2009-2010 Year in Review

Following the close of the 2009-2010 Academic year, this section will review the major projects and accomplishments of the Computing department this past year. As you will see, significant progress has been made on those projects identified as group priorities for this past year. In addition, many steps have been taken towards our overarching goal of providing highly-available, efficient and effective Information Technology and telecommunications services to the Institute community.

Work continued in earnest on many of the goals that were enumerated in last year’s report, focusing specifically on several items identified by the Visiting Committee for Computing which was conducted in early 2009. As well, several critical projects aimed at improving the access or availability of campus-wide information technology services were given high priority. In addition to these improvements to be the campus computing infrastructure, the organization of Computing itself continued to evolve in the past year.

Organizational Structure, Personnel and External Resources

- **Network Group Reorganization.** Following the last several years of aggressively-timed, strategic infrastructure upgrades, combined with the growing use of well-defined policies and procedures for campus-wide IT tasks, gaps have been exposed in the staffing model of the Network Administration Group. This is the group which supports many of the campus’s centralized systems, including its main datacenter, our cable plant, network routers, switches, central servers and our information security office. To address this change in the nature of the group’s work, steps were taken to best position the group to effectively meet these new challenges, both now and into the future.

  Specifically, the Senior Unix Administrator position previously held by Alan Cheng was split into junior two positions, for which the Institute is currently recruiting. The first is a Junior System/Network Administrator, and the second will be a Junior System/Security Administrator. By increasing the size of the group in this fashion, while still remaining budget neutral, we are best able to meet the growing need for 24x7 support for the critical components of our campus network, and ensure that its many aspects are operational whenever faculty and members may wish to utilize them.

  Lastly, to accommodate the management of these new positions, Brian Epstein, previously the Institute’s Network and Security Officer was promoted to the new position of Computer Manager, Network and Security. In this role, Brian will take on management of the day-to-day aspects of the Network Group and its functions, reporting to the Manager of Computing. This request also fulfills a recommendation by the Visiting Committee that the Network Group have its own manager, in line with Computing’s four other groups.

- **Consolidation of IT training.** Beginning this term, all IT training on the campus is being arranged through Computing. Previously, separate curriculums were arranged by both Computing and Human Resources. Building again on a recommendation by the Visiting Committee, these have been combined. Training will still be provided using a mixture of in-house and external trainers. As part of this consolidation, Computing has also begun to evaluate new external training partners who might best serve the Institute community going
forward.

Infrastructure

- **Cellular Signal Improvement.** This year saw the implementation of a Distributed Antenna System on the academic campus, for the purpose of boosting the signal of the 4 major cellular service providers in our area. This past July, signal improvement was achieved for users in Bloomberg and Fuld Halls. Agreements have been reached with all four carriers, Verizon, Sprint, T-Mobile and AT&T. Further expansion of this network is planned for early 2011, and those plans will be discussed in greater detail in the following section.

- **Server Virtualization.** Virtualization continued as a major focus of the Computing groups this past year. All Computing groups now have virtualized servers in production, helping to supplement the availability and reliability of critical service offerings. Work has also been occurring at a rapid pace on a shared platform for managing the campus’s virtualized resources. In addition, a working group of Computing staff has been convened to ensure knowledge-sharing, as well as to help inform the ongoing tactical and strategic planning related to the use of virtualization in our infrastructure.

- **Directory Services Integration/High Availability.** This past year also saw the completion of an important reorganization of the campus-wide directory services system. Operating as an LDAP directory, this system provides low-level interfaces for applications to utilize a centralized authentication database. In practice, this allows for the use of a single password while accessing services provided by both the appropriate school Computing group, and services which are available to the IAS community at-large. As part of this reorganization, two additional features were added. The first is a high-availability configuration for the servers providing this service, ensuring that this critical function is active at all times. Second, was the introduction of the configuration necessary to support federated identity management, a technology which will in the future allow the use of IAS-provided credentials for externally run services.

- **Enterprise Storage Upgrades.** Another round of updates was performed to the enterprise data storage facility now in operation on the campus, to ensure that we are able to continue to provide the necessary disk space for all faculty and members. The system now supports over 200TB of raw data. In addition, the upgrades added significant performance improvements, enhanced the resiliency of the systems to withstand failures and shortened the time needed to backup the data contained therein.

- **Telecommunications Upgrades.** This past August, an upgrade was performed to install the latest version of the operating system software for our campus phone switch. This upgrade ensured that the system remains in a supported configuration as we head into this next academic year. Earlier in the year, the phone desk-set replacement project was also completed, 2 years earlier than initially anticipated.

