, there are two key functional components at this time that can enable this active Team Collaboration:

- 1) Virtual Team Meetings: Meetings are a common process at NASA and are typically accomplished face to face or virtually via teleconferences or VITS. Virtual meetings can be improved with modern collaborative technology that enables sharing and interacting with electronic information. For example, commercial data conferencing services allow a team to share MS PowerPoint presentations (including using a pointer and flipping charts) and even share any other application from their desktop computer. It’s much like being together in the same conference room – or better, like having your teammates looking over your shoulder at your screen in your office as you discuss some subject matter. Data conferencing services also provide for group surveys, chat, and video sharing. Data conferencing services are typically used with (or integrated with) traditional teleconferencing services.

- 2) **Virtual Team Space:** In the past, some co-located teams had a physical “team room” – where they would keep a file cabinet with important team documents, a calendar on the wall highlighting important team events, and a white board – typically with some of the key issues and actions currently facing the team written on it. Much like the physical team room, the virtual team space is a place on the web for keeping the team’s work objects. These work objects include: reference documents, working files, action items, project calendars, off-line threaded discussions, and workflow support. The virtual team space provides a single place for coordinating team work and can be accessed from virtually anywhere on the Internet by authorized team members.

There are several other functionalities and product categories that can be beneficial to virtual team collaboration including instant messaging (with its presence and awareness capability), peer to peer enabled capabilities, high resolution/high frame rate video conferencing, and project management tools. New engineering capabilities, such as the ability to collaborate on 3D objects with nothing but a Web browser are also of interest to NASA. In addition, since collaborative technology is a relatively young area, new functionalities and products are expected over the next several years.

One related functionality is a knowledge repository. A knowledge repository is a place where a team can obtain lessons learned and products from other teams. It is also a place where a team can publish its products and lessons learned for sharing with a broader audience. The knowledge repository then is a place for keeping “results” that should be kept around and made available to larger groups of people. Figure 1 depicts a high level view of the position of Team Collaboration to support the product development process.

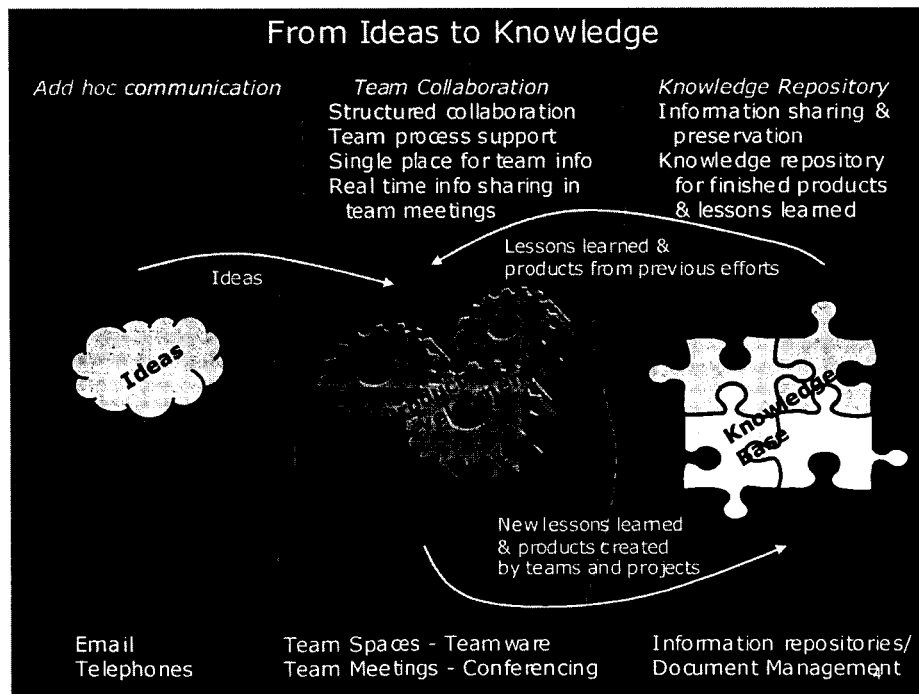


Figure 1

As we make the case for Team Collaboration at NASA, key business drivers include enabling NASA teams to get more work done with less reliance on travel and enabling collaboration across NASA centers and external partners. These business drivers can be satisfied by selecting products and services that provide: tool usability, ubiquitous Internet access, and the appropriate application of Information Technology security.

