Collaborative Tools for the LHC: *Update On Recent Activities*

S Goldfarb[1]
Assistant Research Scientist, University of Michigan
CERN-PH, 1211 Geneva 23, Switzerland

E-mail: steven.goldfarb@cern.ch

Abstract. I report on current activities in the domain of Collaborative Tools, focusing on development for the LHC collaborations [1] and HENP (High Energy and Nuclear Physics), in general, including audio and video conferencing, web archiving, and secure collaborative environments. This note addresses the follow-up to the LCG RTAG 12 Final Report [2] (presented at CHEP 2006 [3]), including formation of the RCTF (Remote Collaboration Task Force) to steer planning and development, installation of prototype facilities at CERN, and funding scenarios. I also summarize the Shaping Collaboration [4] conference held in Geneva in December 2006, and discuss issues facing the LHC collaborations in the coming years.

1. Introduction

When the LHC turns on in 2008, thousands of physicists located at CERN, at universities, and at national laboratories, all over the globe, will turn their attention to the petabytes of data that will come streaming from their detectors. They will be eager to see the performance of the accelerator, the precision of the detectors, and the effectiveness of the software and computing environments they have carefully designed and constructed over the past two decades. Beyond passive observation, these physicists will want to participate actively in the urgent and essential decision-making that will follow the first data. They will have to respond quickly to unforeseen problems, to determine new priorities, find solutions, and hopefully, to observe the effects of this work, in the form of exciting new physics results. In short, they will need clear, secure, interactive communication with their colleagues. This report addresses the steps that have been made over the past year and a half (since CHEP 2006), to prepare and implement high-quality, robust collaborative tools and facilities, to support the communication needs of the LHC, discusses area where more work is needed, and proposes priorities for future development.

During the CHEP 2006 conference in Mumbai, I presented the findings and recommendations of LCG RTAG (Requirements and Technical Assessment Group) 12 [2], the culmination of a year of research and discussions by representatives of CERN, the LHC, and experts in the field of collaborative tools. Since that time, a significant effort has been made at CERN and elsewhere to follow the recommendations, despite severe budget limitations on the part of the laboratory and the projects. Efforts at CERN have included the equipping of prototype conference rooms and the development, implementation and integration of commonly used applications. Outside of CERN,

[1] To whom any correspondence should be addressed.

significant advancements have been made in the development of new tools for audio and video conferencing, web lecture archiving, document sharing, and secure collaborative environments.

This document gives an overview of these activities, examines the current status of the development, and proposes future action needed to prepare our community for the exciting events to come. In conclusion, I present a brief summary of Shaping Collaboration 2006 [4], a recent workshop held in Geneva, December 2006, assembling experts in the field of collaborative tools with LHC users and HENP policy makers to address the strengths and weaknesses of the tools currently in use, examine new developments in the technology, and to propose policy for the coming years. These proposals have resonated to the highest levels and I am optimistic that they will benefit all of HENP, provided we continue as a community to push for their implementation.

2. Brief Recap of RTAG 12

2.1. RTAG 12 Findings in Brief

Details of RTAG 12, including a description of its findings on the status of collaborative tools for the LHC, are found in the group's Final Report [2]. Here I present a short summary of the most critical items, sharpened by the benefits of a couple years of hindsight and perhaps some added wisdom.

