2006-2007 Year in Review

This past academic year was a challenging one for Computing at the Institute for Advanced Study. Much of the year was spent in a transitional state, as a leadership change was initiated in September, 2006 with the departure of Rush Taggart, and completed at the end of January, 2007, with the hiring of Jeff Berliner as the new Manager of Computing.

The year, however, remained a productive one for the campus computing groups, as they worked together to meet several key goals that had previously been outlined. The accomplishments included:

- **Technology planning for the Bloomberg Hall extension.** This included not just ensuring that the new offices would be appropriately configured for Faculty and Members, but also the design and layout of the new Computing space on the ground floor of the extension. This space includes a new 900 square foot central server room, which will house most of the campus’ critical servers once completed in 2007.

- **Initial roll-out of web Content Management System.** The Midgard web content management system was installed, and now manages many of the Institute’s central web pages. The system allows for the separation of the content and design of the Institute’s web pages, while providing a straightforward facility for updating content. In addition, it offers several features for generating dynamic content for the web from various campus data sources.

- **Centralized License Server.** A new centralized license server has been installed to allow for easy access to concurrently-licensed software packages (such as MatLab). This was a collaborative effort involving the ITG, Math, and SNS groups, who had all previously operated independent license servers.

- **Campus Network redesign.** A large project was initiated to review and revise the layout of the campus local area network. A new plan was developed, and the new configuration implemented over the course of this past summer. The upgraded design simplifies the system used for addressing campus computers, clarifies the boundaries between the academic and residential networks, lays the foundation for advanced multimedia technologies, such as multicasting, and reduces the risks for campus-wide outages caused by malware-infected hosts.

- **Wireless Network upgrade.** A new management system for the wireless network on campus was deployed, to simplify the management of the over 90 access points currently installed around the Institute. This new system provides improved reporting capabilities, allowing networking staff to best identify the strength of the wireless signal throughout the campus, and proactively ensure that signal quality is available where it is needed.

- **Improvements to network Self-Registration system.** A new version of the “Self-Reg” system was released, simplifying the process of self-registering a computer for use on the campus network. The new system automatically detects many of the necessary data elements required for registration, no longer requiring users to enter the information themselves. Upon attaching a new computer to the network to be registered, a user need only enter their name and email address and click “register”.

- **Data Security Improvements.** Brian Epstein joined the Institute in his role as Network Security Officer, and several network and data security improvements have followed. These include the installation of an intrusion prevention system for the residential network, the
creation of a PGP “web of trust” for use in secure communication, initial penetration testing for critical servers, and the review and reshaping of various data security policies and procedures.

- **Increased in-house training.** The year saw the continued growth in the curriculum of in-house training courses offered by Computing, largely through ITG. New courses this year included training for Blackberry devices, and working with the Midgard CMS, as well as continued training in several areas, including Microsoft Office, Adobe Illustrator, Scanning and OCR.

- **Audio/Visual Upgrades.** In collaboration with the Administrative Services group, several improvements were made to the Audio/Visual systems on campus, including the upgrade of the main video mixer used to record lectures, and improvements to the hardware and software used for processing videos for publication on the Web.

In summary, through a difficult and lengthy transition, the group managed to remain focused on its primary mission of providing service and support to the Institute’s scholars and administrators, in addition to making technological progress in many areas, and meeting many of their stated objectives for the year.

### 2007-2008 Goals and Objectives

Continuing the growth outlined above, the upcoming year will be one of the busiest ever for Computing at IAS, with upgrades planned across a wide array of our systems and services. This section will outline many of these changes, and their intended impact on the Institute community.

#### Physical Space

The foremost project within computing this year is the upcoming relocation of most Computing services to the new Bloomberg Hall extension. With the exception of the Mathematics Computing group which will remain in Simonyi Hall, all remaining Computing resources will now be located in Bloomberg. In addition, the newly constructed server room will house systems for the ITG, SNS Computing, Databases and Integration, and Networking groups. In most cases, this will entail relocating these systems from their current locations in either Fuld Hall or Building A.

