**Introduction**

The purpose of the Computing Annual Report is to provide a concise summary of the major projects and initiatives on which the Computing team worked over the past year, as well as to introduce our areas of focus for the current year. Thank you for spending some time to review this report. Should you have any comments, or any questions or concerns arise, your feedback is always appreciated.

The 2017-2018 Year in Review section of the report will highlight our accomplishments from the 2017-2018 academic year. IT advancement this past year continued to be focused on expanding the services offered to scholars, improving the operational functions of the Institute’s administration and ensuring the effective security of our information systems and the data contained therein. Highlights include work on the Albert digital repository, the completion of the Lights-Out Datacenter and the introduction of wireless printing. Full details of these and other projects are included below.

Following that review, the 2018-2019 Goals and Objectives section will focus on our priorities and goals for the current academic year. Planned work continues on the themes identified above, including continued focus on new and improved services and support for members, new administrative information system integrations, and a focus on improving continuity for critical business functions, such as email and collaboration. These projects will also be outlined in detail below.

**2017-2018 Year in Review**

**Organizational Structure, Personnel, and External Resources**

On January 2nd, Computing was pleased to welcome Jordan Pisaniello into the role of System Administrator within the Mathematics Computing group. Reporting to Kevin Kelly, Jordan’s responsibilities include supporting the daily operation, maintenance and security of servers, workstations and other devices, as well as participating in many of the projects discussed throughout this report.

In other personnel-related news from this past year, Christopher McCafferty has been given the updated title of Software Engineer, to better reflect the evolving responsibilities he has within the Databases and Integration team. As well, Maria Mercedes Tuya, Software Support Specialist, is now focused full time on supporting scholars working in the realm of digital scholarship, and their projects.

As always, the entire community benefitted from the hard work of several contractors, interns and summer students. This past year Julian Arzadon, Marcus Armenti, Jonathan Bernstein, Nicholas Helmsetter, Christian Joachim, Augustine Lanzetta, Marlon Mayor, Kenneth Roberts, Amanda Rubin and Samuel Tucker all contributed their efforts.

Organizationally, this past year IAS joined two additional technology-focused consortiums. First, in March, we joined NERCOMP, the Northeast Regional Computing Program. NERCOMP membership provides access to discounted licensing and consortia pricing on software and services. This membership has already led to savings and access to new services for the community. In addition, this past summer we also joined TechSoup, a group which manages access to licensed IT services for non-profit organizations. As you will read, both memberships align with our strategic goals for the coming year, and will provide for the most cost-effective solutions to planned projects.
One immediate example, leveraging our NERCOMP membership, IAS was pleased to introduce access this summer to LinkedIn Learning (formerly Lynda.com). Available to all faculty, scholars and staff, LinkedIn Learning is a resource for online training on a wide variety of subjects, all of which can be accessed through your standard IAS account credentials. For access, click on the LinkedIn Learning link found at:

- https://www.ias.edu/campus/training

Finally, to raise awareness of and provide better access to the full scope of services and support offered to the campus community by IAS Computing, a new IT Service Catalog section has been added to the Computing website. This resource provides a categorized view of all IT services, with quick links to critical information or login pages. It can be viewed at:

- https://www.ias.edu/computing/services

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

- **Lights-Out Datacenter (LODC).** The LODC, backed up by generator power in the event of a power failure on the main campus, improves the reliability of our network connections, both wired and wireless, and ensures availability of critical network services. This past summer, the final phase of the multi-year LODC project was completed, providing for full redundancy for the campus Internet connection and network core. In addition, Computing staff continue working to engineer greater resiliency into existing services making use of the LODC.