- The usage and needs of collaborative tools had rapidly increased for several years before the report and common sense indicated that the trend would continue, if not accelerate, as LHC installation and commissioning ramped up. These trends were backed up by data, such as the number of meetings booked in CDS Agenda [5] and Indico [6], and the number of video conference participants on VRVS [7] and ECS [8].
- There was no centrally organized effort at CERN or within the LHC collaborations to coordinate collaborative tool operations, maintenance, and development. Rather, several different groups at CERN handled specific facilities, such as phone and video conferencing, web lecture archiving, and other commonly used applications. This was perhaps natural, as the tools developed independently by different initiatives, but the result was a lack of interconnection between the applications, as well an inherent inefficiency in coordinating resources and seeking external funding.
- The conference facilities in use at CERN were in poor condition, with aging equipment for the codecs and the computing, and with little or no consideration having been made for the acoustic nature of the rooms being used. This was apparently due to the facilities being on a "minimum maintenance" mode for over five years, prior to the RTAG, and not due to the valiant efforts partaken by the technical staff, whose numbers remained at a bare minimum.
- Even if the existing facilities had been in perfect condition, there were not enough to handle the current and future needs of the collaborations. The size and geographical spread of the collaborations, as well as the complex nature of their experiments, implies that remote participation is essential for the functioning of nearly all aspects and stages of their running. A fundamental and guiding principle in the recommendations of the RTAG, therefore, was that all institutes must have the possibility to participate in the key decision-making procedures of their collaborations. This implies the need for the pervasive installation and maintenance of video conferencing facilities at CERN.
- The existing phone conference service at CERN was operator-assisted and thus functioned only during CERN working hours. It was also more and more frequently reaching the limit of its capacity during common meeting times, such as late afternoon (optimal times for transatlantic participation). Integration of the phone system with the video conferencing was rudimentary and typically handled by placing speakerphones adjacent to each other in the meeting rooms.
- Although equipment recommendations for specific applications, such as VRVS, did exist, there was no common centrally maintained list, including which services to use under which conditions and with which equipment. The hardware installed in the various rooms at CERN

varied from facility to facility, requiring new users to spend a significant amount of time and effort gaining expertise with the various tools, and remote users performed their own independent research for installing facilities at their home institutes.

- Finally, although some initiatives did exist for recording and archiving web lectures of the CERN summer student program, as well as some key academic and technical training seminars, there was no coherently organized effort to provide a recording service at CERN for the LHC collaborations.

2.2. RTAG12 Recommendations in Brief

As with the findings above, here I focus on some of the key recommendations of the report and provide additional commentary.

- The first and most important of the recommendations of the RTAG was to create a central organization to oversee the coordination of collaborative tool activities for the LHC. It was recommended that CERN provide the leadership for the group that took on the charge and that representatives of the LHC collaborations provide oversight.
- It was further recommended that CERN and the LHC collaborations maintain close communication throughout all stages of design, development, implementation, and maintenance of the tools at CERN. In addition to oversight, it was recommended that parties from all sides participate in common working groups and initiatives, such as the RCWG [10].
- It was recommended that meeting facilities in common use (all of CERN building 40, e.g.) be equipped for integrated audio and video conferencing. Hardware installations would need to provide the functionality required by the most commonly used tools (VRVS, ECS [9], telephone), present similar, simple operational interfaces to the users, be centrally maintained, and take into consideration the acoustical nature and lighting of the rooms.
- Concerning the video conferencing systems, usage of the LHC community was divided roughly equally at the time between VRVS and ECS. The group saw no compelling reason to force either group of users into making a switch from one system to the other, as the hardware recommended for the new meeting rooms (H.323 [11] codecs and PC's) supported either system equally as well, and because rapid advances in the technology rendered it impossible to guess whether one of these systems (or perhaps a whole new system) would be preferred in only a few years' time. Rather, they recommended that CERN and the LHC support the two systems, and that efforts be made to integrate them, as much as would be beneficial.
- In addition to the integration of the video conferencing tools to each other and to the phone conferencing, it was recommended that other applications in common use by the collaborations, be connected together, with the basic idea of creating a coherent and simplified environment to the user. For example, if a meeting were to be booked in Agenda or Indico, the data entered ought to be sufficient for booking a physical meeting room at CERN, as well as a virtual room in VRVS and a phone conference. It was also noted that putting these capabilities together in a single tool could facilitate the security and authentication requirements to come with LHC start up.
- For web lecture archiving, it was recommended that a service be provided to record plenary sessions, tutorials, seminars and other key events for the collaborations at CERN. The recordings would be stored in a centralized database, in standard format, accessible through a web portal. To facilitate the service, it was recommended that the video conferencing facilities at CERN be equipped with appropriate lighting and access to sound from the speaker and audience, when possible.
- Finally, an emphasis was made to seek Service-Level Agreements (SLA's) whenever possible between the groups providing services and the LHC experiments and/or CERN. This could include purchasing and maintenance agreements for the CERN facilities, as well as support for the entities providing the service, such as VRVS and ECS. Specialized requests for additional

services, such as operational manpower for key meetings and seminars or individual recording sessions, might be made available for a fee.