The move of staff is expected to be completed during October, with the move of systems expected to occur in a phased approach, and be completed in the 2007 calendar year. In addition, many projects identified below are dependant on new space and environmental resources made available by the newly designed server room.
Organizational Structure, Personnel and External Resources

Several critical changes are planned for this upcoming year related to the current organization of Computing. These changes are as follows:

- SNS Computing will assume the responsibility for supporting the computing needs for faculty and members of the Simons Center for Systems Biology. To accommodate this new arrangement, an additional staff position has been created. This new position, for a Linux Software Support Specialist/System Administrator, will report to James Stephens, the SNS Computing Manager, and will assist in the design, installation and support of a new high performance cluster.

- Several changes are taking place within the Databases and Integration group. David Hernandez has been promoted into the position of Web Programmer, and is now a member of this group. In this role, David will provide much-needed programming resources, provide critical backup for existing applications, and work closely on new endeavors related to the Institute’s web presence with the Director’s Office. In addition, the Databases and Integration group, managed by Edna Wigderson, will assume the responsibility for the Midgard content management system project and other duties related to the IAS website.

- Telecommunications functions, which have previously been provided through an annual support contract, will be moved in-house. As part of a restructuring set to coincide with the expiration of our existing support agreement in March, 2008, a new part-time Telecommunications Technician position will be created for Jim DeBeer. He will join the Networking Group and continue to provide service and support to the Institute phone system. This new structure will provide the Institute with at least five hours per week of additional phone support, at a reduced cost.

- As of July, 2007, the Institute has become a subscribing member of the NJEdge statewide academic computing consortium. Membership in NJEdge will offer several benefits to IAS, including network connectivity and bandwidth upgrades, enterprise video conferencing services, and consortium pricing benefits with several key vendors and service providers. Further details about how we will be integrating this new relationship are included in many of the project descriptions in this report.

Infrastructure

As the campus network continues to be a fundamental tool for most Institute personnel, it accordingly remains a high priority for Computing. Several network and server upgrades planned for this year are outlined in this section.

- Selection of Cisco Systems as campus networking vendor. Following a re-evaluation of networking needs that was performed during the summer of 2007 by the Networking Group, in coordination with SPC, the group has identified Cisco as the best positioned vendor to provide...
equipment for our on-campus network going forward. Cisco gear is already used to manage the residential and wireless networks on campus, and will replace, over a 2-year period, the existing Foundry Networks gear currently deployed in the academic buildings.

In addition to the many benefits of standardization, the move to Cisco will also allow for the use of multicasting technology throughout campus. This proved to be an unattainable goal for Foundry Networks, and is in large part responsible for the decision to change course.

During this year, Cisco gear will be installed at the network core, as well as in several academic buildings where multicast is not available today. The following year, the remaining Foundry devices, which will be due for upgrading at that time, will be replaced as well. Beyond multicasting, the move to Cisco will enable the provisioning of gigabit (1000Mb/s) Ethernet to the desktop, as well as an upgraded campus backbone, supporting a throughput of 10Gb/s.

- **Internet2 Connectivity.** Through our new relationship with NJEdge, the IAS network will now provide access to the Internet2 (I2) high-speed academic research network. This connection will facilitate high-speed data transfers from other I2 sites, allow access to the Internet2 Commons remote collaboration service, as well as provide a redundant connection from IAS to the commodity Internet. Utilizing two top-tier providers, Sprint and UUNet, will ensure that we have capable Internet connectivity at all times.

- **Campus-wide Anti-Spam improvements.** The Networking Group, as part of a larger effort undertaken by SPC to simplify our email infrastructure, will deploy a new appliance known as the Proofpoint Message Security Gateway. This new device provides industry-leading spam and virus identification capability, which easily integrates into the existing strategies in use by the schools’ computing groups. In addition, it provides increased flexibility and new tools for the management of email security. This upgrade is scheduled in two phases, the first phase, including the new anti-spam tools, will be completed in October, with the second phase completed in November.

- **Enterprise Video-Conferencing.** In another demonstration of the benefits afforded to IAS through our new relationship with NJEdge, we plan to make significant progress in the provisioning of enterprise video-conferencing services this year. Through NJEdge, we will gain access to two different video conferencing architectures, Internet2 Commons for collaborating with other I2 sites, and the NJEdge Video MCE, which allows any Internet user to connect. Additionally, working with NJEdge technicians, we will certify video “codecs” (videoconferencing stations) in several meeting rooms on campus, as well as create a portable codec which can be used from any network connection on campus.