- **Improved Secure Remote Access.** Another major milestone this past summer was the introduction of OpenVPN, a new platform for secure remote access to IAS network resources. OpenVPN provides a faster and more reliable VPN service than its predecessor Pulse Secure, as well as offering improved compatibility and enhanced security. More information on OpenVPN and its installation is available at:

  - https://www.ias.edu/openvpn-installation-guide

- **Secure File Transfer (FileLocker).** Another new tool introduced this past year is FileLocker. FileLocker provides for a secure method to distribute files to individuals or groups both inside and outside the IAS community. The service, and details for its use, can be found online, at:

  - https://filelocker.ias.edu

- **Updated Privacy Statement.** In response to the launch of the European Union’s General Data Privacy Regulation (GDPR), an effort was undertaken to rewrite the Institute’s privacy policy in GDPR-friendly language. Though nothing about the underlying policy has changed, this new language is available at:

  - https://www.ias.edu/privacy

- **Multifactor Authentication Pilot Project.** A pilot project is underway testing ways in which
we can better secure the Institute’s systems through the application of Multifactor Authentication (MFA) technology. To facilitate this, Computing staff have implemented Duo, a leading MFA security platform, in use widely across the higher education space. More on the long-term plans for MFA will be discussed in section two.

- **Identity Access Management.** A number of initiatives were completed related to Identity Access Management. Most notable was an upgrade to the Central Authentication System (CAS), which provides for single sign-on capability to several IAS applications. In addition, planning and initial work has begun on a project for improving the directory services on campus. Identity management will be a key theme of the upcoming year, and will be outlined more thoroughly in the next section.

- **New Secure Certificate Provider.** In an effort to ensure the continuous protection of our websites and applications, this past year the decision was made to shift to a new provider for secure certificates. For this purpose, Computing is now leveraging the InCommon Certificate Service.

**Infrastructure**

- **Network Switch Replacement.** As part of the ongoing cycle of network hardware upgrades, several campus buildings had their network switches replaced during the year. This includes Simonyi Hall, A Building and the cluster of buildings on South Olden Lane (ECP, 310, 320, etc.) on the academic campus, as well as the final set of Member Housing buildings, completing a full upgrade over the past three years. In addition, the Network Administration team continues to upgrade and install additional wireless access points, 80 this past year, across the campus to ensure ubiquitous access to the network. Finally, to continue to outpace demand, network links between the academic buildings and the network core were upgraded to 20Gb/s.

- **Wireless Printing.** To address the demand to access the IAS printing infrastructure from laptops and wireless devices, the PaperCut wireless printing system was deployed. Via PaperCut, users with IAS network credentials can print from their mobile computing devices by selecting the appropriate printer, and logging in when prompted.

- **Federated Authentication.** A major push was underway this past year to integrate more services and applications into the Institute’s federated authentication infrastructure. This system allows the use of IAS-provided user credentials to access commercial systems, and also helps to implement single sign-on capability across these systems. To date, federated logins are available for many IAS-built websites and applications, as well as tools such as HathiTrust, LinkedIn Learning, Zoom, ReviewSnap, and more.

- **Cable Plant Upgrades.** In addition to the replacement of network hardware, the Network Administration team continues to maintain and improve the Institute’s data and telephone cable plant. This past year, new fiber optic cabling was added between Fuld Hall, Simons Hall and West Building, and further maintained in Fuld Hall, Bloomberg Hall, ECP, Simonyi and Faculty Housing.

- **Other Infrastructure Improvements.** Highlights of additional infrastructure projects that were completed this past year include:
  
  - **Faculty Housing.** Final configuration and connection was completed for the Institute’s
eight new faculty housing townhomes.

- **Investment Office Relocation.** IAS Computing supported the relocation of the Investment Office to their new space in New York City, ensuring the continued operation of their telepresence environment as well.

- **Marquand House.** Networking components in Marquand House were upgraded, and brought into alignment with the main campus this past year. Guests in Marquand House now enjoy seamless connectivity to the IAS network.

- **PCMI Wireless.** Network Administration orchestrated the improvement of wireless service for the annual Park City Math Institute Summer Session in Park City, UT. In partnership with Pop-Up Wifi, the network access for conference participants and administrators was greatly improved from previous years.