2.3. Endorsement by the LHC Collaborations

Shortly following the completion of the Final Report and its presentation to the LCG Project Execution Board, the document was distributed to the LHC collaborations by their representatives. Within a matter of weeks, letters of endorsement were received from each of the collaboration spokespersons. These letters indicated strong support of both the findings and recommendations and provide confidence that the group correctly represented the views of the collaborations.

3. Progress Over the Past Few Years

3.1. Introduction

Members of CERN IT participated in the RTAG discussions and/or were informed throughout the year of the issues under investigation. To their credit, several of the recommendations were implemented fairly quickly during the deliberations or shortly following the completion of the report. A few others have taken some time or required resources, but are in the process of being followed-up. Others are still sitting on the back burner. Here I discuss some of the important progress.

3.2. Organization

The question of centralizing the organization of CERN activities, considered top priority by the RTAG, was addressed immediately. The CERN IT UDS (User and Document Services) group, under the new direction of Tim Smith, took over the reins of the overall organization and began concrete activities concerning the immediate problems of video and audio conferencing facilities. Thomas Baron of the UDS group formed an organizational body called the RCTF (Remote Collaboration Task Force), including representation from his group, from members of the CS (Communications Services) group, and representatives from each of the LHC collaborations.

The RCTF has met regularly since its formation. The primary focus of the meetings has been planning for the installation of audio and video conferencing facilities at CERN for the LHC collaborations. Other topics of discussion have included planning for installation of the Alcatel My Teamwork phone conference service at CERN [12], usage of peer-to-peer (P2P) applications, such as Skype [13], development of the Indico [6] event management software package, collaborative environments, such as Sharepoint [14] and Sakai [15], and issues pertaining to communication security via common group authentication. The collaboration representatives provide important feedback to the IT developers during the meetings and via external communications and the developers have been responsive to requests. In short, the much-needed communication link between the LHC collaborations and CERN IT, concerning collaborative tools, is in place and functioning well.

3.3. Resources

The organization described above would be meaningless, of course, without adequate resources to back up the development plans. Fortunately, significant progress has been made on this front, first with the collaborations and, more recently, with CERN IT. Following the RTAG report in 2005, both ATLAS and CMS committed resources toward equipping video conferencing facilities in CERN building 40. Prototype rooms were designed and installed following the recommendations of the report and a commitment was made to draft an SLA for equipping all of the conference rooms in the building, pending feedback from the prototypes. ALICE and LHCb made similar, but smaller investments, and all collaborations share facilities.

The SLA drafted by the two collaborations committed resources over a period of five years, provided CERN IT support an additional engineer to oversee the installation and maintenance of the facilities. Although initial response from CERN IT was less than optimistic, subsequent negotiations,

including a pointed discussion during the Shaping Collaboration 2006 [4] conference in December 2006, appear to have settled the issue, and sufficient resources to support an engineer during the five-year time period were made available. It should be noted that, during an interim period, resources were provided by the CMS Caltech group to support the engineer, so as not to lose key expertise and the momentum gained over the previous years.

Over the same period, ATLAS committed additional resources toward the recording and archival of web lectures from meetings, workshops, plenary sessions, and tutorials. This commitment came in the form of an SLA with the University of Michigan ATLAS Collaboratory Project [16], covering the plenary sessions in Overview Weeks, selected workshops and tutorials. Collaboration usage and satisfaction with the service has been evident and the commitment has been extended through 2007.

Both CERN IT and the LHC collaborations have provided other resources -- primarily in the form of manpower -- over the past couple years. I will not discuss these here in detail. However, it is important to note that the above commitments focus mainly on the video conferencing facilities provided by CERN and the lecture archival service provided by the University of Michigan. Video conferencing services, such as EVO and ECS are currently receiving funding primarily from the U.S. funding agencies and it would not be unusual for these agencies to request a significant investment from the part of the LHC collaborations (the primary users). In addition, if CERN were to want to provide a lecture archival service, similar to the one used by ATLAS, but for all of the LHC collaborations, additional hardware and manpower funding would be necessary. In short, we are only halfway out of the woods, but things are looking brighter.

