

## Information Systems and Technology

MIT's 2020 IT Vision continues to shape the work of [Information Systems and Technology \(IS&T\)](#). In fiscal year 2018, the department moved forward with a cloud-based software subscription model, hiring a software asset manager and performing an in-depth analysis of its software portfolio and costs. It also completed the transition from on-premises information technology (IT) operations to a hybrid cloud model wherein MIT applications and data interact with online platforms and servers. IS&T now actively brokers IT services for MIT, providing integration, tracking costs, and forecasting.

As the department transitioned to cloud-based services, it required less staff and less space for equipment. In FY2018, the department consolidated its footprint: employees in Building W91 joined colleagues in Building W92, which now houses all IS&T staff. Building W91 was turned over to the provost to put to other use for MIT.

IS&T dedicated significant effort to upgrading MITnet's infrastructure in preparation for the next generation of Internet addressing, IPv6. As part of this effort, IS&T consolidated MIT's in-use IPv4 address space to facilitate the sale of MIT's excess IPv4 capacity. A portion of the net proceeds from the sale are being used to cover costs for NextGen MITnet architecture and equipment.

IS&T's organizational structure underwent modest changes in FY2018. Most notably, Cloud Platforms was elevated to a directorship, and the Service Desk's triage function was outsourced to the CDI Corporation.

IS&T's Architecture Review Board extended the framework developed the previous year for assessing the technical health of MIT systems to provide guidance for new product selection.

With guidance from the Information Technology Governance Committee (ITGC) and the IT Policy Committee (ITPC), IS&T continued on the path to new steady-state IT financial and governance models.

### Governance

ITGC held three meetings with agendas that included IT Policy Committee reports, cloud journey and software governance, software asset management, telephone system updates, draft security protocols for endeavors involving high-risk entities, NextGen MITnet updates, student and administration system steering committee projects and spending updates, modernization funding plan adjustments for FY2018 and FY2019, software funding model updates, Dropbox quota considerations, cybersecurity updates, updates on infrastructure projects, the Committee on Research Computing report, and restructuring options for the committee.

### Highlights

In FY2018, IS&T continued to develop platform-based applications in partnership with various departments, labs, and centers (DLCs). It also provided the MIT community with robust IT services, from Service Desk support and IT training opportunities to extensive network improvements.

## Applications Delivered in Partnership with the Community

IS&T evaluated, developed, deployed, and updated software releases that benefited DLCs and administrators, often in collaboration with other departments. Some of these releases are integrated with the SAP HANA platform and others with the MIT Data Warehouse or Atlas. A number of platform-based projects and applications were completed in FY2018:

- **Data Warehouse 2.0:** This multi-year project is designed to migrate MIT's Data Warehouse to the SAP HANA platform, delivering real-time access to data and reducing IT support costs. IS&T converted the grant management and human resources subject areas (including data on faculty, student, and employee appointments), certifications for eDACCA (a monthly consolidated salary expense report), and benefits eligibility.
- **SAP semi-monthly payroll conversion:** To align with payroll best practices, all monthly paid MIT faculty, staff, graduate students, and fellows were transitioned in April 2018 to a semi-monthly pay schedule. IS&T updated SAP and the Data Warehouse to support this twice-monthly processing of payroll.
- **SAP support pack implementation:** This yearly effort ensured that MIT's SAP infrastructure remained current with SAP's most recently released software.
- **SAP/Data Warehouse disaster recovery exercise:** IS&T performed a comprehensive disaster recovery test for SAP applications including core SAP, Atlas, the Data Warehouse, OpenText archiving, and Business Software Inc. tax reporting to ensure that it was possible to recover all of these systems to MIT's alternate location in Santa Clara, CA; the test was completed successfully.
- **Atlas for new graduate students:** IS&T implemented and deployed an Atlas-based onboarding process for incoming MIT graduate students. As part of this project, IS&T revamped the MIT Kerberos account/email signup process for incoming graduate students to eliminate a manual process involving coordination between departmental academic administrators and the IS&T Service Desk; the new process is fully automated based on data in Grade20, MIT's central graduate admissions system.
- **ServiceNow support package implementation:** This effort ensured that MIT's ServiceNow infrastructure, used by IS&T and the Atlas Service Center for incident, request, and change management, remained current with the vendor's most recently released software.
- **Office of the Executive Vice President and Treasurer (EVPT) dashboard:** The initial release of this dashboard centered on MIT Facilities, displaying information on building projects and repair work orders across campus buildings and departments.
- **DataPool:** In collaboration with the Office of Sustainability, IS&T developed a portal for campus sustainability data; the department worked on both sourcing the data and developing visualizations of several sustainability topics. The platform is powered by the IS&T Data Hub and Tableau.