**World Wide Web, Campus Databases and Data Integration (D&I)**

- **Institute Website.** The continued development of the Institute’s website remains a major focus. This past year improvements continued to be delivered which enhance both the capability of the site, and the ease of administration for content contributors.

- **Administrative Computing.** This past year was another extremely active year in the ongoing upgrade of the administrative computing environment.

  - **Event Management.** Under the aegis of the newly convened Events Committee, Computing has completed the implementation of the SchoolDude Facility Scheduling Direct module, which manages information related to the staging of campus events and improves the flow of event-related communication.

  - **Performance Management System.** In support of Human Resources’ roll-out of a new process for annual staff performance reviews, Computing partnered with HR to implement and roll-out the ReviewSnap system. This tool will provide a convenient online implementation of HR’s improved performance management process, and make the information available to managers and employees year-round.

  - **Purchase Requisitioning System.** To coincide with changes to the Institute’s procurement and purchasing policies, Computing and the Business Office have implemented the Nexonia purchase requisitioning tool, and integrated it into the Netsuite purchasing and financial management platform.

**High Performance Computing (HPC)**

Earlier this summer, Natural Sciences Computing completed the implementation of the new Helios cluster. Helios is the 3rd generation of the Institute’s on-premises HPC program, and represents the fastest and most powerful system provided to date. Coinciding with the implementation of the new cluster hardware were improvements to the network connectivity of the cluster nodes, as well as modernization of the job submission and queue management systems. Helios provides scholars with access to 64 nodes, each with 28 cores and 128GB of memory, in addition to connectivity to a high-performance file system, and an array of ancillary servers for analysis and visualization. For more information, please see:
Digital Scholarship at IAS (DS)

- **Albert Digital Repository, Phase 2.** Significant work was done on Albert, the Institute’s open-access digital repository. Improvements added in this second phase include the integration of the Mirador inline image viewer for media objects; the customization of displays across different collections; processes for batch importing and harvesting objects from existing repositories, and more. In addition, several new collections of documents were added to the system, and it was also opened to include scholarly works from long-term members, in addition to the faculty and emeriti.

- **ORCID Integration.** In conjunction with the Albert project, last year, IAS joined the ORCID consortium, and this past year, completed an integration with ORCID. Through UpdateMe, IAS scholars can use this integration to connect their ORCID profiles to their IAS identities, and enable IAS to, in the future, access and update their ORCID profiles with relevant data. All scholars are encouraged to create ORCID ID’s for themselves, and add them in UpdateMe. For more information, see:

  ➢ https://www.ias.edu/campus/computing/orcid

- **Digital Scholarship Conversations.** For the second year, IAS Computing oversaw the planning for the Digital Scholarship Conversations seminar series. This past year, four talks were held on topics ranging from specific applications and tools to broad policy concerns related to digital scholarship.

- **Support for Projects in Digital Scholarship.**
  - **Zaydi Manuscript Tradition (ZMT).** The second version of the ZMT Portal software was released this past summer, improving navigation, adding mobile device support and implementing a search function to target manuscripts within the growing manuscript collection. See:

    ➢ https://www.ias.edu/digital-scholarship/zaydi_manuscript_tradition

  - **Krateros, Squeezes of Greek Inscriptions at IAS.** This past year, Krateros, the Squeeze Digitization project got underway, and has proceeded to digitize hundreds of squeezes from the Institute’s unique collection and make them available online. This project is supported by the Albert repository platform, and the recent integration of the Mirador viewer. The open-access collection can be viewed at:

    ➢ https://albert.ias.edu/handle/20.500.12111/120

Media Technology Services (MTS)

- **Ad-hoc Videoconferencing Services.** Another improvement from this past summer was the roll-out of Zoom to provide videoconferencing services to all IAS users. Through Zoom, anyone with IAS network credentials can host one or more remote participants in a video call.
conference, as well as have access to cutting-edge collaboration tools including screen sharing, digital whiteboard, conference recording and more.