- **Additional Infrastructure Upgrades.** In addition to the major achievements identified above, a number of smaller projects were also completed this past year. These included:
  
  - The installation of redundant servers providing DNS and DHCP service for the housing campus.
The implementation of a network intrusion detection system to bolster our efforts in preventing unwanted network traffic from affecting legitimate users.

The standardization across all Computing groups on the RT ticketing system for managing support call tracking and problem resolution.

The continued expansion of the wireless network, as well as progress on better mapping of network coverage.

The final, stable implementation of multicast on the campus network.

High Performance Computing

- **SNS High Performance Computing Cluster.** Building on the work done in 2009 to offer the new Aurora HPC cluster, SNS Computing staff spent the past year adding functionality to the system. Improvements were made to the ability of users to access their home directories; more easily submit jobs to the cluster; and to the catalog of software available to assist with processing and analyzing jobs. In addition, the performance improvements described earlier with respect to Enterprise Storage are felt by users of the cluster as well. Also in 2010, access to the Aurora cluster was opened to all faculty and members at IAS, regardless of their school affiliation.

World Wide Web, Campus Databases and Data Integration

- **Community of Scholars.** Significant work continued in 2009-2010 on the Community of Scholars project. Efforts this past year included improvements to the Master List currently available on the IAS website, as well as the development of both an input form used to solicit feedback from former members, and a new “published view” for Community participants which will be released in the near future. Work was also done on several management tools to assist with the ongoing process of keeping the database current.

- **Resource Scheduling.** A project to reshape the campus resource scheduling system was completed. With the goals of replacing the existing Web Event calendar used to reserve public meeting places and improving integration of event information into both campus websites and personal calendaring tools, the new system was released online prior to the start of the 2010 academic year. It can be found online at http://calendar.ias.edu.

- **Web Site Statistical Analysis.** Following the release last October of the new IAS website design, an effort has been underway to collect and analyze the usage patterns of the site. Monthly statistical reports are generated and help to demonstrate how effective IAS has been in communicating with the academic community through the website medium.

Data Security, Business Continuity and Disaster Recovery

- **Reserve Power Upgrades for Critical Areas.** Following the weather-related outages of this past February and March, several upgrades were performed to keep critical areas on the campus running longer with battery backups. Upgrades were done to the UPS protecting the network and telecommunications hubs located in the H-20/Activities Center, now able to run for 18-20
hours on battery, and then longer with a small generator, and also Simonyi Hall’s datacenter, which can now run for over an hour on battery before being shutdown in an orderly fashion, and finally to several areas in Fuld Hall.

- **Updates to Connect-Ed emergency notification system.** Building on lessons learned from the March outage, changes were made to the Connect-Ed emergency notification system to address two shortcomings. First, a group was created in the system to notify only those members of the community living in the Member Housing area, so that more timely and specific updates can be provided to this group without burdening others. Second, the facility for collecting personal information (http://web.ias.edu/UpdateMe) was expanded for members living on campus to be able to provide additional contact information for their companions, so that they, too, will receive Connect-Ed and email notification messages directly in times of emergency.

- **Out of Band Communication.** To ensure appropriate responses to critical events on the campus, Computing has constructed a series of procedures and tools for “out of band” communication. This system is designed to ensure that necessary information is quickly disseminated to all who need it to assist in responding to emergencies or other unplanned outages affecting the IT infrastructure. The system was designed following the February 2010 outage, and utilized successfully during the subsequent March outage.

- **New IT Policies.** As part of the ongoing effort to document IT policies and procedures, several new IT policies were enumerated this past year. These, as with all IT policies, are available on the Office of Information Security website, http://security.ias.edu. New policies included:
  - Log Retention Policy and Guidelines
  - Outbound Email Policy
  - Network Numbering Policy and Guidelines

**Audio/Visual**

- **Enterprise Videoconferencing.** Videoconferencing systems have been installed in both the West Building Seminar Room and the White/Levy Room. These systems allow for standards-based, high-definition video and audio conferencing, and users are encouraged to make use of them as needed. To schedule a videoconference, please be in touch with the Audio/Visual department (av@ias.edu).

- **A/V Infrastructure Improvements.** Work continued on modernizing the Audio/Visual infrastructure this past year. Upgrades were made to many of the digital projectors located around the campus, with several new units installed in new locations. In addition, new HD cameras and recording equipment were added to our inventory to allow for recording simultaneous events occurring on the campus. Audio improvements were also made in the West Building Lecture Hall.