3.4. Equipping of Conference Rooms at CERN

The earliest meetings of the RCTF focused on plans to install prototype video conferencing facilities in building 40, one for each of ATLAS and CMS. The UDS group evaluated the requirements for the rooms, support for audio and video conferencing, bridging, acoustics and lighting, etc. Based on the quality and functionality offered, as well as equipment cost and maintenance issues, Tandberg codecs were selected, along with an array of ceiling and desktop microphones with integrated noise suppression and echo cancellation. Try/Buy agreements were negotiated and separate contracts were drawn up for ATLAS and CMS.

Figure 1. ATLAS prototype video conferencing facility at CERN.

Figure 1 presents the facilities in CERN 40-4-C01, a 25-person conference room. The system includes a 4-way MCU capable of bridging between several video and/or audio conferencing systems. The two screens allow for simultaneous local projection of meeting material and viewing of the video conferencing interface, including controls and video. A "Smart Screen" was installed only in the ATLAS room, primarily for evaluation purposes. Such a screen provides an intuitive interface for navigation on the local PC, including interactive presentations using electronic colour markers that can be seen by remote participants. A similar facility was installed for CMS in CERN 40-R-B10.

The two facilities have provided valuable feedback, concerning the design of the rooms, their equipment, the systems themselves, and the protocols used for interconnectivity. After a year of usage, teething pains do still exist, but they are fewer and farther between. The most important issues have been those of sound quality and sound levels during combined video and audio meetings. Many of the problems had been due to incompatibilities in SIP protocol implementations and have since been resolved. Issues concerning the hardware and installation are still being investigated and will be resolved before other rooms are furnished.

Current plans are to design similar facilities for the rest of the conference rooms in the building, as well as for the auditoria. The latter present new challenges concerning acoustics and audio, in general, that will require significant testing and evaluation. It is hoped, however, to equip these rooms (which are in great demand) by the end of 2008. Finally, investigation is underway for the equipping of small, specialized facilities, such as a remote teaching facility, for visiting faculty, and a tele-presence installation for an always-on video communication channel between specific clients (as needed). Such specialty sites will require additional funding, but could be financed with pay-for-service agreements.

3.5. Audio, Video, and Web Conferencing Systems

3.5.1. EVO (Enabling Virtual Organizations)

During CHEP 2006, EVO was unveiled to the HENP community (and the president of India, himself), as the successor to VRVS. Many of the new features included in EVO indicate that the development team is placing an emphasis on robustness, as well as improved functionality. The installation and usage are somewhat simplified, and integration of the MonALISA [20] framework allows for real time monitoring and corrections, based on available resources and bandwidth.

The production version of the software is only recently available, so it is difficult to judge how well the HENP community is embracing it. My personal experience with ATLAS usage indicates that the collaboration is making every effort to support the changeover, but that certain obstacles, such as the configuration of existing conference rooms at CERN and the increased CPU requirements of EVO are causing some difficulties. Overcoming these obstacles quickly and effectively will be essential to assuring continued usage.

3.5.2. ECS (ESnet Collaboration Services)

The ECS (ESnet Collaboration Service) [9] Ad-Hoc video service has been in use by the HENP community for several years, now. The main components the system are a set of MCU's, a gatekeeper, audio bridges, and gateways. Users connect using an H.323 client registered with ESnet. The primary usage comes from U.S. institutes, as participation by at least one U.S. site is required per meeting.

In the past year, ECS has undergone significant changes in both the management of its video service and in the hardware on which it is based. Concerning the hardware, three new Codian MCU's have been installed, each with 40 video conferencing ports and with 384k access for ISDN systems. This represents a significant increase in both the quantity and quality of the resources available. Audio access is available through a Codian ISDN Gateway, and H.239 [21] content viewing and markup is available using a web interface. More upgrades are foreseen in the coming year, including the possibility of locating additional MCU's at a new physical location on the east coast of the U.S. Organizational changes, in part to support these new facilities, have included the out-sourcing of maintenance and operations to an external firm. Real-time conference support is provided for a fee.

3.5.3. Alcatel My Teamwork

An automated phone conferencing system, called Alcatel My Teamwork [12], was set up at CERN in 2006 and was in beta-test during my report to CHEP 2006 in Mumbai. A limited number of volunteers were registered to test the system. Given the growing need at CERN for 24/7 phone conferencing and the physical limits of the old system, the beta-testers stress-tested the system early on, by booking a significant number of conferences for their collaborations. This led to early problems due to limited resources, but also provided quick feedback to the development team. After an extended beta-testing period and the purchase of additional ports, the system was put into production in 2007.