- Cloud migration: IS&T completed the migration of enterprise applications to vCloud Air, including Stellar, MITSIS, Undergraduate Admissions, Roles, Managed Data Services, the Family Resource Center, and the Space Management System. The department also completed the retirement of the Oracle Real Application Clusters platform.
- Application and system integration: IS&T used Mulesoft as a platform for providing standardized and efficient access to data. Notable projects included cross-registration integration, which supports MIT and Harvard students being able to cross register between the institutions, and people integration, which provides a standard interface for applications to access basic directory information about students, staff, and affiliates at MIT.

In FY2018, IS&T also actively supported the applications it developed in FY2017 in partnership with DLCs (e.g., GAP, SANDI, COSMOS, and Buy-to-Pay).

IS&T's Architecture Review Board reviewed and made recommendations on a number of IT projects, including the deployment of IPv6 support on campus, the implementation of SlideRoom for Undergraduate Admissions, the new MIT home page, enhancements to integrations between Roles and MITSIS, and the campus parking process redesign.

### **Support and Services to the MIT Community**

IS&T continued to provide many services to IT providers and consumers on campus, from Service Desk support and IT training to raising awareness about cybersecurity issues.

IS&T's Provider and Consumer Support teams filled an essential role at the Institute, helping members of the MIT community stay up and running with answers to all of their computing questions. Support ranged from IT help online, by phone, or in person to on-site support and endpoint management.

In FY2018, Provider and Consumer Support resolved more than 75,000 tickets, completed over 2,000 repairs in the Atlas Service Center, and fulfilled more than 1,500 computer orders, renewals, and recoveries. The Service Desk moved from pilot to full-production, around-the-clock telephone and email support with the CDI Corporation in April 2018 and provided initial first-tier troubleshooting services to an increasing number of MIT departments.

Also, Provider and Consumer Support performed many specialized assignments during FY2018. For example, team members:

- Onboarded the MIT Investment Management Company (MITIMCo) and Industrial Liaison Program (ILP) to IS&T's managed deskside support services
- Used remote imaging tools to push updates to hundreds of devices and visited more than a thousand offices on campus to reconfigure the local settings of approximately 8,000 devices in time to meet the deadline for the NextGen MITnet address range transfer
- Consolidated IS&T's BoardEffect offering for use by MIT boards and committees

- Provided endpoint management to over 50 DLCs using Jamf Pro and the Microsoft System Center Configuration Manager, with more than 5,000 computers and 350 mobile devices updated
- Supported 231 DebAthena machines and 32 Apple Macintoshes in campus Athena clusters, adding and updating software throughout the year

The department provided the community with a wide range of IT training and educational opportunities in FY2018. For instance, IS&T staff:

- Developed eLearning courses (taken by more than 2,500 community members) to support MIT's greenhouse gas initiative
- Developed eLearning courses hosted in the Atlas Learning Center (taken by over 4,500 community members) and provided support for Lynda.com courses, with 25,000 active accounts in the MIT community
- Partnered with Human Resources; Environment, Health & Safety; the Office of the Vice President for Finance; and other DLCs to support their knowledge management needs through eLearning, documentation, and hands-on workshops
- Provided in-person security awareness training to Environment, Health & Safety; the Research Laboratory of Electronics; and Human Resources
- Updated the SANS Securing the Human eLearning courses available through the Atlas Learning Center
- Provided Third Thursdays training for Data Warehouse users and led the Reporting User Group
- Started a Quick Base user group, facilitating communication between Quick Base application builders and offering meetings on topics such as notifications, uploading of data from the Data Warehouse, and reporting
- Offered several IT courses during Independent Activities Period (IAP)
- Provided leadership for the Women in Technology Employee Resource Group
- Added over 250 new articles to the IS&T Knowledge Base (KB) and updated more than a thousand KB articles with new content

In addition, IS&T offered several educational workshops and meetings for campus IT technicians. Workshops covered topics such as Jamf and the Microsoft System Center Configuration Manager; meetings focused on endpoint management and talks by vendors such as Lenovo and Dell. IS&T also hosted the daylong 2017 Higher Education Endpoint Management Conference.