In summary, NASA virtual teams do have a need for improved methods of collaboration and Internet based tools that may satisfy this need do exist. A case can be made for a corporate strategy for improved collaboration at NASA and the Team Collaboration pilot is a tactical first step intended to assess the value of tools in the NASA environment.

Team Collaboration Pilot Definition

The overall purpose of the pilot is to assess the value of commercial team collaboration services as applied to NASA teams. One of the first steps in defining the pilot was to draft business requirements (or drivers) for a Team Collaboration service at NASA and verify them with NASA focus groups. As a result of the requirements gathering process, the following prioritized business drivers for collaborative services were generated:

Tools shall reduce the reliance on travel to get work done

This is the major business driver that was stated by the NASA administrator. Today, distributed NASA teams often have no alternative but to travel and physically meet to conduct business.

Tools shall enable collaboration between NASA centers

NASA consists of a headquarters and ten field centers distributed across the continental U.S. Each center has its own Information Technology (IT) infrastructure, including local area network and security perimeter (firewall, etc.). This pilot must enable collaboration throughout the NASA organization.

Tools shall enable collaboration between NASA and its external partners (industry, academia, other government agencies, and international partners)

NASA works extensively with external partners in the research community, aerospace industry, supporting industries, other government agencies, and in some cases international partners. This pilot must enable NASA virtual teams that span all of these organizations.

Tools shall be easy to learn and use (usability)

The usability of tools is critical. There is a well-known issue of being forced to trade off "task" (i.e. real work) and "tool" (i.e. using the IT tool) time. Putting a priority on intuitive and easy to use tools can increase NASA time spent on "task." A priority on usability will also help attract and keep NASA teams engaged in the pilot.

Tools shall be "secure" – all users shall be authenticated and all communication shall be private

NASA virtual teams must trust that their information and group processes can be conducted securely. We need to insure that only "invited" (or authorized) people attend team meetings and have access to team information.

Tools shall appeal to a broad based audience (scientists, engineers, technicians, managers, and administrators)

There are many distributed or "virtual" teams at NASA that span science, engineering, and administrative work areas. Today, all virtual teams use travel, telephones, and email to collaborate. This pilot will "raise the bar" beyond these basic tools and will have appeal to the same broad audience.

Tools shall have high availability and performance

Closely related to usability, tools must be highly available so that teams can rely on them. Tools must perform at a reasonable level similar to popular commercial Internet services.

Cost

NASA needs to wisely use its limited resources. The full cost (licensing, hardware, support staff, etc) of deploying and operating the service must be considered.

With business drivers agreed to, the remainder of the pilot definition consists of four areas:

- 1) Recruitment and selection of pilot teams
- 2) Selection and availability of collaborative technology
- 3) Development and application of team adoption strategies
- 4) Measurement of results

Recruitment and selection of pilot teams

The pilot was planned for a population of about 500 people and participation would be based on selecting a set of virtual teams representing a cross section of NASA project and work areas. As we considered recruitment and selection of pilot teams, we first defined criteria we felt were essential for a team to be successful in the pilot. Specifically:

- The team must be geographically distributed and actively working on team tasks
- The team and team leader must be willing to adopt new work methods and ideally be somewhat frustrated with current distributed work methods
- The team must have a leader who is committed to actively leading the adoption of new work methods and tools
- The team must name one of its members as a pilot focal point who will be responsible facilitating the setup and adoption of tools
- The team should be approximately 2-25 people in size

Next, the NASA CIO sent a call for participation memo to the agency – inviting all centers and enterprises to submit candidate teams for pilot participation. A down select process was performed focusing on selecting a representative set of teams across NASA and getting participant seat counts within range of pilot capacity (approximately 500 seats). This process resulted in an initial set of approximately 25 teams selected for the pilot.