More recently, the number and frequency of reported problems appears to have significantly diminished, even as the number of registered conveners and meeting participants continues to increase, and the system has become a standard tool at CERN. The sound-level problem described in section 3.4, concerning bridging with a video conferencing system, is being addressed.

One issue still being resolved with the Alcatel system is that of the billing of phone calls made from CERN, using the automatic call-back link. This feature allows a participant to click on a URL in the web interface and to have CERN call any specified number. Ideally, one would like for the system to charge the team account of the participant who requested the call. Unfortunately, the software does not allow this. Rather, the call is charged to the team account of the convener or "leader" of the meeting (who made the reservation). While this algorithm is acceptable in the business world, collaborations function differently, and conveners are rarely financially responsible for the groups they lead. Disabling the functionality would solve the issue, but call-back can be useful in many ways. It can be the case, for example, that a participant is not located at a phone that allows calling to CERN. In addition, usage of a web-based request supports accountability of participation and could provide a means for security through authorization. To address the issue, ATLAS is looking into the possibility of creating a dedicated team account or accounts, with full billing details and accountability, to be paid from collaboration maintenance & operations funds.

3.5.4. Others

There are a variety of other audio, video, and web conferencing facilities in existence. In fact, new ones appear in the public domain frequently. Webex [22], for example, offers a web conferencing facility allowing users to share meeting material on the web, while using an IP-based telephone service for audio or video communication. This service is currently in use by the Fermilab and LHC accelerator groups. It is a commercial product and licensing fees are not cheap, even taking into consideration discounts offered to large groups, such as CERN. Although one could argue that the total cost of maintaining and developing a service, such as EVO, is comparable to the fees one could negotiate for a commercial service, the HENP community would need to evaluate requirements of functionality and scalability, if it were to consider paying for such a service. Loss of control over the development and responsiveness of the company toward the collaboration needs, could pose serious problems. Nevertheless, the RCTF has spent significant time discussing the issue and examining alternative products, and will continue to assume this as part of its mandate.

Other alternative audio and video conferencing tools commonly used by the HENP community include Skype [13] and Gizmo [23]. These are web-based audio or video conferencing systems, offering free point-to-point communications between PC's, communication to phone at very cheap rates, and conferencing, free or for a small fee. In general, these tools can work well, provided the participants are sitting at their PC's and there is reliable network bandwidth. Negotiations are currently underway between CERN and Skype to resolve security issues and the RCTF continues to monitor improvements to the systems, as alternative communication tools for the LHC.

3.6. Web Lecture Recording and Archival

Web Lectures are electronic archives of meeting presentations, seminars or tutorials. They typically include the presentation of high-resolution images of slides, screen captures, or other visual material, synchronized to the audio and video of the speaker. Web lectures were introduced to CERN in 1999

through recording of the Summer Student Programme Lectures, as part of a University of Michigan pilot project, sponsored by the U.S. National Science Foundation, to investigate the tool as a potential replacement to the existing archive of video tapes and slide printouts. Since that time, both CERN and the University have, together and separately, evolved the software and archival methods, to improve automation, as required by large-scale recording projects.

A description of the University of Michigan lecture archive project was presented at CHEP 2007 [24] and can be found in these proceedings and at [25]. Over the last 2 years, under a service contract with ATLAS, the project recorded and archived more than 400 lectures, including plenary sessions, seminars and tutorials. The complete archive of ATLAS lectures is found at [26]. CERN independently developed its own program of archiving based on the SMAC application [27] and has used it to produce lecture archives from its Academic and Technical Training Programmes. Work is currently underway to provide interoperability between the two systems, so that lectures produced by either of the methods could be archived and viewed through either project's portal.

CERN has recently upgraded hardware configurations in the main auditorium for improved automation of the lecture capture process and plans to make similar changes to the Council Chamber and other auditoria commonly used by the LHC collaborations. In addition, it is foreseen to create a mobile service to record lectures in smaller venues, as needed.