- **Recording Campus Events.** The A/V team has been diligent in video recording public events on the campus and making them available on the IAS Video website. All Institute-wide lecture series, several seminar series within the School of Mathematics, and the Prospects in
Theoretical Physics are just some of the events that have been recorded this past year. The IAS Video website now boasts over 450 videos for viewing.

School-Specific Projects

- **School of Natural Sciences.** This year marks the first time that SNS users are eligible to select a Macintosh-based desktop system, in addition to the standard Windows and Linux variants that had been previously offered. The school also performed several upgrades to critical servers, and migrated their website to the Drupal content management platform.

- **School of Mathematics.** Math Computing completed a major initiative this year, replacing all printers in the school with new, standardized devices. The move also simplifies the management of toner supplies, as all of the new printers use a standard cartridge.

- **Information Technology Group.** ITG began to roll-out desktop computers with the Windows 7 operating system to their PC clients this past summer. The roll-out is expected to go on throughout the 2010-11 academic year.

The accomplishments and efforts listed above, by no means an exhaustive list, continue to provide a testimony to the talent and commitment of the entire Computing staff. Year in and year out, while managing lengthy project lists, complex requests, and heightened expectations, their dedication to the Institute and its mission remains impressive.

2010-2011 Goals and Objectives

As in previous years, Computing has put together an ambitious set of goals for the coming year. While, over the past several years, efforts have been concentrated on upgrading much of the user-facing infrastructure (i.e., network switches, HPC, Audio/Visual improvements), this year’s goals are largely focused on improving the operation and management of services within the datacenter. Our expectation is that these improvements will still have significant impacts for users, most notably in our ability to provide reliable, available and dependable systems.

Following the challenges the campus faced this past winter, a major focus of this year’s efforts will be on issues related to business continuity and disaster recovery. It is both heartening and validating that our strategic efforts over the last several years, namely investments in network and storage products and our adoption of virtualization technologies, will play critical roles in ensuring the availability of IAS Computing resources.

The detailed list of major projects Computing will be working on this coming year is included below.

**Infrastructure**

- **Improved indoor cellular phone coverage, Phase II.** Building on the success of Phase I, signal improvements will be added to the bulk of the remaining buildings on the campus. These include Simonyi Hall, West Building, the Dining Hall, Wolfenshohn Hall and Building D. In addition, we anticipate finalizing our agreement with AT&T in late-2010, and enabling
• **Secure Remote Access to campus computing resources.** Although some schools currently offer secure remote access through tools such as virtual private networking, no campus-wide standard exists. Following the completion of the Directory Services reorganization noted earlier, Computing will now be able to offer secure remote access to campus services and electronic library resources for all schools in a standardized fashion. New VPN hardware has already been purchased, and will be implemented in the coming months.

• **Datacenter high-speed networking.** A major initiative is underway this year across all computing groups to build a high-speed datacenter data network which will serve as the connective tissue of our enterprise storage and virtualized server environments. The network will provide the necessary levels of bandwidth and security to allow for advanced configurations of the identified systems. Most notably, this endeavor will allow us to strategically utilize the various datacenters and server rooms available to provide for the highest levels of service availability possible on the campus. In addition, the effort greatly simplifies the structure of our system backups, allowing for a typically onerous task to be handled in a standardized way with relative ease. Lastly, the effort will allow for significant amounts of traffic to be offloaded from the “commodity” network, providing greater available bandwidth for user-related traffic.

• **Server Virtualization.** In concert with the work being done to provide high-speed datacenter networking, Computing groups will continue this year to increase the number of their services being offered through the virtual infrastructure (VI). In addition, important work will be done on further developing the procedures and tools used to manage our growing VI.

• **Campus Firewall Upgrade.** During this year, the campus firewall systems will be upgraded with both new hardware and software, to ensure that they continue to be able to manage the growing demand placed on them each day. This work is not expected to cause any prolonged outages. In addition, it is our hope that the newest revisions of the software will offer even more flexibility for using non-standard applications, such as VoIP phones or video game systems, from Member Housing.

• **VoIP Infrastructure Review.** As Voice over IP (internet calling software, such as Skype) becomes an increasingly important tool, Computing will evaluate if there are any improvements that can be made to our existing infrastructure for supporting these technologies. At present, most VoIP implementations work well with our systems, but a few require specialized configurations. By performing an analysis of how other institutions are coping with the similar growth, Computing staff will develop a plan for doing so at IAS as well, with our goal being to make it as easy as possible for members to utilize the applications that they prefer.