- **Audio Improvements in Wolfensohn Hall.** A new soundboard and audio processing system was installed in Wolfensohn Hall to support the growing demands for high-fidelity audio in the space. This work improves the quality of the audio in the hall, improves our ability to capture audio for recording and streaming events, and adds flexibility for additional microphone positions or instrumentation.

- **Audio/Visual Improvements in Simonyi Hall Lecture Hall.** Beyond Wolfensohn Hall, improvements were also completed in S-101, including a new lectern, new audio capture system to allow for Q&A sessions to be recorded in full, and improvements to audio and video cabling. Similar improvements were made in S-114 with the installation of a new ceiling mounted projector and projector screen.

- **Live Event Streaming.** Also this past year, live-streaming of campus public events was added as a standard service for MTS. Streaming for events is done in collaboration with our Internet provider, NJEdge.

IAS Computing’s chief objective is to support the IT needs of scholars, scientists and staff of the Institute. The projects identified above, with their focus on improved operational efficiency and manageability, directly increase our ability to provide the resources necessary to continue to meet this ever-evolving goal.

**2018-2019 Goals and Objectives**

Beyond the day-to-day support for scientists and scholars, and the general upkeep of the technical infrastructure, the attention of the IAS Computing team will be focused on two major areas in the 2018-2019 academic year. Foremost is the focus on the future of email at IAS, specifically around improving collaboration and continuity within this critical space. The second is a major effort to review and improve the tools and procedures related to identity management for the IAS community, including several overlapping priorities in the information security realm.

These two themes, and the projects and tasks that encompass them, are intended to ensure that the community both now and in the future will be able to depend on technology to achieve their academic goals, and do so confident of their safety and security. Details of these efforts and many others, currently underway or planned are included in this section.

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

- **Campus Email Service.** As noted above, a major focus this year will be on engineering the future of email for the IAS campus. This effort will incorporate several projects, including:

  - **Email Server Consolidation.** One key effort will be consolidating the campus from three disparate email silos to a single enterprise platform. As part of this work, Computing will work to ensure compatibility for existing users, and also offer improved
functionality for collaboration and contact management to much of the campus. At the same time, the move to a single platform will allow for better security and simplify the flow of email to and from the campus, which will eliminate unnecessary obstacles and improve delivery times.

- **Improving Email Continuity.** While moving to the unified platform, Computing staff will also be taking steps to improve the availability of email in circumstances where the Institute’s primary data center is offline. As part of this work, a number of configurations are being reviewed, tested and scrutinized for the optimal solution for both now and the future. Once again, a key aspect of this work will be ensuring backward compatibility with existing email systems and configurations.

- **Identity Management (IdM).** Broadly, identity management refers to the set of organizational procedures which oversee the identification, authentication and authorization of network users. In addition to governing their access to systems, IdM technologies also oversee assignment of permissions and roles within applications, and the governance of this information across the organization. IAS Computing has been focused on IdM for several years, and will be taking the following steps this coming year:

  - **Consolidated Directory Service.** In addition to consolidating to a single email platform as described above, work will be completed this year on the effort to consolidate to a single directory service for the campus. This simplification will allow for the maximal compatibility with core services, and create opportunities for data-driven workflows to replace manual management tasks.

  - **Multifactor Authentication.** Already available on campus as part of a pilot project, this academic year will see the move to mandatory multi-factor authentication for access to certain Institute services. In particular, this will focus initially on secure remote access, and on access to services which protect sensitive data. As noted earlier, this past year, Computing staff have worked to put in place the infrastructure to support this service, based on the Duo platform. Much more information on the roll-out of multifactor will be available as the term progresses.