3.7. Event and Meeting Management

Over the past few years, event management at CERN, including the scheduling of individual meetings, conferences, and workshops, has been handled by Indico [6]. This application was developed at CERN as the successor to the CDS Agenda system and was adopted rather quickly by the LHC community, among others in HENP, and elsewhere. Indico has evolved rather quickly, based on feedback from users, and is now an integration point for several services, including conference room, VRVS and Phone Conference booking. New functionality is introduced periodically and is easily tracked by checking the "Indico News" link on the right-hand side of an Indico directory listing, which also includes expected developments, like EVO booking. In addition, as a response to user feedback, a study began recently to try to identify ways to simplify the user interface.

4. Shaping Collaboration 2006

4.1. The Conference

A conference on Collaborative Tools and the LHC, called Shaping Collaboration, was held December 11-13, 2006, at the CICG (Centre International de Conférences Genève) in Geneva. A description of the conference was presented at CHEP 2007 [27] and can be found in these proceedings. The conference web site [4] also contains a summary, including highlights and action items.

4.2. Attendance

The conference was a joint meeting of the Workshop on Advanced Collaborative Environments and the LHC User community. The first 1.5 days were dedicated to LHC matters and were attended by representatives from the collaborations, CERN IT, and collaborative tool experts from around the globe. Notable attendees include Jos Engelen, CERN Deputy Director General for Science; Doug van Houweling, Director of Internet 2; Dan Atkins, Director of the NSF Office of Cyberinfrastructure; Tim Smith, CERN IT/UDS Group Leader; Markus Nordberg, ATLAS Resources Coordinator; and Steinar Stapnes, ATLAS Deputy Project Leader.

4.3. Outcome

The venue provided an ideal opportunity for dialogue between the world's leading experts and developers of collaborative tools and the LHC community. The LHC, with its large, globally distributed scientific collaborations, provides arguably one of the best possible proving grounds for collaborative tool development, so mutual interest was expressed by all parties.

In addition to the abundance of fascinating presentations, a panel discussion was held at the conclusion of the LHC talks, focusing on identifying action items for the various components of the LHC collaborations, the laboratory, service providers, industry, and the funding agencies. Details of the discussion can be found in the summary in [4]. Perhaps the most notable outcome occurred in post-conference follow-up to these discussions, as CERN Management gave a clear signal to IT to provide the required manpower to support the video conferencing program proposed by the RCTF.

5. Challenges on the Horizon

5.1. CERN Facilities

Highest priority has being given to equipping all meeting rooms in CERN building 40, following lessons learnt from the prototype rooms. Acoustic evaluations are planned for the auditoria and estimates are being prepared. The SLA's between the collaborations and CERN IT are in their final stages and there appear to be no serious obstacles. Tutorials have been planned adjacent to both the CMS and ATLAS collaboration overview weeks in Autumn 2007 and more will follow. This does not imply that all work is done concerning the prototypes. As pointed out above, there are still some questions concerning sound quality, but there is confidence that these problems can be resolved quickly and the need to have sufficient facilities at CERN requires that installation begin immediately.

One problem reported more recently, concerning the initial connection of the rooms to EVO, was caused by dependency of the configuration on the remote ESnet gatekeeper. To solve this, a new gatekeeper has been installed at CERN, which is currently being tested. Plans are to move this into production, once the testing is complete.

Concerning phone conferencing, the Alcatel system can be considered ready for production and efforts are underway to find a suitable resolution to the question of call-back billing. It should be noted that the international rates charged to users of the CERN phone system are quite competitive, with transatlantic calls typically costing only a few centimes per minute. One feature frequently requested is for the system to be able to call participants on their PC's rather than on their phones. Given the system's usage of the SIP protocol, there are no major technical hurdles, and investigation is underway to provide such a service.

5.2. Non-CERN Facilities

For outside facilities, documentation needs to be drafted, recommending hardware installations that optimize active participation in meetings with CERN and other institutes. I advocated the creation of a team of trained experts (perhaps students) to travel to the various remote institutes, aiding in the installation and testing of hardware for video conferencing and lecture archiving. A standard set of tests between the sites and CERN could be set up and facilities could be periodically checked and certified for use under a variety of conditions. Local staff would be trained for running and maintaining equipment, including individual users, as well as meeting rooms. This would go a long way in the direction of improving the start-up time and the running of LHC meetings.

5.3. Collaborative Environments

The need for robust communication channels for the LHC in the coming years will be complemented by the need for security of these channels. This includes protection from sabotage, as well as from prying eyes. CERN is already in the process of revamping its authentication tools with the creation of a single sign-on method. To best profit from this work and to simplify the user environment, it would be beneficial for the existing collaborative tools to be integrated under a common framework.