Selection and availability of collaborative technology

Since this activity was a pilot, we were focusing on selling the concept that collaborative technology could bring value to virtual teams, more so than selling a particular product or service. That said, we did need to select collaborative technology for the pilot. This selection was guided by the NASA business drivers and functional requirements developed over the preceding years and updated after discussions with NASA focus groups. Key areas of consideration for pilot product selection included:

- **Features:** The pilot focus was to enable virtual team meetings and virtual team spaces. Data conferencing was the key feature intended to enable virtual team meetings. Data conferencing enables people to share live applications running on their computers with all meeting participants. The virtual team space required basic asynchronous features including file sharing, discussion lists, action item management, calendars, and workflow features.
- **Usability:** The ease of use of collaborative technology is very important for NASA teams. People realize that if tools are difficult to use then team adoption will likely not occur. Teams are already stressed by lack of time and information overload. While this is rather subjective, usability is a key requirement that came directly from NASA customers.
- **Ubiquitous access:** A key business driver is to enable collaboration across NASA centers and external partners. Lessons learned from previous pilots reveal significant problems when special firewall ports must be open and/or when desktop client software (especially if it must be licensed and maintained) must be installed. Our vision is to allow collaborators to participate from anywhere using the Internet and common network and desktop configurations. No special rooms or network configurations should be required – tools should be accessible from any office, hotel room, telecommuting site, partner location, etc.
- **Security:** It is vital that the privacy of NASA team information and processes be maintained. All team members must be authenticated and all communication must be private.
- **Multiplatform:** NASA (and some of its partners) has a heterogeneous computing environment deployed – consisting of Windows, Macintosh, Linux, and Unix workstations. It is essential that collaborators be able to participate using their normal work environment – since this is where their work (applications and data) reside.

Other issues considered include: product maturity, vendor viability, cost, and deployment options. With respect to deployment options, the NASA CIO and the team at GRC were interested in pursuing the option of providing the pilot infrastructure via an Application Service Provider (ASP) rather than deploying in house. The ASP model is being driven by fundamental enabling trends in network services – specifically, the relentless increase in network bandwidth. From a Government perspective, the ASP model provides a provocative option for IT outsourcing. ASPs can give NASA access to the identical services that are competing for customers in the commercial marketplace. In addition, since this was intended to be a pilot, we were interested in both a short deployment time and avoiding capital costs (like purchasing and installing servers and software applications).

Finally, with inputs from Gartner Consulting, the META Group, and previous piloting and standards work at GRC, we recommended a pilot of two ASP hosted capabilities:

- 1) Virtual Team Meetings via the WebEx Meeting Center service and
- 2) Virtual Team Space via eRoom Technologies eRoom Hosted Enterprise service

Development and application of team adoption strategies

Our team realized it would be a significant challenge to transition pilot teams to new ways of working, enabled by team collaboration tools. To meet this challenge, we developed a tool adoption plan. We also did our best to set realistic customer expectations and planned for customer focused technical and administrative support.

The adoption plan focused on the following techniques

- **Defining Key Roles:** A critical success factor for a team to adopt collaborative technology is that the team leader must become an active proponent of the required change in work habits and use of tools. A key role then was that each team must have a defined team leader who accepted the responsibility of actively leading the team into the ongoing application of team collaboration tools. In addition to the team leader, each team was to name a person on the team to act as the team tool expert (or team coordinator), who would be responsible for identifying opportunities to apply tools, tool setup (i.e. directory structures), and immediate assistance to team members. A member from the GRC team was assigned to serve as the team facilitator for each team. The team facilitator would be responsible for checking in with the team leader and team coordinator to assist with team adoption of tools.
- **Providing Proactive Facilitation:** From past pilot experiences, we knew that active engagement with teams would facilitate adoption of tools. Just giving groups of people access to collaborative technology often results in tools sitting there and not getting used. We decided that team facilitators would proactively monitor teams by checking in with teams on a regular basis, attending team meetings when appropriate, and monitoring the team space. Team facilitators would then be in a good position to encourage and assist tool adoption.
- **Facilitating Monthly Pilot Forums:** One way to encourage adoption is to facilitate sharing of results and best practices among all the teams participating in the pilot. Each month, we scheduled a virtual meeting with the team leaders and team coordinators from each team invited. In addition to sharing team information, the forums were planned to be used for obtaining feedback from pilot teams and technology briefings such as tool tips and features of new software versions.
- **Providing Tool Technology Training:** An understanding of the use and purpose of all tool features can facilitate adoption of tools. We planned for both instructor-led and self-paced instruction of the pilot team collaboration tools.