  - **Federated Authentication Services.** Building on progress from the past year, this coming year, Computing will again be focused on increasing the number of services which utilize single sign-on technologies. These tools allow users to securely login to centralized and 3rd-party services using their standard IAS credentials. Throughout the year, as new services are added, they will be configured accordingly, and existing services will continue to be reconfigured where possible.

**Infrastructure**

- **Rubenstein Commons.** Work will be completed this year on the initial IT infrastructure for Rubenstein Commons. This will include laying the groundwork, and physically connecting the building to the existing wired and wireless networks, as well as configuring all of the new spaces in the building to support their intended functions.
• **Digital Signage.** A pilot project will be started this year, testing digital signage technologies within the School of Mathematics. If successful, the program will be implemented campus-wide in the following year. The new touchscreen-based signage will aim to replace existing photo boards and flyer displays, and also be configurable to provide timely information to targeted campus areas, as well as provide on-demand information on a range of topics.

• **Next Generation Network Planning.** Computing staff will begin a multi-year effort to design, build and implement the next generation of the Institute’s data network. In partnership with Cisco Systems, and based on the concept of software-defined networking, this coming year the project will focus on envisioning the ideal structure of the future network, and beginning to lay the groundwork for an implementation and migration in years to come.

• **Other Infrastructure Projects.** In addition to the above, a number of additional infrastructure projects will be completed, including:
  
  • **Wireless Network Expansion.** As in all years, the wireless network will continue to be upgraded and expanded, with approximately one quarter of the campus access points being updated.

  • **Uninterruptible Power Supply Replacement.** The UPS which supports the Fuld Hall network point-of-presence will be replaced this fall. The new unit will provide appropriate power protection to Fuld-based network resources, in light of the completion of the LODC project discussed in section one.

  • **Point-of-Sale Terminal Upgrade.** In partnership with Administrative Services and Dining Services, Computing will be working to install upgraded point-of-sale terminals in Simons Hall.

  • **Facilities Controls System.** In partnership with the Facilities group, a new facility controls platform, Trane Ensemble, will be installed. This upgrades and replaces dated software that is used to monitor and manage the Institute’s facility plant, including air handlers, chillers, and other mechanical systems.

**High Performance Computing**

• **Parallel Filesystem Replacement.** This coming year, the first-generation parallel filesystem currently in use will be upgraded. Specifications for the replacement system are being identified, and implementation is expected to occur in the Summer of 2019.

• **Helios Cluster Realignment.** Following a series of discussions with interested users, a number of configuration changes have been planned for the Helios cluster, in order to bring it more in line with similar resources at Princeton University. In particular, these changes are aimed at binary compatibility between the two environments, as well as improvements in the number of packages and libraries available. In addition, new configurations will allow for interactive nodes and simplified job submission.
• **Globus Online Subscription.** This fall, IAS will begin a subscription to the Globus Online data transfer service. Globus Online is a service which efficiently and securely allows the transfer of large datasets between connected institutions. Practically, this provides a way for HPC users to move their data to and from larger supercomputing sites for job submission or data analysis.

**Administrative Computing Environment**

Part of ensuring that faculty and members are able to fully concentrate on their scholarship during their time at IAS is ensuring the smooth and efficient operation of the Institute’s administration. In recognition of this, IAS Computing will continue to focus on projects which improve the processes and procedures that govern the Institute’s various administrative entities. This coming year, these will include:

- **Event Management System.** Building on the limited roll-out in use for the past year, this academic year all campus events requiring campus services (setup, catering, A/V, etc.) will be coordinated through the SchoolDude event management system. This system coordinates event-related communication and efficiently updates all interested parties on last-minute changes and plan revisions.

- **Adaptive Insights Budget Planning Upgrade.** Work will be completed this coming year on an upgrade to the Institute’s budget planning system, Adaptive Insights.

- **Housing Management.** An effort will also begin to research, identify and implement new tools to help manage the Institute’s administration of its housing resources.