With such a system, a user could sign on to a collaborative tool interface, be identified as a member of an LHC experiment and certain groups within that experiment. She/he could also be identified as a convener or as a user of those groups. This authentication would provide the user with certain privileges, for viewing, editing, and/or managing content and the user could set preferences, defining the content she/he would like to access.

There are a couple existing frameworks that could act as starting points for the creation of such an environment: Sharepoint [14] and Sakai [15]. The RCTF has already held discussion on these tools, including a presentation from a key Sakai developer, and CERN IT has already migrated some tools (e.g. newsgroups) to use components of Sharepoint. I highly advocate a continuation of this work, as the creation of a common environment could help to simplify the user interface to popular collaborative tools, meeting scheduling, document sharing, mailing list and news access, and wiki documentation. Reducing the number and variety of applications an LHC participant has to master and synchronize will also facilitate the entry of new users, improve security, and reduce maintenance for tool developers and conveners.

6. A Few Comments and Conclusions

The past few years -- since my last report at CHEP 2006 -- have seen important progress at CERN and within the LHC collaborations on the development and deployment of collaborative tools. The collaborations have recognized the need to prepare and maintain facilities at CERN and at the member institutes to support active participation by all members, regardless of location. They have backed up this recognition with resources that, while still somewhat limited, allow for the construction of badly needed facilities and support of the systems they exploit.

CERN, for its part, has taken on an important coordination role, assembling a team of competent experts and opening clear lines of reporting to the collaborations. This aspect of the work is vital and all efforts should be maintained to ensure its continuation.

Over the next few years, it is important that we move from the stage of testing and prototyping to one of installation, production, and maintenance. Time is running out, as the LHC start-up approaches, and more facilities are requested every day. This does not mean that we need to stop research and development, especially given the steep development curve of collaborative tool technology, only that this needs to take place in parallel to the installation. It does imply, however, that we need to converge on certain choices of technology to get started.

The choice of video conferencing system, arguably one of the most controversial issues, needs to be settled, based on required functionality, ease of use, robustness, and maintainability, and it must receive adequate support from the collaborations. The RTAG report advocated support for VRVS (now EVO) and ECS, as they were already the most commonly used tools in HENP, and because they appeared to support the LHC requirements. In my opinion, although there are a lot of new choices on the market, none of them yet satisfy fully the needs of the LHC community. So, for now, I would strongly advocate support from the collaborations for these two systems, and continued efforts to integrate the systems to be completely interoperable. In the mean time, further research and evaluations by the RCTF or other LHC expert bodies should continue, but should not distract from our urgent need to move to production.

7. References

[1] The LHC is the Large Hadron Collider under construction at CERN, the European Laboratory for Particle Physics, in Geneva Switzerland. The collaborations include ALICE, ATLAS, CMS, and LHCb. More information can be found at http://www.cern.ch.

[2] S. Goldfarb, et al., "Report of the LHC Computing Grid Project RTAG 12: Collaborative Tools," CERN-LCG-PEB-2005-07: http://cern.ch/muondoc/rtag12/Report/RTAG12-Report.doc.

[3] LCG RTAG 12: Collaborative Tools for the LHC, S. Goldfarb, XV International Conference on Computing in High Energy and Nuclear Physics (CHEP-2006), MacMillan India, Ltd., Vol I (2006). The presentation material can be downloaded from http://indico.cern.ch/contributionDisplay.py?contribId=49&sessionId=5&confId=048.

[4] Shaping Collaboration 2006 was a conference on collaborative tool developments and policy for the LHC and for large, global science projects, in general. A summary description of the

conference, agenda, and attached materials, including video archives of presentations can be found at http://cern.ch/ShapingCollab2006.

[5] CDS Agenda is a meeting management utility developed at CERN primarily for the handling of meeting and conference agenda. The software is now deprecated (replaced by Indico). More information can be found at http://cdsware.cern.ch/agenda.

[6] Indico is the meeting management software package that has replaced CDS Agenda at CERN. More information on Indico can be found at http://cdsware.cern.ch/indico.

[7] VRVS is the Virtual Room Videoconferencing System. This software is now deprecated (replaced by EVO). More information can be found at http://www.vrvs.org.