The department sponsored 2017 back-to-school events (Academic Expo and Computing@MIT) attended by more than 700 students. IS&T staff actively participated in the EVPT poster session and the IT Partners Conference.

IS&T also hosted a “shred-it” day during which community members could drop off papers, disks, and hard drives for secure disposal. As of FY2018, the department offers laptop tagging every weekday in the Atlas Service Center.

The department continued to actively engage with its staff and the MIT community through social media. Across the four public platforms on which IS&T is active (Twitter, Facebook, Instagram, and Snapchat), its follower count had grown to over 7,500 people by the end of FY2018 (an increase of 35%). IS&T engaged with 25% of the incoming Class of 2021 on social media in August and September 2017 and used social media promotion to help drive half of incoming freshmen to interact in person with IS&T staff at orientation events.

## Security

IS&T actively responded to cybersecurity threats throughout the year. Among other measures, the department:

- Quarantined approximately 200 compromised devices from the network
- Suspended approximately 30 compromised user accounts
- Mitigated eight major denial of service attacks (DDoS) using Akamai’s Prolexic service with no disruption to MITnet
- Responded to two internally discovered data breach incidents
- Notified website owners of nearly 300 vulnerable web pages

IS&T also created a cybersecurity scorecard for a presentation made to the Risk and Audit Committee. The department strives for a balance between MIT’s need for openness and its need for IT-related security.

IS&T focused as well on the IT aspects of physical security at MIT. IS&T staff:

- Developed, tested, and deployed a process for nightly scanning of public MIT Andrew File System (AFS) content for social security numbers.
- Partnered with the MIT Police and MIT Emergency Management to implement a new civilian dispatcher and communication center. Technology components included state-of-the-art dispatch consoles, redundant positions for alarms, campus monitoring, computer-aided dispatching, and a multi-screen video wall displaying views of campus and local law enforcement bulletins.
- Worked with the MIT Police to procure next-generation encrypted wireless communications for the entire department. For officers in the MIT motorcycle unit, this included radio interoperability with state police and neighboring municipalities; wireless radio frequency technology allows motorcycle officers to have hands-free radio operation, increasing clarity in transmissions to dispatch as well as officer safety.
- Decommissioned the remaining 97 legacy magnetic swipe readers in 22 buildings and 10 elevators on the campus. They were replaced with new proximity readers, cabling, and control panels that meet MIT standards.

## Network Improvements

In FY2018, IS&T focused on updates to MIT network infrastructure. The department:

- Improved wireless network coverage on campus, adding more than 555 additional access points (for a total of over 6,555 access points)
- Piloted new small cell technology, leveraging existing Wi-Fi infrastructure to enhance cell coverage in Buildings E2 and 76
- Through capital renewal and major construction efforts, improved the network infrastructure in Building W70 (New House)
- Worked with the MIT.nano team to bring the new facility and its complex systems online
- In partnership with the Division of Student Life, improved the network infrastructure in Buildings W7 (Baker House), W71 (Next House), W79 (Simmons Hall), and NW10 (Edgerton House)
- Extended MITnet services to Buildings NE103, NE36, and NW38
- Assisted with the Department of Facilities migration of all building automation systems to IS&T's secured building management system network
- Migrated over 750 lines off 5ESS (an older electronic switching system for phones) to a centralized Voice over Internet Protocol (VoIP) system
- Upgraded more than 100 edge switches in various buildings in support of NextGen MITnet
- Installed rack-mount uninterruptible power supply systems on over 140 racks connected to network equipment on campus to help improve network resiliency to power-related events

## Administration

IS&T supports the development and engagement of its employees. Ten new employees joined the department, and six were promoted. Ninety-two Spotlight Awards and 21 Infinite Mile Awards were presented in FY2018.

## Staff Development

During the past year, IS&T continued to open meetings of the Architecture Review Board to all staff.