Measurement of Results

A key objective of the pilot is to assess the value of team collaboration tools as applied to NASA teams. To that end, we decided to administer two surveys to pilot participants – one before the application of team collaboration tools and another after the teams had used the pilot tools for a fairly significant period of time (about nine months). The first survey's focus was to both measure the pre pilot state of each teams ability to get distributed work done and to assess basic team collaborative skills (trust, etc.). The second surveys focus was to measure each teams ability to get distributed work done, facilitated by pilot tools – and to gather additional feedback on the pilot – such as how well business drivers were met.

In addition to the surveys, customer feedback was collected by team facilitators and at the monthly customer forums throughout the pilot period.

Results to date

The pilot provided Virtual Team Meeting services (via WebEx Meeting Center) to approximately 750 people at NASA and Virtual Team Space services (via eRooms) to approximately 250 people at NASA. At the time of this writing, the second pilot survey was just completed. Full analysis of the survey will be documented in the pilot lessons learned report. Initial analysis of the survey and anecdotal feedback from pilot customers reveals these initial results and lessons learned from the pilot:

- Awareness of and attention to adoption issues is vital for NASA as we strive for productivity increases enabled by collaborative technology. While we did focus on an adoption strategy in the pilot, additional tactics here are needed. A couple key ones are executive management support and a critical mass of participants within a work area. On executive support, some teams were at the project or team level – and people at the program and upper management level had no awareness nor buy-in to using tools – this hurt adoption. Also, due to limited numbers of seats, some teams were given fewer seats than requested, inhibiting the team's ability to effectively use the tool.
- Adoption of the Virtual Team Meeting capability was relatively simple for NASA teams and significant productivity improvements in several teams were observed. Meetings are a common process at NASA, and enriching the meeting experience with a tool like WebEx fits fairly simply in this existing process. The ability to share live content from any computer in a meeting significantly increases the richness of communication. Several teams eliminated real travel due to this increase in communication.
- Adoption of the Virtual Team Space is not simple, we believe largely due to the lack of common established team work processes. eRooms excel at creating templates of common team processes and replicating them. While several teams are successfully using the Virtual Team Space, adoption has been slower than for Virtual Team Meetings.
- The "one year" availability of the pilot in some cases inhibited teams from fully embracing tools – this was especially true in the case of the Virtual Team Space, where significant effort is required to setup and transition a team to this new way of working.
- The ability to include external partners in NASA team collaboration processes is a firm requirement of most teams.
- The ease of use and simple Internet access aspects of both eRoom and WebEx were essential ingredients for getting started. Both tools enabled teams to authorize members from virtually anywhere on the Internet without requiring special network or desktop configurations.
- While both tools support multi-platform environments, in particular Windows, Mac, Linux, and Unix – we see more issues on the non-Windows platforms largely due to their relatively small penetration in the market.
- The ASP model worked well for the pilot. Services and support were excellent.

Looking ahead

The pilot has shown that NASA teams can significantly improve their productivity by utilizing Virtual Team Meeting capabilities such as WebEx and Virtual Team Space capabilities such as eRoom. Based on the pilot results, NASA can benefit from a common corporate capability for virtual team collaboration. As we look towards a corporate capability, the pilot along with our previous work on team collaboration suggests attention to the following:

- An explicit strategy on adoption: Tools are not enough. We need to put energy into facilitating NASA teams, developing and improving common team work processes, training, developing awareness and support from NASA leaders and executives, and building a critical mass at NASA skilled in technology enabled team collaboration.
- A solid operational capability: Teams need to know that agency tools will be available and reliable. Tools must be secure, must have 24x7 support, backup/restore, and disaster planning/recovery processes. Further, a commitment to continuity must be established, so that NASA teams know that service is there for the long term – this should include migration of data when particular products are replaced or upgraded.
- Development and continuous improvement: Collaborative technology is evolving rapidly. NASA must continue to develop the team collaboration environment. Requirements from NASA teams must continue to be collected and refined. New capabilities need to be assessed and brought into the operational environment when a business case warrants it.

Acknowledgements

Rhonda Arterberrie, Steve Eubanks, Dennis Kay, Steve Prahst, and Dave Wenner of the Glenn Research Center advocated and developed Team Collaboration requirements, standards, and this pilot for NASA. Bob Stauffer supported team facilitation. Anita Alexander supported the pilot pre-survey.

Manjula Ambur, Richard Brozen, and Nancy Kaplan were responsible for initiating the pilot out of the CIO office at NASA Headquarters.

Gartner Consulting and the META Group contributed to the pilot development by providing NASA with industry analysis and recommendations.