[8] EVO stands for Enabling Virtual Organizations. It is a videoconferencing system designed to replace VRVS (by the same developers). More information at http://evo.caltech.edu.

[9] ECS is the ESnet Collaboration Service of the Energy Sciences Network at Lawrence Berkeley National Laboratory. The most commonly used component is an ad-hoc MCU with ports connecting H.323 or ISDN protocols. More information is available at http://www.ecs.es.net.

[10] The RCWG is the Remote Conferencing Working Group. More information on this group and its activities can be found at http://vcs.es.net/hypertext/committees/rcwg.html.

[11] H.323 is an ITU-T (International Telecommunication Union) multimedia communications protocol standard. More information can be found at http://www.itu.int/rec/T-REC-H.323.

[12] The CERN Alcatel My Teamwork audio conferencing system is described and documented at http://cern.ch/audioconferencing.

[13] Skype is a peer-to-peer IP-based telephone application. Documentation and free downloading of the software is located at http://skype.com.

[14] The Microsoft Sharepoint server package provides an integrated collaborative environment that supports scheduling, document handling, and group management via a secure web portal. A description and documentation can be found at http://www.microsoft.com/sharepoint.

[15] Sakai is an open source software package designed to provide a "Collaboration and Learning Environment for Education." Like Sharepoint, it supports scheduling, document handling, and group management via a secure web portal. See http://sakaiproject.org.

[16] The University of Michigan ATLAS Collaboratory Project investigates and advances technologies and practices required for the organization and execution of modern large-scale collaborative research experiments. See http://vesuvio.physics.lsa.umich.edu/acp.

[17] MCU is a Multipoint Conference Unit, a component that provides integration of a number of communications, through a common protocol, such as H.323 or SIP.

[18] Tandberg is a video conferencing equipment vendor: http://www.tandberg.com.

[19] SIP is the Session Initiation Protocol, used to create modify and initiate sessions with multiple participants. More information can be found at http://tools.ietf.org/html/rfc3261.

[20] MonALISA are Monitoring Agents using a Large Integrated Services Architecture, a framework designed and implemented at Caltech: http://monalisa.cacr.caltech.edu/monalisa.htm.

[21] H.239 is an ITU-T (International Telecommunication Union) recommendation for multimedia communications under the H.323 protocol. It is commonly used for supporting a second video stream, typically slides or images for a presentation, along with the speaker video.

[22] The WebEx Meeting Center package offers web-based audio and video conferencing for single or multi-point meetings. More information at http://www.webex.com.

[23] Gizmo is an IP-based phone utility that allows conferencing for a fee. Unlike Skype, it is not peer-to-peer software and usage inside CERN is allowed. More at http://gizmoproject.com.

[24] "University of Michigan Lecture Archiving," J. Herr, CHEP 2007 (presentation ID 415), http://indico.cern.ch/contributionDisplay.py?contribId=415&sessionId=33&confId=3580.

[25] The Web Lecture Archive Project, is a joint project between CERN and the University of Michigan ATLAS Collaboratory Project: http://vesuvio.physics.lsa.umich.edu/acp/wlap.

[26] The WLAP ATLAS lecture archives can be viewed at http://www.wlap.org/atlas.

[27] SMAC is the Smart Multimedia Archive for Conferences, and has been developed by the Ecole d'ingénieurs et d'architectes de Fribourg, the University of Fribourg and CERN: http://smac.hefr.ch/index.php.

[28] "Shaping Collaboration 2006: Action Items for the LHC," S. Goldfarb, et al., CHEP 2007, http://indico.cern.ch/contributionDisplay.py?contribId=408&sessionId=21&confId=3580.

Trademark Disclaimer

All trademarks appearing in this text are acknowledged as such.

Acknowledgments

The author would like to thank the organizers of CHEP 2007 for inviting him to speak his mind. He also acknowledges and sincerely thanks his colleagues at the University of Michigan, for supporting his stray into a field that goes a little beyond the physics he ought to be working on (and will get right back to), and especially Prof. Homer A. Neal for raising HENP awareness of collaborative tools issues to the highest level. Finally, he thanks his fellow colleagues in the RCTF, as well as ex-members of RTAG 12, for their hard work and dedication, in support of the LHC physics community.