IS&T staff participated in, contributed to, and played key formal and informal leadership roles, in various professional and industry organizations and conferences such as Internet2, Educause, the Common Solutions Group, the Northeast Regional Computing Program (NERCOMP), the Boston Consortium, the Ivy Plus groups, the SAP International Higher Education and Research Conference, the Association of American Universities Data Exchange, and the Research University CIO Conclave. Staff members collaborated with a wide range of vendors and outside groups.

## Employee Engagement

In FY2018, IS&T continued to offer office hours with senior leaders.

The Individual Contributor Advisory Team (ICAT) held many events during the year, including ICAT meet and greet breakfasts, a “lunch ‘n learn” session about ICAT, and Third Thursday get-togethers after work. ICAT also offered office hours and continued to be available to IS&T employees as a liaison between management and staff.

## Summary of Financials

IS&T provides its IT services through various funding models, including the General Institute Budget (GIB), software development, and revenue recovery. In FY2018, IS&T was given a net budget allocation of \$95.1 million, which included a Pool C loan in the amount of \$16.5 million. IS&T spent \$85.7 million, or \$9.4 million less than budgeted, reducing the necessary Pool C loan to \$7.1 million.

Year-end GIB gross expenses totaled \$87.6 million and were under budget by \$6.7 million. The \$6.7 million variance in GIB gross expenses was primarily due to open position savings resulting from positions that were not backfilled and positions on hold throughout the year, one-time vendor credits, and procurement governance activities. This positive variance was partially offset by higher than anticipated depreciation and interest expenses related to write-off of older capital assets. The breakdown of the \$87.6 million in IS&T gross expenses is as follows:

- Forty percent (\$35.2 million) was spent on network and cloud connectivity, infrastructure, and network security–related expenses.
- Twenty-five percent (\$21.8 million) was spending related to enterprise software products designed to support administrative, student, and infrastructure systems and platforms.
- Seventeen percent (\$14.6 million) was spent on system implementation and integration, user experience and design, and data analytics/science expenses.
- Ten percent (\$8.8 million) was spent on provider and consumer support costs.
- Eight percent (\$7.2 million) was spent on operational and administrative support costs.

IS&T spent \$7.6 million on software development consulting. The breakdown of this \$7.6 million in expenses is as follows:

- Forty-six percent (\$3.45 million) was spent on non-project support work for MIT’s core enterprise systems.
- Twenty-eight percent (\$2.2 million) was spent to support software development projects for the Administrative Systems Roadmap. These projects include the Data Warehouse HANA Migration project, SAP SuccessFactors Employee Central with Applicant Tracking System project, and the data governance monthly expenses dashboard.



- Nineteen percent (\$1.45 million) was spent to develop student systems roadmap projects, including the rollout of the CourseLeaf curriculum module, cross registration for Harvard subjects, and enhancements to student systems platforms.
- Seven percent (\$528,000) was spending related to enhancements of and discovery work on internal IS&T IT projects and development work for DLCs. IS&T received outside funding to cover project expenses for the latter.

Approximately 5% of IS&T activity (\$4.7 million) is funded from services that are billed to DLCs for telephone and network infrastructure services, desktop support, and software distribution. In FY2018, funding from these sources was \$283,000 higher than budgeted, primarily due to an increase in desktop support service-level agreements across MIT.

### **Looking Forward**

Guided by MIT's 2020 IT Vision, IS&T is effectively closing in on its cloud-first strategy for subscription-based software and IT modernization.

IS&T continues to work on a software funding model with the expectation that, over the next year, the department will shift to buying cloud-based software subscriptions on a per-user basis. This shift will require more active management from IS&T to assign users to appropriate bundles and track role changes. The transition will also be impacted by MIT's open culture, which makes software standardization more difficult.

Given that the annual software subscription model is significantly more expensive than the software licenses ("buy it and own it") of the past, ITGC and ITPC will work with IS&T to identify options for recovering costs and handling growth.

Modernization of administrative and student systems continues to be a priority, with a cloud-first strategy for platform-based applications and a move away from on-premises IT operations. Managing portfolio content will be a key requirement, along with lowering the barrier for leveraging Institute data. As with subscription-based software, IS&T will work with IT governing committees to develop a plan for funding recurring costs.

As always, IS&T remains committed to working with the community to provide innovative systems, a secure network, and a full range of IT services and software. It is well on its way to achieving its 2020 vision of IT excellence.

**John Charles**

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