- **Outdoor Wireless Access.** Building on the recently completed upgrade of the wireless network, the Networking Group will be looking to establish reliable wireless connectivity at the Institute’s many outdoor meeting areas on the academic campus.

- **Server Upgrades.** With new room for growth provided by the new server room located in the Bloomberg Hall extension, several new servers will be installed this year. A new pair of
servers will be deployed in support of our growing demand for database technology, providing a fast and highly available platform for the consolidation of many critical systems, such as P3. New servers will also be deployed in conjunction with a planned upgrade of the Midgard CMS system.

High Performance Computing

As in other areas, there will be much work being done in support of high performance computing (HPC) this year. The two existing HPC clusters on campus, the Scheide Beowulf Cluster in the School of Natural Science, and the IBM Cluster in the Simons Center for Systems Biology, will be retired during this year, after many years of service. They will be replaced with a newly designed cluster expected to be in service this spring, and available to all SNS faculty and members, including those in Systems Biology.

Housed in the newly constructed server room located in the extension to Bloomberg Hall, the new cluster will provide a vastly superior platform for computation than its predecessors. Made up of 64 nodes (compared to 48 in the Scheide Cluster), possessing 128 CPUs, 256 “cores” and over 512GB of RAM, the new cluster is designed to meet and exceed the demands of members for years to come. Whereas the Scheide Cluster measured 0.3 TFLOPS (300 GFLOPS) using the standard LINPACK measurement, the proposed new cluster will exceed 1.1 TFLOPS, virtually quadrupling our processing capacity.

World Wide Web, Campus Databases and Data Integration

As previously reported, the Databases and Integration Group has grown in size, and consequently has many projects planned for this coming year. Building on the successful roll-out of the Online Applications system, the group will be focusing on improving other critical workflow issues. These projects include:

- **Community of Scholars.** Working with the Director’s Office, a plan has been established for creating an online version of the printed *A Community of Scholars* publication. This online community will provide a web-based portal for former members to remain connected to the Institute, and with one another. By developing and offering former members a menu of services available through this system, we hope to engage them and through their continued participation ensure that our databases remain current and accurate. Proposed services currently include email forwarding, reference access to the IAS directory, access to IAS digital content and discussion groups.

- **Resource Scheduling.** The group aims to address a major issue this year, by releasing a new system for reserving Institute meeting spaces, and associated services (such as facilities, audio/visual or catering.) Working with on-campus service providers, and administrative officers from each school, a new database-driven, web-based event calendar/room reservation system is being designed, which will include an engine to facilitate securing the appropriate
campus services. The system aims to reduce the complexity in the current scheduling system, provide modern online public and private event calendars for the community, and ensure that any communications related to the scheduling and planning of an event are received as intended, documented and available to interested parties on demand.

- **Web Content Management Systems roll-out.** Continuing the project which began last year, the Midgard CMS deployment will be completed. Ensuring that all administrative sites are under content management, and including content from beyond the Director’s Office are both goals for this coming year. Under the aegis of the new Web Programmer, we will also begin to make better use of the system’s complete feature set, including new ways for deploying dynamic content. Lastly, an upgraded version of the Midgard system will be installed this year, to coincide with the roll-out of new server hardware, and the 2008 update to the Institute’s homepage.

- **P3 Database.** The P3 personnel database continues to grow in its role on campus as the preeminent source of data for active Institute personnel. This year, we will also be adding a historical dimension. We will be incorporating historical data from many distributed data sources around the campus to improve the quality and availability of the information, and enhance the workflows related to its collection and usage. Our goals this year also include the creation of additional reports, to be made available to schools and other administrative areas, the creation of a training curriculum for P3 users, and improved online documentation for the system.

- **Online Lecture Multimedia.** A group of staff from Computing, Administrative Services and Public Affairs, taking technical direction from Thomas Uphill, has developed a new system for quickly publishing multimedia (video and audio) of lectures which have taken place on the IAS campus to the Institute’s website. A special page has been created to highlight the newest content, as well as allowing a user to browse, search and sort the library of existing content. In addition, a process has been developed to quickly process any captured video, so that it is available online shortly after the completion of the initial presentation. Another new development for this year will be the availability of content in podcast format.