**World Wide Web, Campus Databases and Data Integration**

- **Member Onboarding Improvements.** A campus-wide effort is underway to streamline the collection of administrative information needed from incoming members and visitors prior to their arrival. Planned for the 2019-2020 Institute-year cohort, the UpdateMe tool will be expanded to collect all necessary information and properly route it to the appropriate authorities within the administration. In addition to improving efficiency for incoming scholars, this will also allow for better tracking and follow-up on behalf of the administrative departments and school administrators.

- **P3/RaisersEdge Integration.** Work is underway to better integrate two of the Institute’s core information systems, P3, the campus’ academic and operational database, and RaisersEdge, the fundraising and alumni management system. Work this year is expected to produce scheduled programmatic transfers of pertinent information, with the ultimate goal of a seamless information environment between the two systems.

- **IAS Website.** As always, updates to the IAS website will continue to be an important focus of the Databases and Integration team within Computing. This coming year, planning will be underway for the upgrade of the underlying content management platform, Drupal. This major
version upgrade will require significant code refactoring and also include the consolidation of smaller microsites into a single management framework.

**Digital Scholarship at IAS**

- **Albert.** This coming year, the team will be focused on the third phase of the Albert project. Goals for this phase include expanding the universe of scholars able to publish in the repository, replacing the outdated “Publications” database, and developing deeper data integrations with external repositories. Albert can be found online at:
  - https://albert.ias.edu

- **LaTeX for Humanities.** Aiming to grow the technical skills of scholars working in the humanities, IAS Computing’s Edna Wigderson will conduct a series of training sessions this year in document preparation with LaTeX. These trainings are designed to utilize Overleaf, an online LaTeX editing environment available to IAS scholars. Following the training sessions, it is anticipated that a user group will continue to meet regularly for additional question/answer sessions and advanced tutoring.

- **Digital Scholarship Conversations Series.** The Digital Scholarship Conversations seminar series will continue again this academic year. The schedule for this year’s talks can be found online, at:
  - https://www.ias.edu/digital-scholarship/events_ias/

- **Ongoing Support for DS Projects.** IAS Computing will continue to provide planning services, technical support and oversight for several ongoing projects. These include:
  
  - **Krateros.** Stored in the Albert repository, the effort to digitize the Institute’s unique collection of ancient Greek inscriptions will continue this year.
  
  - **Zaydi Manuscript Tradition.** Continued development on the ZMT project will include expansion of the manuscript collections, and the incorporation of new partnerships.

**Media Technology Services**

- **Rubenstein Commons Planning.** The main focus of MTS improvements in the coming year will be on planning and initial build out of the audio/visual infrastructure for Rubenstein Commons. This work will include fitting all meeting and gathering spaces in the new building with the appropriate technologies, as well as the relocation of the Institute’s Broadcast Center into the building’s lower level.

- **Fully Digital Recording.** To match recent upgrades in Wolfensohn Hall, this coming year, both Bloomberg and Simonyi Hall lecture halls will be upgraded to fully digital video feeds for
the recording infrastructure. This will allow for better quality video capture and improved device flexibility.

- **Interactive Event Overflow.** Building on the Zoom technology described in the prior section, testing will be done this year on interactivity between Wolfensohn Hall and its overflow spaces, such as S-101 and BH Lecture Hall.

**Conclusion**

Thank you again for spending a few moments to familiarize yourself with the recent activity and upcoming projects being worked on by the IAS Computing team. This report is intended to highlight the main themes and provide details on the most impactful changes. It is not a complete listing of all work being performed, and priorities may shift as circumstances dictate.

The intent of all projects is to help achieve Computing’s mission, ensuring that the Institute members, faculty and staff have the necessary information technology resources and services in order to complete their own work. Community input and feedback are a critical component of the process used in prioritizing work. If there are any areas that are not discussed in this summary, or you feel should receive greater attention, please reach out to a member of the Computing staff, and we will work with you to incorporate those ideas into this roadmap.
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