• **Configuration Management.** As part of the ongoing effort within Computing to document policies and procedures, and produce repeatable outcomes, a working group has been created to focus on the implementation of a campus standard for configuration management. This
technology allows for the fast and easy deployment of new configurations and settings, and has been in use in various ways on the campus for many years. This year, our efforts will be focused on standardizing our usage of various tools, and moving the technology into widespread deployment. With our growing reliance on virtualized systems, the ability to keep system configurations in sync with one another is more critical than ever. In addition, configuration management will create a more standard environment on every server, and reduce the time necessary to deploy new services.

High Performance Computing

- **Performance Acceleration Modules for Storage System.** Utilizing grant funding from the Department of Energy, SNS Computing has purchased high-speed caching cards for its enterprise storage system. The goal of these cards is to improve the performance of disk access by 40-50%. Once installed, these cards will have a major impact on the performance of jobs submitted to the Aurora high-performance cluster.

- **NSF Major Research Infrastructure Grant Proposal.** Two faculty members from IAS, in addition to faculty from Princeton University and several other institutions have taken part in a grant proposal to the NSF for the construction of a new, shared HPC resource. If this grant is awarded, it will serve as the foundation of a new HPC consortium, and allow for greater access to diverse HPC resources for IAS scholars. The decision on the proposal is expected in this academic year, and implementation would begin the following year if funded.

World Wide Web, Campus Databases and Data Integration

- **Photo Management through Gallery2.** Working with the Director’s Office, and the Institute Archives, a prototype of an IAS campus-wide digital photo management system has been developed, based on software called Gallery2. This year, this system will be moved into production, and utilized to manage all workflows related to the use and storage of our digital photography assets.

- **Upgrade to the Online Application System.** Beginning with the applications for the 2011-2012 academic year, the online application system has been updated to work with MathJobs.org and AcademicJobsOnline.org, centralized application systems managed by Duke University. Scholars applying via these systems still complete the same process as other applicants, but receive a benefit in that the IAS system is able to harvest reference letters automatically from these sites. Further front-end updates are planned for this system as well, following the close of the current application cycles for all schools, with an aim of eliminating some of the most common errors or confusions for users.

- **Community of Scholars.** Work is expected to continue on the Community of Scholars. In the coming year, the goals will include the release of the “published view” for community members, as well as improvements to the “public view” for users of the IAS website.
• **“P4” Database Planning.** As the data management environment evolves at the Institute, it may indeed be time to consider the next version of the People Database (currently known as “P3.”) To this extent, Computing will begin the process of planning for this, and develop a project plan for a transition to occur, most likely in the following year.

**Data Security, Business Continuity and Disaster Recovery**

• **Critical Server Co-Location.** Building again on the framework of both our enterprise storage and our VI, Computing will work this year to establish a presence in a datacenter not physically located on the IAS campus. With computing resources located elsewhere, and the necessary procedures in place for automated “failover”, the goal will be to keep the Institute’s, and the School’s websites running, even if the IAS campus is down. These systems are viewed as critical communications tools in the event of a campus emergency, and as such, we will endeavor to ensure that they are running at all times, even when the physical campus cannot support their operation.

• **Crashplan online backup.** Originally researched by the SNS Computing staff, this year Computing will be offering Crashplan, an online backup tool that can easily backup laptops to a remote server, to the IAS community. As this service becomes available for each school, your school IT groups will be communicating with you about how you can begin to make use of it.

**Audio/Visual**

• **Simonyi Hall Improvements.** Several improvements will be made to the audio/visual system in the Simonyi Hall Lecture Hall. These include a new projection screen and digital projector, as well as a new lecturn equipped with touch-panel control for operating the projector, screen and room lighting, and also improved audio and video playback capability. In addition, fixed-position video cameras will be installed to facilitate easy recording of events.

• **Desktop Videoconferencing.** With the completion of the large-scale projects in West Building and White/Levy, an effort is also underway to provide a simplified way for members to initiate and take part in peer-to-peer videoconferencing sessions, and collaborative work environments. A number of potential software solutions are being tested, and the best will be deployed during this year for all to benefit. This will also tie into the analysis of VoIP infrastructure mentioned earlier.

**Conclusion**

The projects outlined in this report are strategic, targeted improvements to our infrastructure and service offerings designed to improve availability, simplify usage, increase efficiency and reduce costs. They are all being undertaken to ensure that we continue to meet our primary goal, that of providing
excellent service to the Institute Community, for many years to come.