- **Digital Asset Management Database.** Several small projects related to the storage and uses of digital assets which are due to take place this year have been combined under the umbrella project of Digital Asset Management. These small projects include a database to track Institute artwork, a database to catalog the documents and images used on the Institute website and its print publications, and even the archiving of the online multimedia previously discussed. Also seeking a long-term, integrated solution, a group of SPC members has formed a small committee to evaluate our needs against the commercially available DAM products, to see which may address our needs.

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

Although the topics of security and business continuity have been addressed in part elsewhere in this
document (such as the redundancy provided through the NJEdge network connection, the deployment of new database servers, or the Proofpoint Message Security Gateway), this section will further outline the initiatives taking place this year, dedicated to providing the Institute community with a safe, secure and highly available computing environment.

- **Intrusion Prevention System Upgrade.** Although IPS technology has been in use for the past year, an evaluation is underway to ensure that it is being used as effectively as possible. The new IPS that is identified by the evaluation, tied in with the move to Cisco Systems as our core network provider, will be deployed later this year. This will ensure that our networks continue to be protected from the latest computer viruses, spyware, and other newly evolving malware.

- **Server Penetration Testing.** Recommended as a best-practice by many digital security experts, the Networking Group has begun to schedule routine network penetration testing. Coordinated with system administrators from each school, tools are run which scan critical servers for known vulnerabilities, and produce reports with their results. These tests, also run on new systems prior to deployment, help to ensure that our systems and the data that they contain remain secure from computer security threats.

- **Server Load Balancing.** As the dependence on network services (such as email, web, or authentication services) grows, it becomes more important that these services be available to the community at all times. Although many of our services are run on multiple servers which provide redundancy, and as described earlier more will follow during this year, we do not currently have a fail-safe way of ensuring an orderly transition of service should one of the redundant servers fail. This year, a new hardware load-balancing device will be installed by the Networking Group to ensure that the “failover” between the redundant servers happens seamlessly, and without loss of connectivity for our users. This is a critical component of a highly available architecture.

- **Secure Certificate Authority.** An Institute-wide secure certificate signing authority will be established, allowing for the proliferation of SSL certificates for online services. These certificates allow for secure, encrypted communication between clients and servers. In the past, for internal services we have used “self-signed” certificates which in most cases require the user to perform additional steps before securing the communication channel. This project aims to standardize our process to work better with existing clients.

- **Offsite Tape Storage.** All campus computing groups will continue to produce periodic backup media which is stored securely off-site, to ensure that even in the event of a physical disaster on the IAS campus, our data can be recovered at a later date.

- **Disaster Recovery Site Planning.** Through the NJEdge consortium, we hope to identify adequate space to one day host a critical compliment of IAS servers, capable of providing service even during physical outages to the IAS campus environmental systems. Although such a site is not expected to be operational this year, planning will begin, and allow for a more detailed project plan to be developed.
School-Specific Projects

Though this report has mainly focused on projects with an Institute-wide scope, many exciting new initiatives are also taking place within the various schools. The highlights of these include:

- **SNS Computing.** While much work will go into the creation of the SNS/SCSB partnership discussed above, this year SNS Computing has begun distributing Apple Macbook laptops to members for the first time. In addition, this November, they will be conducting their annual member survey to ensure that service needs are being met.

- **Mathematics Computing.** Within the School of Math, new workstations have been deployed in member offices. A new blade server is being installed to meet the growing demand for server resources. The blade technology was chosen to minimize the draw on the limited environmental resources within the Simonyi Hall computer room. As the only group not moving their systems to the new server room, an effort will also be undertaken to ensure that the environmental systems in the Simonyi Hall computer room remain sufficient for supporting the equipment therein. If required, additional cooling and power will be installed.

- **Information Technology Group.** In their support of members in the Schools of Historical Studies and Social Science, ITG will be making several upgrades to their services. Later this year, they will begin to provide Apple computers for members who prefer to work on the Macintosh platform. For their Microsoft users, the upgrade to Windows Vista is planned for this summer. Lastly, a new server for managing email is being evaluated, and will likely be installed in this academic year, following the relocation of their server resources to Bloomberg Hall.

**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.